

FROM EFFICIENCY TO IMPACT

TURNING THERMAL ENERGY INTO DECARBONISATION MOMENTUM

IN FOCUS: HEALTHCARE

OPTI»»ISE TO DECARBONISE

spirax
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THE UNTAPPED POTENTIAL

INTRODUCTION

Across hospitals, laboratories, pharmaceutical production and primary-care estates, heat is the backbone of healthcare operations. It drives sterilisation, hot-water systems, laundry, catering, HVAC, clinical manufacturing and essential building services. Yet despite its critical role, thermal energy remains one of the least optimised areas in healthcare decarbonisation strategies.

51%

REDUCTION IN EMISSIONS
REQUIRED BY 2023 IN THE
HEALTHCARE SECTOR

Over the past decade, sustainability programmes across the NHS, HSE and private healthcare providers have focused heavily on procuring renewable electricity and reducing overall electrical consumption. The NHS commitment to 100% renewable electricity, aligned with the NHS Net Zero Strategy (targeting net zero for Scope 1 and 2 by 2040), together with the HSE's Climate Action Strategy 2023–2050 and its Infrastructure Decarbonisation Roadmap which require public-sector health facilities to cut emissions by 51% by 2030 have already driven significant Scope 2 reductions across hospital groups in the UK and Ireland. Natural gas consumption, steam production and thermal processes represent a significant opportunity for healthcare organisations to reduce Scope 1 emissions through improved efficiency, optimisation and the transition to lower-carbon heat solutions. Ageing heat networks, limited real-time visibility, capital constraints and clinical-critical reliability requirements all slow progress. Yet the opportunity is enormous.

Healthcare estates are typically heat-dominated, with thermal systems often accounting for **50–70%** of total energy use in acute hospitals. How heat is generated, managed and recovered therefore represents one of the most significant untapped opportunities to:



Cut carbon



Reduce costs



Strengthen resilience



Support compliance

with NHS Net Zero, HSE Climate Action Plans and government mandates

In this context, thermal energy efficiency is not a maintenance activity, it is a strategic lever for healthcare decarbonisation and patient-care resilience.

DECARBONISING HEAT

THE MISSING LINK IN UK & IRISH HEALTHCARE NET-ZERO PLANS

Across UK and Irish healthcare, progress on electricity decarbonisation far outpaces the journey to reduce emissions from heat.

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WHY HEAT IS THE CHALLENGE

- ⊕ Electricity in the UK and Ireland remains 2–3× more expensive than natural gas
- ⊕ Grid-capacity constraints often delay hospital electrification projects by several years
- ⊕ Many hospitals continue to operate centralised steam and CHP infrastructure. The challenge is not that steam is obsolete, but that existing energy centres need better data, optimisation and a clear pathway towards lower-carbon operation and future decarbonisation
- ⊕ Clinical operations demand absolute reliability making radical heat-system changes difficult without efficiency-first steps

As a result, hospitals have made strong progress in reducing Scope 2 emissions, creating an opportunity to build on this momentum by accelerating action to reduce Scope 1 emissions.

Addressing heat is now the missing link in credible NHS and HSE net-zero strategies.

WHY THERMAL OPTIMISATION IS ESSENTIAL

Healthcare estates are often large, complex and thermally intensive. Unlike commercial buildings, hospitals cannot simply “turn down” heating loads; sterilisation, hot-water demand and infection-control requirements prevent it.

Therefore, the fastest and most cost-effective decarbonisation gains come from:

- + Optimising boiler and steam systems
- + Improving condensate return
- + Upgrading insulation and heat distribution
- + Recovering waste heat
- + Deploying hybrid gas–electric heat solutions
- + Using digital monitoring to reduce losses and leaks
- + Eliminating unnecessary fuel combustion

Efficiency becomes not a cost-saving exercise but a clinically safe enabler of net-zero progress.

TURNING EFFICIENCY INTO DECARBONISATION MOMENTUM

For hospitals and pharmaceutical manufacturing, thermal optimisation offers immediate decarbonisation without disrupting patient care.

Efficiency delivers healthcare-specific benefits:

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1 Cuts Scope 1 emissions from combustion; healthcare's largest carbon source

Natural gas use in acute hospitals is substantial. Reducing excess steam losses, improving boiler performance and recovering heat can deliver

10–25%

fuel savings within 18–24 months.

2 Delivers rapid financial savings in high-pressure budgets

With NHS and HSE energy budgets under strain, efficiency measures typically offer sub-2-year payback, freeing capital for clinical services and further sustainability investment.

< 2 Year

payback

3 Increases resilience and reduces clinical-risk exposure

Optimised systems reduce:

- + Equipment failure
- + Thermal instability
- + Emergency shutdowns
- + Unplanned downtime in sterilisation and HVAC systems.

4 Prepares estates for future low-carbon technologies

Efficient thermal systems are easier and cheaper to electrify or convert to renewable heat in future; crucial given NHS and HSE net-zero deadlines. Each efficiency gain compounds the next, turning incremental improvements into long-term decarbonisation momentum.

FROM MOMENTUM TO IMPACT

SCALING EFFICIENCY ACROSS HEALTHCARE ESTATES

The NHS and HSE face a unique challenge: large, varied estates with buildings spanning decades of construction and system design. Scaling efficiency requires:

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VISIBILITY – TURNING DATA INTO CLINICAL-GRADE INSIGHT

Digital steam system monitoring and energy analytics platforms now give estates teams always-on visibility into:

- + Steam & condensate performance
- + Heat distribution losses
- + Boiler and autoclave efficiency
- + Sterilisation load profiles
- + Carbon output and savings

This visibility allows trusts and hospital groups to benchmark sites, prioritise investment and prove compliance with net-zero reporting frameworks.



CONSISTENCY – STANDARDISING BEST PRACTICE ACROSS SITES

The most successful health systems establish:

- + Common KPIs
- + Standardised maintenance protocols
- + Unified steam and heat management specifications
- + Replicable optimisation roadmaps

This reduces variation, accelerates implementation and ensures consistent performance across multiple hospitals.



COLLABORATION – BREAKING DOWN THE CAPITAL AND OPERATIONAL SILOS

Decarbonisation in healthcare requires cooperation across:

- + Estates
- + Capital planning
- + Infection control
- + Sustainability teams
- + Finance
- + Clinical operations

This is where strategic consultative partners like Spirax Sarco support healthcare estates with joined-up technical, regulatory and operational alignment.

THE ROLE OF PARTNERSHIP

FROM ENERGY SAVINGS TO SUSTAINABLE HEALTHCARE

Hospitals cannot decarbonise alone. The challenges; clinical risk, regulatory compliance, economic pressure require true partnership.

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CO-CREATING DECARBONISATION ROADMAPS FOR HEALTHCARE

Every hospital site is unique. Spirax Sarco works with trusts, hospital groups and pharma-healthcare manufacturers to map:

- + Thermal demand patterns
- + Carbon-reduction potential
- + Asset condition
- + Compliance requirements (HTM, HSE Estates, NHS Net Zero)
- + Investment priorities

These roadmaps quantify emissions, fuel savings and ROI, making a clear business case aligned with patient-care priorities.

ENABLING KNOWLEDGE SHARING ACROSS HEALTH SYSTEMS

Through sector working groups, best-practice sessions and healthcare decarbonisation forums, Spirax Sarco helps hospitals share what works accelerating progress across the region.

PROVING IMPACT THROUGH MEASURABLE OUTCOMES

Continuous monitoring supports:

- + Net-zero reporting
- + ESOS and SEAI compliance
- + NHS Green Plan outcomes
- + Transparent Scope 1 reductions

These roadmaps quantify emissions, fuel savings and ROI, making a clear business case aligned with patient-care priorities.

BUILDING STRATEGIC ALIGNMENT ACROSS HEALTHCARE FUNCTIONS

True progress happens when: Estates engineers, infection control, sustainability leaders, procurement, clinical operations all align around a shared plan.

PROOF IN ACTION

HEALTHCARE SECTOR RESULTS

Across the UK and Ireland, Spirax Sarco partners in hospitals, pharmaceutical manufacturing and laboratory settings have achieved:

- + 10–25%** reductions in natural-gas use
- + Faster** payback than traditional capital upgrades
- + Significant** sterilisation system stability and reliability
- + Enhanced** compliance with NHS Net Zero & HSE Climate Action Plans
- + Improved** CO₂ savings with minimal disruption to critical services

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**THIS IS
DECARBONISATION
WHERE IT MATTERS
MOST, SUPPORTING
BOTH CLIMATE
GOALS AND PATIENT
CARE.**

SUSTAINABILITY TOTAL SAVED BY INDUSTRY

INDUSTRY GROUP	WATER SAVINGS (M ³ /YEAR)	CO ₂ SAVINGS (TON / YEAR)	ENERGY SAVINGS (GJ / YEAR)
Chemicals	3,690,246	678,493	9,426,098
Food & Beverage	24,047,415	4,340,261	58,843,642
HEALTHCARE	7,111,659	1,337,359	17,976,478
Oil & Gas	3,552,955	628,236	8,843,117
Other	43,605,514	8,016,238	110,387,502
TOTAL	82,007,789	15,000,588	205,476,837

In Healthcare, steam and thermal systems are mission-critical supporting sterilisation, heating, hot water and infection control. But they're also major drivers of energy cost and carbon emissions.

By optimising these systems, we've helped Healthcare providers save over 7 million cubic metres of water, 1.4 million tonnes of CO₂, and 19 million GJ of energy annually.

That means lower operating costs, reduced emissions, improved system reliability and strengthened ESG performance without compromising patient safety or compliance.

LOOKING AHEAD

THE FUTURE OF HEAT DECARBONISATION IN HEALTHCARE

The next decade will reshape how hospitals generate heat. Options will include:



Hybrid electric-gas heating



Low-temperature networks



Industrial-scale heat pumps



Renewable steam generation



Green hydrogen (longer-term)

BUT ALL FUTURE SOLUTIONS DEPEND ON OPTIMISED SYSTEMS TODAY.

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WHY OPTIMISATION IS THE FOUNDATION

Optimised systems:

- + Reduce energy demand before investing in new technologies
- + Lower the cost of future electrification projects
- + Smooth the transition to renewable and low-carbon heat sources
- + Reduce the required capacity and capital cost of replacement assets
- + Improve the efficiency and reliability of existing plant
- + Eliminate avoidable steam, water and energy losses
- + Extend the life of critical infrastructure
- + Provide accurate, verifiable performance and energy data
- + Establish a reliable baseline for measuring carbon reductions
- + Improve business case confidence for future investment
- + Reduce operational risk during system transformation
- + Enable safer clinical operations during infrastructure change
- + Minimise disruption by ensuring systems are performing optimally before modification
- + Deliver immediate carbon and cost savings while longer-term projects are planned
- + Create the operational stability needed to adopt new technologies successfully

CONCLUSION

FROM EFFICIENCY TO ENDURING IMPACT IN HEALTHCARE

Healthcare cannot wait for future technologies alone to reduce emissions. Heat remains one of the sector's most powerful, immediate levers for:



**Cutting
carbon**



**Improving
resilience**



**Lowering
cost**



**High-quality
patient care**

By optimising the thermal systems already in place, hospitals and healthcare manufacturers build the foundation for a credible, affordable and resilient net-zero transition.

OPTI»»ISE TO DECARBONISE

Empowering steam users to cut carbon, reduce cost and build a sustainable energy future.

**LEARN MORE
ABOUT OUR APPROACH**

SOURCES & REFERENCES

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Greener NHS Programme – Renewable Electricity Commitment (NHS England 2021–2024).

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NHS Property Services – Getting NHS Property to Net Zero (2022).

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NHS Heat Decarbonisation Plans (HDPs) – Guidance for Trusts (2023).

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UK Department for Energy Security & Net Zero (DESNZ).

Industrial & Public-Sector Energy Prices (2024).
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UK Net Zero Growth Plan (DESNZ, 2023).

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UK Government – Industrial Heat Recovery Support Programme Evaluation (2023).

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International Energy Agency (IEA) – The Future of Heat in Industry (2022).

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IEA – Energy Efficiency 2023 Report.

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Highlights cross-sector collaboration as a key enabler of decarbonisation.

The Climate Group & CDP – RE100 Progress Report 2024.

Notes commitments of >100 UK-based companies to 100% renewable electricity.



Spirax Sarco is a global leader in steam and thermal energy management, helping manufacturers around the world reduce energy use, cut carbon emissions and accelerate their path to net zero through intelligent, efficient and sustainable thermal solutions.

LEARN MORE AT

www.spiraxsarco.com/global/en-GB