

Energy Modeling: Diagnosing Efficient Opportunities

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by **Richard Halley**

Prepare your building for the heating and cooling seasons using energy modeling.

Real estate owners and developers – and the designers and contractors who plan and build projects for them – are increasingly aware of the clear incentives for going green on new and existing buildings. And with energy as the single largest operating expense in a typical commercial building, increasing the structure's efficiency is a key ingredient to achieving environmentally sustainable goals.

A big question that lingers, however, is how to determine the most effective way for building owners to assess and improve the efficiency of their buildings. Today, one answer many building industry participants are turning to is energy modeling software, which is helping identify opportunities to achieve higher efficiency in both old and new buildings.

It makes sense to assess energy usage in the same breath as green planning. By reducing energy consumption, building owners can make a significant positive impact on the environment by reducing their use of natural resources and lowering greenhouse gas emissions.

In addition, the perception that costs associated with green construction are much higher is fading as building owners realize the financial advantage green technologies provide on a life-cycle basis. The U.S. Green Building Council estimates that an up-front investment of 2% in green-design elements will net a 20% return on total costs over 20 years.

Local and state governments are also offering incentives to make buildings more energy

efficient, distributed as rebates or through tax credits or deductions. Public entities are adopting green building priorities, such as New York City's Local Law 86, which as of this year mandates green building for many city-funded construction or renovation projects.

In addition to such savings and incentives, energy-efficient buildings also increase worker productivity and reduce facility shut-down times. According to EnergyStar, a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy, every dollar invested in energy efficiency can add up to \$3 in building asset value.

Energy modeling is a tool that building owners and managers can use to tap these benefits. It uses sophisticated software to recreate building systems in a simulated environment. The simulation displays the building's systems and their interactions to show how the building is currently operating and demonstrates how the systems affect energy performance.

Once the model is complete and verified, you can virtually run the building in software. This provides a powerful resource for making infrastructure changes in a virtual environment and for testing a variety of solutions to determine which would function best in the building.

Energy modeling can take considerable effort to set up, so a prudent first step is to perform a high-level cursory review of possible energy savings. The extent of possible savings is dependent upon many factors, including the efficiency and health of the existing building systems, local weather patterns, utility rate structures, operational requirements of the building occupants, and the availability of capital for investment in building system upgrades.

Trane recently assisted a client that holds a substantial New York City-area real estate portfolio, which included a building that was



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using significantly more energy per square foot than similar buildings. We built a detailed energy model and found the building was not operating to its original design specifications, in part because the variable air volume system, or VAV, had been neglected, with its regular maintenance deferred. After executing the proper maintenance, the system returned to its original intended performance – saving the owner almost 3 million kWh per year.

In terms of maximizing the value of energy modeling, larger buildings typically have more potential for savings, simply due to their greater energy consumption. Buildings with more complex systems also have a greater potential for savings, because there are more opportunities to uncover inefficiencies.

For instance, a building that uses separate operating systems for office space and a data center is a prime candidate for energy modeling. A model Trane recently developed for a financial services client identified savings from installing a crossover connection between office and data center systems, allowing them to share resources under certain load conditions.

In short, energy modeling is a simple and effective tool that can create more efficient buildings that provide environmental benefits to owners, occupants, and the public. <<