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Energy Conservation and Sustainability at Adobe Systems Incorporated

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Energy Conservation and Sustainability at Adobe Systems Incorporated

Robert Graebert[a] and Martin Fischer[b]

Abstract

The purpose of this case study is to analyze a successful sustainability program run by an owner that has invested $23 million, received rebates of $10 million, accrued over $9 million of savings and has won top scores in LEED and Energy Star. This case study is based on project information supplied by the owner and structured interviews with the operational team. The project drivers are identified and analyzed based on payback characteristics. Finally, the case study puts Adobe Systems' results within the context of the industry by matching it to the challenges identified in other reports.

The results show: (1) 40% of projects are initiated by operation management personnel; (2) the projects with the biggest savings are supported by third-party incentives; and (3) only 10% of projects are evaluated by simulation and account for 12% of annual savings. Performance benchmarking, using Energy Star, is a crucial step to determine the potential and priority of energy improvements and should be run annually. LEED EB is a valuable certification process when expanding conservation efforts beyond energy aspects to sustainability.

Building owners can incorporate the methodologies applied to evaluate these successful projects into their buildings. Facility managers can leverage the findings to present the advantages of recertification and commissioning.

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Introduction

A significant potential for energy efficiency exists in the building industry. A McKinsey and Company study (Granade et al., 2009) shows energy efficiency as the most affordable option for meeting future energy demands. Of the 2,290 Trillion BTU's (671 Billion kWh's) of potential savings in end-use energy for commercial buildings in the United States of America, the report attributes 16 percent to new private buildings and 35 percent to existing private buildings.

McKinsey and Company not only defines the magnitude of the energy efficiency potential but also the barriers the owners face. To study the effects in practice, this case study's goal was to analyze sustainability projects with an owner that has already received top awards for their energy efficiency performance and examine how these results were achieved. Aune et al. (2009) have previously shown how building operators can act as change agents in an organization and how they are "eager to learn" and "networked with colleagues". This case study confirms these findings with results from practice.

The following questions frame the analysis: How are energy conservation and sustainability projects selected? What factors influence the investment decision? How important is Energy Star and what value do green certificates provide?

This case study starts with (1) an introduction to the conservation program at Adobe and continues with (2) the impact of certification. The report then offers (3) an analysis of the projects and (4) places the program in context of other commercial owners and concludes with (5) implications for practice.

Conservation Efforts at Adobe

Adobe is a computer software company, famous for their design software and Flash products, with headquarters in San Jose, California. The headquarters house offices for 2,300 employees, enclosed parking, cafeteria, server rooms, a customer experience center, training, conference, and fitness facilities. The campus in San Jose consists of three towers: (1) East, (2) West, and (3) Almaden Towers. The towers are between sixteen and eighteen floors tall and include 989,000 square feet (92,000 m^2) of rentable area with 938,000 square feet (86,000 m^2) of parking.

As a large property owner, Adobe was affected by the rolling blackouts during the California Electricity crisis of 2001. To help mitigate further energy shortages and to establish itself as an environmentally conscious owner, a conservation program was created. The conservation program examined options for initially reducing energy consumption by 10% at their San Jose buildings and developed into a concerted sustainability effort at all properties worldwide. Adobe has received positive media coverage around their sustainability efforts (CleanTechnica, 2010, Knox, 2011, The Inspired Economist, 2006) highlighting some of the achievements. This case study is the first in-depth analysis of all conservation projects between 2001 and 2010.

The basis for the findings of this case study are a series of interviews with the key personnel at Adobe involved in the sustainability efforts including the Global Sustainability Manager, the Global Energy Manager, the Global Account Manager at Cushman & Wakefield and the Sr. Director Global Workplace Solutions at Adobe. These interviews were conducted over three weeks on site in San Jose. The individual project analysis in the following sections is based on project documentation, gas and electricity records, and auxiliary documents provided by Adobe and supported by interviews with the practitioners.

Since February 2000, Cushman & Wakefield has been operating the San Jose facility for Adobe. In 2001, Adobe and Cushman & Wakefield started the first energy retrofit projects and completed two projects that produced an annual saving of 1.3 GWh and $160,000 (representing a 6% reduction in consumption) with a payback of less than six months.

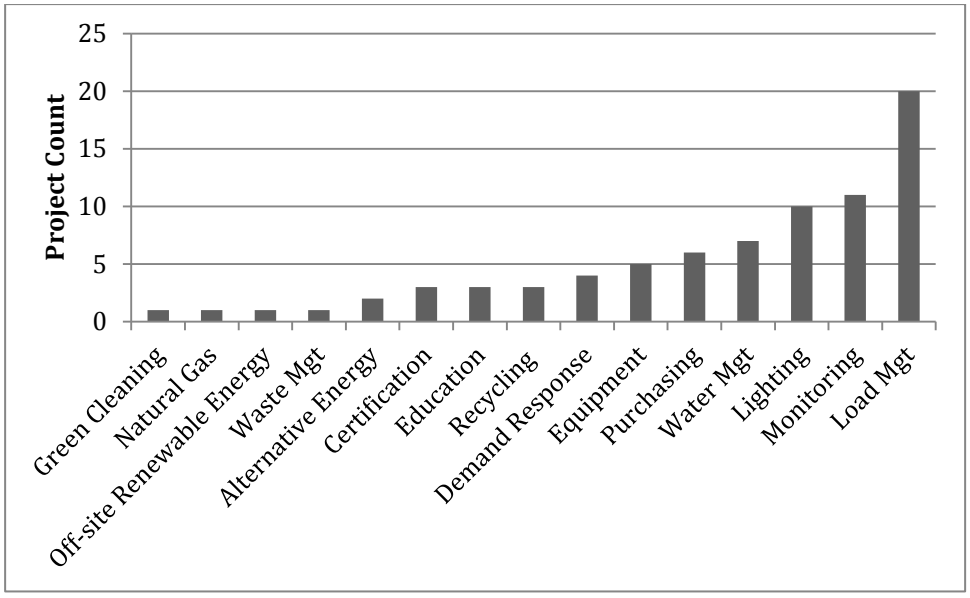

Figure 1: Project types (August 2001 – December 2010)

With the success of the first projects, the conservation program at Adobe continued with further energy reduction projects as well as non-energy related efforts. Some examples of non-energy consumption projects are water reduction, waste diversion, and on- and offsite renewable energy. The full range of project types is shown in Figure 1.

Through 2010, seventy-eight projects have been completed. Projects concentrate on lighting, monitoring, and load management with at least ten projects in each category. Beyond these core energy retrofit categories, a number of projects have been completed that do not directly produce energy savings, but are included in the conservation program because of indirect effects. Examples include on-site electricity generation with biogas powered fuel cells, participation in demand response and green cleaning. For example, in

2006, Adobe started to clean offices and common areas during normal business hours. There are two major benefits of such a practice. First, the cleaning staff can work during the day allowing a more balanced sleep cycle for the employees. Second, the buildings are no longer required to have lighting at night and there is reduced need for night porters resulting in $80,000 of annual savings associated with this project.

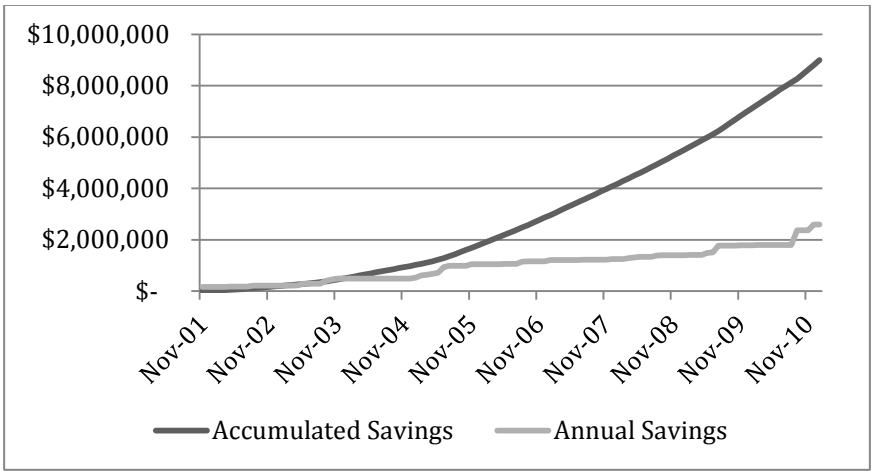

Figure 2: Accumulated and annual savings

In total, Adobe has invested $23 million and received rebates and incentives of $10 million since starting their conservation efforts. The annual savings created by these projects are $2.6 million, which accrued to $9.0 million dollars by the end of 2010[c] (Figure 2). Seen over the last ten years, the investment trend is increasing and, averaged over this period, shows an annual net investment of $0.62 per square foot rentable area resulting in annual savings of $2.83 per square foot.

The largest project by savings and cost has been the installation of fuel cells with a net investment of $3.0 million and annual savings of $1.48 million, which is offset by a $960,000

[c] Accumulated savings are calculated by carrying annual savings forward to the end of 2010 at the original purchase price.

cost for bio-gas resulting in annual savings of $525,000 [d]. The fuel cells reduce Adobe's footprint on the electricity grid by 5,200 kWh (or $645 per employee) each year.

Adobe relies on performance benchmarking as a crucial step to determine the potential and priority of energy improvements. For this purpose, the company participates in Energy Star, the energy performance rating system developed by the U.S. Environmental Protection Agency ("EPA") and the U.S. Department of Energy ("DOE"). The next section describes the impact of voluntary standards, specifically Energy Star, in practice and continues with the implementation of Leadership in Energy and Environmental Design for Existing Buildings ("LEED EB") at Adobe.

Voluntary Standards: Energy Star

The Energy Star Portfolio Manager [e] is an online tool provided by the EPA for building owners and operational managers to report their energy use intensity and to benchmark against the building stock. The Energy Star score represents the percentage of the comparable building stock a building out-performs in terms of energy use intensity. Portfolio Manager has become the standard in tracking energy performance in the United States with multiple municipalities planning compulsory disclosure of scores (U.S. EPA, 2008, IMT, 2011). Adobe records and publishes the Energy Star scores with Portfolio Manager [f].

More generally, energy intensity benchmarking, performed by Energy Star, is an important first step in identifying underperforming buildings. Portfolio Manager normalizes for schedule variation in the building stock and for variation in weather. It offers a first

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[d] Annual savings include operations and maintenance costs for the expected equipment useful life.
[e] ENERGY STAR Porfolio Manager:
http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
[f] ENERGY STAR Certified Buildings and Plants:
http://www.energystar.gov/index.cfm?fuseaction=labeled_buildings.locator

indication of whether a building can be described as high performing. The main shortcoming of Energy Star is that it does not provide suggestions for improvements in underperforming buildings. This lack of guidance is a result of the limited data set Portfolio Manager requires, which focuses on consumption. This limitation reduces the power for energy predictions but at the same time reduces the effort for participation in Energy Star, increasing its reach while it is still a voluntary benchmarking method for most jurisdictions.

Energy Star ranks buildings to the comparable building stock and not to a specific energy consumption target such as net zero. The shortcoming is that even with high scores, the remaining potential for further improvements is not directly apparent and restricts Energy Star to building categories that have a comparable building stock.

The West Tower of Adobe has earned the Energy Star label (a score of 75 or higher) every year since 2003, and the East Tower since 2004. The Almaden Tower has also earned the label every year since 2006. The Energy Star score trend for all three buildings is increasing. The ceiling has been reached for the East Tower with an Energy Star score of 100 representing the top percentile of the comparable building stock (with the other two towers at 93 and 99). A large contribution was the installation in 2010 of six fuel cells producing 1.2 MW of on-site energy. Although the fuel cells have only been in operation for six months, the efficient on-site generation of electricity reduced the site energy consumption enough to reach the top percentile. An additional on-site energy generation project was the installation of wind spires on the sixth floor patio connecting the three towers contributing 50 MWh per year.

The Almaden Tower was completed at the end of 2003, but the building did not earn an Energy Star label until 2006. The reason is that the initial score after one year in operation was 50, far underperforming the other two towers. This unexpectedly low score was a

surprise, as the design team had participated in the "Savings by Design" program by Pacific Gas and Electric Company ("PG&E") [g]. This program rewards owners and designers for buildings engineered with energy efficiency in mind. The expectation of the operations team was an equal or higher score for the new tower.

Discrepancies between performance at design time and performance during operation have been shown in other reports before (Newsham et al., 2009). The Almaden Tower confirms these findings, but also shows that efficient operations can mitigate underperformance after commissioning. In this case, the tower first received an Energy Star score of 78 in 2006.

In summary, designing an efficient building does not necessarily result in an efficiently operated building. However, as illustrated with the Almaden Tower, even with a small number of efficiency projects it is possible to turn an average performance building into a high-performance building.

Voluntary Standards: LEED EB

The focus of Adobe's conservation program is not to only conserve energy and reduce operating costs, but to also provide a green workplace and to be a recognized leader for sustainability within their industry. Earning the Energy Star label alone does not represent all these aspects, so Adobe selected to certify all three towers for LEED EB.

The goal of the LEED EB certification program by the US Green Building Council is to certify and recognize sustainability of the ongoing operation of a building [h]. LEED certification is rated on four levels; (1) Certified, (2) Silver, (3) Gold, and (4) Platinum. In

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g Savings by Design: http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/inc/index.shtml
h LEED for Existing Buildings: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221

2007, Adobe certified all three towers LEED EB Platinum - the first time any building received the Platinum level in the permanent LEED EB program (there was one platinum in the pilot EB program). In 2010, the towers were recertified, again under the LEED for Existing Buildings program; the LEED EB certifications were again at the Platinum level with the East Tower receiving the highest score ever achieved at the time (74 points).

A consequence of LEED EB certification was a refocusing of the conservation activities to include non-energy related aspects of a green building. In total, 34 new projects at Adobe's buildings in San Jose were identified as a consequence of the LEED EB certification in 2007. The analysis in the next section shows that of the 34 projects, Adobe initiated only six with the primary purpose of increasing the LEED EB score, while the remaining 28 projects would have been initiated even without the consideration of LEED EB certification. However, without the certification process, it is unlikely that the conservation efforts would have broadened in scope, therefore, leaving these savings opportunities uncovered.

Investments were higher than average in the respective year leading up to LEED EB certification in 2006 and recertification in 2009. Although LEED EB might not have been the primary driver for each individual project in these years, certification focused the operation team on conservation opportunities and identifying opportunities for higher scoring.

Project Analysis

The previous sections focus on measurable outcomes of the energy conservation and sustainability program. This section analyses the 78 projects within the program at San Jose in more detail, the process for selecting them and the types of payback periods being considered. Additionally, this section discusses the primary drivers for the conservation projects and implications that can be drawn from them.

Projects: Vetting Process

As mentioned in the last section, LEED EB certification provides the operations team with new ideas for projects, but certification is not the exclusive source for new projects. At Adobe it is a well-communicated policy that the building management team is open to vendor presentations and will support trials of new technologies and techniques for feasibility testing. The selection process for any other projects is opportunistic: If the professional network of the operations team identifies a potential project, a trial is set up and the implementation planned. Currently, a full-time Global Energy Manager and a full-time Global Sustainability Manager select, prepare, and manage the 78 projects described in this case study as well as projects at other Adobe properties worldwide.

Reviewing the evaluation process for each project, a number of different approaches become apparent. Adobe's most commonly used evaluation method for projects is a vetting process with a staged rollout. First, the vendor presents the new product or process, then, passing a feasibility calculation, the team runs a trial in one floor of the building and finally, completes the rollout across all towers. The process guarantees a high probability of matching the predicted performance and executing only projects with a reasonable payback period.

Once the performance has been verified with a trial installation, the operations team performs a simple payback calculation: alternatives are evaluated and compared over a 5-10 year project lifetime. One example is a lighting retrofit; the cost of each lamp, the savings and the lifetime of the project can be estimated reliably after running a short trial testing the light's performance ("simple payback calculation projects"). These projects carry a small amount of risk and the components have little interactions with other systems.

For other projects a staged rollout is not possible as they have building-wide consequences. These projects impact the central load management or involve new equipment or processes. Two further analysis methods apply for these projects. First, projects that do not require the installation of new equipment are evaluated by checking the meter's reading after the measure is implemented to test the measure's effectiveness ("meter projects"). Second, there are projects that require simulation models to be evaluated appropriately. The project savings depend on a number of interactions between components requiring a more complex evaluation made possible through simulation modeling. Of the 78 projects that Adobe selected to initiate, projects with a total 12% of annual savings required simulation modeling ("simulation projects").

Projects: Drivers

The preceding section shows how the projects were identified, evaluated, and selected at Adobe from initial vendor presentation to building-wide rollout. This section provides an analysis of the key driver responsible for initiating each project. As mentioned previously, LEED EB and Energy Star scores are metrics Adobe is pursuing in San Jose, but they were not the exclusive drivers for all 78 projects. Based on post-implementation interviews with the operations team, the following five drivers were identified and rated most important:

1. Operations Management: projects proposed by the operations team that are completed independently of available incentives.
2. Third Party Incentives: projects that were pursued to collect monetary incentives. Incentives most frequently came from the programs offered by the Public Utility

Commission and distributed by PG&E [i]. The reduced upfront cost of the projects allowed for larger and more ambitious projects.

3. New Technologies: these projects are driven by new technologies in the market. A potentially positive side effect for the owner is recognition as a leader in adopting new technologies. This was the case with the fuel cells, the wind spires, water free urinals and Dyson Airblades.
4. Corporate: projects that were implemented due to the corporate culture established by Adobe management. Recycling is an example of a corporate policy impacting building operations.
5. LEED EB driven: projects that had the primary goal to increase the LEED EB score.

A note on regulations: None of the Adobe projects were initiated due to regulatory requirements. This changes for coming years and in 2011 the Bay Area Air Quality Management District legislation requires an upgrade to the boilers in the East and West Towers and a replacement of the boilers in the Almaden Tower in 2012.

	Count	Percentage	Savings	Percentage
Operational Management	31	40%	$550,514	21%
Corporate	14	18%	$293,469	11%
LEED EB Driven	6	8%	$231,616	9%
Third Party Incentives	19	25%	$895,916	35%
New Technology	7	9%	$616,852	24%

Table 1: Annual savings by primary driver

For 73 projects a single key driver was identified, four projects also included a significant secondary driver [j] and for one project no driver could be identified. The largest contributor to annual savings is the third-party incentive driven project list (Table 1).

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[i] Rebates, Incentives and Resources: http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/

[j] For the analysis only the primary driver for each project is considered. Two projects account "New Technology" as primary and "Operation Management" as secondary driver. Two further projects report "Corporate" as primary and "Third Party Incentives" as secondary driver.

Although this category represents only 25% of the completed projects, these projects produce 35% of the annual savings. This effectiveness indicates that the incentives "work" as they focus activity on projects that produce large annual savings. The largest driver [k] by project count for conservation projects is the operational management team. The focus of these projects is lighting, load management, and monitoring. Third party incentives are the second most important driver.

Adobe's conservation projects have utilized a number of incentive programs offered by PG&E as well as federal tax credits to initiate projects. Specifically, Adobe received benefits from the following programs: "Customized Retrofit Incentives", "Savings by Design", the "Retrocommissioning Program", the "Demand Response Programs", and the "Self-Generation Incentive Program". Incentives totaling $6.5 million from PG&E and $3.6 million in federal tax credits were awarded to Adobe. These savings are significant and have helped justify a number of projects that would have shown an insufficient return on investment otherwise. This in itself is valuable for the utility and its customers. PG&E is able to reduce expenses at the utility level by lowering demand and influence investment decisions of its customers, enabling larger projects at an earlier time, even when they do not quite meet the customers' investment criteria yet.

Projects: Payback Analysis

This section ties the analysis methods of the two previous sections together with the payback periods for the individual project, as Adobe evaluates conservation projects based on simple payback and lifetime cost.

[k] Projects were categorized with the assistance of the Global Energy Manager.

An evaluation of the payback periods shows a number of projects with fast payback: 28 projects show a payback of less than one year with total annual savings of more than $1 million (Figure 3). Projects with a simple payback of up to two years produce the next $1 million of annual savings. Additionally, as the figure shows, Adobe has invested in projects with a wide range of payback periods and the following discussion highlights the motivations for these investment decisions. Of the 78 projects, three projects resulted in payback periods of over ten years; all three were a result of actual performance falling short of predicted performance resulting in a reduced rollout when possible.

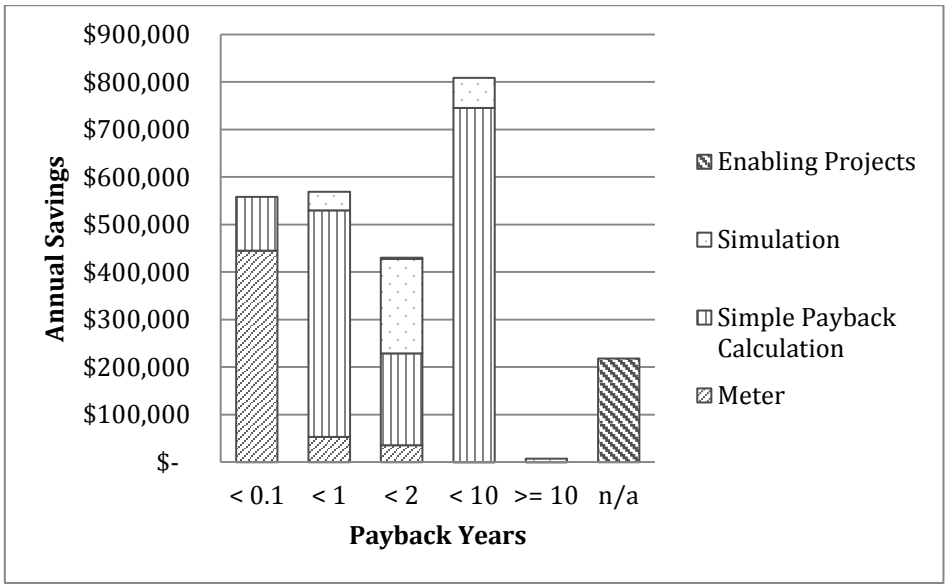

Figure 3: Annual savings by payback period

Eighteen projects have no directly measurable payback. These are investments in monitoring, certification, and education. These three project types, although not measurable directly, have an impact on increased energy savings indirectly: By improving monitoring capability the operations team is able to measure more aspects of the facility and uncover savings opportunities. The certification process encompasses a review of internal processes and performance, which inform new projects. The education category includes writing case studies that spread awareness to the conservation efforts at Adobe.

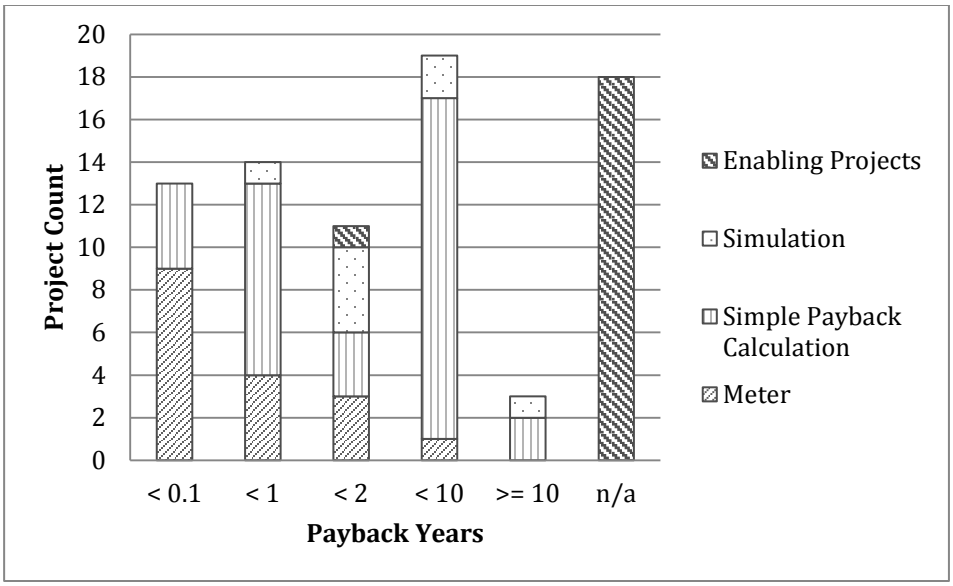

Figure 4: Project count by payback period

Figure 4 shows a grouping of the projects by payback periods. 50% of all projects have a payback of less than two years. Looking at the three evaluation methods, 17 are meter based, 34 simple payback and 8 simulation projects. The mean for payback period is: 0.5 years (Meter), 4.6 years (Simple Payback), 4.7 years (Simulation). The meter-based projects typically have a fast payback, as very little capital is required. The main costs are the evaluation and time spent to program the control system.

Simple payback calculation is not the only criterion for Adobe's decisions to pursue conservation projects. The company completed a number of projects that have longer payback periods or do not directly show a return on investment. The following three factors influence Adobe's decision to invest in sustainability measures:

- As a technology company Adobe has a bias towards testing new technologies, which are inherently more risky in their deployment. At the same time, implementing new technology is helping communicate conservation efforts inside the company and externally.

- Setting yearly targets for Energy Star and participating in LEED EB certification is costly, but creates a continuous commissioning mindset. This focus creates other projects with potentially lower payback periods and projects that further social responsibility goals.
- Both on-site energy production projects have long payback periods. However, both increase independence from the electricity grid. The fuel cells also result in a significant improvement in the Energy Star score.

This section concludes the analysis of the conservation projects in San Jose by Adobe. A complete project list can be found in Appendices A and B with descriptions, investments, rebates and annual savings for each project detailed.

Broader Context

This case shows how an owner is able to achieve significant savings from the conservation efforts at their facilities as well as leveraging the performance of their buildings to position themselves as a leader in sustainability in their industry

Adobe has shown in San Jose one approach to reduce overall energy consumption while increasing employee count and software labs by investing in the operations of their buildings. At the same time, energy efficiency has been identified (Granade et al., 2009) to be a largely untapped resource in the U.S. to overcome the energy challenges of the future. This section analyzes the barriers faced by owners of commercial buildings and how Adobe overcame them.

McKinsey and Company (Granade et al., 2009) identified the following barriers for improved energy efficiency in private commercial buildings in the U.S.: (1) split agency, (2)

expectations of short payback period, (3) upfront capital constraints, and (4) lack of awareness or information.

(1) Split agency has traditionally been a problem for leased buildings, as owners do not have clear financial incentives to invest aggressively in efficiency, as they will not reliably capture the savings directly. However, "Owners may benefit from efficiency investments, if lower operating costs increase the rate of tenant renewals and/or command a rental premium" (Granade et al., 2009). Recent studies (Eichholtz and Kok, 2010, Eichholtz et al., 2010) have shown that voluntary energy standards are an effective tool to overcome this barrier. Otherwise identical buildings show a rent premium of three percent per square foot and an increase in valuation by 16 percent when certified by Energy Star. The energy savings associated by the certification represents one percent in value premium, the remainder are associated with potentially intangible effects such as an improved corporate image and worker productivity (Eichholtz et al., 2010). For the U.S., the impact of temperature and lighting comfort in green buildings on productivity gains have been estimated (Fisk, 2000) at $20 to $160 billion annually.

The adaptation of voluntary standards (Energy Star and LEED) has recently been increasing rapidly (Kok et al., 2011): "In 2010, thirty percent of all commercial office space and ten percent of office buildings in the 48 largest metropolitan areas were certified by Energy Star. Furthermore, about eleven percent of office space and five percent of office buildings were certified sustainable by LEED." [1] For both standards, the space percentage adaptation is higher than the building percentage. This implies that owners of larger properties have overcome the split agency barrier and have identified voluntary standards as a means to demand premium valuations and rental rates. Further research needs to

[1] Kok et al. utilize the CBRE-EA "Building Stock Database" (http://www.cbre-ea.com) for their analysis. The metropolitan areas are across the U.S. and Canada.

confirm if the trend for higher certification continues for large properties in the coming years and if new barriers replace split incentives. For example, it is unclear whether owners continue to invest in energy efficiency beyond reaching certification and to what extend owners realize advantages from investing in buildings that do not have the potential to reach certification by either standard.

Adobe, similar to many technology companies in Silicon Valley, is not directly impacted by the split incentive problem, as it owns the three towers in San Jose. It has, however, identified the opportunity in improving the asset value of their buildings in San Jose by reducing operating expenses and utilizing the certification process to publicize the high performance of their property.

(2) Expectations of short payback periods are holding back larger and more ambitious energy retrofits. The average payback period expected by commercial customers is 3.6 years (Granade et al., 2009). This expectation is contrasted with an average fifteen-year lifetime for energy efficiency measures in the commercial building sector (Granade et al., 2009). In San Jose, Adobe shows $1 million of annual savings based on projects with paybacks of less than one year. However, to reach further savings, the investment strategy needs to consider more expensive projects that will invariably carry a longer payback period. Exclusively using payback period based on operational savings to value energy conservation projects ignores the increased asset value of a more efficient building.

Adobe has aggressively pursued third party incentives to show shorter payback periods for the projects. Over all projects, Adobe achieves an average payback period of 3.4 years. Without incentives the average payback period would have increased to 4.3 years.

(3) McKinsey and Company identify upfront capital constraints as the third barrier for energy efficiency retrofits. Their report also suggests a couple of solutions, including

"establishing a public-private partnership through a government loan guarantee fund, enabling creative financing solutions, and/or introducing mandatory assessments and upgrades".

In the case of Adobe's building operations, capital constraints were not the primary limiting factor. Data on projects not executed was not provided, but large projects as well as projects with long payback periods have been run as part of the sustainability program. The company invested in these projects when it furthered the goals of providing a green workplace for employees and achieving its sustainability targets and as a consequence decided to invest into the 78 sustainability projects. As shown above, the incentives offered by PG&E and the tax credits facilitated some of the projects, but this represents only a subset of the projects. For other owners, mandatory assessments and upgrades will be needed to push investments in sustainability to a broader set of buildings.

(4) Lack of awareness or information is identified in the McKinsey and Company report as the final barrier for energy efficiency in commercial buildings: "Many facility managers are unaware of energy efficiency potential with the belief that the building is already energy efficient. Furthermore, they often possess limited knowledge of energy efficiency measures and ways to deploy them within their facilities."

Adobe embraced performance benchmarking as a crucial step to determine the potential and priority of energy improvements. The operations team discovered the inefficiency of Almaden Tower after performing a benchmark with Energy Star. Once the benchmarking results were known, the operational team could prioritize and execute a set of projects to improve performance. For owners in general, the actual improvement measures can originate from the operational team, or if a third party assessment is necessary, energy audits can deliver a first set of projects.

Implications

There are characteristics of this case study that are inherent to the San Jose location and to a lesser degree to Adobe as a software vendor. However, in the context of building operations, the company is behaving as any other owner with ambitious sustainability goals would or could. This section, following the synthesis of Adobe's results in the previous sections, distills implications for practice.

Opportunities exist for energy conservation in even the most efficient buildings. The following key ingredients enable a successful conservation program: (1) continuous benchmarking performance with Energy Star, (2) aggressive usage of available incentives, (3) an operations team focused on conservation, and (4) investments in the LEED EB certification process for sustainability.

Looking at Adobe's successes, it appears that in many buildings a number of energy conservation projects exist that result in a fast payback: Lighting projects have a fast payback, and these projects may be eligible for incentives thus requiring only simple economic evaluation. Interviews with the operations team showed that with the fast pace of innovation in lighting, it is possible to run a lighting exchange every two years, each time improving efficiency and increasing savings. Adobe saves over $1.5 million dollars annually with projects with less than a two-year payback.

If there are no further clear opportunities in a building, the incentive based programs of the local utility are a valuable resource for targeting projects. The experience at Adobe has shown that incentives provided by utilities encourage projects with large annual savings.

Energy Star has shown to be a very effective tool for Adobe to communicate a single performance metric to stakeholders such as the management at the company. As Amaratunga et al. (2000) reasons, it is key to "translate the FM vision into clearly

measurable outcomes that define success". Additionally, the annual update of Energy Star is a quick fact check if the operations team is running projects that actually impact the performance of the building operation. Running annual updates of Energy Star over multiple years turns into a voluntary retrofit commissioning program, focusing the operations team's effort on conservation.

LEED EB certification has similar effects. Adobe initiated 34 new projects during the certification process. For all owners LEED EB becomes especially important once the conservation focus shifts away from reducing electricity consumption to providing a green workplace. The positive effects might appear operationally intangible, but influence the attractiveness of the workplace. It has been shown that environmentally conscious owners attract and retain more employees (Turban and Greening, 1997).

One finding of studying the projects at Adobe's headquarters in San Jose is that energy modeling plays a very small role in the practice of improving building performance of a very ambitious owner. Only 12% of annual savings are attributed to projects that required simulation for their evaluation, selection and justification. As simulations are a valuable analysis method for testing energy conservation alternatives (Zhu, 2006), explorations into reducing the requirements for simulation are needed to increase relevance for retrofit valuation. One recent example is the "Rapid Energy Modeling for Existing Buildings" effort (Autodesk Inc., 2009).

The number of projects that Adobe has been able to generate for the three towers is a result of the team's intimate knowledge of the buildings. The operations team is on-site, constantly looking for savings opportunities. In contrast, companies with a larger portfolio of buildings, as well as Adobe as a global corporation, might not be able to extend Adobe's approach in a cost efficient manner to all buildings. Instead of leveraging on-site knowledge,

other approaches need to be investigated. The goals also need to be adapted: Energy Star scores of 100 across the portfolio might not be economically feasible, but a continuous improvement of the average portfolio score is achievable.

In practice, companies such as Enernoc [m] and People Power [n] already provide tools that assist with routine analytics to uncover cheap savings opportunities with very little input from the on-site team. No research has been conducted on how on-site operations teams perform when compared to data analytics services, especially in combination with retro-commissioning. This can result in interesting tradeoffs when considering the effectiveness of the engineering team across the portfolio (e.g. in $ saved / employee hour).

This case shows the challenges of energy efficiency and sustainability are not solved with a single improvement. Instead, it shows the value of sustained attention, the multitude of activities required, and how an organization can improve its performance over time. The critical component is sustained benchmarking as a first step towards continuous commissioning. And finally, an advantage of public leadership in sustainability is that instead of incurring costs for researching new developments, vendors are approaching Adobe instead.

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[m] EfficiencySMART: http://www.enernoc.com/solutions/energy-efficiency.php
[n] Energy Services Platform: http://www.peoplepowerco.com/esp/

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Appendix A – Project list

This appendix contains all completed energy conservation and sustainability projects from 2001 until the end of 2010 at the San Jose Adobe Systems headquarters. All projects are identified by completion year, system type, project description, cost, rebates and annual savings. The table of projects is based on documentation provided by Adobe Systems.

Year Completed	System Type	Project Description	Estimated Cost	Rebate & Incentives	Annual Savings
2001	Lighting	Lamp Retrofits/Management - Turned off lamps, de-lamped, or reduced wattage by switching to compact fluorescent lamps. East & West Towers.	$11,088	$-	$98,495
2001	Load Mgt	Watt-Stoppers/Surge Protectors -Installed approx. 4,350 Watt-stopper surge protectors with motion sensors, x $3.14 savings per month x 12 months. East & West Towers.	$104,750	$78,650	$65,520
2002	Lighting	Lighting - Converted 63 elevator lobby lamps and crossover bridge lamps from 65-watt incandescent flood lamps, and 131 high-ceiling lobby lights from 75-watt incandescent flood lamps to 16-Watt fluorescent equivalent lamps for East & West Towers.	$2,930	$-	$8,536
2002	Load Mgt	Outside Lighting - Reduced “on” time for outside lights. East & West Towers.	$25	$-	$292
2002	Load Mgt	Garage Exhaust Fans -Reduced run-time for garage exhaust fans. All towers.	$100	$-	$48,204
2003	Load Mgt	Cooling Tower - Modified cooling tower staging and sequencing to obtain roughly a 50% decrease in energy consumption from the cooling towers. Decrease from 45 amps to approximately 20 amps. West Tower.	$575	$-	$12,220
2003	Load Mgt	Boiler Control Function -Optimized Boiler Control Function Programming and run times. All towers. (Valid end 2010)	$600	$-	$59,606
2003	Lighting	Garage Lighting -Retrofitted existing high-pressure sodium lamps with fluorescent lamps in garages. All towers.	$208,827	$40,558	$110,085
2003	Equipment	VFD for Supply Fans -Installed VFD (variable frequency drive) on West Tower supply fan. West Tower	$126,960	$51,968	$48,256
2003	Equipment	AFD on Chiller -Installed AFD (adaptable frequency drive) on chiller. West Tower.	$65,000	$41,207	$38,719

2004	Load Mgt	Major Rotating Equipment -Balanced Major Rotating Equipment. All towers.	$2,500	$-	$1,820
2005	Load Mgt	HVAC Occupancy Control - Install HVAC occupancy control in file storage rooms, Library & conference rooms. All towers.	$59,499	$17,732	$55,167
2005	Load Mgt	Demand Response - Programmed 80% of lighting in garages to turn off from midnight to 6:00 am, even though buildings open 24/7. All towers. Also rewired East & West office tower perimeter and interior lighting zones to accommodate Demand Response and rescheduled corridor zones. Enabled approximately 260 kW toward Demand Response capacity. All towers.	$75,504	$25,636	$29,829
2005	Load Mgt	Garage Lighting -Rescheduled parking garage lighting to achieve additional reduced operating hours. Previously 126 hrs. per wk., new schedule is 70 hours per week (7:00 am - 9:00 pm). All towers.	$100	$-	$19,393
2005	Load Mgt	IDC Closet Thermostats -Relocated IDC Closet thermostats from the ceiling plenum to the closet walls so they would not be reading higher temperatures in the ceiling. West Tower.	$3,220	$-	$2,519
2005	Water Mgt	ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers - 2nd Floor.	$3,610	$-	$9,001
2005	Monitoring	Real-time Digital Electric Sub-Meters - Installed real-time digital electric sub-meters. All towers.	$19,960	$-	$-
2005	Monitoring	Digital Water Treatment Monitoring - Installed state-of-the-art digital water treatment monitoring and control stations with incoming and bleed-line water meters for calculation of evaporation for reduced sewer charges. All towers.	$39,422	$11,000	$12,000
2005	Water Mgt	Waterless Urinals -Installed waterless urinals throughout. All towers.	$35,374	$5,396	$6,338
2005	Water Mgt	Automated Faucets and Toilet Flush Valves - Installed automated faucets and automated toilet flush valves. All towers.	$110,358	$-	$24,949
2006	Certification	LEED-EB Certification - The three towers were certified as Green Buildings through the U.S. Green Building Council's LEED for Existing Buildings program (LEED-EB) at the platinum level; they will be re-certified every three years.	$135,000	$-	$-
2005	Monitoring	GE Lighting Panel Enhancement - GE Lighting Panel Enhancement to facilitate Demand Load Curtailment. All towers.	$20,450	$-	$29,366

2005	Demand Response	Demand Response - East and West Towers sign on to PG&E CPP & CPA/DPR Demand Response Programs. East & West Towers.	$-	$37,684	$2,893
2005	Lighting	Overhead Lighting -Retrofitted major overhead lighting with GE Nexgen T-8 Lamps and Ballasts. East & West Towers.	$65,106	$4,360	$11,315
2005	Load Mgt	Tune-up - Initiated State sponsored building tune-up engineering study. 6-month study period with energy savings measures recommendations. All towers.	$19,870	$10,964	$208,009
2005	Load Mgt	Chilled Water Pump - Located and corrected chilled water pump control issue in the West Tower with help of new real time digital meters and intelligent building interface monitor and control system (IBIS) (valid until end 2009).	$1,200	$-	$51,112
2005	Purchasing	Recycled Content Office Supplies - Implemented us of minimum 30% recycled content office supplies. All towers.	$100	$-	$8,700
2005	Load Mgt	Motion Sensors - Install motion sensors/dimmers in freight elevator alcoves, stairwells, stairwell alcoves and garage storerooms. All towers.	$94,516	$20,996	$51,282
2005	Load Mgt	Watt-Stoppers/Surge Protectors -Installed approx. 4,350 Watt-stopper surge protectors with motion sensors, x $3.14 savings per month x 12 months. Almaden Tower.	$48,435	$12,750	$31,998
2006	Off-site Renewable Energy	Renewable Energy Credits - Purchased Renewable Energy Credits (RECs) equivalent to 30% of our total energy usage.	$-	$-	$-
2006	Monitoring	Installed Weather Station Display on IBIS	$9,890	$-	$-
2006	Education	Case studies were written for Energy Star to educate members of the building industry regarding Adobe's sustainability successes.	$2,500	$-	$-
2006	Equipment	VFD Chiller -Installed VFD (variable frequency drive) on chiller. East Tower.	$73,000	$29,400	$12,000
2006	Purchasing	Dyson Airblade - Installed twelve Dyson Airblade hand dryers in restrooms. All towers.	$6,000	$-	$1,000
2006	Monitoring	IBIS Monitoring System -Identified and corrected morning chiller hunt spike using new monitoring system. West Tower. (IBIS) (End of 2010)	$100	$-	$715
2006	Monitoring	IBIS - Identified and corrected main chilled water valve defect using new monitoring system (IBIS). West Tower. (IBIS)	$4,364	$-	$4,200
2006	Water Mgt	ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers - 6th Floor.	$3,610	$-	$9,001

2006	Green Cleaning	Green Cleaning -Implemented sustainable "green cleaning" program. All towers.	$100	$-	$81,616
2006	Monitoring	Irrigation Submeters -Installed real-time digital irrigation submeters. All towers.	$24,259	$-	$12,000
2006	Education	Case Studies -Case studies were written for USGBC to educate members of the building industry regarding Adobe's sustainability successes.	$2,000	$-	$-
2007	Recycling	Compostable Food Service -Implement use of compostable food service products in cafeteria and break rooms (paper plates, napkins, paper cups, vegetable-based eating utensils)	$43,134	$-	$46,650
2007	Purchasing	Automated Towel Dispenser - Installed automated paper towel dispensers to facilitate more efficient roll paper, versus folded towels; higher recycled content, less packaging, lower overall cost. All towers.	$34,500	$-	$16,677
2007	Load Mgt	Seals for Freezers and Coolers -Retrofit new seals for coolers and freezers in cafeteria. West Tower.	$250	$-	$100
2007	Monitoring	HVAC Controls -Implemented very visual, highly detailed monitoring & control system for HVAC. All towers. (IBIS)	$25,751	$-	$-
2008	Load Mgt	Thermal Tinting - Applied thermal tinting on south & west facing windows. East & West Towers	$258,699	$55,974	$51,504
2009	Certification	LEED-EBOM Recertification - Re-certifying all three towers through, USGBC LEED-EB Green Building program. (Recertifying on a three-year cycle)	$15,000	$-	$-
2008	Lighting	Café' LED Lighting -Retrofitted lighting in West Tower Café to lower wattage fluorescent lighting. West Tower Café.	$3,500	$386	$500
2008	Monitoring	Data Center Energy Use Monitoring -Isolated data center energy use from overall demand and establish reporting and print-out procedure. All towers.	$10,000	$-	$-
2008	Purchasing	Natural Gas -Contract with third-party provider to purchase natural gas for Adobe at a discount. All towers.	$500	$-	$22,300
2008	Recycling	Paper Towel Composting -Begin composting paper towel waste from restrooms. All towers.	$1	$-	$500
2008	Education	Sustainability Write-ups -Prepared write-ups on Adobe's sustainability initiatives for facilities web site.	$1,200	$-	$-
2008	Lighting	LED Lamps -Retrofitted 640 halogen corridor track lighting with LED lamps. East and West Towers.	$26,062	$6,000	$9,343

2008	Purchasing	Water Filtration System -Install filtration system to reduce disposable water bottles usage. Select tumblers and cups and stock them to facilitate employees using filtered water from the dispensers rather than bottled water. All towers.	$154,034	$-	$35,000
2008	Recycling	Dual-sided Copying -Set copiers default to dual-sided copying. All towers.	$250	$-	$22,500
2007	Equipment	HVAC Ducts -Retrofitting of HVAC ducting in conjunction with floor remodel projects (part of larger remodel project, actual cost estimated). West Tower - W8	$50,000	$17,280	$17,280
2008	Purchasing	Coffee Lids -Replace plastic coffee lids with compostable versions. All towers.	$2,500	$-	$625
2008	Load Mgt	Virtualization - Implement virtualization for the data centers; initial project, 35 servers (San Jose).	$92,505	$5,125	$13,244
2008	Monitoring	Energy Star - Developed formula to project Energy Star score in real time for building interface system (IBIS). All towers.	$15,000	$-	$-
2008	Demand Response	Demand Response - Signed up for demand response program. All towers.	$-	$6,500	$-
2008	Monitoring	Carbon Emissions - Develop and implement metric for calculating global carbon emissions and reporting them.	$80,000	$-	$-
2008	Lighting	LED Task Lamps -Implement substitution of LED task lamps as new standard in place of previous standard, which was fluorescent; not economical to retrofit existing lamps; implement going forward on an as requested basis; initially 6 lamps). All towers.	$810	$-	$14
2009	Demand Response	Participation in Demand Response.	$-	$4,300	$-
2009	Water Mgt	ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers & park.	$7,210	$-	$14,003
2009	Natural Gas	Purchasing Natural Gas from a Broker - Lower cap for Natural Gas purchases ($.41/therm savings).	$-	$-	$65,517
2009	Water Mgt	Changed all aerators to low flow for all faucets and shower heads.	$3,500	$-	$4,850
2009	Water Mgt	Changed all existing high flow toilets to low flush.	$240,000	$7,000	$25,960
2009	Certification	LEED Re-certifying Adobe properties utilizing C&W Portfolio Program. Valid 1 year.	$18,000	$-	$150,000
2009	Lighting	Retro fit beverage coolers with LED Lamps	$2,046	$270	$887
2009	Equipment	Optimum Energy all variable speed Hartman Loop control strategy on the West Tower central Plant.	$179,500	$63,882	$104,195
2009	Load Mgt	Implemented Overnight Exhaust Fan	$1	$-	$24,000

		Strategy to reduce chiller use in the mornings.			
2009	Demand Response	Almaden Data Center Power Savings -D. Morrison.	$-	$1,685	$-
2010	Alternative Energy	Install wind spires on 6th floor deck. Windspires generate electricity using wind energy. - 6th Floor Patio	$318,021	$155,600	$7,000
2010	Lighting	Install LED Lights in the Call buttons of Elevators - Almaden	$7,500	$-	$487
2010	Alternative Energy	Installing Fuel Cells. Fuel Cells generate electricity using bio-gas obtained from dairy farms and landfills - 6th Floor Patio.	$12,364,500	$9,347,000	$525,330
2010	Load Mgt	Adding Lockouts to Air Handlers. All towers.	$320,000	$-	$50,000
2010	Load Mgt	Daylight Cleaning commenced. Daylight cleaning reduces energy usage and promotes work-life balance for the janitors.	$22,222	$-	$75,000
2010	Waste Mgt	Elimination of Bottled Water, addition of iCup, Coffee Grinders, etc.	$30,000	$-	$113,945
2010	Lighting	Installation of Garage Lights, which are lower wattage and longer lasting.	$42,000	$2,500	$29,000
		Total	$15,749,136	$10,061,807	$2,592,568

Appendix B - Projects by Analysis Method and Primary Driver

Appendix B lists all projects with analysis method and primary driver. The operations team assisted with classifying the projects.

Project Description	Analysis Method	Primary Driver
Lamp Retrofits/Management - Turned off lamps, de-lamped, or reduced wattage by switching to compact fluorescent lamps. East & West Towers.	Simple Payback Calculation	Operational Management
Watt-Stoppers/Surge Protectors -Installed approx. 4,350 Watt-stopper surge protectors with motion sensors, x $3.14 savings per month x 12 months. East & West Towers.	Simple Payback Calculation	Third Party Incentives
Lighting - Converted 63 elevator lobby lamps and crossover bridge lamps from 65-watt incandescent flood lamps, and 131 high-ceiling lobby lights from 75-watt incandescent flood lamps to 16-Watt fluorescent equivalent lamps for East & West Towers.	Simple Payback Calculation	Operational Management
Outside Lighting - Reduced “on” time for outside lights. East & West Towers.	Meter	Operational Management
Garage Exhaust Fans -Reduced run-time for garage exhaust fans. All towers.	Meter	Operational Management
Cooling Tower - Modified cooling tower staging and sequencing to obtain roughly a 50% decrease in energy consumption from the cooling towers. Decrease from 45 amps to approximately 20 amps. West Tower.	Meter	Operational Management
Boiler Control Function -Optimized Boiler Control Function Programming and run times. All towers. (Valid end 2010)	Meter	Operational Management
Garage Lighting -Retrofitted existing high-pressure sodium lamps with fluorescent lamps in garages. All towers.	Simple Payback Calculation	Third Party Incentives
VFD for Supply Fans -Installed VFD (variable frequency drive) on West Tower supply fan. West Tower	Simulation	Third Party Incentives
AFD on Chiller -Installed AFD (adaptable frequency drive) on chiller. West Tower.	Simulation	Third Party Incentives
Major Rotating Equipment -Balanced Major Rotating Equipment. All towers.	Meter	Operational Management
HVAC Occupancy Control - Install HVAC occupancy control in file storage rooms, Library & conference rooms. All towers.	Simple Payback Calculation	New Technology
Demand Response - Programmed 80% of lighting in garages to turn off from midnight to 6:00 am, even though buildings open 24/7. All towers. Also rewired East & West office tower perimeter and interior lighting zones to accommodate Demand Response and rescheduled corridor zones. Enabled approximately 260 kW toward Demand Response capacity. All towers.	Meter	Third Party Incentives
Garage Lighting -Rescheduled parking garage lighting to achieve additional reduced operating hours. Previously 126 hrs. per wk., new schedule is 70 hours per week (7:00 am - 9:00 pm). All towers.	Meter	Operational Management
IDC Closet Thermostats -Relocated IDC Closet thermostats from the ceiling plenum to the closet walls so they would not be reading higher temperatures in the ceiling. West Tower.	Enabling Project	New Technology, Operational Management
ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers - 2nd Floor.	Meter	Operational Management

Real-time Digital Electric Sub-Meters -Installed real-time digital electric sub-meters. All towers.	Enabling Project	Operational Management
Digital Water Treatment Monitoring - Installed state-of-the-art digital water treatment monitoring and control stations with incoming and bleed-line water meters for calculation of evaporation for reduced sewer charges. All towers.	Simple Payback Calculation	Third Party Incentives
Waterless Urinals -Installed waterless urinals throughout. All towers.	Simple Payback Calculation	Third Party Incentives
Automated Faucets and Toilet Flush Valves -Installed automated faucets and automated toilet flush valves. All towers.	Simple Payback Calculation	New Technology, Operational Management
LEED-EB Certification - The three towers were certified as Green Buildings through the U.S. Green Building Council's LEED for Existing Buildings program (LEED-EB) at the platinum level; they will be re-certified every three years.	Enabling Project	LEED EB Driven
GE Lighting Panel Enhancement - GE Lighting Panel Enhancement to facilitate Demand Load Curtailment. All towers.	Meter	Operational Management
Demand Response - East and West Towers sign on to PG&E CPP & CPA/DPR Demand Response Programs. East & West Towers.	Enabling Project	Third Party Incentives
Overhead Lighting -Retrofitted major overhead lighting with GE Nexgen T-8 Lamps and Ballasts. East & West Towers.	Simple Payback Calculation	Operational Management
Tune-up - Initiated State sponsored building tune-up engineering study. 6-month study period with energy savings measures recommendations. All towers.	Meter	Third Party Incentives
Chilled Water Pump - Located and corrected chilled water pump control issue in the West Tower with help of new real time digital meters and intelligent building interface monitor and control system (IBIS) (valid until end 2009).	Meter	Operational Management
Recycled Content Office Supplies -Implemented us of minimum 30% recycled content office supplies. All towers.	Simple Payback Calculation	Corporate
Motion Sensors - Install motion sensors/dimmers in freight elevator alcoves, stairwells, stairwell alcoves and garage storerooms. All towers.	Simple Payback Calculation	Third Party Incentives
Watt-Stoppers/Surge Protectors -Installed approx. 4,350 Watt-stopper surge protectors with motion sensors, x $3.14 savings per month x 12 months. Almaden Tower.	Simple Payback Calculation	Third Party Incentives
Renewable Energy Credits - Purchased Renewable Energy Credits (RECs) equivalent to 30% of our total energy usage.	Enabling Project	LEED EB Driven
Installed Weather Station Display on IBIS	Enabling Project	Operational Management
Case studies were written for Energy Star to educate members of the building industry regarding Adobe's sustainability successes.	Enabling Project	Corporate
VFD Chiller -Installed VFD (variable frequency drive) on chiller. East Tower.	Simulation	Third Party Incentives
Dyson Airblade - Installed twelve Dyson Airblade hand dryers in restrooms. All towers.	Simple Payback Calculation	New Technology
IBIS Monitoring System -Identified and corrected morning chiller hunt spike using new monitoring system. West Tower. (IBIS) (End of 2010)	Meter	Operational Management
IBIS - Identified and corrected main chilled water valve defect using new monitoring system (IBIS). West Tower. (IBIS)	Meter	

ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers - 6th Floor.	Simple Payback Calculation	Operational Management
Green Cleaning -Implemented sustainable "green cleaning" program. All towers.	Simple Payback Calculation	LEED EB Driven
Irrigation Submeters -Installed real-time digital irrigation submeters. All towers.	Simple Payback Calculation	Operational Management
Case Studies -Case studies were written for USGBC to educate members of the building industry regarding Adobe's sustainability successes.	Enabling Project	Corporate
Compostable Food Service -Implement use of compostable food service products in cafeteria and break rooms (paper plates, napkins, paper cups, vegetable-based eating utensils)	Simple Payback Calculation	Corporate and LEED EB Driven
Automated Towel Dispenser - Installed automated paper towel dispensers to facilitate more efficient roll paper, versus folded towels; higher recycled content, less packaging, lower overall cost. All towers.	Simple Payback Calculation	Corporate
Seals for Freezers and Coolers -Retrofit new seals for coolers and freezers in cafeteria. West Tower.	Meter	Operational Management
HVAC Controls -Implemented very visual, highly detailed monitoring & control system for HVAC. All towers. (IBIS)	Enabling Project	Operational Management
Thermal Tinting - Applied thermal tinting on south & west facing windows. East & West Towers	Simulation	Third Party Incentives
LEED-EBOM Recertification - Re-certifying all three towers through, USGBC LEED-EB Green Building program. (Recertifying on a three-year cycle)	Enabling Project	LEED EB Driven
Café' LED Lighting -Retrofitted lighting in West Tower Café to lower wattage fluorescent lighting. West Tower Café.	Simple Payback Calculation	Operational Management
Data Center Energy Use Monitoring -Isolated data center energy use from overall demand and establish reporting and print-out procedure. All towers.	Enabling Project	Operational Management
Natural Gas -Contract with third-party provider to purchase natural gas for Adobe at a discount. All towers.	Simple Payback Calculation	Corporate
Paper Towel Composting -Begin composting paper towel waste from restrooms. All towers.	Simple Payback Calculation	Corporate, LEED EB Driven
Sustainability Write-ups -Prepared write-ups on Adobe's sustainability initiatives for facilities web site.	Enabling Project	Corporate
LED Lamps -Retrofitted 640 halogen corridor track lighting with LED lamps. East and West Towers.	Simple Payback Calculation	Third Party Incentives
Water Filtration System -Install filtration system to reduce disposable water bottles usage. Select tumblers and cups and stock them to facilitate employees using filtered water from the dispensers rather than bottled water. All towers.	Simple Payback Calculation	Corporate
Dual-sided Copying -Set copiers default to dual-sided copying. All towers.	Meter	Corporate
HVAC Ducts -Retrofitting of HVAC ducting in conjunction with floor remodel projects (part of larger remodel project, actual cost estimated). West Tower - W8	Simulation	Operational Management
Coffee Lids -Replace plastic coffee lids with compostable versions. All towers.	Simple Payback Calculation	Corporate
Virtualization - Implement virtualization for the data centers; initial project, 35 servers (San Jose).	Simple Payback Calculation	Operational Management
Energy Star - Developed formula to project Energy Star score in real time for building interface system (IBIS). All towers.	Enabling Project	LEED EB Driven
Demand Response - Signed up for demand response program. All towers.	Enabling Project	Third Party Incentives

Carbon Emissions - Develop and implement metric for calculating global carbon emissions and reporting them.	Enabling Project	Corporate
LED Task Lamps -Implement substitution of LED task lamps as new standard in place of previous standard, which was fluorescent; not economical to retrofit existing lamps; implement going forward on an as requested basis; initially 6 lamps). All towers.	Simple Payback Calculation	Operational Management
Participation in Demand Response.	Enabling Project	Third Party Incentives
ET Controllers - Installed ET Controllers for irrigation; web-based weather station-automated control system with drip irrigation system. All towers & park.	Meter	Operational Management
Purchasing Natural Gas from a Broker - Lower cap for Natural Gas purchases ($.41/therm savings).	Enabling Project	Corporate
Changed all aerators to low flow for all faucets and shower heads.	Simple Payback Calculation	Operational Management
Changed all existing high flow toilets to low flush.	Simple Payback Calculation	Operational Management
LEED Re-certifying Adobe properties utilizing C&W Portfolio Program. Valid 1 year.	Enabling Project	LEED EB Driven
Retro fit beverage coolers with LED Lamps	Simple Payback Calculation	New Technology
Optimum Energy all variable speed Hartman Loop control strategy on the West Tower central Plant.	Simulation	Third Party Incentives
Implemented Overnight Exhaust Fan Strategy to reduce chiller use in the mornings.	Meter	Operational Management
Almaden Data Center Power Savings -D. Morrison.	Enabling Project	Third Party Incentives
Install wind spires on 6th floor deck. Windspires generate electricity using wind energy. - 6th Floor Patio	Simulation	New Technology
Install LED Lights in the Call buttons of Elevators - Almaden	Simple Payback Calculation	Operational Management
Installing Fuel Cells. Fuel Cells generate electricity using bio-gas obtained from dairy farms and landfills - 6th Floor Patio.	Simple Payback Calculation	New Technology
Adding Lockouts to Air Handlers. All towers.	Simple Payback Calculation	Operational Management
Daylight Cleaning commenced. Daylight cleaning reduces energy usage and promotes work-life balance for the janitors.	Simple Payback Calculation	Corporate
Elimination of Bottled Water, addition of iCup, Coffee Grinders, etc.	Simple Payback Calculation	Third Party Incentives
Installation of Garage Lights, which are lower wattage and longer lasting.	Simulation	Operational Management