Holly Velez
Executive Assistant to the President
National Institute of Building Sciences

July 15, 2011

Aniruddha Deodhar
Sustainability Program Manager
Autodesk, Inc.
1 Market St
San Francisco
CA 94105

Dear Ms. Velez,

Subject: Data Needs to Achieve High-Performance Buildings (re: NIBS email dated June 18, 2011)

Based on the amount of funding available, we recommend collecting data as follows (details on how we have used these further below):

- Low funding: At minimum, we recommend continuing to fund CBECS, RECS and AHS surveys (per CBECS Survey Forms or RECS Survey Forms) as they have been instrumental in our software development and validation.
- High funding: Augment the collection of building information with that needed for energy modeling such as data about loads (lighting power density, equipment power density, peak demand), operations (schedule, end-use) and structure (glazing percentage, number of floors, building height etc.).

The sample should be large (5,000-10,000 buildings) that are evenly distributed across all the climate zones and building types (similar to what was done for NREL's Commercial Building Benchmark) as well as evenly distributed across other metrics such as square footages, age, activity(as was done in the 2003 CBECS survey).

Autodesk's Building Performance Analysis products rely on the Commercial Building Energy Consumption Survey (CBECS) for the US EPA ENERGY STAR score provided to all our users analyzing their new and existing buildings. We also use the CBECS data to benchmark our analyses during quality control and to provide intelligent defaults (system types, constructions, lighting systems, etc.) to streamline whole building performance analyses to enable its wider adoption at a time when it use is desperately needed to be expanded in the existing building market. Some of this information is also available in a packaged format in the EERE Databook. We have also used the US DOE Commercial Buildings Initiative for internal software validation. Further, we use the Residential Energy Consumption Survey (RECS) data and HUD's American Housing Survey (AHS) for similar purposes. CBECS, RECS, and AHS' survey instruments should be used for any future data collection efforts, and we would welcome expanded data collection in the areas of high-performance building attributes. Up to date survey data is urgently needed for our tool development goals and our user's building performance analysis needs.

Statistical data collection methods mentioned above have relied on CBECS Survey Forms or RECS Survey Forms. In addition, ASTM's recent BEPA standard seeks to make the collection of buildings data more standardized and transparent. It is being considered safe harbor for energy performance disclosures[1]. However, it would need to be augmented by other information (e.g. glazing, HVAC system) that helps with audits and energy modeling. This standard is slowly gaining some traction in the appraisal community. ASHRAE's 105-2007 standard seeks to establish a common baseline for measuring and comparing building performance. Similarly, COMNET developed by Institute for Market Transformation seeks to create a standard for evaluating energy performance with its own Energy Modeling Guidelines and Procedures. A number of building performance mandates[2] are mandating disclosing utility bills which will continue to be a great source of building performance information. In addition, there are numerous efforts underway (e.g. UN, WRI, Green Sigma) to standardize on a single metric for apples-to-apples building energy performance benchmarking. Further, there is a momentum to standardize data collection and interoperability for Smart Grid communication, especially through associated NIST standards[3].

While the above mentioned databases have proven useful to us, we have found that statistical studies, energy benchmarking, pro-forma analyses or preliminary site evaluations often need to be augmented by energy models. Energy models help baseline building's current performance and estimate potential performance. They are also needed to optimize building performance on an ongoing basis and scope energy related retrofits. Further, models inform prioritization and optimization of energy conservation measures and setting of long-term plans for Net Zero Energy.

Further, there's a growing demand for information about a building's performance that's based on a Building Information Model. BIM explores a building's key physical and functional characteristics digitally before it's built, throughout its construction and long after during its operation and maintenance phase. Energy models must be grounded in building science and take into account information about local weather, building equipment and current usage patterns (via utility bills, sub meter data, sensors and Building Automation Systems).

Hence, we recommend collecting additional data that keeps in mind future energy modeling needs as well as information needed to satisfy energy performance disclosure laws, conduct appraisals and property condition assessments, and perform large scale state-wide asset rating pilots.

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[1] http://www.bepinfo.com/images/pdf/ASTMBEPABennett.pdf

[2] http://www.imt.org/files/FileUpload/files/Benchmark/IEECBPaper33.pdf

[3] http://www.nist.gov/public_affairs/releases/upload/FERC-letter-10-6-2010.pdf

In addition to above methods, Autodesk collects information on a dozen of our own buildings as part of our "Living Lab" program where novel technologies and methodologies are tested. They are representative of commercial office buildings of various shapes, sizes and ages in different geographies across the world. Technologies such as Autodesk's research project - Project Dasher seek to tie live data streaming from sensors, sub meters and BMS systems to the Building Information Model. Workflows such as rapid energy modeling seek to democratize the initial steps of an energy assessment process. A critical problem faced by assessors is capturing information on buildings' existing conditions. "Reality capture" involves capturing analog information about the building and converting it into a digital form that lends itself well for energy modeling. Technologies such as Autodesk's Project Photofly convert pictures of building exteriors to building models in a short amount of time. There are other technologies that convert satellite images, laser distance information, and laser scanner data into building models. These technologies as well as our Building Performance Analysis products have been valuable sources of data and foundational tools for constructing building information models of a number of Autodesk facilities.