

# Related Companies Office Lighting Retrofit

**A complicated, after-hours lighting retrofit that greatly improved the office environment, reduced lighting energy use by 56% and shaved peak demand from 70kw to 30kw.**





Time Warner Center at Columbus Circle, the home of Related's offices.

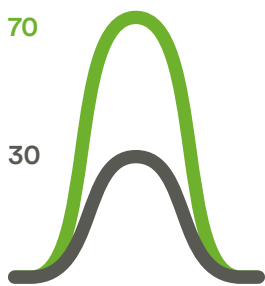
Credit: [Green Light New York](#)

## savings & strategies

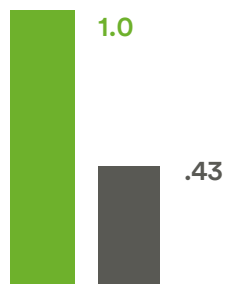
Project Type	Commercial Interior
Location	Midtown Manhattan, NYC
Year of Project completion	2012
Base building completed	2003
Project Size	70,000 sf
Occupied during the retrofit?	Yes

## primary energy figures

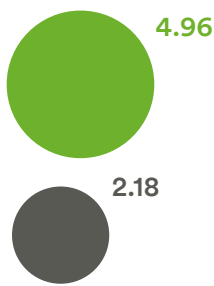
Simple payback	3.6 years
Annual return on investment	28%



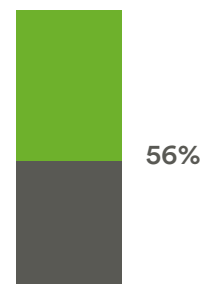
Peak Demand (kw)



Lighting Power Density (W/sf)



Consumption (kWh/sf/yr)



Energy Savings

■ Before ■ After

## strategies

- Addressable, fully dimmable fixtures
- Wireless daylight sensors
- Wireless motions sensors
- Central, web-based control system
- Light tuning capability
- LED downlights (lobbies)
- Fluorescent fixtures (general)

## benefits

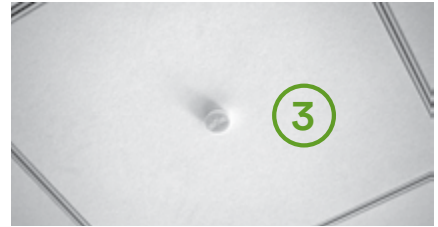
- Eliminates lighting of unoccupied spaces
- Reduces lighting loads
- Increases occupant comfort
- Lighting dims when daylight is sufficient
- Custom tuning for specific needs
- Centralized, web-based control
- Significant peak demand reductions
- Demand response program eligible

### SOURCES

- 1 Construction costs: Lutron, Related Companies.
- 2 Energy savings: Line voltage monitoring.
- 3 Incentive figures: Con Edison.

## products / systems

The retrofit retained the existing fluorescent light fixtures, but increased functionality through the addition of dimmable ballasts, carefully positioned wireless sensors and a control system that features a web-based user interface.



**1 Existing Fluorescent Fixtures**  
The project utilized the existing fixtures, modifying them only as need to receive dimmable ballasts

**2 New Dimmable Ballasts (not visible)**  
Lutron Electronics  
[www.lutron.com](http://www.lutron.com)  
Each existing fixture was outfitted with dimmable ballasts to enable the functionality required

**3 Wireless Daylight Sensor**  
Lutron Electronics  
[www.lutron.com](http://www.lutron.com)  
The daylight sensors are small and as the system is commissioned can be moved (or more added) to optimize the functioning of the system

**4 Wireless Occupancy Sensor**  
Lutron Electronics  
[www.lutron.com](http://www.lutron.com)  
This equipment can also be moved or added to as needed to ensure optimal function of the system

**5 Wireless Sensor Module**  
Lutron Electronics  
[www.lutron.com](http://www.lutron.com)  
This small unit acts as a relay for wireless information, ensuring that the control panel can communicate with all sensors and ballasts in the various rooms and spaces

## project team

Related Companies  
Project Owner

Lutron Electronics  
Products & Installation

Con Edison  
Incentive Provider

## project description

*Wildly successful, despite the challenges we encountered.*

—Charlotte Matthews, Related Companies

Since completion the project has recorded lighting energy savings of 56%. The project has cut peak lighting electric demand from 70 kilowatts to 30 kilowatts, or 0.43 W/sf. These figures are particularly notable considering the building is less than 10 years old, and the replaced lighting was considered state of the art at the time of its installation. The resulting financial savings are estimated to pay back the project cost in 3.6 years after a Con Edison rebate. The new system reduces energy costs and, perhaps most importantly, greatly improves space flexibility, occupant visual comfort, safety and aesthetics. The system also enables easy dimming for demand response.

## summary

Related's lighting retrofit aspirations were modest to start. They wanted recommendations on areas of the office where lighting power could be reduced, and to correct problems they were having with conference room occupancy sensors. Most vendors who met with Related limited their recommendations to one-for-one lamp replacements of halogen for LED in the lobby, and simple replacement of occupancy sensors.

Lutron took a more holistic approach that began with a walk through of the floor to measure light levels. They advised Related that circulation pathways were overlit relative to current design standards, and that a reduction in light level throughout the open office plan would likely improve employees' visual comfort. To enable Related to find the right light level, Lutron suggested replacing the existing fluorescent ballasts with digital dimmable ballasts, which would enable Related to dim the lights as little or as much as desired. In the perimeter offices, the dimmable ballasts could be controlled by wireless photosensors to enable daylight harvesting. Lutron also suggested installing wireless occupancy/vacancy sensors in all of the conferences rooms, enclosed offices, bathrooms and throughout the open office plan. This would enable Related to abandon the existing time clock that turned lights off in the office regardless

of whether the office was still occupied, was confounding to program, and was frequently overridden—resulting in lights often being left on over nights and weekends. The Lutron proposal offered not only significant energy savings but a significant improvement in lighting control, comfort and safety— with an estimated payback under 5-years, including incentives.

18 months later, the lighting retrofit is on track for a 3.5 year payback, and occupant comfort is definitely improved. (General lighting was dimmed about 40% with the new system. Although only a few employees complained about glare or sore eyes prior to the retrofit, during a system reset, the lights briefly returned to their original setting, and there was considerable complaint about the glare.) Related is very happy with the outcome, but learned during the process that lighting retrofits are never simple, and like any renovation project, require regular engagement and persistence.

Since retrofitting their corporate office with wireless, digital lighting controls and LED fixtures, Related has begun rolling out the similar technology in their residential and commercial development projects and pitching it to tenants, both residential and commercial. In new construction projects, Related estimates a 1.5 year payback relative to a code minimum lighting fit-out and a first cost as well as operating cost savings relative to industry standard fit outs.



## existing conditions

Related's corporate office fit out was less than ten years old and built to very high quality standards but, in Related's opinion, the lighting system was already outdated.

All of the lighting was controlled by manual switches and a time clock, and the override switches for the time clock were located in electrical closets that employees only sought out after they found themselves sitting in the dark at 9 PM. Often times, after the time clock was overridden, the system failed to reset and the office lights remained on throughout the night or weekend.

## details of the retrofit

After surveying options in the lighting retrofit marketplace Related decided to work with Lutron, one of the most prominent players in the industry.

Lutron's fully dimmable system was cost effective, in part, because the sensors and controls communicate wirelessly, avoiding the costly installation of additional wiring. Furthermore, the wireless nature of the system enabled the occupancy and daylight sensors to be located and relocated as necessary to optimize performance. This was very attractive to Related because the primary reason that many of their existing occupancy sensors did not function properly was due not to a technology error but due to poor location. The wireless system not only allowed occupancy sensors to be moved but for additional sensors to be added easily when necessary. Ultimately, this flexibility and the low installation costs gave Related the confidence to install occupancy sensors not only in the conference rooms but also in private offices and throughout the open office areas, eliminating the need for a time clock.

The programmability of the occupancy sensor controls enabled further savings. For example, during "working hours", when a row of cubicles is unoccupied, the occupancy sensor is programmed to dim the lights of that particular row enough to save energy but not enough to be perceptible to the neighboring rows. After "working hours", the lights in unoccupied rows turn off, unless a neighboring row is still occupied, in which case they simply dim.

A further benefit of the wireless system is the ability to configure lighting zones by programming instead of wiring. For example, a prior reconfiguration of the floor added several offices without modifying the ceiling and resulted in the lights of these offices being controlled by a switch in an adjacent pantry. After the retrofit, these offices

were given their own wireless switches, as was the pantry. The switches are battery powered so no wiring was required.

## unexpected challenges

Early in the installation process the electrician discovered that the private office lighting ran on a 277V lighting circuit, not the more conventional 120V.

As a result Lutron had to change some of the lighting controls that they had specified for the project. To complicate matters further, Lutron did not have a wireless dimmer compatible with 277V executive offices, which included LED-MR 16 "low voltage" lighting. After exploring the development of a compatible dimmer, Lutron ultimately determined that running a new 120V circuit for these offices would be more time and cost efficient. Due to complications of this sort Related found that the lighting retrofit required their active management from start to finish— even when it came to details like validating the lamp count for the cost estimate.

## unexpected lessons

In an effort to reduce costs and avoid unexpected issues the team did not connect the executive office lighting to the central lighting control system. As a result, the executive office lighting could only be controlled by local switches, not remotely via the Lutron control interface.

Unfortunately, many of the issues and complaints with occupancy sensors and daylight harvesting occurred in these offices and Related staff would have appreciated the convenience of adjusting these systems via the control system and the support of Lutron analyzing the situation remotely. Additionally, after the system was in place it was mistakenly activated in the executive offices before Related staff were trained on how to use and deactivate the new system. This failure of contractor coordination and communication with executives led to a delayed resolution which discredited the Lutron system, and the retrofit itself, in the eyes of at least one senior executive who asked to have their wired switch and halogen lamps reinstalled. Fortunately, the fall out did not extend beyond the one individual and both Lutron and the Related team learned a number of lessons about quality control, testing, and communication that they benefited from as the project moved forward. Overall, the Related team was surprised by the high level of colleague and executive acceptance to the technology. Related also decided to

reduce costs by not retrofitting the conference room fluorescent fixtures with dimmable ballasts. These rooms now seem very overlit relative to the rest of the office and the team has now undertaken to install these ballasts.

## replacing halogen with led

Over the course of the retrofit, the Related team begrudgingly became experts in LED technology. They learned that:

- Not every LED lamp is compatible with every dimmer.
- There are many different “colors” of LED lamps to choose from (from “warm” and amber to “cold” and blue).
- Many LED lamps fall short of the lumen output they promise in their “X-watt equivalent” claims.

To select the right LED replacement for the halogen lamps in the lobby, elevator lobbies, conference rooms and executive offices Related tested 18 different lamps from 6 different manufacturers. A suitable replacement was ultimately found for all applications except one; a unique cove lighting installation, where fluorescent lamps created a better glow.

## commissioning & maintenance

Commissioning was especially challenging because testing and tuning needed to occur while the office was occupied during daytime hours and the team was sensitive to impacting employee performance and upsetting any executives.

Additionally, once lighting levels are customizable, individual preferences must be addressed.

Maintenance of the system was an unexpected challenge because the team failed to integrate the regular lamp maintenance contractor into the work, so the contractor began installing old lamps (which were a different color than the new ones) and damaged the new system during a minor renovation. They even installed a wired, non dimmable light fixture. Related ultimately hired a new maintenance contractor, but recognized that they could have done more to ensure a smooth transition.

## conclusion

Lighting retrofits are often billed as simple and straightforward, but if Related’s experience is a guide they can be complicated and require significant amounts of attention. Despite these challenges the retrofit has resulted in significant energy savings and functionality that has made the effort very much worthwhile. As Charlotte Matthews of Related explained:

“Without the dogged persistence of Related’s Sustainability and Engineering staff who wanted the project to succeed, the whole project might have derailed several times. And Related Sustainability is still now called whenever there is a lighting issue in the office, despite the fact that nearly all are unrelated to the retrofit. However, each is an opportunity to solve a new lighting issue, and Lutron continues to solicit our feedback and ideas for expanding the capability of their system.”

## contributors

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**Building Energy Exchange** is an independent, non-profit organization that is creating an energy efficiency resource center for education and innovation in New York City. Initially focused on lighting, the be-ex center will be a venue to see the best practices, view displays, experience new technology, take a class, receive assistance, test ideas through mock-ups and models, as well as provide a forum for progressive discourse.