SASH SDMP Appendix 1:
Carbon Roadmap

FINAL DRAFT August 2016

Summary

As part of our Sustainable Development Management Plan (SDMP), we have set ourselves a target to reduce our Trusts total carbon emissions by 34% by 2020. In order to ensure this goal is achievable, an initial investigation was performed to identify opportunities for cost and carbon savings across the Trust.

Our target

To achieve a 34% reduction by 2020, we need to reduce our carbon emissions by 3,587 tonnes CO_2e from a baseline of 2014/15. Taking into account efficiencies made in 2015/16, our carbon reduction target over the next 4 years is 2,870 tonnes.

Potential Savings

Across utilities, waste and travel, the total savings identified as part of the Carbon Roadmap will reduce our Trust's carbon emissions by 3,121 tonnes CO_2e over our 2014/15 baseline (which exceeds our 34% target when combined with the progress we have made to date) and save nearly £760,000. A summary is outlined in the Figure A.1 below.

Measure Description	Estimated Annual Savings	
	Cost Savings	Carbon Savings
General	£24k	106 tonnes CO_2e
Energy	£605.2k	2,951 tonnes CO_2e
Travel	£64k	86.7 tonnes CO_2e
Waste	£66.5k	Increase of 22.4 tonnes CO_2e
TOTAL	£758.7k	3,121.3 tonnes CO_2e

Figure A.1: Identified Energy and Cost Savings

Next Steps

The next step is to produce an overarching carbon reduction programme to meet 34% reduction targets by 2020, building on the opportunities identified in this Carbon Road Map. This should be followed by developing detailed feasibility studies for the measures the Trust has outlined in their carbon reduction programme.

Carbon Roadmap

The Climate Change Act (CCA) clearly sets out carbon reduction targets for the UK government and all public body agencies including the NHS. As the largest public sector emitter of CO_2e in the UK, the NHS has set out a national framework for reducing its emissions in line with the CCA targets of 34% by 2020. All individual NHS Trusts are expected to put in place Board-approved action plans setting out how they intend to decarbonise their operations.

Our Carbon Footprint

We have used data provided in the Trust's ERIC returns to determine our annual emissions associated with utilities, waste and travel for the Trust since 2008/09. We have included all the key footprint elements which we can influence, including:

> Utilities (electricity, fossil fuels, water and sewage)

> Fleet transportation

> Business mileage (non-owned fleet)

> Staff commuting

Some of our buildings and services are owned or operated by third parties. As we are not in direct control, this arrangement adds an additional challenge in measuring and making changes to our services to reduce our footprint. Therefore, this plan focuses on East Surrey Hospital and services provided directly by the Trust, where we are more easily able to influence changes and directly benefit from savings.

In addition, emissions from procurement have not been included in carbon footprint as we are not currently able to accurately measure the impact.

A summary can be found in **Figure 2** and **Figure 3** of the SDMP.

External Factors Affecting Our Carbon Footprint

Although most of our emissions are a direct result of our operations, there are various external factors that can influence the emissions produced by our Trust. These factors include:

> NATIONAL EMISSIONS FACTORS issued by the government vary from year to year. This will result in a variance on our carbon footprint, even if there are no changes to our estate operation.

> WEATHER changes every year, which varies the energy consumption profile of our Trust. For example, a very cold year may increase the need for heating onsite, resulting in a higher natural gas usage.

> CHANGES TO OUR ESTATE. The measurement of carbon footprints are an absolute value, so any changes in resource demand will affect our footprint. Our only owned site, East Surrey Hospital, has undergone significant site growth over the past

couple years which resulted in increased emissions.

- LEASED PREMISES. We often have limited control over properties that we occupy that are owned, operated and maintained by a third party, such are Crawley Hospital. In turn this means we have limited influence over investment decisions that reduce our carbon emissions at these sites. This creates an opportunity for us to collaborate more closely with NHS partners to drive cost and carbon savings.
- SERVICES PROVIDED BY THIRD PARTIES. Some of our services are provided by third parties, such as our patient transport. Similar to leased premises outlined above, this limits our ability to make changes to our carbon emissions for these services.

Where We Are Now

Our carbon footprint has been calculated from 2008/09 and is summarised in **Figure 2** and **Figure 3** in the SDMP, as well as **Figure A.2** below. As these figures illustrate, our carbon footprint has changed significantly over time, which can be partially attributed to the considerable growth across our estate:

- Our site has been expanding since 2011/12, which has seen a 21% growth in the GIA of the Trust
- Our staff numbers have increased by 58% since 2008/09
- Our Turnover has been consistently increasing each year, with 2015/16 39% higher than 2008/09
- The number of occupied beds has increased by 20% since 2008/09
- Our overall patient activity has increased by 17% since 2008/09

Things of note:

- The overall trend has been an increase in carbon emissions, however our Trust saw a decrease from 2008/09 to 2011/12, after which point the Trust started expanding its area
- Although water and sewage is one of the smallest contributing factor to our carbon footprint, it has increased 43%
- Waste has seen the largest percentage of carbon reduction which is mainly attributed to ensuring our waste disposal method includes energy recovery where possible
- In 2015/16 energy was responsible for 89% of our total emissions, with electricity accounted for 55% carbon emissions and fossil fuels 33%

In order to reflect the substantial growth in our Trust over the last couple years, we have chosen our baseline year to be 2014/15. Therefore, any targets that are set will be compared against the Trust's performance in this year.

Drivers for Action

In addition to the benefits for sustainability set out in the SDMP, there are many drivers to reduce carbon emissions, which are outlined below.

Financial benefits: There are many cost implications as a result of activities that generate emissions, including:

- Carbon taxes - We currently pay Climate Change Levy (CCL), Landfill Tax and other less visible taxes linked to environmental impact. Through better waste management, energy efficiency and renewables our Trust will alleviate the escalation of these costs.
- Carbon Reduction Commitment (CRC) – Out Trust is part of the CRC programme which we pay for every tonne of CO2 that is emitted as a result of our energy

consumption. Although this scheme is set to be scrapped in 2019, it will be replaced by an increase in CCL.

> Energy Inflation - the Department for Energy and Climate Change (DECC) have set out how they foresee the future changes in energy inflation, with current predictions seeing an annual increase of 3-6%. Energy efficiency measures will help reduce the future financial burden of running our estate.

Enhanced environment for patients and staff: A study from the World Green Building Council showed that Improvements in lighting and ventilation, as well as maximising natural light can improve staff productivity by 23%, 11% and 3% respectively. The same World Green Building Council report highlighted that patients are quicker to recover by 8.5% when they have an external view, which can be further aided by enhancing patient wellbeing through thermal comfort and the environment around them.

Reputational Benefits: There could be considerable reputational benefits associated with achieving the CCA target. It will demonstrate our commitment to achieving greater environmental performance through a tough financial landscape and during a time of extensive expansion.

Where do we want to be?

To achieve a 34% reduction by 2020, we need to reduce our carbon emissions by 3,587 tonnes CO_2e from our baseline of 2014/15. Taking into account the progress we made in 2015/16, we need to reduce our total footprint by another 2,870 tonnes over the next 4 years. This equates to an average reduction of 717 tonnes per year, or a year on year decrease of around 7%.

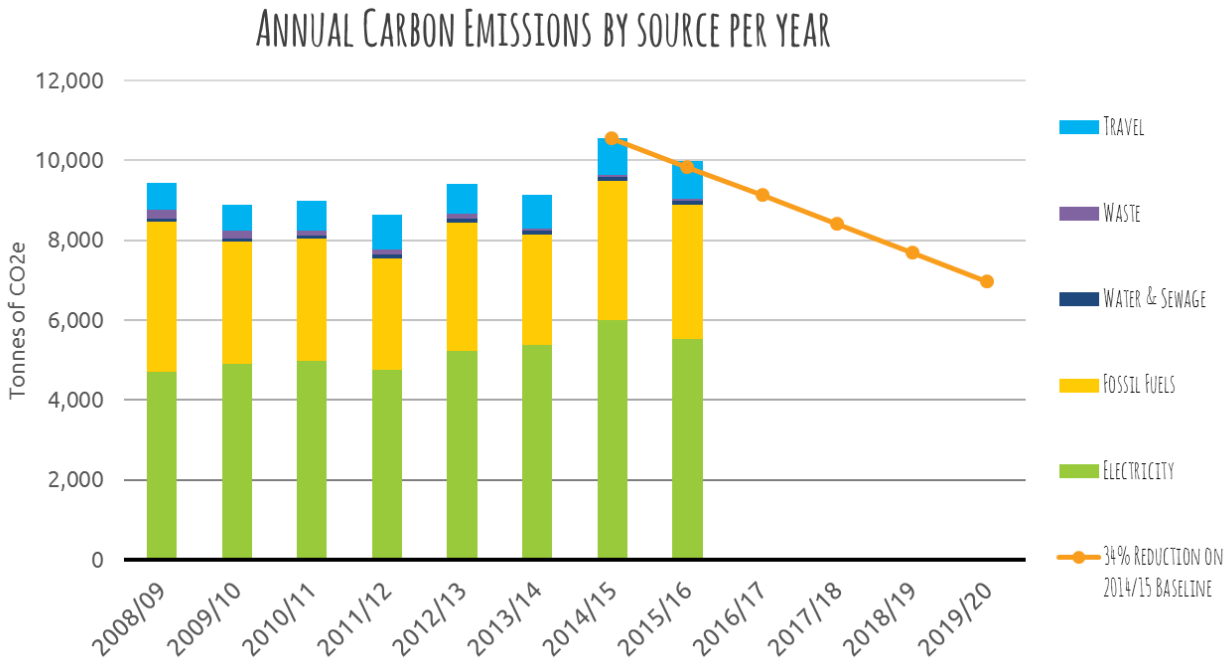


Figure A.2: SASH Annual Carbon Emissions Reduction Target

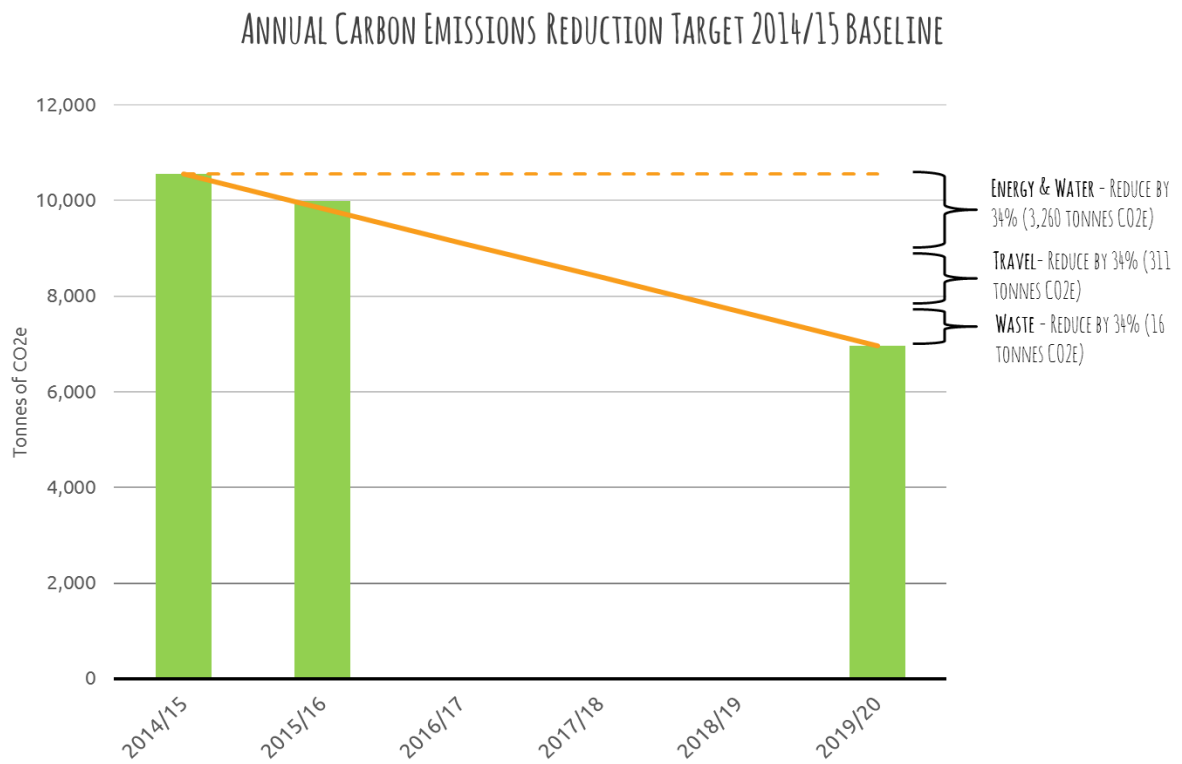


Figure A.3: Carbon Emissions Reduction Target

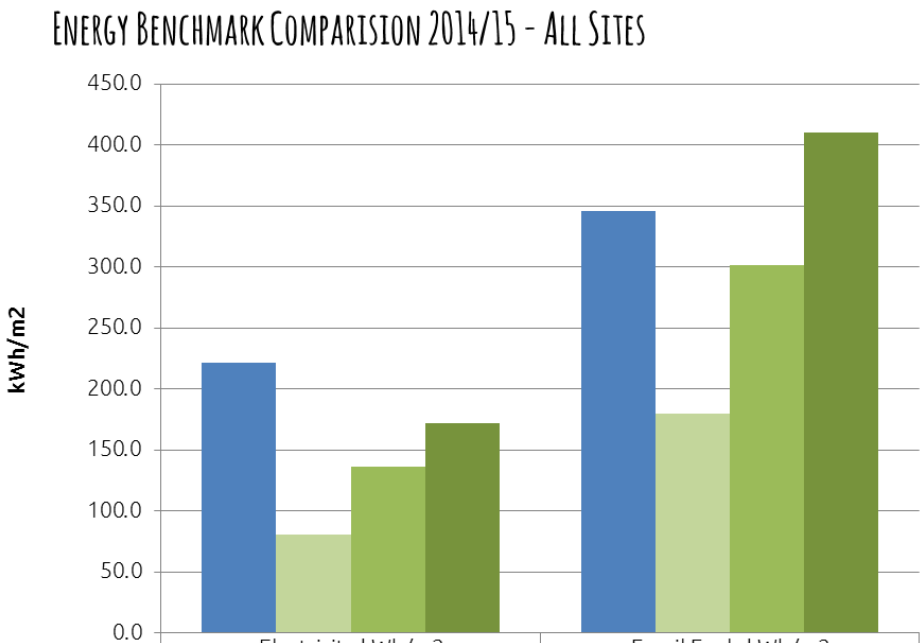
Benchmarking

Comparing our Trust's performance against similar buildings gives a starting point of areas that we can target for possible efficiency savings. Our 2014/15 data has been compared against industry published benchmarks, as well as with other medium acute Trusts across the country using published ERIC data. These comparisons are shown in **Figure A.4** to Figure **A.6**.

As can be seen, we have consistently higher consumption then the average figures across all utilities, indicating that there's a good potential for savings across these areas.

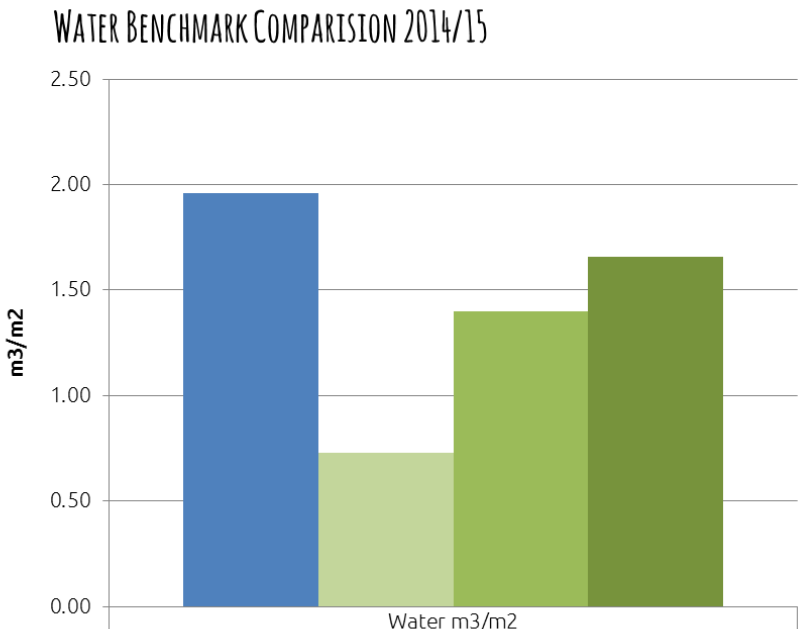
Source	Electricity (kWh/m²)	Heating (kWh/m²)	Water (m³/m²)
Surrey and Sussex Healthcare NHS Trust - 2014/15	222	346	1.96
Heath Technical Memorandums (HTM07-02 2015, HTM07-04 2013) - Median	118	311	1.17 (small acute) 1.66 (large acute)

Figure A.4: Benchmark Comparisons



	Electricity kWh/m2	Fossil Fuels kWh/m2
EAST SURREY HOSPITAL	221.5	345.6
GOOD PERFORMING HOSPITAL	80.7	179.4
AVERAGE PERFORMING HOSPITAL	136.5	301.8
POOR PERFORMING HOSPITAL	172.0	410.4

Figure A.5: ERIC 2014/15 Energy Benchmark Comparison



	Water m3/m2
EAST SURREY HOSPITAL	1.96
GOOD PERFORMING HOSPITAL	0.7
AVERAGE PERFORMING HOSPITAL	1.4
POOR PERFORMING HOSPITAL	1.7

Figure A.6: ERIC 2014/15 Water Benchmark Comparison

Carbon & Cost Saving Opportunities

In order to meet our commitment of reducing our carbon footprint by 34%, the Trust needs to make a significant step change in the way we manage our carbon emissions. We have performed an initial investigation at East Surrey Hospital to identify opportunities for cost and carbon savings across the site. This audit consisted of a combination of desktop reviews, as well as site walkthroughs with the intent to assess potential ways for which our Trust could meet their carbon commitment outlined in this SDMP. Below is a summary of opportunities identified for energy and waste, as well as travel across our Trust including estimated annual savings and typical paybacks for each measure. In order to achieve these savings, the Trust will need to ensure resources are available to support the implementation of the outlined measures.

General Measures

Measure Description	Estimated Annual savings		Average Payback
Behavioural change and monitoring & targeting One of the most cost effective ways to reduce expenditure and the carbon footprint of our Trust is engaging staff to each do their part. A behavioural change campaign can touch on elements across all departments in our Trust - from saving energy by turning off lights, to ensuring waste is segregated properly, to reducing mileage from unnecessary journeys. In addition, monitoring and targeting is a key element in any reduction programme because it can be hard to identify savings when the baseline is unknown. Continuous monitoring can highlight areas of overspend in activities, making finding opportunities for savings much easier. This measure often leads to the	£24k savings	Reduction of 106 tonnes	< 3 years

identification of ‘quick wins’ and inefficiencies, as well as providing positive feedback for behavioural change campaigns. Savings that result from these measures will vary depending on areas of focus and the responsiveness of staff, as well as dedicated resource available to support the implementation. Typical savings achieved are between 1 and 5% and to highlight possible reductions, we have included cost and carbon savings of 1%.		CO_2e	

Energy Measures

East Surrey Hospital is a medium acute hospital which was originally built in 1979, with the Phase 2 expansion of the building occurring in 1991. In recent years, the site has grown again mainly through the use of pre-fabricated buildings.

The main hospital building is heated through three separate boiler plants – one steam plant which supplies heating for Phase 1 and process loads, one low pressure hot water (LPHW) plant which provides heating to Phase 2, and a set of domestic hot water boilers which serve the site. The pre-fabricated buildings around the site are mainly heated by localised boiler plants using natural gas. The site has two main chiller plants serving Phase 1 and Phase 2, in addition to several gas fired heat pump units which provide cooling and hundreds of localised split air conditioning (A/C) units around the site.

The site is fed electricity directly from the grid through one main supply and a few smaller connections. There is currently no onsite generation facility apart from the backup electricity generators and the PV system that is owned by St. Luke's.

The measures have been identified from a combination of desktop audits from information available, discussions with Estates staff and a brief walkthrough of site.

Measure Description	Estimated Annual Savings		Average Payback
Review and validation of utility bills Reviewing utility bills regularly will help to ensure we receive the best value for money. It is recommended our Trust undertakes a review of all their supplies to check available tariffs and other charges if this has not been completed recently. The gas supply to site with MPRN 9299344502 is currently on a deemed contract with a supply rate of 5.5p per kWh and £25 per day standing charge. Switching this supply onto our current contract with Crown Commercial Services (CCS) will save significant costs. The electricity supply for Maple House was noticed to be supplied by e.on and not under the CCS contract.	£30k savings	No carbon impact	< 3 years

The standing charges and unit rates appeared to be considerably higher than similar size supplies on CCS at 22.84p per kWh and 104p per day standing charge. As only one bill was available, the annual consumption has been estimated to identify possible savings. The savings were calculated based on a single rate, however additional savings could be achieved if we are charged on day and night rates (if the meter allows for this). Proposed changes to the water industry in April 2017 mean that non-domestic customers will be able to change their suppliers. It is recommended that the Trust reviews the market to identify possible benefits and savings from this industry change.	£8k savings	No carbon impact	< 3 years
Lighting The lighting across our estate varies considerably, from the original fittings installed when the hospital was built, to new LED high efficiency lights with daylight and occupancy sensors. A walk around the site indicated there is scope to replace old T8 and T12 lighting with LED equivalents. Only a small area of the main hospital building was audited and included in these savings calculations, however there is a larger scope available for retrofit. It is recommended that a full lighting audit is performed across the hospital to identify the possible scope of the opportunity.	£5k savings	Reduction of 25 tonnes CO_2e	3 – 7 years
Localised steam generators Steam is provided to site by three large boilers installed as part of the Phase 1 construction, each rated at 2720kg/hr. The majority of the steam is converted to LPHW in the plantroom for Phase 1 heating, however a small amount of steam is transferred across the site for autoclaves and washers. During the summer, the Phase 2 boilers can provide sufficient heat to supply both Phase 1 and Phase 2 heating required onsite and valves have been installed to allow the heating of Phase 1 to be isolated from the steam supply. Therefore, in summer the large steam boilers are kept running for a small amount of process loads. Installing localised steam generators for the processes will not only allow the steam boilers to be shut down in the summer months, but it will also allow the decommissioning of the steam distribution system outside the plantroom – saving both the energy losses associated with pipe runs and on-going maintenance costs. Savings have been estimated based on reviewing the daily boiler gas logs during the summer of 2015 when	£17k savings	Reduction of 129 tonnes CO_2e	3 – 7 years

the Phase 1 heating was isolated from the steam boilers and the half hourly data to estimate the process load and steam losses.			
Centralised boilers The main heating and hot water services for the hospital is currently provided by 3 separate boiler plants – one system that services the domestic hot water, one LPHW system that provides heating to Phase 2 and one set steam boilers which provide heating to Phase 1. In the summer when the demand is low, the heating for both Phase 1 and 2 is provided by the LPHW Phase 2 boilers. Combining the three systems will improve the efficiency and prevent dry cycling. Although savings have been calculated as if it was a standalone measure, combining this with localised steam generators will allow the site to decommission the steam system. In addition, the Trust could install new boilers, which will increase the possible savings.	£28k savings	Reduction of 214 tonnes CO_2e	3 – 7 years
Installation of a combined heat and power (CHP) plant – 600kWe Electricity is a very carbon intensive and expensive utility to import from the national grid. Installing a CHP onsite allows the Trust to generate electricity locally whilst utilising the by-product of heat for heating or domestic water. These combined plants have typical efficiencies of 85%+ and use natural gas, reducing both the cost and carbon footprint of our Trust. In addition, we would have reduced CRC payments (until 2019 at which point this will be replaced by increase in CCL), as well as possible reduced Triad charges. Initial analysis of the half hourly gas and electricity profiles of the site indicates there is a consistent electrical load of about 1,000 kWe, however the base heat load is much lower around 600 kWt. Therefore, the installation of a smaller 600 kWe engine would minimise the wasted heat that is dumped from the system. Further analysis of the heat demand of the main plant is required to ensure the CHP is sized for the baseload. Although this has been included as a standalone measure, combining it with localised steam generators and a combined heating plant will help in utilising all the heat available from the CHP, however it may also result in a decreased baseload.	£285k savings	Reduction of 1564 tonnes CO_2e	3 – 7 years
Installation of a CHP plant – 854kWe A larger CHP unit offers more benefit to our Trust in terms of costs savings due to the decreased import of	£454k	Reduction of 2,153	3 – 7 years

electricity to the site, although the overall efficiency and environmental impact of the system will be lower as any heat that is not used onsite will need to be dumped. There are alternatives, such as modulating the output of the engine based on the heat load for the site or exploring options to utilise the heat elsewhere, however for this initial review these options have not been explored.	savings	tonnes CO_2e	
Theatre PIR sensor control Installation of Passive Infrared (PIR) sensors to control plant can ensure the ventilation is only operating when the theatres are occupied and maximize savings by placing the plant in setback mode during unoccupied periods. Although some theatres have PIR sensors installed, many still operate solely on schedules. Reviewing the BMS, the theatres are scheduled as follows: • Theatre 1 to 4 – scheduled on from 6am – 8pm Monday – Sunday with PIR controlling setback after hours • Theatre 5 to 6 - scheduled on from 8am – 6pm Monday – Sunday • Theatre 7 and Recovery 7/8 - scheduled on from 8am – 5pm Monday – Friday • Theatre 8 – Emergency always on • Theatres 9 to 10 - scheduled on from 6am – 8pm Monday – Sunday It was noted that staff often don't start prepping the theatres until 7:30 – 8am and end times will change on a daily basis but are scheduled on to ensure the plant will be operating if surgeries run late. It was also mentioned that Theatres 1-4 don't currently operate on weekends. Fan power savings have been estimated using the above scheduling and using the equipment information collected during the audit as a benchmark.	£3.5k savings	Reduction of 18 tonnes CO_2e	< 3 years
Theatre air handling unit (AHU) temperature setback The theatres are typically set at 18°C during hours of operation, with surgeons having the flexibility to adjust the set point, however there is no temperature setback in place during unoccupied periods. Current HTMs allow for this setpoint temperature to be reduced to 15°C during setback to reduce energy consumption. Savings have been estimated on current operation schedules of the Theatres, however there is the	£2.5k savings	Reduction of 20 tonnes CO_2e	< 3 years

potential for additional savings if the Theatre PIR control measure is implemented. A detailed feasibility study should be conducted to identify possible impacts on operation and ensure the installed equipment can recover temperatures in an acceptable timeframe.			
Theatre AHU night isolation The Health Technical Memoranda (HTMs) for theatre AHUs allows non-emergency theatres to be isolated during unoccupied periods to reduce energy consumption where appropriate safeguards are in place. Although the majority of savings will result from the night setback, additional savings can be achieved by shutting down the plant completely. The savings from this measure assumes PIR sensors have been installed on all AHUs. A detailed feasibility study should be conducted to review existing plant can meet operational demands, identify impacts on operation, as well as outline possible risks associated with this measure. In addition, a consultation with stakeholders (such as authorising engineers and infection control) should be held to determine viability of this scheme.	£1.8k savings	Reduction of 10 tonnes CO_2e	< 3 years
Direct drive high efficiency motors There are several low efficiency belt driven motors that can be found around the site. As many of these motors operate continuously, replacing them with high efficiency direct drive motors will reduce electricity consumption. Only the pumps in the main plant room that were audited have been included, however additional savings can be achieved by expanding the scope.	£1.5k savings	Reduction of 8 tonnes CO_2e	3 – 7 years
PIR sensors on local air conditioning A/C units The site has hundreds of localised A/C units that serve offices and meeting rooms. Often these units are turned on and kept operational whilst the rooms are unoccupied, including overnight. Installing PIR sensors on these units will ensure cooling is only provided when someone is in the room. A sample audit was performed on a few of the units and savings have been estimated on installing PIR sensors on 20 offices around site.	£1.9k savings	Reduction of 12 tonnes CO_2e	3 – 7 years
BMS / controls recommissioning Overtime, BMS settings often drift from optimal setpoints when there isn't a dedicated resource to manage it. To ensure the maximum savings are being obtained from the BMS, it is recommended that the controls	£10k savings	Reduction of 62 tonnes	< 3 years

be audited on a regular basis. This will ensure schedules reflect current occupancy, sensors are calibrated correctly, equipment isn't set to 'hand' and the system is operating as expected. A high-level review of the BMS found: • Heat run around coils working in the summer which was heating the incoming fresh air before it was cooled • Systems cooling air to a lower setpoint then being called for downstream, resulting in the air being re-heated locally before it was supplied • Several sensors (such as temperature or humidity sensors, and valve positions) appeared to be out of calibration, which can cause unnecessary heating or cooling. • Some schedules did not match current occupancy (example theatres 1-4 which is covered under a separate measure). In addition, many of the smaller plants across site only have local controls which should be reviewed to match current occupancy. In addition, a review of the existing control strategies should be under taken to identify possible adjustments which can reduce energy consumption. Some examples include: • Implementing holiday schedules • Optimum start and stop (it was indicated this was not currently being done) • The heating and cooling circulation pumps were running consistently at full flow as the existing systems are designed for constant volume. The Trust could review the possibility of modifying the flow rates during periods of low demand, such as on outdoor air temperature. A detailed investigation will need to be performed in order to ensure there are no systems that become 'starved'.		CO_2e	
Cavity wall insulation Most buildings which were built after 1900 were typically designed with cavity walls to reduce heat loss. These cavities can be filled with an insulating material to improve the efficiency of the building. Although it's unknown if Phase 1 and Phase 2 of the hospital were built with cavity walls or if the cavities have been filled, the construction and age of the building indicate this could be a possible measure at the hospital. For	£23k savings	Reduction of 178 tonnes CO_2e	7+ years

this initial investigation, areas and existing conditions have been estimated, however further investigation will be required.			
Window upgrades Our Trust is working on a window improvement programme to be rolled out over the next 3 years which will replace the existing single glazed windows with double glazing. Although this was implemented as a capital upgrade programme, we will receive a benefit of reducing their energy consumption. As information on the windows which will be replaced was not available, savings have been calculated using estimated window size and U-values for pre and post construction.	£10k savings	Reduction of 77 tonnes CO_2e	7+ years
Installation of a 50 kW solar photovoltaic (PV) system The installation of renewable energy systems onsite can reduce imported electricity, generate income through Feed-in Tariffs and demonstrate our commitment to sustainability. There is already a PV system installed on the roof on St. Luke's, however our Trust doesn't benefit from this array. Further investigation will be needed to check if an additional system on the site would affect the existing array, however as we have several MPANs, a new system can be connected to a different point. The Feed-in-Tariff programme has introduced caps for each tariff level and therefore income generation will vary based on when the installation will occur and how subscribed the programme is. The savings have been calculated using the current published rates for Oct – Dec 2016.	£5.5k savings	Reduction of 19 tonnes CO_2e	7+ years
Installation of a 100 kW solar PV system Additional savings can be achieved by increasing the size of the array that is installed onsite. Although there is a decrease in tariff for systems larger than 50kW, less electricity will be imported from the grid.	£9k savings	Reduction of 38 tonnes CO_2e	7+ years

There are other possible measures that have not been included above which could be considered:

- Replace existing calorifiers with plate heat exchangers
- Connecting Phase 1 and Phase 2 chilled water circuits to improve over all efficiency

- Ensuring space is utilised efficiently and effectively
- Review localised heating plants for efficiencies
- Connecting localised plant to the central BMS
- Review kitchen operation and equipment

Note: Some of the measures listed above are interrelated and implementing one measure may have a direct impact on the savings identified for another measure. A detailed analysis of the savings should be carried out once the Trust has identified which measures they wish to proceed with.

Waste Measures

These measures have been identified following a brief site visit and discussion with Dominic Fitzmaurice, Portering Supervisor. Areas visited included the main waste compound, one ward, the kitchen and canteen area.

These investigations showed that while the introduction of the offensive waste stream and recycling are at early stages, we are beginning to make progress as a Trust with implementation of more efficient waste management practices. Continued roll out of offensive waste will provide significant cost savings to our Trust and ensure we are meeting Hazardous Waste legislation and Environment Agency requirements appropriately. Recycling levels are currently low at less than 10% and could be significantly improved; based on experience at other local Trusts, a minimum of 60% recycling should be possible. Cooperation of the waste contractor is key to enabling this to happen, and the opportunity of our Trust's re-tender of the waste contracts will be important in achieving this – as well as other waste management efficiencies – over the next 4 years. For the purpose of this review we have made a conservative estimate of 40% recycling levels, which is achievable on a more short term basis.

In order to achieve the measures below, a renewed focus should be put onto staff engagement including training, consistent signage for healthcare and non-healthcare waste and new bins. All of these will be required in order to meet legislative requirements and achieve the savings set out below.

Measure Description	Estimated Annual Savings		Average Payback
Increase offensive waste to 40% Work with Infection Control to roll out offensive waste across East Surrey Hospital. For simplicity, areas can usually be designated as either offensive (tiger bag) or infectious (orange bag) waste producers. In the event of an outbreak in a ward, all tiger bags would be switched out to orange.	£23.5k savings	Increase of 42 tonnes CO_2e	< 3 years
Recycle 20% of bagged healthcare waste Introduce recycling bins to all wards in place of general waste (black bag) bins. This should be used for all recyclable waste in the ward e.g. handtowels, packaging etc. Savings identified assume the above	£26k savings	Reduction of 8.6 tonnes	< 3 years

measure has been put in place, with offensive waste at 40% of healthcare waste.		CO_2e	
Recycle 40% of non-healthcare waste Introduce recycling bins throughout the hospital. Provide recycling bins for offices (one per office, or corridor), with recycling bins and worktop bins for general waste in all kitchen areas, locate recycling bins under all hand towel dispensers. Recycling rates of 60% should be achievable but a conservative estimate of 40% has been taken for the purpose of this study.	£17k savings	No carbon impact	< 3 years
Switch to incineration with heat recovery for healthcare waste The Trust currently sends healthcare waste to an incineration facility. Carbon savings can be achieved if we switch to a contract with energy recovery when we next go out to tender for a new contract.	No cost savings	Reduction of 11 tonnes CO_2e	< 3 years

Other measures for consideration:

- Through the new waste tender, work with healthcare waste contractors to dispose of offensive waste through energy recovery rather than landfill by 2020. While not currently possible for most waste contractors, infrastructure is currently being developed and should be up and running within the next year or two to allow this. In addition to meeting the requirements of the Environment Agency, this would then remove the additional carbon impact of introduction of offensive waste (calculated at 42 tonnes CO_2e).
- Work with procurement and clinical services to identify measures to reduce overall waste tonnage across the Trust. This might include measures to reduce packaging, use of disposable instruments and medicinal waste.

Travel Measures

Our Trust has done a lot to manage their travel across our estate and have introduced a travel plan to encourage the use of more sustainable travel. Recent actions include:

- Encouraging active commuting by installing changing room and shower facilities, fitting additional bike lockers for staff and continuing to participate in the national cycle to work scheme
- Trial of electric vehicles for transport services, and providing demo bikes – both traditional and electric – for staff to try out
- Encouraging staff to use public transit
- Introducing a lease car scheme for staff and a pool car to be used by staff for business travel
- Manging grey fleet travel by using an online expense system

Measure Description	Estimated Annual Savings		Average Payback
Lease car scheme SASH operates a salary sacrifice lease car scheme through a third party provider (My Car). If not recently carried out, the provider should be market-tested to ensure rates are competitive and maximise uptake amongst staff. By incorporating a monthly administration fee within the scheme, revenue can be generated even where the service remains outsourced - £10 per vehicle will generate £12K per 100 vehicles. It is understood that there is currently no carbon limit applied to the scheme. By implementing an upper threshold the sector emissions can be reduced systematically as new vehicles come online and natural wastage occurs, with all vehicles falling below the limit by the end of one contract cycle. Based on estimated current average emissions of 180 g/km and with an upper limit of 120 g/km applied, carbon savings will be in the region of 9.7 tonnes CO_2e for every 100,000 miles travelled.	£12k per 100 vehicles	Reduction of 9.7 tonnes CO_2e per 100K miles	< 3 years

Pool car scheme There is currently one pool car in operation within our Trust – a VW Golf allocated to Community Midwives – but its annual mileage suggests it may not be breaking even against the equivalent grey fleet reimbursement. Introducing a low emission pool car fleet for business travel (to patients, meetings, training, inter-site etc.) can reduce both costs and carbon emissions. With an estimated grey fleet reimbursement of £0.50 per mile, hybrid pool cars will typically break even at fewer than 30 miles per day and generate in the region of £1.2K / 0.8 tonnes CO_2e annual savings per vehicle. Suggested initial implementation of five vehicles.	£6k	Reduction of 4 tonnes CO_2e	< 3 years
Fleet operation optimisation SASH operates a fleet of seven panel vans which achieve 189K miles per annum. No cost information is yet available for these vehicles. It is recommended to review the utilisation and deployment of this fleet sector, ensuring the lowest possible emissions and whole life costs are achieved – this may be an opportunity to introduce alternate fuels. Consider solus deal (lease or manufacturer) for renewal and rotate vehicles to balance mileages. Review/ implement fuel card use. Lease companies offer more favourable rates for solus provision which could represent around £2K saving for a fleet this size with a further £3K through vehicle rationalisation and fuel cost controls.	£5k	No carbon impact	< 3 years
Courier operation optimisation SASH provides its own internal courier system, however no data on routes or schedules has been shared at this stage. It is recommended to review the courier operation to: • Ensure optimisation of all existing routes • Establish whether mutual cost efficiencies can be made with neighbouring Trusts • Establish whether any commercial opportunities exist to offset the cost of the internal operations – private healthcare, pharmacy etc. Reducing the internal courier network by one driver and vehicle could save in the region of 30K - based on 1.0 WTE full-time band 2 staff using a small diesel panel van – and around 5 tonnes CO2e.	£30k	Reduction of 5 tonnes CO_2e	< 3 years

Salary sacrifice schemes In addition to the lease car scheme, SASH operates a cycle to work scheme, providing savings against pension and NI contributions. No data was received although typical savings will be in the region of £120 - £150 per order. It is recommended to explore and introduce further salary sacrifice schemes. SASH use Connected Benefits for their cycle scheme, who offer additional salary sacrifice scheme options, including electronics, mobile phones and gym membership. For electronics alone, typical savings are in the region of £100 per order; based on 3% uptake in a 3,700 workforce this equates to £11K.	£11k	No carbon impact	< 3 years
Reduce staff commuting by road The largest component of the travel portion of the carbon footprint is related to staff commuting to work by road. A staff travel survey indicated that 71% of staff who work weekdays travel to work by car. The Trust has an array of programmes designed to support staff commuting in a more sustainable way. Re-energising the existing campaign to reducing the percentage of staff that drive to work to 65% will reduce the overall carbon footprint.	No cost savings	Reduction of 68 tonnes CO_2e	n/a

Funding Options

Most of the carbon reduction opportunities presented in this roadmap require some level of funding and the Trust will need to invest in their site inorder to make a step change in their carbon emissions. There are several different financing options available, each with specific benefits and risks, which are explored in detail below.

1. Asset Replacement

This option reflects how the Trust is currently operating, with equipment replaced as and when it wears out with more efficient technology.

BENEFITS:

> This method does not require additional funding from the Trust

RISKS:

> SDMP outlines a 34% emissions reductions by 2020 over 2014/15 baseline - If nothing is done, another plan will be required to meet targets

> Energy and carbon costs likely to increase due to inflation

2. Self-Funding

The most cost effective way to implement a carbon savings programme is to provide all the capital from internal funding, as this eliminates any additional costs to the programme such as interest and margins paid to external suppliers.

Currently, we don't have a capital fund specifically dedicated to carbon reductions measures. Should our Trust decide to pursue this funding option, there are a few typical ways this is done:

> Project by project basis – where each specific project is given capital when required

> Dedicated annual allowance – where our Trust allocates of funding each year for efficiency projects

> Ring-fenced funding – this is where our Trust dedicates an amount of capital to the programme and the on-going savings from the projects implemented under the fund are recycled back into the pot to allow for additional projects to be invested in

BENEFITS:

> Self-funding provides the best financial model as there are no additional charges, such as interest

RISKS:

> We will assume all the risk on cost performance of the measures for a self-funded project

> Our Trust will have to ensure capital is dedicated to carbon reduction measures

3. Outside Funding

If the Trust is unable to fund projects using its own capital resources, there is an option to source outside funding.

i. Salix

Salix is a funding mechanism put together to deliver 100% interest-free capital to the

public sector to improve their energy efficiency and reduce their carbon emissions. The criteria to qualify for this funding in England are:

> The project must pay for itself from energy savings within a maximum 5 year period, which can be a single measure or a combination of measures

> A maximum cost of £100 per tonne of CO2 over the lifetime of the project

> Projects will have to be completed within a 9 month timeframe from the commitment date

> Equipment covered by the funding is included in the 'Approved Technology' list – however other equipment may be considered but will need to be approved

> Projects must be "additional" – i.e. would not have happened without this funding

Salix can be combined with other types of funding in order to finance a full project that does not meet the requirements outlined by Salix. However, with combination financing many Trusts complain about being 'cash strapped' in the first 5 years of the project as all savings typically go to pay back the Salix loan.

ii. Trust Development Authority

The TDA can make available a variety of types of financing for Trusts. Although this can have some of the most attractive interest rates, obtaining the financing can be long process.

iii. Private Finance

There are private financers that will provide funding for projects that are not funding through other routes, however these rates are typically higher than other options available to our Trust.

BENEFITS:

> Installation can occur as a single project or incremental over a few years

> Project costs can be much lower if in-house resources are available for project management and engineering

> Reduced purchase price and on-going costs if directly procured with suppliers or contractors

> Carbon and cost reduction can still be achieved

> Reduction in backlog maintenance

RISKS:

> External funding can be hard to obtain unless it is backed by a guarantee of a third party (typically an Energy Services Company (ESCo). See below for more details)

> Our Trust is responsible for the loan repayments irrespective if the savings are not being achieved which can increase financial obligations for us

> Projects may need to meet specific criteria in order to meet funding requirements

> Private financing can be expensive

4. Off Balance Sheet Financing

An 'off balance sheet' solution has become popular in the NHS as it offers no upfront costs whilst still providing our Trust with new equipment. Instead, the Trust pays a fixed amount over the life of the contract for the kit.

The most popular schemes are for CHPs and boiler plants, however other energy saving measures such as lighting or motor upgrades are often included as part of the projects. There are two main options for this type of arrangement:

> Operating lease - where the ownership, operation and maintenance of the equipment is provided by a third party

> Purchase of power and/ or heat – where the equipment is operated by an external contractor and the generated power and heat is purchased at a reduced rate

BENEFITS:

> No upfront capital investment from our Trust, however will still achieve carbon and cost savings

> Money saved could be reinvested in other measures over the following year

RISKS:

> Operating leases (outside of an Energy Performance Contract) do not have guaranteed savings.

> The Trust will not own the equipment at the end of the project. Therefore our Trust may be liable for a nominal 'lease' cost until the equipment is replaced, or the equipment could be removed at the end of the lease term

5. Energy Performance Contract

An Energy Performance Contract (EPC) is a mechanism which an Energy Services Company (ESCo) designs and implements energy conservation measures (ECMs) with a guaranteed annual savings. A number of ECMs are typically wrapped together into a single project, allowing our Trust to make a step change in their carbon emissions.

This solution allows our Trust to upgrade infrastructure and reduce carbon emissions with any underperformance risk being transferred away from us. This is achieved by an ESCo guaranteeing a minimum level of savings which is typically structured so it is higher than the loan repayment, making the project cash positive from year one.

EPCs are more expensive then implementing the project internally because the fees include engineering and design, project management, construction management, overhead and profit, as well as the guarantee fee. The additional costs result in a turnkey solution provided by the contractor and therefore less support for the project will be required internally. Industry standard pricing for these are around 30-40% of the construction cost of the project. In addition, an ongoing monitoring and verification (M&V) would be expected which will depend on the size and complexity of the project.

There are different mechanisms used to finance EPC project, which can include one, or a combination of those listed above.

BENEFITS:

> No upfront capital investment from the Trust

> Guaranteed savings, typically around carbon and cost

> Flexibility for financing options which can ensure the project is cash positive on an annual basis

> Ability to expand the project to include backlog maintenance and infrastructure upgrades which our Trust may not have capital for

> Turn-key projects

RISKS:

> It is the most expensive option to undertake a carbon reduction programme

> Typically, these projects only include energy efficiency measures

- Long term projects which can last 15+ years, so the Trust needs to be committed to the process
- Contracts can be complex and often not previously seen by in-house teams

For further information please contact:

Ian Mackenzie, Director of Information and Facilities

Email: ian.mackenzie@sash.nhs.uk
Tweet: @NHSIanMackenzie

Surrey and Sussex Healthcare NHS Trust
Trust Headquarters
East Surrey Hospital
Canada Avenue
Redhill
RH1 5RH