Advanced Research Projects Agency • ENERGY

BEETIT PROJECT

GEORGIA TECH

INNOVATIVE MINIATURIZED HEAT PUMPS FOR BUILDINGS

PROJECT TITLE:	Modular Thermal Hub for Building Heating, Cooling and Water Heating		
ORGANIZATION:	Georgia Institute of Technology (Georgia Tech)	LOCATION:	Atlanta, GA
PROGRAM:	BEETIT	ARPA-E AWARD:	$3,010,525
TECH TOPIC:	Building Efficiency	PROJECT TERM:	9/1/10 – 8/31/11
WEBSITE:	www.gtrc.gatech.edu		

CRITICAL NEED

Buildings currently account for 72% of the nation's electricity use and 40% of our carbon dioxide emissions each year, 5% of which comes directly from air conditioning. Current building cooling systems run on electricity and use synthetic fluids, leading to large energy consumption and greenhouse gas emissions. Thermally driven absorption heat pumps—which transfer heat energy from one location to another in a cooling and heating system—offer independence from electricity supply constraints because these technologies can be powered from the combustion of natural gas and solar and waste heat. In addition to providing efficient space cooling and heating, these heat pumps can heat water. However, the use of these technologies in residential buildings has been hindered by the lack of efficient and economical heat and mass exchangers.

PROJECT INNOVATION + ADVANTAGES

Georgia Tech is using innovative components and system design to develop a new type of absorption heat pump. Georgia Tech's new heat pumps are energy efficient, use refrigerants that do not emit greenhouse gases, and can run on energy from combustion, waste heat, or solar energy. Georgia Tech is leveraging enhancements to heat and mass transfer technology possible in microscale passages and removing hurdles to the use of heat-activated heat pumps that have existed for more than a century. Use of microscale passages allows for miniaturization of systems that can be packed as monolithic full-system packages or discrete, distributed components enabling integration into a variety of residential and commercial buildings. Compared to conventional heat pumps, Georgia Tech's design innovations will create an absorption heat pump that is much smaller, has higher energy efficiency, and can also be mass produced at a lower cost and assembly time.

IMPACT

If successful, Georgia Tech's new absorption heat pump could reduce energy use in air conditioning and water heating by up to 50% compared to conventional systems.

- SECURITY: Waste heat or solar heat-based technology for air conditioning would help reduce reliance on fossil fuels—or strengthening U.S. energy security.
- ENVIRONMENT: Greater use of heat-based technology for air conditioners would reduce greenhouse gas production related to electricity generation and could increase demand for solar power—increasing use of renewable energy for cooling.
- ECONOMY: Widespread adoption of this technology could reduce energy consumption for air conditioning of buildings—providing consumers with cost savings on energy bills.
- JOBS: As this new technology develops, there will be new job opportunities in the design, installation, testing, and maintenance of efficient heating and cooling systems.

CONTACTS

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