Green Recovery Dialogues

Barry Morton and Gillian Brown, University of Glasgow - Transcript

See the video at https://youtu.be/0OeCzGtZOG0

Man: Hello, I'm Barry Morton and I'm the Director of Facilities within the Glasgow Directorate at the University of Glasgow. As part of my remit I have overall responsibility for the energy management function for the University, I represent the Glasgow Directorate at the University Sustainability Working Group and the Smart Campus Project Board. The Sustainability working group is developing the university sustainability strategy under five key headings: engaging and empowering our community; promoting efficiency; governance and policy; continuous improvement; and building resilience through partnerships.

The Smart Campus project was set up to address increased student expectations, new ways of learning, the need to focus IT and Estate's investments, and to great global competitiveness.

Woman: My name is Gillian Brown and I am the Energy Manager for the University Estate. Above all else my role is to manage the energy and water used by the University and set strategic targets to reduce the energy and water consumed by the vast and growing estate. Key to enabling any reductions in utility usage is in the understanding of where energy is used both at full estate level and specifically within the buildings themselves. Over the last year the University has invested in the creation of nearly 20 building level digital energy models. The age of our estate makes their creation and calibration very challenging due to the building structural complexity as well as the internal energy load association. To ensure that the digital model is a true reflection of both the physical structure and the energy loading requirements for the building, we calibrate the model using a number of digital systems. Our building management system information and energy metering data are key digital resources we use to ensure the model accurately reflects the energy consumption profile of the real building. Once accurately calibrated these models open up a world of possibilities to assist in our ultimate goal of energy and water reductions.

Image: 3D outline plan of a building with data and graphs

The digital energy models provide the University the opportunity to really understand the building energy profiles on a more granular level. It allows us to look at specific energy consuming systems or specific areas of a building to identify areas of improvement. We can use this information to make physical onsite adjustments to how energy is used. But we can also use these models to trial new solutions to understand the full impact energy management interventions have on the building as a whole before purchasing equipment or making system adjustments. The testing undertaken using these digital energy models ensures that the decisions which are made for the energy interventions are the right ones for each specific building and consider the specific influences of each building independently from others.

Barry Morton speaking: All too aware of the benefits of the digital energy models, the Smart Campus team wanted to enhance and further develop the accuracy of these models.

Image: a 3D plan of the University campus

The group has commissioned the development of a digital twin for three of the University's largest and most complex student populated buildings: the Library; the Rankine Building; and the Wolfson Medical School. A digital twin builds upon the work undertaken in digital energy modelling at a

building level but as a more advanced and detailed model through the introduction of new digital data sources.

Image: graphs and data including days and months

A digital twin uses real-time data streams from energy metering sources, building management system data points, and any other available data source which may influence the energy consumption of a building. This could be lighting sensors which provide lighting intensity levels, natural daylight levels, internal and external temperatures, building occupancy, and renewable energy generation information. The digital twin integrates these sources of data into the model to create a real-time digital version of a working building. By integrating these real-time sources of information the model learns and understands how the building systems react to any changes within the space. This learning allows a model to predict the impacts any changes will have and provides the University the opportunity to make energy reduction interventions before changes in energy consumption occurs. The digital twin trial is still in the early stages of development and we expect to have this fully functioning during the first half of 2021. The Estates Directorate are working alongside academic colleagues from the School of Engineering on a research project in this area with a select group of specialist external partner organisations. The research team are using our first two new building developments to understand how energy modelling and digital twinning can be made more accurate in early construction stages, and therefore more informative for the building owner before hand over. We anticipate enhanced digital twinning through the integration of building systems and data sources will make buildings more energy efficient through enhanced building energy knowledge. This research project will run for two years with the findings informing future development projects

Gillian Brown: Energy management has historically focused on buildings as individual and independent entities. With the integration of district networks for heat power and cooling becoming more prolific it is clear that accurate management of energy can now no longer be undertaken at single building level as these buildings are part of an infrastructure with many internal and external influences. In collaboration with external partners the energy management team have recently begun the development of an intelligent virtual network model to understand the network profiles for heat and power in the Gilmorehill campus.

Image: Map of the campus with a network of nodes and lines over it

This network model brings together information about annual energy load profiles for each building, as well as integrating the self-generation from the combined heat and power engine. This information will be used in two ways. Firstly, we will use this information to understand how the energy interventions which are undertaken in a single building influence energy change at the full network. An example could be the requirement for cooling in an IT server space by installing cooling specifically for that location. The energy load would increase for that building and the network and, if not controlled properly, could lead to an increased requirement for heat. However moving this it server requirement to a different location completely could reduce any requirement for an increase in electricity consumption at building level and across the network. Secondly we will use this model to understand how our integration of renewable energy from our new constructions, as well as our self-generated energy supplies, can work in harmony with the load requirements of the campus. Once fully functioning the intelligent virtual network model will provide the University with usable and very detailed energy profiling which will allow us to set strategic and realistic energy and carbon reduction targets. The model will provide us with the opportunity to understand future changes in the estate as buildings are added or removed, as renewable energy systems are added, and as

building usage changes over time. This information ensures that our targets reflect the changing nature of the estate and therefore the required energy to run that estate

Barry Morton: To ensure that all these new and existing developments in the digital realm are strategic targeted and joined up, the Estate's Directorate will develop a digital strategy. The strategy will consider the need for new systems or ways to capture useful data and how we may integrate these, including specialist systems such as our security systems and building management system. Future investments will be tested against the key aims of our Sustainability Strategy and Smart Campus objectives.