EM Magazine

# ENERGY GUIDE

In Association With: Prefect Cleverly simple **control** of energy.

# ENERGY MANAGEMENT SYSTEMS – STUDENT ACCOMMODATION

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# STUDENT ACCOMMODATION

### The Student accommodation sector

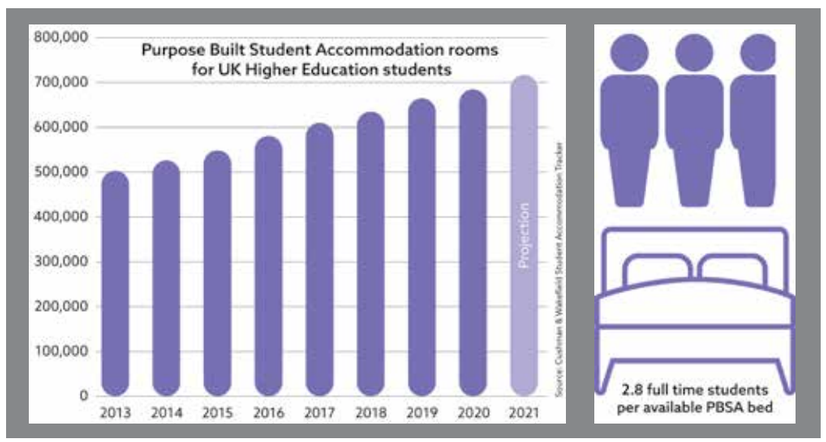
Since the turn of the century the student accommodation sector has been revolutionised! Until around the time of the millenium, students had the choice of university-run halls of residence or converted homes for multiple occupation (HMOs). A 'roof-over-your-head', provision that satisfied the basic needs of students, who were often moving away from home for the first time.

With the arrival of 'Big Money', and developers providing accommodation and re-developments specifically for this sector, students expectations have been completely transformed.

With almost 25,000 new student beds entering the market in 2020/21 there are close to 700,000 student rooms in the UK Higher Education accommodation estate.

An increase of 8.4% in UCAS applications during 2021 and 2.8 full time students for every purpose-built student room during 2019/20, the demand for accommodation is rising and the capacity for new developments is robust.

2020 saw £5.77 billion of investment in purpose-built student accommodation (PBSA) and investors remain confident in the ability of UK PBSA to deliver returns. There is a trend of re-allocation of investment from traditional real estate sectors to rented residential accommodation.




Despite influences such as uncertainty in domestic politics, UK Higher Education is still very attractive to global students with 130,000 university applications from Chinese students and a rise of 60.7% in American applications during 2021. Students from these countries are around twice as likely, to live in PBSA than British students. International students are more likely to focus on accommodation when choosing a university and recent evidence shows that they strongly believe the quality of their accommodation will influence their final grades. Facilities, comfort, technology and safety are prime considerations in the choices they make. Super-fast broadband, private bathrooms, their own cooking facilities and access to a gym or swimming pool are features that these students believe will maintain a healthy study/life balance and maintain their physical and mental wellbeing.

Accommodation providers offer attractive and comfortable environments, but they also need to make it easy for students to move in. Location, choice of room size, cost, on-line booking and all-inclusive packages that cover bills are all part of the marketing engagement.

For those preparing energy budgets the 'all-inclusive price' can sound alarm bells!

**Clang!** Buildings full of students with no responsibility for the cost of their energy consumption. **Clang!** Erratic room occupation. **Clang!** 20-minute showers. **Clang!** Heating turned up to maximum 365 days a year. **Clang!** Opening of windows to cool the rooms.

Before addressing these concerns let's look at how energy management has evolved.

### A brief history of student accommodation heating systems

The majority of halls of residence built pre-1970 would have used central heating plant (CHP) – a large gas fired boiler that would heat water which was then pumped to rooms for both hot water and heating, in very much the same way as domestic central heating, but on a much larger scale. Radiators in rooms were controllable by opening and closing the valve. Large chlorifiers would store hot water which was drawn down when called for by taps in sinks and bathing facilities.

Central heating boilers evolved throughout the latter part of the 20th century and some student facilities employed a more domestic approach to heating and hot water provision. with smaller, locally located gas-fired boilers servicing clusters of flats.

An alternative approach at this time was electric storage

heating, particularly as electricity companies were promoting cheaper 'Economy 7' off-peak electricity.

These systems provided much greater comfort for residents than they had previously enjoyed, however, each had their issues with regard to efficiency.

The 'wet' systems had large capital, ongoing servicing and maintenance costs. The fluctuations in the price of natural gas made energy budgets difficult to estimate. Furthermore, central plant systems lost energy in transmission of water from the boiler to and around the accommodation through the supply pipes. On the other hand electric storage heaters, although more efficient and less disruptive to install, were harder to control and the only option to regulate temperatures was to open a door or window to let in cooler air.

## Heating student accommodation in the 21st century

The 'gas versus electric' conversation has been ongoing for many years and although in the domestic market, electric heating hasn't gained a great deal of traction, in commercial sectors a number of factors have been cited for why the 'e' word is considered the future – expenditure, effectiveness, economy, efficiency, emissions, ease, environment.

So, while a large proportion of student accommodation is 'old' stock and uses gas fired boilers in one form or another, what are the considerations for moving to a cleaner greener, more efficient source of energy?

Removing a 'wet' system and replacing it with electric is far more complex than it sounds. The disruption caused by ripping out radiators and pipework is only the start. Depending on the age of the property the capacity of the incoming mains could be a big cost issue as the load will increase

with the installation of electric heaters and potentially requires a new or upgraded electricity supply.

However, the obligation to reduce emissions by 78% of 1990 levels by 2035 is now enshrined in UK law. A sector the size of student accommodation must commit to long term plans to play its part.

During the last decade high-rise PBSA has appeared in most university towns. Improvements in construction techniques and insulation mean far less energy is used in maintaining comfortable temperatures. Installing wet heating systems and pumping water around tall buildings is problematic and expensive in comparison with an electric specification. Many newer developments favour the electric option for speed, ease and cost of installation, other benefits are reliability and little, if any, ongoing maintenance or servicing costs. The return on investment is also a significant contributor in deciding the best choice.

For providers of student accommodation, concentrating on sustainability is not only the right thing to do, but also makes good business sense. It makes them more attractive to their customers, as it reflects the values of students that are concerned with climate change. Likewise, universities, investors and other stakeholders are increasingly interested in sustainability issues.

Leading providers are setting out detailed plans to demonstrate

their commitment to targeting net-zero construction and operation and reducing environmental impact of their properties by improving energy and water efficiency.

Air and ground-source heat pumps, LED lighting, on-site renewable generation, dynamic demand side management and battery storage - are just some of the initiatives that are being investigated to maximise energy efficiency.

The procurement of green energy and construction of effectively insulated buildings are sensible measures in pursuing net-zero targets, but control at the point of use is the final bastion in ensuring energy isn't being used unnecessarily. These measures could prove futile if thermostats are locked on maximum output and windows are used to regulate room temperature.

## How are leading accommodation providers engaging with energy efficiency?

As reported on the edie website - Unite Students, the largest provider of student accommodation in the UK, are leading the way by using innovative energy-efficiency solutions to reach their net-zero targets. Some of which have been retro-fitted at the Sidney Webb House in London.

As is often the case, there is no one size fits all to sustainability and very few innovations are available that would prove universally applicable across Unite Students' portfolio. However, a lifecycle refurbishment programme at the Sidney Webb House near Borough Market provided a small window of opportunity to implement energy-saving technologies in a cost-effective manner.

In January 2017, Unite Students joined the Innovation Gateway, an alliance of companies that collaborate to examine methods and technologies that can reduce the costs and environmental impacts of operations and buildings.

The Innovation Gateway alliance has sourced more than 640 building-related innovations for its partners, with estimated annual operational savings upwards of £7.5m, 200,000m$^3$ of water and 40,000 tonnes of $CO_2$ as a result.

As part of the project which saw new kitchens and bedrooms fitted in each apartment, Unite Students also fitted the building with Mitsubishi Q-Ton Air Source Heat Pumps and Prefect Heating Controls, while also utilising its past experience with dual-flush toilets, water-saving taps and showers, and LED lighting.

Sidney Webb House has since been retrofitted into a modern student accommodation.

Prefect's local heating controls, ecostat2, automatically turn off heating in unoccupied rooms. Unite Student trials show that the PRE5203ec2 which has integrated PIR, reduces heating-related consumption by around 200 kWh per bed per year. It is anticipated that at a property level that would be 90,000 kWh per year.

Ecostat2 operates the 3-stage student profile that enables Energy Managers to programme Setback, Boost and Frost mode temperatures/times using the dedicated handset. Setback mode is the default setting (typically 18°C), but if the student requires more heat, they simply tap the 'up' button triggering Boost mode (commonly 23°C). Boost runs for a pre-set time (45 minutes) before reverting to Setback. If the student leaves the room during Boost, the PIR detects their absence and reverts to Setback, likewise if windows are opened heat input is reduced by a programmed percentage. If rooms are vacant for longer periods (typically 12 hours), Frost mode is activated which cuts energy input until the room reaches the pre-set protection against

frost temperature which should not be lower than 5°C. Savings of up to 30% on energy costs are commonplace for properties controlled by ecostat2.

Irus, Prefect's central control system, operates in a similar way to ecostat2, but is classed as a building energy management system. Unlike larger BMS, Irus was designed specifically for heating but has evolved to embrace water heating, leak detection, kitchen safety and monitoring of living spaces for humidity, light, decibel and CO2 levels. Data collected by a room node are communicated via the buildings existing wiring circuit to the master interface unit.

Accommodation and Energy Managers have a clear view of environmental conditions and the ability to adjust temperatures in individual rooms remotely via the web-based Portal, without ever having to step across the threshold - a real benefit during the pandemic. As Kirsti Norris of the University of the West of England explains, "If we have students isolating and they have a problem with their heating we can deal with it without even entering the building, which is an added bonus in these Covid-times."

'Strategy 2030 – Transforming Futures' announces UWEs ambition to be carbon neutral with net-zero emissions of greenhouse gases by 2030 along with achieving ISO14001, setting clear targets to reduce water and energy use.

Kirsti, UWEs Energy Manager, heads the team that implements projects to achieve these goals. Her colleague Melissa Clarke is Energy Projects Officer.

The Student Village built in 2006, on Frenchay Campus, is home to 2000 students. After thirteen years the original heating system was becoming tired and inefficient to manage. Each room had to be visited to programme a thermostat, and the heater panels needed replacing. Kirsti explains, "As heaters failed, there was a risk that they would be replaced, on an ad hoc basis, with integrated control heaters, but we had always wanted a better way of controlling the heating. Having to enter students' rooms, even before Covid, was not great. We had a hotch-potch of settings in rooms all over the place and no way to re-set them all at once."

The team discovered Prefect Controls and were pleasantly surprised by the scope of features. Melissa explains, "When we saw the Prefect offering, we thought Fab! This is what we need, more control, shorter running times, reduced energy consumption…"

Prefect Controls was contacted to discuss the project. A survey was commissioned, calculations prepared, and quotations submitted.

Kirsti had to convince colleagues that disruption during the installation would be minimal. "The biggest fear we had for this whole project was from the accommodation team. Considering we were planning the installation around conference bookings the accommodation team were really anxious about any disruption for residents. No matter how good the product is, it was the installation that could have blown the whole thing. To have the reassurances we received from Bangor and Bristol universities, who have worked with Prefect before, really helped to get the accommodation team on board. That good reputation went beyond the product."

Because Irus uses mains borne signalling (MBS) for communication, installation is quick and efficient. There is little interference with a building's infrastructure as there is minimal, if any necessity for routing of data cabling.

With the concerns of the accommodation team allayed, the project moved forward at a pace. As Melissa explains, "the quicker we make the projects happen, the quicker we make the financial savings. We are conservatively estimating saving 20-30% – that's over £75K per year!

## Additional benefits of centrally controlled energy management

The energy saving numbers really start to grow when Irus also takes control of water heating, particularly when observing and reacting to TRIAD warnings and managing TNUoS and DUoS payments.

Triads periods occur between 1 November and 28 February when demand on the transmission network is at its highest. Charges can range


from £20-£60 per kilowatt depending on geographical location. The Triads refer to the three half-hour periods with highest demand, coupled with some additional rules about how close together these three periods can fall.

National Grid uses Triads to determine TNUoS charges for customers with meters that measure their demand on a half-hourly basis. The annual charge is based on the amount of electricity consumed during the three Triad periods.

Although exact times cannot be known until after the winter is over, various organisations attempt to forecast them with 'Triad warnings'. Typically, 20-30 Triad warnings are issued each winter. They alert customers to the likelihood of demand being high and occur on the coldest days.

For large student accommodation premises, being able to control consumption results in savings. Simply adjusting the temperature in 1000 rooms can save around £8000 in DUoS charges annually. However, if Triad warnings are acted upon, for the same facility, a saving in the region of £18,000 for EACH of the three half-hour periods could be made by adjusting room settings AND water heating.

Prefect Irus receives Triad warnings by email, then; Automatically boosts water temperature prior to the Triad, and reduces energy use during it; Restricts output power in rooms; Cancels upward adjustment; and alters temperature levels/time periods. All of these actions combine to maximise cost savings during a Triad.

But the Irus story doesn't stop with saving costs. Another benefit when integrated with water heating and monitoring water tanks is automatic reporting on leaks with the addition of leak detection sensors that alert relevant personnel to issues in real time. These alerts minimise water damage and the associated disruption and cost of reparations.

## Student well-being – the hot topic

Comfortable environments for students will enhance their experience. But their wellbeing is a primary concern taken seriously by all universities. First class educational facilities will enable students to flourish, but emotional, medical, and environmental needs are just as important.

For those with a duty of care, personal interaction provides the chance to assess a student's mindset and if necessary, intervene should there be signs for concern.

But when students spend more time in their rooms, as recently during the pandemic, or in normal circumstances if contact time is only a few hours per week, signals can go unnoticed.

A heating control system, designed to prevent energy from being used unnecessarily, is an unlikely place to start looking for help in assessing a student's wellbeing, but its monitoring capacity is extremely useful. The most basic information the system communicates is that the occupant is interacting with the control unit and therefore in their room and moving around.

But interpretation of data that shows levels of $CO_2$, Humidity, decibels, and light provides a representation of the room's environmental conditions. Unusual levels of any of these can be unconducive to study, comfortable living, and wellbeing.

With this control system, if limits are breached, alerts are generated. Alternatively, if there are concerns, a specific room can be checked, remotely, via the web-based portal and a hypothesis created of the room's conditions and the occupant's interaction with the system.

This insight means an evidence-based decision can be made on the appropriateness of visiting the room to check if all is OK.

This level of information means welfare staff are equipped to be both proactive and reactive. Without being intrusive, those concerned with student wellbeing are better prepared when carrying out their duty of care.

And while considering student welfare, monitoring of water temperature within the tanks produces data and reporting which provides evidence that water safety plans are being adhered to. Programmes are set to ensure stored water is heated to above guideline temperatures within each 24-hour period to keep it safe from the risk of legionella.

## In conclusion...

The major improvements in the quality of accommodation on offer to 21st century students and the technology employed to maintain their comfort also provides benefits to those running these facilities. Particularly when energy management systems, designed specifically for this sector, monitor, measure and manage environmental conditions to ensure energy efficiency, comfort and safety. https://prefectcontrols.com

## Sources


- Savills spotlight on student accommodation
- Student accommodation impact report – Octopus real estate
- Cushman Wakefield UK Student accommodation report 2019/20
- Thepienews
- Edie.net/Library/in-practice

**All student accommodation requires heating.**
**Thermostats are the go-to device to regulate many heating systems.**
**However, thermostats are a very blunt instrument for energy efficiency.**

# Why have thermostats when you could have control?

Both our systems work in similar ways; they give students control over their room temperature; are programmable for temperature and time periods; and reduce energy use in unoccupied rooms.

ecostat2 is a self-contained local control - while Irus is accessed from a secure internet portal. Irus captures data from each room including humidity, light, decibel and CO2* levels. It also controls water heating, detects leaks and produces water safety reports (in terms of Legionella risk).

Our controls are always striving to minimise the use of heat. The 3-stage profile keeps students comfortable while they are in their rooms but, ensures energy isn't wasted when rooms are empty – **making potential savings of 30-40%***.

Qualified for **Energy Technology List** TM


ecostat2
Programmed locally


Irus - Centrally controlled
via the internet portal

Prefect

Cleverly simple
**control** of energy.

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 * Savings are dependant on building, current control methods and settings used.