Researchers to make virtual energy audits a reality

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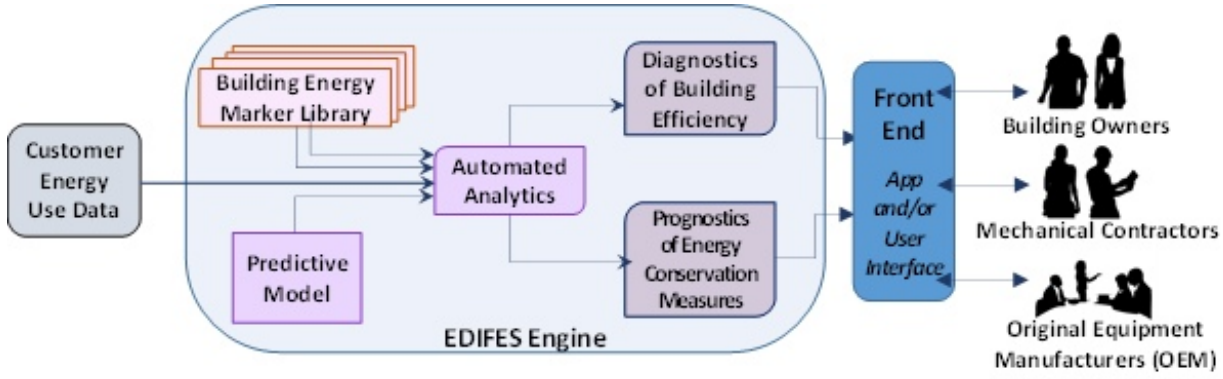

Analysis of multiple streams of data could help light commercial building owners to determine if their heating and ventilation is oversized or undersized, if the building needs new windows and insulation and more. Credit: Alexis Abramson

Case Western Reserve University researchers were awarded a $1.4 million U.S. Department of Energy grant to develop software to perform virtual energy audits of light commercial buildings.

In addition to audits, the computer program will enable a building owner to assess energy efficiency and elicit the most cost-effective solutions to energy waste.

"Before big data analytics, to pinpoint a building's efficiency problems,

we had to walk through a building, read sensors and conduct blower door and smoke tests," said Alexis Abramson, a professor of mechanical and aerospace engineering and director of the Great Lakes Energy Institute at Case Western Reserve. "By analyzing at least two years of whole building energy use data, we can uncover some of the same information."

Large industrial buildings are often wired to provide owners details of energy consumption, but the practice is uncommon in light commercial buildings, particularly older structures.

The national goals of the project are to help ensure that the United States maintains a technological lead in developing and deploying energy efficient technologies, enhance the nation's economic and energy security by improving the energy efficiency of buildings and reduce energy imports as well as harmful emissions. The funding comes from the Advanced Research Projects Agency-Energy (ARPA-E) program.

Abramson and Roger French, the F. Alex Nason professor of materials science and engineering at the Case School of Engineering, and Jiayang Sun, professor of epidemiology and biostatistics at the Case Western Reserve School of Medicine, will work with Milwaukee-based Johnson Controls Inc., a world leader in building-efficiency equipment, controls and services, to develop the software over the next three years. The software will assess and analyze multiple streams of data, including climate, weather, the amount of sunshine each day and utility meter records.

"The data streams are like DNA, which has codes imbedded in it. It took us a while to understand what these codes meant," Abramson said. "Similarly, we can find out what's going on inside a building by uncovering the codes in the data."

The researchers are looking for patterns and correlations in the data that reveal if the heating and ventilation systems are oversized or undersized, when the lights come on, if the building needs better insulation and windows, and more. Using this information, a predictive model, developed from the building's data, can then be created and tested.

For example, a building's electric meter may show substantial fluctuation in energy use. If the fluctuation, when tied to many days worth of weather records, is statistically significant, it could signal a leaky building. With that information, the software could build models that would suggest high return-on-investment, energy-efficiency solutions based on predicted performance.

The CWRU project is one of 41 nationally to receive funding under ARPA-E OPEN this year. Following contract negotiations, the researchers begin their work this winter.

Provided by Case Western Reserve University