Good Morning. I am David Eijadi with The Weidt Group and I am very pleased to be here. I want to thank the National Institute of Building Sciences and the International Codes Council as well as the American Institute of Architects for convening this hearing about our industries' commercial building data needs. This subject touches the core of our firm's founding mission. Since 1977, it has been our mission to account for the environmental impacts of building design and construction. Most of those environmental impacts are energy related and accumulated as on-going costs to the building owner and on-going impacts to the environment after a building is occupied.

Many, though not all, of the energy related environmental impacts are designed into each project. The balance of the energy / cost / environmental impacts are dependent on the operating characteristics of the building and its occupants.

To do better as a community of design professionals and as a society in making EE buildings, we need to know more than our current sets of data permit us to know. There are several approaches to gathering and interpreting data in our industry and, all are needed. There is no silver bullet. Different types of data generation lead, in part, to different knowledge. Survey based, statistical data that are used to compare "like" buildings to one another, as CBECS does, are not the same as data that compares a building to itself over time or data that compares a building to its own potential.

We have worked with each of these three data types and I will try to put them in context. First, I would like to talk about a building compared to its own potential. For roughly two decades, The Weidt Group has been modeling the expected energy performance of new building designs and field verifying the energy efficiency measures installed at occupancy. This is sometimes called Energy Design Assistance or EDA. Our national market penetration is typically between 1% and 2% of total US commercial new construction (as defined by BD&C). Most of this energy modeling work has been through utility Commercial New Construction DSM programs. Of the energy modeling run through these DSM programs, The Weidt Group models and verifies roughly half of what is done in the country. Consequently, we have interacted with thousands of design team members and owners and been accountable for actual energy savings through the utilities.

Periodically there have been longitudinal studies of our modeling accuracy at both a program wide and individual building scale. At the program level; a population of buildings of similar and diverse building types; the accuracy of our modeling predictions for the performance of the total population was recently shown to be within 3% of actual consumption. However, there were initially some significant outliers. After minor investigations and adjustments to the models, the individual building outliers came into reasonable conformance and the population results were within 1% of actual.

What is reasonable conformance? At a the scale of an individual building, our modeling accuracy for new construction, additions and renovations has been repeatedly shown to be plus or minus 5% to 3% on an annual basis when the building is occupied and operated as expected. Stated the other way around, when the model contains the correct operating and behavioral parameters the modeled results will be highly accurate.

One of the most common data interpretation errors in our industry is the comparison of a design model to a performance outcome without verifying actual operating behaviors and bringing modeled parameters into congruency with reality.

In the first example, data created by modeled performance was used to target performance and evaluate cost-effective options for new construction. In this second example, data is used to compare a building to itself over time. The example here is the B3 program run by the state of Minnesota. The B3 program is a high-level screening tool for existing buildings that uses a simulation based benchmark to extend the functionality of EnergyStar into un-surveyed building configurations. B3 also sends data to Energy Star on buildings in Minnesota.

While B3's initial function was to auto generate energy simulation results for all 6000 public buildings in Minnesota and compare actual use to an acceptable target, it has since been used to target energy efficiency investment dollars, and, over the past seven years it has also become the site for tracking the on-going value of energy efficiency improvements.

The Web based B3 tool compares actual energy consumption to a modeled expectation for each specific building. We are certain that the initial model data will not match the actual data in many cases since the initial models contain a very large number of assumptions. We are simply looking for the worst matches. The bigger the delta, the greater the opportunity to improve the refine the building and improve the model.

With a functioning model, the owner can explore cause and effect relationships, propose improvements and track results. The B3 database can also be used to compare "like" buildings to one another. However, as most building operators will tell you, ultimately the final proof of success is a building compared to itself.

Data such as CBECS provides, that are used to compare "like" buildings to one another based on sampling surveys of existing buildings provide a broad picture of the general market. CBECS data are important for tracking large-scale market movements and are well suited to setting broad performance objectives for our country. An inherent challenge with any sampling is the size and diversity of the sample set. This may be especially true when buildings are the sampled set. In spite of many efforts to categorize "like" buildings, we find that their differences are often more telling about energy performance than their categorized similarities.

In 2008, the Minnesota Legislature passed a bill requiring the State to develop a regionalized program based on the energy reduction schedule of the Architecture 2030 program. The program, called SB 2030, is mandatory for building projects receiving state bond funds and requires the incorporation of these standards in utility conservation programs. The program was also required to develop procedures for ongoing monitoring of energy use in buildings using the performance standards.

When we began, we found that less than 30% of the square footage of the public buildings in Minnesota were represented in the CBECS data. Consequently, we analyzed CBECS and developed software that is a CBECS emulator. This allows us to enter building type and space type characteristics along with operating parameters and generate a CBECS or Target Finder equivalent. Once we were certain of that we could match what CEBECS provided, we were able to generate performance targets using energy simulation models for the space types and building types that were not represented in the CBECS survey. One of our long-term goals is to make a CBECS like effort easier and provide more detail about what future CBECS building data represents.

The SB 2030 tool, as it is known, is a Web application that is used by architects and engineers to generate an energy simulation model that returns an EUI that meets the 2030 challenge's interim and final goals. The data from each simulation is retained and the 2030 target can be re-set as the design evolves and/or uses change after occupancy. Though this program initially focused on setting standards and helping design teams achieve "reach-goals" in new construction, it has the potential to dramatically improve benchmarking among existing buildings as well and to serve as a model for rating, disclosure and labeling programs across the country.

While our colleges and we have done well with more integrative design and construction process there is still a gap between what we design and build and how our buildings are operated, reviewed and evaluated. We think of it as the policy gap made real because of a gap in processes that lead to building operations and data gathering.

The SB 2030 tool is an important first step toward creating a heuristic (self-healing) system of consistent data across a population of designers, owners and built projects. Think of it, a single database that includes iterations of every building in a community. A web based tool that makes modeling consistent across an entire state. A heuristic modeling system, operated by the design team, that begins in pre-design to realistically test and set target performance levels. That same model is updated as the design evolves. In Minnesota, our largest utility has now adopted use of the SB 2030 tool as part of their energy design assistance program. When the buildings are built, the same tool and database, containing all the modeling parameters will contain all the operating data available from each building.

We have also extended this functionality beyond setting performance targets and into regulatory compliance. For The Weidt Group this may be the most important frontier. At the request of the government of India, we have created a Web application that projects seeking performance complacence with the energy code in India can use to build a specification for an energy design simulation of their proposed building. The software builds simulation models of their design along with the comparative code runs and returns a detailed performance report, including a pass/fail indicator. The data from these runs remain in the system for future use to evaluate actual performance and test planned changes in codes or policies or to evaluate new technologies across a population of real buildings.

Why are we doing this in India instead of the US? Because they are just beginning. The code is new and there are no prior processes. What they plan to have and what we can have is a consistent system of energy models through simulation applications on the Web for new and existing buildings that can be easily compared to empirical field data and statistical studies for a closed loop information system.

The choice is not between target setting trough statistical surveys and modeling to design and predict performance. In fact, we need both. Advancements in science and technology owe a lot to the scientific method along with the concepts of hypothesizing and designing experiments to prove an assumption. These conscientious and meticulous processes are how we incrementally create knowledge from observations and data.

If I could just have your attention for another couple of hours, I would like to through all the cognitive biases that prevent any one approach from leading us to all the right answers. However… I will end here and just say thank you again to our hosts and I look forward to hearing from all the others.

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