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Sustainable Laboratories Steering Group (SLSG)

Monday 15th January 2018, 3pm

Cuillin Room, Charles Stewart House

AGENDA

1	**Minute** To *approve* the minute of the previous meeting on 3 October 2017 and *raise* any matters arising	**A**
2	**Sustainable Labs Ventilation** To *review* a paper from the SRS Projects Coordinator - Labs and the Occupational Hygiene and Projects Manager proposing wording for a policy around lab ventilation. Associated appendix describes a good practice guide to accompany the policy	**B**
3	**Sustainable Cold Storage** To *review* a paper from the SRS Projects Coordinator - Labs proposing wording for a policy statement around cold storage. Associated appendix describes a good practice guide to accompany the policy	**C**
	To *review* a paper from the SRS Projects Coordinator – Labs describing the risks and benefits of a possible promotion of -70 freezer temperatures	**D**
4	**Lab Equipment Re-use/Re-sale Procedure** To *receive* an update from the Category Manager (Labs and Medical Procurement)	**Verbal**
5	**Estates Development Sustainability Guidelines** To *receive* an update from the Director of SRS	**Verbal**
6	**Edinburgh Sustainability Awards** To *receive* an update from the SRS Engagement Manager	**Verbal**
7	**Improving Support for Technical Staff Careers** To *receive* an update from the School of Education Technical Officer	**Verbal**
8	**Progress against the Sustainable Labs Programme Plan** To *review* a paper from the SRS Projects Coordinator – Labs describing progress against the Sustainable Labs Programme Plan	**E**
9	**Report from Energy Engagement Impact Monitoring at IGMM** If time allows *receive* a report on the impact of energy engagement (posters, stickers and a face-to-face presentation) on lab and office energy consumption at IGMM	**F**
10	**Any Other Business** To *consider* any other matters from Group members.	

If you require this agenda or any of the papers in an alternative format please contact Jane Rooney on 0131 650 4375 or email jane.rooney@ed.ac.uk

A

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MINUTE OF A MEETING *of the Sustainable Laboratories Steering Group held in the Elder Room, Old College on Tuesday 3 October 2017.*

1 Welcome and Introductions

The Convener welcomed attendees to the eighth meeting of the Group and outlined the agenda for the session.

2 Minute **A**

The minute of the meeting held on 29 May 2017 was approved as a correct record.

3 Matters Arising

Freezer Fund

Some expressions of interest and a few claims had been received for the Freezer Fund, though demand was reduced as all freezers were now effectively 'eco' models. While the 'top up' aspect of the fund was defunct, it still had value in helping replace old models. The Convener emphasised the need to either spend these funds, or reallocate them.

Warp-it

There had been changes to the functionality of the system. The next newsletter, issued to all users, would contain an explanation on how to sign up for alerts.

SFC University Carbon Reduction Fund

The soft loan fund of £20M had now been launched, with SALIX as administrators. Concerns had been raised about the amount of paperwork required, and that the loan amount would be deducted from funds awarded to the organisation. UoE aimed to submit a bid by the end of October, focusing on renewables projects and CHP.

Action – All members wanting to know more to contact CO.

Technical Staff

A group currently working on supporting University technical staff had secured agreement for UoE to sign up to the Technician Commitment which aimed to ensure visibility, recognition, career development and sustainability for technicians working in higher education and research across all disciplines.

SUBSTANTIVE ITEMS

4 Sustainable Labs Vision and Programme Plan **B**

The SRS Projects Coordinator – Labs presented this paper summarising outputs from planning and committee meetings in May. Members discussed potential additions, priorities, how to deliver on targets, and how the Plan would be resourced.

Internal SRS project management documentation, summarised in this document, gave more detail on the individual areas and how actions linked to outcomes. All this information was being uploaded to the IS Projects website.

Action – AA to share these documents with the Group to give a better idea of how plans would be delivered.

SLSG endorsed the ambitious Vision and Programme Plan as a basis for reporting and to guide the Group's work over the next three years.

5 Findings from Energy Audits

Over the summer 30 sites had been audited by AECOM, including some labs, focusing on building fabric, plant and lighting. Parallel audits carried out by the SRS Department – where resourced allowed – looked at smaller equipment and behavioural changes. The different areas had very distinct needs and outcomes. AECOM reporting was not yet complete, but would contain recommendations covering boiler replacement, air handling, energy efficiency, lighting upgrades, loft insulation and pipe insulation. It was anticipated that a good proportion of these could be funded through the Sustainable Campus Fund. The AECOM recommendations should not impact on the operation of the labs.

<u>Action – AA</u> to send DG an estimate of the envisaged spend.

The SRS Projects Coordinator – Labs gave a broad summary of findings from the SRS site visits, including a number of recommendations for IGMM and the Swann Building. These focused on cold storage management and maintenance, installing a dividing wall in Swann wash up, being more rigorous about switching off equipment, installing timers, adjusting PCR holding temperatures, lighting efficiencies, adjustments to fume cupboards, various behavioural changes and replacing old equipment such as drying cupboards.

<u>Action – AA</u> to share the full AECOM recommendations when available, along with recommendations from SRS audits.

Recommendations with an associated cost would be put forward to the Sustainable Campus Fund. Those requiring behaviour change (poster campaigns, changes to induction etc.) would be taken up with individual contacts in those buildings. In terms of fume cupboards, the aim was to get maintenance regimes back in line with manufacturers' specification.

<u>Action – AA</u> to follow up with Tommy Angus, Head of Small Projects & Minor Works, to check for overlap with the scheduled programme of works.

6 Estates Development sustainability guidelines development

A review of design guidelines for sustainability at universities had been ongoing with the Estates Capital Projects team. BREEAM had served well, and provided useful consensus, but the time had come to move on, and the review sought to identify what changes needed to be made, and what framework might work best. This should not prioritise points over performance, but focus on delivering resilient, low carbon, low cost buildings that promoted wellbeing. The review group would meet again on 9th October. At the next SLSG meeting members would be briefed on what this would look like in practice. Lab guidelines had already been developed, fitting in to this wider context. The Projects Coordinator – Labs had followed up with Edinburgh and Fife Councils who were also looking into alternatives to BREEAM and would keep communications open.

7 Ventilation policy initial discussion

One of the main aspects of the Labs Programme Plan was to develop University-wide policies on ventilation and cold storage. Ventilation would consider testing of fume cupboards, air changes in labs, demand based ventilation systems, the Aircuity pilot, and arrangements in animal facilities. In-cage technologies were developing which could yield significant savings for future plant, though these would not be appropriate for all facilities. There had been a lot of interest from North American institutions in Aircuity and similar systems. Talks were ongoing with the Home Office on interpretation of the current regulations around air changes and representatives would be meeting with the Home Office in the next week. KCL already had a ventilation policy, drafted by former UoE Labs Coordinator Martin Farley.

Members discussed what the policy should cover, whether it could or should be applicable for all circumstances, and whether it could be accompanied by a set of guidelines. There were existing Estates guidelines for ventilation which were currently being reviewed. There was also an existing policy for labs from a safety aspect, based on British Standards that could be fed in. It should be clear what the policy applied to, offer something to aim for, and be compatible with existing Health and Safety guidance. The policy should include a covering paper outlining the issues, for colleagues unfamiliar with the area, indicating why this was worth pursuing, and identifying which were quick fixes and which aspects were more innovative. Following consultation, the policy would go to the University Health and Safety Committee, Estates Committee and CMG for sign off.

Action – AA to develop a first draft, with CS feeding in on Health & Safety aspects, and all members contributing where they could.

8 Cold storage policy initial discussion

Members discussed whether it would be appropriate to have a cold storage policy, what it might include, whether it should stipulate temperature or ask colleagues to consider operating at higher temperatures, stipulate frequency of maintenance, require users to have a maintenance contract, require defrosting annually, annual inventorying, or use of a centralised archiving system. The Group discussed new cold storage technologies, with Nordic Systems offering a series of insulated cabinets cooled by a compression system, with the heat expelled from each reclaimed and not influencing the temperature of other units. QMRI were considering installing such a system.

The Group suggested offering a policy statement outlining broad aims, along with best practice guidance, including scientific backup. It should include advice on suitable environments to locate freezers. UBC ran an engagement campaign with users, starting from the academic literature and evidence.

Action – AA to draft best practice guidelines, with assistance from the Group.

Action – AA to pass on figures to BM and SM, once they had been received from Nordic.

9 Edinburgh Sustainability Awards update

It was currently audit season, with a couple of new teams coming forward this year, including one from Environmental Engineering. There were still gaps in representation from the rest of the School of Engineering, Physics, and numbers were low in Biology. These areas would be approached via School management systems. Accreditation now lasted two years. A more fundamental review of the Sustainability Awards was planned, to be discussed in more detail next year.

Action – AA to find an early stage researcher to join the Group.

10 Improving support for Technical staff careers

The Technicians Support Steering Group, formed under a year ago with representation from HR and IAD, was working to set ambitions and focus, with tasks for the short and long term. An email list for technicians had been set up, with representation on Twitter and Facebook, to help develop the community and disseminate information. This work was part of implementation of the Technician Commitment, which involved enhancing visibility, supporting recognition, promoting career progression opportunities, and ensuring the future sustainability of technical skills within UoE. A professional registration event run by the Science Council would take place on 14 November.

Action – AA to circulate details.

Action – JR to keep this on as a standing item.

11 Update on lab equipment re-use/re-sale procedure

A flowchart had been developed to help lab managers, PIs, and others with equipment assets they may want to sell, to navigate the process. The chart had been created to build awareness, seek feedback, and secure endorsement. It had been reviewed by senior staff including College Registrars, tax and insurance advisors, and the Director of Procurement. It should be signed off by the next SLSG and would be reviewed by Legal Services before going live. IT equipment had been excluded, as there was already a well-established process for resale.

Members noted that the title could be more inclusive, rather than just restricted to Labs, and that a final step could be added – removing the equipment from the asset register. It should clarify that the seller of the equipment would be responsible for finding a buyer and that a marketing service was not being offered at this time. A conflict of interest declaration may be needed. The seller would also need to be reminded to charge VAT. Overseas sales must have shipping documents on file. A stage confirming that permission to sell had been secured (e.g. from the research councils) should be added to the flowchart.

Next steps included re-convening the sub-group, refining the process, publishing it on the web, investigating the possibility of developing a donation flowchart, and investigating opportunities for extracting further monetary value from low value WEEE.

Action – All members to reflect on how to get more colleagues to sign up to Warp-it for lab equipment.

ROUTINE ITEMS

12 Any Other Business

Sample Databases discussion carried forward to next meeting.

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B

Sustainable Labs Steering Group

15th January 2018

Laboratory Ventilation Policy Note

Description of paper
This paper describes a policy for standardising lab ventilation methods across the University of Edinburgh to ensure best practice in all locations.

Action requested
SLSG is asked to consider the policy, which was discussed in the preceding SLSG meeting in October 2017.

Recommendation
It is recommended that SLSG approve this policy (including any amendments) and the policy be taken forward for further approval by other relevant committees including Health and Safety, and Estates.

Background and context
Lab ventilation is highly energy intensive due to the expulsion of heated or cooled air from the building, requiring fresh air to be heated or cooled. Air change rates for rooms, and flow rates for localised extract ventilation (e.g. Fume Cupboards) are a major determinant of the energy consumption, and should be set based on evidence. Safety of occupants must be prioritised, but should be achieved with the lowest energy consumption possible.

Discussion

Policy Intention
The long-term goal and intention of this policy is to standardise the practices which should be followed in all but exceptional circumstances, in which case the reasons for not following this policy must be clearly recorded. It is intended that these practices apply to laboratory general room ventilation, lab fume cupboards, animal housing facilities general room ventilation, animal housing facilities cages, and fume exhaust stacks. It is intended that, through following the recommended practices, ventilation shall provide safe and comfortable conditions for lab users, compliant conditions for animals used in research, and low energy consumption (and associated carbon and cost implications).
Currently some University of Edinburgh ventilation systems operate at a fixed rate which is designed to cope with ‘worst-case-scenario’ all the time (equivalent to having a fire-suppression sprinkler system operating 24/7 to reduce fire risk). This is an inappropriately crude approach to the issue of safe and sustainable ventilation, and results in unnecessary consumption of energy and resources.

Policy dimensions
For the purposes of this policy, the term “Laboratory” refers to ‘wet labs’ but could also include clinical areas. It does not refer to “computer labs”. The following areas are considered within this policy:

- The frequency of air changes per hour (ACH) generated by air handling systems supplying air to laboratory rooms, and how to reach a safe and comfortable minimum ACH.
- The speed (face velocity in m/s) and therefore also volume of air being drawn through fume cupboards, and how to reach a safe minimum face velocity.
- The frequency of air changes per hour (ACH) generated by air handling systems supplying air to animal housing facility rooms, and how to reach a safe and compliant minimum ACH6.
- The use of individually ventilated cages in animal housing facilities, and how this interacts with room ventilation systems.
- The speed (and control thereof) of fume cupboard exhaust air as it exits the exhaust stacks.

Policy principles

The overarching principles of the policy aim to reduce the 'consumption' of heated or treated air within University of Edinburgh science buildings, and associated energy, carbon and cost implications.

- An evidence-based approach should be used to ensure ventilation rates should be set as to the lowest safe level (for both general lab room ventilation and fume cupboard ventilation).
    - With appropriately designed sills fume cupboards can often operate safely at 0.35m/s face velocity. Higher face velocities may be required for highly hazardous materials such as radio-isotopes. Face velocities should be checked annually and must be within ±10% of the commissioning velocity.
    - In a non-responsive system general lab ventilation should set-back to 4 air changes per hour (ACH) outside of working hours and should aim for as low as possible to achieve safety during working hours. Numerous labs have adopted 6ACH when occupied, others 8ACH. Evidence of need should be provided if a lab is to be ventilated at a rate exceeding 12ACH.
- All tasks undertaken in a lab should be risk assessed. This will determine the level of ventilation and control measures such as fume cupboards required to ensure tasks are undertaken safely.
- Where suitable, control equipment should be installed to vary the ventilation rate in response to varying requirements. Supply air should be controlled to modulate in line with varying extract air rates. Examples include;
    - VAV fume cupboards with automated sash closers
    - Demand controlled room ventilation systems (e.g. Aircuity)
    - Wind responsive fume exhaust (via stacks)
- The volume of highly conditioned air required (i.e. tightly controlled for temperature and humidity for animal facilities), should be minimised.
    - E.g. through technology such as individually ventilated cages where this is compatible with the practices of the facility users/demands of science.
- Where a relative difference in air pressure with neighbouring spaces is required air pressures should be monitored and maintained at the design pressure by a Building Management System, and checked every 3 years

and/or whenever any structural or procedural changes have occurred within the area to ensure the pressure is ±10%[1] of the design pressure.

Guidance and Support

The Health and Safety Department, and the Department for Social Responsibility and Sustainability support improvements to ventilation across University of Edinburgh labs in order to improve safety and reduce energy consumption. A guide to best practice in terms of ventilation is available here[2]. General guidance on relation to safety can be found on the Health and Safety Department website, specifically for biological, radiation and chemical labs, https://www.ed.ac.uk/health-safety. Further advice can be found on the SRS website here - https://www.ed.ac.uk/about/sustainability/themes/laboratories/resources. Additional support is available from the SRS Project Coordinator – Labs, or from your local School Safety Adviser/Manager.

Changes to this policy

This policy will be reviewed regularly by university-wide stakeholders including SRS, Health and Safety, Estates, CBS and other lab users to ensure it continues to meet the needs of our lab-based community.

Resource implications

Compliance with this policy may require some upgrading of ventilation plant and equipment across the University of Edinburgh. Where a suitable business case can be made this could be resourced through the Sustainable Campus Fund. Time resource would be required from Estates (small works team) to implement this, however many of the upgrades are already being planned for Sustainable Campus Fund applications – this policy will merely formalise the standards we are aiming for and standardise into new developments.

Risk Management

This policy should be harmonious with the planned new Estates Development Sustainability Guidelines.

Ventilation provides safety for lab occupants, so alterations to ventilation could affect safety if not undertaken correctly by suitably trained, skilled and experienced individuals and contractors. Some of the actions suggested involve better and smarter control of ventilation, which could actually enhance safety while also reducing energy consumption.

Without taking action on the substantial energy consumption associated with lab ventilation there is a risk that the University of Edinburgh will struggle to meet targets relating to energy, cost and climate change.

Equality & Diversity

No impacts foreseen.

[1] (this is currently being queried with a lab ventilation contractor to ascertain if this is suitable or not)
[2] Hyperlink to be set up once guidance has been written

Next steps/implications
Once this policy is agreed by SLSG it will need further approval from a variety of other committees including Health and Safety and Estates. Any further committees should be identified too.

Consultation
Candice Schmid - Occupational Hygiene and Projects Manager – Health and Safety
Jim Cameron - Health and Safety Officer - Central Bioresearch Services
Matt Sharp – Deputy Director - Central Bioresearch Services
Vince Ranaldi – Departmental Operations Manager – Central Bioresearch Services
Simon Cumming – Chief Technical Officer - Central Bioresearch Services
Craig Watt – School Facility Unit Officer – Central Bioresearch Services
Carl Tucker – Zebrafish Unit Manager – Central Bioresearch Services
Elizabeth Hurd – CBS/IGMM Operations Manager - Central Bioresearch Services
Lesley Penny – Director – Veterinary Scientific Services
Karen Brown – Home Office Liaison Contact/Named Information Office – Veterinary Scientific Services

Further information
Author and Presenter
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Department for Social Responsibility and Sustainability
20th December 2017

Freedom of Information
This is an open paper.

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C

Sustainable Labs Steering Group

15th January 2018

Cold Storage Facility Policy Note

Description of paper
This paper describes a policy for standardising cold storage (specifically ultra-low temperature "ULT" freezers) facilities across the University of Edinburgh to ensure best practice in all locations.

Action requested
SLSG is asked to consider the policy, which was discussed in the preceding SLSG meeting in October 2017.

Recommendation
It is recommended that SLSG approve this policy (including any amendments) and the policy be taken forward for further approval by other relevant committees including Estates.

Background and context
The design of facilities to house scientific cold storage equipment can be a major influence on the energy consumption of that equipment and also of building ventilation and cooling services. In addition, a well-designed facility will provide more favourable ambient conditions and put less strain upon the components of individual ULTs, reducing risk of failure and associated risk to the freezer contents.

Discussion

Policy Intention
The long-term goal and intention of this policy is to standardise the practices which should be followed in all but exceptional circumstances, in which case the reasons for not following this policy must be clearly recorded. It is intended that these practices apply to laboratory ULT freezer facilities. It is intended that, through following the recommended practices, reliable cold storage services shall be available for staff and students at the University of Edinburgh with low energy consumption (and associated carbon and cost implications).
ULT freezers produce a lot of heat and as such the rooms in which they are held can heat up very quickly if not well ventilated. As the room becomes hotter the strain on the ULT freezers' compressors increases, which increases energy consumption and the likelihood of failure (risking potentially irreplaceable biological samples).
Currently some freezer facilities have poor natural ventilation, resulting in excessive energy requirements to maintain the appropriate room temperature with fans and air conditioning, and excessive strain and energy consumption of the ULT freezers.
Facilities with good natural ventilation, such as the facility at the Roslin Institute, maintain lower room temperatures with very low fan and air conditioning energy consumption. This has a positive compounding effect of lower ULT freezer energy

consumption and reduced strain on the compressors, reducing the risk of failure and sample losses.

Policy dimensions
For the purposes of this policy, the term “ULT freezer” refers to specialist laboratory Ultra Low Temperature freezers designed to operate at temperatures between -50 and -90^{0}C. Commonly ULT freezers are held at a set point temperature of -80^{0}C, leading to them also being known as “minus eighties”. ULT freezer facilities are deemed to be spaces specifically designed to house multiple ULT freezers as the primary purpose of the space. Typically numbers of freezers in these spaces is over 10, but can reach over 100. The following areas are considered within this policy:

- The air handling mechanisms for maintaining appropriate room temperatures in ULT freezer facilities[1]

Policy principles
The overarching principles of the policy aim to maximise the free cooling available from natural ventilation and reduce the energy consumption of fans and air conditioning in ULT freezer facilities and associated energy, carbon and cost implications.

- Natural ventilation will be maximised where opposing walls have substantial controllable openings/grilles/louvers. When fitted to opposing (rather than adjacent) walls the cold external air can easily enter via one wall, travel through the facility gathering heat, and exit via the opposite wall.
- In light of the prevailing south westerly wind direction new buildings could maximise their natural ventilation cooling functionality by having the opposing ventilated walls of the freezer facility orientated south west – north east (however, west – east or south – north would also suffice in most scenarios – local wind modelling may be appropriate in highly built-up areas).
- To maximise wind speeds available for natural ventilation freezer facilities should be located in as high a location as possible – ideally in a roof-top location, with large lift access to allow easy movement of new/old freezers as well as personnel and samples.
- The ambient room temperature should be measured at a suitable number of positions within the room, feeding into the BMS. This should be arranged with the Controls Team within the Energy Office.
- The natural ventilation should be designed with 3 escalating functions which should be controlled by Building Management Systems:
    1. In cool weather with external air temperatures under c.18^{0}C the louvers in the walls should be open to allow outside air to flow through the facility
    2. In warm weather with air temperatures between c.18^{0}C and c.20^{0}C the louvers should remain open but the air speed should be artificially increased through the use of fans (fans should be fitted to the same walls as the louvers and should move air in the direction of the prevailing wind (i.e. south west to north east, or west to east, or south to north).

[1] Other areas relating to freezer and sample management will be covered in the best practice guide

3. In hot weather over 20^0C[2] the louvers in the walls should be closed to create a good thermal and draught-proof seal while air conditioning units should be switched on within the facility to control air temperatures.
4. Temperature sensor(s) should be installed for monitoring and alarm purposes. Careful consideration should be given to the sensor location(s)

- Alternative designs which also maximise natural free cooling through other methods may also be acceptable (such as agricultural shed designs, and/or thermal labyrinth cooling). It is recognised that retrofitting these design principles into existing freezer facilities may require alternative designs (such as open windows with security grilles fitted).

Above is a recommended design. Deviations from this design can be accepted if site circumstances require it. All designs should demonstrate that they have prioritised free cooling first, then forced air (fans), then air conditioning as a last resort.

Guidance and Support

The Estates Development team within the Estates Department, and the Department for Social Responsibility and Sustainability support improvements to ventilation across University of Edinburgh labs in order to improve protection for biological samples and reduce energy consumption. A guide to best practice in terms of all aspects of sample cold storage is available here[3]. Additional support is available from the SRS Project Coordinator – Labs, or from your local Building or Campus Technical Manager.

Changes to this policy

This policy will be reviewed regularly by university-wide stakeholders including SRS, Estates and lab users to ensure it continues to meet the needs of our lab-based community and university-wide stakeholders.

Resource implications

Compliance with this policy may require some upgrading of the control and monitoring of ventilation systems for cold storage facilities across the University of Edinburgh. Where a suitable business case can be made this could be resourced through the Sustainable Campus Fund. Time resource would be required from Estates (small works team) to implement this.

Risk Management

This policy should be harmonious with the planned new Estates Development Sustainability Guidelines.

The ULTs housed within University of Edinburgh cold storage facilities contain highly valuable samples, reagents, etc. If the ventilation and chilling systems cannot adequately remove heat expelled by the ULTs the ambient conditions can quickly become dangerously warm, putting major strain on ULT components and increasing the risk of failure. All changes should be checked by suitably trained, skilled and experienced individuals or contractors via thermal modelling to ensure adequate

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[2] An alternative approach would be to use internal temperature as a threshold, rather than external.

[3] Hyperlink to be set up once guide is complete.

heat removal. It should be noted that well designed, naturally ventilated facilities such as at Roslin Institute manage to achieve much better ambient conditions than comparable sized facilities with poor natural ventilation – thus reducing risk.

Without taking action on the substantial energy consumption associated with cold storage facilities there is a risk that the University of Edinburgh will struggle to meet targets relating to energy, cost and climate change.

Equality & Diversity
No impacts foreseen.

Next steps/implications
Once this policy is agreed by SLSG it will need further approval from a variety of other committees including Estates. Any further committees should be identified too.

Consultation
Brian McTeir - Campus Facilities and Services Manager – Easter Bush Campus (CMVM)
Julia Laidlaw – Estate Development Manager, Bioquarter - Estates
Stewart McKay – Facility Manager – IGMM (CMVM)
Steven McLean – Technical Manager – QMRI (CMVM)
Heather Anderson – Building Manager – Chancellors (CMVM)
Ben Gordon – Contract Services Coordinator – Little France (CMVM)
Sandra Lawrie - Technical Services and Estates Manager - School of Biological Sciences (CSE)
Callum Robertson - Estate Development Manager, King's Buildings - Estates
Steven Goodall – Project Manager, King's Buildings - Estates
Lee Murphy – Facility Manager – Genetics Core, Wellcome Trust Clinical Research Facility, Western General (CMVM)

Further information
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22nd December 2017

Freedom of Information
This is an open paper.

APPENDIX – Cold Storage Best Practice Guide

Executive Summary

This paper summarises the findings of research undertaken by the University of Edinburgh's Department for Social Responsibility and Sustainability into best practice in Ultra Low Temperature (ULT) freezer management. It incorporates international best practice from various research institutions, as well as information gained through lab sustainability and energy efficiency audits across the University of Edinburgh.

This document describes a number of actions and the potential savings, including:

Replace old freezers (up to £400/year saving per freezer)

Regular defrosting and maintenance of freezers (around £200/year saving per freezer)

Save space by clearing out old samples (save up to £1,000 per year for every ULT freezer you can retire)

Run your freezers a little warmer (up to £300/year saving per freezer changed from -80 to -70^{0}C)

Out with the old, in with new…

The problem:

Older freezers can use as much as £1000 annually in 'plug load' electricity (i.e. not including their impact on room air cooling systems) while new freezers can use less than £600 plug load annually. Investigations at the National Institutes of Health in the United States of America have indicated that for every year of a ULT freezer's life its energy consumption increases by 3%[4].

The solution:

The University of Edinburgh's Sustainable Campus Fund[5] can contribute to the costs of upgrading old freezers. Installing a plug-in energy monitor onto your old freezer will help you prioritise the worst performing freezers.

The Roslin Institute has an ongoing replacement of their oldest ULT freezers, with a requirement that new purchases are energy efficient. This is also an approach being taken by the National Institutes of Health in the USA.

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[4] Gumapas & Simons, World Review of Science, Technology and Sustainable Development, Vol 10, No.s 1/2/3, 2013

[5] www.edin.ac/fund

Choked up with ice and dust…

The problem:

Freezers which are not regularly defrosted accumulate frost and ice, reducing internal space (and thus exacerbating the problem of a continual demand for more and more ULT freezers, filling up valuable space in science buildings). In addition to reducing the available space for sample storage, poorly defrosted ULT freezers use more energy to operate as often seals around doors do not operate as effectively. Investigations at the National Institutes of Health in the United States of America have indicated that there is a difference in annual operating costs of the equivalent of around £160 between an ice-free freezer and a severely iced up freezer[6].

Freezers draw air through a filter to cool condenser fins and heat exchange coils, helping the removal of heat from the internal space. If these filters and/or fins are dusty the removal of heat is less effective and the compressor mechanisms for heat removal need to work harder. Investigations at the National Institutes of Health in the United States of America have indicated that there is a difference in annual operating costs of the equivalent of around £230 between a freezer with clean filters and fins and a freezer with severely dusty filters and fins[7].

The Solution:

Freezer defrosting and cleaning filters and fins should be done regularly. It is recommended that 6monthly defrosting and monthly seal checking and filter cleaning is integrated into standard lab practices. Another quick-win is to wipe condensation from surfaces which can accumulate when the door is opened. This requires no resources, only a little planning and staff time.

Site visits and auditing for the Edinburgh Sustainability Awards indicated that most of the labs involved outsource mechanical maintenance of freezers - it should be checked which actions are included in these maintenance contracts to ensure filters, fins and heat exchange coils are cleaned. If not, the lab personnel should include this in their own regular maintenance work.

The awards audits also showed that good defrosting practices were in place at The Roslin Institute, the Biology Teaching Organisation, the Wellcome Trust Clinical Research Facility, SynthSys labs, and the Institute of Genetic and Molecular Medicine. Typically these labs undertake regular and planned defrosting schedules, and/or audits from senior lab staff.

[6] Gumapas & Simons, World Review of Science, Technology and Sustainable Development, Vol 10, No.s 1/2/3, 2013

[7] Ibid.

Best use of valuable space…

The problem:

ULT freezers are expensive to purchase and have high operational costs due to their plug-load and air conditioning energy consumptions. However the number of ULT freezers across the University of Edinburgh is growing, adding strain to departmental budgets and diverting money away from other uses.

The solution:

Lab users/lab groups should ensure they only use ULT freezers to store items which absolutely must be stored at these temperatures, and that they use appropriate racking. There are three factors to consider here:

Firstly, do you need to keep all of those samples?

If you are a lab user who stores samples in ULT freezers you can help to reduce significant departmental costs of purchasing and running ULT freezers by regularly checking the samples you are storing and removing those which are now redundant/no longer needed. ULT freezer storage of course does not stop sample degradation, it merely slows it down, so those samples you have been holding onto for years and years may not even be of any scientific use to you if you did decide to use them again.

A well maintained database of the freezer contents can also help lab users find their samples quickly and easily rather than searching for a long time with the door open, risking damaging temperature rises to other samples and excess energy consumption to draw the temperature down again once the door is closed.

Secondly, do your samples need to be stored in ULT freezers?

There is a growing body of evidence which suggests that some sample types can safely be stored in non-ULT freezers (i.e. at -40^{0}C, -20^{0}C, $+4^{0}$C or even room temperature)[8] [9] resulting in significant energy savings. Stanford University found that up to 25% of their biological samples (DNA/RNA/bacteria) could be stored at room temperature after a successful trial.[10] The University of Colorado - Boulder and University of California - Davis have developed a database of over 100 biological sample types which can be stored at -70^{0}C or warmer [11].

Typically the suitability of a temperature for sample storage depends on the length of the storage time - if you are storing samples for only a short amount of time it may be

[8] Colins et al, (1993), "Storage temperature and differing methods of sample preparation in the measurement of urinary albumin" Diabetologica, vol 36, issue 10, pp 993-997

[9] http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/ulf_freezer_user_guide.pdf (U.S. Dept of Energy "Store Smart" ULT freezer guide)

[10] http://www.goodcampus.org/uploads/DOCS/106-case_10_-_uni_california_final_25_2_11.pdf and http://sustainable.stanford.edu/sites/default/files/documents/Stanford_Room_Temp_Pilot_May09.pdf

[11] https://docs.google.com/spreadsheets/d/13UvBeoXAhwSHshSYoUDHwcxWiW7qYLnUb-eLwxJbCYs/pubhtml

safe to store them at a higher temperature. Freeze-thaw cycles may be more important than the storage temperature for degrading samples[12] [13] [14] [15].

If samples are valuable and vulnerable enough to require ULT freezer storage the freezer should also be fitted with an external alarm system which would alert individuals in the event of rising internal temperatures.

Thirdly, are you making best use of storage space?

Efficient use of space in ULT freezers can help to reduce the demand for additional units. Ensuring that your samples are neatly stored in appropriate storage solutions (racks/boxes) for the type and size of material will allow more items to be stored in the existing number of freezers. Steel racking has better thermal performance than aluminium, providing better protection for your valuable samples.

Where possible try to avoid storing bulky items in freezers if you can divide them up into more easily stored small samples/aliquots. An example might include extracting DNA from tissue and storing only the DNA, rather than a large bulky tissue sample. Minimise numbers of aliquots stored to reduce unnecessary use of space. Storing your samples in racks/boxes can also make them easier to quickly transfer in the event of a freezer failure.

Labelling and/or a Lab Information Management System should allow any lab user to determine who each sample belongs to. A well established and up to date inventory will allow samples to be found more quickly, reducing the length of time the door is open.

Good practice has been observed around the University of Edinburgh including:

Hugh Robson Building charge for space in the Hotel Freezer.

BTO consolidate their materials into fewer fridges/freezers over the summer holiday and switch off extraneous ones.

Wellcome Trust Edinburgh Clinical Research Facility have good racking to make best use of space, and control samples using a LIMS (providing Biobank storage for researchers).

IGMM consolidated the contents of c.40 small LN2 storage tanks into 2 large ones saving c.£18k annually in LN2 refill costs.

[12] http://bitesizebio.com/19700/freeze-thaw-cycles-and-why-we-shouldnt-do-it/

[13] M. S. Charde et al. (2014) "Review: The procurement, storage and quality assurance of frozen blood and tissue biospecimens" International Journal of Pharmacological Research Volume 4 Issue 2 (2014)

[14] Brand, J.J., "Cryopreservation of Cyanobacteria" http://www-cyanosite.bio.purdue.edu/protocols/cryo.html

[15] B. L. Mitchell et al., (2005) “Impact of Freeze-thaw Cycles and Storage Time on Plasma Samples Used in Mass Spectrometry Based Biomarker Discovery Projects”, Cancer Informatics 1(1): 98–104.

The mass spectrometry facility at the IGMM have a very good database of their ULT freezer contents.

SynthSys allocate specific shelves/space in ULT freezers to lab groups.

QMRI biobanking is done on a ‘cost recovery’ basis.

Chancellors' Building are investigating room temperature storage of DNA.

Space to breathe…

The problem:

ULT freezers operate by removing heat from inside the freezer cabinet and expelling it (usually through heat exchangers at the back of the freezer). In an enclosed space this quickly results in the air temperature of the room rising to temperatures which are uncomfortable for the users and cause the freezer to work harder to maintain a set internal temperature (“Each 1°C drop in ambient temperatures from 32°C lowers the energy consumption for a ULT freezer by approximately 2%”[16]). To counteract this, energy intensive air cooling/mechanical ventilation equipment is installed and operated, adding to the energy consumption of operating freezers.
Some ULTs do not have enough space around them for air to circulate adequately (i.e. they are up against a wall and/or have boxes on top of or around them). This reduces the ability of the freezer to dissipate the heat from inside to outside.

Some labs keep numerous ULT freezers in the lab or in surrounding corridors. Sometimes the air handling and natural ventilation options in these areas are not able to deal effectively with the extra heat gain from the ULT freezers, leading to overly warm spaces which are uncomfortable to work in and also increase the strain on the ULT freezers (increasing energy consumption and wear and tear on components).

Some labs keep ULT freezers adjacent to heat sources such as radiators, drying ovens, incubator shakers, etc. This increases the strain on the ULT freezer, and can also speed up the process of ice accumulation, leading to more work for those responsible for de-icing the unit and a greater threat of freezer failure.

The solution:

Dedicated spaces with abundant natural ventilation have been constructed at the Roslin Institute to house the majority of their ULT freezers. These spaces have large louvered vents and fans which allow external air to be used either passively (fans switched off, air moves with convection and pressure differentials/wind) or actively (fans switched on to drive air through the space) to remove hot air from the freezers. If external air temperature rises above a certain level the louvers are closed and the room cooled with air conditioning. This is currently not required very often in the

[16] Gumapas & Simons, World Review of Science, Technology and Sustainable Development, Vol 10, No.s 1/2/3, 2013

Edinburgh area but climate change forecasts suggest more frequent warm weather. This design significantly reduces the amount of air conditioning required to keep the air temperature of the freezer space at a level which allows the freezers to operate safely and with low energy consumption. Designs incorporating methods for free cooling and more ‘passive’ design while incorporating active cooling for when required will be better able to adapt to future climate changes.

Freezers (especially ULT freezers) should have 15cm space on the back, sides and top. Some freezers will need to be pulled out away from walls in order to achieve this. No objects (including boxes) should be stored on top of the freezer.

Freezers should not be located in large numbers in labs or corridors. One or two in a large lab or corridor may be acceptable, but this is not ideal - locating the freezer in a dedicated facility would have substantial benefits in terms of energy consumption and freezer failure rates.

Where a ULT must be kept within a lab or corridor it should always be located in the coolest point of the room, away from heat sources such as radiators, drying ovens, incubator shakers, etc.

Too Cool…?

The problem:

Fifteen or twenty years ago the lowest temperature achievable by most lab freezers was -70^{0}C. Technology improved and newer freezers were able to achieve temperatures of -86^{0}C. The lower temperature (often -80^{0}C) was then adopted by many lab users/groups as a new standard operating practice. The technological advance which led to freezers achieving lower temperatures came at a price - higher energy consumption in terms of both plug-load and impact on air conditioning loads.

The problem of selecting too low a temperature exists in shipping too (“cold chain).

The solution:

There has so far been little evidence produced which shows that operating ULT freezers at -80^{0}C has substantial benefit for lab research, in fact some sources show that a variety of samples are stable at -70^{0}C[17] [18] [19] [20] [21] [22] [23] [24] [25]. The University of Boulder Colorado and University of California - Davis have developed a database which details a wide variety of samples being stored at -70^{0}C[26]. Some samples will benefit from being stored at -80^{0}C so it is worth checking the literature first, or even doing your own tests. Even if your samples do benefit from being stored at -80^{0}C it is a good idea to run your back-up freezers ("hotel freezers") at -70^{0}C or even -60^{0}C to reduce energy consumption, and then adjust them to -80^{0}C when required. Many freezers around the campus have temperature monitors connected to remote alarms which are activated if the temperature rises above a threshold and alerts a nominated member of staff. This reduces the need to store samples at a lower temperature in order to have a 'buffer' to give more time between a freezer failure and the internal freezer temperature exceeding a threshold temperature.

There are ways of collecting biological samples that do not rely on cold chain shipping. For example the saliva collection kits from Isohelix (http://www.isohelix.com/) and DNA genotek (http://www.dnagenotek.com) that allow room temperature storing and shipping of samples. Saliva for RNA can be stored at room temp for 2 weeks and for DNA for 2 years. And the DNA Genotek OmniGUT kit allows stool sample collection for microbiome work.

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[17] http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/ulf_freezer_user_guide.pdf (U.S. Dept of Energy "Store Smart" ULT freezer guide)
[18] Tedeschi, R. & De Paoli, P; (2011) "Collection and Preservation of Frozen Microorganisms"; Methods in Molecular Biology Volume 675, pp 313-326
[19] Marino, D, (2013) "Best practices for storing biological samples in ULT freezers" http://www.biocompare.com/Bench-Tips/137747-Best-Practices-for-Storing-Biological-Samples-in-ULT-Freezers/
[20] Colins et al, (1993), "Storage temperature and differing methods of sample preparation in the measurement of urinary albumin" Diabetologica, vol 36, issue 10, pp 993-997
[21] De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 897–910 and Reimer, L. and Carroll, K. (2004) Procedures for the storage of microorganisms In: Manual of Clinical Microbiology (Murray, E., Baron, E., Pfaller, M., Tenover, F. and Yolken, R., Eds.), pp. 67–73. ASM Press, Washington, DC
[22] De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 897–910 and Michel, C. and Garcia, C. (2003) Virulence stability in Flavobacterium psychrophilum after storage and preservation according to different procedures. Vet. Res. 34, 127–132.
[23] De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 897–910 and Harbec, P.S. and Turcotte, P. Preservation of Neisseria gonorrhoeae at 20 C. J. Clin. Microbiol. 34, 1143–1146.
[24] De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 897–910 and Sebire, K., McGavin, K., Land, S., Middleton, T. and Birch, C. (1998) "Stability of human immunodeficiency virus RNA in blood specimens as measured by a commercial PCR-based assay". J. Clin. Microbiol. 36, 493–498. And Winters, M.A., Tan, L.B., Katzenstein, D.A. and Merigan, T.C. (1993) "Biological variation and quality control of plasma human immunodeficiency virus type 1 RNA quantitation by reverse transcriptase polymerase chain reaction". J. Clin. Microbiol. 31, 2960–2966.
[25] Mitchell, B.L. et al, (2005) "Impact of Freeze-thaw Cycles and Storage Time on Plasma Samples Used in Mass Spectrometry Based Biomarker Discovery Projects" Cancer Informatics 98–104
[26] https://docs.google.com/spreadsheets/d/13UvBeoXAhwSHshSYoUDHwcxWiW7qYLnUb-eLwxJbCYs/pubhtml

Running a freezer at -70^{0}C instead of -80^{0}C can produce almost 30% plug-load energy savings[27] equating to **up to £300 annually**, as well as further savings on room air conditioning. A number of lab users around the University are running freezers at -70^0 including Roslin, IGMM and BTO.

Sharing has benefits for all…

The problem:

Where freezers are individually owned and space is not shared this can lead to scenarios where a large ULT freezer may not be full of useful samples, and may have empty space, but this space is not made available to neighbouring scientists. The neighbouring scientists are then required to purchase and operate an additional ULT freezer - doubling the cold storage energy consumption.

This problem is facilitated by individual ownership of ULT freezers. Where individual freezer ownership is the model this can encourage those with small ULT storage needs to purchase a small under-bench ULT freezer. These types of ULT freezers have the highest energy consumption per volume of cold storage space, and can use almost as much energy as a unit twice their size (9kWh/day[28] for a new 100litre underbench unit, versus c.12-15kWh/day for a new 600-800 litre unit[29]).

The solution:

Sharing freezer space, combined with maintaining a good database of freezer contents and regularly throwing out redundant samples can lead to great cold storage space efficiencies, reducing the need to purchase additional ULT freezers, saving capital and operational costs as well as freeing up space within the lab making it a more pleasant space to work in.

Where the ULT freezers are owned by the institute and cold storage space allocated to lab groups on a needs-assessed basis (possibly involving re-charging) better sample storage and inventorying practices are encouraged and rewarded.

Under bench ULT freezers should be avoided and discouraged unless absolutely necessary, due to their high energy consumption per cold storage volume.

Medium and large institutions across the University of Edinburgh should be aiming to move towards a model where the institute provides the cold storage facilities to the scientists rather than having private ownership of individual ULTs.

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[27] Farley M., et. Al., (2013) "Freezer Energy Consumption Report"
[28] https://labcold.com/wp-content/uploads/2016/04/Labcold-ULT-FreezerLULT80100-1.pdf
[29] https://www.thermofisher.com/uk/en/home/life-science/lab-equipment/cold-storage/lab-freezers/ultra-low-temperature-freezers-minus-80.html

Lab contacts who can help you with these projects:

Freezer replacement

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Lee Murphy, Wellcome Trust Clinical Research Facility, Lee.Murphy@ed.ac.uk

Defrost and maintenance

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Eliane Salvo-Chirnside, SynthSys labs, Eliane.Chirnside@ed.ac.uk

Stewart McKay, Institute of Genetic and Molecular Medicine, Stewart.McKay@igmm.ed.ac.uk

Efficient use of space

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Lee Murphy, Wellcome Trust Clinical Research Facility, Lee.Murphy@ed.ac.uk

Stewart McKay, Institute of Genetic and Molecular Medicine, Stewart.McKay@igmm.ed.ac.uk

Jimi Wills, IGMM Mass Spec facility Jimi.Wills@ed.ac.uk

Eliane Salvo-Chirnside, SynthSys labs, Eliane.Chirnside@ed.ac.uk

Moira Nicol, QMRI, Moira.Nicol@ed.ac.uk

Steve McLean, QMRI, Steven.Mclean@ed.ac.uk

Heather Anderson, Chancellors' Building, Heather.Anderson@ed.ac.uk

Reducing the requirement for air con in freezer rooms

Brian McTeir, Roslin Institute, brian.mcteir@roslin.ed.ac.uk

Running freezers at higher temperatures (e.g. -70^{o}C)

Brian McTeir, Roslin Institute, brian.mcteir@roslin.ed.ac.uk

Stewart McKay, Institute of Genetic and Molecular Medicine, Stewart.McKay@igmm.ed.ac.uk

Useful links and resources

Impact of age, dust, ice, freezer temperature set point and size on energy consumption of freezers

Gumapas & Simons, World Review of Science, Technology and Sustainable Development, Vol 10, No.s 1/2/3, 2013 http://www.inderscience.com/info/inarticle.php?artid=50786

Impact of ventilation on freezer energy consumption
http://www.triplered.com/downloads/pdf/Sterling%20Freezer%20Efficiency%20paper.pdf

General energy consumption of freezers and impact of ambient air temperature
www.eventlink.org.uk/.../103-Arthur_Nicholas_-_Cold_Storage_at_the_University_of_Manchester

Pardise, A. et al., "Ultra-Low Temperature Freezes: Opening the door to energy savings in laboratories", Centre for Energy Efficient Laboratories

Freezer energy savings
http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/ulf_freezer_user_guide.pdf (U.S. Dept of Energy "Store Smart" ULT freezer guide)

Impacts of cold storage conditions on sample integrity

De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 897–910

Mitchell, B.L. et al, (2005) “Impact of Freeze-thaw Cycles and Storage Time on Plasma Samples Used in Mass Spectrometry Based Biomarker Discovery Projects” Cancer Informatics 98–104

Colins et al, (1993), "Storage temperature and differing methods of sample preparation in the measurement of urinary albumin" Diabetologica, vol 36, issue 10, pp 993-997

Tedeschi, R. & De Paoli, P; (2011) "Collection and Preservation of Frozen Microorganisms"; Methods in Molecular Biology Volume 675, pp 313-326

Marino, D, (2013) "Best practices for storing biological samples in ULT freezers" http://www.biocompare.com/Bench-Tips/137747-Best-Practices-for-Storing-Biological-Samples-in-ULT-Freezers/

Wu, J et al., "Stability of Genomic DNA at Various Storage Conditions", International Society for Biological and Environmental Repositories (ISBER) 2009 Annual Meeting, Poster QAC 03

THE UNIVERSITY of EDINBURGH

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Sustainable Labs Steering Group

15th January 2018

"-70 Switch" Briefing

Description of paper
This paper describes some concerns with a planned 'Switch' campaign aimed to encourage users to change their Ultra Low Temperature (ULT) Freezer settings from -80^{0}C to -70^{0}C. It will also offer some solutions.

Action requested
SLSG is asked to consider and respond to the recommendations relating to a potential engagement campaign for ultra-low temperature (ULT) freezer temperatures.

Recommendation
It is recommended that Option 1 is followed, perhaps also including specific work around Option 2 if such groups can be identified. This is recommended as it is recognised that in many instances -70^{0}C may be suitable, but there are enough instances where it would be unsuitable to warrant a nuanced approach.

Background and context
Within SRS Department planning for the Sustainable Labs programme, we are committed to run a specific SWITCH campaign encouraging those using energy intensive ULT freezers to shift temperature settings up from their lowest setting at -80^{0}C to -70^{0}C, a measure shown to save up to 30% of the energy consumption of the freezer, and in some cases proven to maintain samples at an appropriate quality for research. There is an ongoing research project taking place at Roslin Institute in partnership with a freezer manufacturer to test the impact of temperature adjustments on research sample quality.

Existing evidence
Studies at University of Edinburgh have demonstrated the energy savings available (c.28%) from changing set points from -70 to -80^{0}C.[1] [2]

Additional evidence can be gained from a database operated by University of California Davis and University of Boulder Colorado[3] which describes numerous different biological sample types and the storage temperature – useful as this is, it is not a peer reviewed scientific study.

[1] https://www.ed.ac.uk/files/atoms/files/freezer_energy_consumption_report.pdf
[2] https://www.ed.ac.uk/files/atoms/files/efficient-ult-freezer-storage.pdf
[3] https://docs.google.com/spreadsheets/d/13UvBeoXAhwSHshSYoUDHwcxWiW7qYLnUb-eLwxJbCYs/pubhtml

A study is underway at Roslin, in collaboration with Eppendorf and VWR, to look at a much wider variety of sample types stored at -60, -70 and -80^{0}C in order to address the gap in current literature (see below). Initial reports[4] indicate that some samples have degraded faster at -70^{0}C than at -80^{0}C – see below:

Sample Type	Survival at -80°C	Survival at -70°C	Survival at -60°C
A	Y	Y	Y
B	Y	Y	N
C	Y	N	N
D	N	N	N

Some studies have been undertaken looking at the impact of different storage temperatures on one or two specific sample types[5 6 7 8 9 10 11 12 13 14 15]. Because each study only looks at one specific type of tissue, and may not look at -70 as a storage option (often the storage options used are -80, -20, +4 and room temperature) there is deemed to be a gap in the current body of scientifically assessed and peer reviewed knowledge.

[4] https://www.eppendorf.com/UK-en/about-us/news/

[5] Tedeschi, R. & De Paoli, P; (2011) "Collection and Preservation of Frozen Microorganisms"; Methods in Molecular Biology Volume 675, pp 313-326

[6] Marino, D, (2013) "Best practices for storing biological samples in ULT freezers"

[7] Colins et al, (1993), "Storage temperature and differing methods of sample preparation in the measurement of urinary albumin" Diabetologica, vol 36, issue 10, pp 993-997

[8] De Paoli, P, (2005) "Biobanking in microbiology: From sample collection to epidemiology, diagnosis and research", FEMS Microbiology Reviews 29 pp. 897–910

[9] Reimer, L. and Carroll, K. (2004) Procedures for the storage of microorganisms In: Manual of Clinical Microbiology (Murray, E., Baron, E., Pfaller, M., Tenover, F. and Yolken, R., Eds.), pp. 67–73. ASM Press, Washington, DC

[10] Michel, C. and Garcia, C. (2003) Virulence stability in Flavobacterium psychrophilum after storage and preservation according to different procedures. Vet. Res. 34, 127–132

[11] Harbec, P.S. and Turcotte, P. Preservation of Neisseria gonorrhoeae at 20 C. J. Clin. Microbiol. 34, 1143–1146

[12] Sebire, K., McGavin, K., Land, S., Middleton, T. and Birch, C. (1998) "Stability of human immunodeficiency virus RNA in blood specimens as measured by a commercial PCR-based assay". J. Clin. Microbiol. 36, 493–498

[13] Winters, M.A., Tan, L.B., Katzenstein, D.A. and Merigan, T.C. (1993) "Biological variation and quality control of plasma human immunodeficiency virus type 1 RNA quantitation by reverse transcriptase polymerase chain reaction". J. Clin. Microbiol. 31, 2960–2966

[14] Mitchell, B.L. et al, (2005) "Impact of Freeze-thaw Cycles and Storage Time on Plasma Samples Used in Mass Spectrometry Based Biomarker Discovery Projects" Cancer Informatics 98–104

15 Wu J, et al., (2009) " Stability of Genomic DNA at Various Storage Conditions" International Society for Biological and Environmental Repositories 2009 Annual Meeting, Poster#: QAC 03

Successful programmes
Notable successful large-scale -70 promotion campaigns include the following locations:

- UBC
- UC Davis
- University of Boulder, Colorado
- University of Aberdeen

Good sample management (asking people to critically assess what temperature is required by their samples – rather than a blanket promotion of -70^{0}C) is being promoted in many other locations:

- University of Edinburgh
- King's College London
- University of Bristol
- University of Oxford
- Tufts University
- University of Birmingham
- University of Cambridge

Notably, University of Dundee heavily promoted -70^{0}C storage and have since reversed this promotion. Further information has not been received about the details.

Also notable, Harvard have guidance for sustainable use of ULT freezers which does not suggest changing to -70^{0}C.

Discussion
Anecdotal evidence coming out of the Roslin freezer project (full data release at this stage is against the terms of the project) indicates that for some of the samples being assessed there is a noticeably greater degradation in samples stored at -70^{0}C versus the same sample type at -80^{0}C. Thus two scenarios are possible if we promoted blanket adoption of -70^{0}C:

1. Users adopt -70^{0}C and some will experience problems with their research as a result, leading to some potentially catastrophic impacts on relationships with key stakeholders, a loss of trust, and bad publicity for the department.
2. Users are critical of the advice (or aware of the interim outputs of the Roslin study) and refuse to adopt -70^{0}C, potentially straining relationships with stakeholders and reducing the credibility of this and future sustainability messages.

Option 1
We adopt a softer, more nuanced message than would normally be included in a -70^{0}C Switch campaign, which encourages freezer users to critically evaluate the evidence and literature around their storage temperature choice.

This solution is very similar to our current approach and good practice advice. Thus, consideration should be given to whether this will have any additional impact on top of our existing messages.

Option 2

There are two groups who may be suitable for a specific -70^{0}C Switch campaign, although the individuals who comprise these groups have not yet been identified:

- Those storing samples for only short periods of time (days/weeks) would likely not be impacted by the accelerated degradation of storing certain samples at -70^{0}C, so would still be appropriate to target.
- Those storing samples which the Roslin freezer project has not identified as having accelerated degradation at -70^{0}C would also be suitable to target. This, however, would likely require approval of the Roslin project partners as any publicity around which samples we are promoting for storage at -70^{0}C would, by process of iteration, give away some of the initial conclusion of the Roslin trial.

Option 3

SRS undertakes a -70^{0}C Switch campaign, accepting the above noted risks.

Option 4

SRS does not undertake a new -70^{0}C Switch campaign.

Resource implications

This campaign would be resourced through the existing budget of the Department for Social Responsibility and Sustainability – no additional resources are expected to be required.

Risk Management

Risks are outlined above, namely risk to samples, risk to research and consequential risk to SRS relationships with researchers (reducing effectiveness of other SRS programmes). However, a cautious, evidence-based approach can be taken which should alleviate these risks.

Equality & Diversity

No impacts foreseen.

Next steps/implications

Once SLSG has responded to this paper, the Project Coordinator – labs within the Department for Social Responsibility and Sustainability will take steps to implement the campaign as advised by the SLSG response.

Consultation

Michelle Brown – Head of Programmes - Department for Social Responsibility and Sustainability

Caro Overy – Engagement Manager - Department for Social Responsibility and Sustainability

Further information

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20th December 2017

Freedom of Information

This is an open paper.

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Sustainable Labs Steering Group

15th January 2018

SLSG Programme Plan update (Oct 2017 - Dec 2017)

Description of paper

This document is intended to give an update on progress against the objectives of the 2017-20 Sustainable Laboratories Steering Group Programme, which was drawn up to provide a structured approach to improving sustainability within laboratories at the University of Edinburgh over that time period, with a view to achieving wider University goals such as the Zero by 2040 target within the Climate Strategy. A traffic-light system (RAG) has been used to communicate quickly and clearly the progress which has been or is being made. In general this is taken to mean: green = on track, amber = delayed or problematic, red = objective is in danger of not being met. Further details on the progress against each individual action is included within the comments column. This document will be updated prior to each meeting of the Sustainable Laboratories Steering Group.

The purpose of this report is to report against progress in relation to activities with further thought on monitoring of outputs and outcomes to be considered. The outcome objectives of the 3 year plan are noted below:

Action requested

SLSG is asked to note the progress described in this paper and provide any advice or guidance for further improvement.

Background and context

At the October 2017 meeting of the SLSG a programme plan was presented and approved. This report notes the progress against this 3-year plan.

Outcome objectives:

1. 10% reduction in energy consumption.
2. Lab equipment reuse and sharing increased
3. Reduced consumption of materials, especially hazardous materials.
4. Enable culture of sustainable working through provision of support and training for lab technicians.
5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.
6. 100% of labs covered by Edinburgh Sustainability Awards teams
7. By 2020 every building with labs will have an energy coordinator who is lab-based.

RAG Progress Reporting

Communications and Engagement

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Promote use of the Sustainable Campus Fund	1. 10% reduction in energy consumption 3. Reduced consumption of materials, especially hazardous materials	• Robert MacGregor (seconded) • Energy Office • Estates Small Works Team	• Emails sent promoting the fund • Verbal communications with colleagues, including via Sustainability Awards teams	Green
Develop further sustainability communications materials for use by non-SRS staff including persuasive body of evidence to influence academics and lab users, as well as lists of recommended items of lab equipment (based on verified sustainability credentials)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• No direct work undertaken yet but: • Work to develop policies/guidance around ventilation and cold storage will feed into this project, and • Work to determine effective communication methods (e.g. energy monitoring) will feed into this	Green
Work with lab users/building managers to make use of improved	1. 10% reduction in energy consumption	• Energy Office • Lab Users	• Improved data has not yet been made available, but this is not yet considered to be delayed. • Where short term localised energy monitoring projects have been undertaken (e.g. IGMM and	Green

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
energy data (when available) – e.g. communicating the data, setting targets			Roger Land) the energy data has been a useful communication and engagement tool.	
Recognition of good practice via awards and/or other communications.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams	• Lab Users	• 2017 awards audits completed in November • 2 new teams joined • Most existing teams were retained (based on 2 year accreditation) • 33% of lab buildings (by number) are covered. Notable areas where coverage is low are Biology (notably Swann) and Engineering (many buildings not covered) – however both of these schools are engaging more strongly with SRS and so it is hoped that teams will increase / expand	
Regular communications between SRS and SLSG/lab users (e.g. newsletter or emails)			• No action taken specifically relating to this, however similar work relating to the Technician Commitment may have overlap	
SLSG meetings (strategic direction, project support and progress reporting)		• SLSG members	• Suitable scheduling of meetings is taking place	
Share good management processes – e.g. equipment sharing	2. Lab equipment reuse and sharing increased	• Lab Users	• No specific promotion of this has taken place yet	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Peer learning of sustainable labs best practices (via awards, workshops, campus meetings) – including recruitment of awards teams and energy coordinators.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• Awards audits have taken place with peer auditors • Some awards teams are recruiting additional teams • C.60% of lab buildings have an energy coordinator based on recent analysis, however it is currently unknown if these energy coordinators are lab based.	
Encourage and support organisation of a prestigious conference over video conferencing, potentially with support from The Wellcome Trust		• Lab Users • Academics • Funders	• No specific action has been taken on this yet	

Utilities, Waste and Carbon

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Support implementation of ventilation improvements in labs	1. 10% reduction in energy consumption.	• Health and Safety • Energy Office • Estates small works team	• Some practical projects are in development/implementation phases (e.g. Demand Based Ventilation, fume cupboard upgrades, chemical store upgrades) • Feasibility work is assessing Wind Responsive Ventilation • Policy Statements and guidance notes are being developed	
Develop targets of kWh/m2 for various space use categories	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Estates Development • Estates Operations • Contractors (Cundalls and Henry Gun-Why)	• A new Edinburgh Standard is being developed to replace BREEAM and equivalents, cherry picking the best aspects for University of Edinburgh • Progress is slower than hoped	
BMS/HVAC control sense checks programme extended to further lab spaces (incorporating checks of biohazard category activities)	1. 10% reduction in energy consumption.	• Energy Office (controls) • Lab Users	• No action has been taken yet	
Work with Schools/Colleges to ensure School/College	1. 10% reduction in energy consumption.	• SLSG members • School and College management	• No action has been taken yet • SLSG members are asked to encourage their school/college management to meet with SRS representatives about this.	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
plans describe how the School/College will play its part in achieving 'zero by 2040'	6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.			
Engage with lab users on development and publication of labs design guidelines	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• Edinburgh Standard is being influenced by input from the Delivering Sustainable Labs document, which has been reviewed by SLSG and Lab Users • Once a draft Edinburgh Standard is available this will be circulated for critique to SLSG and Lab Users	

Living Labs projects

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Recruitment and implementation of student (paid) interns for freezer inventories and/or other laborious semi-skilled work.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• No action has been taken on this	
Support lab-based 'living lab' sustainability projects (DNA, lighting, freezers)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased	• Lab Users • Estates	• Discussions have started around DNA storage • Long-term cold storage project (-60, -70 and -80) is ongoing (expected publication 2020) • Energy efficient equipment replacements (SCF) are being monitored	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
	3. Reduced consumption of materials, especially hazardous materials.			
Hazardous chemical substitution opportunities identification.	3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• No action has been taken on this	

Technical Staff

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with Technicians' Support Steering Group to improve CPD, career development and community cohesion of technical staff.	4. Enable culture of sustainable working through provision of support and training for lab technicians.	• Technical Staff • Technical Managers • IAD • HR • Academics	• University of Edinburgh has signed up to the Technician Commitment • The TSSG is working with Val Gordon (seconded to work on Technician Commitment for 10h/wk) to develop and implement an Action Plan incorporating a website, events, CPD, Professional Registration, newsletters, emails	

Funders

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with funding bodies to influence their approach to sustainability.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 4. Enable culture of sustainable working through provision of support and training for lab technicians. 5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• SRS department personnel are involved in discussions with Wellcome Trust on a bilateral and multilateral (via the UK-wide Lab Efficiency Action Network) basis. • No firm progress yet but our suggestions have been well received.	

Resource implications
No resource implications are related to reporting on progress against this plan. Implementation of the plan will have wider resource implications, which have been detailed elsewhere.

Risk Management
No risks associated with reporting on progress against this plan. No items on the plan are currently at risk of failure (red graded).

Equality & Diversity
No foreseen impacts.

Next steps/implications
A further progress report will be provided at the next SLSG meeting by the SRS Project Coordinator - Labs. During that time further actions will be taken towards the outcome objectives of the plan.

Consultation
Michelle Brown – Head of Programmes - Department for Social Responsibility and Sustainability

Caro Overy – Engagement Manager - Department for Social Responsibility and Sustainability

Further information
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20th December 2017

Freedom of Information
This is an open paper.

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Sustainable Labs Steering Group

15th January 2018

IGMM Energy Engagement Monitoring Project Results

Description of paper
This paper provides the results of an energy monitoring project at the Institute for Genetic and Molecular Medicine at the University of Edinburgh.

Action requested
SLSG is asked to note the findings of this project and consider implications for future lab energy engagement methods.

Recommendation
SLSG members are asked to consider if a similar project could be instigated in their area, and to make recommendations to SRS relating to this.

Background and context
Electricity consumption was monitored during the summer at IGMM during which time an engagement campaign was conducted in 2 phases. The data from electricity monitoring was used to assess the impact of different engagement methods. In addition, monitoring equipment was reinstalled in late November for 10 days to assess the longevity of impact.

Methodology
Four 3-phase electricity monitors were installed in the IGMM distribution boards to monitor four electrical distribution boards (DBs) which (roughly) cover the 2nd floor labs, 2nd floor offices, 3rd floor labs and 3rd floor offices (each DB may have a mixture of office and lab space, but will be predominantly one or the other). Energy data was captured from 5th July until 26th September. It had been hoped that we could also monitor how busy each space was through footfall counters, however equipment to monitor this was not available until the end of the project. Instead, data has been used from H.R. files which indicates days of absence (for annual leave or sickness), from which variations in the populations of the 2nd and 3rd floors have been deduced.

After an initial monitoring period to establish a baseline, posters were installed around the site advising of energy saving practices on the 31st July. This was followed up by a further period of monitoring prior to face-to-face presentations on energy saving practices being provided on 22nd and 23rd August. Attendance at the presentations was low, with perhaps a maximum of 20 staff attending in total across both sessions.

Data collection and manipulation
The energy monitors needed to be extracted at regular intervals in order to recharge batteries for several hours (overnight). As such days at the beginning or end of a monitoring period have only partial energy recording as either the evening or morning is missing. These days have been removed from the energy data presented below, in order that only full 24h periods can be shown and compared. The first and second monitoring periods ended in an uncontrolled manner when batteries ran out. As such, the period of time covered by the first and second monitoring periods varies depending on the battery life of the individual monitor. The 3rd floor lab monitor also has missing data from 1st August until 10th August (for some reason the period of monitoring from 4th August to 9th August which other monitors successfully captured seems not to have worked on this monitor).

For the 2nd and 3rd floor labs the first two monitoring periods were July 5th to July 17th, and July 21st to August 1st.

For the 2nd floor offices the periods were: July 5th to July 16th, and July 21st to August 2nd.

For the 3rd floor offices the periods were: July 5th to July 14th, and July 21st to August 2nd.

This required the removal of energy data from the following dates:

July 5th, (14th, 16th, 17th) and 21st.

August (1st, 2nd) 4th, 9th, 10th, 17th, 18th, 23rd, 24th and 31st

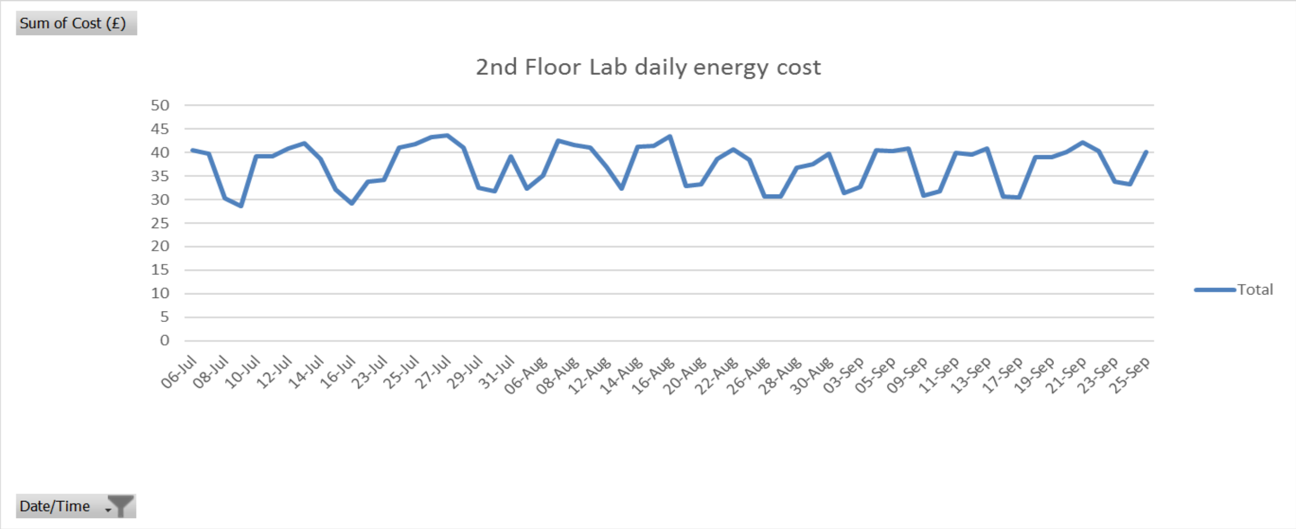
September 1st, 7th, 8th, 14th, 15th and 26th.

(dates in brackets denote dates which are included in some datasets but not others, depending on when the battery ran out)

Energy consumption results

The below graphs exclude dates with partial data. Weekend dates have been included.

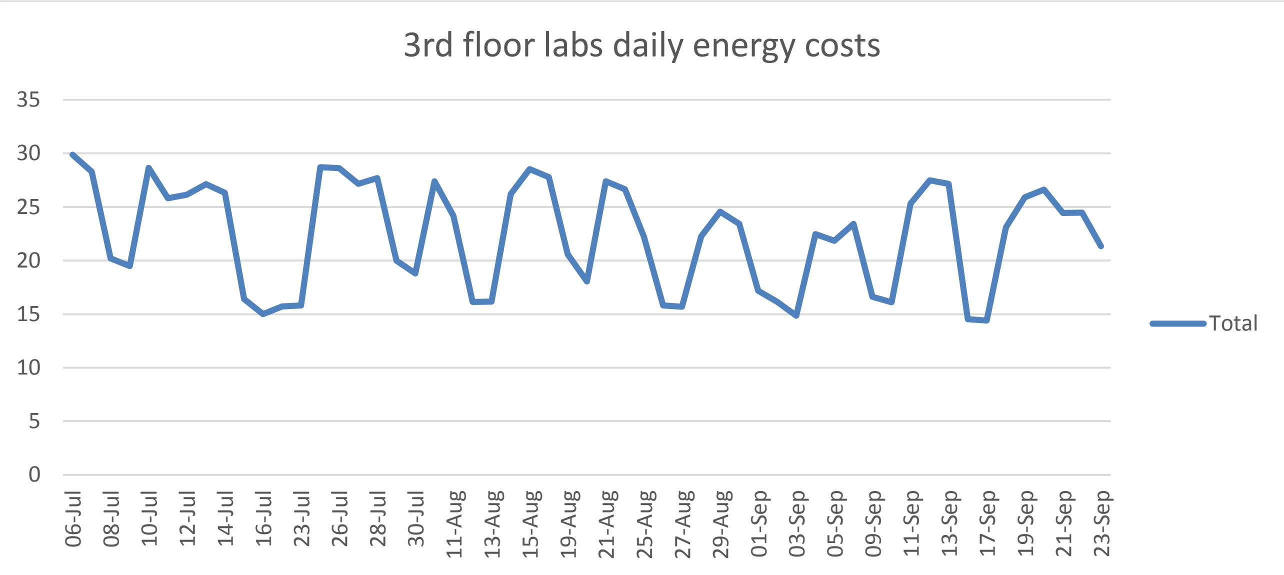
2nd floor lab



The 2nd floor lab monitoring shows no discernible reduction in energy consumption. In fact, the trend seems to have been towards increasing energy consumption, mainly via slightly increased weekend consumption.

The average daily energy cost of the first 15 days was £36.77, the average of the last 15 days was £36.81, an increase of 0.1%.

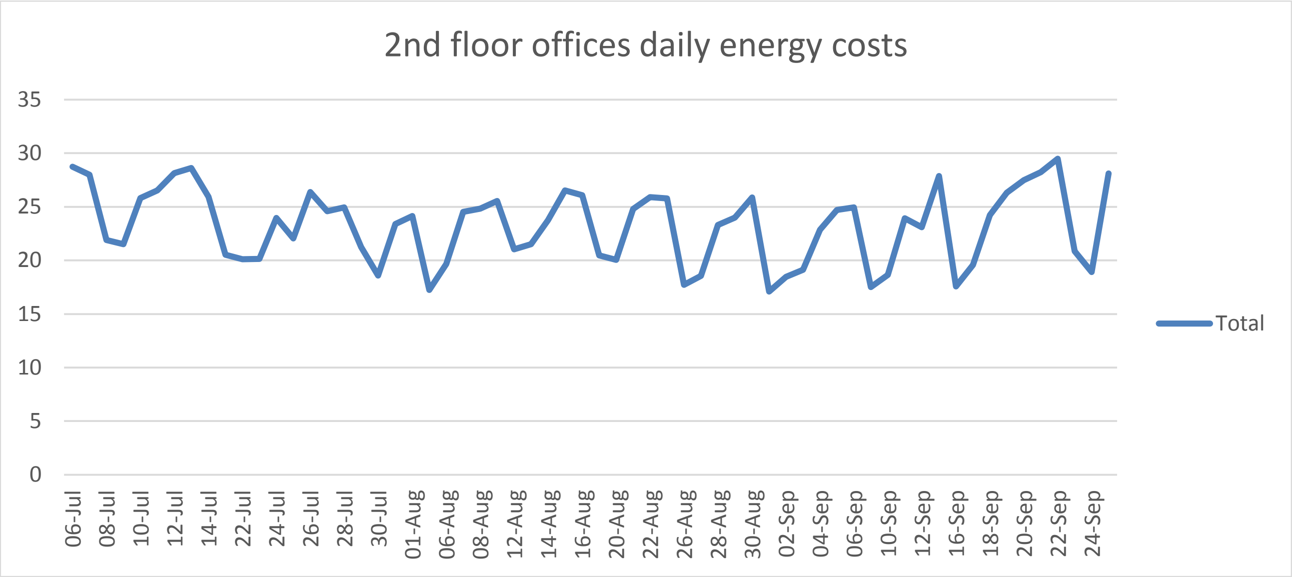
3rd floor lab



The 3rd floor lab energy cost monitoring shows a slight decrease over the monitoring period. Slightly lower week-day peaks can be observed, especially around the period at the end of August, beginning of September. This coincides with the energy saving presentations from SRS on 22nd and 23rd August, but other factors could also be at play. Regardless, week-day peaks rose in mid-September, although remaining slightly lower than in July.

The average daily energy cost of the first 15 days was £24.48, the average of the last 15 days was £22.18, a decrease of 5.5%.

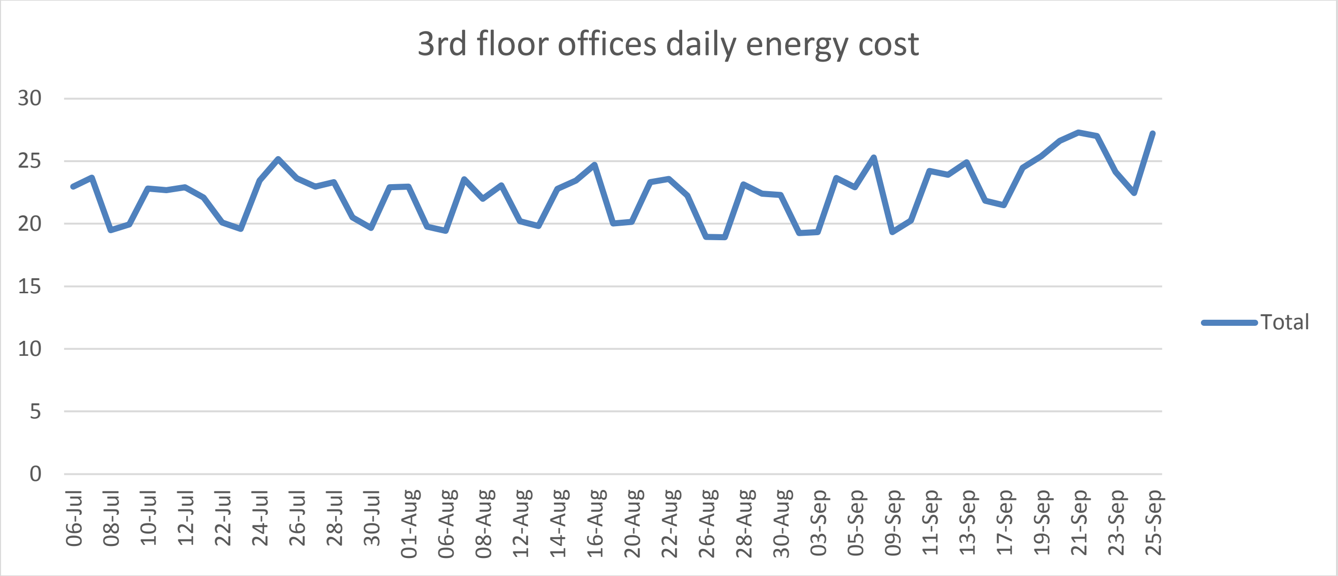
2nd floor offices



The trend of this data shows that week-day peaks declined throughout the period until the week of 13th September when they began to rise again to the highest recorded peak on 29th September of almost £30/day. However, weekend use remained low during this period, when compared with the beginning of the monitoring period.

The average daily energy cost of the first 15 days was £24.56, the average of the last 15 days was £23.45, a decrease of 4.5%.

3rd floor offices



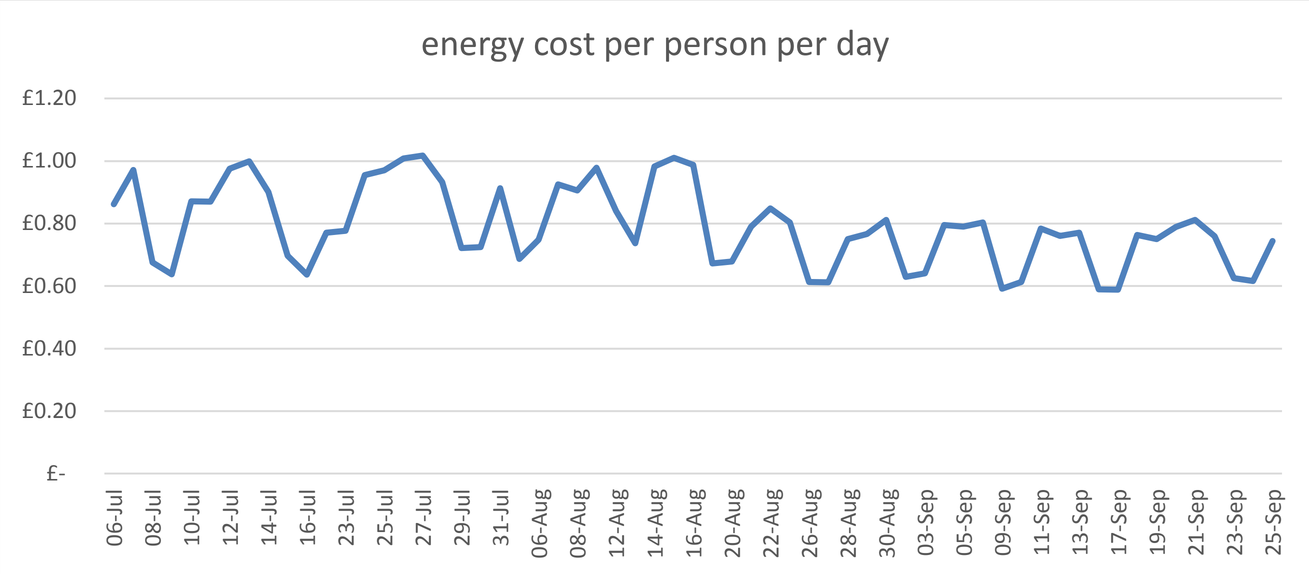
The most noticeable feature of the energy data in the 3rd floor offices is the small difference between weekday and weekend use. This may be due to efficient consumption during the weekdays, or inefficient consumption during weekends. In comparison with the 2nd floor offices the weekend troughs seem quite high in the 3rd floor offices, indicating comparatively higher energy consumption over weekends. When we take into account that weekday consumption is lower at the 3rd floor offices (compared with 2nd floor offices) it is even more striking that the weekend energy consumption is higher in this space.

Another obvious trend is that both weekend and weekday consumption increase from around 17th September after a period of relative stability throughout August.

The average daily energy cost of the first 15 days was £22.32, the average of the last 15 days was £24.04, an increase of 7.7%.

Energy consumption per person results

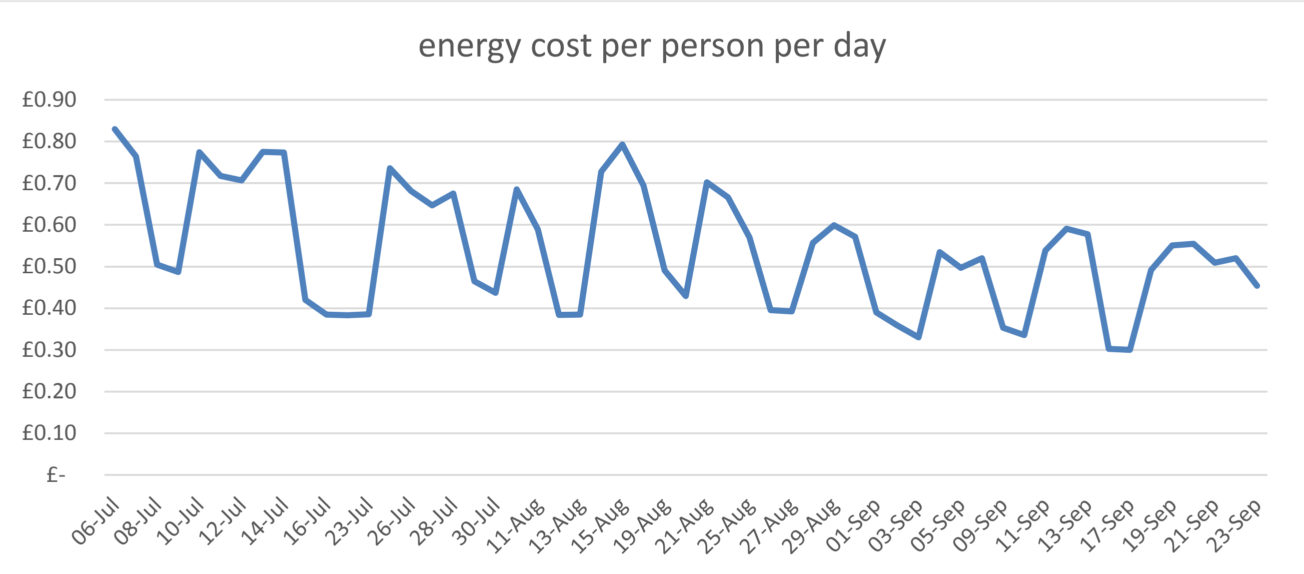
2nd floor Labs



The energy cost per person in the 2nd floor labs shows an overall downward trend over the period, with a fairly noticeable change in late August when the peaks become substantially lower (troughs remaining around the same level).

The average daily energy cost per person of the first 15 days was £0.84, the average of the last 15 days was £0.70, a decrease of 16%.

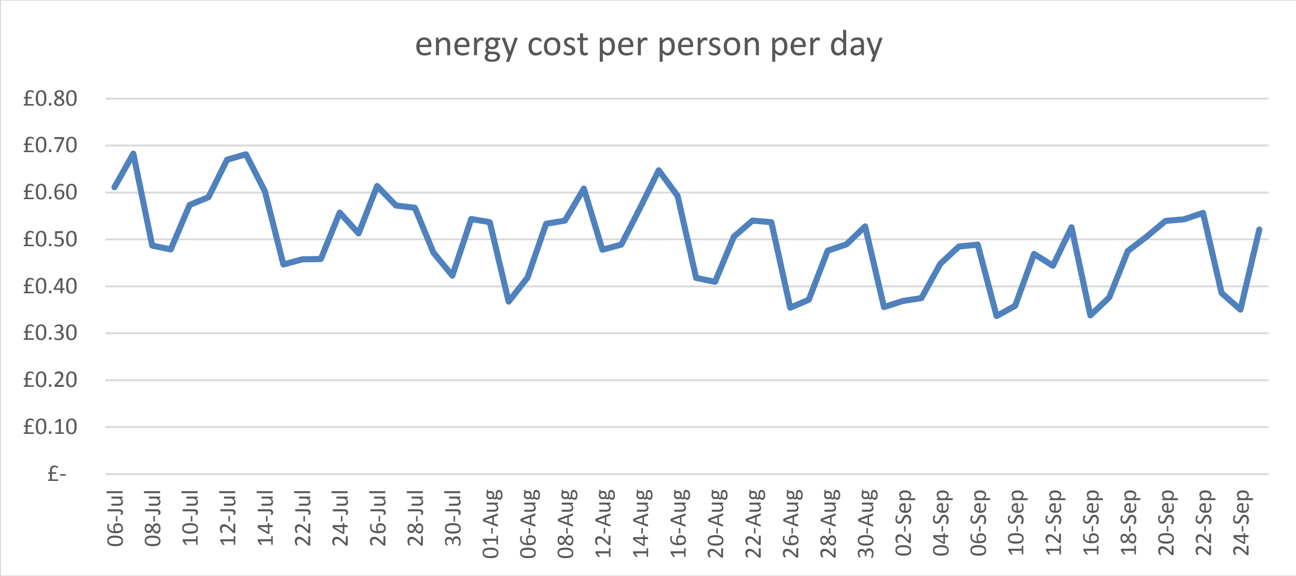
3rd floor labs



The energy cost per person in the 3rd floor labs shows an overall downward trend over the period, with a relatively subtle change in late August when both the peaks and troughs become lower.

The average daily energy cost per person of the first 15 days was £0.62, the average of the last 15 days was £0.47, a decrease of 24%.

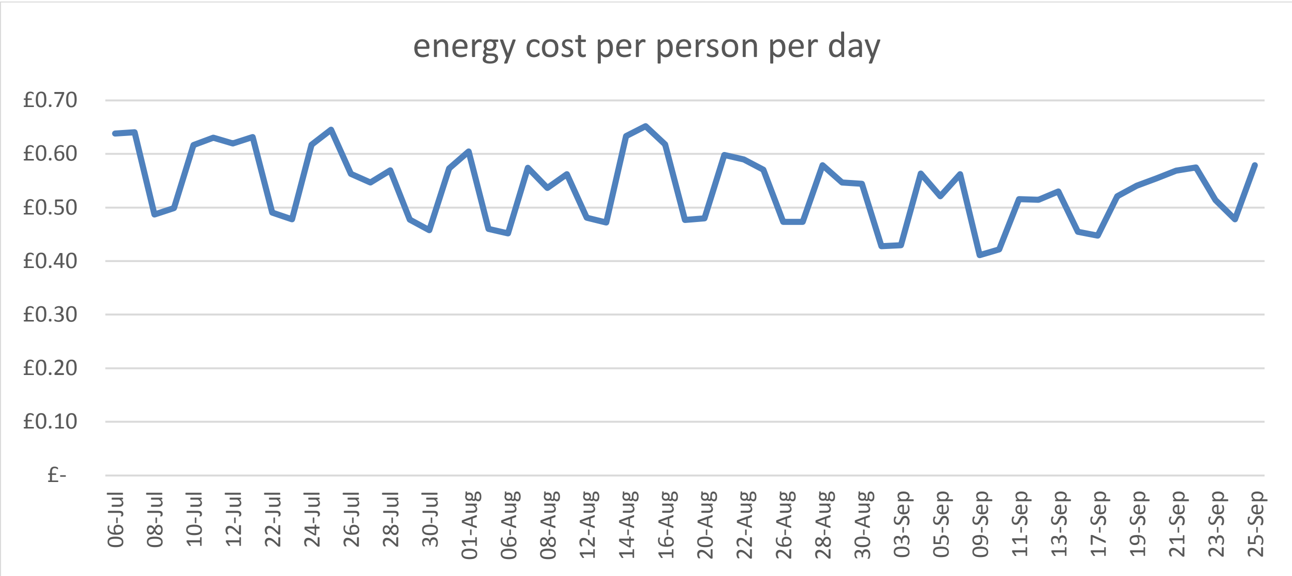
2nd floor offices



The energy cost per person in the 2nd floor offices shows an overall downward trend over the period, with a noticeable change in late August when both the peaks and troughs become lower.

The average daily energy cost per person of the first 15 days was £0.56, the average of the last 15 days was £0.45, a decrease of 20%.

3rd floor offices



The energy cost per person in the 3rd floor offices shows an overall slight downward trend over the period, with the lowest readings in early September but a rising trend in mid-late September.

The average daily energy cost per person of the first 15 days was £0.58, the average of the last 15 days was £0.51, a decrease of 12%.

Combined offices and labs per floor

Combined labs and offices energy cost per person per day on the 2^{nd} floor dropped by 17.9% (£1.40 to £1.15), while on the 3^{rd} floor the drop was 18.4% (£1.20 to £0.98).

Discussion

Medium term impact of engagement

Taking the whole monitoring period into account, the below table summarises the findings when the first 15 days are compared to the last 15 days.

Location	**% change in average daily energy cost per person**
2nd floor lab	-16%
3rd floor lab	-24%
2nd floor offices	-20%
3rd floor offices	-12%

Data from beginning and end of monitoring period

Short term impact of engagement

The average daily energy cost for the 15 days prior to placement of posters on 31st July, compared with the 15 days after the placement of posters shows the below impact:

Location	**% change in average daily energy cost**
2nd floor lab	-2%
3rd floor lab	-5%
2nd floor offices	-6%
3rd floor offices	-3%

Data from 15 days before and after placement of posters

The average daily energy cost for the 15 days prior to face to face engagement presentations on 22nd and 23rd August, compared with the 15 days after the presentations shows the below impact:

Location	**% change in average daily energy cost**
2nd floor lab	-15%
3rd floor lab	-21%
2nd floor offices	-16%
3rd floor offices	-8%

Data from 15 days before and after energy saving practices presentation

Inter-site comparison

The 2nd floor labs are easily identified as the highest energy consumer, with weekdays often over £40/day and weekends almost always over £30/day.

The energy consumption at the other sites is quite comparable.

The 3rd floor lab energy consumption during weekdays is in the high-£20s/day, but drops significantly over weekends to around £15/day.

The offices both have lower weekday peaks, at around mid-£20s/day, but also higher weekend troughs in the high 'teens of £/day.

Offices vs labs

Given the sometimes 24/7 nature of life-science research it might have been expected that it would be easier to switch off office equipment over weekends and evenings, giving lower troughs for the offices than for the labs. However this seems not to be the case with the 3rd floor lab at least, which achieves lower weekend troughs than the associated 3rd floor offices, and lower costs per person by the end of the monitoring period.

Impact of engagement

Energy consumption when described in relation to the site population (daily energy cost per person) has dropped at all sites by a substantial amount over the monitoring period (ranging from 12 – 24%). The cause of such a reduction in energy consumption per person may be associated with improved efficiency of practices – for example switching off more items of equipment when not in use, especially over nights (weekend consumption seems to have varied less). However, it could also be due to the variations in populations during the monitoring period, with lower populations in all locations at the beginning of the period, and higher at the end. This increase in population will mean that the energy consumed by communal equipment which must remain 'on' permanently or for long periods of time will be shared among more individuals, and thus the energy intensity of any one individual is reduced. This could account for some of the reduction in energy cost per person per day.

However, bearing all of the above in mind, it still appears that there was a coincident reduction in energy use at some sites (specifically the labs) which could be attributed to the timing of the face-to-face presentation sessions.

Future recommendations

It is recommended that the same H.R. data be sought and monitoring equipment be returned to the same sites in future, perhaps at end of November (3 months after the presentation) to ascertain whether practices have remained efficient, or if energy consumption per person has returned to higher levels.

Resource implications

The project has indicated that face-to-face engagement has a substantially higher impact than posters/stickers. This should influence resource distribution away from posters/stickers and more towards staff time.

Risk Management

To move completely away from posters/stickers would likely be counter-productive, as they are likely to be useful as reminders to lab users after they have received a face-to-face presentation.

Equality & Diversity

Face-to-face engagement should be beneficial in terms of equality and diversity of engagement methods, as it will be more accessible to those with visual impairments.

Next steps/implications
SLSG members are asked to suggest further locations for similar engagement projects.
The face-to-face engagements incorporated energy information in graphical form – this was deemed to be impactful, and thus energy display monitors should be prioritised for distribution as soon as practical.

Consultation
Michelle Brown – Head of Programmes - Department for Social Responsibility and Sustainability
Caro Overy – Engagement Manager - Department for Social Responsibility and Sustainability
Stewart McKay – Facility Manager – IGMM (CMVM)
Robert MacGregor – Secondee from AECOM - Estates

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20th December 2017

Freedom of Information
This is an open paper.

Appendix – Phase 2 data gathering December 2017

From 28th November to 10th December 2017 energy monitoring equipment was reinstalled to monitor the 2nd Floor Labs, 3rd Floor Labs and 3rd Floor Offices. In addition HR for the building provided data on staff absences from sickness/annual leave. The aim of this monitoring was to understand if the energy reductions achieved in the summer (noted above) would be long-lasting or not. The data has provided the following results:

	Average energy cost per person per day					
Site	**July 2017 (Before Engagement)**	**September 2017 (1 month after engagement)**	**December 2017 (4 months after engagement)**	**% change June to Sept**	**% change Sept to Dec**	**% change June to Dec**
2nd Floor Labs	£0.84	£0.70	£0.73	-16%	+4%	-13%
3rd Floor Labs	£0.62	£0.47	£0.46	-24%	-2%	-26%
3rd Floor Offices	£0.58	£0.51	£0.53	-12%	+4%	-9%

This can be interpreted as encouraging news about the longevity (at least in the medium term) of impact of face-to-face energy engagement with staff.

As with data analysis above, the first and last days of the monitoring were excluded from the data set as they were incomplete days and thus were providing skewed outlying exceptionally low results.

Seasonality (summer to winter) may have influenced results slightly through the monitored equipment operating in a hotter room environment in summer versus winter, however the impact of this is thought to be low due to the temperature control exerted upon the rooms by air handling systems. In addition, some of the energy consumption monitored in labs would be from equipment which would have reduced energy consumption in a hotter room environment (e.g. incubators/incubator shakers). Thus, from the data we have available, it is reasonable to assume that the observed energy consumption differences result from behaviour changes among staff.