

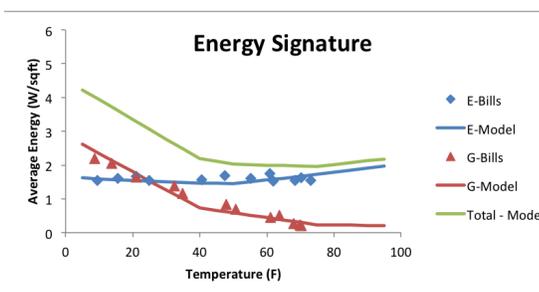
A Diagnostic Review of Building Energy Performance

What is FirstView?

FirstView, a new software tool developed by New Buildings Institute, allows for a quick and inexpensive initial diagnostic review of a building's energy performance. Using monthly utility bills, the FirstView calculation engine creates an auto-calibrated energy model of a building, provides feedback on performance areas that indicate a possible need for improvement, and allows for benchmarking comparisons to other buildings. Just as a prism can be used to break light into its component parts, FirstView disaggregates monthly utility bills into end-use information in key areas, including heating, cooling, hot water heating, and plugs and lights. The resulting information provides an action-oriented benchmark, performance diagnostics and a common, yet detailed, framework for comparing building performance.

What is an Energy Signature?

An Energy Signature is a graph of monthly energy use (vertical axis) in relation to outside temperature (horizontal axis) for the same period. Higher energy use is expected during hot and cold periods, with lower energy use expected during the mild temperature periods.



What is the difference between FirstView and the ASHRAE inverse modeling approach?

Although both FirstView and the ASHRAE Inverse Modeling Toolkit (IMT) use energy signatures to visualize a building's energy use, the fundamental approaches differ. The IMT is essentially a statistical method of analyzing energy, using a regression algorithm to determine the relationship between temperature and energy use. In contrast, FirstView uses a physics based building energy model to estimate energy use as a function of temperature. This method accounts for all energy sources (typically electricity and gas) and the interactions between different fuels. Once the energy model is properly calibrated to match utility bills (a process that FirstView completes automatically) it provides a powerful mechanism for exploring the energy use of your building.

What type of comparisons does FirstView enable?

FirstView enables comparisons well beyond a single benchmarking score. Since FirstView analysis works with monthly energy and temperature data, comparisons can be made that consider how buildings perform under various conditions. Additionally, the disaggregation performed by FirstView enables comparison of end uses and physically derived building characteristics. Designers, owners and operators can compare building performance from year to year, or they can compare to other buildings. As data sets from participants grow, comparisons become more robust. For example, data can be aggregated from particular regions, by building type or LEED accreditation level.

How are the FirstView diagnostics generated?

Parameters for specific diagnostic categories are generated using the FirstView results and New Buildings Institute staff's experience in building science research. After reviewing more than a thousand results using FirstView, along with decades of work in high performance buildings, NBI sets thresholds for each diagnostic category. FirstView automatically inspects the FirstView results for a particular building and compares these to the thresholds to identify possible opportunities for energy savings.

Technically, how does FirstView work?

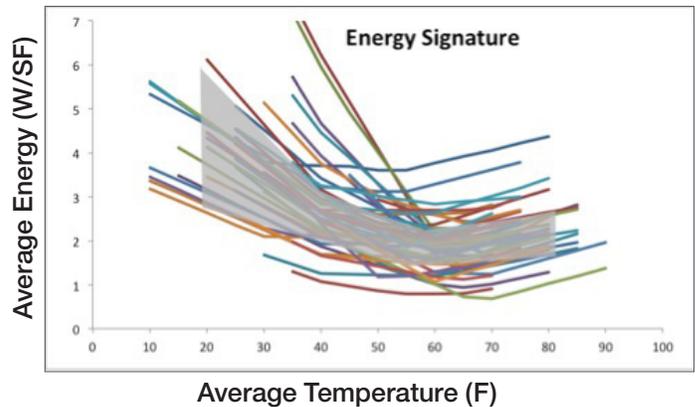
For a comprehensive analysis of how FirstView works, please refer to the RESOURCES section of the website. http://newbuildings.org/sites/default/files/FirstViewTool_NBI_aceee2010.pdf

What is an aggregated building data set, and how can it be used as a benchmarking tool?

An aggregated building data set, commonly referred to as a 'spectrum' by NBI, is a sample set of buildings that serve as a benchmark for comparison. Spectrums provided by NBI include at least 10 buildings and do not reveal identifying details such as building name, specific location or exact size. NBI intends to eventually collect enough aggregated data to expand comparison groups for users. For example, a user might be able to select a spectrum that represents FirstView signatures from 50 San Francisco area office buildings between 25,000 and 50,000 square feet.

What is a 'spectrum'?

FirstView can compare the energy signature of an individual building to a range of performance representing comparable buildings. This collective range of performance for an aggregated group of buildings is referred to as a 'spectrum'. The shaded area of the spectrum represents the range of data for a specified subset that have used the FirstView tool. As more projects use FirstView, NBI will be able to provide more refined spectrums focused more closely on individual project types and characteristics.



NBI currently offers two spectrums available for comparison. The first, 'Median Performance Office', is based on FirstView analysis from office buildings. The spectrum is plotted to represent buildings that perform in the 25th (better) to 75th (worse) percentile of this group. The median EUI of these buildings is 66kBtu/sf. Median square footage is 130,248, and median Energy Star Score (when available) is 86.

The second spectrum represents 'High Performance Office' buildings. This spectrum is plotted to represent buildings that perform in the 10th (better) to 25th (worse) percentile of the same building group.

How has FirstView been tested?

The FirstView calculation engine has been used on more than 1,000 buildings. These analyses range from individual buildings to large data sets on behalf of the US Green Building Council's Building Performance Partnership program and the Oregon Cool Schools Initiative. Additionally, with funding from a California Energy Commission Public Interest Energy Research grant, NBI conducted a 'deep dive' into a group of 22 recently certified LEED buildings in California. For those with available monthly energy bills, NBI compared the results of the FirstView results with inspections conducted during a walk through audit of the buildings. A high degree of correlation was found in the results at a fraction of the cost and effort as the walk-through efforts. You can read more about examples of how FirstView has been used at <http://www.newbuildings.org/firstview-case-studies>.

What data inputs do I need to make FirstView work?

FirstView can be used by almost anyone. All that's needed are one year of utility bills, zip code and building square footage. During the beta phase, FirstView is limited to buildings with gas heat and electric cooling, minimal process loads (e.g., kitchen equipment or excess hot water demands of an exercise center) and a full year's occupancy. Future versions of FirstView will support additional building types.

How can data be input into FirstView?

The current web-based version of FirstView requires manual entry of individual building data. While automated downloading of data from utility bills is not yet available to users of the web-tool, custom solutions tailored to your organizations needs are possible. Please contact Amy Cortese at amy@newbuildings.org for more information.

Is data input into FirstView confidential?

New Buildings Institute will not reveal any identifying information input into FirstView. Aggregated data may be used for research purposes, but will never reveal information about individual buildings. A comparison data set (referred to as a 'spectrum' by NBI) will include at least 10 buildings and does not reveal any identifying details such as building name, specific location and exact size.

Do I need submeters and interval data?

No. The only energy use data required for a FirstView analysis is your monthly utility bills. FirstView reports are not intended to replace the more complex, detailed and costly outputs from building automation, submeters or energy information systems. Instead, FirstView provides a quick level of insight that can be applied to all buildings, even those that often do not have such systems and cannot afford to dedicate resources to detailed data analysis.

FirstView provides a common "language" that can easily compare buildings to each other, and acts as a compass or filter which directs your attention and resources to buildings within a portfolio, or the areas of a building with the most potential for energy savings. After FirstView has identified areas for further investigation, additional analysis tools or on-site auditing can be better directed and deployed with greater efficiency.

My building has electric heat. Will FirstView work?

In the current beta release, FirstView works for buildings with gas heat and electric cooling, predictable process loads and continuous annual occupancy. Future versions of FirstView will accommodate more building types.

What if my building has multiple electric meters, or uses more than two fuels?

FirstView requires that users input at least 12 months of utility bills from two different fuel types (typically gas and electric). If a building has multiple electric meters or uses more than two fuels, these values must be combined before they are entered into FirstView.

How do I account for oil or propane deliveries?

FirstView relies on actual energy used, not delivered. Therefore oil and propane deliveries will need to be adjusted into monthly usage. Feel free to contact NBI for additional guidance on how these fuels can be accommodated. You can reach us at firstview@newbuildings.org

How are renewables handled?

The primary goal of FirstView is to account for the energy used within a building, regardless of generation method. Therefore, onsite renewable energy should be treated just like energy purchased from the utility. For example, let's consider a set of bills:

	December 2011	June 2011
Meter 1 (grid purchased electric)	10,000 kWh	-5,000 kWh
Meter 2 (Solar PV array)	5,000 kWh	15,000 kWh
Total usage input to FirstView	15,000 kWh	10,000 kWh

Does FirstView work in all climate zones?

Yes, FirstView works in all climate zones as long as the building has gas heat and electric cooling (if you're building does not use gas, hang in there, we are finalizing our all-electric building model).

Why is the Y axis W/SF?

Isn't gas included? Gas energy use, typically expressed in therms or Btus, is converted and expressed in the same units as the electric to facilitate the whole building energy balance analysis. Both fuels are combined in the plots that FirstView creates.

What does Average Energy on the Y axis mean?

The vertical axis for energy use is expressed in Normalized W/SF. In this sense, normalized means the energy use is normalized both to building size and to the number of days in a month. Let's consider an example for a 10,000 SF building: In April 2011, the electric bill indicates 25,000 kWh of usage. Since April has 30 days, this is $25,000/30 = 833.3$ kWh/day. We can then convert days to hours with $833.3/24 = 34.7$ kWh/h or 34.7 kW. The final step is to normalize by building size and convert kW to W, which gives $34.7*1000/10,000$ SF = 3.47W/SF. If for some reason this bill was for a period of only 15 days, the Average Energy would be doubled, or 6.9W/SF. Normalizing in this way makes the data inter-comparable between cases of different billing periods and building sizes and expands opportunities for comparisons. We have chosen to express the energy use in W/SF, but equivalent units of kWh/(Day*SF) or Therms/(Day*SF) could also be used.

Does FirstView work for non-office building types?

FirstView beta works for all building types with gas heat and electric cooling, predictable process loads and continuous annual occupancy. However the current spectrums (aggregated building data sets) that NBI uses for comparisons are heavily influenced by office buildings.

What if my building has large process loads?

Although the underlying energy model used by FirstView can be used to analyze buildings with consistent large process loads, the current web tool does not offer this functionality. If your building has modest process loads the FirstView analysis should not be affected. However, buildings with large process loads may cause FirstView to not allocate the process load energy accurately. For example, the model may assume that the large electric baseload from a datacenter provides sufficient heat to displace the need for a gas furnace. However, the datacenter may be designed such that the waste heat is vented outside your building and does not contribute to the heating/cooling load. Additionally, if your process load fluctuates, the driving factor behind that fluctuation, such as a production schedule in a machine shop, will not be captured in the FirstView model.

What types of automated responses does FirstView make?

FirstView provides automated responses for the following key performance indicators:

- Occupant load
- Heating and ventilation
- Cooling efficiency
- Controls
- Reheat
- Gas baseload

For more information about the automated responses generated by FirstView, see Understanding FirstView Results <http://newbuildings.org/sites/default/files/UnderstandingFirstView.pdf>

How does FirstView compare to other modeling packages, such as eQuest or EnergyPlus?

Other modeling tools are primarily intended for use during building design. These models are extremely detailed and provide a comprehensive framework for modeling hourly

energy use, with the primary purpose of sizing HVAC equipment and predicting comparative energy use.

The intention of FirstView is quite different. In this case the building is already constructed and operating. Often the as-built condition has changed from the original model and operating conditions may differ from the assumptions used during design. In many existing building cases a design model was not generated or cannot be found. Even if a model is available, a thorough audit and experienced modeling engineer would be required to properly calibrate the model to as-operated conditions. Each team may use a different approach and arrive at different conclusions. FirstView automates this process, providing a consistently calibrated energy model that can be compared from one building to the next. The FirstView approach aims to provide a lot of useful information at a low cost.

Who is using FirstView?

The U.S. Green Building Council is currently using FirstView to provide analysis of all commercial buildings in their Building Performance Partnership program. The Oregon Department of Energy used FirstView for a portfolio-level analysis of public schools. In that project, special considerations were made for the seasonal occupancy of schools.

Where do I go for a second view?

FirstView provides an initial diagnostic look at how buildings use energy. With that information, owners, operators and designers can make more informed decisions on how to prioritize their next steps. This might include conducting a more targeted audit, changing operating practices or working to minimize particular areas of a building's energy use. NBI has many resources to assist through our Advanced Building® suite of tools.

www.advancedbuildings.net

New Buildings Institute

New Buildings Institute (NBI) is a nonprofit organization working collaboratively with commercial building professionals and the energy industry to improve the energy performance of commercial buildings.