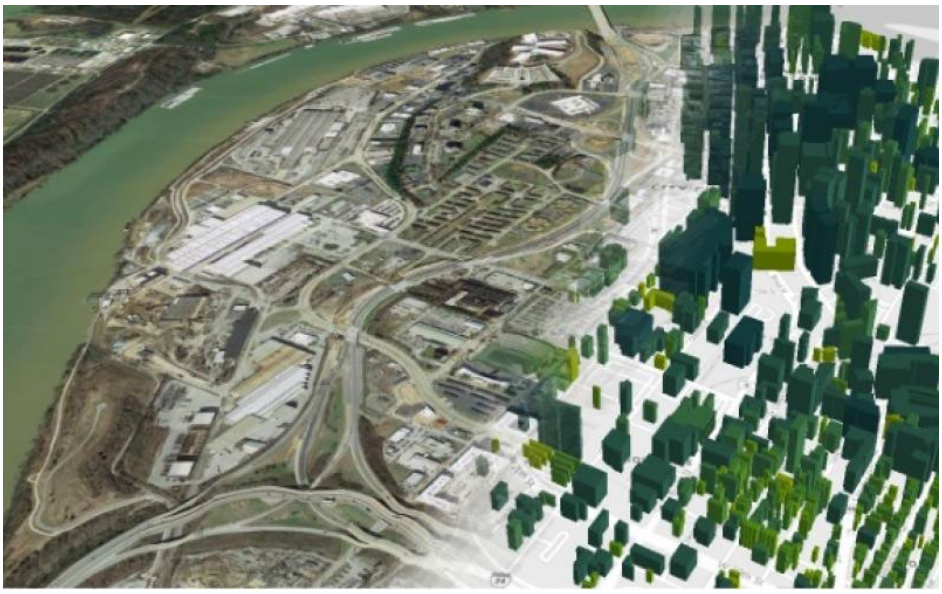
OAK RIDGE National Laboratory NEWS RELEASE



Oak Ridge National Laboratory's software suite AutoBEM is being used in the architecture, city planning, real estate and home efficiency industries. Users take advantage of the suite's energy modeling of almost all U.S. buildings. Credit: ORNL, U.S. Dept. of Energy

Industry partners use ORNL software to trim carbon footprint of buildings

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Two years after the U.S. Department of Energy's Oak Ridge National Laboratory provided a model of nearly every building in America, commercial partners are using the tool for tasks ranging from designing energy-efficient buildings and cities to linking energy efficiency to real estate value and risk. International companies like Google and SmithGroup are sharing the benefits by making the resulting data publicly available. Since the buildings sector accounts for 40% of American energy consumption, increasing its efficiency is vital to national decarbonization goals.

Dozens of companies have requested data from ORNL's Automatic Building Energy Modeling software suite, or AutoBEM, said project leader Joshua New. He and his team developed AutoBEM using high-performance computing to process layers of imaging data with information about individual buildings, such as their size, use, construction materials and heating and cooling technologies.

“The unifying theme is to create a digital twin of our nation’s buildings,” New said. “We can simulate market-relevant ways to reduce energy use and offset with renewable sources.”

The software has simulated energy use for 123 million structures, representing 98% of U.S. buildings. New’s team is updating the software this year for even greater building detail and accuracy.

Google is using AutoBEM to improve its free Environmental Insights Explorer tool, which launched in 2018 to help cities worldwide recognize sources of greenhouse gas and reduction opportunities. Saleem Van Groenou, product manager for Environmental Insights Explorer, said Google wants to incorporate more precise energy efficiency simulations for buildings.

“Oak Ridge has much deeper expertise in building energy systems and modeling management and action than we do,” Van Groenou said. “We can now help cities focus more on what changes should be made, then track the impact of those changes over time.”

Google is combining its trove of building data with ORNL’s ability to scale up energy models and develop machine-learning algorithms, Van Groenou said.

Google is one of five major companies contributing data, staff time and equipment to AutoBEM partnerships.

Most users of AutoBEM focus on existing buildings, but SmithGroup, an international architecture and engineering firm, takes the approach of incorporating efficiency from the first blueprint.

“Our interest in AutoBEM and working with the lab stems from a dramatic need to scale the work we’re doing in response to climate change,” said Stet Sanborn, who oversees the ORNL collaboration for SmithGroup. “The number of buildings we need to touch, and the pace we need to do it, exceeds what an individual could do in their lifetime. And we need to do that in the next five years.” He pointed out that AutoBEM’s ability to run 200,000 energy models in less than an hour equals the output of one employee working full time for 365 years.

For SmithGroup, ORNL simulated every possible combination of design parameters, building types and U.S. climate zones. This information was used to train an artificial intelligence tool, essentially allowing the company to pre-simulate the energy impact of every design possibility for any building.

AutoBEM also incorporates climate change scenarios identified by the Intergovernmental Panel on Climate Change, modeled by the Climate Change Science Institute at ORNL. This feature attracted the attention of partner LightBox, which offers a platform for mapping and analyzing real estate information.

“As a leader in the commercial real estate and location intelligence industries, we offer new data sets that are critical for understanding new risks,” said Zach Wade, LightBox vice president

for data science. “LightBox plans to use AutoBEM to model the long-term energy and operation costs of buildings and to support understanding and reporting greenhouse gas emissions, providing valuable information to real estate investors, brokers, lenders and banks, appraisers, engineers and environmental consulting firms.”

LightBox and other partners will provide benefits to AutoBEM in turn by contributing data sets like building footprints, interior details, property parcel boundaries and financial information to improve future simulations.

In addition, partners such as SmithGroup and Google have committed to sharing data sets created using AutoBEM. “The entire market needs to shift, and that's where the relationship with AutoBEM becomes incredibly important,” said Sanborn. “We don't want to hold a secret sauce or limit everyone’s ability to drive efficiency in response to what is really a climate emergency.”

Other AutoBEM partners include glass manufacturer Cardinal Glass Industries and Bentley Systems, an infrastructure engineering software company. Cardinal Glass, which supplies window manufacturers, is using the tool to understand the energy performance of various window types in different regions and climate scenarios when compared to other efficiency upgrades. Bentley Systems is researching how to leverage city-scale digital twins and building energy models to optimize building design and decarbonization.

"The biggest surprise has been the amount of interest from companies and the array of data modeling or analysis they request,” New said.

AutoBEM’s development, expansion and collaborations are funded by DOE’s Office of Electricity, the Energy Efficiency and Renewable Energy’s Building Technologies Office and the National Nuclear Security Administration. The research team leveraged supercomputing resources from Argonne National Laboratory.

UT-Battelle manages Oak Ridge National Laboratory for the U.S. Department of Energy’s Office of Science. The single largest supporter of basic research in the physical sciences in the United States, the Office of Science is working to address some of the most pressing challenges of our time. For more information, please visit energy.gov/science.