THE UNIVERSITY of EDINBURGH

Sustainable Laboratories Steering Group (SLSG)

Monday 29 May 2017, 3pm

Cuillin Room, Charles Stewart House

AGENDA

1 Welcome, Introductions, Purpose and Aims of Meeting
The Director of SRS will outline the programme for the session

2 Minute **A**
To *approve* the minute of the previous meeting on 12 December 2016

3 Matters Arising
To *raise* any matters arising not covered on the agenda or in post-meeting notes.

SUBSTANTIVE ITEMS

4 Sustainable Labs Vision and Programme Plan **B**
To *note* a paper from the SRS Projects Coordinator (Labs) describing the medium-term plan and long-term vision for sustainable labs at University of Edinburgh, based on outputs from the 1st May planning meeting.

5 Lab Awards: Change from S-lab to NUS criteria **Verbal**
To *receive* an update from the SRS Engagement Manager

6 Engagement with Wellcome Trust **Verbal**
To *receive* a presentation from the Director of SRS

7 Lab Equipment re-use process update **Verbal**
To *receive* a presentation from the SRS Projects Coordinator (Labs)

8 SFC bid – update and request for suggestions **Verbal**
To *receive* a presentation from the Director of SRS

9 Improving support for Technical staff careers **Verbal**
To *receive* a verbal update from the SRS Projects Coordinator (Labs)

10 Estates Development sustainability guidelines development **Verbal**
To *receive* a presentation from the Director of SRS

11 Lab equipment selection for sustainability **C**
To *note* a paper from the SRS Projects Coordinator (Labs)

12 Freezer Inventories – Student Summer Internships? **Verbal**
To *receive* a presentation from the SRS Projects Coordinator (Labs)

ROUTINE ITEMS (verbal)

13 Any Other Business
To *consider* any other matters from Group members.

UNIVERSITY OF EDINBURGH **A**

MINUTE OF A MEETING *of the Sustainable Laboratories Steering Group held in the Cuillin Room, Charles Stewart House on Monday 12 December 2016.*

1 Welcome and Introductions

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

2 Minute **A**

The minute of the meeting held on 14 September 2016 was approved as a correct record.

3 Matters Arising

The Engagement Manager updated the Group on ways to increase internal lab equipment reuse through Warpit. CCL North were also aiming to increase their reuse rate through partnership working. SITG proposed including a link to Warpit on the University homepage and using the CCL North list to populate it.

Action – CO to circulate a request for suggestions for low-value high-use items to feature on Warpit, as well as ideas on how to improve the process and increase use of the portal for lab items.

SUBSTANTIVE ITEMS

4 Energy audits in lab buildings – main findings

As part of a larger project, Estates and SRS had identified the top 20 energy consuming buildings, 17 of which were targeted for walkarounds and improvements. This included lab audits at SCRM, QMRI and Hugh Robson, focusing on: behaviour change, fitting timers on small equipment, BEMS review and optimisation, draught-proofing, replacing old equipment, and installing LEDs and daylight sensors. Estates were encouraged to look into reinstating ground source heat pumps at SCRM, and solar shading for the south side of Hugh Robson. Lab audits were still to be carried out at Joseph Black and the Vet School.

Carbon appraisals based on DEFRA figures had demonstrated that it was more efficient to remove some old equipment from the University estate entirely, rather than reuse it internally. A BMS operator would be in post for the next six months, helping to identify options and opportunities. The Sustainable Campus Fund could have a role in funding draught-proofing projects.

Action – AA to circulate a one page briefing on findings to date.

Action – JR to circulate November UWG paper on energy engagement.

***Post-meeting note**: UWG Paper F circulated on 5 January.*

5 Sustainable Campus Fund lab projects

Since launching in August 2016, the SCF had funded ten projects related to labs (including equipment replacements, helium reuse and fume cupboard refits) predicted to generate £110K in savings. Some projects (notably freezer replacement and lighting) did not quite fit the criteria for the fund. A paper on freezer replacements had been presented to the Utilities Working Group which had agreed to release a set amount of funding. A higher tolerance for lighting project paybacks had also been

approved. Work was ongoing to establish a suitable balance with school contribution / match funding. The aim was to have more viable projects to take to Estates Committee than available funding.

SLSG noted a potential capacity issue in Estates around how many projects it could deliver at the same time, though, once done, these were largely replicable. Significant savings could be achieved by reducing ventilation in labs, but the Group recognised that it would not be possible to approach this on a whole campus basis. The Fund acted as an initial mechanism to raise awareness, build in processes, and uncover issues and opportunities.

6 Progress against Labs Implementation Plan **B**

The Labs Projects Coordinator presented the paper, noting that progress had been made on operational savings (Area A). On lab design and construction (Area B), SRS were now invited to consult on new development projects as a matter of course and were working with Estates colleagues to develop guidelines that could be adopted across the University. Work was ongoing to review appropriate design guidelines, including alternatives to BREEAM, that may be better suited to the Edinburgh context (e.g. on rainwater recovery). In terms of data (Area C), work was ongoing to generate evidence from business cases and review best practice.

On engagement (Area D), the labs coordinator role had now been made permanent. Some contacts had moved on and had not necessarily been replaced, or their replacements were not quite as engaged. While some areas had become less engaged, focusing on core business, this was balanced by other areas improving. A video was currently being produced on areas of good practice identified as part of the Sustainability Awards.

SLSG noted that freezer inventories were useful in helping to reduce the ever expanding fleet, but were not standard across the estate. The Wellcome Trust inventoried twice annually. The summer inventory was carried out by an intern, one way to address the time demand, which also linked to the University goal to provide more work experience opportunities for students. A case could be made to the Sustainable Campus Fund, or a central fund could be proposed. There were benefits in terms of space, air conditioning saved, and the avoided energy cost of additional freezers. The Group recognised the inherent difficulty in trying to calculate avoided costs. The aim was to make throwing away old samples part of routine maintenance. Some areas had very detailed computerised records, while others used paper records on freezer doors. Health & Safety were planning to implement a system for radiation and biological organisms capable of recording room, fridge and shelf details. If departments bought in to this system, it could be used to monitor other samples.

Action – AA to draw up thoughts on how to facilitate the process.

Replacing mercury lamps in microscopes with LEDs (Task A11) did not generate sufficient carbon savings to meet campus fund criteria. This type of action currently fell entirely to the School or College, and the Group should look into other mechanisms to encourage this to happen, perhaps through industry collaboration as King's College London were doing, or centralisation of imaging services. In larger imaging facilities the trend was for lasers rather than LEDs, so replacements would be small scale. Benefits included time saved, hazardous waste reduction, and less down time.

Action – SG to request Estate Development report from the Development Engineering Manager.

Action – JR to forward the capital projects list (tabled at UWG) to the Projects Coordinator (Labs).

***Post-meeting note**: sent on 6 January 2017.*

SLSG noted that there was no financial component to the Sustainability Awards, which ran like a certification scheme (though project awards were timebound, including deliverables). There were seven labs teams across the estate. Once Schools had received an award, they tended to sustain the effort internally to keep the activity going. Different prizes were offered at different staff levels. SRS were looking at using the campus fund to extend this. It was proposed that Biology add a sustainability prize to the Impact Awards – SRS could provide the criteria.

Action – AA & CO to follow up with David Gray on links to Impact Committee.

7 Sustainable Labs Vision and Programme Plan **C**

At the previous meeting the Engagement Manager had presented on overall goals and activities. This update was based on feedback from that meeting. It was a Programme Plan for the SRS Department, and further discussion would be required on how it mapped to the Implementation Plan.

The Engagement Manager outlined goals, outcome objectives, outputs and activities and how to interpret these into annual Sustainable Labs Implementation Plans, including an aim to increase the number of Energy Coordinators based in labs.

The Group advised the current Implementation Plan be extended to cover the time period to the end of the academic year 2016/17. It was recognised that the vision and the programme plan for the Department for SRS was correct, but there could be more done to deliver on the vision more broadly than within the Department for SRS so a workshop was suggested to develop these ideas (see next item).

8 Extension of Labs Implementation Plan to August 2017

Members discussed whether to draw up a 2017 plan, use the department plan, or a third option. SRS Programmes already had a rigorous reporting system in place. It was agreed that a formal Implementation Plan was required, separate from SRS Department planning, and combining straightforward achievable outcomes with more ambitious, free-text goals. A more detailed and strategic view would then be taken for the next three to four years, including a possible design session looking at specific goals for 2020, working up from planned actions.

Members agreed to move to planning aligned to the academic year, extend the current implementation plan, and hold a workshop session to establish how all stakeholders will contribute to delivering the vision.

9 Working with People Committee, HR and IAD to improve support for Technical staff

The Projects Coordinator (Labs) had been working with technical staff via the HEaTED network on concerns, succession planning, and impact on the University. There were currently around one thousand technical staff across the University and they had some of the greatest impact on lab behaviours. A paper went to People Committee who recognised the issue. The challenge now was to work out how to address it. A small Technicians Support Steering Group (TSSG) had been established, had met and begun to discuss the issues. This was also discussed at the

Labs Workshop on CPD and professional development for lab technical staff on 6 December. Suggestions were being sought on ways the University could make its support for technical staff clearer. One recommendation of the TSSG is that a member of technical staff could be seconded to HR, though additional funding would be required to free them up from their current tasks. A further recommendation was that a webpage could be set up for University technical staff, including videos describing their roles and a directory of services which facilitated cross-University links and requests for use of those services, an approach that was working well in other Universities.

Members recognised that it would be beneficial to have a physical or online forum to bring technical staff together, promote collaboration, circulate newsletters, arrange get-togethers and CPD opportunities, and share a career pathway toolkit (there were a number of off-the-shelf versions that UoE could adopt that could help alleviate concerns around career progression). UoE could promote professional registration more, offering and supporting it, rather than making it mandatory.

ROUTINE ITEMS (verbal)

10 Any Other Business

The new Climate Strategy had been launched on 23 November. They key was adopting a whole institution approach as much about what the University was teaching, purchasing, and investing in as how it ran its buildings. New targets included reducing carbon emissions per £million turnover by 50% from a 2007/08 baseline by 2025, and becoming carbon neutral by 2040.

Initial actions would include development of a three year Implementation Plan, building on work in labs, energy management, and waste, and making a case for alternatives to aviation (including promoting rail travel to London and videoconferencing facilities). The Renewable Energy and Low Carbon Options Review Group was looking at the case for large-scale investment in wind, solar, biomass, heat pumps and so forth, including their value as a teaching resource.

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B

Sustainable Labs Steering Group

29th May 2017

Sustainable Labs Vision and Programme Plan

Description of paper
This paper summarises discussions held on 1st May in an SLSG meeting specifically focused on developing a plan for sustainable labs activities up to 2020 and a vision for longer term action up to 2040.

Action requested
SLSG is asked to receive and provide feedback on, and (if appropriate) approve the findings and recommendations below. Feedback should be provided to the SRS Projects Coordinator (Labs) on or before 3rd July 2017. Once approved, the below recommendations will be adopted into a structured plan to 2020 and 2040.

Recommendations

Actions up to 2020:

BUILDINGS AND ENERGY

- Influence design of new/refurb buildings to prioritise sustainable ventilation
- Development of Sustainable Design Standards (Paper to Estates Committee September 2017) to invest in design for future savings
- Uptake of Sustainable Campus Fund to implement feasible energy saving actions (from energy audits) in existing buildings

COMMUNICATIONS AND ENGAGEMENT

- Better internal communications
- Aim for full participation in lab awards
- Promote Sustainable Campus Fund
- Developing and publicising evidence of energy saving/sustainable equipment

PRACTICES

- Work with Schools/Colleges to develop their own Plans describing how they will help achieve the climate strategy targets

Actions to/Vision for 2040:

BUILDINGS AND ENERGY

- Implement sustainable design standards
    - Ventilation policy
    - Cold storage policy
    - Renewable energy generation and net positive buildings

    - Reclaim and use waste heat
    - Soft landings
    - Better understanding of users' needs and practices
    - Better briefing for engineers and contractors (including lab design)
- Many of our buildings in 2040 have already been built – we need to be effective at making sustainable use of old buildings
- Need a better understanding of the University's Capital Plan (consolidation of campuses?)
- Improved energy data, allowing better metrics and measurement (e.g. kWh/m2 for different categories of space)
- Critical appraisal of (leading to limitation of) 24/7 accessible space
    - Does lone working align with H&S and Climate Strategy aspirations?

COMMUNICATIONS AND ENGAGEMENT

- High quality of internal communications
- Non-SRS people spreading SRS messages (using SRS materials)
- Sharing of good management processes (e.g. equipment sharing)
- Development and promotion of a sustainable equipment register

PRACTICES

- Shared services across the University of Edinburgh (e.g. waste disposal, freezer farms, washing/sterilisation) served by electric vehicles
- Run a prestigious conference over video-conferencing technologies as a demonstrator to show it can be done, reducing business travel.
- Many active living labs projects
- Student projects/interns (e.g. for freezer inventories)
- Funders may be requiring sustainability

Background and context

Since its inaugural meeting in January 2015 the Sustainable Labs Steering Group has operated annual plans based on the calendar year. At a meeting in December 2016 there was agreement that the SLSG would prefer to take a longer-term approach and to align its activities with other University of Edinburgh priorities. As such it is recommended that future plans be based on academic years, and that such plans should work towards aims at a scale similar to other University of Edinburgh plans (specific reference is given to the Climate Strategy).

Discussion

The above noted action points for both 2020 and 2040 focus largely on energy and climate change, as this will be a major priority for the University of Edinburgh during this time. As such the following areas were highlighted as priorities for action:

- Building design (control and standards)
- Ventilation
- Cold storage and equipment

Other areas which were highlighted during the 1st May meeting include transport emissions, potential increase in sustainability emphasis from funders, and engagement and communications with staff and students.

In the context of sustainable practices and behaviours in laboratories the Lab Awards section of the Edinburgh Sustainability Awards should continue to provide a checklist of actions for best practice for participants and other interested parties. This will be periodically updated.

Resource implications
The outputs and aspirations of the SLSG may require resource in terms of capital, but this is likely to fall within the scope of existing sustainability and estates funding streams, e.g. the Sustainable Campus Fund.

Time/personnel resources will also form a major requirement if the SLSG is to achieve the aims stated in this paper. The Department for Social Responsibility and Sustainability will continue to strongly support the aims within this paper, as well as wider SRS aims, however contributions of time resources from other SLSG members (as well as other personnel outwith the SLSG) will be required if intended culture change for embedding more sustainable practices is to be achieved.

Risk Management
Without adequate resourcing there is a strong risk that the aims of this paper will not be achieved, that the University of Edinburgh will fail in its Climate Strategy and related targets, potentially suffering reputational damage and reduced support from funders (if funders begin to place more emphasis on sustainability).

Equality & Diversity
No equality and diversity issues have been identified connected to this paper.

Next steps/implications
SLSG is asked to review the recommendations of this paper and provide feedback to the SRS Projects Coordinator (Labs) on their suitability for forming the basis of an SLSG plan to 2020 and aims for 2040. **Feedback should be provided on or before 3rd July 2017.** The plan to 2020 should take effect from 1st August 2017 (beginning of 2017-18 academic year).

The SRS Projects Coordinator (Labs) will bring the plan to 2020 to the next SLSG meeting for final approval, taking into account any feedback from SLSG members.

Consultation
This paper has been reviewed by the Director of SRS, and Head of SRS Programmes.

Further information
Author and Presenter
Andrew Arnott
SRS Projects Coordinator (Labs)
Department for Social Responsibility and Sustainability
8th May 2017

Freedom of Information
This is an open paper.

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C

Sustainable Labs Steering Group

29th May 2017

Equipment Selection for Sustainability (ongoing research process)

Description of paper

This paper summarises the results of desk-based research into the most efficient versions of different types of laboratory equipment. The equipment chosen for research was selected either due to known high energy/water consumption across the University of Edinburgh, or in response to requests from colleagues.

Action requested

SLSG is asked to receive and provide feedback on, and (if appropriate) approve the findings and recommendations below.

Recommendation

General conclusions	Issue	Recommendation
There appear to be more energy efficient CO2 incubators available	The manufacturers' data may have been generated in unusually favourable conditions.	ESCO should be approached to request a trial of their incubators where we monitor them for in-use energy consumption.
Efficiency of glasswashers can be compared between Lancer models now	Further work is required for other manufacturers.	The above table should be used to guide purchase of Lancer models.
The results show that, in general, larger ovens are more efficient (if used at full capacity)	Lack of relevant data from Genlab. Further work is required for other manufacturers.	Genlab and other models which appear to be efficient should be requested for in-use trials to compare performance. Further manufacturers should be investigated prior to units being selected for trial.

Background and context

The creation of the Sustainable Campus Fund and associated applications has prompted SRS and colleagues across the University of Edinburgh's laboratories to try to identify Best Available Technology among commonly used equipment. The below research covered CO2 Incubators, Glassware washers, and Sterilising Ovens. Previous research has already been undertaken on drying ovens and ULT freezers.

Findings

CO_2 Incubators

Colleagues in the Centre for Integrative Physiology at Hugh Robson Building (HRB) queried whether there were more energy efficient CO_2 incubators available. Relatively comprehensive research was carried out, covering the following brands:

- Sanyo
- Panasonic
- VWR
- NuAire
- Thermo
- Esco
- RS Biotech
- Napco
- Haraeus

The data was gathered from three sources:

- Measured energy consumption of two CO_2 incubators in HRB (old Sanyo and new Panasonic)
- Published manufacturers data
- Measured data gathered by lab efficiency counterparts in King's College London (KCL).

The old Sanyo measured in HRB had a faulty heating element but still managed to achieve the required temperature of 37°C. This was initially compared to a new Panasonic CO_2 incubator elsewhere in HRB with surprising results. The Panasonic consumed more electricity than the old (partially broken) unit. Both units were the same size and experienced the same usage. Looking at rating plates and published manufacturers' data it seems that newer models are being produced with higher power. It is unclear why this would be the case unless they are expecting to operate in more challenging environmental conditions (i.e. colder room temperature or more frequent door openings).

This initial surprising result prompted desk-based research and contact with other lab sustainability professionals elsewhere to gather a greater body of evidence.

Below is a summary table. See appendix for full table.

name and model	volume (litres)	kWh/year	cost per year	annual cost/litre
Sanyo MCO-18AIC (UV) *	170	664	£66.36	£0.39
Panasonic MCO19MPE *	170	790	£78.96	£0.46
VWR Scientific 2300	184	2,219	£221.90	£1.21
NuAire NU-5510E	188	1,533	£153.30	£0.82
THERMO SCIENTIFIC HERACELL 150I CO2 INCUBATORS	150	701	£70.08	£0.47
THERMO SCIENTIFIC WATER JACKET CO2 INCUBATORS	184.1	883	£88.32	£0.48
NuAire NU 5831 Hypoxic CO2	200	2,190	£219.00	£1.10

ESCO CelCulture CCL-170	170	405	£40.47	£0.24
ESCO CelCulture CCL-170 WJ	170	405	£40.47	£0.24
ESCO CelSafe CLS 170	170	361	£36.09	£0.21
ESCO CelMate CLM 170B	170	701	£70.09	£0.41
Nuaire 5500E **	124.65	1109.6	110.96	£0.89
Sanyo - MCO-17AIC**	164	781.1	78.11	£0.48
RS Biotech (Pre-NBS)**	124.36	697.15	69.715	£0.56
RS Biotech (Pre-NBS)**	124.36	646.05	64.605	£0.52
Heracell 150**	150	701	£70.08	£0.47
Napco 5415**	153.5	1,142	£114.25	£0.74
Heraeus - Function Line BB16**	151	511	£51.10	£0.34
Sanyo - MCO-18AIC**	170	799	£79.94	£0.47

*Measured in Hugh Robson Building

**Measured in King's College London

Note that measured energy consumption of the HRB Sanyo is lower than the KCL Sanyo, likely because one fewer heating elements is operating.

Note also that the manufacturers' data for the Thermo Heracell 150 is supported by the measured energy consumption in KCL.

Finally, it should be noted that the manufacturers' data (describing running power at 37°C) from ESCO indicates that their models are substantially lower energy. This seems a little 'too good to be true' but perhaps should be investigated by running some 'in-use' testing.

Glasswashers

A much less substantial body of evidence was gathered relating to glassware washers, with only 2 manufacturers covered; Lancer and Miele. This was due to lack of time – this study should be considered to still be in progress. The evidence was gathered purely through desk based research (manufacturers' data)

Below is a summary table. See appendix for full table.

Brand	Model	Capacity (litre)	Energy consumption per cycle	Energy consumption (kWh/year/litre)	Water consumption per cycle (litre)	Water consumption (litre per year per litre capacity)
Lancer	810 LX	139	0.70	**6.29**	12	**2,079,117**
Lancer	820 LX	139	0.90	**8.07**	12	**2,079,117**
Lancer	910 LX	148	0.90	**7.54**	13	**2,411,994**
Lancer	1300 LX	254	1.00	**4.93**	15	**4,754,652**
Lancer	1400 LXP	296	1.40	**5.89**	22.5	**8,324,663**

Lancer	1600 LXP	494	1.74	**4.41**	32.5	**20,066,396**
Lancer	1800 LXA	418	1.40	**4.17**	41	**21,413,931**
Miele	G7883	134	2.12	**19.80**	51.6	**8,650,212**

Sterilising Ovens

As with glasswashers, the number of manufacturers covered in the research for sterilising ovens was also reduced due to time constraints and this research should also be considered to still be in progress. For this research Thermo, Genlab and Binder were the manufacturers included. Again, all research was desk based and therefore relies upon manufacturers' data.

Below is a table of the full dataset.

name and model	volume (litres)	heat dissipation to env't at 150degC (room temp 25degC) (Watts)	heat dissipation per litre (W/l)	power rating (W)	heat up time from 25degC to 98% of 150degC (Minutes)	category
Thermo Heratherm OGS 60	60	194	3.23	1800	25	general protocol
Thermo Heratherm OGS 100	100	261	2.61	3100	25	general protocol
Thermo Heratherm OGS 180	180	320	1.78	3100	25	general protocol
Thermo Heratherm OMS 60	60	291	4.85	1400	18	general protocol
Thermo Heratherm OMS 100	100	426	4.26	3060	15	general protocol
Thermo Heratherm OMS 180	180	473	2.63	3060	18	general protocol
Thermo Heratherm OGS 400	400	520	1.30	2400	35	general protocol
Thermo Heratherm OGS 750	750	795	1.06	300	60	general protocol

Thermo Heratherm OGS 750-3P	750	795	1.06	6350	60	general protocol
Thermo Heratherm OGH 60	60	170	2.83	1810	22	advanced protocol
Thermo Heratherm OGH100	100	210	2.10	3100	25	advanced protocol
Thermo Heratherm OGH180	180	290	1.61	3100	25	advanced protocol
Thermo Heratherm OGH-S 60	60	170	2.83	1810	22	advanced protocol
Thermo Heratherm OGH-S 100	100	210	2.10	3100	25	advanced protocol
Thermo Heratherm OGH-S 180	180	290	1.61	3100	25	advanced protocol
Genlab HAS/100/SS/DIG	100		-	1000		N/A
Binder ED 115	114	250	2.19	1250	45	Avante garde
Binder ED 260	255	370	1.45	2250	55	Avante garde

Discussion

CO2 Incubators

There are obvious difficulties around comparing 2 units in use, where one has a broken heating element. However, given that it seems to be meeting the two important criteria: serving the needs of the users; and not consuming excessive amounts of energy; it would seem appropriate to continue using the equipment until it fails in one of those two criteria.

The use of manufacturers' data should always be undertaken with caution, and a degree of scepticism should be levelled towards the rather incredible claims from ESCO until further proof can be obtained.

Glasswashers

The small number of manufacturers included in this research is an obvious weakness. Some initial conclusions can be drawn, especially in relation to Lancer models. If a decision has to be made between lower energy use and lower water use, lower energy use should be prioritised as the energy consumption associated with glasswashers is a far greater contributor to costs and carbon emissions (see table in appendix).

Sterilising Ovens

Data was all derived from manufacturers' publications, but not all manufacturers publish the useful measure of heat dissipation to environment. Notably the Genlab unit, which may be low energy as it has a relatively small power rating for its size (1kW for 100litres, as compared to 3.1kW from Thermo), does not describe its heat dissipation so cannot be compared on that measure.

Resource implications

There are unlikely to be associated additional costs associated with this work. Possible (but unlikely) sources of additional costs are any costs associated with purchasing 'test' equipment – although this should be available for free on loan. Additional costs in relation to potentially higher purchase prices will be weighed up against associated savings from greater operational efficiency prior to any funds being allocated from the Sustainable Campus Fund.

Risk Management

Low risk of small costs associated with purchasing 'test' equipment (see above).

Equality & Diversity

No identified impact on Equality and Diversity.

Next steps/implications

The SLSG response to this paper will guide next steps.

Consultation

This paper has been reviewed by the SRS Head of Programmes

Further information

Author and Presenter
Andrew Arnott
SRS Projects Coordinator (Labs)
Department for Social Responsibility and Sustainability
Paper written on 24th April 2017

Freedom of Information

This is an open paper.

Appendix

CO_2 Incubators

name and model	rated max energy consumption (Watts)	volume (litres)	rated max energy consumption per litre	typical kWh/week	measured kWh/week	Unit heat load (BTU/hour)	Unit heat load (kWh/hour)	weekly average operational hours	annual average operational hours	kWh/ year	cost per year	annual cost/ litre
Sanyo MCO-18AIC (UV) (**broken heating element but still achieving 37°C)	310	170	1.82		13.272					664	£66.36	£0.39
Panasonic MCO19MPE	382.3	170	2.25		15.792					790	£78.96	£0.46
VWR Scientific 2300	264.2	184	1.44	44.38						2,219	£221.90	£1.21
NU-5510E (running power)	175	188	0.93						8760	1,533	£153.30	£0.82
THERMO SCIENTIFIC HERACELL 150I CO2 INCUBATORS		150	-			273	0.08		8760	701	£70.08	£0.47

THERMO SCIENTIFIC WATER JACKET CO2 INCUBATORS		184.1	-			344	0.10082		8760	883	£88.32	£0.48
NuAire NU 5831 Hypoxic CO2 (running power)	250	200	1.25						8760	2,190	£219.00	£1.10
ESCO CelCulture CCL-170 (nominal running power at 37)	46.2	170	0.27						8760	405	£40.47	£0.24
ESCO CelCulture CCL-170 WJ (nominal running power at 37)	46.2	170	0.27						8760	405	£40.47	£0.24
ESCO CelSafe CLS 170 (nominal power at 37)	41.2	170	0.24						8760	361	£36.09	£0.21
ESCO CelMate CLM 170B	80	170	0.47						8761	701	£70.09	£0.41
Measured values (from KCL)												
Nuaire 5500E		124.65								1109.6	110.96	£0.89

Sanyo - MCO-17AIC		164								781.1	78.11	£0.48
RS Biotech (Pre-NBS)		124.36								697.15	69.715	£0.56
RS Biotech (Pre-NBS)		124.36								646.05	64.605	£0.52
Heracell 150		150								701	£70.08	£0.47
Napco 5415		153.5								1,142	£114.25	£0.74
Heraeus - Function Line BB16		151								511	£51.10	£0.34
Sanyo - MCO-18AIC		170								799	£79.94	£0.47

Glasswashers

Brand	Model	Capacity (l)	Energy consumption per cycle	assumed kWh/year (based on 8 hours per day or 5 cycles per day)	estimated annual carbon from elec (tonnes CO2E)	estimated annual cost from elec	kWh/year/litre	water consumption per cycle (l)	assumed number of cycles per day	assumed number of cycles per year	water consumption per year (l)	estimated annual carbon from water (tonnes CO2E)	estimated annual cost from water	water consumption (litre per year per litre capacity)
Lancer	810 LX	139	0.70	871.89	0.39	£ 87.19	6.29	12	5	1250	15,000	0.0158	£ 30.37	2,079,117
Lancer	820 LX	139	0.90	1,118.80	0.50	£ 111.88	8.07	12	5	1250	15,000	0.0158	£ 30.37	2,079,117
Lancer	910 LX	148	0.90	1,118.80	0.50	£ 111.88	7.54	13	5	1250	16,250	0.0171	£ 32.90	2,411,994
Lancer	1300 LX	254	1.00	1,249.22	0.56	£ 124.92	4.93	15	5	1250	18,750	0.0197	£ 37.96	4,754,652
Lancer	1400 LXP	296	1.40	1,743.77	0.78	£ 174.38	5.89	22.5	5	1250	28,125	0.0296	£ 56.94	8,324,663
Lancer	1600 LXP	494	1.74	2,179.72	0.98	£ 217.97	4.41	32.5	5	1250	40,625	0.0427	£ 82.25	20,066,396
Lancer	1800 LXA	418	1.40	1,743.77	0.78	£ 174.38	4.17	41	5	1250	51,250	0.0539	£ 103.76	21,413,931
Miele	G7883	134	2.12	2,652.78	1.19	£ 265.28	19.80	51.6	5	1250	64,554	0.0679	£ 130.69	8,650,212