



Monitoring-Based Commissioning of BAS: Reducing Energy Consumption Using Analytics

Case Study
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Overview

1670 Broadway is a 700,000 rentable square foot, 35-story Class A high-rise office tower located in downtown Denver, Colorado. In 2012, the building management team embarked on a major initiative to reduce energy consumption in the building. The process began with a retro-commissioning study funded in part by Xcel Energy followed by a major upgrade of the building automation system (BAS).



Commissioning of the BAS was completed in 2013 and Measurement and Verification (M&V) was conducted to verify the savings achieved.



The improvements were verified to save over \$180,000 in annual operating costs and they helped increase the Energy Star score to 85.

These improvements also contributed significantly to achieving the USGBC’s LEED-EB: O&M Gold certification.

Solution: Deploy SkySpark Software

As part of the BAS upgrade, SkyFoundry’s SkySpark® software was deployed by Group14 Engineering, PBC, a consulting engineering company that provides commissioning and SkySpark services in new and existing buildings. SkySpark® was used to provide thorough monitoring-based commissioning of the upgraded BAS after the initial upgrade and to achieve ongoing optimization.

	Annual Cost (\$)
Total	
Baseline - 2013	\$1,634,303
Current Year - 2014	\$1,451,641
Savings	\$182,662
Percent Saved	11%

SkySpark® software was integrated with the Tridium Niagara AX® control system with a live connection over the web. Near real time data is available via a cloud hosted version of the software and programmed rules monitor the operation of equipment at all times. There are 33 active rules programmed in the system that look for AHU schedule issues, temperature and pressure sensor errors, incorrect outside air damper control, equipment failures, zone temperatures out of range, and more.

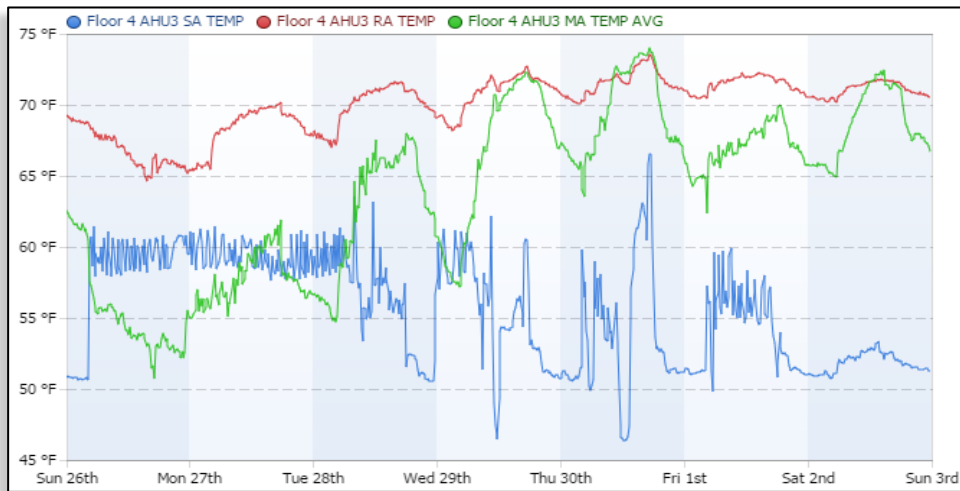


Figure 1: Visualization of Trend Data

The system also continuously monitors hundreds of zone devices to look for common issues. The following images display trend analysis and automatic faults or “Sparks” identified with programmed rules.

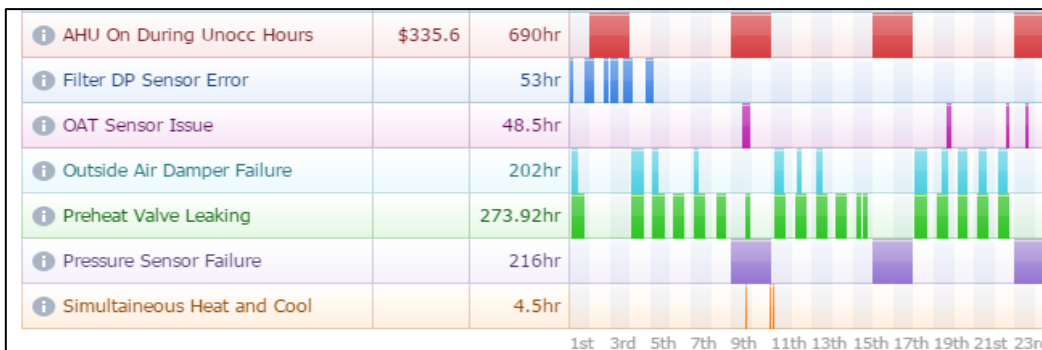


Figure 2: “Sparks” Clearly Show Operational Faults

SkySpark® is still active today and is used by the in-house facilities staff to troubleshoot issues, conduct preventative maintenance and perform ongoing commissioning to achieve continuous improvement. These efforts helped generate another 4% in electricity cost-savings from 2014 to 2015 and continue to improve ongoing troubleshooting and increase energy efficiency year after year.

On-Going Monitoring

As part of the on-going monitoring and energy management effort, Group14 has deployed in-house measurement and verification analytics to track energy use and automatically calculate energy savings. Baseline energy is calculated with regressions that include both outdoor air temperature and hour of the week. The baseline energy is then adjusted for the weather conditions of the current year and calculated for each unique hour of the year.

The following chart displays the monthly energy use in 2016 compared with weather adjusted baselines in previous years:

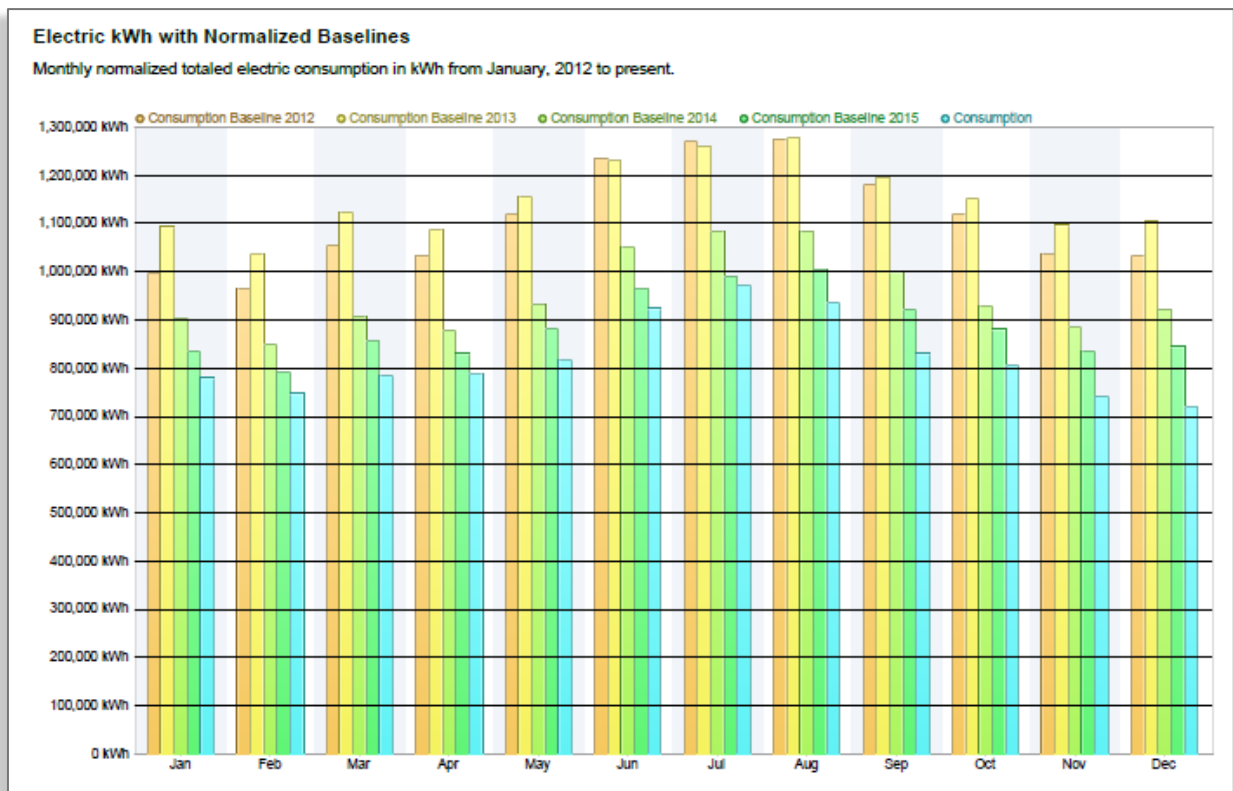


Figure 3: Monthly Energy Use in 2016

Energy use can be further drilled down to compare the real time electric demand data to the projected baseline. The next chart displays the significant drop in electric demand during both occupied and unoccupied hours in December of 2016.

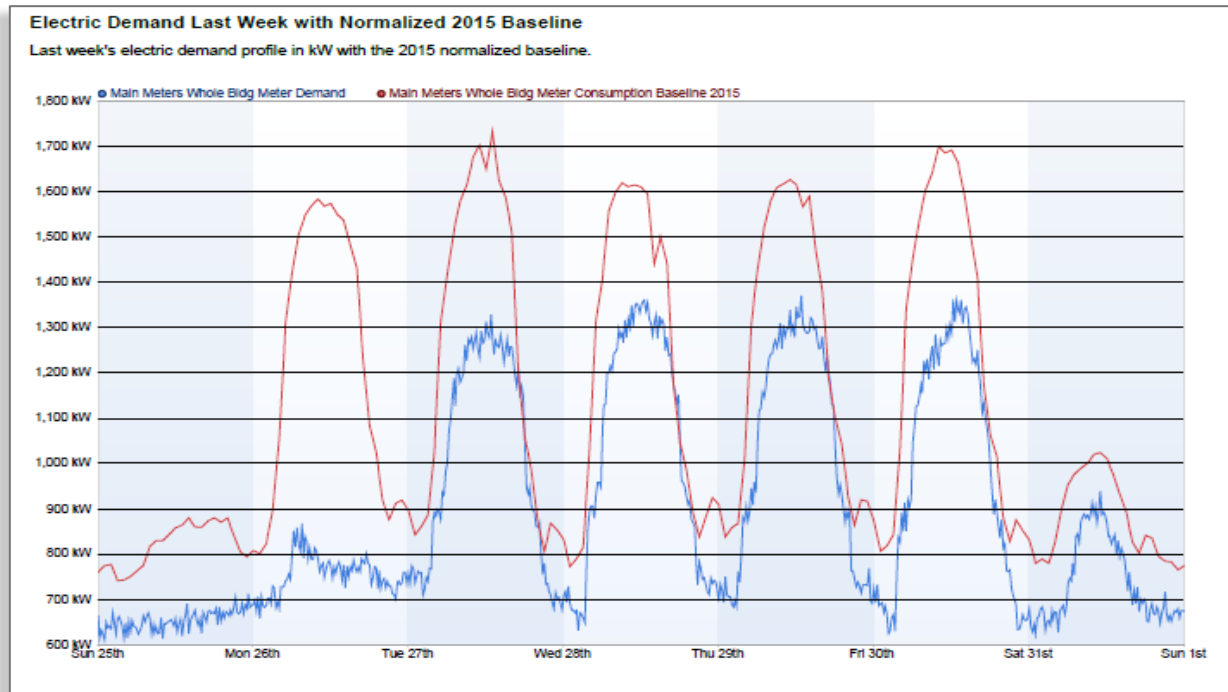


Figure 4: Electricity Demand During Occupied and Unoccupied Hours

The energy savings were achieved by installing LED lighting, upgrading terminal boxes from pneumatic to DDC, and making continuous operational improvements.

On-Going M&V Analytics

The M&V Analytics developed by Group14 automatically calculate the energy savings achieved each month with a totalized value calculated over the course of each year. The following year-over-year energy cost-savings were automatically calculated and verified using SkySpark®.

Metric	2015 vs. 2014	2016 vs. 2015
Annual Cost	\$ 1,117,679	\$ 1,035,575
Annual Savings	\$ 77,903	\$ 84,823
% Savings	6 %	7.6 %

Table 1: Year-Over-Year Savings for 2015 and 2016

Summary

Project Scope Summary

SkySpark® can help identify retuning strategies by analyzing years' worth of data quickly and finding recurring issues. When monitoring needs to be done, SkySpark® can use the data to estimate the savings without using temporary data logging.

Performance Summary

SkySpark® continues to be a powerful tool for the 1670 Broadway team to perform ongoing commissioning, track energy at a large quantity of sub meters, and improve building performance year after year.

Additional Information

This case study was compiled by Group 14 with help from SkyFoundry. Group14 Engineering, PBC is a consulting engineering firm that provides energy efficiency, sustainability and commissioning services for new and existing buildings. To further drive energy efficiency and optimize building operation, Group14 performs SkySpark® integration, development, and software hosting for facilities and campuses across the country. If you have any questions or would like additional case studies, please contact SkyFoundry.



SkySpark® – Analytics for a World of Smart Device Data

The past decade has seen dramatic advances in automation systems and smart devices. From IP connected systems using a variety of standard protocols, to support for web services and xml data schemas, it is now possible to get the data produced by the wide range of devices found in today's buildings and equipment systems.

Access to this data opens up new opportunities for the creation of value-added services to help businesses reduce energy consumption and cost and to identify opportunities to enhance operations through improved control, and replacement or repair of capital equipment. Access to the data is just the first step in that journey, however. The new challenge is how to manage and derive value from the exploding amount of data available from these smart and connected devices. SkyFoundry SkySpark directly addresses this challenge.

About SkyFoundry

SkyFoundry's mission is to provide software solutions for the "Internet of Things". Areas of focus include:

- Building automation and facility management
- Energy management, utility data analytics
- Remote device and equipment monitoring
- Asset management

SkyFoundry's software helps customers derive value from their investments in smart systems. Learn more and request a demonstration at www.skyfoundry.com.



The new frontier is to efficiently manage and analyze data to find what matters™

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