

Decarbonizing
New York City Offices

Guide to

Fitting Out a High- Performance Commercial Space



for Commercial Tenants, Building Owners and Consultants



Base building and interior tenant space design directly impacts whole building energy consumption. With leased tenant spaces often accounting for more than 50% of a commercial building’s energy use, office fit-outs represent substantial opportunities to reduce building energy consumption and associated emissions.

A successful high-performance office fit-out achieves an array of benefits across stakeholder groups, including reducing energy consumption, lowering carbon emissions, and achieving cost savings. Increased energy efficiency in office spaces has been shown to reduce operating costs by 30 – 50%, saving hundreds of thousands of dollars over the lease term.¹ Other benefits include improved productivity, increased asset value, reduced risk exposure for noncompliance with regulations, industry recognition, alignment with broader sustainability goals and more. For example, the employees of an NYC-based architectural firm reported that newly implemented energy efficiency measures had a positive impact on their overall job satisfaction.² **As such, high-performance fit-outs are a critical component to complying with building performance standards, like Local Law 97’s (LL97) increasingly stringent carbon emissions limits, and reaping a variety of benefits.**

It’s important to note that, while prior to move in may be the optimal time to implement a comprehensive tenant fit-out, simple improvements post-occupancy can also achieve notable savings and maximize benefits over the entire term of the lease.

Purpose

To help make high-performance fit-outs the industry standard, this guide provides tenants and owners key considerations that are critical to successfully designing and implementing an energy efficient, low emissions office fit-out.

This resource is part of a series of actionable resources developed for the [Decarbonizing New York City Offices](#) project, an initiative dedicated to reducing carbon emissions in leased commercial spaces. Included within this resource are eight key considerations for implementing a successful energy efficient, low-carbon office fit-out.

Owner-Tenant Collaboration

Open communication and early collaboration between owner and tenant teams ensures alignment of sustainability objectives and facilitates energy efficient practices.

Timing

Early implementation and strategic timing of energy and emissions reduction measures can maximize savings over the entire lease term.

Setting Sustainability & Performance Goals

Establishing clearly-defined targets prior to the design phase helps achieve the levels of energy and emissions reduction needed to meet internal goals and regulatory requirements.

Leveraging Technical Experts

Assembling an integrated team of experts, including an energy specialist, early in the process will maximize the benefits of a high-performance tenant fit-out.

Defining a Fit-Out Scope of Work

A long-term, comprehensive scope of work developed for specific project conditions allows for all energy and emissions reduction measures to achieve maximum impact.

Training Building Operators & Facility Managers

Providing training sessions for staff members responsible for operating and maintaining the building or space equips them with the necessary skills and knowledge to ensure that systems are operating as intended.

Tracking & Sharing Data

Collecting performance data, such as energy usage, and sharing the findings between the owner and tenant teams is critical for maintaining and improving system performance.

Celebrating Success

Recognizing milestones and achievements can help build support, motivate teams, and reinforce the value of sustainable practices in commercial tenant spaces.

1 <https://www.mdpi.com/1996-1073/13/20/5311>
2 <https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Case-Studies/Commercial/COM-RE-CT-gensler-cs.pdf>

The Importance of:
Owner-Tenant Collaboration

Decarbonizing existing office buildings to meet LL97 requirements and other energy/emissions reduction goals requires a new paradigm of proactive coordination between building owners and commercial tenants over the entire lease term, and particularly in anticipation of a tenant fit-out.

The owner, tenant, and their extended teams—including consulting engineers/energy specialists—need to convene prior to the fit-out phase to discuss the following topics:

Building Performance & Systems Attributes

- ❑ Review existing building performance characteristics and systems information—such as the installed mechanical, electrical, and plumbing (MEP) systems, operating schedules, fuel-type, equipment end-of-life, etc.—collected during the site selection phase. This should include base building systems that service the tenant space and any existing tenant space equipment that may be utilized for the new office.
- ❑ Conduct a site visit to walk through the space, ideally with an MEP engineer, to:
 - 1. Collect any remaining or additional building system information.
 - 2. Identify potential energy-saving improvements for inclusion in the fit-out scope.
- ❑ Identify whether the owner or the tenant is responsible for operating and maintaining each system/equipment serving the tenant space.
- ❑ Ensure a mutual understanding of any long-term decarbonization/improvement plans for the base building, including MEP systems and building envelope, and how these upgrades may impact the tenant space.

Design Guidance

- ❑ Review any high-performance design guidelines developed by the building owner to reduce energy consumption and emissions.
- ❑ Identify any pre-build measures ownership can implement to support the high-performance office fit-out.
- ❑ Discuss any third-party building certifications or rating systems that the office space must comply with and that might impact the office fit-out scope and/or require specific utility data reporting.

Regulatory Requirements

- ❑ Work together to ensure compliance with key regulations such as LL97. This discussion should cover relevant topics such as the building’s current carbon emissions (GHG/SF of CO2e), whether it is in compliance with upcoming LL97 emission limits, plans for phasing out fossil fuels, potential energy and emissions targets for the tenant space, as well as financial opportunities—such as a tenant improvement allowance or incentives.

Ultimately, early collaboration between owners and tenants prior to the design phase as well as ongoing communication over the entire lease term is essential to developing and executing an impactful office fit-out.

NYSERDA’S The Great Energy Disconnect: Lessons Learned from the Pandemic on Commercial Office Energy Use

Key Finding: Landlord-Tenant Collaboration

Landlords and tenants should enter joint operating and maintenance plans aimed at optimizing whole building energy performance and minimizing greenhouse gas emissions. These joint O&M plans and periodic coordination meetings should be codified in the lease.

Learn more: [Strategies to Maximize Whole-Building Energy Savings](#)

The Importance of: Timing

Timing is an influential factor for both building owners and tenants when it comes to making changes to the systems serving leased office spaces.

Building Owners

For building owners, the most impactful times to implement energy and emissions reduction measures (ERMs) include tenant turnover, building repositioning, and equipment replacement. These events provide key opportunities to increase cost-effectiveness and reduce disruption when retrofitting both tenant and base building systems. The opportunity for impact is augmented when an anchor tenant vacates a space.

Tenant turnover is a particularly critical trigger point for both decarbonisation and energy conservation efforts in a building’s occupancy and capital cycle. For many buildings, the most significant improvements to the energy performance of leased spaces—including upgrades necessary to enable beneficial electrification of space heating systems—require vacancy. As a result, building owners must plan long-term energy performance improvements in advance of tenant fit-outs; otherwise they risk locking in underperforming base building systems for the duration of newly signed leases.

Tenants

For tenants, implementing ERMs prior to move in will maximize logistical, financial, and energy savings co-benefits over the entire lease term.

Retrofitting occupied spaces can be challenging—not only because of the potential disruption to tenant workflow, but also due to the planning and logistical complexities that are required. Although it is possible to make strategic improvements to an office post-occupancy, prioritizing fit-out measures before occupants move in is most advantageous. This approach mitigates the risk of operational disruptions, such as noise pollution, that can decrease productivity, while capitalizing on energy savings over the full term of the lease.

Capital expenditures (CapEx) are typically available for capital events such as the procurement of a new office space. Tenants should take advantage of any available CapEx funds to support a high-performance fit-out. Furthermore, communicating the importance of energy conservation and decarbonization during tenant lease negotiations is important—for long-term leases in particular, which often last twenty years—as efficiency measures can translate into considerable energy and cost savings. Executing a high-performance lease with energy-aligned clauses is an essential tool to ensuring that ERMs are implemented.

While the period prior to move in is undoubtedly the most impactful time to implement comprehensive energy conservation measures, it’s also important to recognize that energy efficiency efforts don’t end once a space is occupied. Further action is required to (1) maintain the space’s operational performance and (2) seize opportunities for additional upgrades and improvements as needed. The continued evolution of climate legislation, technological advances, and the organization’s goals necessitate an ongoing commitment to assessing and improving the space through equipment updates and operational improvements.

The Importance of: Setting Sustainability & Performance Goals

Tenant and building owner teams should establish performance targets prior to the design phase. Setting goals early on will affirm both teams’ commitment to sustainability, ensure accountability, and provide a means for gauging success over time. The goals should be informed by:

Organizational Sustainability Commitments

More and more companies are adopting sustainability strategies that extend to their real estate portfolios. These commitments include:

- Striving to achieve net-zero carbon emissions by 2050 or sooner.
- Aligning efforts with recognized environmental standards such as Science Based Targets initiative (SBTi), Sustainability Accounting Standards Board (SASB), and Global Reporting Initiative (GRI).
- Pursuing third-party certifications for real estate assets such as ENERGY STAR and LEED.
- Publicly disclosing key building metrics such as energy usage and carbon emissions.

Tenants and building owners should have a clear understanding of any sustainability commitments their organization is pursuing to ensure that their space design decisions align with broader organizational goals.

Property-specific Performance Targets

Understanding a building’s annual estimated emissions and ensuring compliance with local regulations, such as LL97, are critical steps to minimizing environmental impact and avoiding hefty fines for noncompliance. Key actions that building owner teams should take include:

- Calculating a building’s annual carbon emissions
- Comparing the results with emissions limits to understand required reductions and potential financial implications.
- Developing a comprehensive retrofit plan to enhance energy efficiency and transition onsite fossil fuel systems to electric alternatives.
- Sharing emissions data and related long-term or immediate action plans with tenants to foster collaboration and ensure alignment on respective or shared sustainability commitments.

It is imperative that tenants and owners proactively set sustainability & performance goals and maintain communication throughout the leasing cycle to capitalize on synergies and inform the scope of the tenant fit-out. Engaging relevant stakeholders such as sustainability experts, project managers, facilities teams, and organizational leadership will ensure complete and comprehensive goal-setting and implementation.

BE-Ex’s LL97 Carbon Emissions Calculator

The LL97 Carbon Emissions Calculator estimates a building’s carbon penalty as a result of NYC LL97. Automatically load building data from NYC’s benchmarking database or manually enter information to generate carbon thresholds, potential penalties, and utility cost metrics across each compliance period.

Learn more: www.be-exchange.org/ll97-calculator

The Importance of:
Leveraging Technical Experts

Assembling an integrated team—that includes energy specialists, architects and MEP engineers—is crucial to maximizing the benefits of a tenant fit-out as these professionals provide essential technical expertise. The team must also include owner and tenant representation with a focus on asset management.

Technical experts need to be engaged early and throughout the design process, including project kick-off, design charrettes, and ongoing coordination meetings. This ensures that specialists have ample opportunities to guide and optimize the high-performance fit-out scope of work which can help maximize benefits, such as energy/emissions reductions and cost savings.

To optimize positive outcomes, the integrated team should:

- Determine the “business as usual” (BAU) approach to tenant fit-outs and compare alternative approaches to this baseline.
- Identify impactful and innovative energy/emissions reduction measures (ERMs) that are applicable to the project.
- Highlight similar completed projects where ERMs were successfully implemented.
- Prepare an energy model, if relevant for the fit-out scope of work, to calculate baseline energy use and projected energy savings for package(s) of ERMs ranging from basic low-cost improvements to innovative solutions worth evaluating.
- Propose ERM packages across HVAC systems, plug loads, lighting, and other process loads based on the information collected from the building owner and during the walkthrough of the office space. Measures could include suggestions for base building system upgrades for ownership’s consideration.
- Conduct a financial analysis to determine the incremental costs and corresponding savings/returns—e.g. net present value (NPV), internal rate of return (IRR)—for the chosen ERMs over the life of the lease, and build the business case for going above and beyond baseline code requirements. It is critical to consider annual returns as well as LL97 fine avoidance over the full lease term to have a comprehensive understanding of the financial impacts of implementing a high-performance fit-out.
- Identify and apply for financial resources such as incentive programs, federal funding, loan opportunities, tax incentives, and rebates to offset the cost of the project.
- Provide expertise on potential third-party certifications to pursue.

Financial Terms

Incremental costs are additional sums (net of cost-avoidance amounts), compared with what was already budgeted for the planned system or equipment (e.g., the estimated difference in cost between high-performance lighting and baseline code-compliant lighting).

Net present value (NPV), expressed in dollars, is a basic metric used in capital budgeting to analyze the profitability of a project (such as a high-performance tenant buildout).

Internal rate of return (IRR) reflects the rate of growth a project is expected to generate. It is a metric that allows investors to avoid wasting money on projects that cannot earn back the cost of their capital.

ULI’s Tenant Energy Optimization Program (TEOP)

TEOP integrates energy efficiency into tenant space design and construction and delivers excellent financial returns through energy conservation.

Learn more: www.tenantenergy.uli.org

TEOP Energy Value Analysis Guide

This guide describes how to quantify the impact of energy performance solutions in a commercial space.

Learn more: [Energy Value Analysis Guide: Design and Construction](#)

The Importance of:
Defining a Fit-Out Scope of Work

Once a tenant has collected the necessary base building performance and systems information, conducted a walkthrough of the tenant space with an MEP engineer/energy consultant, and established performance goals, it’s time to evaluate all options and choose the best energy/emissions reduction measures (ERMs) for the space.

Tenant teams should develop a scope of work that is informed by key factors including regulatory requirements, performance goals, financing cycles, and end of system life if any existing equipment will be utilized. To help in this effort, below is a summary of some of the most common and effective measures for reducing energy use and carbon emissions in leased tenant spaces.

ERMs are organized by building system and into two categories—moderate and deep—relative to the anticipated emissions reduction.

Measures may be relevant to a complete office fit-out that constructs an entirely new tenant space or an office retrofit / renovation that may utilize components from and improve upon an existing tenant space.



Heating

Since tenant spaces are typically tied to the base building heating system, equipment upgrades usually need to occur at the building-level. While moderate energy and emissions savings can be achieved with higher efficiency boilers and improved controls, converting to electric-powered systems, like heat pumps, will be necessary to achieve the deeper emissions reductions required for compliance with LL97 in 2030 and beyond.

- Moderate measures
- ☐ Thoroughly air seal all ductwork

☐ Zone for variables such as occupancy or use type

☐ Evaluate potential for local radiator controls, such as thermostatic radiator valves, as applicable

☐ Optimize set points and schedules for occupied hours
- INSIGHT: Many building systems operate with set points and schedules meaning that a space will be conditioned once the temperature dips below or rises above a set temperature or at a certain time. Optimizing set points and schedules ensures that systems can use less energy after normal working hours and adjust to real-time conditions as needed.
- Deep measures
- ☐ Convert to water source heat pump or other electrification option, as appropriate

☐ Integrate into a heat sharing/thermal network, if feasible
- INSIGHT: This measure electrifies a tenant’s heating and cooling load, which moves the building towards electrification. Ensure systems are properly sized for the anticipated loads.
- INSIGHT: Waste heat from various sources, such as data centers, can be utilized when it is captured and redistributed to other spaces in need of heating.

BE-Ex’s Take the Heat! Part 2: Building Core & Perimeter

An event in a two-part series that highlights projects deploying breakthrough heat recovery solutions. The presentations and panel discussion from Take the Heat! Part 2: Building Core & Perimeter specifically showcases approaches to ventilation and cooling heat recovery projects in New York City.

Learn more:
www.be-exchange.org/take-the-heat-part-2

The Importance of:
Defining a Fit-Out Scope of Work



Cooling

Energy efficiency upgrades for cooling systems are similar to heating, often necessitating building-level equipment upgrades. For tenant fit-outs, project teams should consider the following options, keeping in mind that, as with heating systems, they must ultimately convert to electric-powered systems to achieve deeper decarbonization.

Moderate Scope

- ☐ Thoroughly air seal all ductwork
- ☐ Zone for variables such as occupancy or use type
- ☐ Optimize set points and schedules for occupied hours
INSIGHT: Many building systems operate with set points and schedules meaning that a space will be conditioned once the temperature dips below or rises above a set temperature or at a certain time. Optimizing set points and schedules ensures that systems can use less energy after normal working hours and adjust to real-time conditions as needed.
- ☐ Clean and maintain coils
INSIGHT: As dirt and dust accumulates on condenser coils, they become less efficient at releasing heat. More energy is used if a compressor has to work harder to cool a space.
- ☐ Optimize server room/data center cooling
INSIGHT: Since modern IT equipment can tolerate higher operating temperatures, teams should utilize energy-saving strategies such as increasing set points based on ASHRAE’s latest data center temperature range (64.4oF - 80.6oF as of 2008) or the equipment’s inlet temperature specifications.

Deep Scope

- ☐ Upgrade packaged units
- ☐ Convert to water source heat pump or other efficient electric alternative, as appropriate
INSIGHT: This measure electrifies a tenant’s heating and cooling load, which moves the building towards electrification. Ensure systems are properly sized for the anticipated loads.
- ☐ Integrate into a heat sharing/thermal network, if feasible
INSIGHT: Waste heat from various sources, such as data centers, can be utilized when it is captured and redistributed to other spaces in need of heating.

NYSERDA’S The Great Energy Disconnect: Lessons Learned from the Pandemic on Commercial Office Energy Use

Key Finding: Leveraging Set Points

Cooling and heating temperature requirements in leases are a major culprit in whole-building energy waste...just modifying the ambient temperature requirement to 74 degrees in the cooling season and 70 degrees in the heating season (both well within ASHRAE guidelines) should generate substantial whole-building energy savings according to engineers and building owners.

Learn more: [Strategies to Maximize Whole-Building Energy Savings](#)

ENERGY STAR’s 5 Simple Ways to Avoid Energy Waste in Your Data Center

A checklist of five measures can save a significant amount of energy and are fairly easily to implement, including:

- Raise the temperature
- Virtualize servers
- Identify and remove unused servers
- Replace standard fans with variable speed fans
- Institute ENERGY STAR purchasing policy

Learn more: [5 Simple Ways to Avoid Energy Waste in Your Data Center](#)

The Importance of:
Defining a Fit-Out Scope of Work



Ventilation

Ventilation plays a critical role in indoor air quality and works in tandem with an airtight envelope. Fit-out upgrades must prioritize balanced ventilation that delivers filtered air directly to tenant spaces to maintain occupant health and comfort while also ensuring maximized energy efficiency.

Moderate Scope

- ❑ Thoroughly air seal all ductwork
- ❑ Zone for variables such as occupancy or use type
- ❑ Optimize variable air volume (VAV) static pressure reset schedule
- ❑ Install variable frequency drives (VFDs) on air handling units (AHUs)

Deep Scope

- ❑ Install a dedicated outside air system (DOAS) with a high efficiency energy recovery ventilator (ERV)
- ❑ Install demand-controlled ventilation (DCV)

NYSERDA’S The Great Energy Disconnect: Lessons Learned from the Pandemic on Commercial Office Energy Use

Key Finding: HVAC Zones

The pandemic highlighted that many landlords are hampered in their efforts to rein in whole building energy use due to a lack of sufficiently granular building system HVAC zones and a lack of up-to-date building system HVAC controls. In older buildings, there can be as few as 2 or 3 building system HVAC zones even in a 1MM square foot building. The result is that even a few occupants on a few floors can require delivering HVAC to hundreds of thousands of square feet. Engineers should take a fresh look at the costs and energy savings opportunities of adding more HVAC zones to be nimbler in the future in response to fluctuating occupancy.

Learn more: [Strategies to Maximize Whole-Building Energy Savings](#)



Hot Water

Similar to heating systems, many tenant spaces are tied to the base building domestic hot water system. However, more tenants are starting to install their own electric-powered water heaters, which moves the building towards electrification.

Therefore, the most impactful emissions reductions occur when equipment is switched to electrically powered alternatives at the building-level.

Moderate Scope

- ❑ Install low-flow, WaterSense-certified faucets or aerators

Deep Scope

- ❑ Install heat pump water heaters
INSIGHT: Assess if ejected cold water/air can be utilized to cool other spaces, such as a server room.
- ❑ Consider efficient electric point-of-use water heaters, if/where feasible
- ❑ Evaluate opportunities for wastewater energy recovery at the building-level, such as a Highmark SHARC Wastewater Energy Recovery system or similar

BE-Ex’s Take the Heat! Part 1: Geo & Wastewater

An event in a two-part series that highlights projects deploying breakthrough heat recovery solutions. The presentations and panel discussion from Take the Heat! Part 1: Geo & Wastewater specifically showcases approaches to wastewater heat recovery as well as geothermal projects in New York City.

Learn more: www.be-exchange.org/if-you-cant-take-the-heat

The Importance of:
Defining a Fit-Out Scope of Work



Lighting

Many tenant fit-outs typically involve installing or updating lighting fixtures with energy efficient options such as with LEDs and dimmable ballasts. Efficiency lighting is a straightforward approach to reducing energy use, as new technologies for lamps and fixtures can provide higher efficiency while improving lighting quality. New codes regulating lighting power density may require many of the following measures.

Moderate Scope

- ❑ Install LED lighting systems with an appropriate lighting power density (LPD) (W/sf) for the space type
- ❑ Install occupancy/vacancy sensors and timers
- ❑ Install bi-level lighting in stairwells

Deep Scope

- ❑ Install advanced daylighting system & controls



Plug Loads

Another relatively easy way to limit energy consumption is reducing and managing plug loads. Upgrading to more efficient appliances and using advanced power strips can make a big impact on energy use in the tenant space, while simultaneously reducing operating costs. Additionally, over the past few decades, data servers and increased computation needs have become a major consumer of energy in office spaces. With the emergence of cloud computing and remote servers, this energy consumption can be shifted to remote locations, resulting in a lower energy demand on the building.

Moderate Scope

- ❑ Utilize sleep modes on IT equipment
- ❑ Install advanced power strips (APS)
INSIGHT: Plugged-in electronics continue to use electricity even when turned off. This wasted energy is called standby power loss or “vampire energy.” Advanced power strips (APS) reduce the amount of energy used by electronics by shutting off the supply power to devices that are not in use.
- ❑ Install plug load controls/timers
- ❑ Use ENERGY STAR appliances and evaluate quantity and location of shared equipment
- ❑ Provide remote, app-driven controls

Deep Scope

- ❑ Migrate onsite IT, such as server rooms and data centers, to the cloud



Building Envelope

Improvements to the building envelope can directly impact the performance of mechanical systems by reducing heating and cooling demand, thus saving energy and minimizing operating costs, while improving thermal comfort and asset value. Tenants can make moderate improvements to the walls (and roof if applicable) enclosing their office space, though the measures that will generate the greatest impact—such as installing high-performance windows and upgrading wall and roof insulation—occur at the building level and are the responsibility of the building owner.

Moderate Scope

- ❑ Install (automatic) window shades or other shading devices
- ❑ Install window film
- ❑ Thoroughly air seal exterior and demising walls
- ❑ Install (cavity) insulation in all exterior and demising walls

Deep Scope

- ❑ Coordinate with building owner to understand viable measures at the building-level

Embodied Carbon: Beyond Operational Carbon

Beyond the operational carbon reduction strategies provided above, a greater emphasis is being placed on the carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building, known as *embodied carbon*. Put simply, embodied carbon is the carbon footprint of a building, or a finished tenant space, before it becomes operational. Due to advances in reducing operational carbon, embodied carbon is becoming a larger portion of a building’s overall carbon footprint. As such, owners and tenants should consider the following strategies to ensure that their buildings and spaces are designed to minimize total emissions.

- **Conduct a Life Cycle Assessment (LCA)**
Work with a qualified consultant to conduct a Life Cycle Assessment to assess the environmental impacts of the fit-out scope of work and devise strategies to mitigate environmental impacts, such as
 - utilizing existing components, e.g. partitions and furniture (if applicable)
 - specifying low embodied carbon materials, e.g. floorings, gypsum board, and acoustic insulation
- **Specify products with embodied carbon reports**
Specify products that have Environmental Product Declarations (EPDs) or third-party verified documentation that quantifies and reports on the environmental impacts of a product.
- **Reuse existing partitions**
Reuse existing partitions to the maximum extent possible when planning the new space.
- **Utilize demountable partitions**
Maximize reusability of partitions for flexibility and future renovations.
- **Eliminate or minimize floor covering**
Finish and use exposed concrete floor in lieu of carpeting or another applied floor covering. Otherwise, flooring products should be certified by either CRI Green Label Plus (carpet) or FloorScore (resilient flooring).

[Learn more about embodied carbon, including its role in our buildings and impact on climate change: Embodied Carbon in New York City](#)

The Importance of:
Defining a Fit-Out Scope of Work

Process & Policies

Improvements to building policies and processes can have a large impact on both energy efficiency and financial savings. When base building systems are regularly evaluated and managed, efficiency gaps can be more easily identified and reduced.

- ❑ Commission newly installed equipment

INSIGHT: Have a qualified Commissioning Agent conduct functional testing on all installed HVAC equipment and controls, and share results/final report with the building owner in a timely and accessible manner.
- ❑ Calibrate sensors and controls

INSIGHT: Sensors need to be routinely inspected and adjustments made to make any sensors function as accurately as possible.
- ❑ Integrate tenant HVAC and lighting systems into base building real-time building management system

INSIGHT: Tenants and owners should coordinate to ensure that the equipment serving the tenant space can be properly incorporated into any existing Real Time Energy Management (RTEM) and/or Building Management Systems (BMS). Consider installing a whole building RTEM and BMS if one is not already in place. See the “Importance of Tracking & Sharing Data” section for more information.

It is important to note that each building and office space is unique. Tenants must develop and implement a fit-out scope of work that best aligns with their individual project needs including end of system life, sustainability goals, and LL97 compliance. Using these moderate and deep ERM’s as references, project teams can begin to determine the combination of ERM’s that is optimal for building out the tenant space, the team can use tools such as energy modeling results (if applicable), financial analysis, and expertise from team members. Besides energy and emissions reductions, these ERM’s will also have additional co-benefits, such as increased air quality, productivity, and occupant comfort.

BE-Ex’s Turning Data into Action: Decarbonization Pathways for Commercial Office Buildings

An initiative to develop retrofit packages of *Base Building* and *Tenant Fit-Out* measures well-suited to four common commercial building typologies typical to New York City:

- Central Chiller System with District Steam Heating
- Packaged Cooling Systems with Steam Heating
- Decentralized Cooling Systems with Hot Water Heating
- Decentralized Cooling Systems with Steam Heating

The tear sheets include different scopes of work to achieve varying levels of emissions reductions and provide viable pathways to LL97 compliance.

Explore all the tear sheets and report with key findings: [Turning Data into Action: Office Buildings](#)

NYSERDA’s Commercial Tenant Fit-Out Success Stories

Learn from real world, New York-based examples of successful office fit-outs through NYSERDA’s Commercial Tenant Success Stories. Each company profile includes the office retrofit scope of work, anticipated annual savings, and post-occupancy results showing that high-performance upgrades do realize important energy/emissions reductions, enable cost savings, and provide a better employee experience.

Explore all the case studies: [Commercial Tenant Success Stories](#)

BE-Ex’s Technology Primers

The High-Performance Technology Primers are a set of resources that introduce readers to solutions that can help save energy and improve comfort in their buildings.

Each Tech Primer introduces a high performance technology and outlines steps for its implementation. A costs and benefits rating system helps readers choose the right technology for their building.

Explore all the Tech Primers: [www.be-exchange.org/tech-primers](#)

Retrofit Playbook for Large Buildings

Developed by NYSERDA, RMI, Building Energy Exchange, and Urban Land Institute, the Retrofit Playbook for Large Buildings offers a living library of case studies, technical resources, and best practices to support high quality, low carbon retrofits. By utilizing the solutions and strategic planning tools presented here, teams can develop decarbonization roadmaps that create value, reduce emissions, and enhance the resilience of their assets.

Learn more: [www.retrofitplaybook.org](#)

The Importance of: Training Building Operators & Facility Managers

Leverage building operator and facility manager training, as well as peer-to-peer learning to ensure that systems serving the office space are operating as intended.

When implementing high-performance measures, it's important to keep in mind that the mere addition of energy efficient technology will not automatically translate into optimal building performance and energy savings. The systems must be properly operated and maintained. Building engineers, operators, and even occupants play a critical role in realizing the full potential of these new systems.

As such, a comprehensive orientation—including access to equipment schedules and manufacturer specifications—is essential to helping building operators effectively manage high-performance systems and navigate their nuances. Training building staff and facility and office managers on the specific equipment installed as part of the fit-out package helps ensure that these systems are maintained at peak performance, which prolongs their overall lifespan throughout and beyond the term of the lease.

Furthermore, building operators who have been properly oriented and reoriented on a periodic basis to the new building systems are also better equipped to identify and resolve issues with sophisticated systems, mitigating the need for outside/external services. This capability not only saves costs but ensures that potential maintenance needs will be addressed in a timely manner. To reinforce accountability, owners and tenants should consider codifying a systems training for operators and facility managers in the lease and/or building regulations.

While training personnel who are responsible for operating and maintaining an office's MEP equipment is essential, tenants should also provide their employees with an orientation to the energy efficient systems. Empowering employees with insights into the intent, benefits, use, and maintenance of their office's high-performance equipment—particularly if they will be interfacing with the system—generates buy-in and helps ensure that the benefits of a high-performance fit-out are fully realized.

NYSERDA'S Building Operations & Maintenance Training Program

The Building Operations & Maintenance Training Program, offered by NYSERDA, provides funding for organizations to design and deliver training for their maintenance and facilities teams. Funds from this program have been used successfully across New York to:

- Customize training programs for staff based on their specific buildings and equipment
- Develop mentoring programs
- Create on-demand training videos
- Create on-site training facilities

Learn more: [Building Operations & Maintenance Training Program](#)

The Importance of: Tracking & Sharing Data

Tracking and sharing actual performance data is crucial to understand how energy is consumed, whether systems are functioning as intended, and how to improve performance.

Prior to developing a fit-out scope of work, owners and tenants must discuss what specific monitoring tools are already being used and/or may be required, particularly if components such as sensors need to be installed within the tenant space. From there, the teams must collaborate to make sure the specified base building and tenant systems are able to properly integrate so that information is being collected accurately and in a timely manner once the tenant has moved in.

The following are tools to support data tracking and sharing:

- **Benchmarking Platforms**, such as ENERGY STAR Portfolio Manager, are digital resource management tools that enable users to track energy use at the tenant or whole building scale and compare a building or space's energy use to a yearly baseline, national medians, or similar assets in a portfolio.
- **Building Management Systems (BMS)**, also referred to as a Building Automation System (BAS), is a control system installed in a building that monitors and manages various systems such as heating, ventilation, air conditioning (HVAC), and lighting systems. A BMS automatically regulates and controls internal environmental conditions, such as temperature, to predefined set points. In addition to monitoring building systems, a BMS also optimizes energy use so that the system is as efficient as possible.
- **Real Time Energy Management (RTEM) systems** continuously collect and transmit a building's current and historical performance data to the cloud. An RTEM system can detect equipment faults, so they can be addressed before they become failures or impact occupant comfort. Building owners can use this data to optimize the building's energy consumption, including tenant spaces when integrated into the system, and show in real time how a property is performing.

An RTEM system works with an existing BMS by utilizing additional sensors and advanced analytics to automatically manage energy consumption and equipment performance, diagnose system issues/errors in real time, and identify operational improvements.

The Importance of: Tracking & Sharing Data

While tracking data is the first critical step, sharing energy consumption and equipment performance data across teams is also essential. Be sure to identify the key points-of-contact from the owner’s or tenant’s teams—such as an energy manager, facilities personnel, office manager, or otherwise—responsible for managing and acting upon the collected data.

How to Enter and Manage Tenant Spaces in ENERGY STAR Portfolio Manager

The EPA ENERGY STAR Portfolio Manager tool helps building owners and tenants measure and track energy, water use, and waste, all in a secure online environment.

Users of Portfolio Manager enter information at the “property” level. A property can be a whole building, a campus of buildings, an individual tenant space, or even a common area within a building. This guidance describes how to create a tenant property, as well as how to link tenant properties to the whole building.

Learn more: www.energystar.gov/sites/default/files/tools/HowToBenchmarkTenantSpacesinPortfolioManager.pdf

Con Edison’s Real Time Energy Management (RTEM) Program

ConEdison’s RTEM Program helps customers monitor and manage their energy usage in real time. Program applicants work with a qualified contractor to install the RTEM system and then implement the recommendations to improve building operations. Following installation, the customer can apply for incentives based on saved energy, which cover a portion of the RTEM system and service costs.

Learn more about eligibility requirements and the application process: www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-commercial-industrial-buildings-customers/real-time-energy-management-systems

NYSDERDA’s Real Time Energy Management (RTEM) website

Building owners and tenants can use NYSDERDA’s RTEM website to learn useful information regarding the benefits of RTEM, explore project data across New York State, submit information requests, and more. Users can also review success stories, learning about RTEM best practices and implementation across various building types.

Learn more: www.nysderda.ny.gov/All-Programs/Real-Time-Energy-Management

Explore all the RTEM Success Stories: www.nysderda.ny.gov/All-Programs/Real-Time-Energy-Management/Success-Stories

The Importance of: Celebrating Success

Tenants that improve energy efficiency may be eligible for certain awards and recognition. Earning industry recognized achievements spotlights an organization’s commitment to sustainability, which can help distinguish the company from competitors, attract and retain talent and investors alike, and build internal support for current and future sustainability efforts.

ENERGY STAR Tenant Space

ENERGY STAR Tenant Space is a program through the U.S. Environmental Protection Agency (EPA) which recognizes sustainability efforts in leased office space. To achieve the designation, tenants must:

- Estimate energy use
- Meter actual energy use
- Light efficiently
- Use efficient equipment
- Share data with the landlord

Learn more: www.energystar.gov/buildings/building_recognition/tenant_space_recognition

Green Lease Leaders

The Green Lease Leaders program, developed by the Institute for Market Transformation and the U.S. Department of Energy’s Better Buildings Alliance, recognizes landlords and tenants who incorporate green lease clauses and sustainability initiatives into their lease agreements. Participating organizations can be honored at the Better Buildings Conference.

Learn more: www.greenleaseleaders.com

As one can see, there are many key considerations to take into account when designing a high-performance office space.

Most importantly, it is critical that owner and tenant teams actively and effectively communicate throughout the process, working together to develop a scope of work that will achieve long-term energy and emissions reductions, creating a win-win scenario for both teams.