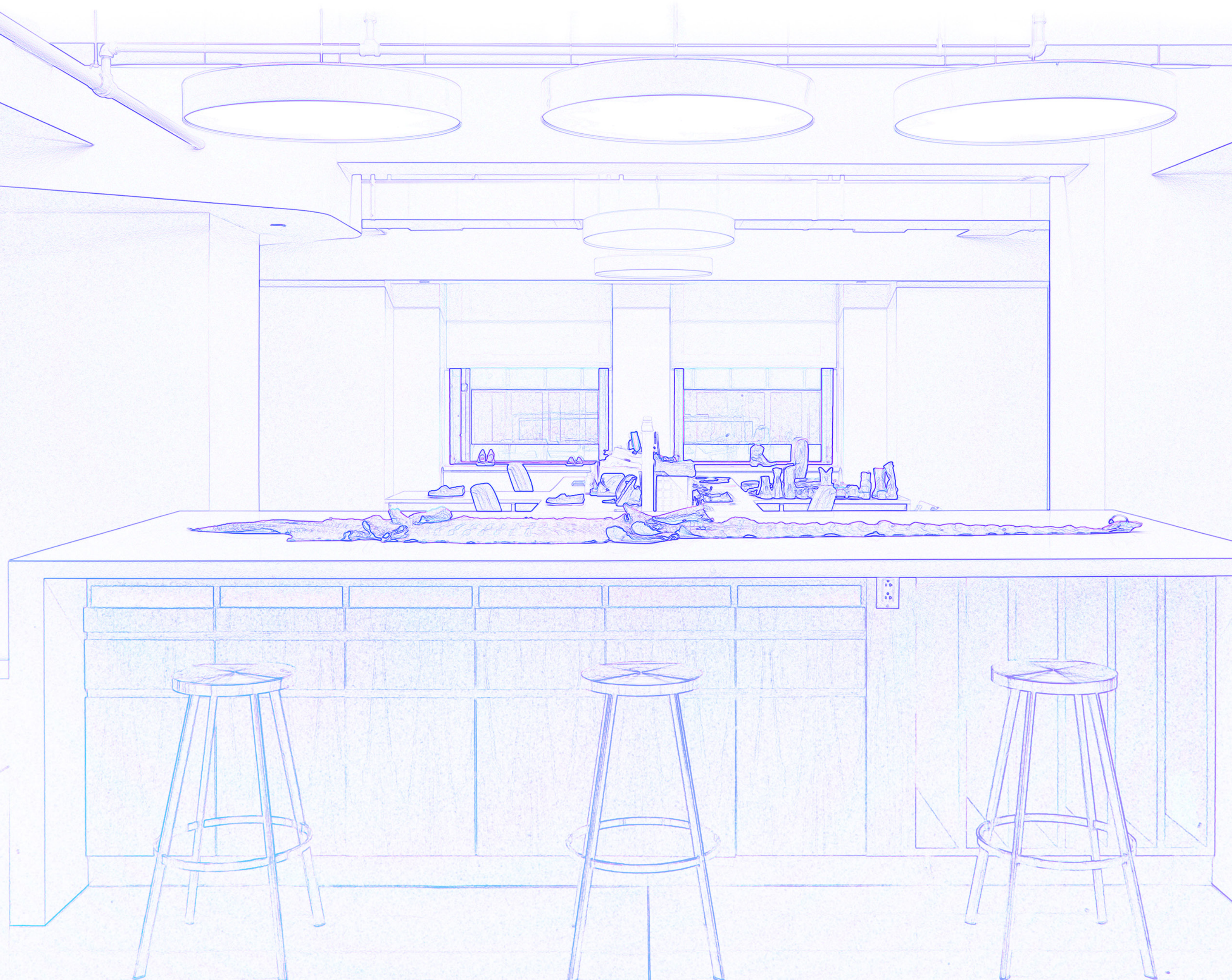
Urban Land Institute

ULI Tenant Energy Optimization Program

Case Study:
Global Brands Group



Executive Summary: Global Brands Group's Story

In January 2011, Global Brands Group Holding Ltd.[1] —a worldwide leader in global retail and apparel—leased 137,000 square feet on Floors 7,8, and 9 in the Empire State Building.

Global Brands Group was motivated to select a new office space that would capture the company's core values and culture, including a high prioritization on sustainability. The Empire State Building was a great fit: the 2.8 million square-foot icon had just undergone major retrofit and repositioning, transforming it into a Class-A, high-performance building located in the heart of Midtown Manhattan at Fifth Avenue and West 34th Street.

When it was time to design and construct its new space, Global Brands Group had several major goals, including reducing operational costs, increasing energy efficiency, and implementing sustainability best practices. Enter the Tenant Energy Optimization process—a proven, replicable approach that integrates energy efficiency into tenant space design and construction and delivers excellent financial returns through energy conservation. Working in tandem with building owner Empire State Realty Trust (ESRT) and a project team of experts, Global Brands Group evaluated an integrated package of energy performance measures (EPMs)[2] for the new floors. The chosen EPMs were incorporated into the space design to achieve substantial, cost-effective energy savings and a superior workplace environment.

Over the term of Global Brands Group's 15-year-lease, the project is estimated to provide energy cost savings of more than $438,090, a 126% return on Global Brands Group's investment[3], and a 20.5% internal rate of return (IRR)[4]. The projected payback: only 4.6 years.

The project was broken into two parts; the result of Phase 1 (the buildout of Floors 7 through 9) helped inform the buildout of the future leased floors, demonstrating the scalability of the process.

Global Brands Group's project is part of a series of case studies aimed at presenting the energy and cost savings impact of high-performance tenant design. The case studies and companion resource guides[5] provide a replicable model to expand the demand for high-performance tenant spaces, and supply the market expertise to deliver strong results from such projects. Projects using this step-by-step design and construction process typically demonstrate energy savings between 30% to 50%[6], have payback periods of three to five years, and average a 25% annual return.

1. Formerly known as Li & Fung USA when the lease was signed.
2. EPMs are technologies and systems that aim to reduce energy use through efficiency and conservation. They are also frequently referred to as Energy Conservation Measures (ECMs).
3. Assuming zero escalation in electricity prices over the lease term and a 5% administrative fee per the terms of tenant's lease.
4. The discount rate often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. (See more: http://www.investopedia.com/terms/i/irr.asp)
5. The guides can be accessed at tenantenergy.uli.org.
6. Compared to American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1-2007 code requirements.

What Is the 10-Step Tenant Energy Optimization Process?

The Tenant Energy Optimization process is a proven, replicable approach that integrates energy efficiency into tenant space design and construction and delivers excellent financial returns through energy conservation.

What Are the Benefits of the Tenant Energy Optimization Process?

It generates an attractive return on investment (ROI)—Tenants using the step-by-step design and construction process typically have experienced:
- Energy savings of 30 percent to 50 percent
- Payback in as little as three to five years
- An average annual internal return rate of 25 percent

It provides a competitive edge—Companies with more sustainable, energy-efficient workplaces enhance their ability to attract, retain and motivate workers who are healthier, happier, and more productive.

It is scalable and replicable—The process can provide energy and financial savings whether the tenant leases 2,500 or 250,000 square feet. Tenants and service providers who have gained expertise through implementation of the process have demonstrated that there is high potential for transferability beyond tenant office space to other property sectors.

It is proven—Through measurement and verification, tenants are able to demonstrate and communicate energy and financial savings.

It is environmentally critical—Energy use in buildings is the largest source of climate-changing carbon pollution and tenant spaces generally account for more than half of a building's total energy consumption, making this process essential to improving the environmental performance of buildings and addressing global climate change.

Overview: Global Brands Group Project Information and Projected Performance

Building Information				
Tenant Name	Global Brands Group Holding Ltd.			
Building Owner	Empire State Realty Trust			
Location	350 Fifth Avenue, Midtown Manhattan			
Building Size	2.8 million square feet (102 floors)			
Principal Use	Class-A office with street-level retail			
Construction Type	Pre-World War II skyscraper			
U.S. EPA ENERGY STAR® Rating	90			
Energy Retrofit Completion Date	2011			
Global Brands Group Lease Term	15 years			
Phase 1 Buildout (Three Floors)	**Projected Design**		**M&V Calibration**	
Modeled Square Footage	137,400 square feet		137,400 square feet	
Modeled Energy Reduction	25.5%		11.8%[7]	
Annual Electricity Reduction	200,746 kWh	1.5 kWh/SF	168,820 kWh	1.2 kWh/SF
Total Electricity Savings over Lease Term	3.0 GWh	21.9 kWh/SF	2.5 GWh	18.2 kWh/SF
Incremental Implementation Cost: ***Energy Modeling Soft Cost:*** ***State Incentives:***	$164,370 *$6,600* *$36,940*	$1.20/SF *$0.05/SF* *$0.27/SF*	$164,370 *$6,600* *$36,940*	$1.20/SF *$0.05/SF* *$0.27/SF*
Adjusted Incremental Implementation Cost	$134,030	$0.98/SF	$134,030	$0.98/SF
Total Electricity Costs Savings over Lease Term	$546,983	$3.98/SF	$438,090	$3.19/SF
Electricity Cost Savings over Lease Term (Present Value)	$387,097	$2.82/SF	$303,148	$2.21/SF
Net Present Value of Project Investment	$253,067	$1.84/SF	$169,118	$1.23/SF
Return on Investment over Lease Term	189%		126%	
Internal Rate of Return	30.2%		20.5%	
Payback Period (with Incentives)	3.7 years		4.6 years	

7. Differences in modeled energy reduction is usually due to a discovered underestimation or overestimation of energy use in the measurement and verification process.

Who Is Involved in the Tenant Energy Optimization Process?

It is collaborative—The process connects the dots between tenants, building owners, real estate brokers, project managers, architects, engineers, and other consultants to create energy-efficient workplaces. In this regard, the process reflects ULI's longstanding tradition of bringing together professionals from a variety of real estate disciplines to improve the built environment.

Tenants | Building Owners | Real Estate Brokers | Project Managers | Architects, Engineers, and Contractors | Energy Consultants

Supply and Demand: The Role of the Broker, Tenant, Building Owner, and Consultants

Leasing brokers are influential tenant advisers during the pre-lease phase. If experienced in energy efficiency conversations, brokers can help tenants demand and understand building energy performance information during the site-selection process. Brokers who highlight case studies or examples of work representing tenants in the selection of high-performance spaces may gain additional clients.

Tenants create demand for energy-efficient, high-performing space. Tenants also create demand for consultants who can advise them on how to reach their sustainability goals through the design and construction of energy-efficient space. By prioritizing energy-efficient space and working closely with their advisers, tenants can develop better workplaces to attract and motivate employees, attain recognition for sustainability leadership, and manage costs.

Building owners supply high-performance buildings that help tenants meet their energy performance and financial goals. Real estate owners can gain competitive advantages by marketing energy-efficient buildings' cost-saving energy and operations improvements to attract high-quality, sophisticated tenants. Tenants may prefer longer lease periods in highly efficient buildings that better align with their corporate environmental and social responsibility goals, provide financial benefits, and add recognition value.

Consultants (e.g., architects, engineers, project managers, energy consultants, and contractors) provide the expertise to optimize energy performance and present the technical options and economic case for a comprehensive, cost-effective, and high-performance space while meeting the tenant's schedule and budget. Consultants offering these services may attract additional clients by demonstrating cost savings and other benefits to tenant's business goals.

Key steps for choosing a high-performing space include:

1. Select a leasing broker experienced in energy efficiency.
2. Convene a workplace strategy and energy performance optimization workshop.
3. Perform a financial analysis.
4. Assess high-performance space feasibility.
5. Meet with the building owner to discuss collaboration to improve energy performance.

Selecting an Efficient Base Building

Good:

- ☐ Building reports ENERGY STAR score
- ☐ Ongoing tenant-landlord energy efficiency coordination
- ☐ Landlord willing to allow submetered tenant space

Better—includes all of Good, plus:

- ☐ Building ENERGY STAR score of 75 or higher
- ☐ Central building management system (BMS) with tie-in of tenant heating, ventilating, and air conditioning (HVAC) and lighting
- ☐ Building energy audit, ongoing commissioning activities, and energy capital projects completed
- ☐ Submetered tenant space with energy billed on actual usage

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Best—includes all of Better, plus:

- ☐ Subpanels to measure tenant lighting, HVAC, and plug loads separately
- ☐ Tenant energy management program (such as a dashboard)

Questions to Ask the Building Owner

What is the building's ENERGY STAR score? The EPA recognizes top-performing buildings that meet or exceed a score of 75. Even if a building has not achieved ENERGY STAR recognition, an owner that tracks and reports the building's score may be more willing to collaborate on energy efficiency efforts than one who does not currently monitor energy performance.

Is the space submetered, and is the utility billing structure based on actual use? What is the utility rate and average energy cost per square foot? A recent study found that submetered spaces save 21 percent in energy compared to spaces without energy-use information.

What has the building done to improve and maintain energy efficiency and conservation, and when were the improvements installed? Buildings with excellent natural daylight, energy-efficient windows and lighting, envelope walls, advanced equipment controls, and efficient HVAC equipment reduce tenant equipment and energy costs.

Does the building have resources or programs to help with design, construction, and ongoing management of energy-efficient spaces? Request from ownership any design and energy efficiency criteria for the buildout of tenant spaces, recommended cost-effective energy measures with financial value analysis, or a building energy model for reference. Owner-provided resources are a starting point for sensible energy strategies and promote a collaborative relationship between the building owner and tenant. An existing energy model will reduce the upfront cost and effort of implementing the process. Experts can help identify opportunities for cost-saving lighting, outlet plug load, and HVAC opportunities throughout the lease term.

Choosing Global Brands Group's New Space

One of the strongest drivers that persuaded Global Brands Group to take space in the Empire State Building is that the landmark recently underwent a major capital improvement program and retrofit, positioning it as one of the most energy-efficient buildings in New York City.

A Collaborative Effort

When Global Brands Group signed its lease with the Empire State Building, the lease language required the tenant implement specific EPMs that demonstrate an acceptable payback period. In Global Brands Group's case, the lease required measures such as reducing the lighting power density, implementing lighting controls, optimizing HVAC systems, implementing demand-controlled ventilation, reducing plug loads, and commissioning energy systems.

The language also requires utilization of the Empire State Building's Tenant Energy Management System, which is provided to tenants at no cost and provides continuous real time usage data, benchmarking data, and real-time feedback in the form of actionable recommendations which will incentivize and encourage tenants to reduce their energy usage.

Realizing that tenant participation is critical in achieving energy savings, ESRT began introducing this language in lease documents back in 2008 in order to reach its energy savings target. In fact, actions taken by tenants in the building would ultimately account for more than one-quarter of the anticipated energy reduction from the initiative. For one, Global Brand Group's electricity consumption is sub-metered, and the tenant pays for electricity based upon its actual sub-metered electrical usage. The innovative provisions ensure that the impact of the base building upgrades would be maximized across the tenant spaces, which account for the bulk of the building's energy consumption.

The Empire State Building retrofit team also built a whole-building energy model for all 102 floors; upon each lease signing, ESRT makes this model available to tenants to refer to in the design process. Although a new energy model must be customized for each space design, the base-building model saves time and money—engineers can better understand the building's design and energy improvements therefore reducing upfront energy modeling costs and enabling more accurate projections. By packaging the analysis to include current and future floor designs, further upfront soft costs for energy modeling savings were realized.

Global Brands Group Project: Key Stakeholders

The Tenant: Global Brands Group

Global Brands Group Holding Ltd. (HKG: 0787) is a Hong Kong-headquartered multinational group widely recognized as an international leader in consumer goods design, development, sourcing, and distribution. The company specializes in supply chain management of high-volume, time-sensitive goods for leading retailers and brands worldwide via an extensive global network.

Sustainability is an integral part of Global Brand Group's corporate identity, as the company not only strives to improve efficiency within its own facilities and operations, but also promotes sustainability efforts among its suppliers, business partners, and throughout its global supply chain.

The Building Owner: Empire State Realty Trust

Empire State Realty Trust, Inc. (NYSE: ESRT), a leading real estate investment trust (REIT), owns, manages, operates, acquires, and repositions office and retail properties in Manhattan and the greater New York metropolitan area, including the Empire State Building, the world's most famous building. ESRT is a leader in energy efficiency in the built environment.

Lesson Learned: Lease Structure

The Empire State Building's standard lease provisions incentivize energy efficiency and demand reduction. First and foremost, the tenant's space is separately sub-metered, and the tenant pays for electricity based on actual electricity consumption in its space, allowing the tenant to realize direct savings from the EPMs it elects to implement. The lease also requires tenant to incorporate various EPMs in its build-out, provided that those EPMs are projected to have acceptable payback periods (three to five years, depending on the measure). Finally, the lease form requires the tenant's design team to meet with the Empire State Building team for an energy workshop and to work toward the most energy-efficient execution of the tenant's installation program without compromising design intent or space performance. These lease provisions require the tenant to consider efficiency in its design process, but also ensure that the tenant is able to realize direct savings from the implemented EPMs, making such measures economically viable.

The entire Tenant Energy Optimization process emphasizes the importance of owner and tenant collaboration, particularly since tenant spaces typically account for more than half of a commercial office building's total energy. Overall, the process has seen the strongest results and most significant savings when the building owner engages with the tenant in the process; openly shares the building's energy information; and implements building-wide energy saving measures.

The Empire State Building is now home to global tenants such as Coty, LinkedIn, and Shutterstock, which have all gone through the process with the support of ESRT.

A 2014 survey[8] discovered that 36% of facility, real estate and energy management executives said they were willing to pay a premium for space in a certified green building—a jump from 15% the previous year—and 28% planned to build out tenant space to high-performance standards, an increase from 18% in 2013. Project stakeholders can take advantage of the energy efficiency opportunity by gathering the right information and putting it in front of the right people at the right time during the tenant engagement and decision making process—the earlier the involvement, the more successful the project.

8. The 2014 Energy Efficiency Indicator Survey conducted by Johnson Controls' Institute for Building Efficiency can be found at http://www.institutebe.com/Energy-Efficiency-Indicator/2014-EEI-executive-summary.aspx.

Lesson Learned: Owner & Tenant Collaboration

This case study demonstrated that the alignment of building owner and tenant goals can be mutually beneficial. The Empire State Building retrofit and commitment to energy performance was one of Global Brands Group's primary reasons for selecting space in the Empire State Building. The completed base building measures, such as upgraded windows and radiator insulation, increase tenant comfort. Additionally, the ESB's building automation system ties into the tenant energy management system to enhance the tenant's ability to monitor and manage ongoing energy usage in the tenant space.

Global Brands Group Integrates the Tenant Energy Optimization Process

As Global Brands Group signed its lease for multiple floors and began its design process at the Empire State Building, ESRT recommended that the tenant take part in the Tenant Energy Optimization process.

The project was one of the first applications of the Tenant Energy Optimization process, and both project manager Gardiner & Theobald and Global Brands Group required that the process add value and be integrated throughout the overall design and construction effort. Having experienced private sector consultants familiar with Empire State Building retrofit lead the process helped establish a streamlined and more effective collaboration.

Selecting the Buildout Team

The Global Brands Group Buildout Team

Company	Role
Gardiner & Theobald	Project Manager
DPM Architecture	Architect
Benchmark Builders	General Contractor
AMA Consulting Engineers	Engineer
Integral Group	Energy Consultant and Modeler
Wendy Fok	Energy Project Director
CodeGreen Solutions	Energy Incentive Consultant
Empire State Realty Trust	Building Owner
JLL	Owner's Representative

Those leading the process, including the energy modeler, had already been involved in the Empire State Building retrofit and were experienced in the process.

The 10-Step Tenant Energy Optimization Process

PHASE I: PRE-LEASE

Step 1: Select a team

Step 2: Select an office space

PHASE II: DESIGN AND CONSTRUCTION

Step 3: Set energy performance goals

Step 4: Model energy reduction options

Step 5: Calulate projected financial returns

Step 6: Make final decisions

Step 7: Develop a post-occupancy plan

Step 8: Build out the space

PHASE III: POST-OCCUPANCY

Step 9: Execute the post occupancy plan

Step 10: Communicate results

Decreasing the average lighting power density in a building is often one of the most cost-effective means of reducing annual energy use. Lighting power can be reduced in several different ways while still maintaining full functionality, aesthetics, and illumination. Photo by Timothy Schenck.

Setting Energy Performance Goals and Developing a Menu of Measures

The process was kicked off with an energy design workshop in the summer of 2011, which brought together the design and construction team that would be involved in Global Brands Group's build out. These groups worked in tandem to make sure all energy reduction strategies conformed to the goals and intent of Global Brands Group's design.

Among important factors Global Brands Group wanted to consider in the design was:

- What energy and operational best practices from other global locations could be implemented at this location to save money;
- How the design would allow for flexible space, retail showroom space, and office space for creative designers and staff; and
- That it would provide proper IT data speed for e-commerce and the ability to conduct business with international offices.

Global Brands Group also outlines environmental stewardship and occupational health and wellness goals in its corporate sustainability strategy—ones that the Tenant Energy Optimization process aims to further.

For instance, through its environmental stewardship goal, Global Brands Group seeks opportunities to efficiently manage the environmental footprint of its operations and those of its suppliers; for instance, it focuses on reducing its impacts by continually looking for opportunities to be more efficient, to source and use environmentally-responsible materials in its products, and to use environmentally-responsible equipment, building materials, and services in its buildings and operations.

Its health and wellness goals include promoting general health awareness, improving overall health and wellbeing, and encouraging its colleagues to be proactive in maintaining a healthy lifestyle.[9]

With Global Brands Group's objectives in mind, the project team put together tenant space parameters, which formed the basis for the project's energy performance goals. The accompanying Menu of Measures summarizes the energy efficiency measures that were discussed at the energy design workshop:

9. To learn more about Global Brands Group's corporate social responsibility, see http://www.globalbrandsgroup.com/about/corporate-responsibility.

Menu of Measures

Daylight Harvesting Controls: Daylight harvesting utilizes an automatic system that recognizes when a space has adequate illumination by natural light penetrating through exterior windows and dims lighting in response. Because of the building's position, the Empire State Building windows provide adequate access to daylight on most floors, although the low ceilings can limit the penetration of sunlight into spaces closer to the core.

Reduced Interior Lighting Power Density: Decreasing the average lighting power density in a building is often one of the most cost-effective means of reducing annual energy use. Lighting power can be reduced in several different ways while still maintaining full functionality, aesthetics, and illumination.

Optimized HVAC Units: With heating and cooling supplied by the base building plant, the primary HVAC equipment power usage by the tenant is fan energy. The AHUs specified in Global Brands Group's original design drawings were more efficient than code-compliant units; In addition to having a slightly more efficient fan system, optimized AHUs use a variable air volume (VAV) system, which holds the supply air temperature constant while adjusting the air flow rate to respond to heat gains or losses in the thermal zone.

Demand-Controlled Ventilation (DCV): Conditioning outside air is one of the most significant loads on the HVAC system in any building; it is also a significant contributor to the air quality within a space. Inadequate outside air can result in unpleasant and "stuffy" spaces, but bringing in too much outside air wastes energy as the system must work harder to condition the air. An efficient way to optimize these competing demands is to install CO_2 sensors in the space that actively monitor the air quality. The system senses when CO_2 levels rise within the space due to occupancy, and, in response, bring in outside air only when needed.

Low-Velocity Air Handlers: A significant portion of the electricity consumed by an air handling unit is fan power used to push air through the filters and coils on the face of an AHU. Spreading the fan coils and filters across a larger surface area allows air to pass more evenly and efficiently at a lower velocity from the supply ducts through the face of the AHU, while still maintaining a high level of filtration. The increased face area allows the unit to operate with lower fan speed, thus reducing the amount of energy consumed to run the fan. In addition to the energy savings, there are typically maintenance cost savings as filters can be changed less frequently than in typical models. Furthermore, larger AHUs have the added benefit of reducing the noise generated by fans as they run at a lower speed.

Plug Load Management: In a typical office building, computers, office equipment, electronics, appliances, and other plug loads account for as much as 10% to 15% of whole-building electricity consumption, and an even greater percentage of energy use within tenant spaces. Many devices continue to draw power, albeit at a reduced rate, even when they are in standby or off modes. One method to minimize these phantom loads is to install an active control that can shut off power to specified outlets when the space is unoccupied.

Modeling the Projected Energy Performance

During design development, a predictive energy model[10] was created using eQuest software, which modeled energy consumption and EPM results for Global Brands Group's new office space. The model was modified to break out Floors 7 through 9 only and was later calibrated using metered data gathered during tenant occupation.[11]

Assumptions Present in the Modeling:

- **Windows:** Operable windows will be open a negligible amount of time.
- **Density:** The estimated density is 200 GSF per person, typical for this type of office space.
- **Occupancy:** On a typical day, only 70% of the maximum occupancy will be present and working on the floor. Lower occupancy is generally due to offsite meeting, absences, and travel. The majority of occupants depart around 5 p.m., with a few people staying until 6 p.m.
- **Lighting:** Most lights are turned on at 7 a.m. and off at 5 p.m. On a typical day, 80% of the installed lighting is turned on (ignoring daylight harvesting controls but including occupancy sensors).

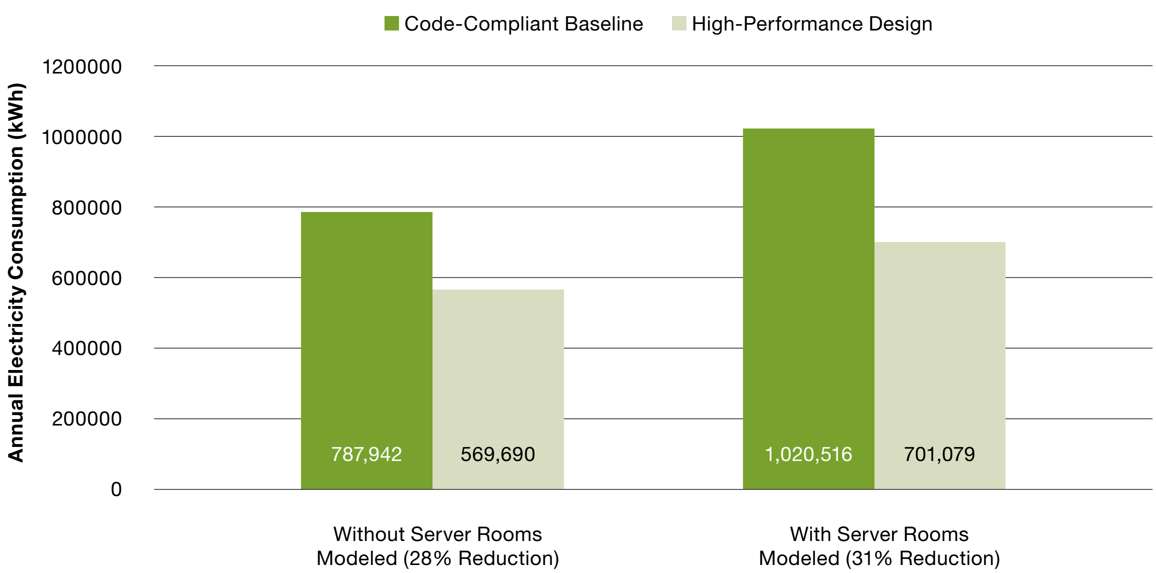
10. There are three baselines shown in the energy model: the as-built baseline of the Empire State Building; an ASHRAE 90.1-2007 baseline, which has been used for the majority of the savings calculations; and an ASHRAE 90.1-2010 baseline.
11. See Appendix A for detailed analysis.

Global Brands Group's Passive Optical Network System:
As a separate feature of its build out, Global Brands Group decided to install a passive optical network (PON) system in the intermediate distribution frame (IDF) rooms on Floors 8 and 9. This fiber optic networking technology eliminates the need for powered routers, drastically reducing plug load. Energy savings are achieved directly from the lower plug loads and indirectly from the reduced need for cooling, as traditionally powered routers create substantial waste heat that requires supplemental cooling to maintain space temperature and equipment performance. The PON system allowed for the elimination of four 800 CFM fan coil cooling units from the four server rooms on Floors 8 and 9.

Installation of the PON system was an elective measure, which Global Brands Group independently decided to implement to support the IT system rather than from an energy savings motivation. However, because the PON system dramatically reduces waste heat in the server rooms, the project team decided to build this measure into one iteration of the energy model to review its effect on the projected energy performance of the space. The model estimated that inclusion of the PON system achieves an additional 3.4% energy savings over the adjusted baseline, which included the server rooms.

While the PON system has energy saving implications, installation of the system was a technology-driven decision, and as the system can be very expensive, it cannot necessarily stand alone as a cost-effective energy performance measure. Therefore, the PON system is not accounted for in the value analysis performed by the project team. In order to most effectively analyze the cost savings implications of the package of EPMs without conflating the results due to the presence of the PON system, the value analysis excludes the server rooms and PON system from the results.

Modeled Electricity Consumption of Baseline Design and High-Performance Design as Implemented, with and without the Inclusion of the Server Rooms and PON System in the Energy Model



Daylight harvesting works best in tandem with high-efficiency lighting design for optimized performance. Spaces that provide natural daylight improve occupant comfort for visual tasks. Photo by Timothy Schenck.

Reviewing Incremental Costs and Incentives

With the baseline standards in place, the project team moved on to the impact that potential EPMs would make on Global Brands Group's space performance. The model analyzed a range of EPMs in terms of three types of quantifiable results: cost estimates for energy efficiency measures; projected energy savings for each measure and for packages of complementary measures; and projected payback period, return on investment, and other key financial metrics.

The New York State Energy Research and Development Authority (NYSERDA) offers incentive programs for energy efficiency upgrades, which Global Brands Group was able to utilize. CodeGreen, the LEED consultant engaged by LFUSA, prepared the pre-qualified incentive submittals for all three Phase 1 floors; the received incentives totaled $45,400 ($0.33/SF). The cost for CodeGreen to prepare, review, and submit the incentive filings was $8,460, leading to a net NYSERDA incentive capture of $36,940 ($0.27/SF). The incentives reduced the simple payback period for the EPM package of the Phase 1 buildout by one year (see below), further improving the economic feasibility of the project.

Recommended EPM[12]	Target Area	Incremental First Cost
Daylight Harvesting Lighting Controls	Lighting	$41,850
High-Efficiency Lighting	Lighting	$30,000
Optimized HVAC Units	HVAC	N/A
Demand-Controlled Ventilation (CO_2 Sensors)	HVAC	$47,520
Low-Velocity Air Handler Units (AHUs)	HVAC	N/A
Plug Load Management	Plug Loads	$45,000

12. For a more detailed analysis, see Simple Payback Analysis for EPMs on Floors 7, 8, and 9

Global Brand Group's Payback Analysis, Including NYSERDA Incentives

Including Incentives	Floor 7	Floor 8	Floor 9	Floor 7, 8, 9
Electricity Use Reduction	28.9%	26.3%	27.9%	27.7%
15-Year Electricity Cost Savings	$193,712	$181,503	$191,280	$566,495
Net NYSERDA Incentives	$12,610	$11,183	$13,147	$36,940
Energy Modeling Soft Costs	($2,200)	($2,200)	($2,200)	($6,600)
Adjusted Incremental First Cost	($44,380)	($45,807)	($43,843)	($134,030)
Incremental First Cost /ft²	*$0.97*	*$1.00*	*$0.96*	*$0.98*
Payback (w/ Incentives)	**3.4 yrs**	**3.8 yrs**	**3.4 yrs**	**3.5 yrs**
Without Incentives	**Floor 7**	**Floor 8**	**Floor 9**	**Floor 7, 8, 9**
Incremental First Cost (incl. modeling soft costs)	($56,990)	($56,990)	($56,990)	($170,970)
Incremental First Cost /SF	*$1.24*	*$1.24*	*$1.24*	*$1.24*
Payback	**4.4 yrs**	**4.7 yrs**	**4.5 yrs**	**4.5 yrs**

Note: Incremental costing was not provided by the contractor for the PON system, therefore energy savings due to PON are not included in the payback analyses.

Lesson Learned: Incentives

Early engagement in the incentive seeking process is critical. Because NYSERDA was not engaged at the earliest stages of the energy modeling process, Global Brands Group was not able submit for the custom performance-based incentives, which are typically greater than the pre-qualified incentives they ultimately achieved. Additionally, integrating an early quantitative energy modeling process and value analysis can allow the tenant to prioritize energy efficiency and cost-effective measures for multiple purposes.

Performing the Value Analysis

Using energy modeling and incremental costing information, the project team then performed a quantitative value analysis that determined the projected electricity cost savings annually and over the lease term; the resulting payback period; and the tenant's return on investment. This analysis enabled the team to package the energy performance measures to meet the three- to five-year simple payback threshold desired by the Global Brands Group and prescribed by ESRT's lease.

The final analysis includes only floors 7 through 9. The intention of the final report was to document the projected performance of the first three floors in Phase 1, and to serve as a guide for the design and build out of future floors.

Based on the projections for Phase 1 of construction on Floors 7 through 9, if Global Brands Group were to implement the full recommended package of EPMs, including low-velocity AHU measures, on the six remaining floors, the tenant has the opportunity to capture nearly $1.25 million in additional projected electricity savings over the 15-year lease term, with a 29% IRR. For future floors, initiating an energy model early in the design process to apply for customized performance-based incentives through a NYSERDA-approved technical advisor may enhance the incentive amount available for the build out (estimated to range from $0.30-$1.00/SF), which will contribute to even shorter payback periods and greater ROI.

Simple Payback Analysis for EPMs on Floors 7, 8, and 9

The projected energy cost savings for each implemented measure, the incremental first cost above code-compliant installations, and the simple payback period.

Floors 7, 8 & 9 Energy Performance Measures	Annual Electricity Reduction (kWh/year)	Percentage of Electricity Use Reduction from Baseline	Annual Electricity Cost Savings	Incremental First Cost	Simple Payback
Daylight Harvesting Controls	30,968	3.9%	$5,359	($41,850)	7.8 years
High-Efficiency Lighting	55,746	7.1%	$9,646	($30,000)	3.1 years
Optimized HVAC Units	0	0%	$0	$0	N/A}
Demand-Controlled Ventilation (CO2 Sensors)	21,147	2.7%	$3,659	($47,520)	13.0 years
Plug Load Management	103,713	13.2%	$17,946	($45,000)	2.5 years
Combined EPM Package (without Incentives or Energy Modeling Costs)	**218,252**	**27.7%**	**$37,766**	**($164,370)**	**4.4 years**
Net NYSERDA Incentives	-	-	-	**$36,940**	-
Energy Modeling Soft Costs	-	-	-	**($6,600)**	-
Combined EPM Package (with Incentives and Energy Modeling Costs)	**218,252**	**27.7%**	**$37,776**	**($134,030)**	**3.5 years**

Note: The energy savings above are evaluated independently for each measure, and to evaluate the implemented EPM package as a whole, which accounts for the interactive effects of measures.

Reviewing the Budget and Selecting the EPMs

Energy modeling and costing analysis determined the following six EPMs would offer the best value for Global Brands Group on Floors 7 through 9 while informing the decision making for the next phase of construction for the remaining six floors.

1. **Daylight Harvesting Lighting Controls:** Utilize luminaires with built-in photo sensors and controls to dim lights when ambient daylighting lights the space.
2. **High-Efficiency Lighting:** Utilize high efficiency luminaires and install occupancy sensors.
3. **Optimized HVAC Units:** Right-sized, high-efficiency, variable air volume (VAV) units.
4. **Demand-Controlled Ventilation (CO_2 Sensors):** Use CO_2 sensors to control outside air damper.
5. **Low-Velocity Air Handler Units (AHUs):** Reduce the fan power requirement through use of lower-face velocity air handlers (larger footprint or additional unit).
6. **Plug Load Management:** Circuit plug loads to a single master shutoff switch that is turned off outside of business hours.

Lesson Learned: Commitment at the Top

Global Brands Group is committed to sustainability throughout its organization. When it was time to decide on EPMs that were outside of the lease requirements, the decision to include plug load management came from the executive level. It is important to have commitment to energy performance at the highest levels of an organization, who can translate the vision of a potential high-performance workplace into execution.

Building the Space

Global Brands Group team leaders reviewed the data and made the final decision to move forward on the energy recommendations.[13]

Benchmark Builders was selected as the general contractor for the construction of the space. The company has a background in constructing energy-efficient commercial interior spaces and is familiar with all of the required cost reporting, facilitating a smooth construction process.

One unforeseen issue that arose during construction was the need to coordinate installation of the end-use sub-meters with the base building system. Given that the tenant space is already sub-metered by floor, there were challenges tying the panel level sub-meters into the tenant energy management system so that the tenant could monitor plug load, HVAC, and lighting electricity independently. As a consequence, the start of the measurement and verification phase was delayed until the upgraded system was put in place.

Five of the EPMs were implemented on schedule and within the anticipated timeframe.

Due to the long lead time of custom HVAC units, the project team was not able to pursue one of the target measures—low-velocity AHUs—for the first phase of the project because the tenant had purchased the standard units before a final decision could be made, and decided that the increase in mechanical room size was not viable in order to implement the measure. The results are inclusive of the five implemented measures listed. However, the package recommendation for the buildout of future floors incorporates the low-velocity AHU measure, leading to higher projected savings on the future floors.

13. See Appendix B for detailed breakdown per floor.

Developing a Post-Occupancy Plan: The Measurement & Verification Process

As one of the final phases of the process, measurement and verification (M&V) has been performed for Global Brands Group on Floors 7 through 9.

This formalized process shows whether the EPMs have the effect on energy consumption as projected. Often the M&V process is not utilized, as it is assumed the measures were installed and commissioned to work. However, for the Global Brands project, M&V was vital in demonstrating that the energy value analysis achieved the level of value promised.

Energy use projections are based on assumptions, and operations and behavior can alter design intent and projects. If the actual results diverge from the projected results, then something went wrong—savings were incorrectly calculated, or a piece of equipment was incorrectly programmed or not operated as intended, or a product did not perform to its specifications. Naturally, Global Brands wanted to be certain that the demonstration project yielded the projected ROI, and if the M&V process showed otherwise, the team would need to re-examine the analysis and implementation to account for the discrepancy between the simulated and measured results.

Results show that weekend and overnight electricity consumption were higher than initially predicted, resulting in increased overall consumption.

Global Brands Group's Initial Energy Model versus Global Brands Group's Calibrated Model after the M&V Process

	Original Model	1st Monitoring Period	2st Monitoring Period	Calibrated Model
Occupancy Hours (weekday)	7 a.m.–6 p.m.	8 a.m.–10 p.m.	8 a.m.–10 p.m.	8 a.m.–10 p.m.
Peak Plug Load Power (W/SF)	1.25	0.87	1.2	1.2
Peak Lighting Power (W/SF)	1.0	0.8	0.8	0.8
Minimum Lighting Power (W/SF)	0.05	0.1	0.1	0.1
Minimum HVAC Power (kW)	2	10	10	10
Peak IT Power (W/SF in Computer Rooms)	13.0	14.6	16.5	16.5
Total Electricity Consumption As Designed (kWh)	749,164	N/A	N/A	1,300,991

Green meeting guidelines are implemented to reduce energy use, consumption, and waste during internal and external meetings; increased use of video conferencing reduces face-to-face meetings. Photo by Timothy Schenck.

Plug Load Management: The largest discrepancy was found in plug load management, as a master shutoff switch was not implemented on Floor 7 (and has been modeled as such in the calibrated model). Floor 7 was already partially built out at the start of the process, and therefore this EPM could not be implemented. Underutilization of the switch may also be a result of unexpected usage patterns, such as overnight cleaning staff. So the total estimated savings for the as-designed package fell from 206,355 kWh to 169,410 kWh.

HVAC: The most significant changes made to the calibrated model are overnight HVAC energy and occupancy patterns (reflected in lighting and plug load schedules). Metered data reveals an unusually high minimum HVAC consumption on Floor 7 of approximately 10 kW. This indicates that air handler fans are running continually and not shut down during unoccupied hours. Additional spikes during morning warm-up periods indicate that electric reheat coils may be operating in an unpredictable fashion. Unfortunately, the interaction between building baseboard heating and zonal electric heat is difficult to model effectively due to limitation in eQuest software. Savings due to electric heat reduction may therefore be overestimated.

The project team recommended that careful attention should be given to operation of electric heat, a notoriously large contributor to wasted energy, as well as commissioning of the AHUs to ensure the schedule is operating as required.

Lighting: Metered data also reveals lighting patterns extending later than initially predicted, with lighting load peaks not tapering off until approximately 10 p.m.. two to three hours after plug loads begin to decrease. Lighting controls should be another area of focused attention. If, for example, 50% of occupancy left the office, plug loads should show a corresponding reduction in power, while all lighting may remain on. Alternatively, less than optimal lighting controls may be failing to switch off when appropriate.

Global Brands Group's Sustainability Initiatives and Their Impacts on Employees

As part of Global Brands Group's environmental stewardship mission, it continues to encourage its offices and facilities around the world to adopt sustainable elements whenever feasible, and it also shares this guidance with its suppliers. Its five floors at the Empire State Building feature daylight harvesting with sensors and automatic controls, high-efficiency lighting, optimized HVAC units, demand-controlled ventilation with CO_2 sensors to monitor occupancy and adjust outside air intake, and plug load management.

Additionally, it has continuous, ongoing initiatives to raise awareness and effect change through its facilities through its employees. Among the measures it encourages:

- Turning off lights, computers, monitors and printers when not in use;
- Implementing an automatic computer and lighting shutdown policy outside of working hours;
- Consolidating and installing energy-efficient servers, photocopiers, printers and other equipment;
- Maintaining office and server room temperatures at levels that minimize energy use;
- Implementing green meeting guidelines to reduce energy use, consumption, and waste during internal and external meetings, and increasing use of video conferencing to reduce face to face meetings;
- Implementing sustainable design, construction, and renovation guidelines for new construction, major renovation and commercial interiors;
- Extensively installing water efficient faucets, fixtures, and fittings in its offices and facilities;
- Encouraging employees to conserve water in their daily lives;
- Maintaining a recycling program with enhanced capture of recyclables, including used paper, packaging, aluminum cans and plastic bottles. (Globally, all of its offices and facilities seek to maximize waste reduction, reuse, and recycling.)

Daylight harvesting, high-efficiency lighting (0.8 W/SF), demand-controlled ventilation, low-pressure drop air handlers, and master shutoff plug load management generate strong returns: 126% ROI, 20.5% IRR, and 4.6-year payback period. Photo by Timothy Schenck.

Appendix A: Original and Final Energy Model Results for Tenant Electricity

Original Model Results

	Description	Total Electricity: Floors 7, 8 & 9					
EPM ID	Name	Peak kWh	Total kWh	Lighting kWh	Equipment kWh	HVAC kWh	Electric Heat kWh
0	ASHRAE 90.1 Baseline	367	955,519	306,681	507,591	78,705	26,423
1	Daylight Harvesting	361	923,852	275,606	507,591	76,314	28,933
2	High-Efficiency Lighting (0.8 W/SF)	345	898,984	247,232	507,591	74,829	34,035
3	High-Efficiency HVAC	423	971,343	306,681	507,591	84,243	24,266
4	Demand-Controlled Ventilation	271	934,916	306,681	507,591	83,699	210
5	Low Pressure Drop AHUs	362	922,307	306,681	507,591	45,379	28,317
6	Plug Load Management (Occupancy Sensors)	371	851,565	306,681	393,917	73,617	41,540
7	As-Designed Package (EPMs 1,2,3,4,6)	285	749,164	223,154	393,917	79,682	4,337
	Incremental Savings vs 90.1 Baseline Run						
1	Daylight Harvesting	5	31,667	31,075	0	2,391	-2,510
2	High-Efficiency Lighting (.8 W/SF)	22	56,535	59,449	0	3,876	-7,612
3	High-Efficiency HVAC	-56	-15,824	0	0	-5,538	2,157
4	Demand-Controlled Ventilation	96	20,603	0	0	-4,994	26,213
5	Low Pressure Drop AHUs	4	33,212	0	0	33,326	-1,894
6	Plug Load Management (Master Shutoff Switch)	-5	103,954	0	113,674	5,088	-15,117
7	As-Designed Package (EPMs 1,2,3,4,6)	81	206,355	83,527	113,674	-977	22,086

Calibrated Model Results

	Description	Total Electricity: Floors 7, 8 & 9					
EPM ID	Name	Peak kWh	Total kWh	Lighting kWh	Equipment kWh	HVAC kWh	Electric Heat kWh
0	ASHRAE 90.1 Baseline	528	1,470,401	463,023	696,998	201,315	67,586
1	Daylight Harvesting	525	1,438,068	426,425	696,998	198,447	75,237
2	High-Efficiency Lighting (0.8 W/SF)	528	1,423,129	398,508	696,998	197,238	89,709
3	High-Efficiency HVAC	527	1,465,072	463,023	696,998	195,939	67,837
4	Demand-Controlled Ventilation	216	1,404,857	463,023	696,998	201,246	1,276
5	Low Pressure Drop AHUs	525	1,444,503	463,023	696,998	174,842	69,171
6	Plug Load Management (Occupancy Sensors)	521	1,384,181	463,023	594,357	199,851	85,616
7	As-Designed Package (EEMs 1,2,3,4,6)	110	1,300,991	371,427	696,998	189,833	1,880
	Incremental Savings vs 90.1 Baseline Run						
1	Daylight Harvesting	3	32,332	36,598	0	2,868	-7,652
2	High-Efficiency Lighting (.8 W/SF)	0	47,272	64,515	0	4,077	-22,123
3	High-Efficiency HVAC	1	5,329	0	0	5,376	-251
4	Demand-Controlled Ventilation	313	65,544	0	0	69	66,310
5	Low Pressure Drop AHUs	3	25,898	0	0	26,473	-1,585
6	Plug Load Management (Master Shutoff Switch)	8	86,220	0	102,641	1,464	-18,030
7	As-Designed Package (EPMs 1,2,3,4,6)	418	169,410	91,596	0	11,482	65,706

Appendix B: Energy Model Output by Measure (Original and Calibrated)

Energy Model Output by Measure

		Calibrated Model		Original Model	
EPM Description		**Annual Electricity Savings (kWh)**	**Percent Savings**	**Annual Electricity Savings (kWh)**	**Percent Savings**
1	Daylight Harvesting	32,332	2.2%	31,667	3.3%
2	High-Efficiency Lighting (0.8 W/SF)	47,272	3.2%	56,535	5.9%
3	High-Efficiency HVAC Units	5,329	0.4%	-15,824	-1.7%
4	Demand-Controlled Ventilation	65,544	4.5%	20,603	2.2%
5	Low Pressure Drop Air Handlers	25,898	1.8%	33,212	3.5%
6	Plug Load Management – (Master Shutoff Switch)	86,220	5.9%	103,954	10.9%
7	As-Designed Package (EPMs 1,2,3,4,6)	169,410	11.5%	206,355	21.6%

About the Urban Land Institute

The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. Established in 1936, the Institute today has more than 39,000 members worldwide representing the entire spectrum of the land use and development disciplines. ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

About the Center for Sustainability

The ULI Center for Sustainability is dedicated to creating healthy, resilient, and high-performance communities around the world. Through the work of ULI's Greenprint Center for Building Performance, the ULI Urban Resilience Program, and other initiatives, the Center advances knowledge and catalyzes adoption of transformative market practices and policies that lead to improved energy performance and portfolio resilience while reducing risks caused by a changing climate.

Acknowledgments

Case Study Participants

The foundation of ULI's Tenant Energy Optimization Program is a ten-step process that, when implemented in ten pilot fit-out projects, yielded impressive energy and cost savings. Pilot projects applying this process were carried out in tenant spaces occupied by Bloomberg L.P., Coty Inc., Cushman & Wakefield, Estée Lauder Companies, Global Brands Group, LinkedIn, New York State Energy Research and Development Authority (NYSERDA), Reed Smith LLP, Shutterstock, and TPG Architecture. Case studies documenting their experiences were written to inform tenants, building owners, real estate brokers, project managers, architects, engineers, contractors, and energy consultants.

Project Director

ULI's Tenant Energy Optimization Program builds on the energy efficiency retrofit project conducted at the Empire State Building under the direction of Wendy Fok, principal of OpDesigned LLC. From 2011 to 2016, Fok led the development of a portfolio of tenant buildouts to create a financial and design template to incorporate energy efficiency in tenant spaces. Fok has been a key contributor to the standards set forth in the Energy Efficiency Improvement Act of 2015 (S. 535), which created the national Tenant Star framework. A registered architect, she received her degree from the University of Texas at Austin with real estate executive education from Harvard Business School.

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For More Information

Interested in implementing the process?
ULI provides tools such as technical resource guides, how-to documents, case studies, and other training materials. These materials can be found at: **tenantenergy.ULI.org**.