CENTER OF EXPERTISE
FOR ENERGY EFFICIENCY IN DATA CENTERS

Building the Business Case for Energy Efficiency in Data Centers

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Overview: Building the Business Case for Energy Efficiency in Data Centers

The energy intensity of data centers means that energy efficiency improvements have the potential to deliver substantial energy (and monetary) savings to an organization. There are dynamics unique to data centers that create a set of underlying drivers, stakeholders, and barriers to data center energy efficiency projects that are distinct from energy efficiency projects generally. This resource provides information and resources to help project champions identify underlying drivers for data center energy efficiency, win over key stakeholders, and overcome barriers, as they build the business case for driving improvements in their data center.

1. Identify drivers that can effectively demonstrate the benefit of energy efficiency in your data center.

What are the motivating factors (and benefits) of implementing an energy efficiency project in your data center?

2. Win over stakeholders within your organization whose buy-in is critical to advancing your energy efficiency project. Improve your understanding of how their interests might be impacted (either positively or negatively) from a project. Learn which drivers and barriers are specific to them, and explore available resources that can help achieve buy in.

Which stakeholders are relevant in my organization? What drivers resonate with those stakeholders? What barriers might impact their buy-in? What resources are helpful to achieve their buy-in?

3. Overcome barriers you might encounter during the planning and implementation of your energy efficiency project. Identify opportunities (and resources) that can help you overcome institutional, technical, and financial barriers.

What barriers do you expect throughout the initiation, planning, and implementation process? What resources are available to help overcome these barriers and successfully initiate a data center energy efficiency project?

How to use this document

Use the bookmarks to explore specific drivers, stakeholders, or barriers listed below to learn more and uncover relevant resources. Note that this document will be replaced with an interactive, web-based tool, available at datacenters.lbl.gov.

Step 1. Identify *drivers* for energy efficiency in data centers

Reduce operating costs

Data center operational costs are often driven by energy consumption, and can be extremely expensive, with estimates that the electrical costs for large data centers running in the millions.[i] It's no wonder then, that 92% of companies report being influenced by operational savings in their decision to pursue energy efficiency projects. Energy efficiency improvements stand to significantly reduce energy costs in data centers. Larger investments can result in energy savings of 40% or more. Many organizations have found that operational savings outweigh the upfront capital investment required by a wide margin, with low (under a year) payback periods and notable energy cost savings over the lifetime of the equipment.[ii] These savings can be allocated to other organizational activities and goals. With organizations relying on and incorporating data centers as a critical part of their business, the incentive to effectively manage their operating costs will only increase.

Increase data center reliability and resiliency

As mission critical operations, data centers are already sited, designed, and operated with reliability and resiliency needs in mind. While there can be the perception that energy efficiency is at odds with resiliency and reliability, they can work synergistically. Energy efficiency measures can extend the life of existing facilities. Outages can be costly – with a recent survey pinning the average cost at over $700,000. Outages, whether manmade or natural, stand poised to continue to increase with climate change or with malicious attacks. Integrating renewable energy sources (whether solar, hydro, wind, or geothermal) into operations is one increasingly popular path to heightened data center resiliency. According to AFCOM's 2018 State of the Data Center Industry report, approximately 42% of respondents have or are planning to deploy renewable energy over the next year. Most of these respondents also indicated that they expect this will lower their overall data center total cost of ownership (TCO).[iii]

Free up data center capacity

Even when electricity supply is maxed out, energy efficiency can provide a way to increase a data center's effective capacity (and/or cooling capacity). Energy efficiency can result in improved computing performance per kilowatt, and consolidating data centers and equipment can free up floor space and reduce infrastructure complexity, physical constraints, and staffing requirements. This can, in turn, provide an opportunity to add new IT capacity if needed. More effective monitoring can help delay future capital expenditures related to data center expansion, as tools that continuously monitor capacity on UPSs can help operators reclaim stranded capacity in their current data center.

Comply with codes and standards

Energy codes and standards play an increasing role in data centers, particularly in new construction or major retrofits. Public and private organizations are required to demonstrate compliance with a range of standards- whether it be ASHRAE energy efficiency requirements for data centers, state-level energy codes (e.g. Title 24), or federal statutes (such as OMB's Data Center Optimization Initiative). Procurement and Contracting Officers also may be required to comply with purchasing requirements set by various standards, such as the purchase of ENERGY STAR data center equipment.

Save energy in accordance with organizational values

Organizations are increasingly pursuing sustainability as part of standard practice. Taking meaningful steps towards energy conservation is a key way that organizations today are demonstrating their commitment to corporate social responsibility to consumers. This commitment can improve a company's public image as well as employee morale.

Leverage utility & other incentives

Utilities, state energy offices, and other entities are critical partners in disseminating energy efficiency information, opportunities, and incentives for the marketplace. Utilities are well positioned to help data center customers realize significant energy and cost savings. Utility incentives can help motivate organizations to implement energy efficiency projects in their data center by offsetting the (often high) initial cost of a project. The level of support provided by a utility (both in terms of financial incentive as well as other benefits including free training opportunities or energy assessments) can vary greatly between programs. Program design and scope also impacts the energy efficiency opportunities a data center customer may pursue. For example, some utilities offer prescriptive programs, which typically assign a dollar rebate amount for the replacement of older equipment with newer, more efficient equipment. Utilities also, in some instances, have more customizable financing opportunities available which typically demand a greater level of effort and often entail performance assurance. Other entities, particularly at the state and local level, may also offer similar prescriptive and/or customizable incentives.

Address aging facility & IT equipment infrastructure

As data center equipment becomes old and obsolete, or begins to break down, there is the opportunity to replace it with newer, more efficient products. It is at this time that many organizations consider upgrading their equipment and data center infrastructure, and in tandem, may decide to invest in newer, more energy efficient IT equipment, or other energy efficiency measures – such as more efficient air management systems, for example. Some data centers may choose to retire equipment before the end of its useful life for several reasons. For example, in older

data centers, the infrastructure may not be capable of meeting heightened security and privacy needs of the modern day, or equipment may be difficult to maintain as it becomes worn out.

Step 2. Identify *Stakeholders*

Facility Manager

While others in an organization may spearhead data center energy efficiency efforts, Facilities Managers are one of the most common project champions (especially when an organization does not have a Sustainability Manager). The facilities department is responsible for maintaining a data center's building and infrastructure as well as replacing equipment to ensure electrical power, air flow, and cooling needs. Facilities Managers also work to assure uptime and recoverability. Facility Managers are most likely to pay (or at least see) a data center's energy bill. Therefore, they will likely be more receptive to energy efficiency improvements, particularly if they are expected to reducing operating costs (presuming the bill comes out of their budget). Energy efficiency efforts often have the added benefit of reducing the management burden of a data center (e.g. server rooms that lack standardization can result in inefficiencies and a higher management burden for IT and Facilities staff), which can make the job of facilities managers easier. Once physical infrastructure energy efficiency gains (e.g. hot and cold aisles) have been implemented in a data center, further improvements can require significant investment and diminishing returns. For this reason, facilities managers and operators may have an amplified incentive to turn to IT energy efficiency opportunities. With the needs of IT and operations converging, there are now more natural opportunities for collaboration between the two.

Drivers

- Reduce operating costs: One study found that the majority (almost 80 percent) of data center energy bills are housed in the facilities budget.[v] Thus, Facility Managers have an innate incentive to pursue energy efficiency measures that will lower energy costs.
- Free up data center capacity: Freeing up capacity entails allowing more space, power, and cooling capacity to be available, all of which are a core concern and responsibility of a data center Facility Manager. Freeing up capacity allows a Facility Manager to more easily respond to needs from the IT Manager or CIO for increased computing abilities.
- Comply with codes and standards: Facility Managers are often tasked with ensuring compliance for State and Federal codes and standards for new data centers as well as data center expansions or retrofits. Thus, energy efficiency measures that aid with compliance are inherently of interest.
- Address aging infrastructure in need of upgrade: Given that a Facility Manager is typically responsible for maintaining a data center's building and infrastructure, aging equipment that

is near the end presents a unique opportunity to upgrade to newer, more energy efficient equipment or infrastructure (e.g. air management systems).

- Leverage utility and other incentives: While capital expenditures for IT equipment most often come from the CIO/IT Manager's budget, certain measures relative to data center infrastructure (like more efficient cooling or power distribution equipment) typically are housed in the Facilities budget. For this reason, utility or other financial incentives (e.g. rebates) for such improvements could drive a Facility Manager to undertake improvements.

Barriers

- Misaligned interests: While others in an organization may spearhead data center energy efficiency efforts, Facility Managers are likely the project champion for energy efficiency measures. This means they must often align stakeholder interests with a data center energy efficiency project as well as facilitate discussion and collaboration. Facility managers often have the strongest interest in energy efficiency projects (as they typically pay the energy bill), and the misaligned interests innate to an organization (e.g. IT managers most concerned with reliability and capacity, CFOs most concerned with cost) can mean that significant time and effort is required to successfully push a project through. Facility Managers will likely need to align the interests of the IT Manager and CIO in order to implement a project. Increasingly, effective asset utilization joins the interests of both IT and Facility Managers. Through joint efforts and increased information sharing, IT and Facility Managers can find common ground.
- No one person is tasked with energy efficiency: Projects are more likely to fall through the cracks (or not be initiated at all) if no one person in an organization is tasked with energy efficiency improvements. Even though implementing energy efficiency improvements is typically not part of a Facility Manager's job description, they may take on the burden of guiding a project through internal stakeholder consensus while balancing their other roles and responsibilities within an organization. Dedicating significant time and resources can be a challenge.
- Lack of awareness of energy usage, costs, and opportunities: While Facility Managers are most likely to be aware of a data center's energy cost, they may not be aware of opportunities to reduce these costs. Many Facility Managers are resource constrained, particularly in organizations with small or medium sized data centers. Therefore, Facility Managers may not have the opportunity to learn about energy reduction measures and subsequent monetary benefits for data centers, including those that may be considered "low hanging fruit."

Resources

- Data Center Profiling Tools
- Master List of Efficiency Actions

- Small Data Centers Page
- DCEP Training
- FEMP Data Center Energy Efficiency Series Training
- Data Center Optimization Initiative (DCOI)
- DCOI Fact Sheet
- Best practices for modernizing vintage data centers
- TCO Model for Data Centers
- Data Center Energy Efficiency Investments: Qualitative Evidence from Focus Groups and Interviews
- Master List of Efficiency Actions
- The Green Data Center: Steps for the Journey
- Best Practices for Increasing Data Center Energy Efficiency

IT Manager/CIO

IT Managers are responsible for ensuring the service and security of data center operations within an organization. They typically make purchases and upgrade decisions for servers and software with service and security goals at the forefront. Reliability is a key concern for IT managers- for example, they may be risk adverse to new technology for fear of loss of uptime. Certain energy efficiency opportunities require IT re-design and rest squarely with IT Managers and CIOs, like leveraging virtualization to reduce power consumption. Unlike Facility Managers, IT departments often do not pay (or even see) monthly energy bills and ultimately the financial consequences of their decisions. As a result, energy cost reductions alone are not a strong incentive for IT Managers to take energy efficiency actions. Despite this, IT Managers, have a lot to gain from energy efficiency improvements. Energy efficiency can simplify the IT environment, reducing the management complexity and allowing IT managers to focus on improving management of fewer responsibilities. Consolidation, for example, can free up floor space for increased flexibility and capacity, as well as reduce licensing software costs.

CIOs will likely be concerned with the impact of an energy efficiency project on operations, specifically on whether the project will allow the data center to sustain or increase its current operations. Since CIOs often have a role in project approval decisions, energy efficiency can provide the CIO more flexibility in increasing IT capacity within current facilities to support the company's business growth. Energy efficiency improvements can also reduce power demands of the physical data center infrastructure, leaving organizations in a better position organizations to support future IT growth. Continually increasing IT capacity while containing operating costs is an important way for the CIO to contribute to company growth and demonstrate leadership within the executive team. While concerns of reliability may make CIOs wary of energy efficiency projects, project champions must address these concerns while clearly articulating the project benefits that align with these

efforts. Framing the benefits as well as planning a project with their interests in mind, including safeguards against reliability issues, can help project champions get buy-in from the CIO and IT department.

Drivers

- Reduce operating costs: While data center energy costs are most often housed in a facilities budget, IT Managers & CIOs can also be responsible for these costs. One study found that approximately 20 percent of data center energy bills are housed within the IT/CIO budget.[iv] However, as organizations realize that additional energy saving opportunities rest with IT, there has been a slight shift towards moving them to the IT/CIO budget. As Facility Managers exhaust infrastructure energy efficiency opportunities, they increasingly turn to IT opportunities. As a result, IT and Facility Managers may find themselves working in closer coordination than they did previously on matters related to data center capacity and energy management.
- Free up capacity: Energy efficiency actions can effectively increase a data center's floor space and capacity, and can also reduce the complexity of a data center. Freeing up capacity allows for possible delayed data center expansion and purchasing of additional equipment, which often comes out of the CIO/IT Manager budget. An estimated 20 to 30 percent of physical servers are considered comatose (meaning they haven't seen any activity in the past six months).[iv] Metering and monitoring efforts can uncover unused servers and allow for recommissioning. Monitoring UPS capacity and power demand can allow IT Managers/CIOs to reclaim stranded power.
- Increase data center reliability & resiliency: Reliability is a core concern for IT Managers and CIOs. There is a misconception that these goals can be at odds with energy efficiency, but energy efficiency can work synergistically to advance both reliability and resiliency. Well informed IT Managers or CIOs may already understand how certain energy efficiency improvements (including DCIM systems as well as improved air management systems can enhance a data center's ability to operate under compromised conditions). Further, technologies such as demand response, renewable integration, and microgrids can simultaneously enhance a data center's sustainability, reliability, and resiliency, and even provide a revenue stream for an organization.
- Address aging facility and IT Infrastructure: IT Managers and CIOs are typically responsible for IT equipment purchases. When data center equipment has reached (or is close to reaching) the end of their useful life, IT Managers and CIOs have an opportunity to upgrade to newer, more energy efficient equipment. IT Managers and CIOs may also be motivated to retire equipment early, given the improved security and expanded opportunities for virtualization that newer equipment bring.

- Comply with codes and standards: Given that IT Managers are often involved in (or tasked with) data center equipment purchase decisions, they may be driven to purchase equipment that ensures compliance with relevant codes and standards related to energy efficiency (e.g. ENERGY STAR).

Barriers

- Misaligned Interests: CIOs and IT Managers within an organization are likely to prioritize IT stability, security, and flexibility. If capital expenditures for new equipment (e.g. new servers) are drawn from their budget, CIOs and IT Managers may place more weight on first costs than anticipated equipment operating costs when making purchasing decisions. CIOs and IT Managers may see energy efficiency measures at odds with their primary goals and can be resistant to change. For this reason, it's critical that a project champion emphasize how an IT Manager's and CIO's interests are advanced by energy efficiency measures, including freeing up capacity (which can delay costly expansion projects), increasing data center reliability and resiliency, and reducing operating costs (if data center energy expenditures are housed in the IT budget).
- Mission critical and risk averse nature of a data center: An IT Manager and CIO's goals are first and foremost to ensure the smooth running and availability of their data center. Data centers support critical services in organizations, with interruptions in service being very costly (both financially and from a reputation standpoint). As a result, IT Managers and CIOs have a low risk tolerance for new projects that may initially appear at odds with these goals. This risk aversion can influence energy efficiency projects in different ways. For example, an IT Manager might be hesitant to decommission unused servers in fear that it may interfere with a business function that may occasionally run on those servers.[1] If an IT Manager or CIO perceives that an energy efficiency project could jeopardize data center operations, they may oppose a project or energy efficiency measure. However, energy efficiency improvements often are accompanied by improved data center reliability and resiliency. It may be the job of the project champion to clearly communicate this to a CIO or IT manager and find opportunities to mitigate perceived risk for a project.
- Lack of awareness of current energy usage and opportunities: Energy usage (and its costs) are typically outside the IT Manager's and CIO's purview. Thus, IT Managers and CIOs may not be aware of how energy efficiency can advance their interests- including illuminating opportunities through metering and monitoring, effectively increasing capacity, or reducing IT management complexity. Project champions are challenged with the task of successfully

articulating the benefits opportunities provide, as well as designing projects that mitigate risk as it is perceived by an IT Manager/CIO.

Resources

- DCEP – IT Equipment Module
- Master List of Efficiency Actions
- Data Center Profiling Tools
- DCOI Fact Sheet
- Why your CFO needs to meet your IT department
- EPEAT Registry
- ENERGY Star Data Center Equipment
- The Green Data Center: Steps for the Journey
- Best practices for modernizing vintage data centers
- Best Practices for Increasing Data Center Energy Efficiency
- Six Energy-Efficient Data Center Practices

CEO

Successfully attaining executive buy-in can make or break a project, and CEOs in particular may not be familiar with the benefits of data center energy efficiency projects. Not only do CEOs often hold the key for funding access, but their support (and enthusiasm) can also engender priority and attention of other resources (such as staff time). CEOs are driven by the opportunity to improve the financial health of the company and reduce operational spending. In some industries, there is competitive pressure to demonstrate commitment to sustainability. While CEOs have an interest in ensuring that data centers are cost effective, their foremost concern is likely that data centers meet business needs and are secure, reliable, and able to scale with organizational growth. Although CEOs are likely to be held accountable to a Board or shareholders, they may also be needed to reconcile differences between IT and Facilities (such as risk management). While a CEO's interests and responsibilities vary across organizational type and industry, a project champion should look to identify leadership's priorities and frame their energy efficiency project in terms that will resonate.

Drivers

- Save energy in accordance with organizational values: Organizations that have green-ness or energy efficiency as an organization value, may have a particular interest in pursuing energy efficiency in data centers. CEOs may have a range of underlying motivators to pursue, promote, and advertise energy efficiency efforts, whether it be demonstrating corporate social responsibility, for marketing purposes, or differentiating themselves from competitors.
- Comply with organizational policies and/or codes and standards: Identifying energy efficiency projects that follow organizational policies or Federal and state codes and standards may help capture a CEO's attention and prioritizing the project.

- Improve data center reliability & resiliency: CEOs are likely aware that data centers can be mission critical to their organization's operations or service offerings. Downtime is not only expensive, but it also can negatively impact the core mission, products, or service offerings of an organization. At a minimum, it can lead to day-to-day disruptions for employees. For this reason, CEOs may be more receptive to energy efficiency measures when framed in terms of the added reliability and resiliency benefits, they provide.

Barriers

- Misaligned Interests: CEOs have many interests across their organization; however they are most generally concerned with running it as efficiently and effectively as possible. Though there are many, their top concerns may include financial and operational management, communications, innovation, and managing reputation. In most instances, a CEO will not be familiar with the benefits of improved energy efficiency in their data centers or how it could advance their primary objectives. It's important for a project champion to understand how to pique the CEO's interest for a data center energy efficiency project. For example, what concerns do CEOs have that could be addressed by an energy efficiency project? CEO concerns could include improved resiliency, reductions in downtime, lower operating costs, delayed expansion projects, or projecting an image of sustainability and corporate citizenship, to name a few. All these benefits can be points of leverage. It is up to the project champion to connect the dots for a CEO and craft a message that clearly articulates how their interests are advanced by a project. This also means using terms that resonates with CEOs and understanding what metrics are used to gauge success at the executive level (e.g., do not present payback estimates if ROI is used more commonly to assess a project's potential).
- Opportunity Cost of Capital: CEOs perpetually balance needs and requests from different business units within an organization. One of their main concerns is prudent fiscal management. CEOs may be bombarded with requests and initiatives from different stakeholders and consistently must prioritize the allocation of resources (spending, staff time, etc.) while making sure an organization achieves its core business objectives. It may require a concerted effort to articulate why data center energy efficiency measures warrant their attention, and build the case for how they can improve an organization's performance and service offerings when competing for funds, attention, or staff time.
- No one person within an organization is tasked with energy efficiency: In many organizations, data center energy efficiency improvement is not explicitly in any one person's job description. Given the complex nature of data center energy efficiency improvements and diverse stakeholder interests, organizational leadership may need to actively identify a point person to take charge if they wish to reap the benefits of data center energy efficiency. While

this project leader (or project champion) is most likely to be the Sustainability Manager or Facility Manager, the CEO could task others in the organization with this responsibility.

Resources

- ISO 50001 Ready – Task 4: Management Commitment
- Cost of Data Center Outages
- TCO Model for Data Centers
- A Holistic Approach to Reducing Cost and Resource Consumption

CFO

Like the CIO, CFOs often play a key role in project approval decisions. CFOs are tasked to conduct responsible financial management of an organization. The level of knowledge and justification required to build consensus among parties responsible for managing financial resources may vary organization to organization. Prior to deciding on an energy efficiency investment, most organizations perform some sort of financial analysis- whether it be payback, total cost of ownership (TCO), or return on investment (ROI). Further analysis and decision making, such as how "well proven" the ECM technology is, may also be required to convince CFOs and the financing or budget department. Outside funding or alternative financing mechanisms (such as utility rebates or energy savings performance contracts (ESPC)) can increase how receptive a CFO is to a project, or their willingness to pursue measures that have longer payback periods. It's the responsibility of the project champion to understand what terms the CFO will view the project in, how they'll view the opportunity cost of capital due to competing priorities in the organization, and to create and frame the project in such a way that will resonate.

Drivers

- Reduce operating costs: Given CFOs are tasked with financial management, reducing operating costs (and ultimately their organization's OpEx) is an incentive in its own right. Given their background and understanding in finance, CEOs may be receptive to energy efficiency opportunities that reduce operating costs, particularly when the payback is low and/or more certain (e.g. well-proven ECMs).
- Leverage utility and other incentives: Incentives provided by utilities and other entities (e.g. at State or Federal level), or alternative financing opportunities (e.g. ESPCs) can be leveraged to win CFO approval of an energy efficiency project. Incentives that partially (or entirely) sponsor a data center energy efficiency project offset the capital investment required for a project.
- Free up capacity: Expanding and building new data centers is very costly. While an organization's CFO may not have data center capacity as a top of mind concern, an effective

increase of capacity can delay or eliminate the need to build or expand. This benefit could be leveraged to attain CFO approval.

Barriers

- Opportunity cost of capital: CFOs are constantly having to prioritize which investments are most aligned with an organization's strategic objectives. For this reason, they may need to be presented with information that differentiates why upgrades in data center energy efficiency could "beat out" competing requests. Additionally, CFOs may be inclined to focus on lowest upfront capital costs when investing in improvements. Project champions must clearly communicate the comparably favorable life-cycle costs for more energy efficient data center equipment.
- Misaligned interests: CFO's generally have cost containment objectives and may tend to prioritize lowest first cost, particularly for shorter term reporting periods. For example, if a proposed ECM requires a large capital investment with a payback of five years, and their performance is judged on reductions in capital expenditures year over year, then there may be a perverse incentive to prioritize short term wins over long term gains. Project champions should emphasize the vast cost savings potential associated with data centers given their energy intensity. Additionally, increasing project visibility across other executive-level stakeholders could facilitate a common understanding of its benefits and help engender support and a willingness to proceed.
- Lack of awareness of current energy usage & opportunities: CFOs may be unaware of the potential operating savings and other benefits that accompany energy efficiency projects. The Uptime Institute's 2016 Data Center Industry Survey reported that Finance was the number one business function consistently absent from major IT infrastructure decisions.[v] In particular, they may be unaware that data centers consume drastically more energy than other office spaces, (depending on how that information is reported to them), or the "low hanging fruit" that can significantly reduce operating costs.

Resources

- FEMP Energy Savings Performance Contracts for Federal Agencies
- Database of State Incentives for Renewables & Efficiency (DSIRE)
- Why your CFO needs to meet your IT department
- Discovering Hidden Costs in Your Data Centre- a CFO Perspective
- TCO model for Data Centers
- Using a Total Cost of Ownership (TCO) Model for Your Data Center
- Cost of Data Center Outages
- Towards sustainable data centres: Novel internal network technologies leading to sustainable cost and energy consumption in data centres in the Netherlands

Sustainability Manager

Sustainability managers may be predisposed to view energy efficiency projects favorably, and are one of the most likely project champions within an organization. However, they may have a limited pool of resources (either human capital or funds) and must weigh these opportunities amongst others- such as an employee waste education campaigns, water efficiency measures, or pursuing lighting retrofits in office space. Sustainability Managers are likely interested in energy efficiency opportunities that not only provide an adequate return on investment but have clear tracking and reporting opportunities through which they can demonstrate their accomplishments. They are also likely interested in energy efficiency projects that are highly visible, innovative, and favored by management. Given their energy intensive nature,[vi] data centers offer ample opportunity for improving organizational sustainability. However, project champions may need to effectively convey this to sustainability managers.

Drivers

- Save energy in accordance with organizational values: Sustainability managers are, among other things, typically tasked with reducing an organization's environmental footprint. This manifests through different business units and areas within an organization, data centers included. Data centers consume ten to 100 times more energy per square foot than a typically office building and can represent up to 40 percent of an organization's carbon footprint. Since data centers may represent the single biggest energy consuming component of an organization, including data centers as part of an energy efficiency portfolio can easily align with a Sustainability Manager's goal.
- Comply with organizational policies and/or codes and standards: Sustainability Managers may have helped craft (and/or are tasked with enforcing) an organization's energy or sustainability policies. A Sustainability Manager's job may also entail overseeing the implementation and enforcement of codes and standards from outside entities, whether this be the Data Center Optimization Initiative (DCOI) for Federal Agencies or voluntary standards, such as ISO 50001.
- Leverage utility and other incentives: Due to the fact that sustainability managers may be balancing spending priorities, participation in utility and other incentive programs may make data center energy efficiency measures more attractive for a Sustainability Manager to undertake. Aside from reducing costs, an innovative partnership with a local utility, for example, could be a more highly visible and marketable opportunity.

Barriers

- Misaligned interests: While efficiency improvements in data centers are highly relevant to a Sustainability Manager's goals, there may be factors other than energy savings potential (e.g. competing office priorities or reporting requirements) that influence which projects are

undertaken. Sustainability Managers may be interested in opportunities that are less time or capital intensive, are more highly visible within an organization, are simpler to meter and report, and/or that engage employees more.

- Lack of awareness of energy usage, costs, and opportunities: Sustainability managers may not be aware of the potential that lies within their organization's data center. This could be a ramification of lack of visibility and proximity, or perhaps a history or preference within the organization to tap other opportunities as part of a sustainability plan. They are likely unaware that data centers can consume up to 50 times more energy per square foot than typical office space, and in some cases are responsible for up to 40 percent of an organization's footprint. The Uptime Institute's 2016 Data Center Industry Survey reported that Sustainability was one of the top three business functions consistently absent from major IT infrastructure decisions.[v] Understanding how a Sustainability Manager prioritizes and funds projects, as well as how their success is gauged, is critical. Project champions (assuming they're not the Sustainability Manager), should seek to leverage the vast potential of data center energy efficiency measures and pursue projects that may have additional sustainability benefits such as reduced waste, increased recycling, water consumption savings, etc.
- No one person within an organization is tasked with energy efficiency: In many organizations, data center energy efficiency improvement are not explicitly in any one person's job description. Despite this, a Sustainability Manager is one of the most likely stakeholders to either undertake these projects independently or be assigned to it by organizational leadership.

Resources

- DCOI Fact Sheet
- DSIRE Database
- ENERGY Star Data Center Equipment
- Better Buildings ISO 50001 FAQs
- Business Case for Energy Efficient Building Retrofit and Renovation
- Five Benefits of Data Center Energy Management
- The Markley Group Data Center
- Global Energy Management System Implementation: Case Study

Procurement & Contracting Personnel

Procurement and Contracting's role as it relates to procuring data center equipment and infrastructure varies from organization to organization. In some organizations, they may simply carry out purchase order from their IT and Facilities Departments. In other organizations, however, Procurement may have its own, more rigid set of policies to follow. This is particularly true in Federal

Agencies. As a result, Facilities and IT departments may find that Procurement and Contracting officers are a key stakeholder who should be consulted with and included early on in an energy efficiency project.

While some procurement departments may have policies that ensure equipment that is purchased is energy efficient (e.g. Federal requirements for EPEAT registered products), others may not.[vii] This department may first prioritize criteria other than energy efficiency – including lowest first cost, performance, or other specifications when selecting data center equipment.[iv] Energy efficiency and assessment of the total cost of ownership (TCO) should be integrated into the procurement process. Reviewing and revising current policies and practices to ensure that energy efficiency is a criteria in purchasing, and that first costs alone do not drive purchasing decisions) is important in order to advance data center energy efficiency. Federal agencies also should look to emphasize energy efficiency requirements or criteria in their solicitations for IT equipment.

Drivers

- Comply with codes and standards: Given that IT Managers are often involved in (or tasked with) data center equipment purchase decisions, they may be driven to pursue energy efficient projects that incorporate purchasing equipment that ensures compliance with relevant codes and standards (e.g. ENERGY STAR).

Barriers

- Misaligned Interests: Procurement and contracting personnel likely have their own set of criteria for purchasing IT and other data center equipment, and have an incentive to follow internally set procedures and policies. They may place greater weight on product performance or other specifications, or lowest first cost, without consideration of energy efficiency or lifetime operating costs. Ensuring that procurement includes energy efficiency as a criteria when making purchasing decisions, and that assessments of cost effectiveness considers payback or TCO is important for making purchasing decisions that advance energy efficiency.

Resources

- DCOI Fact Sheet
- Contracting for Efficiency: A Best Practices Guide for Energy-Efficient Product Procurement
- Green Procurement Tool
- DSIRE Database
- ENERGY Star Data Center Equipment
- EPEAT Registry
- The Markley Group Data Center
- TCO Model for Data Centers

Step 3. Overcome *Barriers*

No one person within an organization is tasked with energy efficiency

The Problem

Most organizations do not have an individual who is explicitly tasked with managing energy efficiency in their data center. Whether a product of organizational silos, an oversight, or lack of resources, this makes it less likely that energy efficiency projects will be undertaken. Even if efforts are unofficially assigned, (and participants are well-intentioned), energy efficiency improvements may constantly be pushed to the back burner as stakeholders prioritize other concerns that are formally part of their job (and a measure of their success).

Opportunities to Overcome

Establish a point person or individual who is responsible for periodically assessing data center energy efficiency, as well as initiating, implementing, and tracking projects. This "Project Champion" is most likely to be the Facility or Sustainability Manager, but could be virtually anybody in an organization. Shepherding a project through initiation to completion and overcoming organizational resistance and inertia often demands an individual's explicit attention to be successful. Given the significant effort required, this barrier is most effectively overcome when written formally into a job description. If that is not an option, establishing a cross functional improvement team (see "Misaligned Interests" barrier) can create action amongst different stakeholders to make energy efficiency improvements that can advance individual and mutual goals. However, having a project champion (whether formal or informal), is often of critical importance for seeing a project through successfully.

Resources

- ISO 50001 Ready Navigator
- DCEP Training
- Energy Efficiency Toolkit
- Creating a green data center to help reduce energy costs and gain a competitive advantage
- Getting to "Yes" for Energy Efficiency

Lack of awareness of current energy usage, costs, and opportunities

The Problem

Data centers are costly to operate and can represent forty percent or more of an organization's overall operational expenditures. Despite this, information on operating costs may be silo-ed in a single department -typically facilities. Facility Managers may see a monthly power bill that includes energy use in data centers and offices- while an organization's IT department never sees the impact of their decisions on a utility bill. Even if there is a desire to assess the True Cost of Ownership (TCO)

for data center energy consumption, split financial reporting can make this difficult. Data center energy management is simply outside the purview of key decision makers- from the CFO to the CEO. As a result, these stakeholders may not be aware of how energy efficiency benefits that align with and may advance their interests.

Opportunities to Overcome

A project champion shouldn't expect other stakeholders within an organization to be familiar with energy efficiency opportunities in their data center. Instead, becoming more familiar with your data center's energy consumption, expenditures, and efficiency potential is a critical first step to effectively communicate opportunities to key stakeholders. Project champions need to take initiative to identify opportunities and benefits and educate relevant stakeholders. Importantly, champions should also work to establish common reporting mechanisms that will better enable reporting across fragmented departments. Creating a continuous improvement team will help with communication and create a forum where standardization can be established. Seek out fragmented information from relevant stakeholders and present findings to the cross-functional improvement team (if one exists) to increase information sharing. If feasible, establish a method for continuously sharing this type of information across stakeholder groups. Standardized and transparent documentation of current projects can also help advance awareness of energy efficiency opportunities (and the associated benefits) in an organization. Setting measurable goals, establishing benchmarks, and monitoring and reporting of current projects, makes it easier for stakeholders to understand current project benefits. This, in turn, makes it easier to communicate "wins," paving the way for future projects.

Resources

- DC Pro & PUE Estimators
- Master List of Energy Efficiency Actions
- Air Management Tool
- How to Save Money in Your Small Data Center
- Data Center Best Practices Guide
- Top reasons to upgrade vintage data centers
- ISO 50001 Ready – Task 8: Energy Data Collection & Analysis

Opportunity Cost of Capital

The Problem

Investing organizational resources (e.g. funds or staff time) in energy efficiency projects inevitably means that organizations are foregoing those funds for something else. Energy efficiency projects need to compete not only with other investments, but also different sustainability initiatives within the organization (e.g. an organization could prioritize water savings in plumbing). This problem is largely defined by the funding source- as this will determine what the project is "competing" with.

Does investment for a data center energy efficiency project come out of a facilities budget, a dedicated sustainability fund, or a general fund? Additionally, some companies choose to be part of a multi-tenant data center (also known as a co-lo), rather than independently operate their data center, as to not detract from core business competencies, which may expenses related to data center efficiency improvements from capital expenditures (CapEx) to operating expenditures (OpEx). This can impact how organizational leadership may perceive a project – or the hoops a project must jump through, as CapEx spending may undergo a more rigorous assessment- e.g. payback and ROI calculations. Project champions need to effectively convince stakeholders that funds are worthy of being allocated considering the potential project benefits (see drivers for energy efficiency in data centers).

Opportunities to Overcome

Project champions should determine the anticipated source of funding for the project, and assess whether there are other stakeholders also vying for those funds. For example, if project funds are slated to come from the sustainability office, are there other initiatives that might be foregone? Assess the financial and other reporting requirements of various stakeholders, and frame the project in terms that will resonate with key stakeholders. Project champions also should consider the risk tolerance of the organization. For example, in a more conservative organization, perhaps ECMs with a well-proven track record and shorter payback periods should be prioritized. Organizations report being more likely to adopt energy-saving technologies when the costs savings fully offset the higher initial purchase cost within the first few years of operation; and are less likely to adopt those that are paid off over a longer time frame.[viii] Project champions can improve odds of overcoming this barrier in the future by implementing consistent yet flexible financial benchmarks. Establish baseline consumption and costs so that improvements can be benchmarked against something. Concrete monetary savings that speak to a stakeholder's' bottom line are better equipped to pave the way for improvements in the future. Additionally, partnerships and alternative financing opportunities- e.g. efficiency programs, utility incentives or rebates, ESPCs, UESCs, other potential sponsors can be critical in building a case for an energy efficiency project. ESPCs for example, do not require any upfront capital for a project (with costs paid throughout the life of the project). Lastly, while identifying funds for energy efficiency is key, maintaining and continuing to advocate for those funds (e.g. through a green or revolving fund) is also important for sustaining investments.

Resources

- FEMP Energy Savings Performance Contracts for Federal Agencies
- Resources for Implementing Federal Energy Savings Performance Contracts
- Database of State Incentives for Renewables & Efficiency
- TCO model for Data Centers
- Using a Total Cost of Ownership (TCO) Model for Your Data Center

- Determining Total Cost of Ownership for Data Center and Network Room Infrastructure
- Discovering Hidden Costs in Your Data Centre- a CFO Perspective

Misaligned Interests

The Problem

Each department faces its own separate challenges—with facility staff struggling with limits on rack and floor space, power availability, and equipment, while IT staff try to ensure they have sufficient processing power, network bandwidth, and storage capacity to support upcoming IT initiatives and sufficient redundancy to handle system disruption. CEOs are concerned with organizational performance and image, while CFOs are focused on cost containment and the bottom line. Additionally, the mission critical nature of data centers tends to lead to a hierarchy of these interests, with some (e.g. reliability) superseding others. It is rational that different parties with different objectives view energy efficiency through a particular lens and express concerns where they may feel their core objectives may be threatened. However, many energy efficiency projects provide benefits to all of these parties- the challenge is framing them appropriately and effectively communicating them. Split incentives (e.g. one part of an organization paying for upfront equipment costs while another pay operating costs) can also reinforce misaligned interests.

Opportunities to overcome

Champions must take an active role in breaking down institutional barriers and silos. Establishing a cross-functional improvement team creates a forum in which stakeholders from different backgrounds can come together and better understand where their interests align and how they can leverage overlapping financial, environmental, and IT goals to build consensus. It is important to review how an organization allocates resources and hardware, as well as how billing and accounting function for these projects, as these practices often drive or explain the interests of stakeholders. Organizations stand to benefit from a more holistic energy management approach when internal processes and incentive structures are developed in a more coordinated manner. Project champions should push for more coordination between IT and Facility departments in order to advance more integrated decision making. Further, adverse incentives should be reconsidered (such as project designers who receive bonuses when projects come in under budget). This can help to ensure that the energy efficiency gains made by one department are not undone (or mitigated) by another.

Resources

- Assembling and Managing an Energy Team ISO 50001
- ISO 50001 Ready – Task 2: People and Legal Requirements Affecting the EnMS
- ISO 50001 Ready – Task 6: Energy Team and Resources
- Best practices for modernizing vintage data centers
- Best Practices for Increasing Data Center Energy Efficiency

- Data Center Energy Efficiency Investments: Qualitative Evidence from Focus Groups and Interviews
- A Holistic Approach to Reducing Cost and Resource Consumption
- See Stakeholder section of this document

Mission critical & risk averse nature of data centers

The Problem

Whether it's a part of an organization's core business offering or to keep daily operations running smoothly, data centers are mission critical to an organization's operations. For this reason, energy efficiency actions taken in a data center may be viewed more cautiously than other sustainability measures (such as installing low flow toilets or switching to LEDs in office space). IT Managers and CIOs in particular will be concerned with ensuring data center operations are not compromised by energy efficiency measures. There is often a strong desire among stakeholders to maintain the status quo, and hesitancy to take any actions that are perceived as risky. Aside from lost productivity and reputation issues that can be associated with downtime, they are costly, estimated at over $8,000 per minute.[ix]).

Opportunities to Overcome

There are many positive testimonials of how energy efficiency can reduce energy consumption and operating costs without compromising (and even boosting) data center reliability and service. Energy efficiency improvements, particularly those that entail upgraded data center infrastructure and equipment, often have added benefits of improved and reliability and resiliency. For example, wider environmental envelopes (with more robust IT equipment), can allow for greater efficiency and continued operation under compromised conditions (e.g. failure of compressor cooling). Data center infrastructure management (DCIM) systems, which are often installed as part of an energy management upgrade, can detect faults and provide early warning of potential problems. When operating within a risk adverse organization, project champions may need to educate other stakeholders as to how energy efficiency actions can actually bolster a data center's reliability and resiliency. Additionally, project champions could pursue energy efficiency measures that are perceived of as less risky from the IT perspective in order to demonstrate a proven process for implementing projects.

Resources

- Designing and Managing Data Centers for Resilience: Webinar
- Data Centers and Advanced Microgrids: Meeting Resiliency, Efficiency, and Sustainability Goals through Smart and Cleaner Power Infrastructure.
- View "Increase data center reliability and resiliency" driver

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