

Midnight Oil

Reducing energy use from out-of-hours working in research buildings



“Midnight Oil”, a project funded by the Higher Education Funding Council for England (hefce), set out to answer the question ‘how are Oxford University’s 24 hour access research buildings really used, and how can out-of-hours use be better managed to reduce carbon emissions?’

The project was delivered during 2010 to 2012 by the Sustainability Team within the Oxford University Estates Directorate (OUED), working in partnership with research staff and graduates from the Environmental Change Institute (ECI) also based at Oxford University. Hoare Lea consulting engineers provided technical support to the project.

The need for the project stemmed from the fact that 24 hour access research buildings rank amongst the highest energy users on the University, but very little was known about actual usage patterns of these buildings out-of-hours.

Project description

The project consisted of two phases, which were:

- **Phase 1: assessment of actual usage patterns, and researchers’ requirements for out-of-hours working in four research buildings.** The four buildings were the Chemistry Research Laboratory (CRL), the Old Road Campus Research Building (ORCRB), the new Biochemistry building, and the Henry Wellcome Building for Gene Function. This phase was led by ECI and consisted of stakeholder interviews, building surveys, analysis of swipe card and energy use data. It demonstrated how the buildings were barely used at night, and identified the organisational and technical potential for reducing energy use during out-of-hours periods (which was defined as between 7p.m. and 7a.m.).
- **Phase 2: technical surveys and trials.** This work consisted of a more detailed assessment of the technical requirements for implementing changes to the building services during out-of-hours periods. It also trialled interventions. Initial trials have focussed on two of the four buildings: the ORCRB and the new Biochemistry building.

FACTFILE

Many scientists wish to be able to work in their research buildings after hours from time to time, but this does not mean that those buildings need to have all heating, cooling and ventilation systems on throughout the night and weekend.

The four research buildings we studied accommodate over 1500 research staff and account for 16% of the University’s total buildings energy use.

Security guards for the Old Road Campus Research Building commented that they find no more than six or seven people working in the building at night, and usually only two to three. All are in the write-up areas, which are shared by up to 15 researchers. They had never seen anyone working in a lab, or in any of the senior staff offices, or in the atrium.



Key findings

From our interviews with users of the buildings, it was clear that creating designated areas for out-of-hours working would not be viable, for laboratory buildings, because researchers need ready access to their equipment.

Therefore, the key technical interventions that were identified all related to making changes to the mechanical ventilation used to provide fresh air, and heating or cooling to different spaces used for out-of-hours working. These changes were to:

- switch off the mechanical ventilation in the Biochemistry building write-up area altogether and rely on natural ventilation from the atrium;
- in the new Biochemistry building, allow the overnight air temperature in laboratories to vary over a wider range (range increased from 18-22°C to 14-25°C) to reduce heating or cooling demands;
- for both buildings, reduce the night-time ventilation rates in secondary laboratories (from five air changes per hour to one).

The latter change included adding a “plant extend” button in each laboratory, which users can press if they use the facility out-of-hours. This then returns the ventilation rates for that laboratory back to normal daytime levels for the remainder of the night. This approach relies on having proper instructions

to the users and proper notifications next to the buttons.

Benefits

The team has estimated that implementing these changes in the two buildings could save, annually, £20,000 and nearly 130 tonnes of CO₂ per year. This saving is due to a reduction in the amount of electricity required to run the ventilation fans. Other key benefits have been:

- the technical surveys have identified a number of other opportunities for saving energy, not specifically related to out-of-hours use;
- the building managers have become very engaged with the project: an unexpected benefit of the project has been the setting up of a forum so that building managers in the Medical Sciences division can meet and share experiences, which they had not had the opportunity to do before.

Next steps

- For the trial installations, the team will carry out further measurement and testing to validate the level of energy savings being achieved.
- Once the savings have been validated, the installations and control system changes will be rolled out to all of the relevant out-of-hours spaces in the two buildings.
- This approach will then be rolled out to other research buildings at the University.

Our six top tips for success based on our experience are:

- 1** Influencing the design of new laboratories and research buildings is crucial, to ensure that the building services can be zoned and controlled to minimise energy use during out-of-hours periods.
- 2** Make sure that you engage with senior management and heads of departments, as the building managers, who are key to implementing any changes, will need support from their managers.
- 3** Collaborate, collaborate, collaborate! Working together with academic researchers and experts within your University can have multiple benefits, such as reducing costs, building relationships, and sharing expertise.
- 4** Having flexible and out-of-hours access to buildings does not mean they have to be 24 hour buildings. A successful strategy is to try to extend the areas, activities and times in which the default settings for building services are ‘off’. This can then be overridden within individual areas if out-of-hours working is required.
- 5** Pay close attention to the building services control system, known as the Building Management System (BMS). Once changes to the controls have been made, take measurements soon after to ensure that the changes have been implemented correctly.
- 6** Be patient and persistent! It can take longer than you may expect to implement change, due to the complexities of understanding and making changes to the building services control systems.



FACTFILE

Reducing the night time ventilation rates in the Biochemistry secondary laboratories could reduce the building’s carbon footprint by over 3%.

Almost all the researchers that we spoke with welcomed the Midnight Oil initiative, expressing pleasure or even relief that the University was addressing a major sustainability issue.

FURTHER INFORMATION

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