EDF ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

How 77 West Wacker Found a Competitive Edge While Lowering Energy Use

A case study in smart energy management in Class A buildings

Smart building technology investments **typically pay for themselves within one or two years** by delivering energy savings and other operational efficiencies.

JLL was well on the way to making 77 West Wacker an energy efficient Class A building. Then in 2014, they partnered with Environmental Defense Fund and found even more energy and cost reduction opportunities. JLL's success story is a model for energy management in Class A buildings.

Summary

77 West Wacker is an iconic building in downtown Chicago. The building rises 50 floors to support more than 16 businesses with over 950,000 square feet of rentable space. When the building was constructed in 1992, the cost of electricity was cheap, the timeless architectural style incorporated a lot of glass, and the news of the day was about sick building syndrome. The building was mechanically designed with a pneumatic HVAC system versus direct-digital control used today, creating large opportunities for energy efficiency.

So how did building management company JLL take this all-electric building from struggling for Energy Star rating to a Class A standout in 10 short years?

About JLL (NYSE: JLL) JLL is a professional services and investment management firm offering specialized real estate services to clients seeking increased value by owning, occupying and investing in real estate. With annual gross revenue of $4.5 billion, JLL has more than 200 corporate offices, operates in 75 countries and has a global workforce of approximately 53,000. On behalf of its clients, the firm provides management and real estate outsourcing services for a property portfolio of 3.0 billion square feet.

About Environmental Defense Fund (EDF), a leading international nonprofit organization, creates transformational solutions to the most serious environmental problems. EDF links science, economics, law and innovative private-sector partnerships.

About EDF Climate Corps Climate Corps is EDF's innovative summer fellowship program that places specially trained graduate students within organizations as dedicated energy problem solvers.

Current ASHRAE and OSHA standards call for 1,000 parts per million of CO2. Install sensors to get transparency into your CO2 data and stop paying to bring in more outside air than you need to.

The 77 West Wacker team also took on a full retrocommissioning in 2010, whereby they implemented all recommendations in the first 90 days, seeing up to 900,000 kWh of immediate energy reductions.

Tip: Get a full-service contract with your automation system software provider so you can utilize unused maintenance hours for energy efficiency customizations.

The Story

It all began with the simple gesture of sharing the building's energy contract and electric bills.

Myrna Coronado-Brookover, a senior vice president and general manager at JLL, oversees the management of 77 West Wacker. Her job is to constantly maximize value, control operating expenses, and keep the building attractive to current and potential tenants. With energy costs amounting to the second largest expense line item in the building's budget, she knew she had to create a team effort to tackle energy efficiency.

Tony Marzano is JLL's chief engineer for 77 West Wacker. His goal is to run an efficient operation while creating value for JLL. In 2004, Tony was at the meeting when Myrna handed over the energy contract and the electric bills to the engineering team and challenged them to collaborate with her on finding ways to reduce energy use.

A unique partnership was being formulated between business and operations at 77 West Wacker. The two departments now shared a common goal: to be more sustainable while increasing the building's competitiveness in the Class A commercial real estate market.

Together, Myrna and Tony put together an aggressive strategy for 77 West Wacker to achieve ENERGY STAR®, LEED EBOM Gold and become one of the most energy efficient Class A buildings in the U.S., joining Retrofit Chicago and later also achieving BOMA 360 designation. The duo was able to bring a new mindset to managing 77 West Wacker by focusing on education, automation, and data.

Implementation

One of the biggest obstacles for 77 West Wacker in attaining energy efficiency was complacency. Like many established buildings, there was a history of doing things the way they'd always been done. At least, that is, until Myrna pointed to the energy bills and made it clear that the way it was always done was inefficient, from an energy and expense standpoint. However, there were already some great ideas for efficiency improvements coming from the engineers of 77 West Wacker. The engineers just needed the impetus and support from management to act.

Data

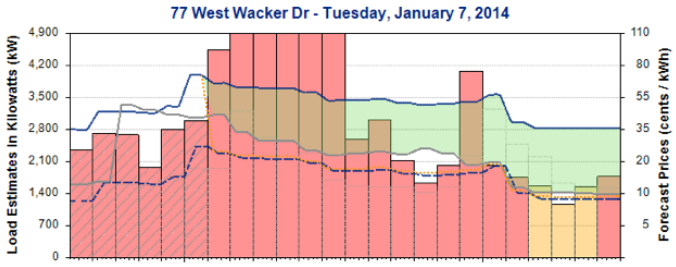
At the core of any organization's energy management is data. Without data, there is no transparency into a building's energy use, no baseline to measure improvement, and no ability to monitor trends. But as Tony witnessed, the electric bills didn't provide relevant information about how the energy was being utilized. At 77 West Wacker, Tony's first move toward more abundant and transparent data was to digitize the 28 base building electric meters and pull the nine highest consuming meters into Johnson Control's GridConnect dashboard. By monitoring real-time energy consumption, Tony and his team could immediately optimize their energy use to when prices were more favorable.

Next, Tony and his team collected CO2 information by installing sensors. For Class A buildings built in the 1990s, the standard operating procedure was to call for elevated outside ventilation levels, which costs more to heat or cool a building depending on the time of the year. By adjusting 77 West Wacker's ventilation systems to current ASHRAE and OSHA standards for allowable CO2 exposure, Tony saved energy (and money) because he could bring less outside air into the building than required in the past.

A key obstacle for any Class A building engineer is having enough time, resources and expertise to collect and analyze data. This is where Environmental Defense Fund's Climate Corps program was able to provide hands-on help. EDF recruited and trained graduate student Karan Gupta to work at 77 West Wacker during the summer of 2014. Through his analysis, the JLL team was able to identify an energy reduction goal of 5 million kilowatt hours by 2018. He also uncovered opportunities to reduce 2 million kilowatt hours, helped to enhance the building's demand response program, and helped facilitate the team's goal of whole building energy reduction by launching a tenant engagement project.

Automation

The more accurate and holistic your data, the more control you have over energy use. However, because of the size of 77 West Wacker, like all Class A buildings, the ability to efficiently manage data and make real-time adjustments falls on the building's automation system. Unfortunately, 77 West Wacker was underutilizing their automation system. The key to maximizing savings for the building was to make sure Tony's team could customize their automation system based on what their data told them. By retrofitting, (during regular tenant build-outs), to Direct Digital Control, they were able to gain precise control over fan powered boxes, which triggered unique Building Automation System (BAS) programming opportunities.



Having control over all the fan powered boxes is a game changer in that it allows the operator to set a global room temperature set point. In the summer this can be utilized to pre-cool the building and all its contents below normal, during the late night and early morning hours when the energy is at its least expensive; thereby deferring the building's peak demand period. The adverse is true for winter operation. For example: when the polar vortex hit on January 7, 2014, the energy prices went through the roof, peaking at $1.73 per kWh; 77 West Wacker was able to reduce over 1,000 kWh per hour during this 12-hour period. This resulted in not only a banner day for the engineering team, but also for participation in demand response.

Tip: if you have great data, and an educated team of building engineers, you will find low/mid-hanging fruit for energy savings.

The team at 77 West Wacker also established a list of non-critical versus critical systems to help reduce energy use on a daily basis, and when the grid called for reductions.

Every building is unique. For 77 West Wacker, there were some necessary adjustments that had to be made to the automation system in order to take advantage of easily achievable energy savings. For example, Tony's engineering team adjusted the programming so that the building was not actively heating and cooling simultaneously, (unfortunately a common occurrence in many buildings). They also implemented a BAS global heat disable function, which turns off resistive heat coils on fan-power-boxes with a single command. And as mentioned, they automated a pre-cooling and night purge control sequence, which eliminated daytime electric demand spikes.

Through these and other energy management innovations, the 77 West Wacker team was able to decrease electrical expenses by 47%, from $1.3 million in 2009 to $686,000 in 2012. Today, 77 West Wacker's energy costs are approximately $.83/psf, (versus the original cost of $1.25/psf), an enormous accomplishment for an all-electric building.

Education

A building owner can inspire their staff to seek knowledge, information, and collaboration around best energy management practices. For Myrna, this included a scrutiny of the expenses, a renegotiation of energy contracts, and a rethinking of how 77 West Wacker teams worked together. For Tony, the education path was clearer: get himself and his team credentialed for Building Operator Certification (BOC) Levels 1 and 2; take energy and environment classes through I.U.O.E Local 399; and complete the Systems Maintenance Administration (SMA) designation.

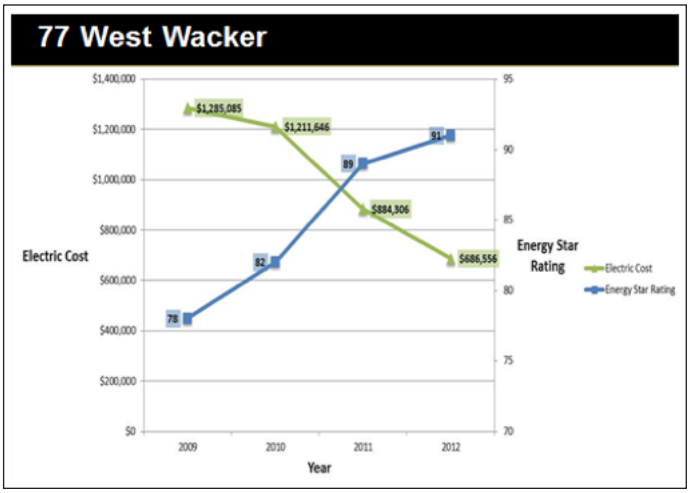
Education is also the key defense against the barrier of complacency. When considering retrocommissioning 77 West Wacker, the team could have replaced equipment that had lasted 20 years with the same piece of equipment - after all 20 years is a decent ROI. Instead, they invested in efficiency and the long-term gains of decreased energy use.

While management and staff education is ongoing, there is another key stakeholder that must be involved in any building's energy management strategy: the tenants. A key barrier in tenant engagement around energy efficiency is shifting the mindset that energy use at work is different from energy use at home. In 2014, 77 West Wacker began educating tenants in energy efficiency. They started by obtaining baseline data, performed analysis for efficiency opportunities, and provided tenants with the information and impetus to act. This tenant engagement project is another way that 77 West Wacker has developed a scalable solution that can serve the JLL building portfolio.

Results

77 West Wacker's impressive results were a collaborative success story, with management seeing the panoramic view of building efficiency, and the engineers managing and optimizing the daily details.

- In 2009 energy expenses were $1.3 million
- By the end of 2009, 77 West Wacker achieved an ENERGY STAR rating of 78
- In 2010, they completed retrocommissioning; expenses were driven down by 27%, and they achieved an ENERGY STAR rating of 89
- Between 2010 and 2011, they reduced energy expenses by another $300,000
- By 2012 energy expenses dropped to $686,000



From 2009 to 2012, the team at 77 West Wacker reduced base operations energy expenses by almost half (47%).

Moving Forward

At the end of 2012, 77 West Wacker had a record high ENERGY STAR rating of 91 and was holding steady on energy expenses. But they didn't stop there. With the help of EDF Climate Corps, they continued to find opportunities to become more efficient, take advantage of demand response programs, and dive deeper into real-time data and automation. 77 West Wacker had already reduced overall energy use by 32%. But they decided to go even further by joining the City's Retrofit Chicago program. They have now committed to an additional energy reduction of 26.5% by 2018, directing their strategy toward tenant engagement.