service sheet

greenpowerlabs

Predictive Energy Management Services for Building Managers and Operators

Commercial and residential buildings consume about one-third of the world's total energy. Building heating and cooling is the single largest item in building energy consumption. It is also the most expensive item in building energy cost as power for heating/cooling is purchased at peak rates.

Predictive energy management improves the efficiency of buildings energy use by anticipating and reacting to the changing weather conditions and requirements for heating and cooling in real time. Because weather and heating/cooling loads can vary significantly throughout the day, the impact of intelligent prediction is significant.

Green Power Labs is a leading predictive building energy management technology developer and service provider with over 13 years on the market. Predictive energy management encompasses predictive analytics services providing critical weather and energy data for building operations in real time, and predictive controls, using this data to optimize building performance and minimize energy use, cost and carbon footprint. Our **Predictive Building Control** platform allows for **reducing building heating and cooling energy costs by on average by 10% to 25%** while improving tenants' thermal comfort.

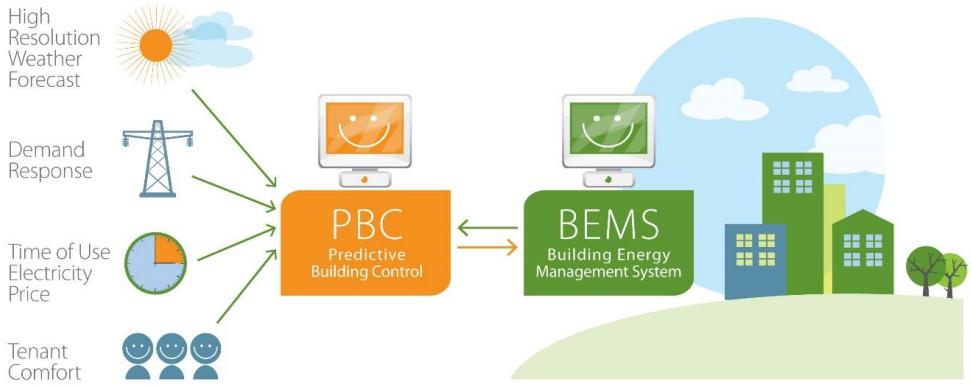
Predictive Building Control – What Is It?

Predictive Building Control is a supervisory control technology. It makes predictive weather and energy use, generation and storage data fully operational in real time which leads to significant improvements in building energy performance. Green Power Labs' Predictive Building Control continuously (at 15 minute intervals) produces optimal control set points for building heating, ventilation and air conditioning (HVAC) operations and sends these set points to the Building Energy Management system (BEMS). This improves the HVAC system performance and minimizes building energy use, costs and carbon footprint while achieving better comfort conditions in buildings.

How Predictive Building Control works?

Step 1: **Forecast weather at building site and building surfaces** (walls, roof) in real time. We utilize in-house mesoscale numerical weather prediction models and access to weather observation networks. This includes 3D modeling of the building and fisheye imagery analysis to consider obstructions to sunlight and map solar irradiation on building surfaces.

Step 2: **Model building energy use** in forecasted weather and occupancy conditions in real time. The Predictive Building Control system utilizes an **artificial intelligence-based building energy model** which reflects the relationship between building operating conditions (such as control variables, ambient weather variables, building occupancy and electric loads) and energy "response" of the building to these conditions (i.e. energy consumption and thermal zone temperatures).



Step 3. **Produce control set points to optimize building energy performance**. The Predictive Building Control system utilizes an **artificial intelligence-based optimizer** for selecting optimal scenarios for HVAC performance and building energy use. The optimization process is focused on maintaining thermal comfort in all individual thermal zones of a building while minimizing the overall energy use and costs. Other optimization criteria include utility rates such as time of use and demand charges, and demand response commitments.

Unique Features

- Operational weather and solar irradiation forecasting at building site and building walls, all in real time
- Solar irradiation forecasts for building roof and walls, all obstructions to sunlight considered, on clear-sky and cloudy days
- Artificial intelligence-based energy models forecast building energy use in real time
- Continuous learning sharpens PBC's control of the buildings' response to weather conditions
- As smart building brain, PBC develops multiple building energy use scenarios based on real time conditions and selects the option maximizing thermal comfort and minimizing energy use

Pre-Requisites

The only prerequisites to implement PBC are a digital building automation system and metering of the electrical and thermal energy consumption for the building. Please contact Green Power Labs for an assessment of your building's potential savings and a cost estimate to implement the service.

Low Risk Approach

- No upfront costs for clients
- No new hardware purchase required
- Service fee is a share of savings delivered by Predictive Building Control

Typical Savings

Standard building energy savings feature the range of 10 -25% of HVAC energy use. Savings at the higher end of this range are in heavily glazed buildings located in areas which experience variable weather conditions. Site testing has revealed that energy savings can be much higher if the building has historically experienced simultaneous heating and cooling.

Predictive Building Control - Absolute Energy Savings (kWh)						
Location	Large Office (500K ft2)		Medium Office (50K ft2)		High School (200K ft2)	
	Today	Pre-1980	Today	Pre-1980	Today	Pre-1980
Seattle	297826	380142	26614	33550	424422	408397
Chicago	206438	253242	27893	32043	376714	340618
Halifax	257870	305507	28430	34834	509460	468185

Predictive Building Control - Absolute Energy Savings ($)						
Location	Large Office (500K ft2)		Medium Office (50K ft2)		High School (200K ft2)	
	Today	Pre-1980	Today	Pre-1980	Today	Pre-1980
Seattle	$23,826	$30,411	$2,129	$2,684	$33,954	$32,672
Chicago	$16,515	$20,259	$2,231	$2,563	$30,137	$27,249
Halifax	$20,630	$24,441	$2,274	$2,787	$40,757	$37,455

Benefits

- HVAC energy cost reduced over 20%; happier *building owners*.
- Improved comfort in individual thermal zones: happier *tenants*.
- Reduced carbon emissions: successful corporate *sustainability teams.*
- Live building energy performance analytics: more productive *building managers*
- Improved building's energy benchmarking score: better suited for future lease
- LEED® certification support: option to claim additional LEED® points.
- A clear example of commitment to minimizing carbon footprint: a great story for the *President* for shareholders' annual meeting.

Case Study: Mona Campbell Building, Dalhousie University, Halifax

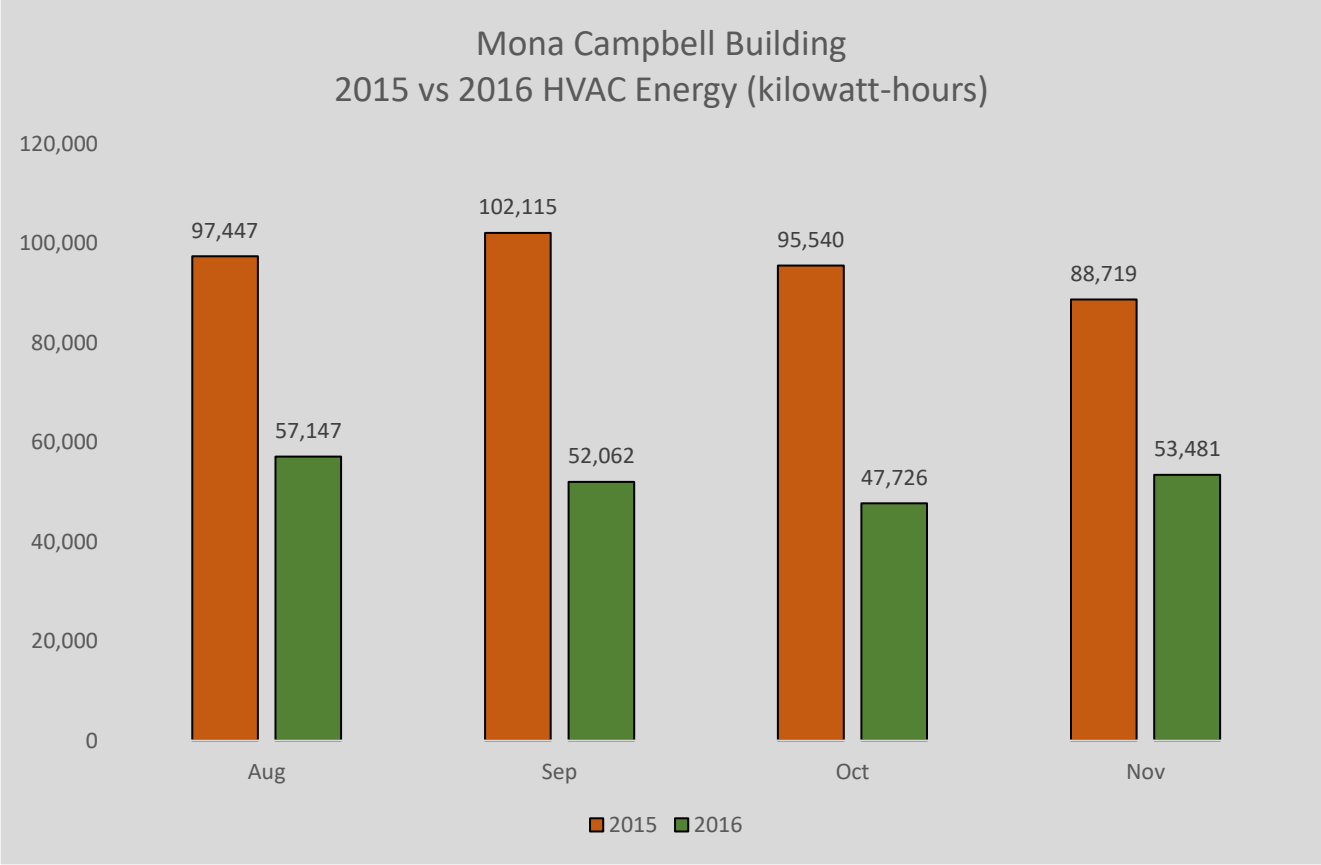
Client Building Profile:

- Construction Completed: September 2010
- Square Footage: 100,000 sq. ft
- Construction Standard: LEED Gold Certified
- Heating and Cooling Systems: distributed heat pump loop
- Energy Sources: Electricity and District Steam

Predictive Building Control Achievements:

Thermal comfort improvement: following installation of Predictive Building Control, the building zones remained within the established indoor temperature range 92 percent of the time, up from 85 percent.

Energy cost reduction: in the range of 40% - 50% of HVAC energy costs depending on the month.



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