Queensland Children's Hospital in Brisbane, one of the i-Hub's Living Laboratories.

Healthy alternatives

As part of the i-Hub initiative, two "Living Labs" in Queensland are paving the way for more energy-efficient and effective hospitals and aged-care facilities. By **Mark Vender**.

The HVAC&R industry is not short of promising innovations and great ideas. Implementing them and taking them to market, however, often proves more challenging.

It's a challenge that the Innovation Hub for Affordable Heating and Cooling is taking on. The i-Hub is an initiative proposed by AIRAH, CSIRO, the Queensland University of Technology (QUT), the University of Melbourne and the University of Wollongong to facilitate the HVAC&R industry's transition to a low-emissions future, stimulate jobs growth, and showcase innovation in buildings.

LIVING LABORATORIES

One of the three i-Hub activity streams is titled Living Laboratories. These are places that enable testing of new technologies under controlled conditions, and green proving grounds to accelerate market acceptance and adoption of technologies.

In the case of healthcare, the term "living" laboratories is particularly apt. Fernhill Residential Aged Care in Caboolture, Queensland, and the Queensland Children's Hospital in Brisbane are trialling alternative approaches to heating and cooling, and measuring the results not just on energy use but also on occupants.

Dr Wendy Miller from QUT is the i-Hub activity leader for the Living Laboratories, and says that over the past six months her team has been gathering international information on health and energy indicators.

"We're trying to challenge the way we report on the energy indicators for hospitals and aged-care centres," says Miller, "to get something more complex or informative than just kilowatt hours per bed or kilowatt hours per square metre."

Fernhill Residential Aged Care in Caboolture, Queensland – another i-Hub Living Laboratory.

The goal is to find alternative ways of quantifying the benefits of energy efficiency and renewables for hospital and aged-care sectors. Rather than simply reducing kilowatt hours or reducing CO_2, it's about linking these metrics to enhanced staff welfare or reduced hospital stays.

"We're trying to find mixed key performance indicators that might have health and other benefits as well," says Miller.

TRIALLING THE TECH

So which HVAC&R innovations are being tested in these healthcare living labs?

At Fernhill, the team is looking at the impact of "honeycomb" or insulated blinds on reducing the heat demand into residence rooms, which then impacts on their air conditioning.

Queensland Children's Hospital, meanwhile, is trialling graphene-dosed coatings for external condensers to improve their heat rejection.

Both sites are trialling a machine learning software to help assess how the HVAC systems are performing and how can they be optimised.

Miller notes that the work is raising important questions about standards and codes. For example, testing the impact of graphene-dosed coatings on external plant for HVAC systems is made more challenging because there is no standard to determine if systems are meeting their COP as per designed specifications. This makes it harder to test the impact of improvements or test the impact of non-maintenance on installed HVAC systems.

But the Living Labs are also presenting an opportunity to develop and refine standards and codes – or in this case, ratings systems.

"Through the Living Labs we've managed to connect (project participant) Bolton Clarke with the NABERS team for the development of the aged-care tool," says Miller. "So, Bolton Clarke has provided some Queensland data that NABERS was missing as part of its database, and NABERS will be trialling its tool in one of Bolton Clarke's Brisbane facilities."

BENEFITS ALL ROUND

The Living Laboratories rely heavily on the involvement of businesses and other organisations, who in turn can reap the benefits of the new technologies and approaches.

"We have a large portfolio of aged-care assets," says Bolton Clarke's asset manager James Mantis.

"A lot of them are legacy stock, but we also have a substantial capital works program, so the lessons learned and what we can harness out of the Living Labs will provide significant insights in terms of how we can better manage our energy demands, our carbon footprint, and the solutions that we provide for our residents and staff."

Bolton Clarke faces the challenge of building facilities that operate both as residences and commercial places of business for staff – at times with conflicting demands.

"Increasingly it's about providing a consumer-centred environment that allows residents to dictate their own comfort and their own modalities in terms of how they live within these facilities," says Mantis.

"The Living Labs will be a great platform from which we can harvest data to then put into future developments."

HOLISTIC SOLUTIONS

Bruce Bonney is facilities maintenance manager at the Queensland Children's Hospital. He says that one of the biggest challenges is trying to get a real-time picture of how heating and cooling affects the patients.

"They're usually things like lengths of stay, overnight bed occupancy, number of patients in being treated in hospital," he says of the things that impact. "And there are some numbers out there around kilowatt hours per occupied bed day and that sort of thing, but again they tend to be lagging rather than leading."

Another challenge is meshing data from very distinct teams within the hospital.

"The energy side sits with me," says Bonney, "and the operations and the clinical stuff sits with the with the operations people and clinical people. It'd be good to try and get the two to marry up together."

The hospital is also looking at analytics to help provide these insights.

"We're keen to tap into that as well as an organisation and get either some sort of digital twin moving or something along those lines and then see if we can merge that data together," says Bonney.

Both Living Labs projects will run until midway through 2022 and promise important results for both healthcare in Australia, and the HVAC&R sector. ▮

The i-Hub project has received funding from ARENA as part of ARENA's Advancing Renewables Program.

Would you like to know more?

To learn about the Innovation Hub for Affordable Heating and Cooling, visit www.ihub.org.au