CLIMATE MOBILIZATION ACT & LOCAL LAW 97
PART 3: THE GROWING ROLE OF ENERGY MODELING

Tzvi Karoly & Jack Jenkins

It may be a quick exercise to generate a rough estimate of projected penalties by reviewing the previous year's utility bills and plugging the info into an Excel spreadsheet. Any energy consultant can do that in short order. However, there's a lot more to it than that for a building to do proper strategic planning and to prepare for the onset of LL97.

(For previous articles, click here).

A properly calibrated energy model can offer a building insight into projected penalties (if any) and can enable valuable sensitivity analysis as well. Essentially, once a model is created, it is possible to tweak various elements to answer complex questions such as:

> "What if building occupancy changes by 20%?"
>
> "What if 2024 is unusually hot/cold?"
>
> "What if we change how the space is utilized?"
>
> "How much will it add to energy costs to increase ventilation?"
>
> "How much should we budget for LL97 penalties?"

… and most importantly:

> "Which energy or carbon saving improvements will be the most cost effective for this building?"

Evaluation of energy saving improvements, or Energy Conservation Measures (ECMs) as they are often called, are where energy models really pay dividends. By allowing ownership to test out which measures are going to be most cost effective in a computer simulation, before spending money on actual changes at the building – limited funds can be leveraged to implement the most effective improvements.

Do all buildings need an energy model? No. In many cases, a more basic energy audit by a competent energy engineer will be sufficient to identify a good, cost effective, program of energy and carbon saving improvements. However, buildings are complex systems. Accurately projecting annual heating or cooling energy use is significantly more difficult than figuring peak loads as it requires consideration of how the building responds to weather conditions throughout the year, not just during the coldest or hottest conditions. In addition, even something as simple as replacing old lighting can have knock-on effects on energy use for heating and cooling. Energy modeling offers a way of simulating these interactive and weather effects year-round, by the hour, or even by the minute, making it a much more accurate way of projecting savings – which is especially useful in evaluating more comprehensive upgrades.

Building managers looking to prioritize their spending most effectively often find value in energy modeling both for this reason, and to support more accurate budgeting of future utility costs.

Modeling may also be necessary in order to unlock funding for upgrade programs, from owners, lenders and/or utility incentive programs who need to see a robust forecast of future value.

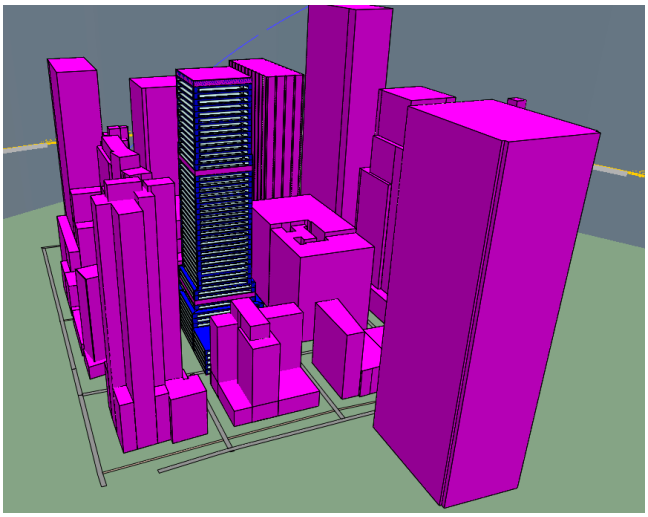
ENERGY MODELING CASE STUDY

RDE created an energy model to analyze the effects of major energy and carbon savings upgrades at a 1.2 million square foot Class A commercial office building in Manhattan. The suite of proposed measures included installation of low emissivity window film on the interior of the existing curtain wall system, converting from a steam to electric chiller, and shifting some of the heating load to water source heat pumps.

Our energy modeling demonstrated that implementing these three measures would achieve a 35% reduction in the building's greenhouse gas emissions – with annual savings equivalent to eliminating the carbon footprint of about 2,600 households – while also avoiding LL97 penalties of around $0.70 per sf per year and cutting almost 25% from the building's annual energy bills.

An energy model allows the building owner to weigh the energy and LL97 penalty savings from a particular measure against the estimated cost. Obviously, not all measures are worthwhile for all buildings. The circumstances for each building are unique. For example, in a 1960's vintage building with steam absorption chillers, the introduction of a high efficiency electric chiller might carry a much more attractive payback than the same measure in a more modern

building with an existing electric chiller. Simply recommending a chiller replacement to all clients in all situations is a clear sign that a landlord should seek a new consultant.



The quality and usefulness of the analysis will depend heavily on the skill of the energy modeler in translating real world conditions into a computer model. As the saying goes "garbage in, garbage out". It isn't enough to simply understand how the modeling software works. The modeler must also have a deep understanding of building science, HVAC design, and the real-world practicalities of operating and maintaining a building and its systems, to ensure that the outputs make sense and the proposed ECMs are feasible.

Pursuing energy modeling as a first step to a building upgrade can often make a lot of sense. It can predict accurate savings and help the Owner budget properly and claim utility incentives.

However, modeling is only as effective as the skill of the modeler and their understanding of the modeling process and engineering design considerations. A list of ECMs must be carefully tailored to the specific needs of the building. Every building situation is unique, especially in New York City, and a generic list of ECMs should not be the sole basis for a program of major capital spending.

Tzvi Karoly, PE, CEA

Tzvi is engineering lead at RDE. He has spent more than a decade assisting commercial, institutional, and athletic facilities achieve their energy and sustainability goals.

Jack Jenkins, CEA, LEED AP BD+C

Jack is founder and director of RDE. He is a keen advocate for a greener economy and has been helping organizations to cut their energy and carbon costs for over 15 years.

:: E-mail Jack at RDE

***In part four**, we will discuss some unexpected considerations for various energy saving upgrades.*