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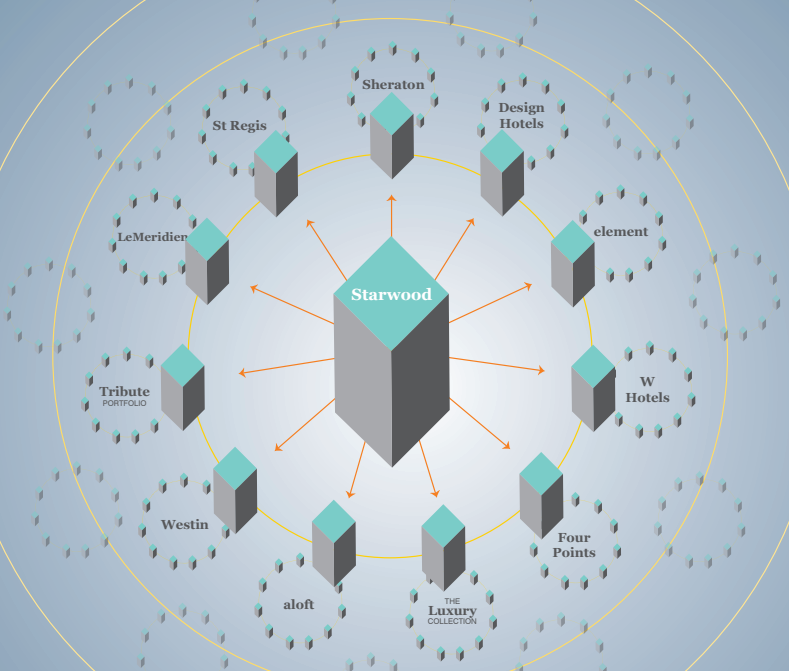

Accelerating Sustainability Across Portfolios

Starwood's tool for reducing energy and water use at +1,270 properties

"What makes our sustainability goals different is that we've included our franchises. We never have distinguished properties by the different types of ownership, and so all of our corporate goals are mandatory across the entire portfolio."

Andrea Pinabell, Vice President of Sustainability, Starwood

Summary

As part of the strategy to reduce the environmental impact of its business, the sustainability team at Starwood Hotels & Resorts Worldwide, Inc. (Starwood) needed an easy way for its more than 1,270 properties to better understand and visualize their energy and water reduction performance. Based on the recommendations of Starwood's sustainability team, facilities had already implemented a number of low- and no-cost efficiency efforts, but the next round of projects would require capital expenditure. To support all Starwood properties, including franchises, in making clear business cases for efficiency projects, the sustainability team partnered with EDF Climate Corps to create a performance measurement tool. This would enable facility managers to visualize and monitor actual energy and water performance compared to modeled performance. By reducing labor costs, facilitating more informed decision making and enabling locations to fix leaks and other problems more quickly, the tool could save more than $20,000 annually at each property.

Responsibility Across the Portfolio

As part of Starwood's overarching strategy as a responsible company, and knowing that sustainability can strengthen businesses and enhance resiliency, the company announced its 30/20 by 20 environmental goals in 2009. These goals are to reduce Starwood's global energy consumption and greenhouse gas emissions by 30 percent and water consumption by 20 percent per built room by 2020. In contrast to others in the hospitality industry, these goals are set for all locations, regardless of whether they are owned, managed or franchised by Starwood.

About Starwood Hotels & Resorts Worldwide, Inc.
Starwood is one of the leading hotel and leisure companies in the world with more than 1,270 properties in some 100 countries and over 180,000 employees at its owned and managed properties.

About EDF Climate Corps
EDF Climate Corps embeds trained graduate students in organizations to help meet their energy goals by accelerating clean energy projects in their facilities. In just one summer, fellows get clean energy projects on the fast track to accomplishment – improving the organization's bottom line and environmental impact at the same time.

Foundational Efficiency Efforts

Since 2009, more than 80 percent of Starwood properties globally have implemented these low-and no-cost energy efficiency projects, resulting in significant reductions in energy and water use:

- Establishing cooling and heating set points
- Upgrading chilled water pump variable frequency drives
- Upgrading guestroom fan control units
- Installing garage exhaust control and co-monitoring sensors
- Upgrading to efficient lighting in interiors and parking garages
- Replacing candelabra lamps
- Installing occupancy sensors
- Sealing elevator shafts to reduce infiltration and exfiltration
- Installing energy recovery ventilators
- Upgrading domestic hot water systems and controls
- Converting to drip irrigation for landscaping
- Installing single showerheads
- Installing faucet aerators

To meet these goals, Andrea Pinabell, Vice President of Sustainability at Starwood, and her team implemented a three-part approach. The first part calls upon properties to implement a number of what Starwood calls "foundational initiatives." These are low-or no-cost initiatives and projects, including installing high efficiency lighting, low-flow faucets and fixtures and establishing heating and cooling set points that have a Return on Investment (ROI) of approximately one year. The second part requires capital expenditures to implement larger projects such as upgrades to boilers, chillers and other engineering and mechanical systems. The third part focuses on implementing new, innovative technologies.

Compared to both the foundational efficiency and the technology projects, the initiatives requiring up-front capital expenditure were progressing at a slower rate. After digging into why that might be, Pinabell found that owners and asset managers traditionally prioritize spending money on initiatives that are visible to guests, such as lobby and room renovations. Most of the sustainability projects that would result in energy and water savings, however, were "back-of-house" items that would improve the guest experience (i.e. through less noise and thermal comfort), but in ways that would be less readily perceptible.

Given this, Pinabell determined that sustainability projects would need a strong business case to compete with these other initiatives for funding. If it was clear that these efficiency projects could bring a return equal to or greater than that of the front-of-house projects, they would be able to secure capital.

The difficulty in making the business case for efficiency initiatives was the uncertainty surrounding fluctuations in energy and water use. In many cases, it was impossible for facility managers to tell if changes were due to a shift in the weather, an increase or decrease in occupancy rates, a difference in guest behavior or the establishment of programs like Starwood's "Make a Green Choice" program.

Having previously participated in EDF Climate Corps, a program that embeds trained graduate students within companies to accelerate energy projects over the summer, Pinabell thought an EDF Climate Corps fellow might be able to build a tool that could help. If facility staff could see how efficiently or inefficiently their locations were performing with regard to energy and water use, managers could build a more certain business case for efficiency projects.

Building a Performance Measurement Tool

EDF matched Joseph Nyangon, a doctoral candidate in energy finance and economics at the Center for Energy and Environmental Policy (CEEP), University of Delaware, with the Starwood project in the summer of 2015. When he arrived at the Stamford headquarters, Pinabell explained the challenge they were facing and tasked Nyangon with creating a performance measurement tool to help facilities managers visualize their energy and water performance.

Nyangon set out to collect his data. He used Starwood's Environmental Impact Assessment Survey (EIAS) to collect total energy data and total water consumption. He also used other databases such as Resource Advisor, a platform owned and operated by Schneider Electric. Nyangon made sure the data was complete for the time period he wanted to analyze, using statistical techniques to account for missing data points and outliers. He then normalized the data, making it possible to compare locations with different numbers of beds and occupied space.

With complete data that was comparable across locations, Nyangon used a regression model to analyze what factors had the most impact on energy and water use. In the end, he found that occupancy rates, heating degree days and cooling degree days were most influential.

Westin Singapore

Beyond performing the regression analysis, Nyangon aimed to make the tool as useful and as feasible as possible. To this end, he established weekly meetings with stakeholders from across multiple departments to get their advice and perspectives. As a result of these meetings, Nyangon realized he would need to establish an automatic way to import monthly energy and water data into the tool, which would also need to be easily transferred onto Starwood's intranet for facilities managers to use. Knowing these factors early on helped ensure success. Nyangon also consulted with industry experts, notably, Dr. John Byrne, Distinguished Professor of Energy Climate Policy at the University of Delaware, who offered valuable advice on strategies for benchmarking energy efficiency in buildings by means of regression analysis.

"The success of this project was entirely dependent on two main factors: the right level of technical knowledge to articulate the data science metrics and create the right visualization to communicate the core business metrics and financial worthiness of the project."

Joseph Nyangon, EDF Climate Corps Alumnus

Finally, Nyangon looked at the savings that could result if all of Starwood's facilities used the tool. He wanted to ensure it would be worth the time and effort put into not only making it, but also encouraging facilities managers to use it. His findings revealed that through faster decision-making, labor savings and quicker identification of problems, such as hidden water leaks, air duck leaks and faulty fittings, each facility in Starwood's portfolio could save more than $20,000 annually. Scaled across all 1,270 facilities, this amounts to more than $2.4 million in savings.

Global Implementation and Results

At this point, Nyangon's summer fellowship was complete, and it was up to Pinabell and the sustainability team to implement the tool. One of the main concerns stakeholders had was that it would need to be functional for users with a range of education levels in a number of different languages. Despite complicated regression techniques, the tool needed to end up on a visually appealing and easy to interpret dashboard. To that end, the basic tool is represented visually on the intranet highlighting monthly energy and water use patterns. Then, if users are curious, they can explore a "Learn More" section that describes how the tool accounts for weather patterns, occupancy and different size facilities. All they need to know on the main dashboard is that these factors – the noise – have been taken out.

Factors Affecting Energy and Water Performance

Nyangon looked at several factors to determine which had the greatest influence on energy and water use, including:

- Occupancy rates
- Operating schedules
- Heating degree days
- Cooling degree days
- The presence of facilities such as restaurants, heated pools and in-house laundry facilities
- Participation in the "Make a Green Choice" program

Andrea Pinabell and Joseph Nyangon at Starwood's headquarters in Stamford, Connecticut.

"How the tool works is fairly complicated pulling in multiple types of data, but you don't have to understand regression or be a highly technical person to use the tool. That was one of our main objectives."

Andrea Pinabell, Vice President of Sustainability, Starwood

In October 2015, the tool was rolled out globally. To date, the help desk has heard only positive feedback. Facility managers highlight that they find it very interesting and useful in eliminating feedback about weather and occupancy rates. In addition, hotels have been able to use the data to take immediate action. For example, one location reported that they were able to detect a water leak much earlier than they might have been able to. They noticed that their water use had an unusual spike one month, so they investigated and quickly fixed a leak. A month later, the facility's water performance was back on track.

Moving Forward

In the coming months and years, Nyangon's tool will have several functions for Starwood. Soon, all of Starwood's facility managers will be using it to help complete sustainability surveys. In addition, Pinabell's team will use the tool to cross-check progress on their 30/20 by 20 goals to see how each facility is doing on a monthly basis. Beyond that, because the tool makes it possible to compare locations with different occupancies and sizes, there is the possibility that facilities will be able to use their dashboard as a benchmarking device. In that way, all Westin properties would be able to compare their performance against each other, or all of the facilities in a certain climate zone could compare their energy and water use. Already, the tool is proving useful, and it has the potential to become increasingly so in the future. With an estimated 187,000 employees in the world, the energy, water and cost savings that could result from developing tools like this across the board are staggering.