Centre for Sustainable Delivery

NHS SCOTLAND

National Green Theatres Programme

Pròg̀ram Nàiseanta Lannsaireachd Uaine

Automated switch off out of hours Heating Ventilation Air Conditioning (HVAC) within operating theatres - Opportunity for Change

Revised: July 2023

An opportunity to save across NHS Scotland:

6,594 Tonnes of CO_2e

£7,798,262

1. Description of action

1.1 It is the intention of this opportunity for change to highlight the environmental benefits and cost saving opportunity of switching off the HVAC systems within operating theatres during out of hours operation.[1]

2. Background

2.1 Operating theatres are three to six times more energy intensive than the rest of a hospital as a whole.[2] This carries a financial as well as environmental cost that is often poorly appreciated. People are increasingly aware of the need to reduce energy consumption at home and it is important that the NHS educates, encourages and enables staff to do the same at work.[3] Within the operating suite HVAC systems commonly account for over 90% of operating theatre energy consumption[4].

2.2 Energy manager Allan Lamb from NHS Greater Glasgow and Clyde conducted an evaluation of the plant running regimes within his site. The outcome has identified the specific carbon and financial impact of an air handling unit within a theatre. Each unit costs an average of £132.84 per day to run[5] and emits 114kg of Co2e per day.[6] If we extrapolate these figures to understand what this means nationally it equates to an annual spend of £18,715,828 each year.[7] If we look at the carbon impact it is over 16,058 tonnes of Co2, this is more emissions than driving a medium sized petrol car round the earth, twice.[8]

2.3 At present, some hospitals have automated controls with local over-ride, but many units have person-specific protocols for management that are inherently unreliable, meaning these

[1] Out of hours is defined as the hours when the theatres are not in use.
[2] MacNeill AJ, Lillywhite R, Brown CJ. The impact of surgery on global climate: a carbon foot printing study of operating theatres in three health systems. Lancet Planetary Health 2017; 1; e381-88
[3] Dr, J. and Puddy, E. (n.d.). *Sustainability: Energy use and water consumption*. [online] Available at: https://www.rcoa.ac.uk/sites/default/files/documents/2021-12/Energy%20use%20and%20water%20consumption%20final.pdf.
[4] MacNeill AJ, Lillywhite R, Brown CJ. The impact of surgery on global climate: a carbon foot printing study of operating theatres in three health systems. Lancet Planetary Health 2017; 1; e381-88
[5] Costing is based on one unit using 540kw energy per day and a kilowatt of energy costing 0.246p (23/24 figures).
[6] Figure based on a kilowatt of energy producing 211.07g of Co2e
[7] Based on 386 theatres in Scotland.
[8] UK Government GHG Conversion Factors – 0.296kg Co2e omitted per mile.

energy expensive systems can remain switched on 24/7. Instituting automated systems with occupancy sensors would potentially reduce energy consumption by 66%.

2.4 Health Facilities Scotland (HFS) published an amended Scottish Health Technical Memorandum (SHTM)[9] in February 2022. The document recommends switching a system "off" when not required to be at the most energy efficient policy. If the system is needed to maintain a minimum background condition, reducing its output by "setting back" to the minimum necessary to achieve and maintain the desired condition is the next best option.

2.5 NHS England also published their Health Technical Memorandum in 2021 and addressed the issue of sterility. Their report stated that 'a ventilation system should not be run at full output "just in case it will be needed". This is particularly a problem in operating departments where the ventilation is often run out of hours as it is believed that it will "maintain sterility" in the operating suite. This is not true as airborne contamination in operating theatres is caused by the people in them when they are in use. The theatre ventilation is provided to cater for this "in use" biological load. When the theatre is not in use, there is no biological load so the ventilation can be turned off and set to automatically start at "Set back" in order to maintain a minimum background condition, for example room temperature, if needed. The time taken to start the ventilation and achieve full operating conditions in an emergency will be less than the time taken to bring a patient to theatre and prepare the staff and instruments ready for emergency surgery to commence. A similar situation applies to obstetrics theatres and "special" delivery rooms.'[10]

2.6 Working on the assumption that each theatre switches off their systems between the hours of 8pm and 6am[11] and that there are 386 theatre suites in Scotland, there is a potential financial saving of £7,798,262 per year. Importantly there is also a potential carbon saving of 6,594 tonnes, this is the equivalent of heating 10,774 homes for an entire year. [12] It is recognised that many theatre suites are not in use over the weekend period, further savings of over £1,500,000 and 1.3 tonnes of carbon can be made if sites switched off 50% of their

[9] SHTM 03-01 Part A v3.0 Feb 2022 (nhs.scot)
[10] Health Technical Memorandum 03-01 Part B (england.nhs.uk)
[11] Exceptions need to be considered for emergency theatres and will be taken into account when validating these figures with board representatives.
[12] Figures based on Ofgem publication https://www.ofgem.gov.uk/information-consumers/energy-advice-households/average-gas-and-electricity-use-explained

theatre systems during this period. Board specific figures will be provided and validated with local Health Boards.

3. Who needs to be involved in this change locally?

3.1 In order to implement this action it is recommended that the following groups should be consulted and involved:

- Anaesthetists
- Surgeons
- Theatre staff / managers
- Estates and Facilities
- Engineering leads
- Infection prevention and control

4. Boundaries

4.1 The table below identifies the boundaries for this action:

In scope	Out of scope
All surgical suites across NHS Scotland.	Emergency theatres that must run at optimum capacity.

5. What is the change and how will it be implemented?

5.1 Hospital sites will switch off out-of-hours Heating Ventilation and Air Conditioning (HVAC) systems. This will be implemented at all sites with the required equipment on site to make these changes safely.

6. What are the potential co-benefits of this change?

Outcome	Potential Benefits
Carbon	6,594 tonnes

Cost Savings	£7,798,262
Patient Outcomes	Care needs to be taken to ensure correct infection prevention policies and testing are completed to validate the new policy. If implemented correctly this should not pose any increased risk to the patient and will reduce the patients' carbon footprint when undergoing an elective surgeries.
Staff Experience	Input from estates/facilities will be required to set up the correct conditions via the building management system.

7. Risks and Issues

7.1 As part of the development of this action a number of risk and issues have been identified below:

Description of risk or issue	Mitigation / Action Plan
Older hospitals will have to retrofit these changes through their BMS systems at a cost and as such the change is not taken forward.	Discussions will take place with the engineering and finance networks to identify the scale of the issue and determine ways to break through the barriers to change.

8. Implementation Guidance

8.1 The opportunity for change highlights the importance of implementing this action. This modification will help your site and NHS Scotland achieve net-zero emissions by 2040 as stated in NHS Scotland's Climate Emergency & Sustainability Strategy 2022-2026

8.2 Below the National Green Theatres Programme has provided guidance on how you can implement this change within your area. If you require any further information or guidance, please contact the National Green Theatres programme team on: cfsdgreentheatres@gjnh.scot.nhs.uk

Local Sustainability or Green Theatre Group:	
1.	Review opportunity for change and validate what this means locally.
2.	Provides National Green Theatre Programme Team with validated information/local targets.

3.	Convene a discussion with the staff who need to implement it and those who are impacted by the action.
4.	Understand what the opportunity is for implementing the action locally: work already undertaken and challenges.
5.	Agree a local implementation plan.
6.	Implement local plan.
7.	Provide data as per measurement plan.
8.	Monitor implementation of action.

Appendix 1 – Measurement plan

Name of measure *(carbon, cost, staff experience and patient outcomes)*	Type of measure *(Outcome, Process, Balancing)*	Concept being measured?	Where is the data available from?	Who is collecting the data?	Frequency of collection?
Carbon	Outcome	The number of theatres within each board that have implemented the automated switch off of HVAC systems within operating theatres.	Board Contacts	Health Board collects their own data to be made available to CfSD.	Quarterly
Financial Savings	Outcome	The number of theatres within each board that have implemented the automated switch off of HVAC systems within operating theatres.	Board Contacts	Health Board collects their own data to be made available to CfSD.	Quarterly
Staff Experience and Engagement	Process	Staff pushback.	Verbal	NHS Boards who then feedback to the SDG.	Quarterly