Retail Energy Efficiency Guide

This *Retail Energy Efficiency Guide* provides a general overview of how to measure and manage energy use to identify energy-saving options to lower operating costs, improve energy efficiency, and reduce greenhouse gas emissions.

Introduction

Retail companies in the United States spend over $28 billion on energy each year,[1] and the retail sector in New York City comprises over 270 million square feet of real estate, or five percent of citywide building square footage.[2] The improvement of energy efficiency in these spaces represents a significant opportunity to lower operating costs and reduce GHG emissions. This Retail Energy Efficiency Guide is a resource for retail organizations interested in joining the NYC Carbon Challenge, a voluntary program launched by the NYC Mayor's Office of Sustainability.

The NYC Carbon Challenge

The NYC Carbon Challenge is a partnership between the NYC Mayor's Office of Sustainability and leading organizations within the private and institutional sectors who have committed to reduce their GHG emissions by 30% or more over ten years. More than 100 of New York City's largest universities, hospital organizations, commercial owners, commercial offices, residential property management firms, and hotels have pledged to accelerate GHG reductions in their buildings, helping the city achieve its commitment to reduce citywide GHG emissions 80 percent by 2050 (80x50) and become the most sustainable big city in the world.

For more information, visit: www.nyc.gov/carbonchallenges and www.nyc.gov/onenyc

The NYC Mayor's Office of Sustainability invites leading retail organizations to join the Challenge. Retail sectors include:

Apparel
Convenience and Pharmacy
Department Stores
Financial Services
Flagship Stores
Food and Beverage
Health Clubs
Wireless Communications
Specialty Stores
Supermarkets

NYC Carbon Challenge Progress:

- **120 participants** across six different sectors
- **510 million square feet**, totaling almost 10% of citywide building square footage
- **580,000 metric tons of carbon dioxide** equivalent reduced
- **$190 million**, estimated energy cost savings by participants to date

80 x 50

#ONENYC

MEASURING ENERGY USE

Measuring energy use is a critical first step to reducing energy use and improving energy efficiency. Measuring energy use allows staff to identify areas of energy waste, engage in energy efficiency planning, and track progress toward energy and GHG reduction goals. Methods of assessing the energy usage of buildings or retail spaces include:

- **Sub-metering and direct metering**, which offers the ability to accurately monitor energy and water usage for individual tenants or specific building systems such as lighting, heating, ventilation, and air conditioning (HVAC), and domestic hot water (DHW). In New York City, owners of buildings over 25,000 square feet in floor area are required by local law to sub-meter all commercial tenant-leased spaces over 5,000 square feet in floor area, including retail spaces, by 2025.
- **Benchmarking**, which is the measurement of energy performance year over year and the comparison of that performance with similar buildings or retail spaces. Retail organizations can benchmark their energy use by using direct metered or sub-metered energy use information and entering it into an online platform such as the U.S. Environmental Protection Agency's Portfolio Manager tool. This will help retail organizations assess and identify retail locations within their portfolio that have the highest energy consumption and could have the greatest opportunities for energy efficiency upgrades.
- **Energy audits**, which provide detailed information about the energy use of individual systems within a building or a retail space and recommendations for energy efficiency upgrades or retrofits. An audit is completed by an energy auditor based on a walk-through of a building, analysis of key building systems, and assessment of past utility bills. Please see Incentive Opportunities in the Resources section for more information on how to pay for an energy audit.

Once you have started measuring energy use, there are more sophisticated ways to track energy use that will help you manage performance. These strategies include:

- **Installing a Building Management System (BMS) or Building Automation System (BAS)** to facilitate the centralized automation of various building systems such as heating, ventilation, and air conditioning (HVAC) systems and lighting through a combination of sensors and controls.
- **Installing an Energy Management System (EMS)** to remotely measure, monitor, and adjust HVAC and lighting usage in facilities to adapt to real time needs. The data collected from EMS systems can also be used to help identify trends and opportunities for additional energy savings.

Credit: NYCEDC

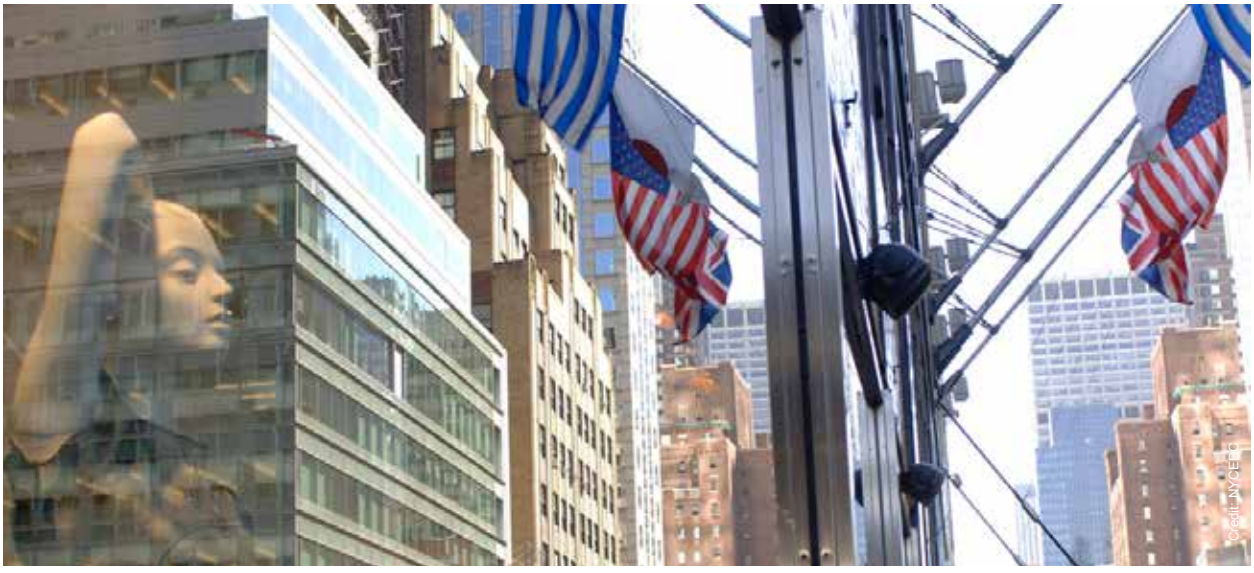
REDUCING ENERGY USE

Once you have begun measuring your energy use and conducted an energy audit, the next step is to create an energy master plan.

- **An energy master** plan will envision future energy projects to reduce energy use across interdependent building systems and provide an implementation strategy to achieve these reductions. An energy master plan should identify specific energy projects within each building or retail space, include an implementation timeline for projects, name key staff or contractors responsible for completing projects, and highlight opportunities to fund or finance projects. An energy master plan could cover just one retail location or could cover a portfolio of retail locations, which allows for economies of scale in project implementation.

An energy master plan should consider all key systems highlighted in this *Retail Energy Efficiency Guide*, including:

- Plug loads
- Lighting and lighting controls
- Operations and maintenance
- Refrigeration
- Building envelope
- Heating, ventilation, and air conditioning (HVAC)
- Water efficiency
- Efficient on-site generation and renewables
- Employee engagement
- Building owner engagement
- Resiliency



PLUG LOADS

Every appliance plugged into an electrical outlet is drawing electricity, including air conditioners, cash-registers, commercial kitchen appliances, computers, printers, refrigerators, televisions, and vending machines. You can reduce your plug load energy consumption by:

- **Setting a policy to purchase ENERGY STAR® and EPEAT®** rated energy-efficient equipment. Any non-rated equipment should be researched to find the most efficient model.
- **Enabling power management settings** on computers and monitors as well as shutting down equipment during off-hours.
- **Installing standby mode** enabled point-of-sale equipment such as cash registers, barcode scanners, and conveyor belts, which save energy when idle for extended periods.
- **Implementing power management surge protectors** on plug load equipment to eliminate energy waste from standby electricity consumption.

LIGHTING AND LIGHTING CONTROLS

As lighting and control technologies become more sophisticated, the potential for savings are increasingly substantial. Potential opportunities include:

- **Standardizing the practice of shutting off lights** during off-hours.
- **Limiting the amount of light fixtures on during off-hours** and consider placing them on motion sensors.
- **Turning off refrigeration lighting during off-hours**.
- **Installing LED lighting** in all indoor, outdoor, and refrigeration lighting fixtures.
- **Utilizing natural day-lighting and skylights** to offset demand for electrical lighting.
- **Installing bi-level switching** for back-of house lighting, which can dim lights by 50% or more when full lighting levels are not necessary.
- **Installing vacancy sensors** that automatically shut off after the room is vacant for a set period of time, which can be especially useful in bathrooms and basements.
- **Installing timers** that switch on and shut off at scheduled times of the day for exterior lighting.

OPERATIONS AND MAINTENANCE (O&M)

Operations and maintenance (O&M) encompasses all the services required to ensure that a building's systems and equipment continue to perform the way they were originally designed and constructed. O&M opportunities include:

- **Retro-commissioning**, which is the testing and fine-tuning of existing building systems to confirm they are operating as designed, and as efficiently as possible. Retro-commissioning commonly identifies maintenance, calibration, and operational misalignments within a building that are easily corrected and, when implemented, save energy and improve equipment reliability.
- **Conducting regular tune-ups** for refrigeration and checking for fan and motor performance, refrigerant level, and belt tension.
- **Staff training** programs are available to instruct facility managers and building operators on methods for improving a building's operating efficiency. See *Resources* section for more information on training opportunities.

REFRIGERATION

Refrigeration equipment for businesses such as grocery stores, convenience stores, and restaurants can account for between 25% and 60% of electricity consumption.[2] Potential opportunities to improve refrigeration performance include:

- **Adding night curtains** on open refrigerator cases.
- **Checking door seals and gaskets** for deterioration or leaks to reduce wasted energy and ensure proper cooler or freezer temperatures.
- **Checking temperature settings** to ensure freezer and cooler set points are not lower than temperatures specified in the National Sanitation Foundation (NSF) International Standard / American National Standard NSF / ANSI 7 – 2009.
- **Regularly maintaining** refrigeration equipment, which includes keeping cooling coils free of dust and keeping evaporator coils free of ice build-up to help extend equipment life.
- **Installing premium motors and/or variable frequency drives (VFDs)** on evaporator and condenser fans for reach-in refrigerators, walk-in coolers, and freezers.
- **Replacing aging, inefficient refrigerators** with ENERGY STAR® rated closed-door refrigerators.

BUILDING ENVELOPE

The building envelope consists of everything that separates the building interior from the exterior, including the roof, walls, windows, doors, and foundation. Improving the envelope will help maximize investments in the heating and cooling equipment by reducing heating and cooling losses. Measures to improve the building envelope performance include:

- **Air sealing and weather-stripping** to reduce drafts and unwanted infiltration of outdoor air, particularly around windows and doors. This is a low-cost measure to improve building envelope performance that can be completed by in-house facilities maintenance personnel.
- **Closing exterior doors** to prevent both conditioned air from escaping and unconditioned outside air from entering the retail space, which causes additional heating or cooling needed to maintain stable indoor temperatures. See *Resources* section for more information on the NYC Dept. of Consumer Affairs' "Shut The Front Door" Campaign.
- **Upgrading to energy efficient windows** with lower U-Values can help reduce cooling loads during the cooling season and reduce heat loss during the heating season. The performance of existing windows can also be improved by applying a low-emissivity film or glazing to reduce solar heat gain and prevent ultraviolet (UV) damage to merchandise.
- **Using a highly reflective coating** on roofs can minimize the amount of heat the roof absorbs, reducing the building's cooling load, and prolonging the useful life of the roof. See *Resources* section for more information on the NYC Dept. of Small Business Services NYC °CoolRoofs program.

HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC)

Heating and cooling systems account for as much as half of the energy use and GHG emissions from typical commercial buildings commercial buildings in New York City.[3] Retail spaces may have either central HVAC equipment or supplemental equipment that provides additional heating or cooling in one particular space. Below are opportunities for improving the energy efficiency of both central and supplemental HVAC systems.

- **Installing programmable thermostats** to regulate temperatures based on seasonal averages and using automated settings to cycle on and off in accordance with business hours.
- **Installing wireless thermostats** that monitor air temperature and humidity levels, provide notifcations, and offer greater control of temperature settings.
- **Installing variable frequency drives (VFDs)** on HVAC fan motors, which save energy by adjusting fan speeds based on cooling needs.
- **Incorporating louvers or strategic shading** to reduce solar heat gain from windows in order to lower cooling loads.
- **Installing demand-controlled ventilation systems** that detect the level of carbon dioxide in the return air, using it as an indicator of occupancy to adjust for variations in occupancy.
- **Retrofitting or replacing roof-top HVAC units (RTU)** with newer, more energy-efficient models.
- **Installing variable refrigerant flow (VRF)** technologies including air-source heat pumps which can provide energy-efficient heating and cooling.

WATER EFFICIENCY

Conserving water and using high-efficiency water fixtures such as US EPA WaterSense® labeled products not only reduces the amount of water used in commercial kitchens, restrooms, and showers, but also helps save on fuel used for the hot water heating load. Effective measures include:

- **Conducting a water audit** to analyze on-site water usage patterns and identify potential leaks.
- **Installing faucet aerators, high-efficiency toilets, and high-efficiency showerheads** helps conserve water and reduce associated utility costs.
- **Submeter water usage** to accurately measure water consumption.

EFFICIENT ON-SITE GENERATION AND RENEWABLES

On-site generation technologies can produce some or all of the energy your building or retail space consumes. Energy produced on-site is typically cleaner and more efficient than the energy supplied by your utility. A few on-site generation and renewable energy technologies include:

- **Solar PV, or solar photovoltaic**, converts sunlight into electricity. Installing solar PV can help save on energy costs by reducing the need to purchase electricity from a local utility provider.
- **Community Shared Solar** is a model that provides owners and renters in buildings or retail spaces without adequate solar access the opportunity to subscribe to portions of a solar array located off-site and managed by a third party.
- **Combined Heat and Power (CHP), or cogeneration**, generates electricity using a fuel such as natural gas and utilizes the waste heat for productive purposes such as space heating and preheating domestic hot water (DHW).
- **Fuel cells** convert chemical energy from a fuel such as natural gas into electricity through a contained chemical reaction.

EMPLOYEE ENGAGEMENT

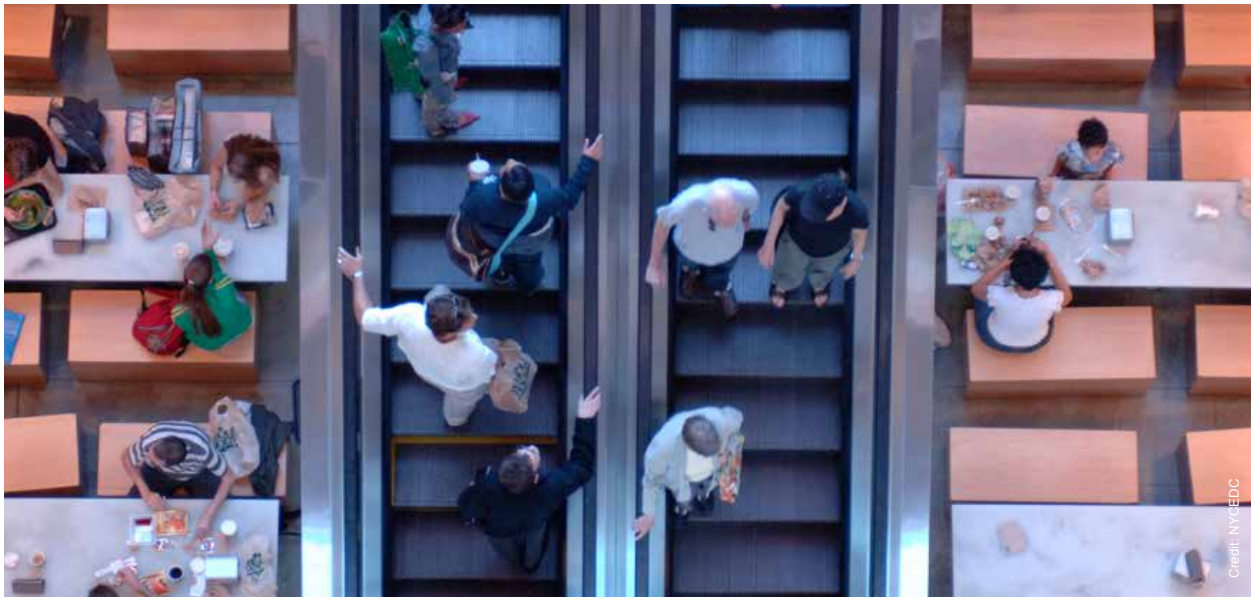
Education and training can lead to impactful reductions in energy use and create a culture of sustainable practices throughout your organization. Methods of effectively engaging employees include:

- **Promoting employee awareness** of energy efficiency and best practices through training, orientations, and consistent messaging through e-mails, signage, and videos. See *Resources* section for more information on the NYC Mayor's Office of Sustainability's GreeNYC public outreach initiative.
- **Committing to a GHG reduction or sustainability goal** to facilitate commitment to this goal across the organization. Tracking and sharing progress to the goal to employees and the public can help recognize success and sustain motivation.

BUILDING OWNER ENGAGEMENT

Coordinating with the building owner can help maximize the effectiveness of energy efficiency projects in a leased space while also improving the performance of a building's base load systems. Strategies include:

- **Implementing green leasing agreements**, such as energy-aligned leases, during lease negotiations or tenant fit-outs. These arrangements allow tenants and building owners to share the financial benefits of energy efficiency measures. By addressing what is often referred to as the split-incentive barrier, green leases can be a path towards collective energy cost savings.
- **Engage your building owner** through participation in the NYC Carbon Challenge for Commercial Owners and Tenants, in which participants make a joint commitment to a GHG reduction target and pledge to coordinate on the implementation of energy efficiency projects. See *Resources* section for more information on Building Owner Engagement.



RESILIENCY

Resiliency assets increase your building's and business's ability to recover from extreme weather events. Examples of resiliency assets include:

- **Installing battery storage systems** to enable the utilization of electricity when the cost is highest, or when there is a power outage. Batteries can be charged through a grid connection when electricity is cheapest, utilized to participate in utility demand response programs, and can be coupled with on-site generation assets such as solar PV or CHP.
- **Dry floodproofing** ground floor retail space by installing deployable flood shields at front and rear openings below the design flood elevation (DFE).
- **Wet floodproofing** ground floor retail space by installing flood vents and replace all windows, doors, and finishes with flood damage-resistant materials.
- **Elevating the critical systems and electrical utilities above the DFE** by relocating them to an upper level.
- **Developing an emergency plan and business continuity plan** to ensure necessary physical and operational measures are in place before an emergency to reduce the risk of costly damages or business interruption.

RESOURCES

Incentive Opportunities

Direct incentives from Con Edison, National Grid, and the New York State Energy Research and Development Authority (NYSERDA) are available to help offset the cost for energy efficiency projects.

- Con Edison: Rebates and Incentives
- Con Edison: Commercial Systems and Environments
- Con Edison: Demand Response Program
- National Grid: Programs for Businesses
- NYC Solar Partnership: Shared Solar NYC
- NYSERDA: Commercial Real Time Energy Management (RTEM) Program
- NYSERDA: Flexible Technical Assistance (FlexTech) Program

Guidance

- ENERGY STAR®: Retail: An Overview of Energy Use and Energy Efficiency Opportunities
- Glasgow Caledonian University: The Fair Fashion Center
- New York State Energy Research Development Authority (NYSERDA): Retail
- New York City Department of Consumer Affairs: Shut The Front Door Campaign
- NYC Mayor's Office of Sustainability: Greener, Greater Buildings Plan

RESOURCES

- NYC Mayor's Office of Sustainability: NYC Benchmarking Help Center
- NYC Mayor's Office of Sustainability: GreeNYC
- Small Business Administration (SBA): Energy Efficiency

Financing

- Institute for Market Transformation (IMT): Guide to Internal Financing for Energy Efficiency in Retail
- Institute for Market Transformation (IMT): External Financing for Energy Efficiency in Retail Primers

Training

- 32BJ Green Building Training: Green Commercial
- CUNY Building Performance Lab: Energy Efficiency Training & Professional Development
- Solar One: Green Workforce Training Programs
- Urban Green Council: Green Professional Building Skills Training

Building Owner Engagement

- Institute for Market Transformation: What's in a Green Lease?
- NYC Carbon Challenge: Commercial Owners and Tenants
- Retail Industry Leaders Association: Retail Green Lease Primer

Resiliency

- NYC Department of City Planning: Resilient Retail
- NYC Emergency Management: Business Community Resources
- NYC Department of Small Business Services: NYC °CoolRoofs
- NYC Department of Small Business Services: Risk Assessment and Grant Program
- FloodHelpNY: NYC Flood Risk Map

Industry Associations

- International Council of Shopping Centers: ICSC
- Professional Retail Store Maintenance Association: PRSM
- Retail Industry Leaders Association: RILA

END NOTES

[1] US Energy Information Administration: CBECS 2012

[2] Analysis provided by NYC Mayor's Office using PLUTO data

[3] US Small Business Administration: Energy Efficiency Upgrades: Refrigeration

[4] NYC Mayor's Office: Buildings Technical Working Group Report