i-HUB

ACT SCHOOLS
LIVING LABORATORY

SBRC SUSTAINABLE BUILDINGS RESEARCH CENTRE

THE INNOVATION HUB FOR AFFORDABLE HEATING AND COOLING
HUB

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The Innovation Hub for Affordable Heating and Cooling (i-Hub) is an initiative led by the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) in conjunction with CSIRO, Queensland University of Technology (QUT), the University of Melbourne and the University of Wollongong and supported by Australian Renewable Energy Agency (ARENA) to facilitate the heating, ventilation, air conditioning and refrigeration (HVAC&R) industry's transition to a low emissions future, stimulate jobs growth, and showcase HVAC&R innovation in buildings.

The objective of i-Hub is to support the broader HVAC&R industry with knowledge dissemination, skills-development and capacity-building. By facilitating a collaborative approach to innovation,

i-Hub brings together leading universities, researchers, consultants, building owners and equipment manufacturers to create a connected research and development community in Australia.

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The views expressed herein are not necessarily the views of the Australian Government,
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i-Hub ACT Schools Living Laboratory

A 'Living laboratory' is a user-centred open-innovation, ecosystem within collaborative partnerships. The i-Hub ACT Schools living laboratory establishes research-quality measurement and verification systems within existing school buildings, HVAC services and occupants in order to observe and evaluate technology upgrades within the context of the daily life of these school ecosystems. The technology upgrades trialled in this living laboratory will be selected from promising electric heating and cooling strategies that increase the energy flexibility of ACT schools facilities, and deliver increased value for renewable energy, at the site and grid level.

The living labs venues are:

Amaroo

Constructed from 2004, and fully operational since 2008, Amaroo is a large (GFA: 16,832 m2) facility with over 1,800 students from preschool to year 10. Amaroo has a range of eco-friendly features, including a 600 kW solar array and a wind turbine. From this large venue two areas have been selected to participate in the living laboratory:

Classrooms Years 6-10:

— Gas boiler with hydronic in-slab heating;
— Passive design for summer comfort with high and low BMS-integrated actuated windows;
— Integrated building management system (BMS);
— Split system reverse cycle air conditioning units, with ceiling fans.

Preschool:

— Ducted gas heating to main classrooms, with electric heating to offices;
— Split system AC units;
— Two identical transportable classrooms for side-by-side testing.

Fadden

Opened in 1984 with a gross floor area of 3,283 m2 and over 450 students. The main systems installed include: solar array.
— Ageing central gas boiler providing heating for all classrooms
— Evaporative coolers in learning areas.
— Retrofit split system reverse cycle air conditioning units in staff room.

A non-exhaustive list of potential example retrofits technologies of high relevance to these sites include:
— electric heat pump to replace the central gas boiler,
— ground sourced heat pump system to aid efficiency and reliability in sub-zero temperatures,
— BMS upgrade to provide automation management opportunities;
— Central thermal storage.
— Demand-side management solutions

Amaroo

The challenge...

Australia's school stock will use an estimated 8.8PJ of energy in 2020. The provision of, or demand for, thermally comfortable teaching environments through passive or active systems is a large driver for rising energy consumption in Australian schools.

HVAC presents a significant energy and demand challenge to school communities and education departments with social, technical, economic and environmental consequences.

Approaches to the provision of 'Cool Schools' and renewable energy in schools still tends to happen in an ad-hoc and silo-approach manner, often without holistic consideration of the occupants, buildings, technologies and electricity grid, and the management and control of that system.

What we propose...

This living laboratory research team will carry out rigorous testing and evaluation of a range of renewable energy compatible heating, cooling and ventilation technologies that deliver thermal comfort conditions conducive to learning.

The living laboratory includes active engagement of the occupants and users of the facilities in the evaluation of these technologies.

HVAC&R systems will be installed and tested at two school sites representative of schools built before and after the introduction of energy efficiency standards. This could include both passive and active systems with a focus on improving the value of renewable energy through energy efficiency, demand response (load shedding or load shifting), and ancillary services.

The potential for the tested solutions to be widely deployed across the education sector, both in the ACT and nationally will be explored.

As part of the project we provide...

- The means for energy flexibility and renewable energy enabling technologies to be independently and rigorously evaluated by using the available funding for the living labs.
- Technical reports on the tested technologies in first two years
- Provide opportunity for technology providers to demonstrate practical and cost-effective strategies for school facilities to reduce energy demand and increase value of renewable energy, through the use of new technologies relating to HVAC control, demand management, and grid interoperability.
- Improved baseline metrics for energy consumption, demand and renewable energy specific to living lab venues. .

How to participate

Industry are invited to submit expressions of interest to participate with their products or services for testing

Results for technologies that are evaluated using the iHUB funding will be publically made available, along with knowledge sharing activities through the Renewable Energy Knowledge Sharing Task-Group for Schools, and development of the Renewable Energy and Enabling Technology and Services Roadmap for Schools.

Submit EOI's to **Clayton McDowell**: claytonm@uow.edu.au

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