

MEDIA RELEASE

BCA AWARDS S\$8.4 MILLION TO EIGHT RESEARCH PROJECTS ON SMART AND SUSTAINABLE BUILDING TECHNOLOGY OF THE FUTURE

- This 1st Grant Call under the Green Buildings Innovation Cluster supports the development of smart and energy efficient technology and solutions for buildings in the tropics.

Singapore, 26 October 2016 – The Building and Construction Authority (BCA) has awarded S\$8.4 million in grants to eight research projects that focus on smart and sustainable building technology for the future. Through this 1st Grant Call, the research community and the industry will collaborate to develop solutions that will support the BCA's efforts in achieving a greener, smarter and healthier built environment in Singapore.

2. The research on smart Building Management and Information Systems is one of the four focused technology areas identified under the Building Energy Efficiency Roadmap launched in 2014. Among the research projects awarded grants are:

Name of research project	Description
i. Learning-based Thermal Comfort Models via Pervasive Sensing	A system that tracks building occupants' thermal comfort with wearable devices (e.g., wristband and smart watches) to sense their vital signs (e.g., heart rate and skin temperature). With the collected data, the system can then adjust the building's air-condition system and room temperature for better energy efficiency without compromising its occupants' comfort.
ii. Intelligent Building Automation and Analytics using Model-Predictive Control	An intelligent control system that can analyse a building's energy efficiency so that developers can optimise the building's energy performance and its occupants can enjoy a better indoor air quality.

<p>iii. Green Building Management System - An Open IoT Platform Approach</p>	<p>A system that collects real-time information on a building's energy and water consumption, and analyses it with patterns of human activities so that energy consumption from its fixtures and appliances can be optimised. The information is then stored on the Cloud and accessible to other related and relevant applications used by building professionals, including facilities management professionals.</p>
<p>iv. Real-Time Occupant Engaged Indoor Environmental Quality Monitoring and Controlling System using Wireless Sensor-Actuator Network for Smart Indoor Environments</p>	<p>A wireless network that “senses” the quality of an indoor environment so that developers can optimise building energy performance and the building occupants can enjoy a better indoor air quality.</p>
<p>v. A Personality-based Energy Management System</p>	<p>An energy management system for a building that takes into consideration its occupants/users' behaviours and personalities. The results of the analysis will determine the pattern of energy use and optimise energy savings.</p>
<p>vi. Lifecycle BIM Integration with Energy MM&V for Net Zero Energy Building</p>	<p>This system will “merge” or “integrate” a virtual three-dimensional model of a building with a model of its energy consumption using a series of measuring tools. By putting both models together, building professionals can analyse the measurements as well as patterns of energy consumption and create simulations that attempt to reduce the energy consumption to a minimum, if not zero.</p> <p>The proposed system will be validated against an on-going Net Zero Energy Building project in the National University of Singapore.</p>

vii. Scalable and Smart Building Energy Management Systems	A smart energy management system that plans and controls the timing and distribution of cool air in a building without compromising human comfort and energy efficiency.
viii. Data-Driven Modelling and Real-Time Optimisation for Diversified Chiller Plants	A model that optimises the energy performance / consumption of an air-con chiller plant by tracking and analysing real-time data, and then identifying the patterns of human usage for optimal energy performance

Details of each project are in the [Annex](#).

3. Research teams of these projects will work with collaborators from the public and private sector including small and medium enterprises (SMEs). Under the BCA's Green Buildings Innovation Cluster¹, the Grant Call was introduced to encourage public-private collaborations to develop smart and sustainable technology for the built environment. It complements Singapore's Smart Nation initiatives and supports the BCA's 3rd Green Building Masterplan².

4. Commenting on this first Grant Call award, BCA Chief Executive Officer Dr John Keung said, "This batch of research projects is another step towards realising our green building vision of 'Positive Energy Low-rise, Zero Energy Medium-rise and Super Low-energy High-rise' buildings in the tropics. We are also seeing the research community and the industry growing closer together in their collaboration on sustainable building technology. The research community can develop their ideas on how certain technology can contribute to the sustainability of our buildings in the tropics while building owners, developers as well as professionals are keen to have developments that can significantly reduce their carbon footprint. With this Grant Call, the BCA can facilitate the two groups in working together that not only benefit themselves but for the good of our environment, mitigating the effects of climate change.

5. "We want to encourage more members of the research community and academia to step forward with ideas for smarter, greener and healthier buildings from their research projects. With this Grant Call, coupled with the keen participation from the industry and ample facilities for comprehensive tests to be conducted – notably the BCA SkyLab, I am optimistic that many of these projects will pave the way for Singapore to be the model for a greener built environment in the tropics in years to come," added Dr. Keung.

6. These eight projects were chosen based on an evaluation criteria that include innovation, relevance with respect to the current challenges faced in the built environment sector, potential to produce breakthrough results (i.e., greater than 30% potential energy savings) and the possibility to be commercialised for adoption in buildings.

Annex – Research Projects Awarded the inaugural BCA Grant Call

¹ Administered by the BCA's Built Environment Research and Innovation Institute and funded by the National Research Foundation, the Green Buildings Innovation Cluster (GBIC) is established by the BCA in 2014 to accelerate the use of innovative, energy-efficient technology. The Cluster is a one-stop Research, Development and Demonstration programme to experiment, exhibit, and exchange knowledge of promising building energy-efficient solutions with the industry.

² The third Green Building Masterplan was developed with an emphasis on engaging building tenants and occupants more actively to drive energy consumption behavioural change and to address the well-being of the people.

ANNEX

Research Projects awarded the inaugural BCA Grant Call

1. Toward Learning-based Thermal Comfort Models to Instill Behavioural Changes for Greener, Smarter and Healthier Buildings in the Tropics via Pervasive Sensing

A system that tracks building occupants' thermal comfort with wearable devices (e.g., wristband and smart watches) to sense their vital signs (e.g., heart rate and skin temperature). With the collected data, the system can then adjust the building's air-condition system and room temperature for better energy efficiency without compromising its occupants' comfort.

Principal Investigator: Dr Wen Yonggang, Nanyang Technological University

Collaborators:

- Evercomm Pte Ltd
- Huami
- Tsinglink
- Nanyang Technological University
- University of Technology, Sydney
- BCA

2. Intelligent Building Automation and Analytics using Model-Predictive Control

An intelligent control system that can analyse a building's energy efficiency so that developers can optimise the building's energy performance and its occupants can enjoy a better indoor air quality.

Principal Investigator: Dr. Wan Man Pun, Nanyang Technological University

Collaborators:

- Nanyang Technological University
- Schneider Electric Singapore Pte Ltd

- University Colorado, US
- BCA

3. Green Building Management System - An Open IoT Platform Approach

A system that collects real-time information on a building's energy and water consumption, and analyses it with patterns of human activities so that energy consumption from its fixtures and appliances can be optimised. The information is then stored on the Cloud and accessible to other related and relevant applications used by building professionals, including facilities management professionals.

Principal Investigator: Dr. Yuen Chau, Singapore University of Technology and Design

Collaborators:

- Singapore University of Technology and Design
- JC Kuipi
- Khoo Teck Puat Hospital
- Power Automation
- Princeton University
- BCA

4. Real-Time Occupant Engaged Indoor Environmental Quality Monitoring and Controlling System using Wireless Sensor-Actuator Network for Smart Indoor Environments

A wireless network that “senses” the quality of an indoor environment so that developers can optimise building energy performance and the building occupants can enjoy a better indoor air quality.

Principal Investigator: Prof. Panda Sanjib Kumar, National University of Singapore

Collaborators:

- National University of Singapore
- Advanced Digital Sciences Center
- Honeywell
- BCA

5. Smart Solutions Promoting Behaviour Driven Energy Efficiency: A Personality-based Energy Management System

An energy management system for a building that takes into consideration its occupants/users' behaviours and personalities. The results of the analysis will determine the pattern of energy use and optimise energy savings.

Principal Investigator: Dr. Lu Yujie, National University of Singapore

Collaborators:

- University of Maryland, College Park, US
- George Washington University, US
- City University of Hong Kong
- National University of Singapore
- BCA

6. Lifecycle BIM Integration with Energy MM&V for Net Zero Energy Building

This system will “merge” or “integrate” a virtual three-dimensional model of a building with a model of its energy consumption using a series of measuring tools. By putting both models together, building professionals can analyse the measurements as well as patterns of energy consumption and create simulations that attempt to reduce the energy consumption to a minimum, if not zero.

The proposed system will be validated against an on-going Net Zero Energy Building project in the National University of Singapore.

Principal Investigator: Dr. Shen Lijun, National University of Singapore

Collaborators:

- National University of Singapore
- Surbana Jurong Pte Ltd
- OSIssoft
- BCA

7. Scalable and Smart Building Energy Management Systems

A smart energy management system that plans and controls the timing and distribution of cool air in a building without compromising human comfort and energy efficiency.

Principal Investigator: Dr. Su Rong, Nanyang Technological University

Collaborators:

- UC Berkeley, US
- Beca Carter Hollings & Ferner (S.E. Asia) Pte Ltd
- ABB Pte Ltd (Singapore)
- BCA

8. Data-Driven Modelling and Real-Time Optimization for Diversified Chiller Plants

A model that optimises the energy performance / consumption of an air-con chiller plant by tracking and analysing real-time data, and then identifying the patterns of human usage for optimal energy performance

Principal Investigator: Dr. Zhang Zhenjie, Advanced Digital Sciences Center

Collaborators:

- Kaer Co.
- Nanyang Technological University