In search of energy-efficient comfort through 'smart' ceiling fans and thermostats

September 7 2016, by David Lehrer

Ceiling fans provide comfort and save energy at Berea College's "Deep Green" residence hall, the first student residence hall certified under the Living Building Challenge. Credit: Center for the Built Environment

A research team led by the University of California, Berkeley's Center

for the Built Environment (CBE) will develop ways to integrate commercially available "smart" ceiling fans and communicating thermostats, and to evaluate how they may improve energy efficiency and comfort in multi-family residential and small commercial buildings.

The California Energy Commission recently approved approximately $1.9 million in funding to support a research team that includes the engineering and energy efficiency consulting firm TRC and technical services firm Association for Energy Affordability. The project will also receive matching funds from CBE industry partners and in-kind support from CBE industry partner Big Ass Solutions.

CBE officials said the study proposal is based on the idea that a generation of new internet-enabled products can improve customers' comfort while reducing energy costs. In spite of the opportunities these products offer, uncertainties remain in quantifying these benefits, and understanding barriers to wide adoption of such products.

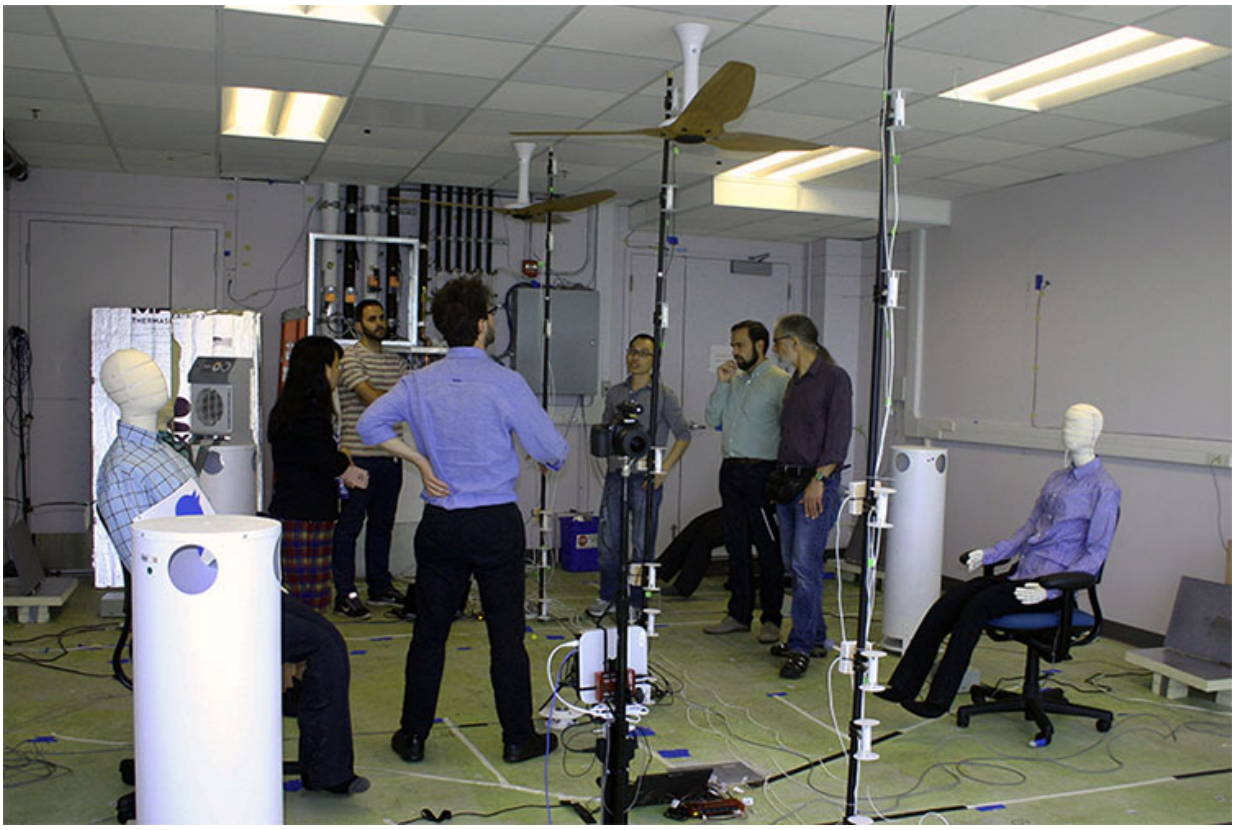
Researchers hope the UC Berkeley-led project will produce insights into these questions through a series of laboratory tests and field demonstrations, using ceiling fans with controls that respond to the environment and occupants' preferences, and thermostats that also offer learning and communicating capabilities.

Comfort, efficiency and informed choices

The intelligent fan control system to be tested, branded "SenseME" technology, had been developed by Big Ass Solutions in collaboration with CBE researchers, who conducted thermal comfort tests to identify the combinations of temperature, humidity, and air velocity that would provide the most comfort.

Demonstration sites will include housing units, common areas and fitness

facilities in historically under-served low-income, multi-family housing in California.



Researchers with UC Berkeley's CBE discuss a laboratory test configuration. Credit: CBE

The researchers will also conduct complementary laboratory studies to develop standardized methods for testing and rating fans for energy and comfort performance. These new standards will help manufacturers refine their offerings, and help customers to make informed choices.

The project will be led by CBE professor of architecture Gail Brager, CBE research team members Therese Peffer, Paul Raftery and Hui

Zhang, and TRC's Gwelen Paliaga. Big Ass Solutions will provide approximately 160 energy-efficient ceiling fans for the study, and access to its full-scale labs.

Funding will be provided by the energy commission under its Electric Program Investment Charge Program, which supports clean energy research and demonstration projects that promote improved electricity reliability and lower costs.

Although the research will examine commercially available products, the idea of integrating communicating thermostats with "human-centric" products such as ceiling fans is original, said Brager, an expert in energy and green buildings. "By integrating these smart products correctly," she said, "we hope to show that using less energy does not need to be at the expense of people's comfort."

Helping California meet energy goals

Brager also said such approaches will help California meet its goal of having all new homes incur net-zero energy usage by 2020. Previous CBE research has already demonstrated that personal control devices, including occupant-controlled fans, can both save energy and improve comfort.

In addition to these research activities, the project team will conduct market research with customers and other building industry stakeholders on adoption of these products. Findings will be disseminated though the creation of a design guide, an online design tool, case studies and industry outreach activities.

Ultimately, the research team said it expects to also leverage its findings to advocate for improved codes and standards for fans and other smart devices.