SAP Thought Leadership
Green IT

SUSTAINABLE ENERGY MANAGEMENT IN THE DATA CENTER

A HOLISTIC APPROACH TO ENERGY OPTIMIZATION

THE BEST-RUN BUSINESSES RUN SAP™

A fully integrated energy management approach in your data center can deliver the energy visibility you need. This approach can help you achieve improvements in system utilization, capacity planning, workload management, and smart capital investment. In this paper, you will learn how software from SAP and its Green IT Community member Sentilla Corporation can deliver these benefits.

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EXECUTIVE SUMMARY

TAKE CONTROL OF YOUR DATA CENTER'S ENERGY USAGE

Energy management is an emerging challenge in data center operations. Not only is data center energy consumption the fastest-growing cost, it is also the single largest line item in a CIO's operating expenses. Unfortunately, companies have little visibility into how energy is used in the data center and virtually no insight into the financial and sustainability impacts of ongoing IT operations.

Companies lack the ability to monitor energy consumption of each component that runs in the data center – the servers, the racks, the power equipment, and more. They also lack the ability to analyze energy consumption data to make improvements to reduce not only energy and cost but also carbon emissions. This is crucial, because as sustainability initiatives become standard business practice for companies, data centers must be integrated into an organization's overall carbon emissions monitoring and reduction strategy.

By employing the following three-phase approach to establish comprehensive energy management in the data center, you gain the complete visibility you need to optimize energy usage. In the first phase, you can use energy measurement software and metering technology to continuously monitor energy usage for every component running in your data center. In the second phase, you can leverage your energy monitoring data by employing analytics software to help you optimize database hardware and operations. Finally, in the third phase, you can use carbon management software to streamline reporting and monitor critical assets in real time to help ensure that you are meeting emissions targets.

THE ENERGY-OPTIMIZED DATA CENTER

COMPREHENSIVE ENERGY MANAGEMENT TO RUN LEANER AND GREENER

The lack of energy insight prevents you from answering critical questions about your data center operations such as: What components consume the most energy? How does consumption change on a daily, weekly, monthly, or yearly basis? Given the fact that cooling can account for over 50% of your data center energy costs, having a more granular, comprehensive level of energy monitoring can deliver tremendous cost savings that you may otherwise miss.

Data centers are the central nervous system of the enterprises they serve. They host highly sophisticated applications that provide powerful business processes and analytics to support all aspects of the business. Not only do these applications require large amounts of data, but business demand for them is growing – resulting in strained data center capacity and rising energy costs. This is why today's CIO must not only improve service delivery but also manage data centers in a highly cost- and energy-efficient manner. Reducing energy use as well as carbon emissions is also a critical part of a company's sustainability initiatives.

Unfortunately, you probably have little visibility into your data center's energy use, or of the associated financial and sustainability impacts. The following describes how a fully integrated energy management approach in your data center can deliver the energy visibility you need. This approach can help you achieve improvements in system utilization, capacity and capital planning, and workload management. You will also learn how software from SAP and its Green IT Community member Sentilla Corporation can deliver these benefits.

END-TO-END ENERGY MANAGEMENT

A THREE-PHASE APPROACH TO ENERGY OPTIMIZATION

Traditional approaches to reduce power consumption in the data center are effective. Virtualization and consolidation reduce the number of dedicated servers and other components required to meet service demand. Moreover, you can rearrange your data center architecture to minimize hot spots and use cooling equipment more effectively. However, the challenge for many data center managers is that they cannot precisely measure the effectiveness of these improvements, nor can they prioritize which improvement projects will yield the greatest energy and cost savings.

For effective energy consumption management in the data center, you need a holistic approach that consists of three critical steps:

- **Continuously measure the energy consumption and heat of all of the components in your data center.** Establish real-time energy and heat monitoring of all the components involved in your data center, including the facilities, power distribution units (PDUs), uninterruptible power supply (UPS), cooling equipment, servers, racks, and so on. This comprehensive data will help you establish a complete energy baseline from which specific improvements can be made.

Most likely, your data center has already taken advantage of virtualization, decommissioning, and other energy-efficiency measures. However, by combining energy monitoring with analytical support, you can gain application-level insight on energy performance and operation cost.

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- **Analyze energy consumption data.** Identify virtualization, decommissioning, and consolidation opportunities through comprehensive analysis of your energy data. Using robust analytics software, you can turn this data into actionable intelligence that can help you improve performance and efficiency, reduce downtime, and make better strategic and capacity planning decisions.
- **Manage carbon reduction and report on emissions.** Calculate carbon emissions, establish and meet reduction targets, and automate reporting of your data center's carbon footprint.

By using integrated software to streamline these three activities, you can continuously optimize your data center operations to improve energy efficiency, lower operating cost, and better manage data center capacity. We will examine each activity in detail.

Monitor Energy Use of All Data Center Assets

Most data center managers have little control over some key areas of their operation. The building and facilities in which they operate are most likely managed by a separate business unit or company. As a result, managers often have no visibility into how much power is being consumed in the physical space or by the cooling and power equipment. This creates a tremendous blind spot that makes effective energy planning virtually impossible.

To remove this blind spot and enable efficient management of all data center resources, the information barriers between the IT resources controlled by data center managers and the facilities controlled by external entities must be removed. Energy measurement software can bridge this gap by giving you visibility into both the IT- and facility-based sources of your data center's energy consumption. To be effective, the software you select should include the following functionality.

Traditional approaches to capacity planning are hardware centric and often fail to account for facilities equipment, physical space, and the energy used by these components. By combining continuous and comprehensive energy monitoring software with strong analytics software, you can build capacity planning scenarios and models that take all of these factors into account.

Continuously Measure Facility- and IT-Based Resources

The software should provide real-time energy use monitoring of all data center components, including the servers, storage, networking equipment, chillers, computer room air-conditioning units, switchgear, UPS, and battery backups. Every asset – whether or not it is metered – should be monitored. The objective is to establish a continuous reading of your data center's power usage effectiveness to identify efficiency gaps between IT and facility energy use. By monitoring throughout the operating day, you can identify patterns in energy demand that occur hourly, daily, weekly, or monthly.

The software should also monitor heat generation throughout the data center to identify hot spots and any servers that are operating outside of normal threshold temperatures. This information can help you arrange your cooling equipment and servers more efficiently. With continuous heat monitoring, for example, you can determine if hot spots are occurring periodically, and increase cooling only when needed.

Employ Analytics to Leverage Energy Consumption Data

To gain the full benefits of comprehensive energy monitoring, you need the ability to transform the energy consumption data you are collecting into critical business intelligence that can optimize your data center operations. To get there, you need analytics software to help you answer critical questions such as:

- Where are energy inefficiencies occurring in the data center?
- What are the costs and benefits associated with addressing these inefficiencies?
- Are there application operations that should be moved to a cloud computing environment?
- Which assets are being over- or underutilized?

By combining an energy measurement solution with robust analytics software, your data center operations can realize the following strategic and operational benefits.

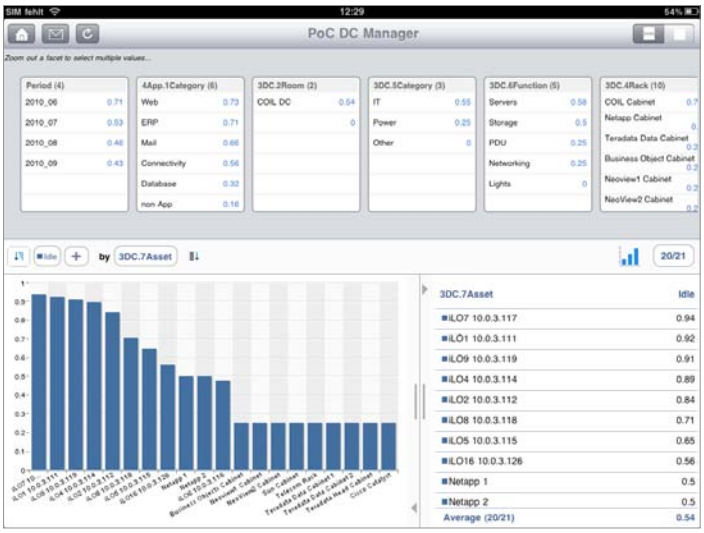

Figure 1: Dashboard in SAP BusinessObjects Explorer™ running on the Apple iPad

Optimize Your Application and Hardware Deployments

Most likely, your data center has already taken advantage of virtualization, decommissioning, and other energy-efficiency measures. However, by combining energy monitoring with analytical support, you can gain application-level insight on energy performance and operation cost. For example, you may determine that demand for certain applications peaks only at the end of each quarter, so at all other times you can operate with 200 fewer servers. By moving those applications to a cloud computing environment during the peak demand period, you can decommission those servers and eliminate the total costs of powering, cooling, and maintaining them.

Improve Cost Reporting and Chargeback Opportunities

Strong analytics software increases your awareness of how and where energy is being used in your data center to help you manage energy as a cost center. This can reduce overall energy consumption and allocate energy costs to those departments or customers that are using the power. If your data center is a hosting operation, you can effectively separate energy use as a line item in your customer billing system. Whether your facilities are leased or support a larger organization, you can use your energy consumption data to improve lease terms or make budget adjustments. In addition, you can take advantage of rebates and incentives offered by utility companies.

Make Smart Capacity Planning and Cost Optimization Decisions

Traditional approaches to capacity planning are hardware centric and often fail to account for facilities equipment, physical space, and the energy used by these components. By combining continuous and comprehensive energy monitoring software with strong analytics software, you can build capacity planning scenarios and models that take all of these factors into account. For example, you can determine if inefficiencies exist in your cooling system as well as your rack, server, and network configuration. By decommissioning your underutilized servers and consolidating the remaining servers and racks to free up floor space, you avoid costly expansion of your facilities. Moreover, your planners can determine the true cost of your deployed hardware assets and may find it more cost effective to purchase new, more energy-efficient servers.

Streamline Carbon Emissions Management

With growing pressure to disclose carbon emissions, data center managers should make carbon reporting an integral part of operations. However, this is often a time-consuming, spreadsheet-based process that requires extensive manual effort. The underlying data is incomplete and inaccurate, and there is no ability to make real-time, daily assessments of carbon impact. In addition, data

centers must also determine emissions across the operation, from the facility level down to the application level. And because mandatory reporting is forthcoming, carbon reporting processes should be repeatable and verifiable. Carbon management software can help you meet these reporting challenges in the following ways.

Use Carbon Management Software to Leverage Your Energy Data

By employing carbon management software, you can leverage energy consumption data and standardize carbon reporting. For example, if the software uses standardized report templates and built-in calculation logic – and integrates with your deployed energy management software – your carbon reporting can be fully automated. If your data center is part of a larger enterprise, your carbon reporting processes and targets should align with the organization's.

Enable Constant Monitoring of Data Center Carbon Emissions

By choosing carbon management software that accesses your real-time, asset-level energy consumption data, you can monitor data center components on an ongoing basis to help ensure that they are operating within set key performance indicators (KPIs). You can be proactive in your emissions reduction through notifications when facilities, servers, and other equipment exceed thresholds.

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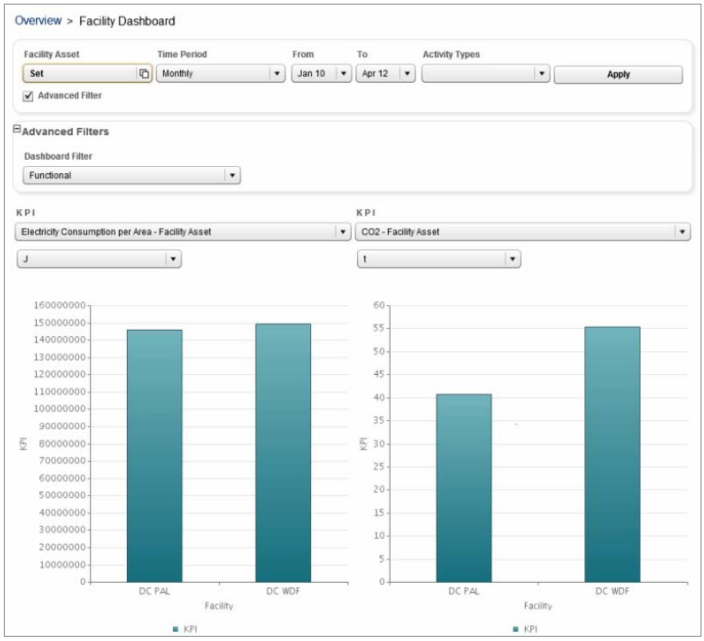

Figure 2: Facility Dashboard in the SAP® Carbon Impact OnDemand Solution

INTEGRATED ENERGY MANAGEMENT SOLUTIONS FROM SAP AND SENTILLA

SOFTWARE TOOLS FOR ENERGY-TRANSPARENT DATA CENTER OPERATIONS

We have discussed the advantages of adopting fully integrated software solutions to establish a highly responsive and energy-optimized data center. Integrated solutions from SAP and Sentilla offer an innovative approach that brings comprehensive energy management, cost visibility, carbon impact reporting, capacity management, and service efficiency to your data center. By deploying comprehensive energy monitoring software from Sentilla with proven, enterprise-level business intelligence and reporting software from SAP, you gain complete insight into all aspects of your data center operations. Working together, these solutions support the three critical activities – measurement, analysis, and carbon management – required for optimized energy management.

Measure and Control Energy Use with Sentilla Energy Manager

Sentilla Energy Manager is a software solution that provides total visibility about energy performance throughout the data center, across both IT and facilities. It accounts for the energy consumption of every asset in your data center, metered or unmetered. You can monitor your cooling equipment, servers, switches, racks, PDUs, UPS, and more. By deploying thermal sensors throughout your data center, the software also measures heat and allows you to identify and mitigate hot spots. With Sentilla Energy Manager, organizations gain a comprehensive picture of where, when, and why energy is used at minimal cost and without disrupting your data center's equipment or service.

Analyze Energy Data with SAP BusinessObjects Explorer™

By integrating with Sentilla Energy Manager, SAP BusinessObjects Explorer™ software can leverage your entire repository of energy consumption data on a monthly basis to establish energy performance baselines, set efficiency targets, monitor KPIs, and more. SAP BusinessObjects Explorer simplifies your data analytics, allowing you to ask critical questions about application virtualization, infrastructure upgrades, and server capacity – without the need to understand the underlying data.

By using SAP BusinessObjects Explorer with Sentilla Energy Manager, you can not only enhance your energy management in the data center but also establish a central repository of energy consumption data that can be shared across the entire enterprise. This enables everyone in your operation – facility managers, capacity planners, and application and hardware support staff – to fully leverage your energy consumption data to improve performance and make better decisions.

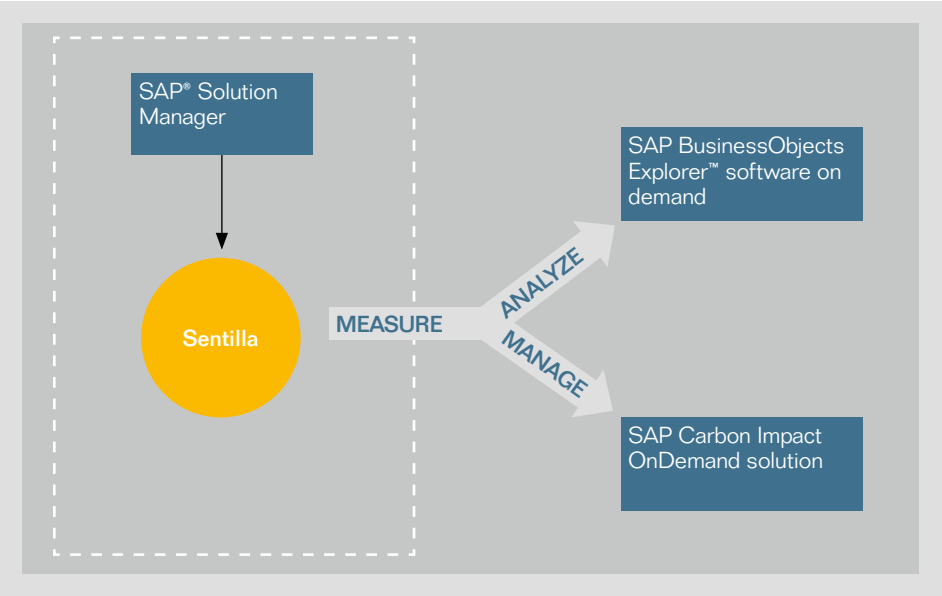

Figure 3: SAP® and Sentilla Solution Overview

Manage Emissions with SAP® Carbon Impact OnDemand

The SAP® Carbon Impact OnDemand solution automates and simplifies the carbon reporting process and helps you identify the most cost-effective opportunities to reduce energy consumption and emissions. By integrating with Sentilla Energy Manager, SAP Carbon Impact OnDemand makes your energy consumption data highly available for carbon emissions reporting and monitoring. From the facility level down to specific servers, you can benchmark and monitor all of your data center components to help ensure that they are meeting carbon emission reduction targets. Because SAP Carbon Impact OnDemand supports carbon emissions and reporting across the enterprise, it is the only solution that allows you to incorporate carbon emissions information from your data centers into the overall reporting infrastructure of your organization.

By deploying comprehensive energy monitoring software from Sentilla with proven, enterprise-level business intelligence and reporting software from SAP, you gain complete insight into all aspects of your data center operations. Working together, these solutions support the three critical activities – measurement, analysis, and carbon management – required for optimized energy management.

Take the Next Step

While data centers play a central role in improving the operational efficiency and financial performance of the enterprises they serve, little focus has been given to the efficiency and performance of the data center itself. By using the integrated software approach outlined in this paper, you can achieve the energy and cost visibility you need to dramatically lower energy costs and carbon emissions while still providing outstanding service. To learn more about how your data center operations can get there, contact your SAP representative today or send us an e-mail to info@sap.com.

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