

Estates Decarbonisation Strategy

A Roadmap to Net Zero Carbon
Executive Summary



HEALTHIER PLANET
HEALTHIER PEOPLE



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1. What is the Estates Decarbonisation Strategy?

The Estates Decarbonisation Strategy provides a roadmap for Leeds Teaching Hospitals NHS Trust (LTHT) to achieve net zero carbon operation focusing on the scope 1 and 2 emissions associated with operational energy. The Decarbonisation Strategy outlines the steps required for the removal of fossil fuels as primary energy sources across the LTHT estate and provides a framework for future capital projects to ensure the Trust continues on the net zero journey.

It aligns with the Trust's Green Plan and Estates Strategy and is in line with the NHS priorities established within the Delivering a 'Net Zero' National Health Service and Estates 'Net Zero' Carbon Delivery Plan reports.

The key elements of the Decarbonisation Strategy are:

- To ensure the Trust aligns with the NHS ambition to be the first healthcare system in the world to reach net zero carbon emissions
- Provide a clear roadmap for the LTHT estate to reduce operational energy and carbon emissions in line with NHS net zero carbon targets
- Provide site specific strategies which align with the key goals and themes of the Green Plan and Estate Strategy
- Support the Trust in achieving the Estate Strategy goals to provide safe, high quality, sustainable healthcare



2. Trust Vision and Compliance

2.1. NHS Strategic Direction

NHS mandate to decarbonise

Climate change directly impacts the population's health, and providing healthcare services contributes significantly to the UK's carbon footprint. The NHS has committed to decarbonising its operations including all aspects of NHS healthcare services, their estates and supply chains.

For the NHS to achieve net zero two targets have been developed:

- Net zero by 2040 for the NHS Carbon Footprint with 80% reduction by 2028 to 2032
- Net zero by 2045 for the NHS Carbon Footprint Plus with 80% reduction by 2036 to 2039

The ambitious targets, shown in Figure 2.1, make it imperative that individual Trusts push for decarbonisation to ensure the NHS can meet its commitments.

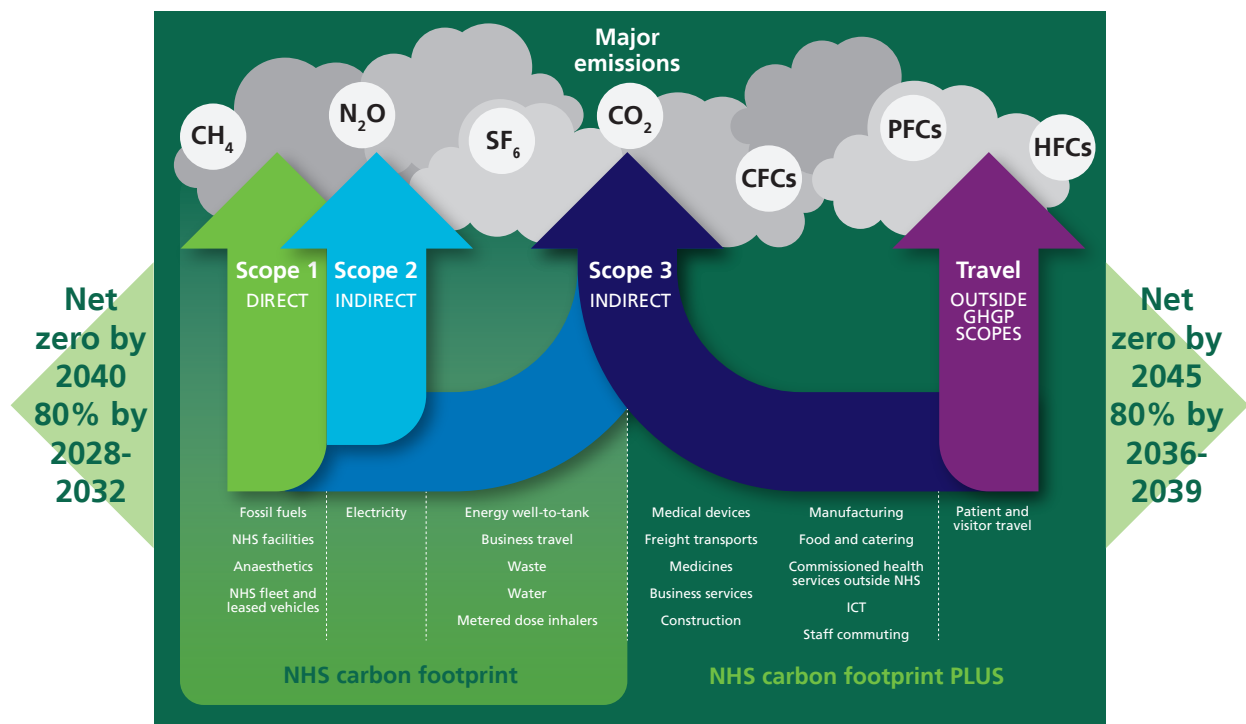


Figure 2.1: NHS Carbon Footprints and Carbon Emissions Scope

New guidance and policies are coming into place to support and drive forward the decarbonisation of the NHS. The Estates 'Net Zero' Carbon Delivery Plan introduces the estates strategy; a four-step approach helping to drive a more efficient operation of healthcare services, pushing circular economy and low carbon energy. Other policies ensure buildings have net zero carbon emissions throughout both construction and operation, such as the new 'NHS Net Zero Building Standard'. Compliances with HTM and HBM standards will ensure that NHS buildings will help deliver quality healthcare in buildings designed for the future.



Figure 2.2: Four step approach to decarbonise the NHS estate, Estates 'Net Zero' Carbon Delivery Plan

2.2 LTHT Vision

Leeds Teaching Hospitals NHS Trust (LTHT) has the ambition to be one of the greenest NHS Trusts in the UK. The Trust has set clear commitments to improving sustainability throughout the organisation, with significant work underway to align with NHS targets. The Trust will publish the update to the Green Plan in 2022 which alongside the Estate Strategy drives sustainability and working towards achieving net zero.



LTHT Green Plan

The Green Plan is the central sustainability strategy which addresses all scopes of emissions and NHS carbon targets. The document focuses on 10 core areas aligned with the key drivers for change within the NHS and covers a wide range of sustainability considerations beyond those more typically associated with reducing carbon emissions such as sustainable care models and digital transformation.

LTHT Estate Strategy

The Estate Strategy has 6 key goals that will enable the Trust to provide safe, high quality, sustainable healthcare. The key goals focus on targeted development of the LTHT estate to reduce backlog and provide an efficient, suitable estate for the changing face of healthcare delivery.

LTHT Estate Decarbonisation Strategy: A Roadmap to Net Zero Carbon

The purpose of the Decarbonisation Strategy is to provide the Trust with a roadmap towards net zero operation in line with NHS targets. A suite of documents has been produced to provide a robust solution, including an overarching guidance document and site-specific roadmaps which align with the key goals and themes of the Green Plan and Estate Strategy.

	Estate Strategy	Green Plan	Decarbonisation Strategy
Reducing our backlog liability	Invest in and reduce critical backlog maintenance by 50% within the next 15 years, in clinical areas that will remain for the long term.	Ensure the estate is fit for the future and facilitates high quality healthcare services and a healthy environment for patients, staff and visitors.	Reduction in backlog liability through targeted building fabric upgrades and replacement of ageing services infrastructure.
	Remove backlog, including critical infrastructure risk (CIR), through the Building the Leeds Way Programme.		The roadmaps include the planned development for the different sites across the estate, illustrating the operational cost and carbon benefits of investment in sustainable development of the site.
Become one of the greenest trusts in the UK	Deliver the Green Plan, demonstrating significant carbon reduction by 2030 and becoming carbon neutral by 2040.	Sustainable Action Plan in place to improve sustainability and reduce emissions.	Implementation of the proposed roadmaps will enable the Trust to achieve the 80% targeted reduction in NHS Carbon Footprint emissions by 2032 and be in a strong position to continue working to net zero by 2040.
	Deliver BREEAM Excellent healthcare buildings	Demonstrates the importance of green spaces on the environment and the community. Ensure new building work aligns with BREEAM.	The overarching strategy provides guidance for future projects with respect to carbon accounting to ensure that development of the estate is sustainable including alignment with BREEAM.
Support future clinical and corporate requirements	Redevelop the Estate with a patient-centred approach.	Investigates patient-centred outlook to determine important values and aims to deliver changes to improve patient care and environmental impact.	Business case guidance that incorporates carbon into project reviews and decision making.
	Improve the resilience of the estate by continual investment in its infrastructure.	Aims to educate and engage staff to empower them to take action to improve sustainability.	Improve existing buildings to improve suitability and thermal comfort by fabric improvements and services.
	Deliver the necessary estate for the implementation of cutting edge technologies.	GRASP Programme which promotes sustainable behaviours.	Resilient energy systems that ensure clinical services can continue to be delivered in the face of climate change.
	Invest in improving staff facilities.	Carbon Literacy training in place to help positively influence the behaviour of the staff and patients.	
Reducing size of the estate	Develop a lean estate that aligns to clinical and corporate needs.	Initiatives to review clinical services provision digitally and increased working from home would result in less site accommodation to be required.	Roadmaps utilise the proposed site masterplans for LGI and SEA which focus on the removal of buildings not fit for purpose; and in some cases, the provision of new accommodation e.g. HotF.
	Reduce the overall estate size by 2035.		Interventions to improve retained assets to reduce baseline energy consumption and move to leaner buildings.
Improve space utilisation	Reduce non-clinical floor space.	Looks into staff working from home where possible to reduce air pollution from travel, which would allow rationalisation of under utilised office space.	Roadmaps utilise the proposed site masterplans for LGI and SEA and planned developments on all sites, which focus on improvement of retained estate to ensure they can provide clinical services and in some cases, removal of buildings that are not fit for purpose.
	Reduce unoccupied and under-used floor space.		
Develop a digital estate	Support the Trust's digital strategy.	Looks to facilitate virtual appointments and reduce paper usage by using a digitalised system.	Review and potentially upgrade and install improved building monitoring systems (BMS) across the estate to improve information available on the operation of the estate. Improved BMS will enable more efficient management of energy consumption.
	Create smart buildings to improve environmental and social elements for a healthy hospital.	The Trust is upgrading 16,000 computers throughout the organisation to improve systems and ensuring equipment is recycled where possible.	
	Develop a single multi-purpose interconnected 'Smart' infrastructure that produces information related to the built environment, to improve and deliver operational performance, sustainability, patient care and experience.		

Table 2.1: LHT Strategy Alignments



The Estates Decarbonisation Strategy focuses on the operational energy emissions under scopes 1 and 2 as these are most relevant to work undertaken by Estates and Facilities.

Alignment of this strategy with the Green Plan and Estate Strategy is essential to support the Trust's aim to prioritise interventions that will enable the Trust to continue delivering quality patient care and carbon reductions whilst improving wider sustainability performance.

2.3. LTHT Challenge

The LTHT estate comprises of a wide range of building types, varying in age, heritage, condition and suitability for clinical delivery. It is vital that existing accommodation is reviewed for suitability and use in line with the Estate Strategy goal to reduce estate size and improve space utilisation; as well as identifying opportunities for improvements in energy reduction. Additionally, the future estate development in terms of clinical direction and service delivery should be considered to ensure the Trust builds on the strong sustainability work already undertaken and continues to push towards net zero.

The Decarbonisation Strategy focuses on the five acute hospital sites:

- St. James's University Hospital (SJUH)
- Leeds General Infirmary (LGI)
- Chapel Allerton Hospital (CAH)
- Seacroft Hospital (SEA)
- Wharfedale Hospital (WHF)

SJUH and LGI are large acute hospitals that are responsible for the majority of the Trust's energy consumption and operational carbon emissions; Figure 23 shows the proportion of annual carbon emissions attributed to each of the sites.

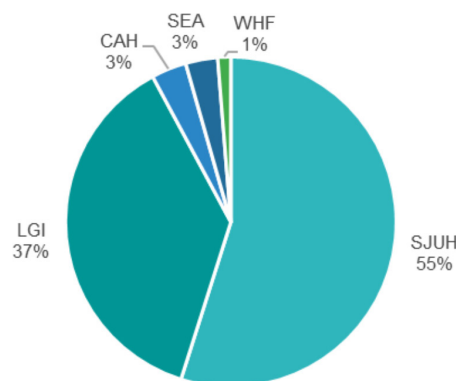


Figure 2.3: Annual Estate Carbon Emissions
Source: 2021/22 annual emissions provided by WRM

The extent to which SJUH and LGI dominate the estate energy and carbon figures demonstrates the importance in sustainable development of these two sites as they have the largest impact. Across the sites, 15 blocks consume 80% of the total energy consumption for the whole estate; Bexley Wing (at SJUH) and Jubilee and Clarendon Wings (at LGI) consume approximately 50% of the total estate annual energy consumption alone.

The forecast for total LTHT estate annual carbon emissions for 'business as usual' (BAU) are shown in Figure 2.4, with the target for an 80% reduction in operational emissions in line with NHS targets. The graph clearly shows the dominance in gas consumption from use of the combined heat and power (CHP) engines serving both the SJUH and LGI sites to provide heat and electricity.

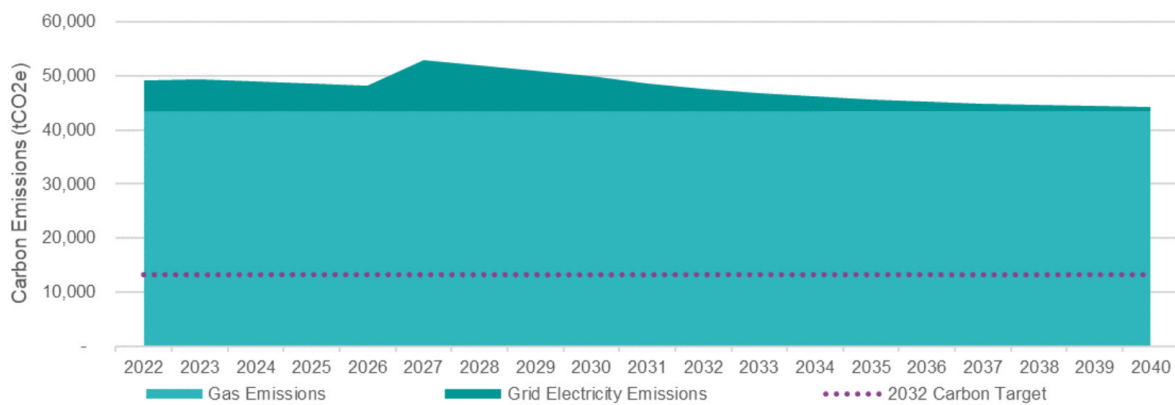


Figure 2.4: LTHT Operational Carbon Emissions for BAU

Source: 2020/21 measured energy consumption and BEIS Green Book Long-run marginal carbon factors

It is vital that fossil fuel consumption is reviewed on all sites and heat is decarbonised to enable a meaningful reduction in carbon emissions to achieve the 2032 target.

Due to the extent of capital investment required for the proposed roadmaps and the availability of capital budget and additional funding opportunities such as the Public Sector Decarbonisation Scheme (PSDS) it is likely that the Trust will undertake a staged approach to each estate as shown in Figure 2.5.

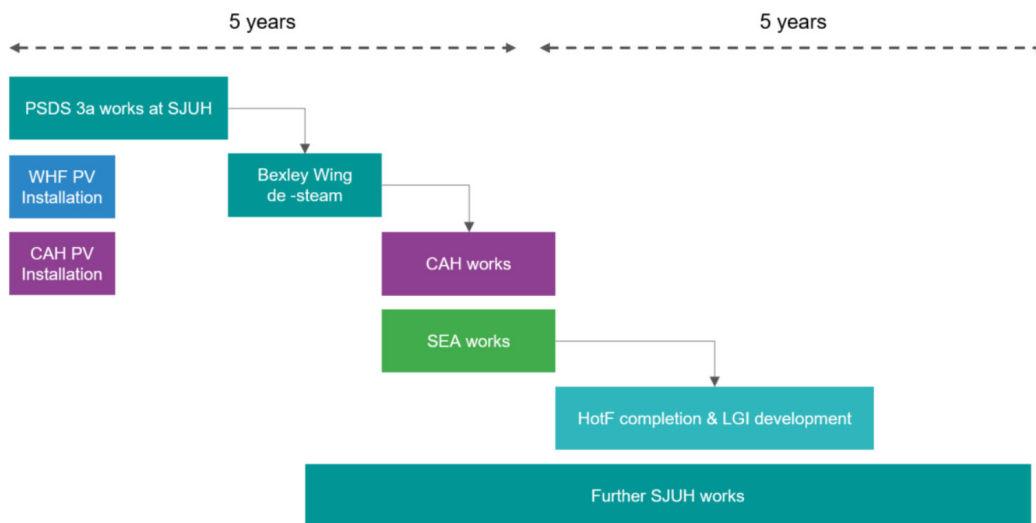


Figure 2.5: Trust Works Timeline

Currently PSDS works are being undertaken at SJUH to improve some building fabric and to de-steam a number of ancillary buildings on the site. An air source heat pump (ASHP) is being installed on the low temperature hot water (LTHW) system that will be interlocked with the CHP to provide additional LTHW with improved efficiency. In addition to this, a connection to Leeds Pipes district heat network (DHN) is also being installed to provide resilience and another source of low carbon heat on site. Post completion of these works the Trust is aiming to undertake de-steaming and energy efficiency works for Bexley Wing (also at SJUH), which is the most energy intensive building on the LTH estate, to further reduce energy and carbon. Further works aligning with the SJUH roadmap will continue to be undertaken to reduce energy consumption and carbon emissions.

Following the PSDS Phase 3a works at SJUH the next step will be works at both CAH and SEA; including fabric and system improvements to reduce energy demand prior to electrification of heat. Whilst works are ongoing at CAH and SEA, the new Hospital of the Future (HotF) development will be being constructed at LGI. Completion of the HotF will allow the Trust to redevelop the rest of the LGI site.

2.4. Roadmap to Net Zero Carbon

The Decarbonisation Strategy provides a roadmap for each of the sites which align with the LTH Estate Strategy and Green Plan. The interventions at each site have been developed alongside the four-step approach illustrated in the NHS Estates 'Net Zero' Carbon Delivery Plan (see Figure 22). This strategy emphasises the importance of driving down the energy consumed on site with targeted building management and efficiency measures before then transitioning to low carbon energy sources.

By using a data-driven modelling methodology to assess the estimated energy consumption on a block-by-block basis, priority actions have been identified for the Trust to direct interventions for maximum benefits.

The Trust is currently undertaking works that will reduce energy consumption and carbon emissions across the estate which have been included in the site roadmaps. As part of the LTHT Estate Strategy, masterplans are being developed for SJUH, LGI and SEA. The high level impact of current thinking for LGI and SEA on energy and emissions, at Trust and site levels, has been included within the energy modelling and forecasting.

The interventions for the sites have been modelled in an optimal workflow to provide maximum benefits to the Trust, and on individual site timelines. Figure 2.6 shows the projected reduction in carbon emissions through implementing each of the site roadmaps and the potential to achieve the 80% reduction in operational carbon two years prior to the 2032 target.

The operational costs have been forecast based on data available to LTHT in July 2022 and current BEIS Green Book values. The graphs reflect the current significant increase in energy unit costs to the Trust through existing energy contracts and the unpredictability of the energy market. Despite the rapid increase in energy costs the proposed interventions across the estate result in a lower expected operating cost compared to 'business as usual' due to reduced energy consumption as shown in Figure 2.7.

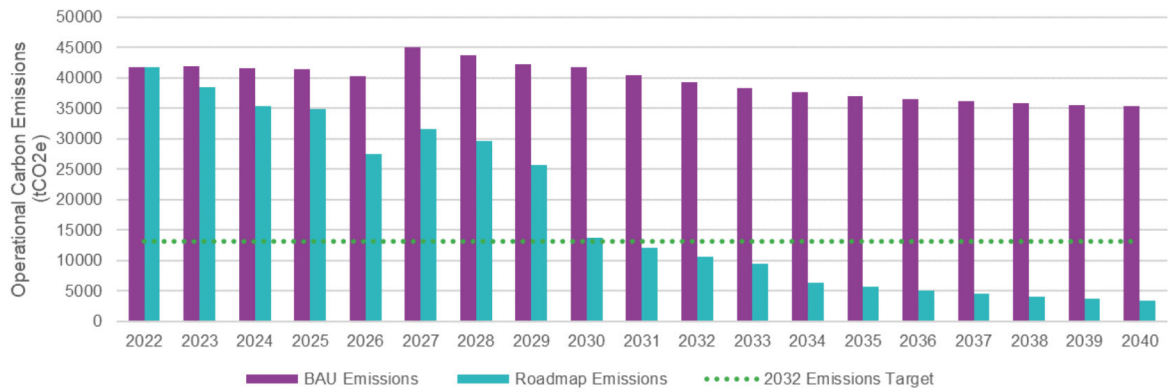


Figure 2.6: LTHT Roadmap Operational Carbon Emissions

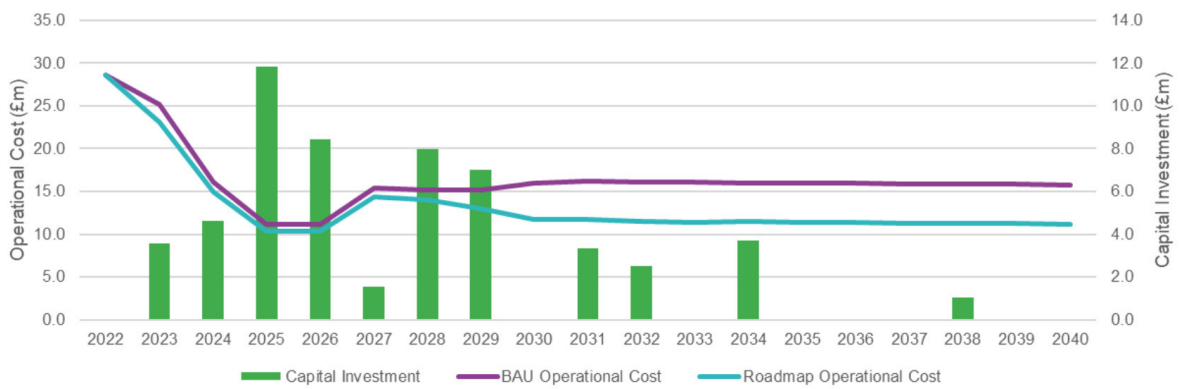


Figure 2.7: LTHT Operational Cost and Capital Investment

3. St James's University Hospital

St James's University Hospital (SJUH) is one of the largest NHS hospital estates in the UK and is the largest of the LTHT sites. The site comprises five main clinical blocks and multiple ancillary blocks providing clinical and non-clinical accommodation, University of Leeds accommodation and the Thackray Medical Museum.

The Trust has been successful in securing funding from the PSDS Phases 1 and 3 which has been utilised for multiple energy savings initiatives across the site.

Site progress towards Net Zero

- Beckett Wing roof and glazing upgrades and LED lighting replacement. Connection of Beckett Wing to Leeds Pipes district heat network
- Ongoing glazing replacement for Gledhow Wing
- Heat pump installation to be interlocked with the CHP for heat generation
- Single glazing replacement for Research and Innovation Centre and roof replacements for Lincoln Wing, ETDC and Chancellor's Wing
- Connection of 10 blocks to the LTHW network on site to reduce steam consumption, and connection to the Leeds Pipes network for additional resilience
- All external lighting is LED and local LED replacements across the site



6.48

2020/21 Operational Energy Cost (£m)¹

25,309

BAU Annual Operational Energy Carbon Emissions (tCO₂e)²





6,917

2032 Carbon Emissions Target (tCO₂e)

5.58

Roadmap 2032 Annual Operational Energy Cost (£m)



5,563

Roadmap 2032 Annual Operational Energy Carbon Emissions (tCO₂e)

£28.8m

Roadmap Capital Investment



The site roadmap includes:

- BMS controls reviews for all main clinical blocks to improve efficiency and reduce energy consumption and align with improving the digital estate
- Fabric improvements to reduce energy demand and enable lower operating temperatures
- Further de-steaming of the site and decarbonisation of heat which reduces critical backlog risk, maintenance and operational carbon

Implementing these steps will enable SJUH to meet the NHS target for 80% reduction in NHS carbon footprint emissions and reduces site energy consumption by over 45%.

¹ Operational energy cost from ERIC 2020/21 (includes gas, electricity, oil and other energy costs)

² SJUH 2021/22 annual emissions for gas and grid electricity provided by WRM



Figure 3.1: SJUH Operational Carbon Emissions

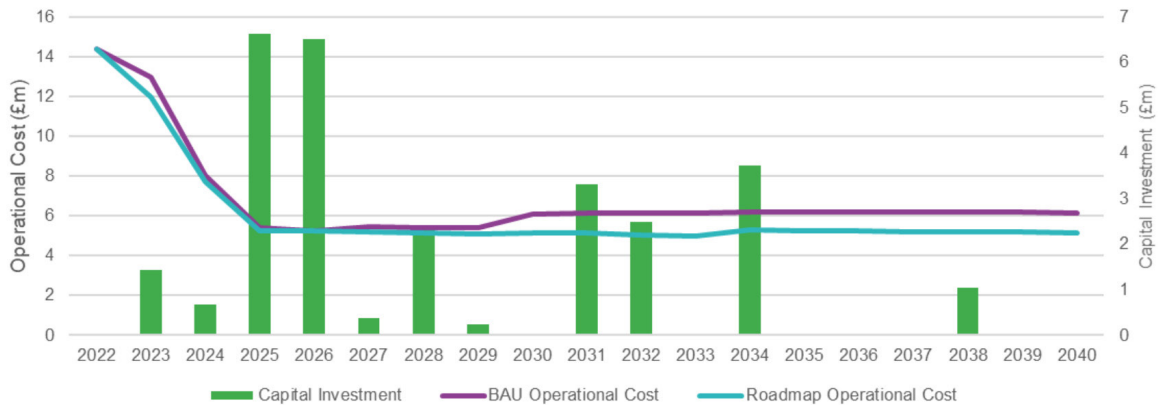


Figure 3.2: SJUH Operational Cost and Capital Investment

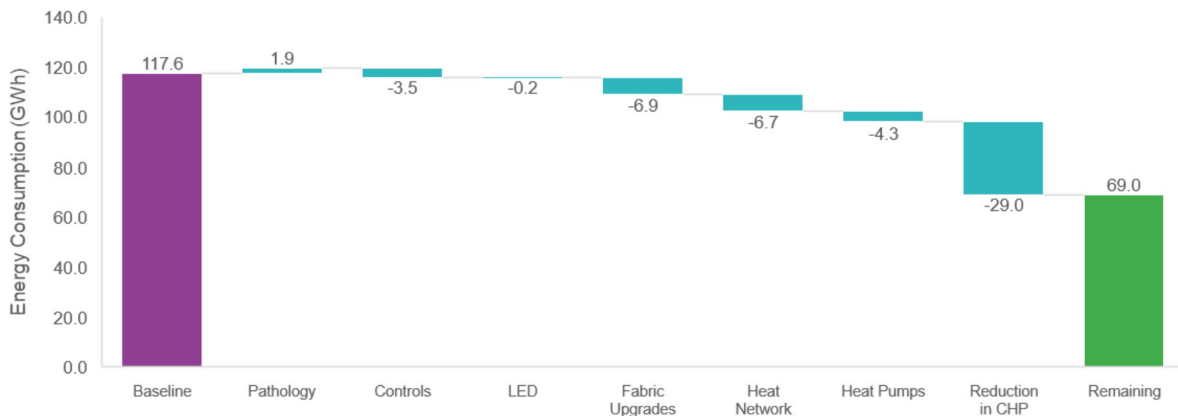


Figure 3.3: SJUH Operational Energy



4. Leeds General Infirmary

Leeds General Infirmary (LGI) is the second of the two major acute teaching hospitals operated by the Trust. It is a mix of listed, historic and modern buildings and is currently undergoing redevelopment as a part of the New Hospital Programme (NHP). The NHP will see the construction of the Hospitals of the Future (HotF) development set to be complete in 2027; a new 94,000m² hospital which will consolidate services at the LGI and across the wider LTHT estate.

The HotF development is key to unlocking the future development of the LGI site and will enable works for significant reductions in energy and carbon.

Site progress towards Net Zero

- HotF will be designed in accordance with the upcoming NHS Net Zero Building Standard, with a fully electrified heating solution providing a much lower energy use intensity (EUI) in comparison to other buildings across the estate



4.55

2020/21 Operational Energy Cost (£m)³

17,186

BAU Annual Operational Energy Carbon Emissions (tCO₂e)⁴





5,359

2032 Carbon Emissions Target (tCO₂e)

5.45

Roadmap 2032 Annual Operational Energy Cost (£m)



3,161

Roadmap 2032 Annual Operational Energy Carbon Emissions (tCO₂e)

£15.3m

Roadmap Capital Investment



The site roadmap includes:

- Controls reviews for all main clinical blocks to improve efficiency and reduce energy consumption and align with improving the digital estate
- LED lighting installation throughout the blocks that will be retained through the site redevelopment to reduce energy demand
- Fabric improvement works for Eckersley House (Sick Children's Trust (SC) accommodation) to reduce energy demand and enable lowering of operating temperatures prior to replacement of the gas boiler with heat pumps to reduce fossil fuel consumption



- Glazing upgrades to the blocks that will be retained through site redevelopment to reduce energy demand
- Decarbonisation of heat on the site by exploring low carbon heat opportunities
- HotF completion and future site rationalisation and development which will provide an overall reduction in estate size and increase in space utilisation

Implementing the steps enables the LGI site to meet the NHS target for 80% reduction in carbon emissions associated with energy use and reduces site energy consumption by 60%.

³ Operational energy cost from ERIC 2020/21 (includes gas, electricity, oil and other energy costs)

⁴ LGI 2021/22 annual emissions for gas and grid electricity provided by WRM

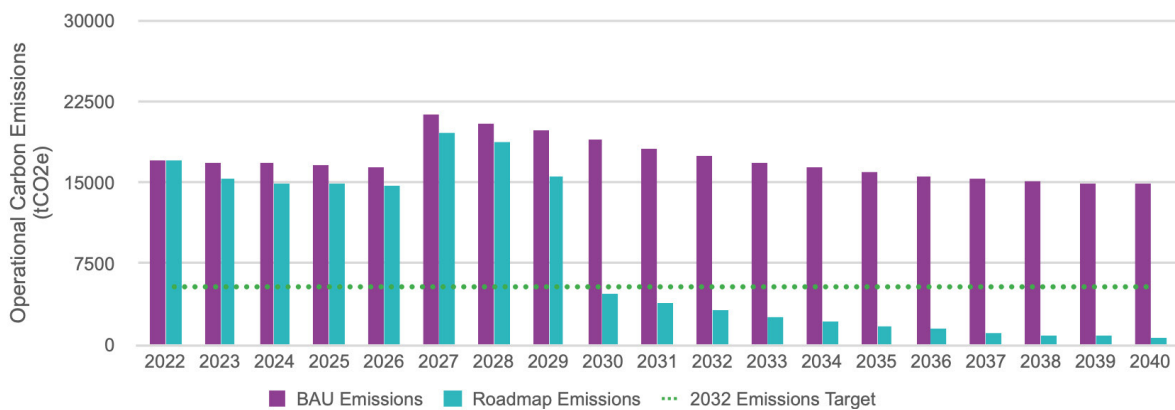


Figure 4.1: LGI Operational Carbon Emissions

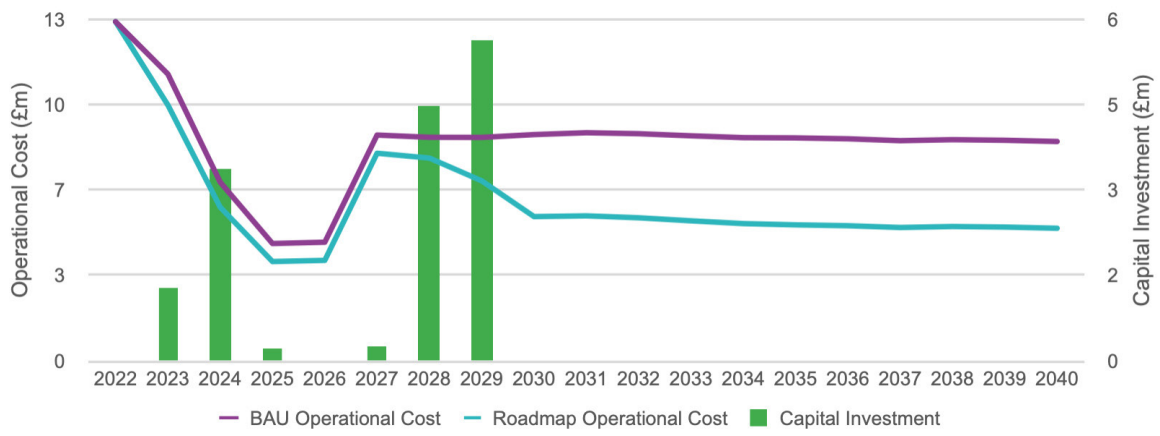


Figure 4.2: LGI Operational Cost and Capital Investment

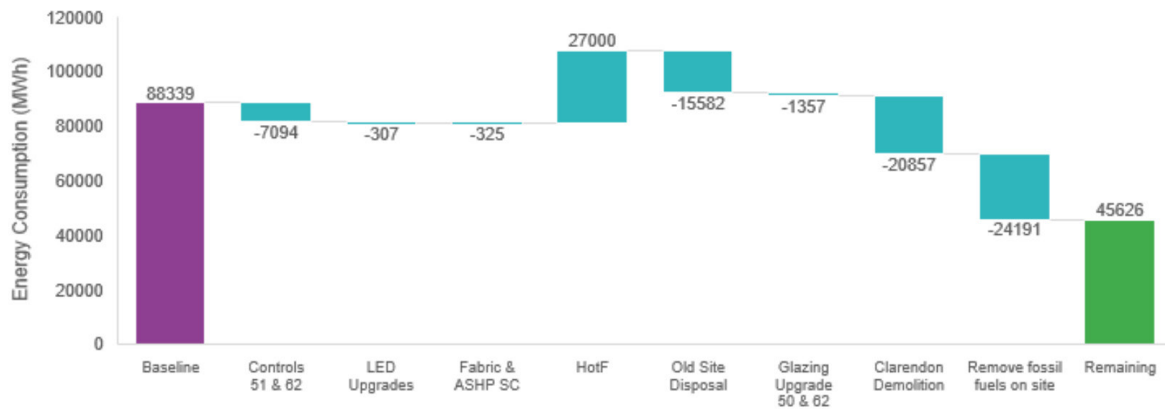


Figure 4.3: LGI Operational Energy



5. Chapel Allerton

Chapel Allerton Hospital (CAH) provides both inpatient and outpatient services and is a nationally acclaimed centre for musculoskeletal research.

The site accommodation is a mixture of 1970s and 1990s buildings; the thermal performance of the 1990s accommodation is good whilst the older blocks provide opportunity for additional fabric improvements, building on works already completed to further reduce site energy consumption.

Site progress towards Net Zero

- Glazing replacement to blocks 8 and 9 and refurbishments to blocks 2, 3 and 4.
- Roof replacements to blocks 3, 4, 5 and 6
- LED replacement across site is at 85%
- Ongoing scheme to install PV on blocks 3 and 4 via funding from PSDS Phase 1
- Replacement of gas boiler in block 10 with electric heating



0.69

2020/21 Operational Energy Cost (£m)

1,581

BAU Annual Operational Energy Carbon Emissions (tCO₂e)





421

2032 Carbon Emissions Target (tCO₂e)

0.54

Roadmap 2032 Annual Operational Energy Cost (£m)



311

Roadmap 2032 Annual Operational Energy Carbon Emissions (tCO₂e)

£5.2m

Roadmap Capital Investment



The recommended decarbonisation pathway for CAH includes:

- Completion of LED installation across site to further reduce energy consumption
- Installation of air source heat pump (ASHP) to provide heating and domestic hot water generation, reducing fossil fuel consumption on site and operational carbon emissions
- Roof replacement for block 2 and replacement of remaining single glazed windows across the site to reduce energy consumption





- BMS controls audit to optimise plant operation and further reduce energy consumption and carbon emissions

Implementing these steps enables CAH to meet the NHS target for 80% reduction in NHS carbon footprint emissions and reduces site energy consumption by over 50%.

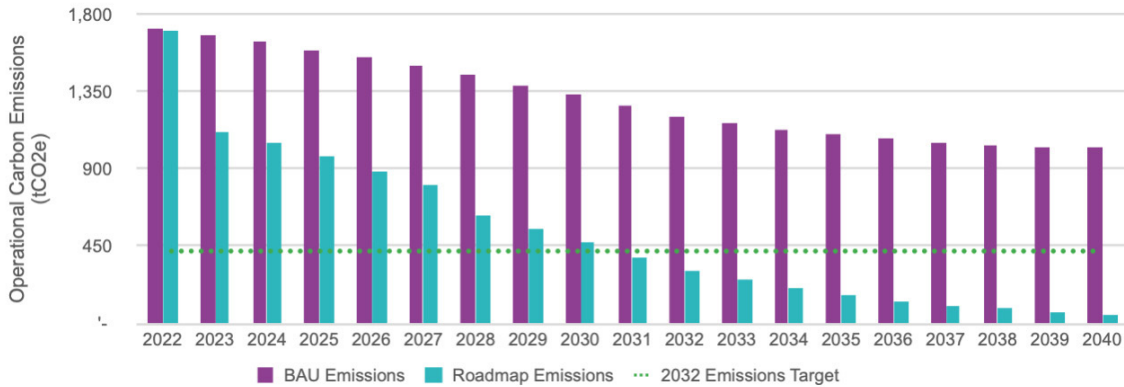


Figure 5.1: CAH Operational Carbon Emissions

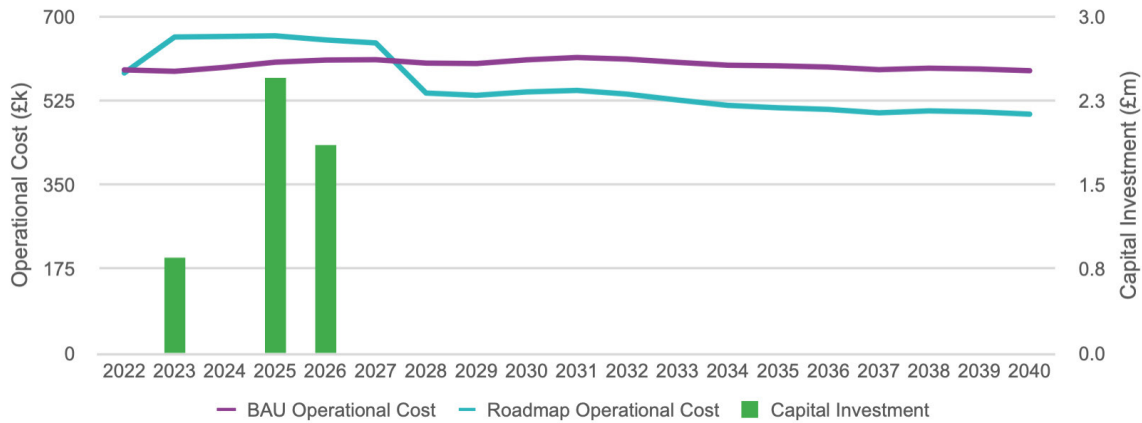


Figure 5.2: CAH Operational Cost and Capital Investment

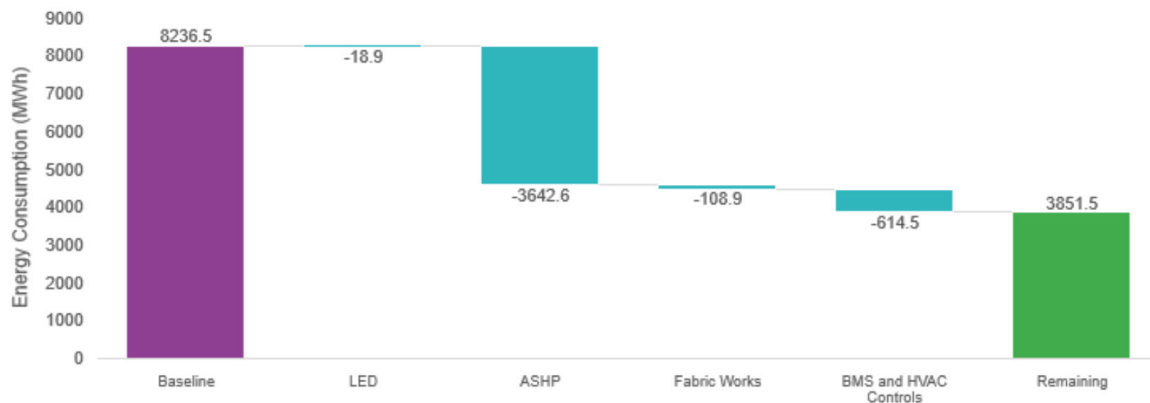
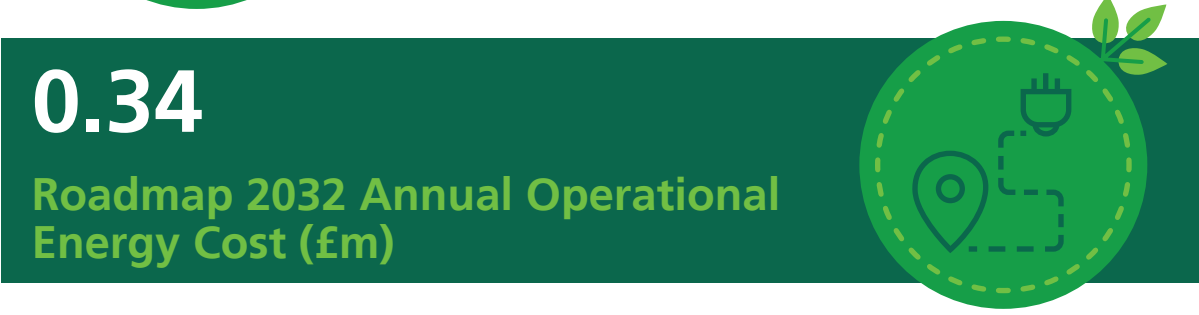
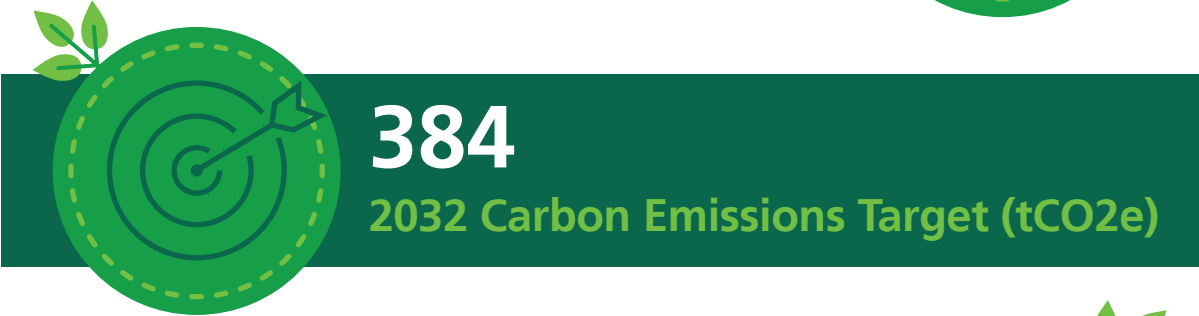
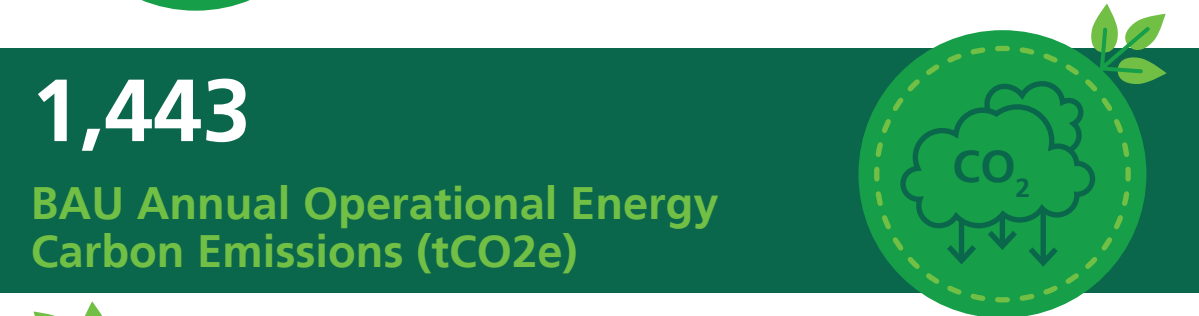


Figure 5.3: CAH Operational Energy

6. Seacroft

Seacroft provides outpatient services and is home to the largest fertility services facility in the NHS. It also provides Breast Screening Services, Renal Dialysis and Prosthetics, Orthotics and Wheelchair Services. Many of the blocks on the site are currently vacant as they are unsuitable for use and a proportion of the land has been sold for housing development.





193

Roadmap 2032 Annual Operational Energy Carbon Emissions (tCO₂e)

£4.1m

Roadmap Capital Investment



The recommended decarbonisation pathway utilising the decarbonisation tool for SEA includes:

- Roof and glazing upgrades to blocks 13 and 27 and glazing upgrades to Blocks 61-64 to reduce heat losses and total energy consumption
- Fabric works also enable the reduction in operating temperatures for heating systems to minimise the impact on existing heating distribution and emitters
- LED installation to block 27 to reduce energy consumption
- Installation of heat pumps including HVAC control optimisation and remedial works to the existing sitewide distribution to remove fossil fuels from site as a primary energy source

The masterplan for SEA involves rationalisation of the site aligning with the LTHT Estate Strategy to reduce estate size, which has been included within the roadmap.

The recommended pathway enables the SEA site to meet the NHS target for 80% reduction in carbon emissions associated with energy use by 2032 and reduces site energy consumption by 65%.

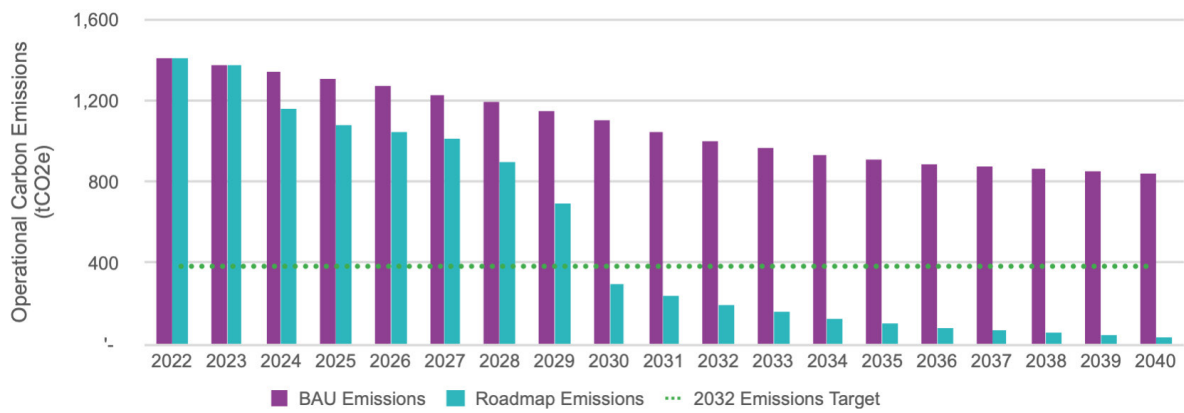


Figure 6.1: SEA Operational Carbon Emissions

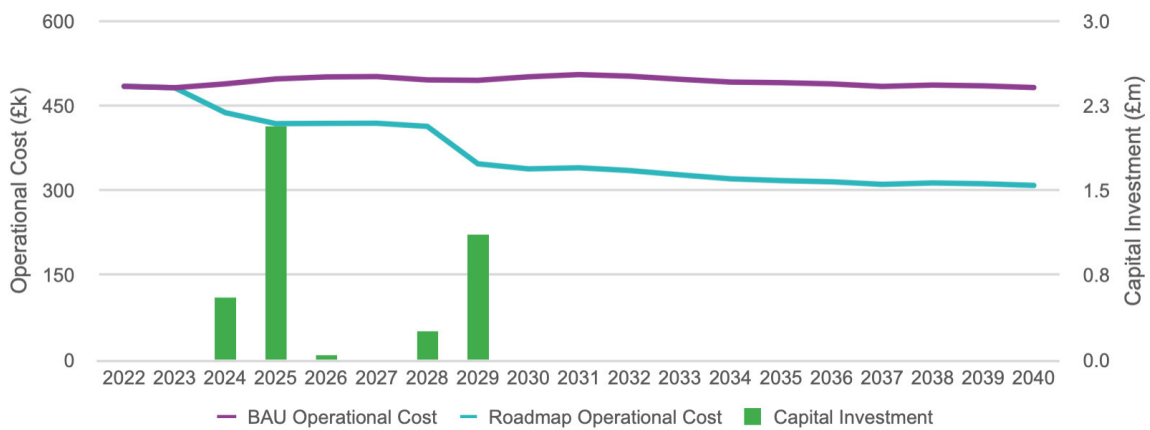


Figure 6.2: SEA Operational Cost and Capital Investment

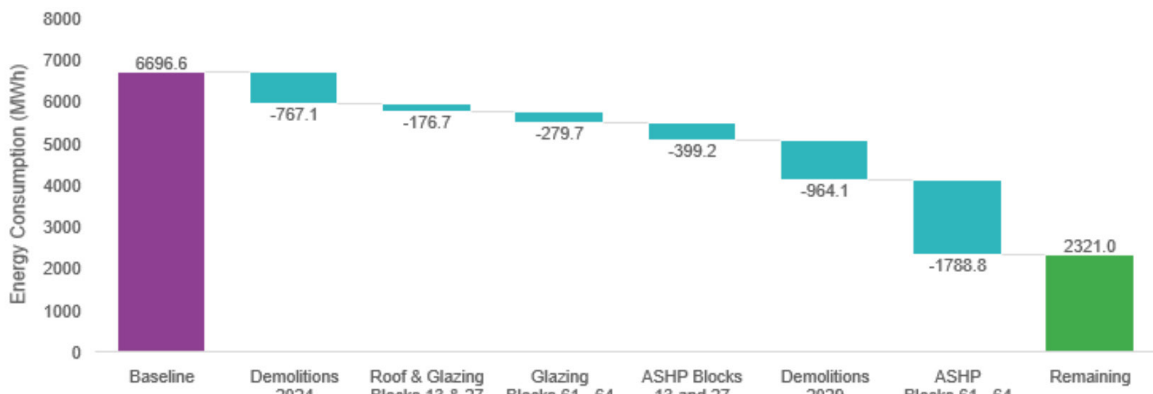


Figure 6.3: SEA Operational Energy

7. Wharfedale

Wharfedale General Hospital (WHF) is located 14 miles from Leeds City Centre and is in good condition and thermally efficient. The hospital was constructed in 2004 and is maintained under Private Finance Initiative agreement until 2032. The hospital has 50 beds and has a GIA of 9,669m² making it the smallest hospital in the trust.

Wharfedale has an inpatient day surgery unit as well as a having a variety of outpatient services. The hospital also has two daycase theatres, daycase beds, community beds and outpatients' accommodation. Wharfedale focuses on clinical services including Chemotherapy, Endoscopy Services and Radiology.

Site progress towards Net Zero

- PV canopy over the car parking funded via PSDS Phase 1 currently under construction



0.23

2020/21 Operational Energy Cost (£m)

591

BAU Annual Operational Energy Carbon Emissions (tCO₂e)



166

2032 Carbon Emissions Target (tCO₂e)

0.17

Roadmap 2032 Annual Operational Energy Cost (£m)



94

Roadmap 2032 Annual Operational Energy Carbon Emissions (tCO2e)

£2.2m

Roadmap Capital Investment



The recommended decarbonisation pathway utilising the decarbonisation tool for WHF includes:

- Installation of electrodes for DHW generation to reduce fossil fuel consumption
- LED installation with enhanced lighting controls to reduce energy consumption, operating costs and carbon emissions
- Installation of a low temperature air source heat pump for heating and domestic hot water generation to decarbonise heat generation and remove fossil fuels as a primary energy source on site
- HVAC controls review with heat pump installation to optimise the system operations

The recommended pathway enables the WHF site to meet the NHS target for 80% reduction in carbon emissions associated with energy use by 2032 and reduces site energy consumption by over 50%.

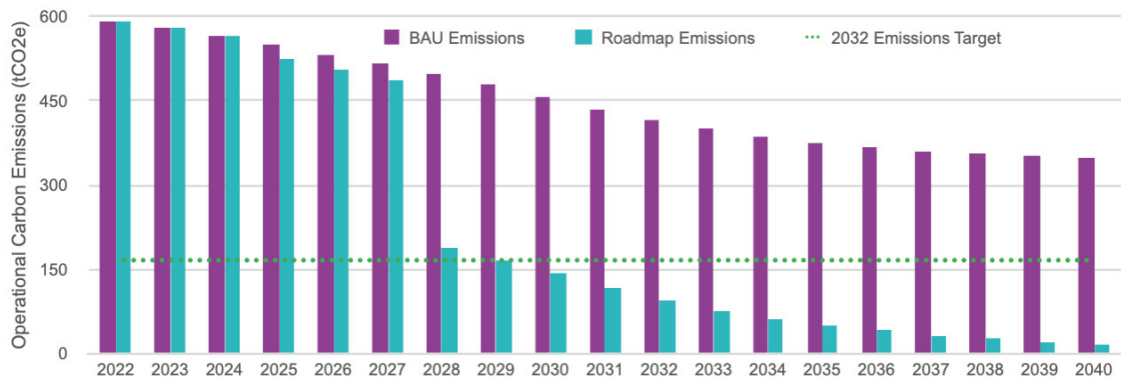


Figure 7.1: WHF Operational Carbon Emissions

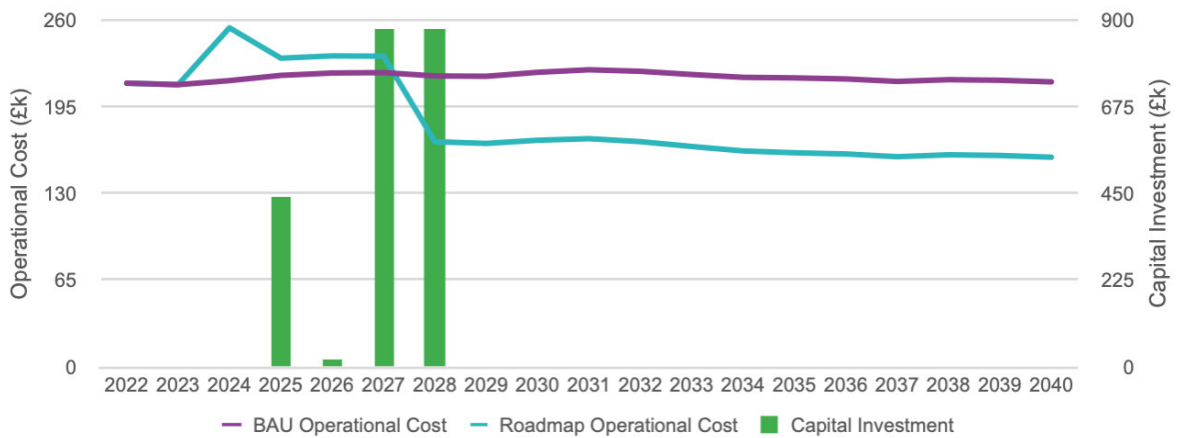


Figure 7.2: WHF Operational Cost and Capital Investment

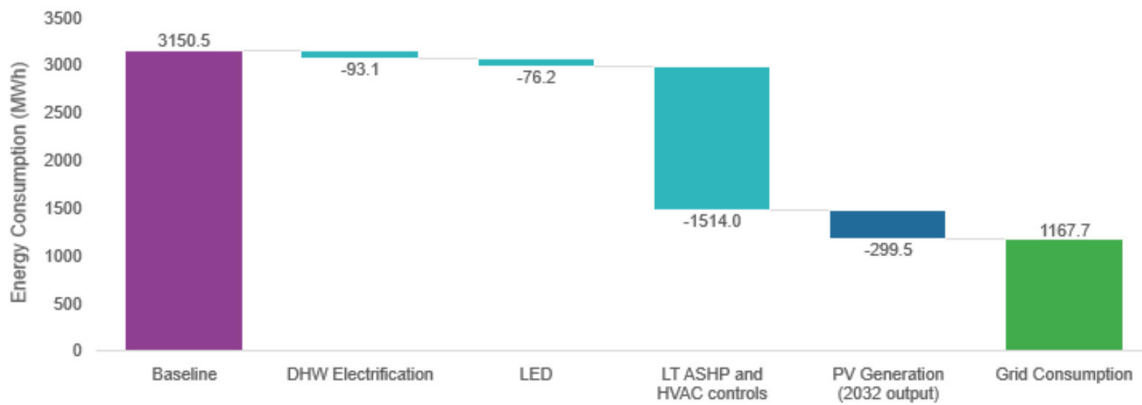
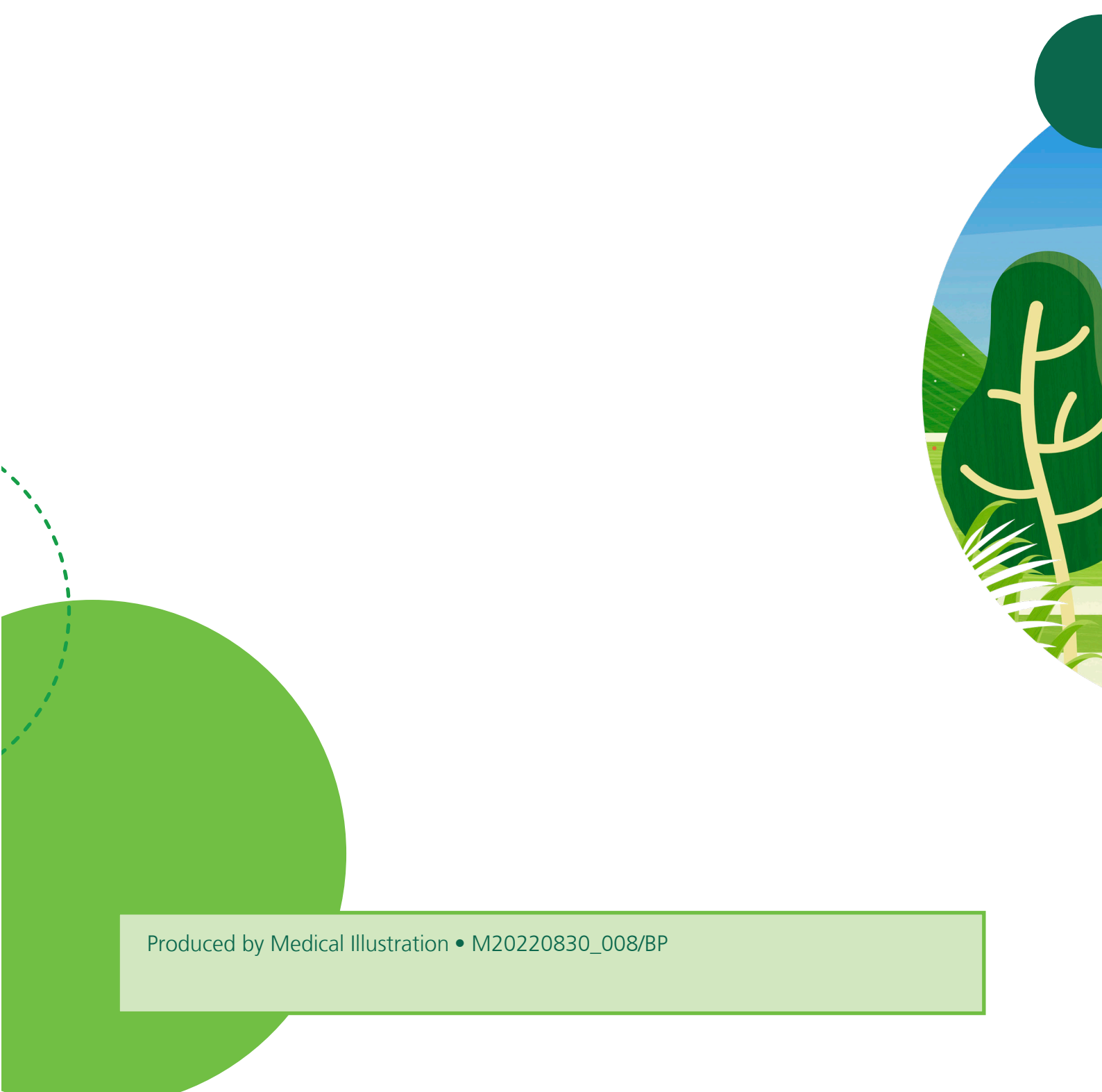


Figure 7.3: WHF Operational Energy



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