

**MEDIA RELEASE**

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**26 AUGUST 2014**

**A\*STAR, BCA AND HITACHI PILOT PLANT FACILITATES RESEARCH FOR GREENER BUILDINGS**

*A\*STAR's Experimental Power Grid Centre (EPGC), together with Hitachi Ltd and Building and Construction Authority (BCA), have commissioned an advanced Combined Heat and Power (CHP) pilot plant, furthering research in powering cities sustainably*

**Singapore**—Imagine powering a building's air-conditioning using heat. A newly completed Combined Heat and Power (CHP) pilot plant has been commissioned to harness waste heat, and convert it to energy to power air-conditioning. A\*STAR's EPGC and Hitachi have been working on a joint verification testing of the CHP control systems, which will control heat and power facilities as the operating point to best minimise costs and energy consumption. The plant marks the successful completion of a milestone in the three-year research collaboration project between EPGC and Hitachi.

The advanced CHP plant combines EPGC's expertise in energy technologies with Hitachi's strength in energy-saving air conditioning control systems that have been developed and commercialised<sup>1</sup>. The newly operational plant is funded by the A\*STAR-Ministry of National Development (MND) Green Building Joint Grant call. As the lead agency championing the green building movement, BCA administers this grant as part of its drive towards more environment-friendly energy-efficient buildings.

CHP systems are not widely adopted in Singapore as most buildings obtain power from the grid<sup>2</sup> to provide electricity for air-conditioning, mechanical ventilation systems (ACMV), water pumps, lights and other services such as lifts and escalators.

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<sup>1</sup> In 2001, Hitachi developed and commercialised an optimised energy-saving air conditioning control system for controlling the operation of air conditioning devices using an optimum point that minimises energy consumption throughout the entire air conditioning system.

<sup>2</sup> In Singapore, electricity is supplied through the electrical power system, which consists of multiple power grids. A power grid is a large and complex network of transmission and distribution cables, which will supply electricity from power plants.

These needs account for up to 54 percent<sup>3</sup> of total electricity consumption in a commercial building. With the large electricity consumption, there is a need for an energy efficient system that decreases reliance on fossil fuels, and reduces carbon dioxide emissions. This is crucial as buildings are estimated to contribute almost 14 percent<sup>4</sup> of Singapore's carbon emissions by 2020.

### **Driving Energy Efficiency and Sustainability in Buildings**

The advanced CHP pilot plant will enhance a building's efficiency and sustainability as it explores the integration and control of two systems—utilising existing embedded generation<sup>5</sup> and using excess heat from generators, normally discharged into the environment, for heating and cooling purposes in air conditioning.

When a CHP system is integrated into a building, a generator need not perform at full capacity as excess heat is now used to power air-conditioning. The building now has the ability to produce and control both electrical power, and heating and cooling services required to power air conditioning, thus increasing energy-efficiency. EPGC and Hitachi estimate an increase in energy efficiency from 36 percent with just a generator, to 52 percent with the implementation of this integrated system.

The simulation software developed in this project can simulate various building system configurations. This enables consultants to implement the best control strategy resulting in optimal performance, thus improving energy savings even before a building is built.

Associate Professor Ashwin M Khambadkone, Programme Director of EPGC said, "With the commissioning of the advanced CHP pilot plant, EPGC is able to provide a platform to further research in energy efficiency in buildings. Our research in this field addresses the Government's call for more environment-friendly energy-efficient buildings and penetration of renewable energy. The CHP pilot plant further supports the Building to Grid (B2G) concept, enabling buildings to act as virtual power plants."

Mr Kunizo Sakai, Vice President and Executive Officer and President & CEO of Hitachi's Infrastructure Systems Company said, "Hitachi is pleased to collaborate with A\*STAR to establish the advanced CHP pilot plant. Coupled with Hitachi's expertise in optimised energy-saving air conditioning control technologies and EPGC's microgrid technologies, we are sure that the pilot plant will create new cutting-edge and valuable technologies for buildings, factories and community. We will commercialise the CHP control systems in 2015 based on the results obtained

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<sup>3</sup> Source: Climate Change & Singapore: Challenges, Opportunities, Partnerships -

<http://app.nccs.gov.sg/data/resources/docs/Documents/NCCS-2012.pdf?AspxAutoDetectCookieSupport=1>

<sup>4</sup> Source— Climate Change & Singapore: Challenges, Opportunities, Partnerships -

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<sup>5</sup> Embedded generation involves the generation of electricity within the building by utilising smaller generators or renewable energy sources

through this joint research and provide solutions of increasing energy-efficiency and reducing carbon dioxide emissions with lower cost for buildings and factories, primarily in Asia.”

Dr John Keung, Chief Executive Officer of BCA said, “The CHP pilot plant project is a statement of a strong joint research collaboration between the research community and private sector. We wish to see more companies coming forward and engage in collaborative efforts in future research and development, and demonstration of green building projects for the built environment.”

### **The Future of CHP in Singapore**

Building to Grid (B2G) is a new concept that leverages on a building’s capability to generate electricity on its own for the building’s needs through embedded generation. The building will then become a grid in itself, also known as a microgrid. When many building microgrids with CHP systems are connected to the power grid, these buildings are now able to power the grid and potentially supply excess electricity power to the grid.

The integration of CHP system into the B2G concept enables the building to act as a virtual power plant. This enhances the grid’s resilience to function independently and decreases reliance on the main power grid, which is useful during emergencies or disasters. With B2G, the grid can respond faster to load changes, allowing more intermittent renewable energy to be integrated into the grid.

The CHP pilot plant will function as a platform for experimental support to explore new research ideas for potential energy savings benefits, and study the feasibility of robust energy management and control system under various weather conditions, for greener buildings in Singapore. The pilot plant will be an enabler for buildings to function independently, bringing the B2G concept to life.

## **About the Agency for Science, Technology and Research (A\*STAR)**

The Agency for Science, Technology and Research (A\*STAR) is Singapore's lead public sector agency that fosters world-class scientific research and talent to drive economic growth and transform Singapore into a vibrant knowledge-based and innovation driven economy.

In line with its mission-oriented mandate, A\*STAR spearheads research and development in fields that are essential to growing Singapore's manufacturing sector and catalysing new growth industries. A\*STAR supports these economic clusters by providing intellectual, human and industrial capital to its partners in industry.

A\*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities, located in Biopolis and Fusionopolis, as well as their vicinity. These two R&D hubs house a bustling and diverse community of local and international research scientists and engineers from A\*STAR's research entities as well as a growing number of corporate laboratories.

For more information on A\*STAR, please visit [www.a-star.edu.sg](http://www.a-star.edu.sg).

## **About the Experimental Power Grid Centre (EPGC)**

The EPGC is a programme under A\*STAR's Institute of Chemical and Engineering Sciences, with the mission to undertake research and development activities in defined core areas for intelligent and decentralised power distribution, interconnection and utilisation. These activities will foster collaboration with industry, A\*STAR's research institutes, universities, and Singapore's public agencies, to which EPGC will offer:

- Research excellence in core areas (Intelligent/decentralised power distribution networks, Control and management of distributed energy resources, Smart and interactive energy utilisation)
- Advanced Lab facilities and tools
- High value-add R&D activities integrated in A\*STAR framework and capable of delivering proof of concept prototypes
- The benefit from working together with partner agencies to facilitate test bedding and technology trials of developed products

## **About Hitachi Ltd**

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, delivers innovations that answer society's challenges with our talented team and proven experience in global markets. The company's consolidated revenues for fiscal 2013 (ended March 31, 2014) totaled 9,616 billion yen (\$93.4 billion). Hitachi is focusing more than ever on the Social Innovation Business, which includes infrastructure systems, information & telecommunication systems, power systems, construction machinery, high functional materials & components, automotive systems, healthcare and others. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

## **About Building and Construction Authority (BCA)**

The Building and Construction Authority (BCA) of Singapore champions the development of an excellent built environment for Singapore. BCA's mission is to shape a safe, high quality, sustainable and friendly built environment, as these are four key elements where BCA has a significant influence. In doing so, it aims to differentiate Singapore's built environment from those of other cities and contribute to a better quality of life for everyone in Singapore. Hence, its vision is to have "a future-ready built environment for Singapore". Together with its education arm, the BCA Academy of the Built Environment, BCA works closely with its industry partners to develop skills and expertise that help shape a future-ready built environment for Singapore. For more information, visit [www.bca.gov.sg](http://www.bca.gov.sg).

## AN OVERVIEW OF THE CHP PILOT PLANT

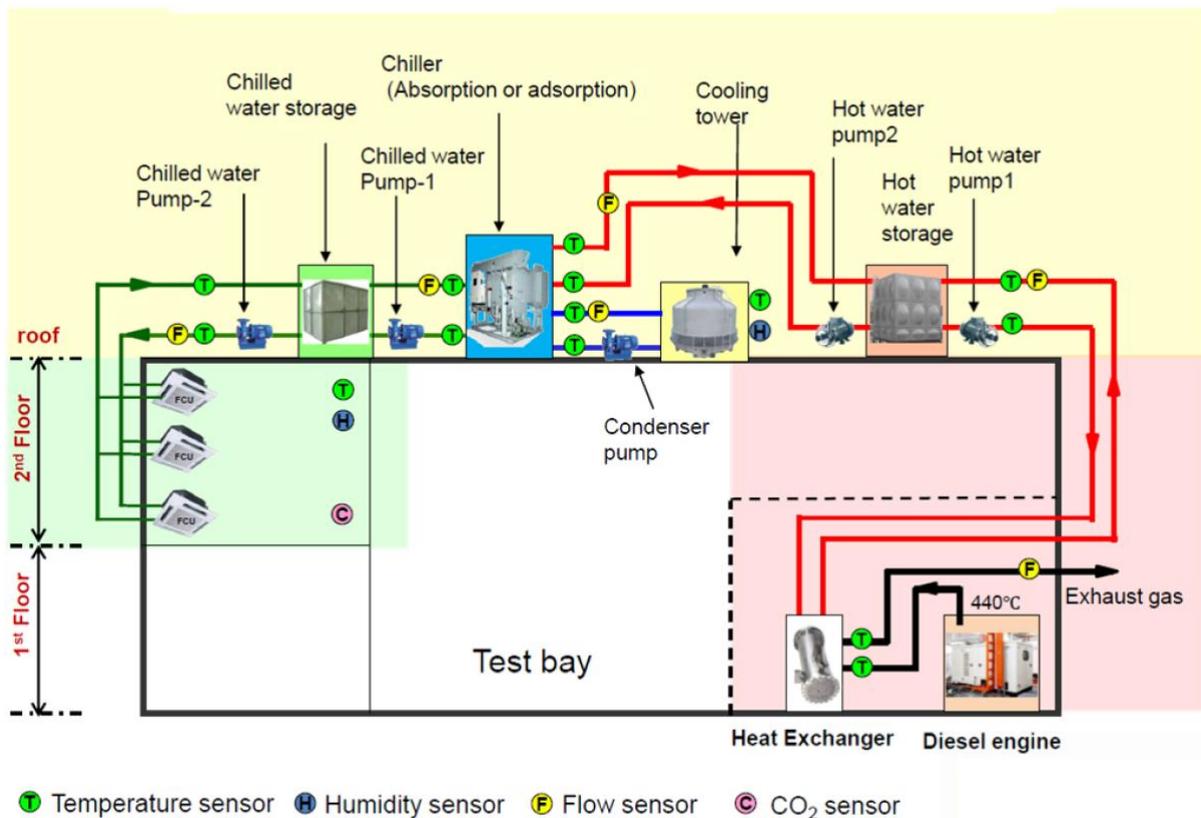


Image 1:

- The waste heat from the diesel engine exhaust is recovered as hot water (at 90°C) is supplied to the absorption chiller to produce chilled water (at 7°C) for air conditioning purpose. Hot water and chilled water storage provide operational flexibility during supply-demand mismatch situations.
- In addition to operating at high efficiency according to supply and demand, inverters are installed in a pump and cooling tower fan, and a cold water temperature variable type chiller is adopted.
- The developed CHP control systems operate all equipment according to set point conducted calculations. Through simulation, these aim to achieve overall optimisation of high energy efficiency and low operation costs.

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Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.

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