
Green Investment Bank

A healthy saving: energy efficiency and the NHS

A market report by the UK Green Investment Bank

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Executive summary

The NHS is **one of the UK's most energy intensive organisations.**

The NHS spends **more than £750 million on energy costs** each year.

Energy costs are expected to increase at a rate above inflation. So energy costs will demand an increasing share of NHS budgets.

The UK Green Investment Bank (GIB) estimates that energy efficiency measures **could cut this bill by up to 20 per cent**, £150 million each year.

GIB estimates the **capital investment requirement in the NHS estate could be up to £1.5 billion** based on a 10 year payback, significantly contributing to backlog maintenance.

Investment in energy efficiency will deliver more reliable and resilient energy systems on NHS sites, reducing costs and operating risks of these facilities.

The NHS has adopted a **target to cut its greenhouse gas (GHG) emissions by 10 per cent** by 2015.

By introducing energy efficiency measures, **GHG emissions could be quickly cut by 25 per cent.**

The time is right to introduce energy efficiency measures. The **technology is mature, reliable and well proven.**

Energy efficiency measures include combined heat and power systems, LED lighting, heating, ventilation and control systems and biomass boilers.

Upfront investment is provided by GIB and repayments are funded by savings realised.

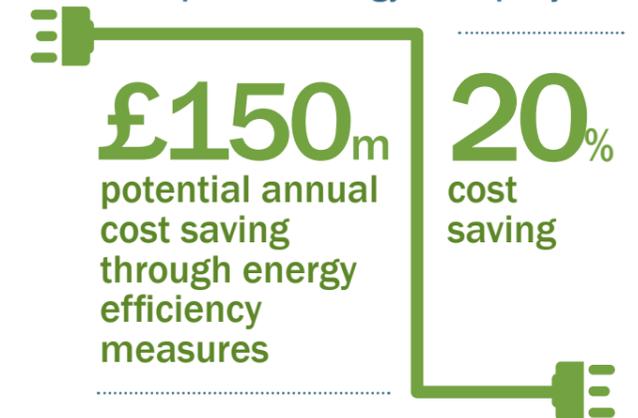
GIB has developed **the GIB Health Sector Energy Efficiency Programme** tailored to the needs of the NHS: priced competitively, long term (up to 25 years) and highly flexible. GIB has earmarked several hundred million pounds to back NHS energy efficiency projects through financial partners and direct GIB lending.

Funding examples include the energy innovation centre in Cambridge serving Addenbrooke's and Rosie hospitals. The £36 million funding package led by GIB and Aviva Investors is a 25 year contract. Housing a combined heat and power unit, biomass boiler, dual fuel boilers and heat recovery from medical incineration, the centre **will reduce costs by £6 million a year before capital and interest repayments.**



£750_m

NHS spend on energy costs per year



25%

Potential reduction in greenhouse gases through energy efficiency measures

Introduction

This report is aimed at anyone with an interest in NHS estate management and capital spending for energy efficiency projects within the NHS: Chief Executives, Finance Directors, Estate Directors, Energy and Sustainability Managers.

The purpose of this report is:

- To set out the opportunity available to the NHS to reduce energy usage and associated costs and improve energy services. A range of energy saving measures are currently available some of which, such as lighting, can offer up to 80 per cent energy savings, without affecting patient care.
- To outline how the UK-Government-backed Green Investment Bank (GIB) can help finance these energy efficiency measures.

This report has been produced by GIB. Created by the UK Government and capitalised with £3.8 billion of public money, its mission is to help the UK transition to a greener economy by supporting projects that are both green and commercial. One of GIB's priority areas for investment is public sector energy efficiency, especially in the NHS where we have established a track record of activity.

GIB can provide the full spectrum of financing across debt and equity with the ability to fund long term projects. It has a dedicated team of energy efficiency project and finance experts set-up to work with private and public sector organisations and co-investors.



80%

potential savings through energy efficiency lighting measures

PART 1:

Energy efficiency and the NHS: the opportunity

The UK NHS provides critical services, caring for more than one million patients every 36 hours. The nature of NHS activities naturally makes the organisation energy intensive. The NHS currently spends more than £750 million every year on energy costs. Currently a significant emitter of greenhouse gases, the organisation is working towards a 10 per cent reduction in its carbon footprint by 2015.

Implementing energy efficiency measures across the NHS's UK-wide estate has the potential to cut energy costs by 20 per cent and reduce greenhouse gas emissions by up to 25 per cent, far exceeding the existing target on an annualised basis.

The NHS

The NHS property estate is one of the biggest in Europe, covering some 2,300 hospitals and 10,500 General Practices, as well as numerous clinical commissioning groups, acute trusts, mental health trusts, community providers and ambulance trusts.

Employing more than 1.7 million people across the UK, the NHS performs more than 10 million operations a year, making more than 15 million hospital admissions and handling nearly 22 million Accident & Emergency attendances.

NHS journeys – deliveries and ambulances – make up around five per cent of all UK road traffic and account for 25 billion passenger kilometres every year.

High energy and waste disposal costs

The size of the NHS estate and the nature of its activities naturally make the organisation both energy intensive and a high producer of waste. Each year, across the UK, the NHS spends over £750 million on energy costs and a further £100 million on waste disposal. The NHS generates 400 thousand tonnes of waste and recyclable material every year – and accounts for one in every 100 tonnes of non-domestic waste in the UK.

Greenhouse gas emissions

In addition to high energy and waste costs, the NHS is also one of the biggest emitters of greenhouse gases in the UK. The annual carbon footprint of the NHS in England is around 25 million tonnes of carbon dioxide equivalent (MtCO₂e). These emissions come from a wide range of day to day activities needed for the healthcare network, with the majority coming from embedded carbon in goods and services bought by the NHS. However, almost 20 per cent of this is attributed to heating, lighting and providing power across NHS sites, with a further 13 per cent being attributed to staff, patient and visitor travel.

An organisation of the NHS's scale and type will always be a higher energy user in relative terms. Hospitals, for example, will always be required to run 24 hours a day, 365 days a year, with heavy heating and cooling requirements, air heated to higher than average temperatures with more frequent air changes and filtration, high hot water usage for hygiene and kitchen facilities and operation of energy intensive lifesaving equipment such as intensive care beds and operating theatres.

Cost savings and emission reductions through energy efficiency

Reducing carbon intensity can create significant financial opportunity. The NHS could achieve annual savings of up to £150 million through energy efficiency and low carbon technology upgrades, staff engagement and improved procurement.

To achieve this, a range of proven technologies can help cut energy costs by up to 20 per cent, supporting a capital investment of up to £1.5 billion in the NHS estate assuming a 10 year payback.

This investment would also make a significant contribution toward backlog maintenance, reducing pressure on these budgets. It is estimated that up to 30 per cent of backlog maintenance could be addressed through energy efficiency investment, which equates to over £450 million in NHS England.

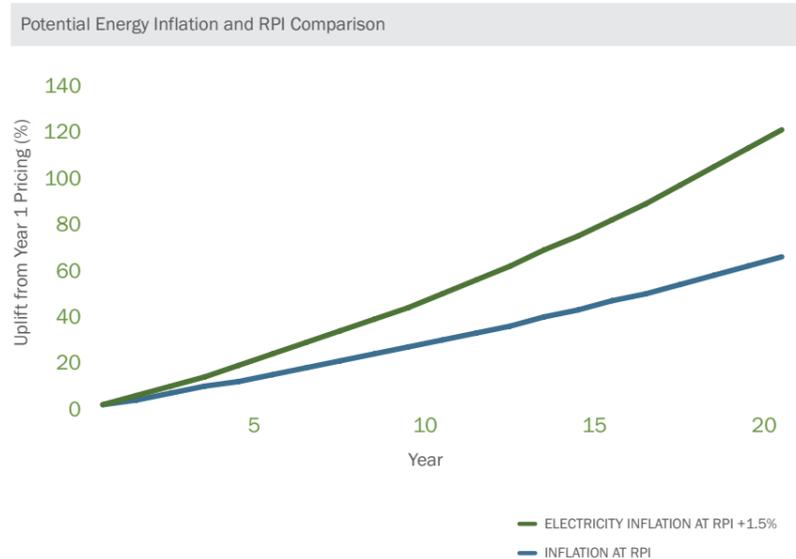
In addition, energy efficiency investment will deliver more reliable and resilient energy systems on NHS sites not only reducing operating costs but also reducing operating risks of these facilities.

A report by the Stockholm Environment Institute and Arup indicates that around 25 per cent of the NHS's current emissions (1.15 MtCO₂e in England) could be saved within its existing building estate through the following measures:

- Reduced electricity carbon intensity through greater adoption of on-site renewable electricity;
- Reduced electricity consumption through lighting, improved controls, standby savers, better product choices;
- Increased Combined Heat and Power (CHP) coverage as it avoids the losses from grid-electricity.

Global Action Plan, the UK's leading environmental behaviour change charity, reports that behaviour change techniques within the NHS could achieve additional savings and support the performance of installed technologies.

It doesn't have to be large scale schemes. Every little helps. Last year, a pilot project encouraging staff to turn off lights at Bart's Health NHS Trust in London saved £100,000.



With energy costs rising at a much faster rate than RPI and this trend set to continue, the NHS is exposed to significant financial risk.

Existing carbon reduction guidance and initiatives

The NHS has published a number of reports on carbon reduction and has committed to a number of carbon reduction targets, commitments and plans. Many of these initiatives – some of which are detailed below – have led to carbon reduction across NHS facilities.

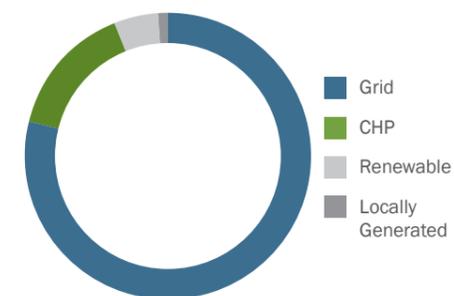
- All NHS organisations were required to submit a Board approved carbon management strategy by the end of 2009.
- From 1 April 2010, all qualifying NHS Trusts must register for the Government's Carbon Reduction Commitment scheme. Trusts must report gas and electricity use annually and purchase allowances against the emissions associated with their fuel use. The Autumn Statement 2013 set allowance price in 2014-15 at £15.60 per tonne of direct CO₂.

In January 2009, the NHS Sustainable Development Unit published 'Reducing Carbon, Saving Lives', a carbon emissions reduction strategy for the NHS. This requires every NHS organisation to return its carbon emissions to 2007 levels by 2013 and to deliver a ten per cent reduction in carbon emissions against 2007 levels by March 2015.

Under the revised EU Energy Efficiency Directive, central government bodies are required to renovate three per cent of the total floor area of heated and/or cooled buildings owned and occupied by them, annually from 1 January 2014.

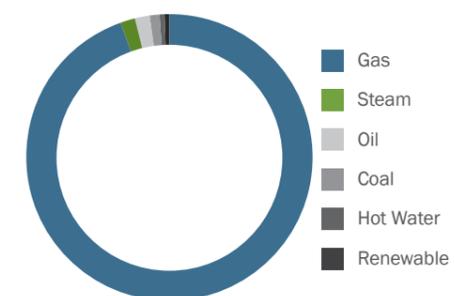
The NHS Sustainable Development Strategy includes 14 mandatory requirements to be adopted to achieve a low carbon NHS. These include mitigation and adaptation plans and sustainability champions.

Electricity Usage by Source, NHS England



A significant majority of electrical energy used by the NHS originates from the grid. While CHP is growing, the opportunities for further investment in CHP and onsite renewables are significant.

Heat Usage by Source, NHS England



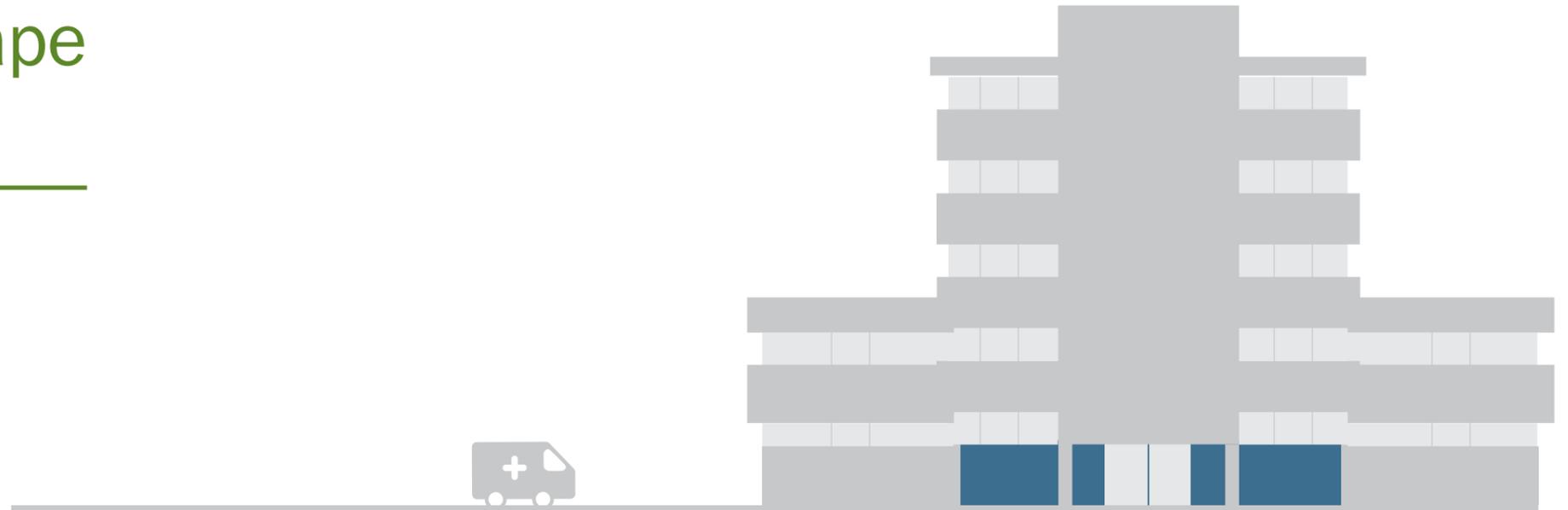
The heat generation opportunity, particularly for the large acute hospitals, show additional scope for further renewable heat generation over and above CHP (note that the fuel source for heat from CHPs is included within the totals). Steam and hot water (e.g. on a district heat network) remain comparatively low.

Energy efficiency and the NHS: the existing landscape

Energy efficiency technologies

A number of interventions are available to the NHS to help reduce energy usage and save money.

While there are a range of energy generation and energy efficient technologies and measures, each health facility will have unique needs requiring a tailored solution.




CHP

Combined heat and power (CHP) systems – also known as cogeneration systems – use a reciprocating engine or gas turbine to simultaneously generate both electricity and heat. They convert waste heat from electrical generation into energy that can be used for heating and cooling. Acute care facilities are ideal candidates for CHP systems because they function 365 days a year, 24/7, and require round-the-clock heat and electricity. CHP systems enable hospitals to reduce energy costs, improve environmental performance, and increase energy reliability.



HVAC

Heating, ventilation and control systems can be upgraded to be more energy efficient by providing heating and cooling as required and controlling the temperature within a much closer tolerance.



Building fabric

Building fabric upgrades will include such measures as increased insulation of roofs, cavity walls, solid walls and floors and replacement of single glazed windows with double glazed windows.



Lighting

Upgrading to light emitting diodes (LED) and other high efficiency lighting can reduce lighting energy costs by 50 – 80 per cent and extend replacement cycles which will have significant associated labour saving. Lighting quality has improved considerably in the last few years and in many instances is a marked improvement on the existing technology which degrades over time. Studies have also shown that improving the lighting can have benefits for patient care and recovery.



Biomass boilers:

A 4 MW biomass boiler, which has the capability of reducing CO₂ emissions by as much 4,500 tonnes each year, can be installed as part of a hospital wide central plant installation or can be installed as a standalone measure. Biomass boilers also benefit from the subsidies through the Government's Renewable Heat Incentive (RHI).



Fuel cells

Fuel cells are relatively new to commercial CHP and storage use in the NHS but are gaining popularity in large office developments where back-up and security of supply is just as important as the cost savings and ability to deploy these on constrained city centre sites. Carbon dioxide emissions are low during operation, but life-cycle emissions vary with fuel type. Although emerging quickly, the technology is not yet proven at scale in the UK.



Other generation methods

Ground source heat pumps may be suitable as part of new build or refurbished health facilities where a constant heat load is required (similar to biomass this will benefit from RHI). Other alternative generation methods include solar panels (either thermal to heat water or photo-voltaic to generate electricity) and wind turbines on large sites outside of towns and cities.



Service specific measures

Water/waste water/effluent systems can be made more energy efficient with specific measures in hospital laundries, catering facilities, compressed air systems, vacuum pumps, hydraulic systems, services to medical equipment, lift controls and other niche and specialist uses.



Waste management measures

Clinical waste incinerators and waste heat recovery systems could be designed into the overall energy centre solution to meet the heat and electricity requirements.

NHS energy efficiency procurement options

Procurement of an energy efficiency project can be a complex process. NHS organisations have a number of options open to them, in addition to the direct OJEU procurement route.

- **The Carbon and Energy Fund (CEF):** The Carbon and Energy Fund is the most widely used framework assisting the NHS across England and Scotland to meet its energy efficiency and carbon reduction goals. CEF simplifies the procurement process by bringing together the specialist expertise in the NHS and by consolidating the procurement of advisors and contractors. CEF was the framework and consulting agreement used in the Addenbrooke’s Energy Centre. See case study on p.13 for more information.
- **RE:FIT:** The London RE:FIT framework is now available to all public sector organisations in the UK. Using a mini competition process an NHS organisation would select one of 13 pre-qualified Energy Service Companies (ESCOs) for the design and implementation of energy conservation measures.
- **Essentia:** Created in 2012 by Guy’s and St Thomas’ NHS Foundation Trust, Essentia brings together professionals experienced in procuring healthcare infrastructure. Essentia is in the process of establishing a framework agreement to provide a model for implementing energy efficiency and local energy generation measures into public sector estates.
- **Ecovate:** Ecovate and King’s College Hospital NHS Foundation Trust (KCH) entered into a strategic partnership to help other public sector organisations realise significant financial and carbon benefits. KCH will host Ecovate to deliver an end to end service to the public sector to deliver more energy efficiency projects.

The above frameworks are best suited to larger energy efficiency projects. Single contractual structures do not make sense financially for small retrofits or energy efficiency interventions at smaller primary care facilities, unless they can be batched. There are however public private partnerships already in place that could potentially fund and deliver these if they were batched to sufficient scale such as:

- The NHS LIFT (Local Improvement Finance Trust) programme commenced in 2002 as part of the Department of Health’s long term initiative to modernise primary care (including surgeries for minor operations), social care and GP facilities in England and Wales.
- The Hub initiative in Scotland which covers the provision of services for the design, development and/or refurbishment of community based facilities and facility management (FM) services, delivered by a Hubco serving one of five Hub territories.

Current NHS energy efficiency investment

Some NHS organisations, such as Foundation Trusts, have the ability to directly borrow for energy efficiency investment, but many are capital constrained. Therefore large scale energy efficiency investments are not always prioritised within NHS capital programmes.

Others, such as the Health Boards in Scotland where healthcare budgets are devolved, as in Northern Ireland and Wales, have no ability to borrow and, like other capital constrained NHS organisations, seek to develop structures that can be considered revenue contracts, for even small scale investments. Health Facilities Scotland has identified a potential energy efficiency requirement of over £200 million capital investment across the primary and acute hospital estate.

In addition, the finance market has, over recent years, seen the withdrawal of a number of lenders. This began with the aftermath of the financial crisis and more recently with the cessation of new business activities from the dominant asset finance lender in the market, Co-op Bank. Co-op funded a number of the earlier CHP installations under the Carbon and Energy Fund framework through their Renewable Asset Finance Unit.

Whilst there is a compelling opportunity for investment in the NHS estate, these liquidity problems are hindering progress. Central government and devolved administrations have provided financial support to some NHS organisations for smaller projects, but given the limitations on government borrowing currently in place this creates a greater risk that energy efficiency projects will not be funded.

GIB has recognised this liquidity gap and is actively working with private finance partners to plug this gap. GIB has been at forefront of recent NHS energy efficiency investment, providing the much needed liquidity to the market.

GIB: financing NHS energy efficiency measures

GIB Health Sector Energy Efficiency Financing Programme

The governance of the NHS and the diversity of its facilities and needs, means that there can be no ‘one size fits all’ financing solution for NHS energy efficiency projects. To reflect this GIB has put together a programme of activity – The GIB Health Sector Energy Efficiency Programme – to offer all parts of the NHS a suite of products to meet their needs.

Each of our finance options, set out below, are based on consistent principles:

- **Spend to save:** finance repayments are lower than and repaid from cost savings which means there is no need for upfront expenditure by the NHS
- **Attractive rates:** finance is priced competitively
- **Long-term:** we can lend for up to 25 years
- **Flexible:** we can be flexible to meet the project requirements:
 - finance can be structured on or off balance sheet
 - repayment profiles set to match project saving expectations.

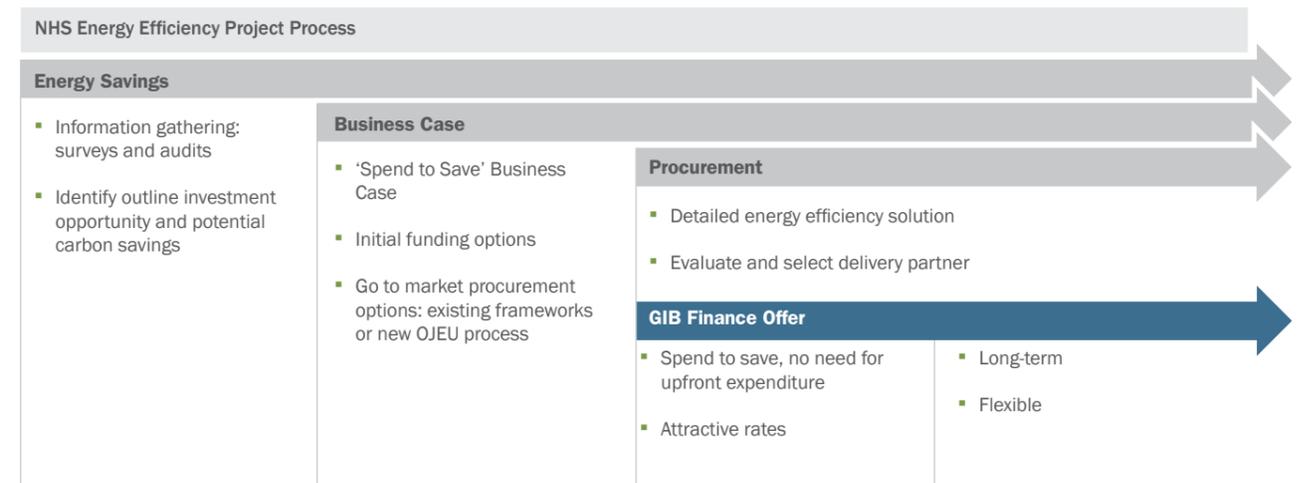
GIB products and finance partners include:

- Direct GIB lending
- Aviva ReALM Energy Centre Fund
- Societe Generale Equipment Finance alliance
- GIB Energy Efficiency Funds: SDCL and Equitix

A typical energy efficiency project in the NHS follows the steps set out in the graphic below. In most cases the procurement framework consultants can advise the financing solution that best works with the set of measures. In many cases these will be through GIB partners.

There will be some projects at a stage where a robust energy efficiency business case has already been developed. In such cases, where NHS organisations or the contractors guaranteeing the savings wish to investigate the financing options independently, GIB can introduce them to funding partners.

GIB has earmarked several hundred million pounds to back NHS energy efficiency projects through financial partners and direct GIB lending, providing long-term, flexible finance at competitive rates, on a spend-to-save basis with costs covered by energy savings and no upfront outlay from the NHS.



Some examples of how that can work

We have backed the UK's largest NHS energy efficiency project, alongside our partner Aviva, with Cambridge University Hospitals NHS Foundation Trust. It is also the base transaction for the establishment of the Aviva ReALM Energy Centre Fund – the third of the energy efficiency funds to be funded by GIB, after SDCL and Equitix were established earlier in 2013. See case study on p.13 for more information.

The Aviva ReALM Fund is not the only funding solution GIB has developed for the NHS. GIB is working actively with players in the market and concluding funding arrangements to cater for the different financing requirements of different NHS organisations. Three further examples are set out below:

- Asset finance – GIB partnerships:** Active asset finance into the NHS market (largely CEF projects) include Societe Generale Asset Finance and De Lage Landen. The recently announced energy efficiency refurbishment of Rampton Hospital was concluded by Societe Generale Asset Financing and corresponded with the announcement of a syndication alliance with GIB and Societe Generale for £50 million of funding for asset financing of energy efficiency retrofits at the NHS, and other select private and public sector hosts. The funding will be used to build a new CHP plant, biomass and dual fuel boilers, an effluent treatment plant and various upgrades to its control systems. See case study on p.14 for more information.
- PFI variations and GIB funds:** GIB recently announced, through its energy efficiency fund manager SDCL, a low carbon combined cooling, heating and power solution for St Bartholomew's Hospital delivered under SDCL's "Powering Health" partnership with GE, Clarke Energy and the NHS Confederation. It is the first fully financed PFI variation of its kind, and will fund a low carbon combined chilling/heating and power (CCHP) solution delivered by Skanska. See case study on p.14 for more information.
- Devolved Administrations:** GIB is working closely with the Scottish Government and Scottish Futures Trust (SFT) in finding a solution that will allow NHS Scotland to proceed with getting projects funded across the Health Boards, and to making sure that both the large acute and smaller primary care facilities can aggregate their energy efficiency projects for the benefit of users of the NHS in these areas. GIB is also at early stages of engagement with players in the NHS in the other devolved administrations.

GIB financing in action

Case Study 1: Addenbrooke's Energy Centre

In 2013, GIB provided capital for the largest energy efficiency retrofit at a UK hospital to date, at Addenbrooke's Hospital, Cambridge University Hospital NHS Foundation Trust, spending £18 million alongside Aviva for a total of £36 million. The investment will result in a reduction of headline costs by £6 million each year (60 per cent) before capital and interest repayments.

The investment will provide heat and power to the Trust (including Addenbrooke's and Rosie Hospitals). The technology includes a Combined Heat & Power (CHP) engine, biomass boilers, efficient dual fuel boilers, and heat recovery from waste incineration. The project also involves investment in energy demand reducing measures such as new lighting and improved heat and lighting controls.

The funding is being used for upgrades to be incorporated into the new Energy Centre. Upgraded equipment includes a Rolls Royce CHP engine, a wood-fired biomass boiler, two back up diesel/dual fuel boilers (only used for peak demand). A further £3 million has been ring fenced in other projects at the hospital site including a heat pump for the physiotherapy pool and LED lighting.

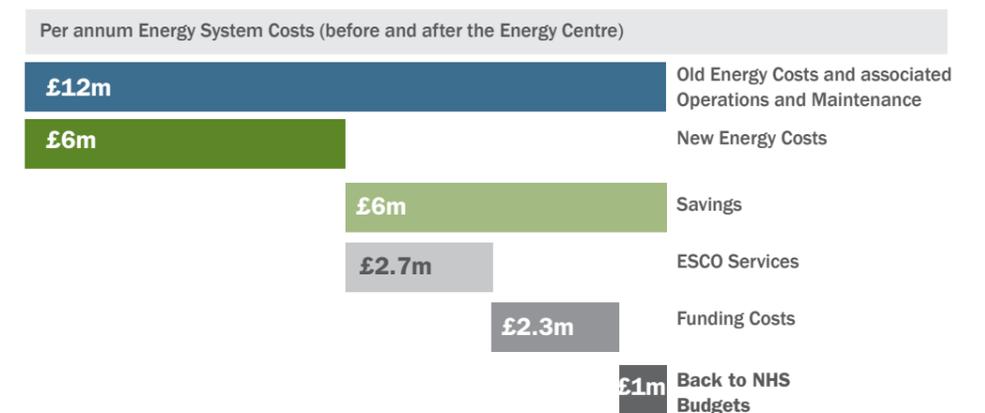
After taking account of the service costs of the Energy Centre and the financing costs this allows £1 million per annum to go back into the Trust.

In developing the new efficient energy plant, the hospital has longer term energy security and should be able to reduce maintenance costs compared to the old plant.

What's more, the Energy Centre is considering expanding to provide centralised services to the surrounding buildings potentially saving the NHS even more money per annum.

The project aims to:

- Generate avoided annual emissions of approximately 25,000 tonnes of CO₂e.
- Help the Trust achieve its 2020 carbon reduction goals.
- Reduce the Trust's overall energy bills by over £20 million over the 25 year operational term of the project.
- Reduce the Trust's payments due under the Carbon Reduction Commitment scheme by generating renewable energy from biomass.



Case study 2: Nottinghamshire NHS Trust – Rampton Hospital

GIB and Societe Generale Equipment Finance (SGEF) have joined forces to provide £50 million of finance for energy efficiency projects. The alliance will allow public and private sector organisations to put in place measures which will reduce their costs and emissions without having to find the capital upfront. The cost savings will be higher than the repayments, so organisations can start saving money from day one.

The first project to benefit from the GIB-SGEF partnership is at Rampton Hospital, Nottinghamshire Healthcare NHS Trust. The £5 million investment will finance the installation of a combined heat and power unit, a biomass boiler, dual fuel boilers and an effluent treatment plant. The project will be constructed and operated by energy services company Cofely.

Case study 3: St Bartholomew's Hospital

SDCL has provided finance for Skanska to deliver a low carbon combined chilling/heating and power (CCHP) solution at St Bartholomew's Hospital.

The £2.5 million investment will be made by the UK Energy Efficiency Investments Fund.

The project is the first investment under the strategic partnership formed between SDCL, GE, Clarke Energy and the NHS Confederation to finance and implement CHP solutions in the NHS, "Powering Health".

St Bartholomew's is the oldest hospital in London, founded in 1123, and the oldest in the UK that still occupies its original site. The project is being procured and delivered through a variation to the existing PFI contract.

The project involves the installation of a 1.4MW GE Jenbacher CCHP system with 250W absorption cooling, designed to maximise financial savings, increase efficiency of operation and improve system reliability and resilience. The CCHP solution will be delivered in conjunction with the construction of a new energy centre at St Bartholomew's.

Further information

Contacts

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You can find out more about GIB at www.greeninvestmentbank.com or find us on LinkedIn.

Additional resources

- Carbon and Energy Fund Ltd www.carbonandenergyfund.net
- RE:FIT www.refit.org.uk
- Essentia www.essentia.gstt.nhs.uk
- Ecovate Group www.ecovategroup.com
- Scottish Futures Trust www.scottishfuturestrust.org.uk
- Sustainable Development Unit www.sduhealth.org.uk
- Global Action Plan www.globalactionplan.org.uk

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