

# SiteWatch Case Study

## Measurement and Verification for Office HVAC Fan VFDs

### Summary

This case study summarizes support provided to a channel partner to measure and verify savings from installing variable speed controls on air handling unit supply and return fans. The partner engaged with SiteWatch to provide energy monitoring using Panoramic Power<sup>1</sup> sensors and bridges. The result was a successful energy efficiency project that reduced utility costs and received an incentive from the local electric utility. The incentive was based on 'before' and 'after' energy data with customized SiteWatch reporting.

The customer deployed snap-on/snap-off wireless sensors on supply and return fans, and a bridge/gateway to allow sensors to communicate with the cloud-based platform, Power Radar<sup>1</sup>. Data was sent using a cellular connection, rather than wi-fi, limiting the need for support from onsite IT personnel while reducing time to deploy and integrate the energy monitoring system.

SiteWatch supported the installation in the following ways:

**Identifying Wasted Energy** – Reviewing equipment operation through Power Radar, the customer used SiteWatch to quantify the cost of baseline equipment operations and identified that existing equipment was operating when not needed, allowing for potential savings.

**Early Indication of Measure Non-Performance** - By setting real-time alerts for fans running during off hours and fans exceeding maximum power setpoints, the partner identified when the VFDs were not performing as designed. Without early measurement, the partner could have lost utility incentives used to make the project financially viable as well as potential energy savings.

**Troubleshooting and Commissioning** – SiteWatch worked with the partner to coordinate with the equipment manufacturer, and leverage collected energy use data, the issue with VFD settings was identified and fixed.

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<sup>1</sup> Panoramic Power and PowerRadar are registered trademarks of Panoramic Power Ltd in the United Kingdom and United States of America

## SiteWatch Successes

**SiteWatch calculates annual baseline energy use** – The existing supply and return fans were running at a constant speed regardless of outside air temperature conditions or building occupancy. **Baseline energy cost for a single air handling unit was more than \$60,000 per year.**

Figure 1: Baseline AHU fan Heat Map showing constant operation<sup>2</sup>

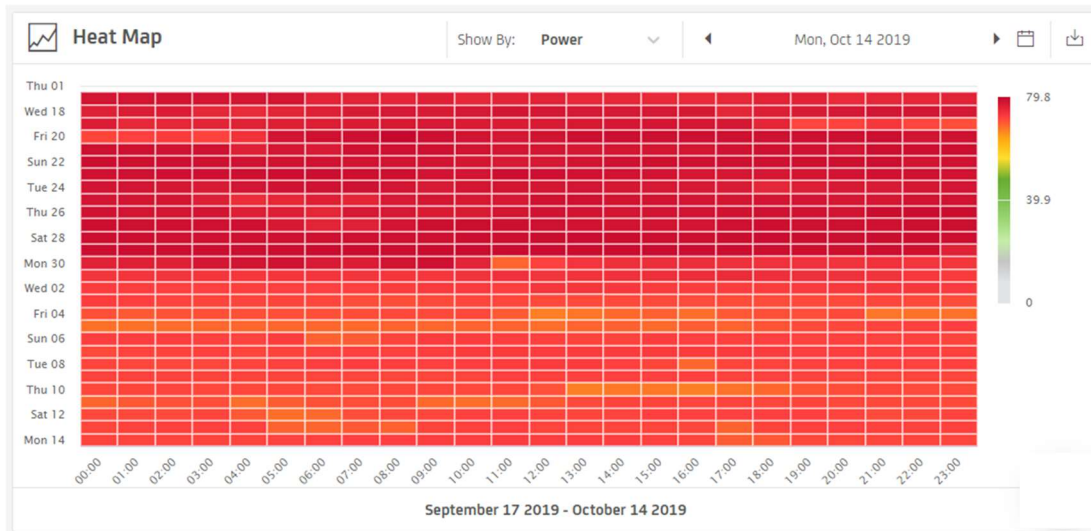
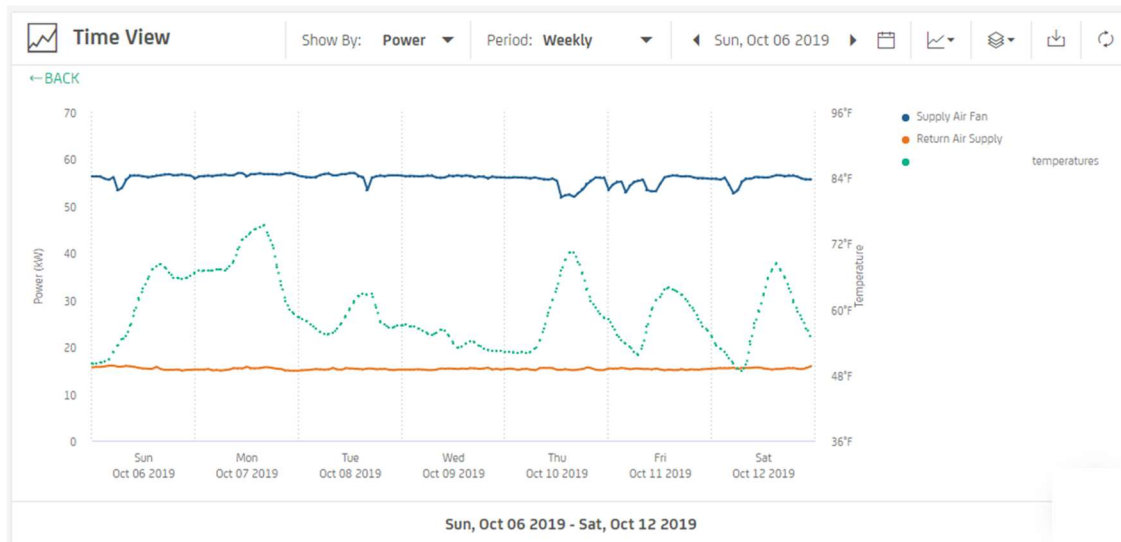


Figure 2: Baseline AHU fan kW weekly load profile and OA temperature



<sup>2</sup> Views from Power Radar. Panoramic Power and PowerRadar are registered trademarks of Panoramic Power Ltd in the United Kingdom and United States of America.

**Site Watch Application** – Baseline usage was calculated with a custom report using actual onsite weather and fan energy use data. The heat map visually verified there was little variation in fan operation over time, regardless of time-of-day or day-of-week.

**Variable speed device was installed, but not saving as expected** – The channel partner installed the variable speed device and programmed an operating schedule to match expected building occupancy. With the new schedule in place, the fan operated fewer hours than before, but they were not reducing speed to match HVAC system demand, so energy use during fan run hours actually increased over the baseline use (despite fewer hours of operation).

*Figure 3: Initial post period AHU fan kW showing fans off overnight and on Sundays, though with higher kW during weekdays and little variation in running kW*



**Site Watch Application** – SiteWatch identified higher-than-expected energy use during weekday periods when the fans were on. Variable speed devices should have allowed motors to unload, reducing kW. In fact, energy use during running periods increased from the baseline.

**Channel Partner uses SiteWatch to help commission VFD** – SiteWatch contacted the equipment manufacturer on behalf of the channel partner, sending energy use data to demonstrate how the VFD was not unloading as intended. A programming change was recommended and deployed by the channel partner.

Figure 4: Final post period AHU fan kW



**Site Watch Application** – After the re-programming, SiteWatch verified the drive was operating as designed. Ongoing measurement in the post-installation period (after the issue was fixed) was used to calculate annual savings for the project and secure utility incentives. **The post annual energy use was approximately \$20,000 per year, meaning the customer saved almost \$40,000 in year one alone! For the life of the project (10 years minimum) savings are expected to exceed \$400,000!**

## How does a customer benefit from SiteWatch?

Using SiteWatch’s low-cost, snap-on/snap-off energy monitoring solution powered by Panoramic Power, a performance issue with an energy efficiency project was identified and fixed, making the installation successful by ensuring 1) the project actually reduced energy costs and 2) the project received utility incentive based on annual energy savings. At the conclusion of the M&V process, the customer retained the energy monitoring system and will have ongoing, real-time energy data for a critical HVAC system.

Over time, the fan VFDs may fall out of commissioning as facility personnel override automated controls or equipment begins to have mechanical/electrical issues. With SiteWatch ongoing monitoring, these issues can be identified and fixed, allowing the customer to benefit from reduced energy use for the life of the equipment.

The first year energy savings quantified by SiteWatch paid for all hardware and ongoing costs within 6 months. Lifetime monitoring and support costs are recovered from permanently reduced operating costs of at least 6x the annual support cost.

This study does not reflect additional benefits to the site from early warning of equipment failure and continuous commissioning of the AHU. Savings paid for with the fan VFD project allowed



the site to expand monitoring to other equipment, such as chillers. SiteWatch will continue to work with this customer to provide annual reporting on equipment operations and provide additional measurement and verification on other energy saving projects.

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