Building Energy Benchmarking: How Measurement Prompts Management

A Survey of New York City Facility Managers

April 2017

About the National Electrical Manufacturers Association

The National Electrical Manufacturers Association (NEMA) is the association of electrical equipment and medical imaging manufacturers, founded in 1926 and headquartered in Rosslyn, Virginia. Nearly 350 members strong, its companies manufacture a diverse set of products, including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems. Domestic production exceeds $114 billion per year and exports top $50 billion.

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New York City's Energy and Water Benchmarking Law (Local Law 84-09) requires annual benchmarking data to be submitted by owners of buildings with more than 50,000 square feet for public disclosure by May 1 of every year. This law creates transparency for energy and water usage and informs building owners and tenants on how to make their buildings more efficient.

To determine what energy-saving operational changes and technologies facility managers and building owners are implementing as a result of New York City's benchmarking policy, the National Electrical Manufacturers Association (NEMA) conducted a survey in New York City.

Select Survey Responses

"[New York City Local Law 84] has made us more aware of wasteful spending and how to make cost saving changes."

"I think the LL84 inspections helped my company identify key areas of improvement for creating a more energy efficient building. The cost savings are worth it in the long run, even though the initial capital outlays can cost a lot."

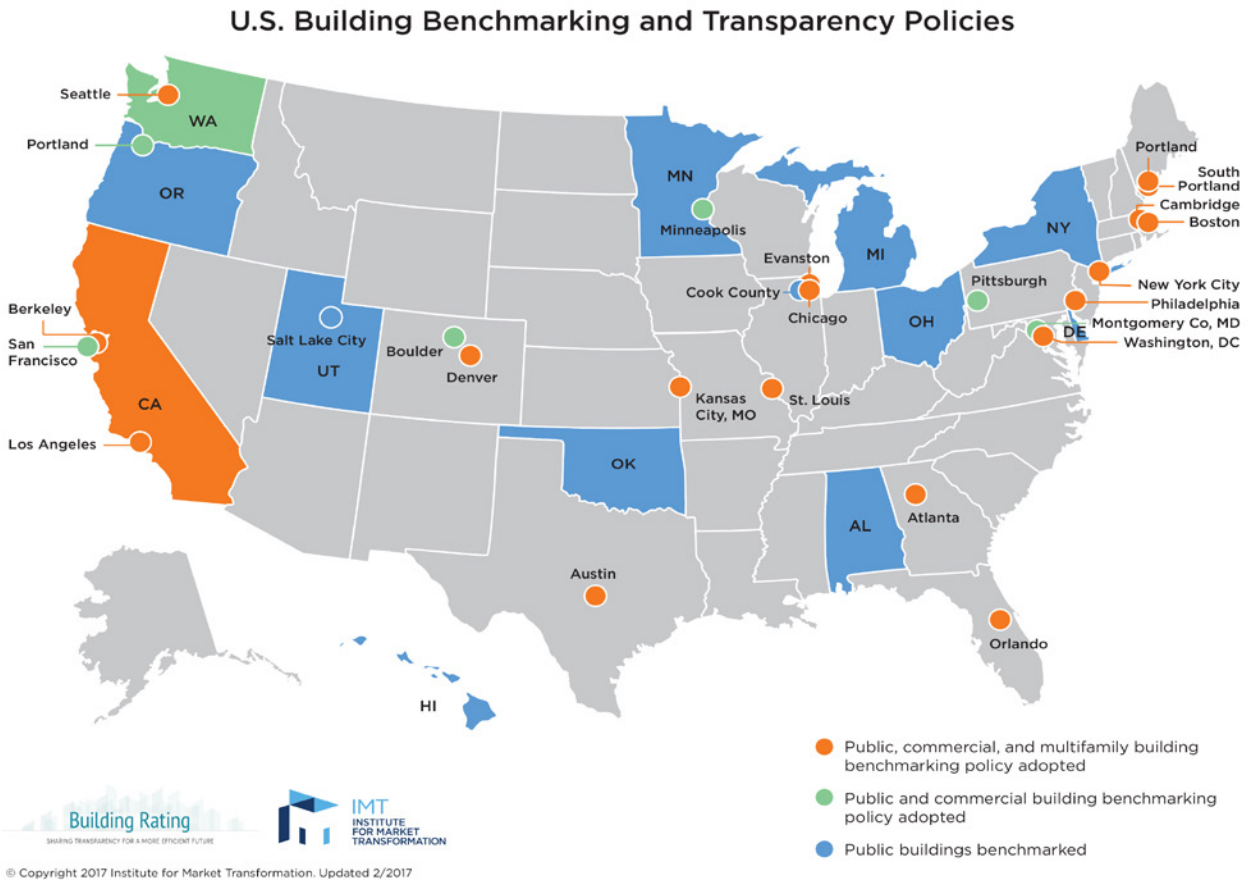
"LL84 is a waste of time."

Contents

Executive Summary

Cities around the United States are implementing building energy benchmarking and transparency ordinances that require large buildings to measure and disclose their energy use as a way to encourage energy efficiency improvements. These policies allow building owners and occupants to compare their buildings' energy performance with that of similar buildings. This analysis enables them to make informed decisions about where to purchase or rent and whether or not to improve the energy efficiency of their facilities through operational changes or by investing in new, energy-efficient building systems that allow for lighting, heating, cooling, building controls, and building envelope improvements.

Multiple studies have shown that commercial, multifamily, and public buildings that have benchmarked their energy use pursuant to city benchmarking ordinances have reduced their energy use intensity and increased their ENERGY STAR Portfolio Manager® scores faster than buildings not subject to such laws. These findings are consistent with the conclusion that benchmarking laws are catalyzing increased building efficiency.

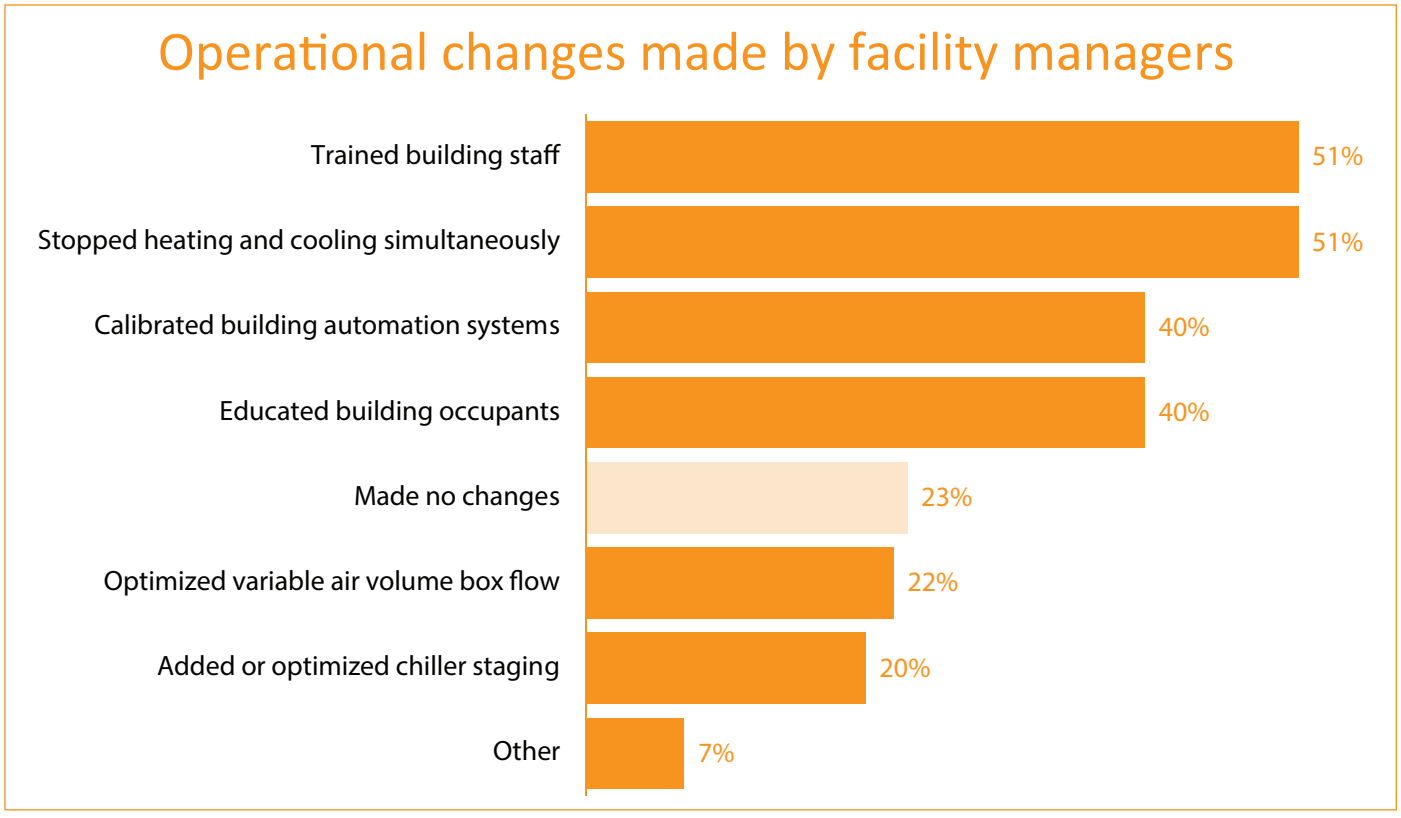


1 www.nyc.gov/html/gbee/downloads/pdf/nyc_energy_water_use_2013_report_final.pdf

In New York City, the Urban Green Council and New York University Center for Urban Science and Progress found that energy use intensity fell by 6% in a sample of 3,000 buildings that benchmarked in all four years from 2010–2013.[1] Another study conducted by researchers at the Massachusetts Institute of Technology and the University of Pennsylvania found that New York's benchmarking ordinance is correlated with a 14% reduction in building energy use intensity from 2011–2014.[2]

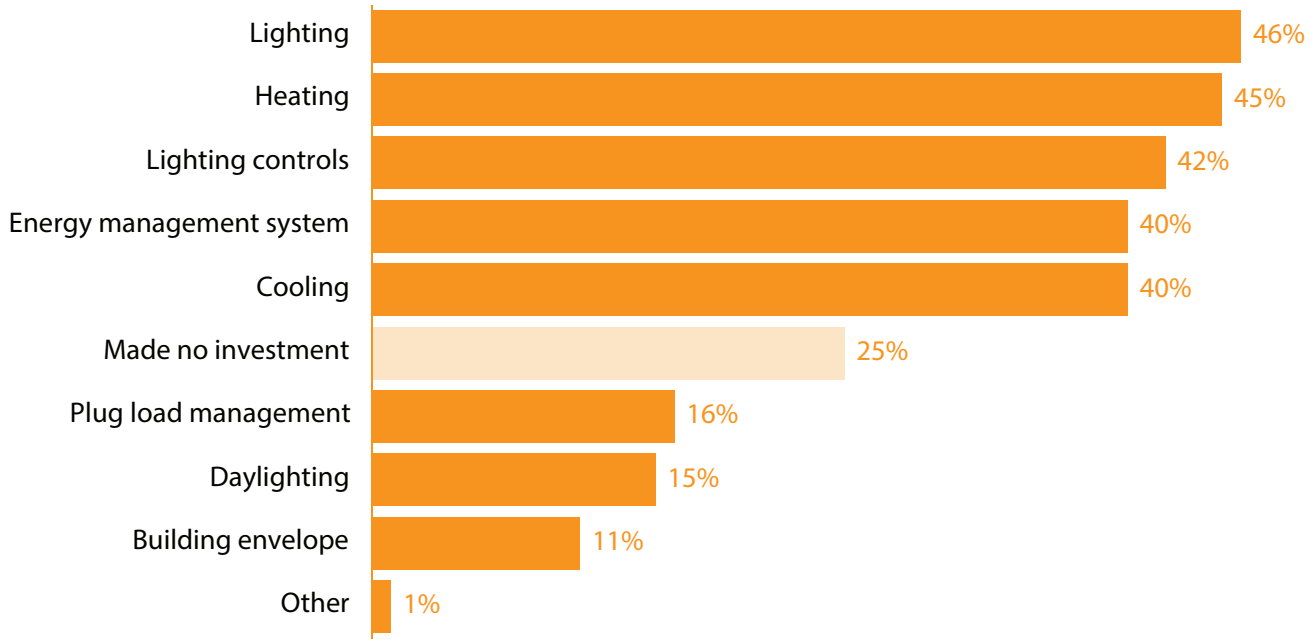
To determine what operational changes and technologies facility managers and building owners are implementing as a result of New York City's benchmarking policy, Local Law 84, the National Electrical Manufacturers Association (NEMA) conducted a survey of building, facility, and maintenance managers (referred to as "facility managers" throughout this report) of large buildings (greater than 50,000 square feet) located in New York City regarding policy compliance and outcomes. A third-party vendor of survey samples that recruits and maintains panel databases contacted these qualified respondents, who were then invited to participate in an online survey.

Of those surveyed, 77% reported that they had changed how they operated their facility as a result of Local Law 84 (LL84), including training building operation staff, stopping simultaneous heating and cooling, calibrating building systems, educating building occupants, and more.



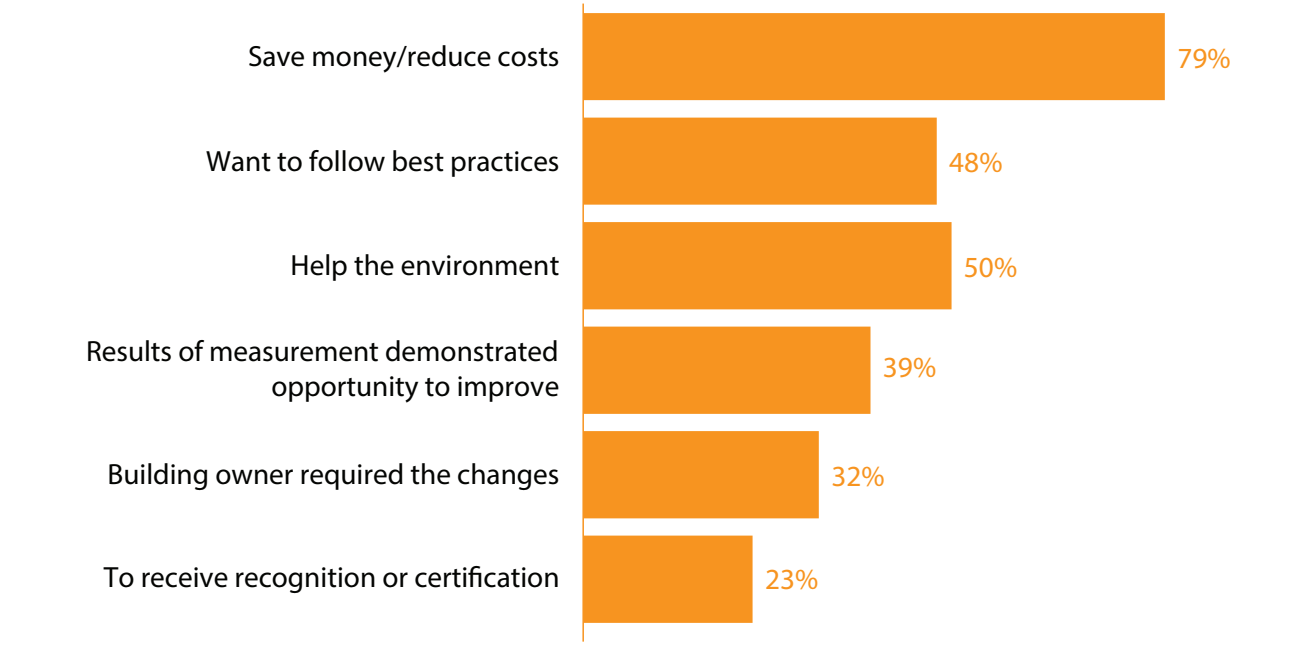
2 aceee.org/files/proceedings/2016/data/papers/9_988.pdf

Equipment investments made by facility managers



Seventy-five percent reported that they had made capital investments in new equipment to improve the efficiency of their building. The most frequent upgrade was lighting, followed by heating systems, lighting controls, energy management systems, cooling equipment, plug load management, daylighting upgrades, and building envelope investments.

Reasons why facility managers made efficiency improvements



Local Law 84 Explained

From New York City Mayor Bill de Blasio's Office of Sustainability:

"The NYC Benchmarking Law requires owners of large buildings to annually measure their energy and water consumption in a process called benchmarking. The law standardizes this process by requiring building owners to enter their annual energy and water use in the U.S. Environmental Protection Agency's (EPA) online tool, ENERGY STAR Portfolio Manager® and use the tool to submit data to the City. This data informs building owners about a building's energy and water consumption compared to similar buildings, and tracks progress year over year to help in energy efficiency planning.

"Benchmarking data is also disclosed publicly, analyzed in reports, visualized in the NYC Energy and Water Performance Map, included in energy efficiency policy development efforts such as the Buildings Technical Working Group Final Report, and used to develop free resources such as the NYC Retrofit Accelerator and Community Retrofit NYC to help building owners use less energy and save money."

Source: www.nyc.gov/html/gbee/html/plan/ll84.shtml

The survey also asked those facility managers who had made changes improving their buildings' energy efficiency a series of questions to assess why they had made those changes. Most respondents were motivated to make changes to save money and reduce costs, to follow industry best practices, or to reduce their environmental impact. For those who did not improve their facility, most stated that no change was needed, while a minority suggested that cost was an impediment. Regardless of the reason for inaction up to now, a majority of those that had not made an operational or capital improvement to their building expect to make operational changes and capital expenditures to improve energy efficiency sometime in the next two to three years.

By demonstrating that New York City's energy benchmarking and transparency ordinance is motivating actions and investments to save energy, this survey adds to the mounting evidence that policies like LL84 should be adopted by communities as a way to spur energy savings in buildings and support local construction and manufacturing jobs.

I. Introduction

Energy use information is not publicly available for the vast majority of existing buildings. It is easy to compare the miles-per-gallon rating of different car models or the EnergyGuide label of different home appliances, but often information is not publicly available to compare the energy performance of buildings.

Cities across the country have addressed this problem by implementing energy performance transparency laws, commonly referred to as "benchmarking and transparency" or "rating and labeling" ordinances. These policies allow building owners and tenants to compare their buildings' energy performance with that of similar buildings, enabling them to make informed decisions about where to purchase and rent and whether to invest in energy efficiency upgrades to their facilities.

Cities that make building energy use transparent do so by publishing data—often in the form of a downloadable spreadsheet—on their website on an annual basis. These scores can then be used by third parties to identify poor-performing buildings and place market pressure on owners to retrofit their buildings to improve energy performance and their ENERGY STAR score. For example, a *New York Times* article that named some of the worst-performing buildings in New York City quoted a building manager who said he was "shocked" to find out that his building had a very low ENERGY STAR score (3 out of 100); after finding out, he invested more than $12 million in an energy retrofit of the facility, including "upgrades like motion sensors for lighting, new mechanical equipment, monitoring controls for elevators, and fans and water pumps that operate only when needed."[3]

The results of this survey indicate that LL84 is prompting facility managers and building owners to make investments in energy-efficient equipment and low- or no-cost operational changes to improve building energy performance. Other cities should consider adopting building energy benchmarking and transparency policies similar to New York City's LL84 to spur energy savings and to support the manufacturing and construction jobs that stem from building upgrades.

3 www.nytimes.com/2012/12/25/science/earth/new-york-citys-effort-to-track-energy-efficiency-yields-some-surprises.html

What is ENERGY STAR Portfolio Manager?

From the U.S. Environmental Protection Agency:

"Portfolio Manager is an interactive resource management tool that enables you to track and assess energy and water use across your entire portfolio of buildings....Simply enter your consumption data, cost information, and operational use details. Portfolio Manager will then help you track more than 100 different metrics. Use them to compare your building's performance against a yearly baseline, national medians, or similar buildings in your portfolio.

"Many buildings can also receive a 1–100 ENERGY STAR score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide—and may be eligible for ENERGY STAR certification."

Source: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/learn-how-portfolio-manager

This report is a summary of a survey of building, facilities, and maintenance managers (referred to as "facility managers" throughout this report) of large buildings (greater than 50,000 square feet) located in New York City regarding compliance and outcomes related to Local Law 84 (LL84). NEMA conducted this survey with the goal of assessing the degree to which building energy benchmarking and transparency policies spur energy-saving operational changes and capital expenditures in buildings.

The survey first asked respondents whether they were compliant with LL84; these results are summarized in section II. Throughout this report, results are presented separately for compliant and non-compliant facilities. Next, respondents were guided through a series of questions (see appendix B) to identify the specific operational changes they made to the facility to improve its energy performance and their motivation for doing so. The results from the questions on operational changes and capital expenditures are summarized in sections III and IV, respectively. Finally, respondents were asked an open-ended question to gather their general thoughts on energy efficiency and LL84; those results are summarized in section V.

Of those surveyed, 77% reported that they had changed how they operated their facility as a result of LL84, including training building operation staff, stopping simultaneous heating and cooling, calibrating building systems, and educating building occupants. Full results are detailed in section III.

Seventy-five percent reported that they made capital investments in new equipment to improve the efficiency of their building. The most frequent upgrade was lighting, followed by heating systems, lighting controls, energy management systems, cooling equipment, plug load management, daylighting upgrades, and building envelope investments. Full results are detailed in section IV.

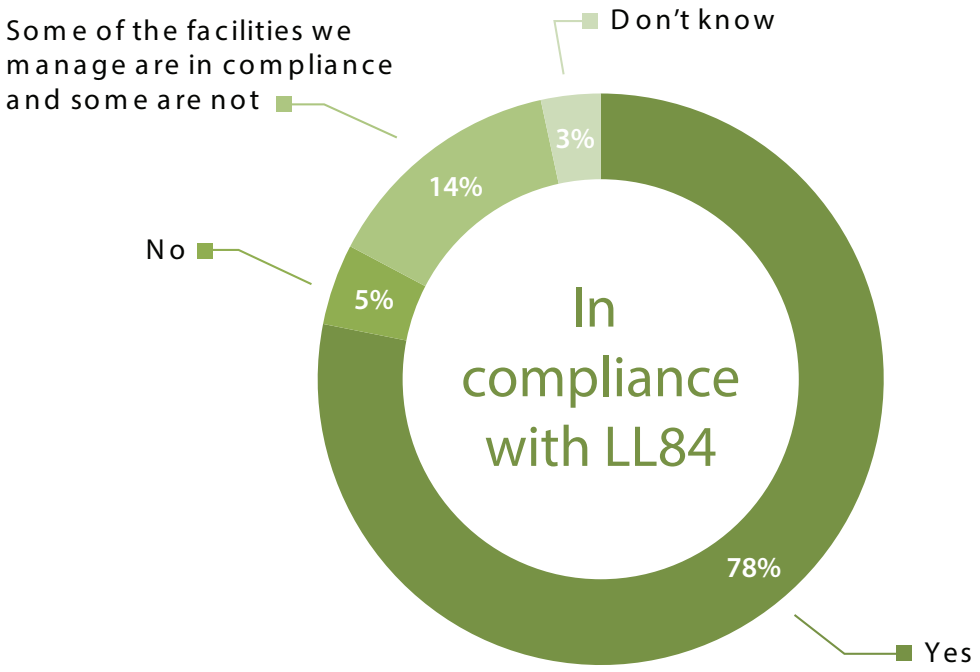
II. Compliance with Local Law 84

The City of New York reports that in 2013, 87% of covered buildings were compliant with LL84.[4] The first question in the survey asked whether or not the respondent's buildings were in compliance with LL84. While the survey was conducted in 2016, the responses reasonably fit with the official compliance rate.

Survey respondents were asked the following questions:

New York City Local Law 84 requires large buildings to measure and report their energy usage on an annual basis using ENERGY STAR Portfolio Manager. As of today, are the facilities you manage in compliance with LL84?

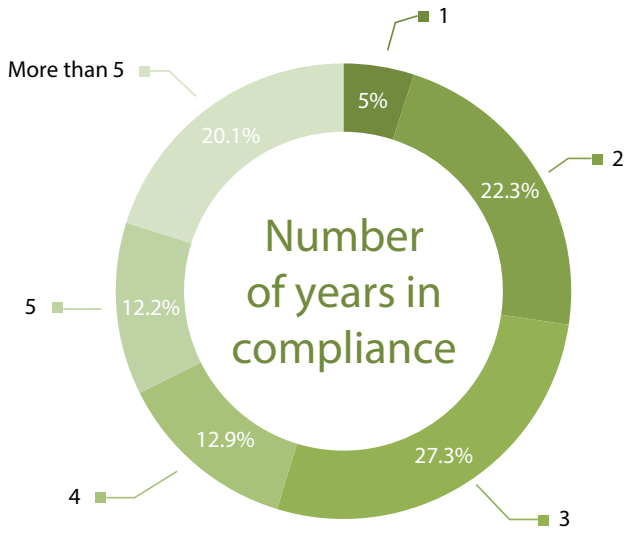
Answer	Percentage	Count
Yes	78.1	118
No	4.6	7
Some of the facilities we manage are in compliance and some are not	13.9	21
Don't know	3.3	5
Total	100	151



4 www.nyc.gov/html/gbee/downloads/pdf/nyc_energy_water_use_2013_report_final.pdf (page 60)

Those who reported being in compliance with LL84 were asked to specify the number of years that the facility had reported benchmarking data.

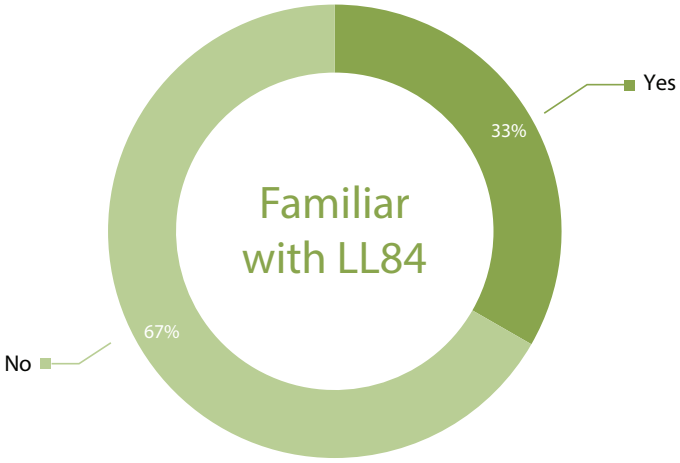
Answer	Percentage	Count
1 year	5.0	7
2 years	22.3	31
3 years	27.3	38
4 years	12.9	18
5 years	12.2	17
More than 5 years	20.1	28
Total	100	139



Those who responded that they were not compliant with LL84 or did not know (n=12) were asked the following:

Are you familiar with New York City's Local Law 84?

Answer	Percentage	Count
Yes	33.3	4
No	66.7	8
Total	100	12

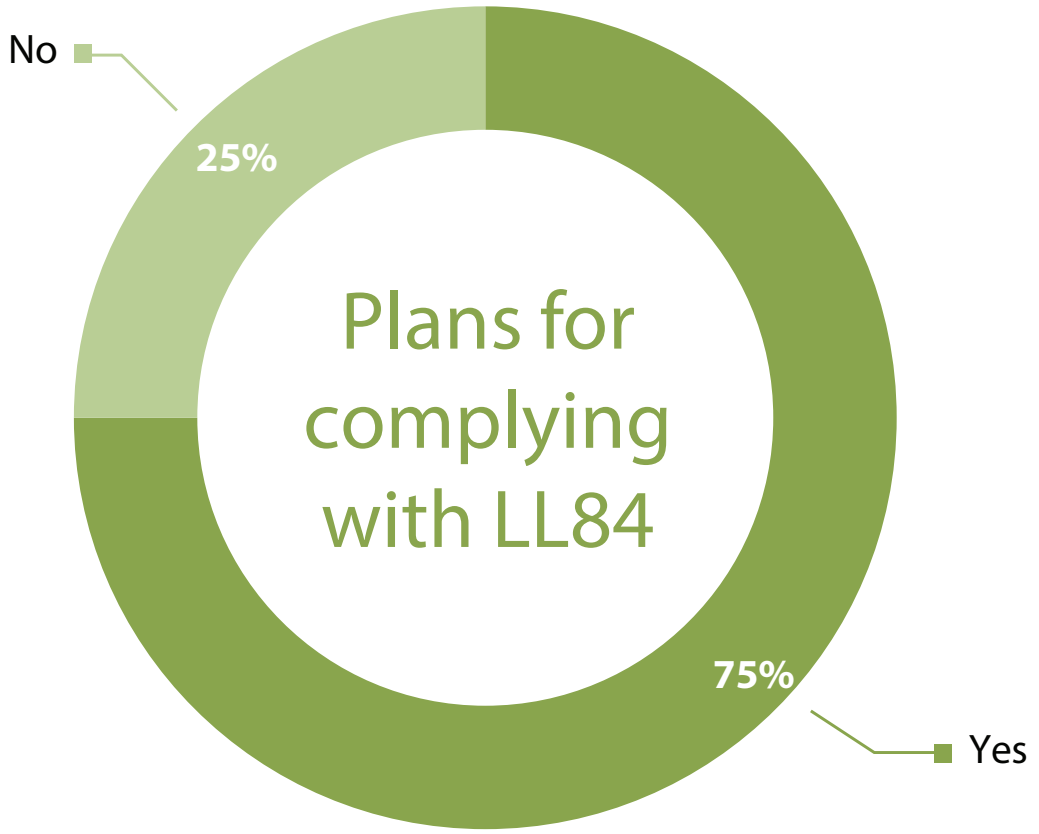


Those who were not familiar with LL84 were shown the following description of the policy and asked the subsequent question:

"Local Law 84 is part of New York City's Greener, Greater Buildings Plan (GGBP) that requires owners of large buildings to annually measure their energy consumption in a process called benchmarking and annually report their score to the city online. Local Law 84 (LL84), the first law in GGBP, standardizes this process and captures information with the U.S. Environmental Protection Agency's (EPA) free online benchmarking tool called Portfolio Manager. LL84 gives building owners and potential buyers a better understanding of a building's energy and water consumption."

Do you have plans for complying with Local Law 84 in the future?

Answer	Percentage	Count
Yes	75	9
No	25	3
Total	100	12



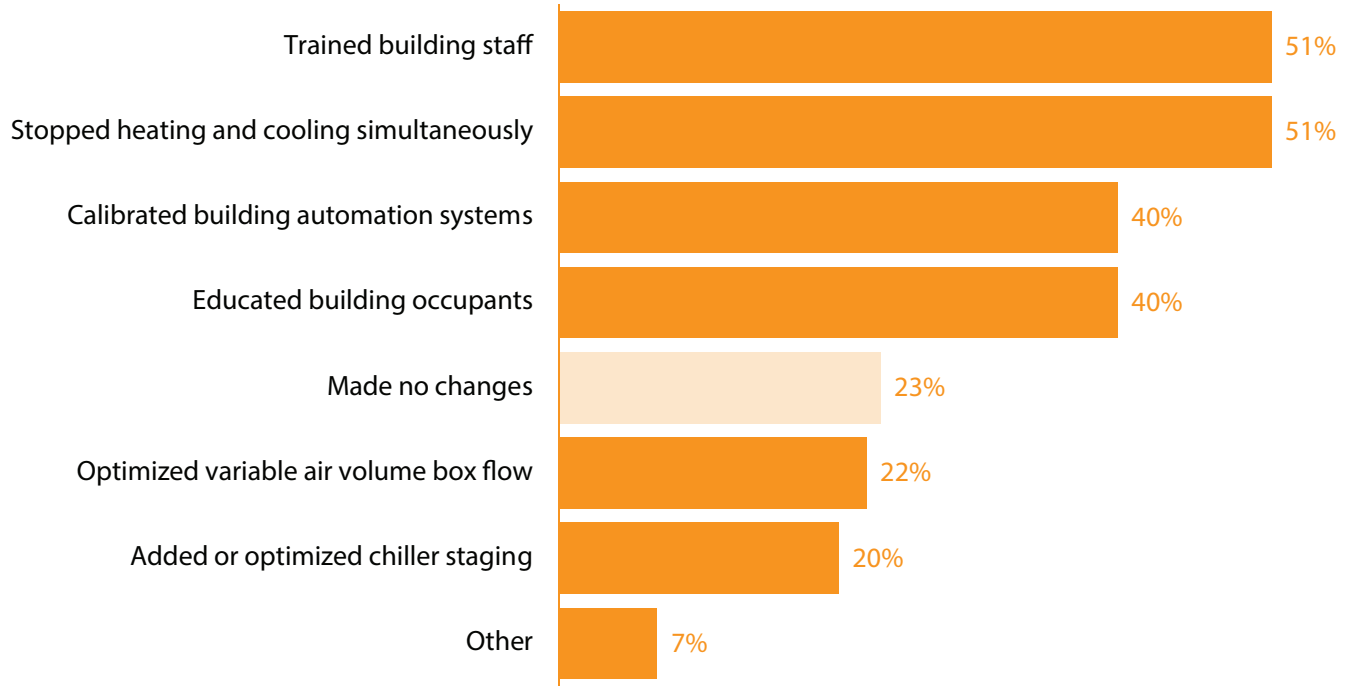
III. Operational Changes

Summary of Results

Operational changes—low- or no-cost modifications to how a building is run that do not require installing new equipment—can yield significant energy savings with very attractive returns on investment.

Survey respondents were asked a series of questions to better understand what kinds of operational changes facility managers made in their buildings and why they made them (or why they did not make them, in certain cases).

Operational changes made by facility managers



Of those surveyed, 77% reported that they had changed how they operated their facility as a result of LL84. Of those who were compliant with LL84, 84% made an operational change. The operational changes most frequently made by compliant facilities include the following:

- Provide energy efficiency training to building staff (66%)
- Make sure heating and cooling systems don't run at the same time (66%)
- Calibrate building automation system (52%)
- Provide energy efficiency education to building occupants (51%)

- Optimize variable air volume box flow (28%)
- Add or optimize chiller staging (26%)

There were a number of primary motivations aside from LL84 for making operational changes amongst compliant facilities:

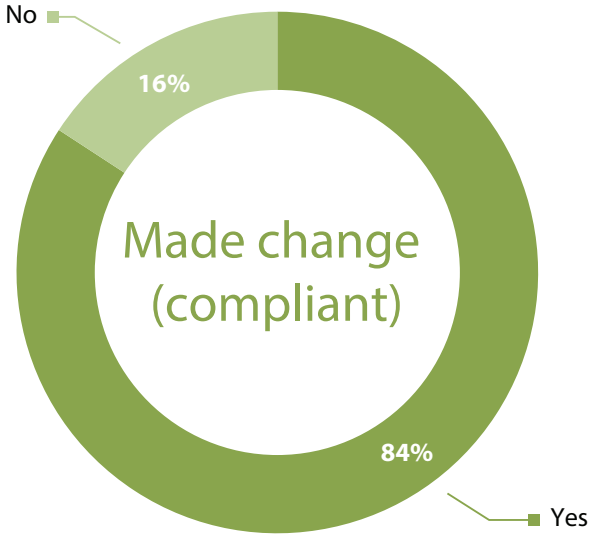
- To save money/reduce costs (79%)
- To follow best practices (54%)
- To help the environment (48%)
- Results of measurement demonstrated opportunity to improve (43%)
- Building owner required the changes (33%)
- To receive recognition or certification (21%)

Detailed Results

Questions asked in the original wording and relative results for LL84-compliant and non-compliant facilities are listed below.

Compliant: As a result of measuring the energy performance of the building(s) you manage, did you make any changes in how you operate your building(s)?

LL84-Compliant		
Answer	**Percentage**	**Count**
Yes	84.2	117
No	15.8	22
Total	100	139



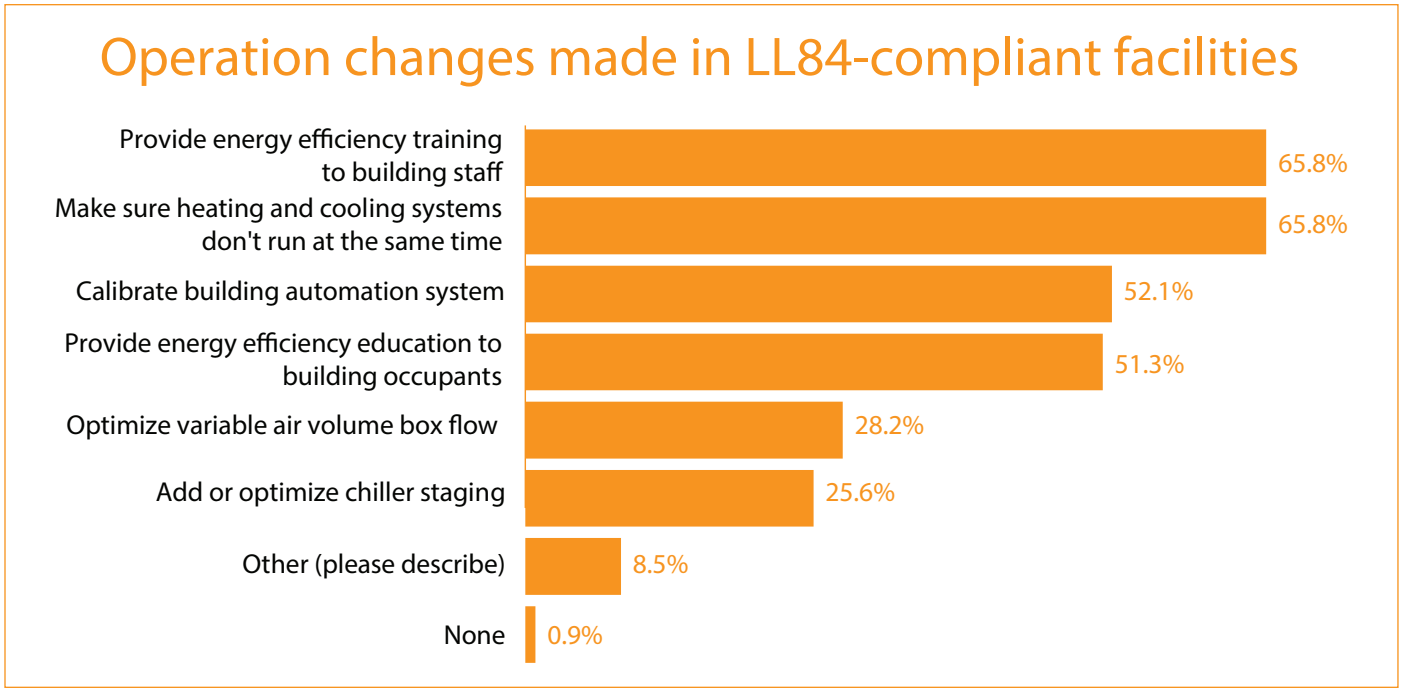
Non-compliant: Have you made any operational changes (changes in how you run your building that don't require installing new equipment) to improve energy efficiency in the building(s) you manage?

Non-compliant		
Answer	**Percentage**	**Count**
Yes	66.7	8
No	33.3	4
Total	100	12

Those who had made operational changes were asked the following:

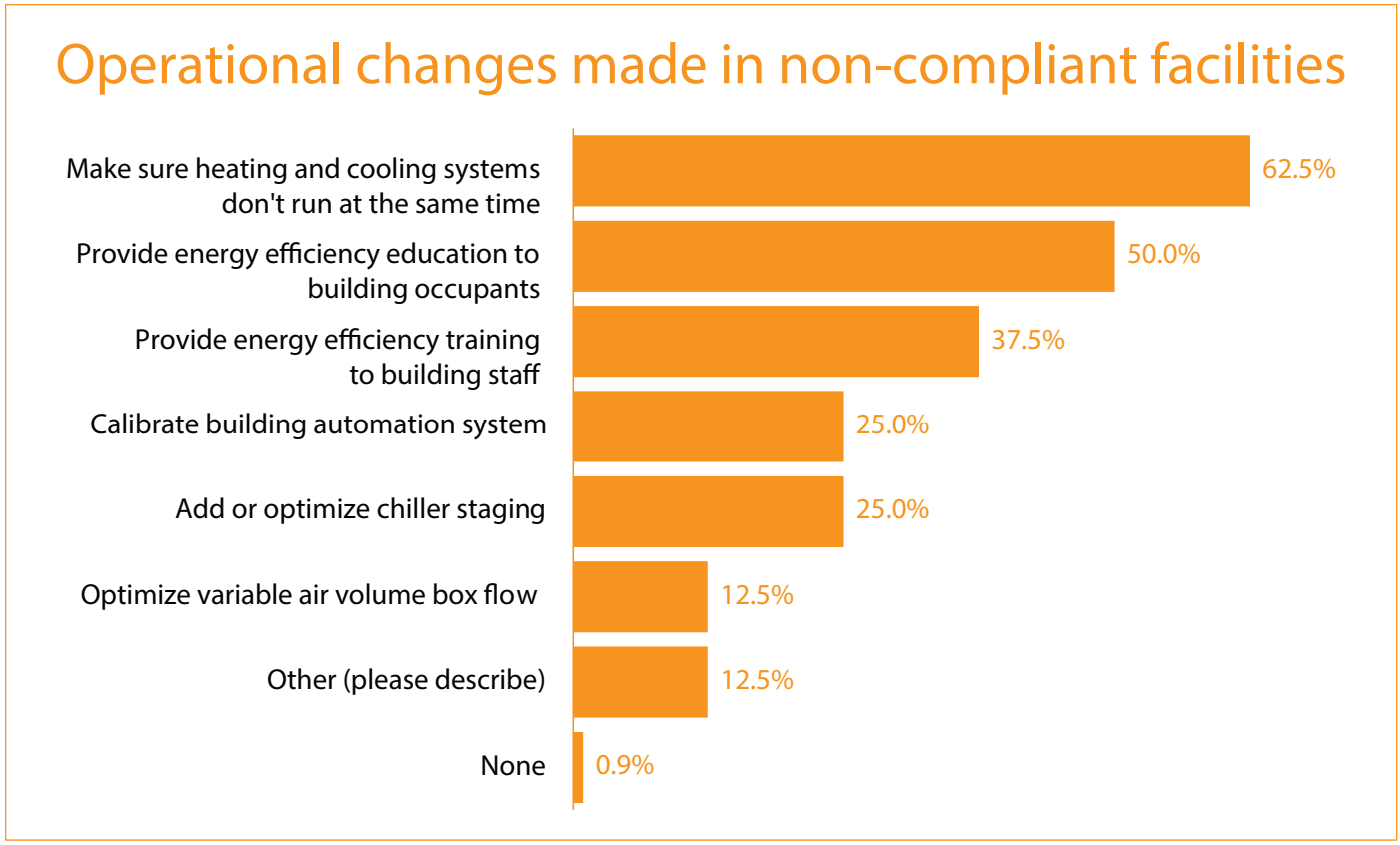
Compliant: What operational changes (changes in how you run your building that don't require installing new equipment) did you make in the building(s) you manage to improve energy efficiency? [select all that apply]

LL84-Compliant		
Answer	**Percentage**	**Count**
Provide energy efficiency training to building staff	65.8	77
Make sure heating and cooling systems don't run at the same time	65.8	77
Calibrate building automation system	52.1	61
Provide energy efficiency education to building occupants	51.3	60
Optimize variable air volume box flow	28.2	33
Add or optimize chiller staging	25.6	30
Other (please describe)	8.5	10
None	0.9	1
Total number of respondents	100	117



Non-compliant: What operational changes did you make in the building(s) you manage to improve energy efficiency? [select all that apply]

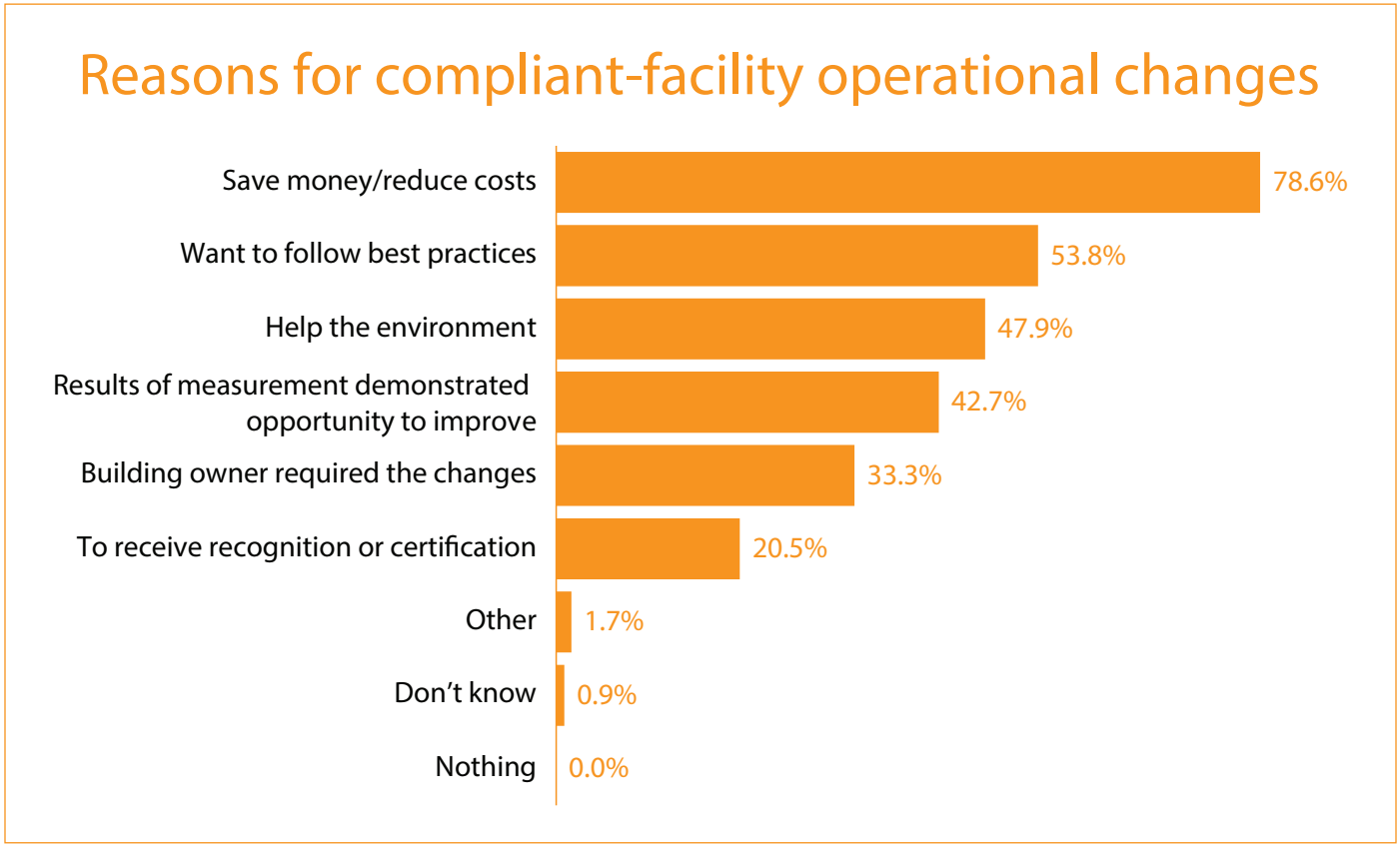
Non-compliant		
Answer	**Percentage**	**Count**
Make sure heating and cooling systems don't run at the same time	62.5	5
Provide energy efficiency education to building occupants	50.0	4
Provide energy efficiency training to building staff	37.5	3
Calibrate building automation system	25.0	2
Add or optimize chiller staging	25.0	2
Optimize variable air volume box flow	12.5	1
Other (please describe)[5]	12.5	1
None	0.9	1
Total number of respondents	100	8



5 Other: "more efficient lighting"

Compliant: Besides measuring your building's energy performance, what else motivated you to make operational changes to improve the energy efficiency of your building(s)? [select all that apply]

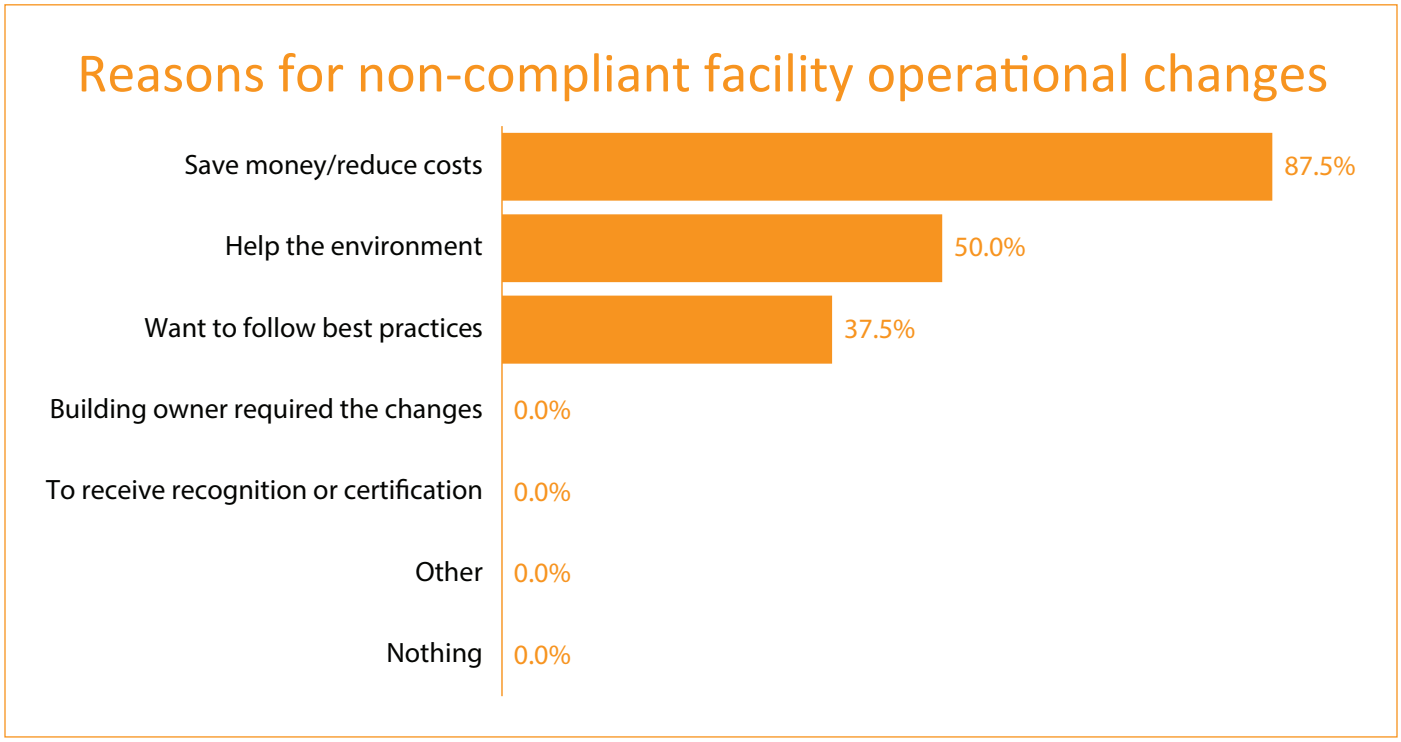
LL84-Compliant Facilities		
Answer	**Percentage**	**Count**
Save money/reduce costs	78.6	92
Want to follow best practices	53.8	63
Help the environment	47.9	56
Results of measurement demonstrated opportunity to improve	42.7	50
Building owner required the changes	33.3	39
To receive recognition or certification	20.5	24
Other[6]	1.7	2
Don't know	0.9	1
Nothing	0.0	0
Total number of respondents	100	117



6 Other: No descriptive responses provided

Non-compliant: What motivated you to make operational changes to improve the energy efficiency of your building(s)? [select all that apply]

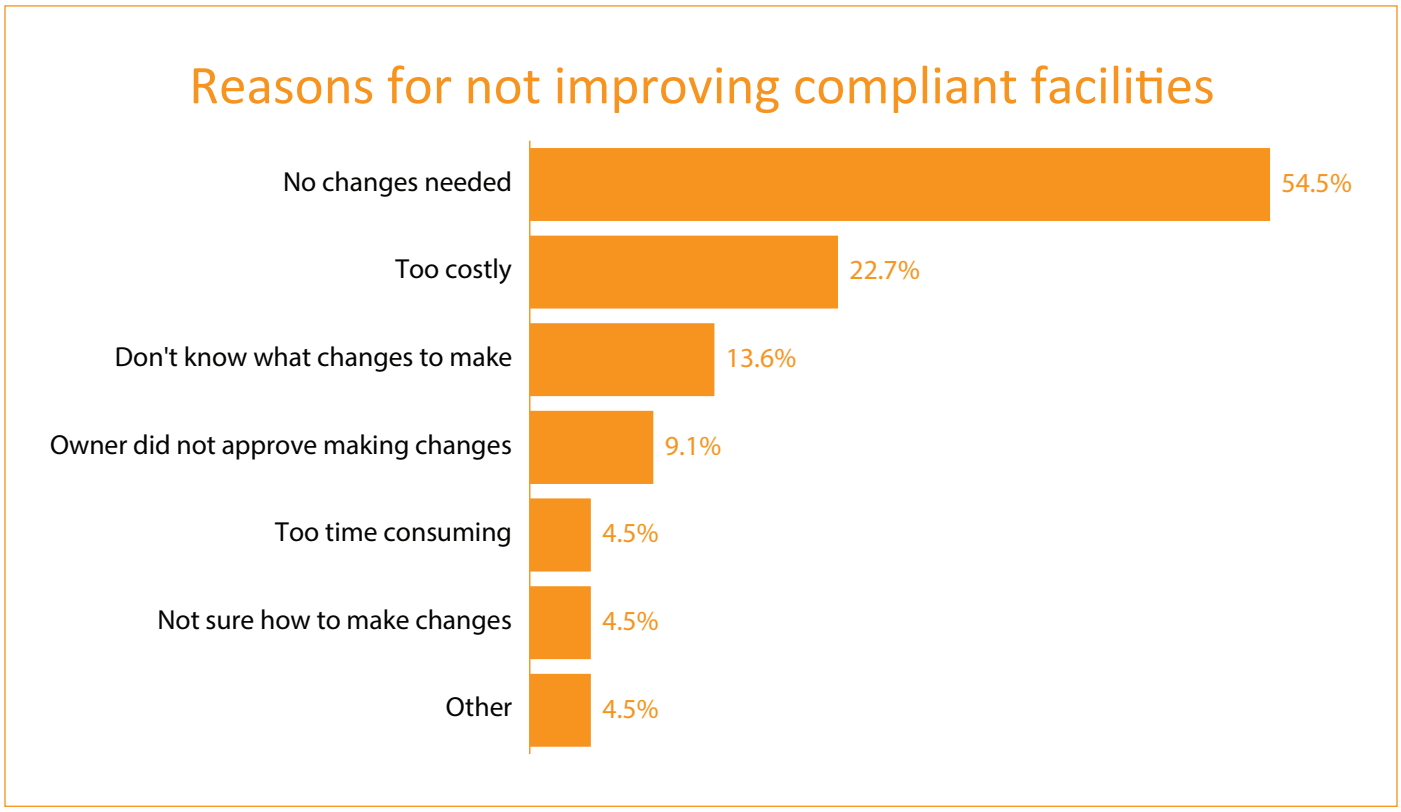
Non-compliant Facilities		
Answer	**Percentage**	**Count**
Save money/reduce costs	87.5	7
Help the environment	50.0	4
Want to follow best practices	37.5	3
Building owner required the changes	0.0	0
To receive recognition or certification	0.0	0
Other	0.0	0
Nothing	0.0	0
Total number of respondents	100	8



Those who responded that they had not made any operational changes were asked the following:

Compliant: Why have you not made operational changes to improve energy efficiency in the building(s) you manage? [select all that apply]

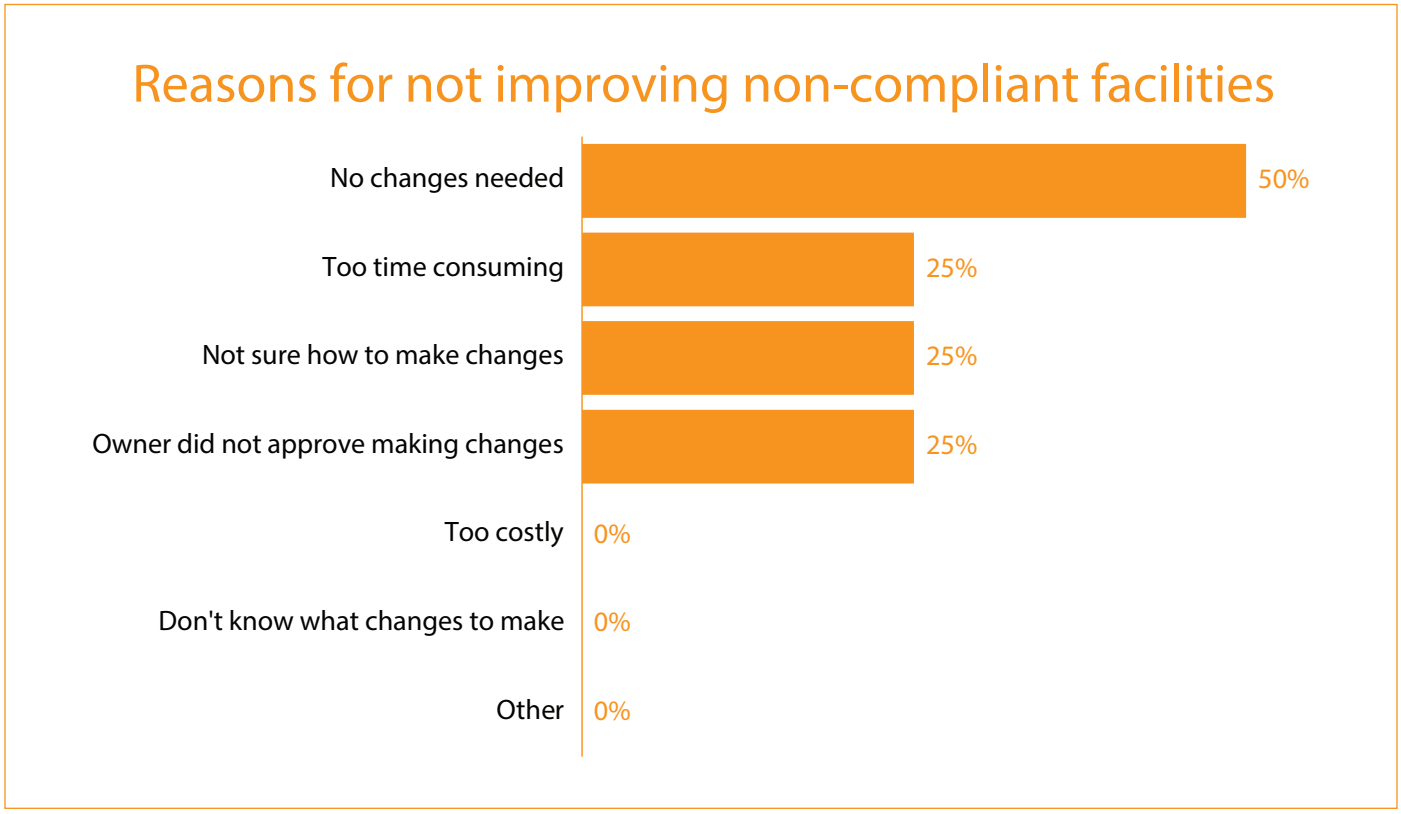
LL84-Compliant Facilities		
Answer	**Percentage**	**Count**
No changes needed	54.5	12
Too costly	22.7	5
Don't know what changes to make	13.6	3
Owner did not approve making changes	9.1	2
Too time consuming	4.5	1
Not sure how to make changes	4.5	1
Other[7]	4.5	1
Total number of respondents	100	22



7 Other: No descriptive responses provided

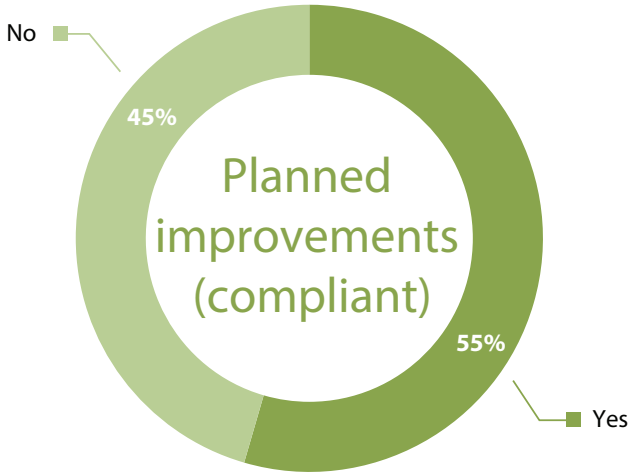
Non-compliant: Why have you not made operational changes to improve energy efficiency in the building(s) you manage? [select all that apply]

Non-compliant Facilities		
Answer	**Percentage**	**Count**
No changes needed	50	2
Too time consuming	25	1
Not sure how to make changes	25	1
Owner did not approve making changes	25	1
Too costly	0	0
Don't know what changes to make	0	0
Other	0	0
Total number of respondents	100	4



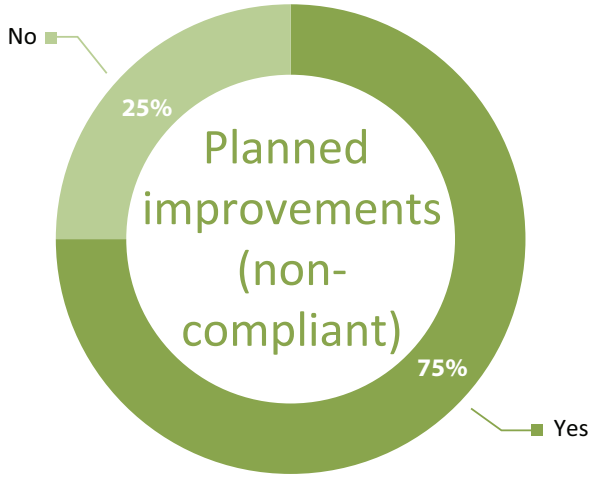
Compliant: Are you planning on making operational changes (changes in how you run your building that don't require installing new equipment) sometime in the next 2 to 3 years to improve the energy efficiency of the building(s) you manage?

LL84-Compliant		
Answer	**Percentage**	**Count**
Yes	54.5	12
No	45.5	10
Total	100	22



Non-compliant: Are you planning on making operational changes (changes in how you run your building that don't require installing new equipment) sometime in the next 2 to 3 years to improve the energy efficiency of the building(s) you manage?

Non-compliant		
Answer	**Percentage**	**Count**
Yes	75	3
No	25	1
Total	100	4



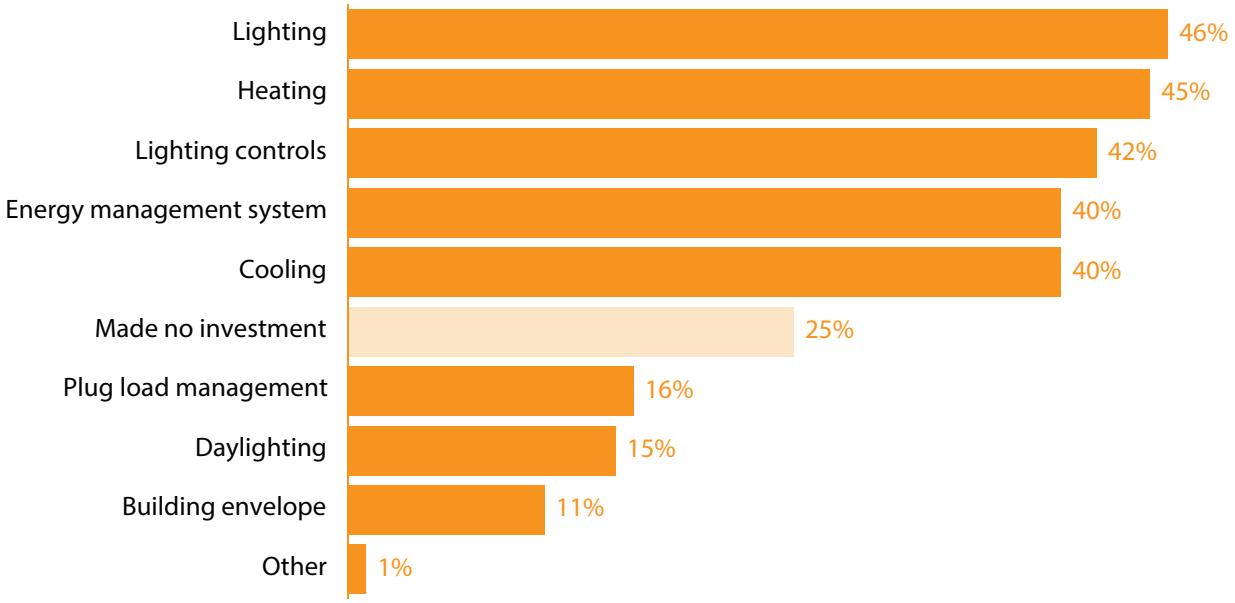
IV. Capital Expenditures

Summary of Results

Installing new energy-efficient equipment such as lighting and heating, ventilation, and air-conditioning (HVAC) systems requires some up-front capital expenditure, but the resulting energy savings often quickly repay the initial cost, after which point the energy and cost savings continue to accrue.

Survey respondents were asked if they had invested in new equipment as a result of LL84, to understand which building systems they installed and their motivations for doing so (or not, in certain cases).

Equipment investments made by facility managers



Of those surveyed, 75% reported that they had made capital investments in new equipment to improve the efficiency of their buildings. Of those who were compliant with LL84, 82% invested in new equipment to save energy. The investments made by LL84-compliant facilities include the following:

- Lighting (lamps, ballasts, fixtures) (61%)
- Heating (60%)
- Lighting controls (55%)
- Building energy management system (54%)
- Cooling (53%)

- Plug load management (21%)
- Daylighting (20%)
- Building envelope (15%)

There were a number of primary motivations aside from LL84 for investing in new equipment amongst compliant facilities:

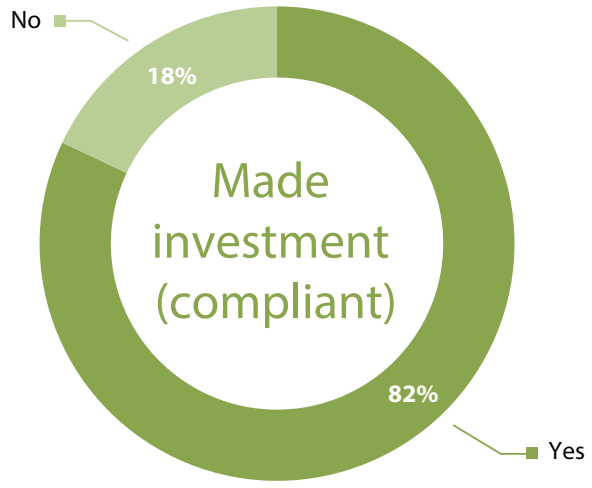
- To save money/reduce costs (79%)
- To help the environment (53%)
- To follow best practices (41%)
- Results of measurement demonstrated opportunity to improve (35%)
- Building owner required the changes (31%)
- To receive recognition or certification (25%)

Detailed Results

Questions asked in the original wording and relative results are listed below.

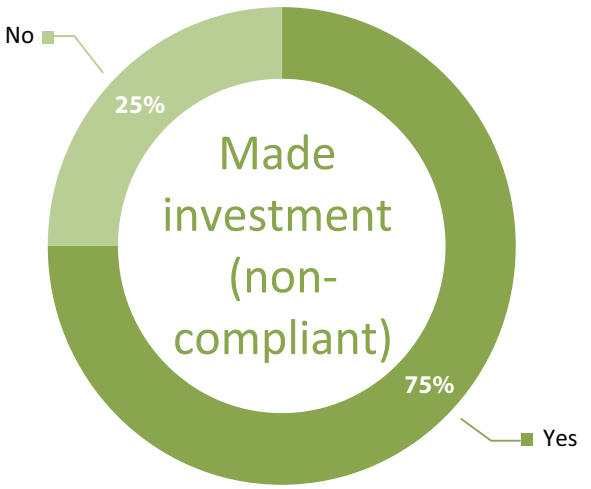
Compliant: As a result of measuring the energy performance of the building(s) you manage, did you make any capital expenditures (investments in equipment) to improve the energy efficiency of your building(s)?

LL84-Compliant		
Answer	**Percentage**	**Count**
Yes	82	114
No	18	25
Total	100	139



Non-compliant: Have you made any capital expenditures (investments in equipment) to improve the energy efficiency of the building(s) you manage?

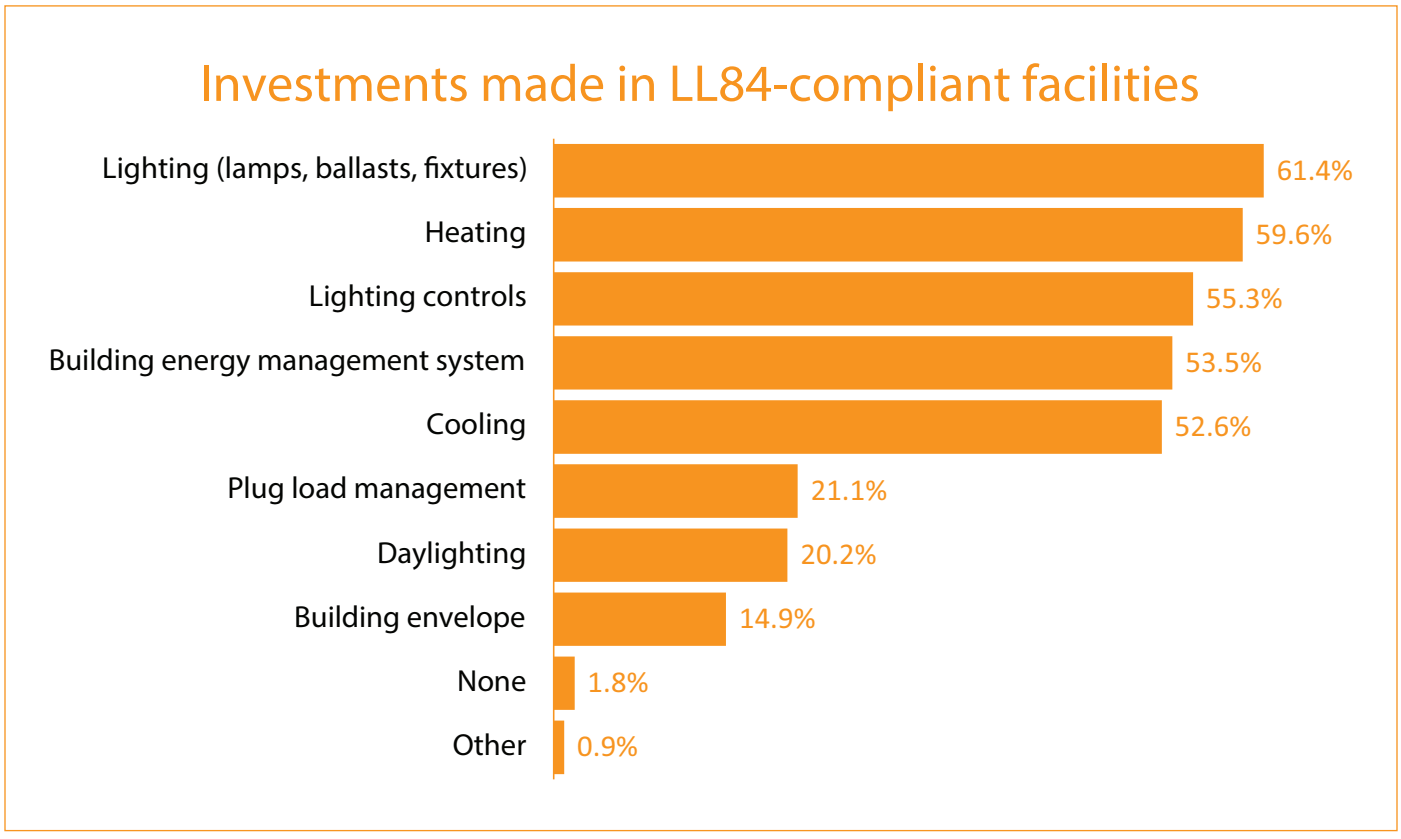
Non-compliant		
Answer	**Percentage**	**Count**
Yes	75	9
No	25	3
Total	100	12



Those who had made capital expenditures were asked the following:

Compliant: What capital expenditures (investments in equipment) have you already made on your building(s) to improve energy efficiency? [select all that apply]

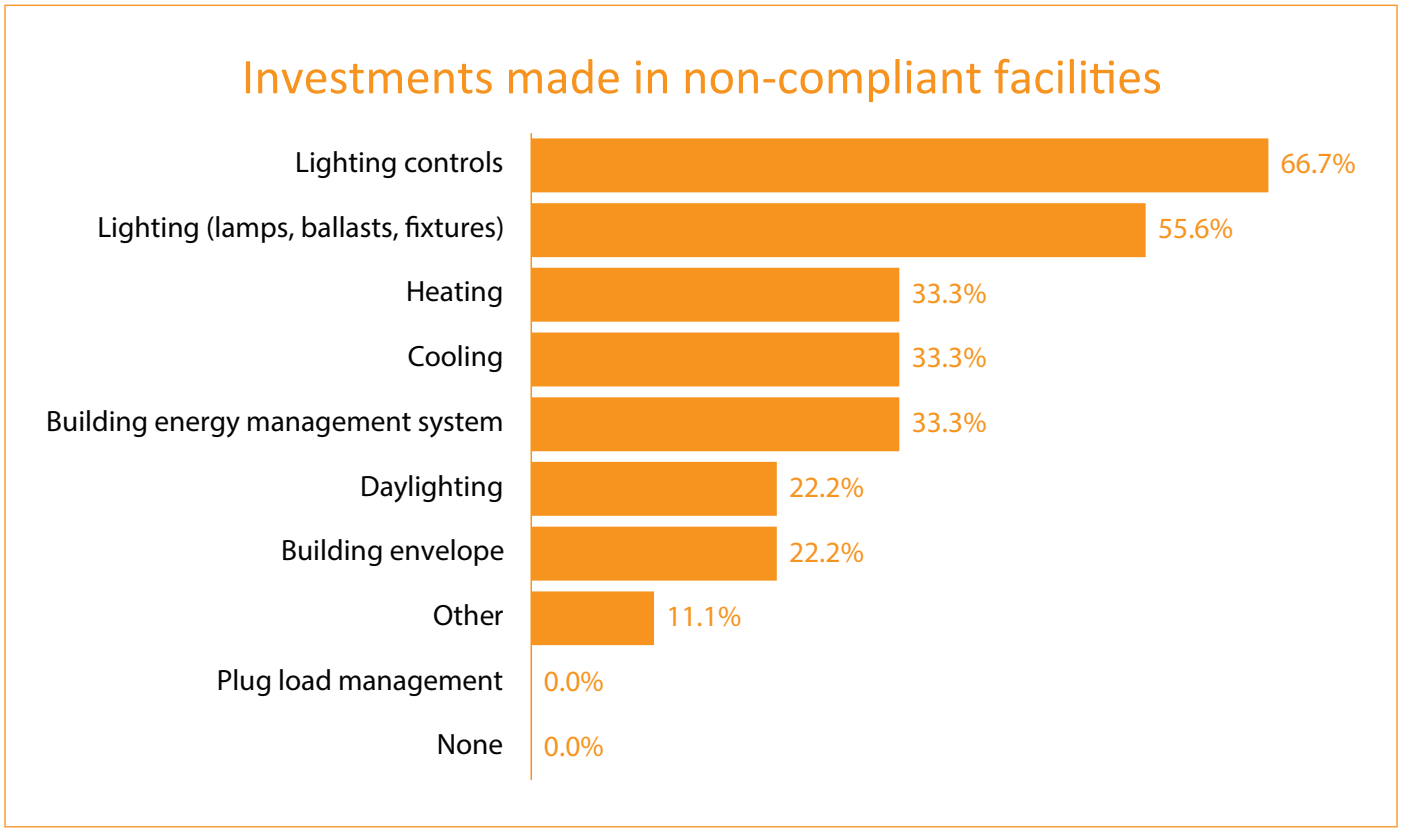
LL84-Compliant		
Answer	**Percentage**	**Count**
Lighting (lamps, ballasts, fixtures)	61.4	70
Heating	59.6	68
Lighting controls	55.3	63
Building energy management system	53.5	61
Cooling	52.6	60
Plug load management	21.1	24
Daylighting	20.2	23
Building envelope	14.9	17
None	1.8	2
Other (please describe)[8]	0.9	1
Total number of respondents	100	114



8 Other: No descriptive response provided

Non-compliant: What capital expenditures (investments in equipment) have you already made on your building(s) to improve energy efficiency? [select all that apply]

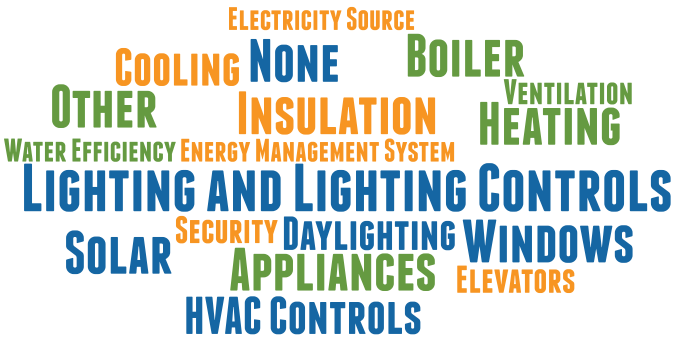
Non-compliant		
Answer	**Percentage**	**Count**
Lighting controls	66.7	6
Lighting (lamps, ballasts, fixtures)	55.6	5
Heating	33.3	3
Cooling	33.3	3
Building energy management system	33.3	3
Daylighting	22.2	2
Building envelope	22.2	2
Other (please describe)[9]	11.1	1
Plug load management	0.0	0
None	0.0	0
Total number of respondents	100	9



9 Other: "recycling, plumbing"

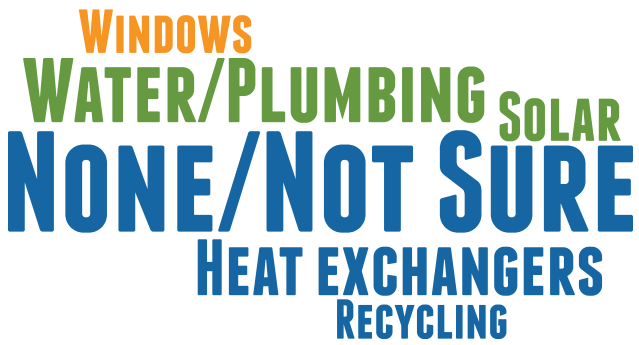
Compliant: What additional capital investments (investments in equipment) have you made in your building(s) to improve energy efficiency?

LL84-Compliant		
Category	**Percentage**	**Count**
None	23.7	27
Lighting and lighting controls	20.2	23
Appliances	8.8	10
Insulation	7.9	9
Other	7.9	9
Heating	7.0	8
HVAC controls	7.0	8
Solar	7.0	8
Boiler	6.1	7
Windows	6.1	7
Cooling	5.3	6
Daylighting	2.6	3
Energy management system	2.6	3
Electricity source	1.8	2
Water efficiency	0.9	1
Elevators	0.9	1
Ventilation	0.9	1
Security	0.9	1
Total	100	114



Non-compliant: What additional capital investments (investments in equipment) have you made in your building(s) to improve energy efficiency?

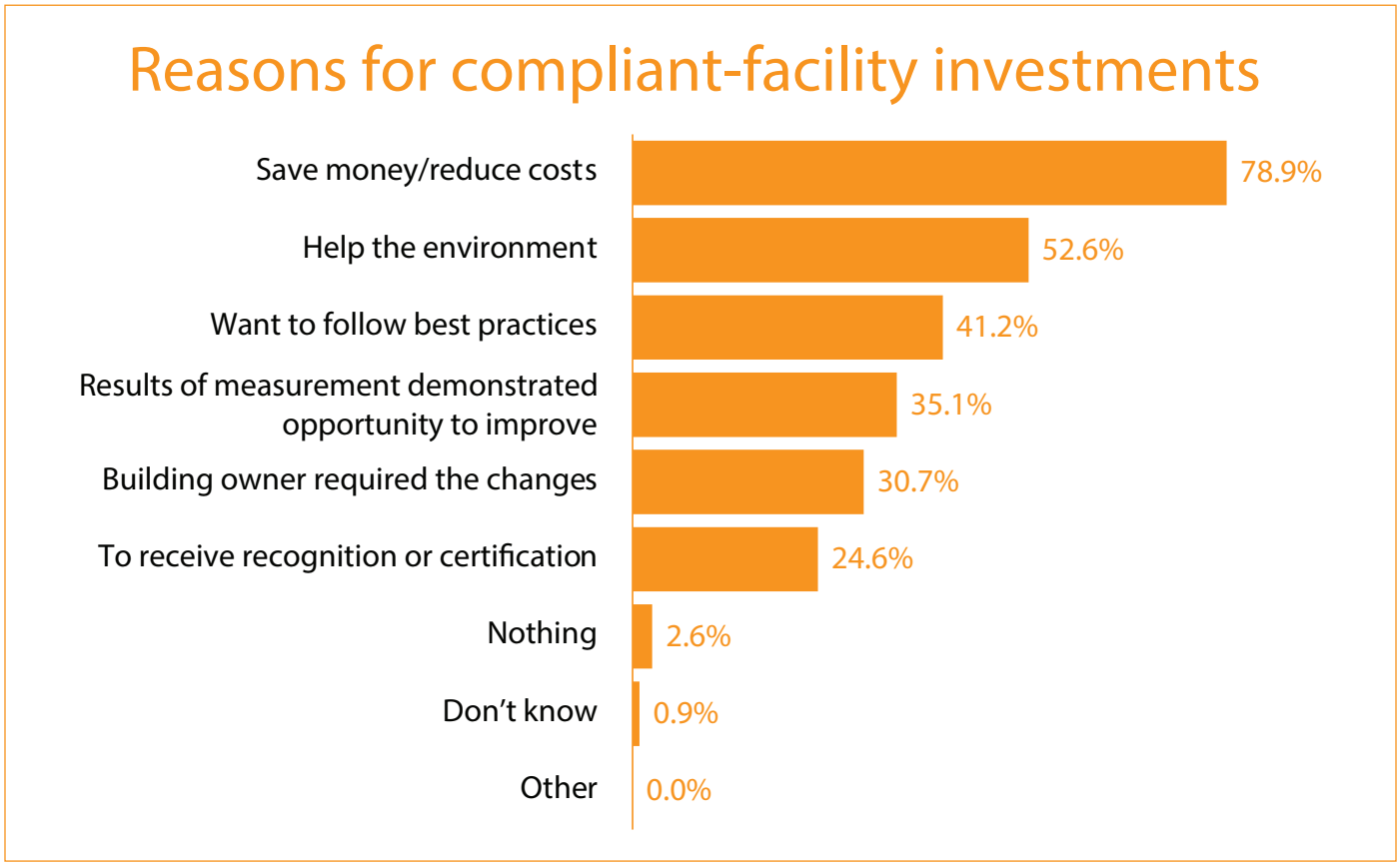
Non-compliant		
Category	**Percentage**	**Count**
None/not sure	37.5	3
Water/plumbing	25.0	2
Heat exchangers	12.5	1
Windows	12.5	1
Solar	12.5	1
Recycling	12.5	1
Total	100	8



Verbatim responses for both compliant and non-compliant facilities are included in appendix C.

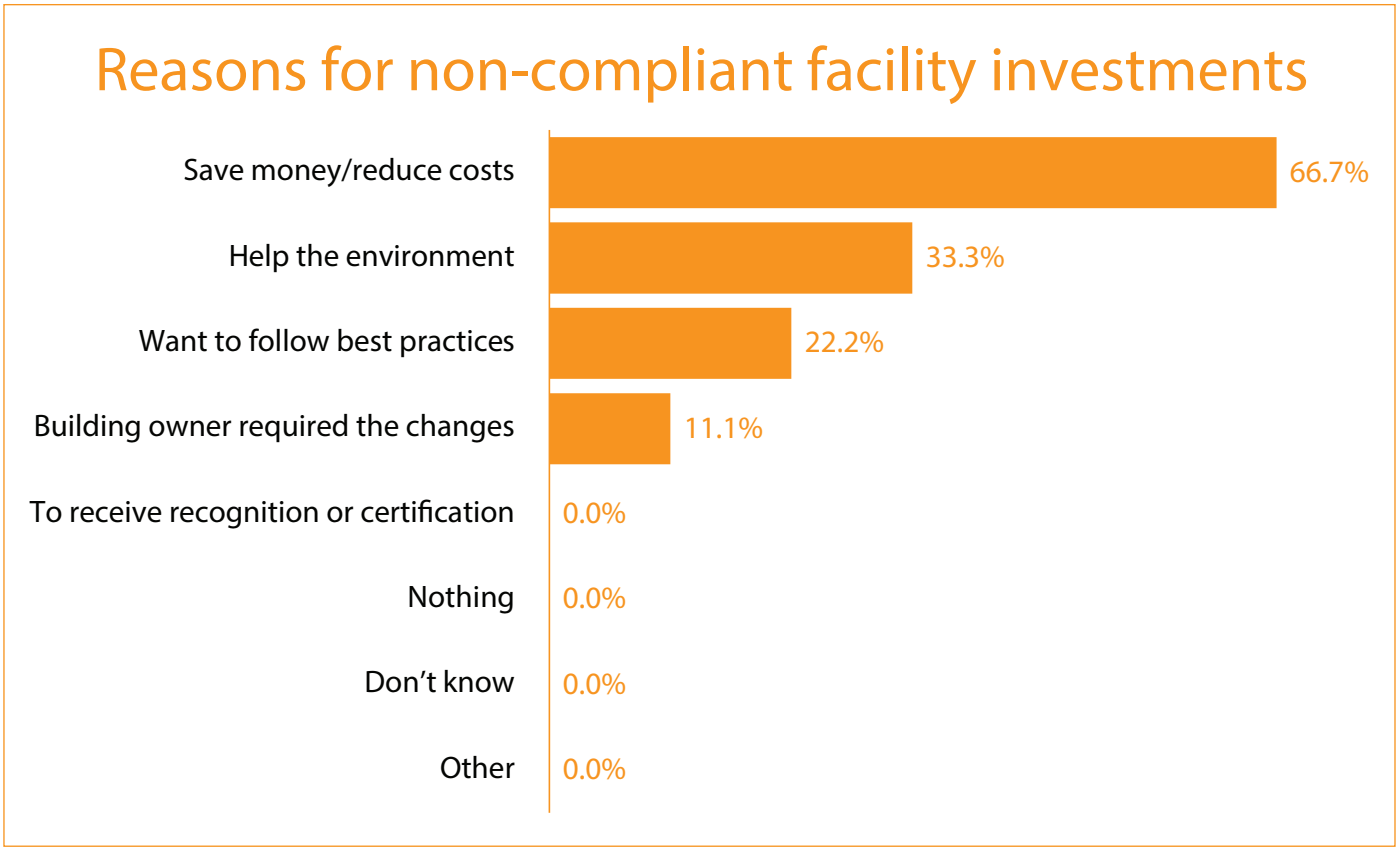
Compliant: Besides measuring your building's energy performance, what else motivated you to make capital expenditures to improve the energy efficiency of your building(s)? [select all that apply]

LL84-Compliant		
Answer	**Percentage**	**Count**
Save money/reduce costs	78.9	90
Help the environment	52.6	60
Want to follow best practices	41.2	47
Results of measurement demonstrated opportunity to improve	35.1	40
Building owner required the changes	30.7	35
To receive recognition or certification	24.6	28
Nothing	2.6	3
Don't know	0.9	1
Other	0.0	0
Total number of respondents	100	114



Non-compliant: What motivated you to make capital expenditures to improve the energy efficiency of your building(s)? [select all that apply]

Non-compliant		
Answer	**Percentage**	**Count**
Save money/reduce costs	66.7	6
Help the environment	33.3	3
Want to follow best practices	22.2	2
Building owner required the changes	11.1	1
To receive recognition or certification	0.0	0
Nothing	0.0	0
Don't know	0.0	0
Other	0.0	0
Total number of respondents	100	9



Those who had not made capital expenditures to improve the efficiency of their facilities were asked the following:

Compliant: Are you planning on making capital expenditures (investments in equipment) sometime in the next 2 to 3 years to improve the energy efficiency of the building(s) you manage?

LL84-Compliant		
Answer	**Percentage**	**Count**
Yes	52	13
No	48	12
Total	100	25

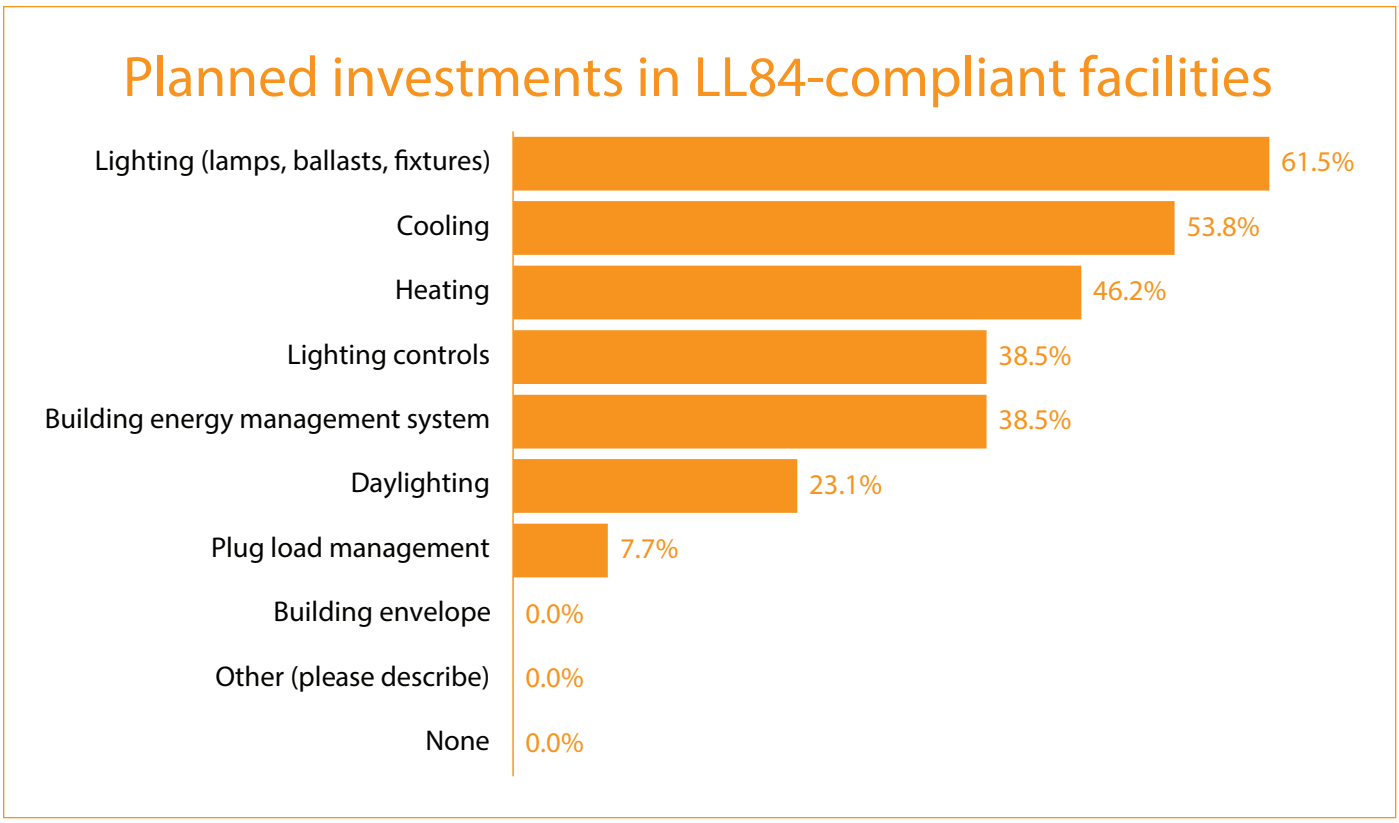
Non-compliant: Are you planning on making capital expenditures (investments in equipment) sometime in the next 2 to 3 years to improve the energy efficiency of the building(s) you manage?

Non-compliant		
Answer	**Percentage**	**Count**
Yes	100	3
No	0	0
Total	100	3

Those who said that they were planning on making a capital expenditure in the next two to three years were asked the following:

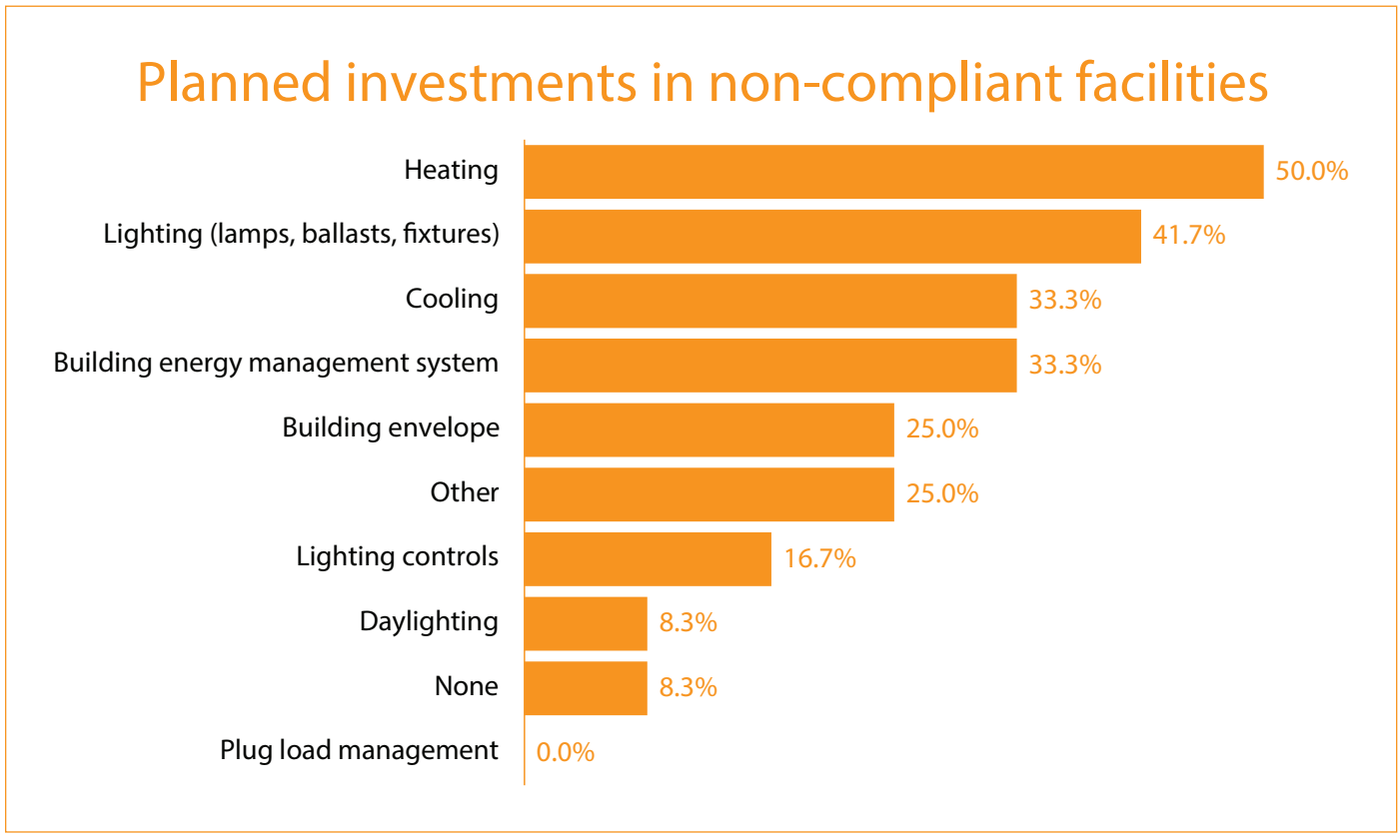
Compliant: What capital expenditures (investments in equipment) are you planning on making sometime in the next 2 to 3 years on your building(s) to improve energy efficiency? [select all that apply]

LL84-Compliant		
Answer	**Percentage**	**Count**
Lighting (lamps, ballasts, fixtures)	61.5	8
Cooling	53.8	7
Heating	46.2	6
Lighting controls	38.5	5
Building energy management system	38.5	5
Daylighting	23.1	3
Plug load management	7.7	1
Building envelope	0.0	0
Other (please describe)	0.0	0
None	0.0	0
Total number of respondents	100	13



Non-compliant: What capital expenditures (investments in equipment) are you planning on making sometime in the next 2 to 3 years on your building(s) to improve energy efficiency? [select all that apply]

Non-compliant		
Answer	**Percentage**	**Count**
Heating	50.0	6
Lighting (lamps, ballasts, fixtures)	41.7	5
Cooling	33.3	4
Building energy management system	33.3	4
Building envelope	25.0	3
Other (please describe)[10]	25.0	3
Lighting controls	16.7	2
Daylighting	8.3	1
None	8.3	1
Plug load management	0.0	0
Total number of respondents	100	12

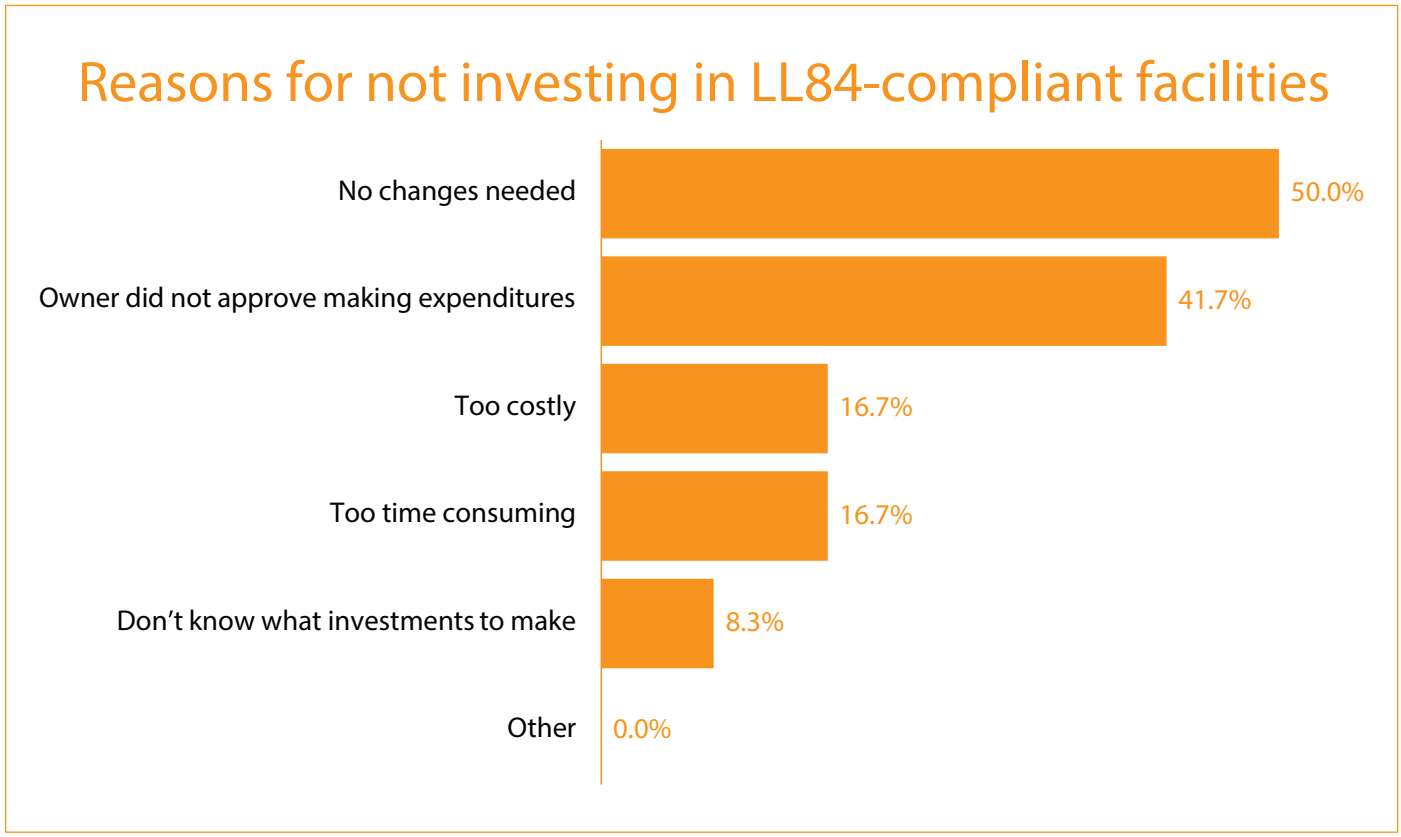


10 Response 1: "whatever is needed to be in compliance with local law 84"; Response 2: "additional window replacements"; and Response 3: "not sure"

Those who said that they were not planning on making a capital expenditure in the next two to three years were asked the following:

Compliant: Why are you not planning on making capital expenditures sometime in the next 2 to 3 years to improve energy efficiency in the building(s) you manage? [select all that apply]

LL84-Compliant		
Answer	**Percentage**	**Count**
No changes needed	50.0	6
Owner did not approve making expenditures	41.7	5
Too costly	16.7	2
Too time consuming	16.7	2
Don't know what investments to make	8.3	1
Other	0.0	0
Total number of respondents	100	12



There were no responses from those who were non-compliant.

V. General Thoughts on Energy Efficiency and Local Law 84

To gather greater insight into how facility managers perceived LL84 and energy efficiency in general, we asked respondents an open-ended question:

Please share any comments you may have about your buildings' energy efficiency in general or LL84 in particular.

LL84-Compliant		
Response	**Percentage**	**Count**
Positive	50.4	62
Neutral	41.5	51
Negative	8.1	10
Total	100	123

Select Responses

The following answers were selected as illustrative examples. All responses for both compliant and non-compliant facilities are reproduced verbatim in appendix C.

Positive

- Always interested in hearing about and implementing more cost effective energy efficient programs that result in cost savings.
- Efficiency is much better than before the LL84 was implemented. I am saving on the total monthly energy bill.
- great idea that should have come about a lot earlier
- happy to be doing more for the environment and at the same time saying more money in the long run
- I JUST LIKE SAVE ON ENERGY
- I think the LL84 inspections helped my company identify key areas of improvement for creating a more energy efficient building. The cost savings are worth it in the long run, even though the initial capital outlays can cost a lot.
- In total compliance no problems at all
- it has made us more aware of wasteful spending and how to make cost saving changes
- it is added work, but proved informative
- LL84 has been very eye-opening. Our building is older so it's hard to get a good score, but we'll keep trying to improve incrementally.

- Significant costs were cut with the installation of energy efficient appliances and the change of the boilers
- The building has seen a decrease in energy consumption due to LL84 but I feel that more can be done. However, with the rising cost of maintaining a building in New York City, it will be a it harder to achieve those goals.
- The improvements paid off in saving money and being compliant
- There has been an increase in our knowledge of improving our building operations.
- We continue making our building more energy efficient every day to save cost and environment.
- We have had no trouble complying with LL84 though I know a few people who have resisted the changes wherever possible.
- We have installed nest thermostats and changed the light bulbs to much more energy efficient models. We have seen a significant reduction in electricity usage.
- we were motivated to make changes
- Well, it just makes good common sense to make the building as energy efficient as possible, and it is a wise fiscal decision on our part!
- While we've made some improvements there is still room for more.

Negative

- Although we are able to follow the law, the time wasted in reporting to get certification is cumbersome.
- have no further comment on such an idiotic topic
- LL84 is a waste of time

VI. Conclusion

The State and Local Energy Efficiency Action Network included energy benchmarking and transparency on a list of commonsense energy policies that all states and cities should adopt by 2020.[11] More than two dozen cities, counties, and states have already enacted some version of a building energy benchmarking and transparency policy, and more than 10.7 billion square feet of building floor space are currently covered by such policies.[12] Early adopters of benchmarking policies with multiple years of public data—such as New York, NY; Washington, DC; and San Francisco, CA—are beginning to see the energy use intensity of their facilities dropping and the energy performance and ENERGY STAR scores of buildings increasing.

Evidence is pointing to building energy benchmarking and transparency policies as a foundational element of all jurisdictions' energy management strategy. The results of this survey add to a growing body of evidence pointing to the efficacy of benchmarking policies as a means to promote operational changes and capital expenditures in buildings in order to reduce wasted energy in buildings, but there is more research to be done.

This survey was limited in the number of technologies studied (submetering, for example, was not included), and it was focused on just one market, New York City. The study was also limited to LL84, although there are other complimentary laws—like LL87 on energy audits and retrocommissioning and LL88 on lighting and submetering—that may also have motivated facility managers to make improvements to their buildings and should be considered for further research. Additional studies should be conducted in other jurisdictions with benchmarking and transparency policies.

With 77% of survey respondents reporting that they had changed how they operated their facility as a result of New York City's LL84 and 75% reporting that they made a capital investment in new equipment to improve the efficiency of their building as a result of the policy, the indicators are strong that benchmarking and transparency policies are encouraging energy-saving actions and investments. All cities should consider adopting similar energy benchmarking and transparency policies.

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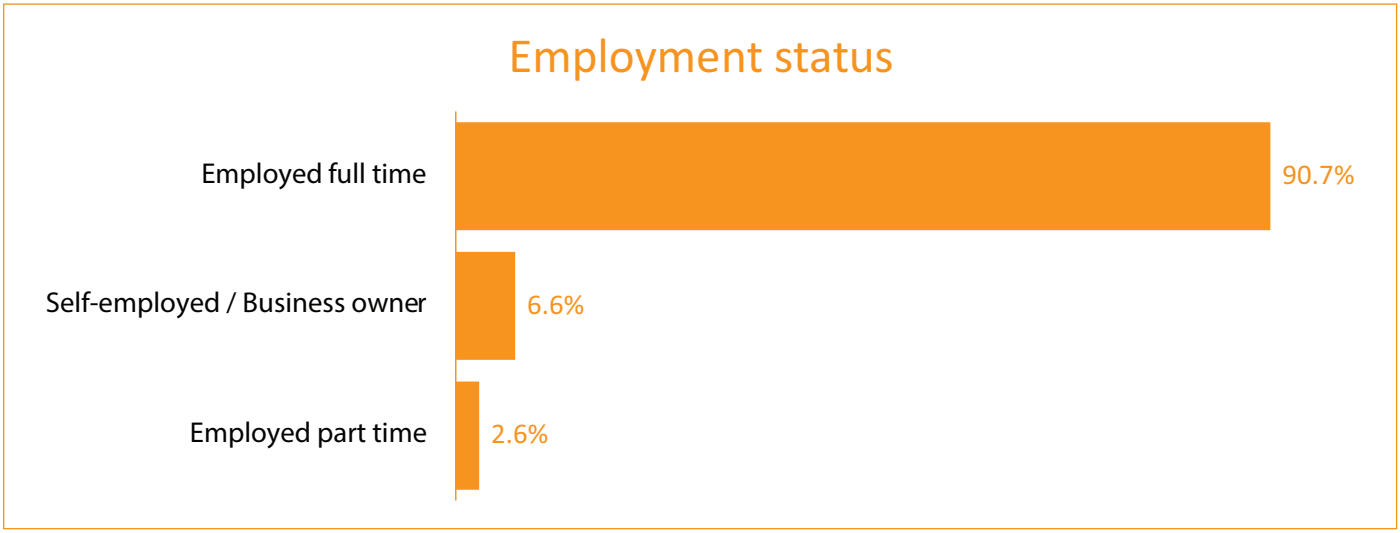
11 www4.eere.energy.gov/seeaction/system/files/documents/SEEAction_Leadership%20Agenda-finalv4.pdf

12 www.buildingrating.org

Appendix A: Demographics

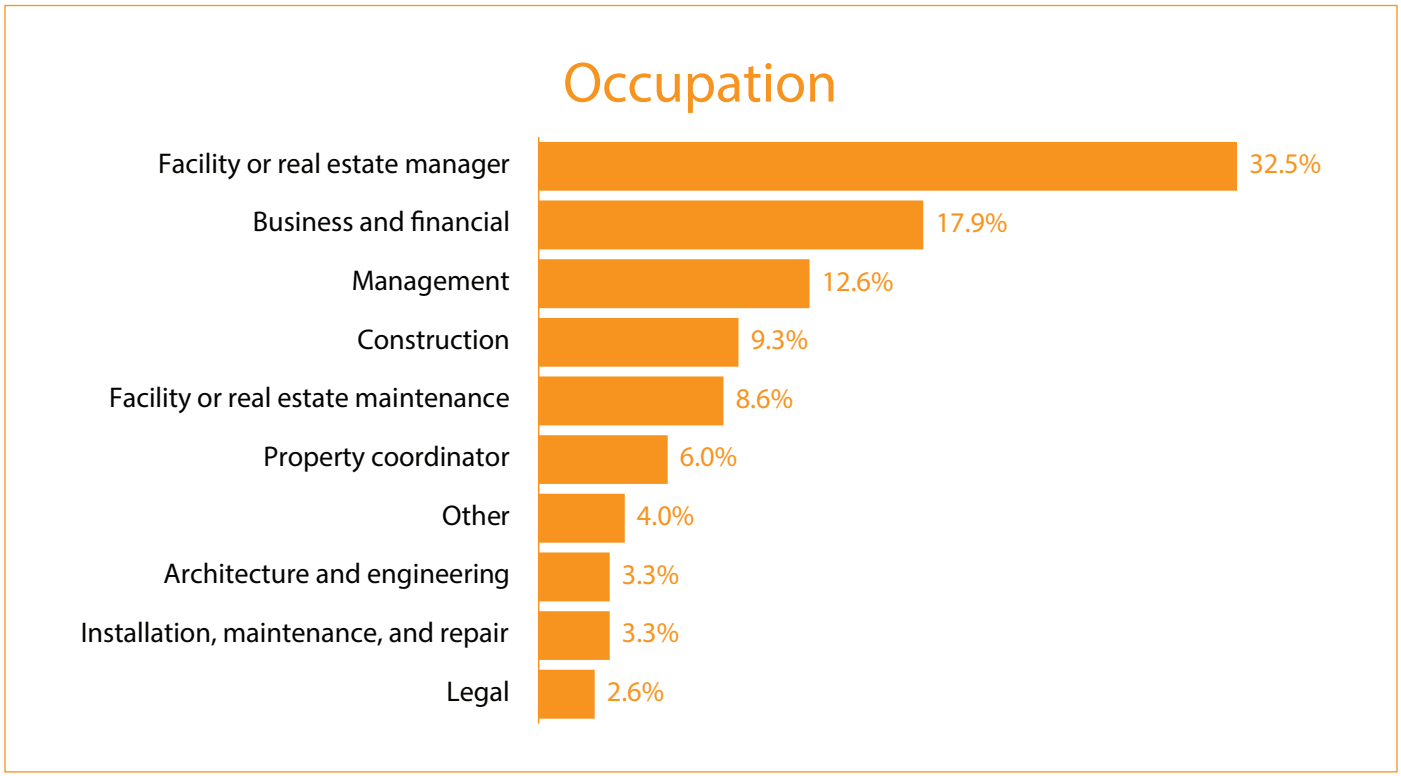
How would you describe your current employment status?

Answer	Percentage	Count
Employed full time	90.7	137
Self-employed / Business owner	6.6	10
Employed part time	2.6	4
Total	100	151



Please indicate your occupation:

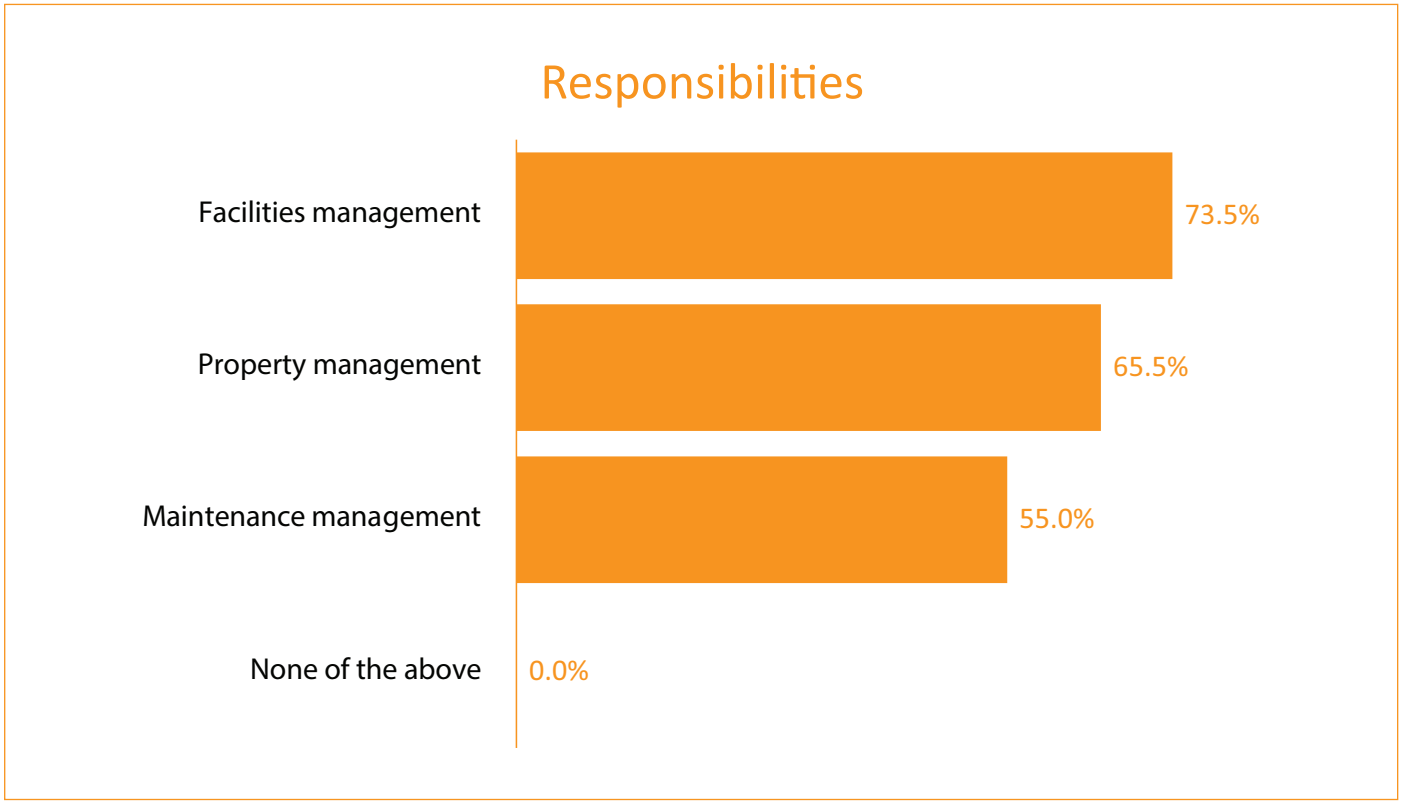
Answer	Percentage	Count
Facility or real estate manager	32.5	49
Business and financial	17.9	27
Management	12.6	19
Construction	9.3	14
Facility or real estate maintenance	8.6	13
Property coordinator	6.0	9
Other[13]	4.0	6
Architecture and engineering	3.3	5
Installation, maintenance, and repair	3.3	5
Legal	2.6	4
Total	100	151



13 Other: "Real estate" (x3); "Energy"; and "Government"

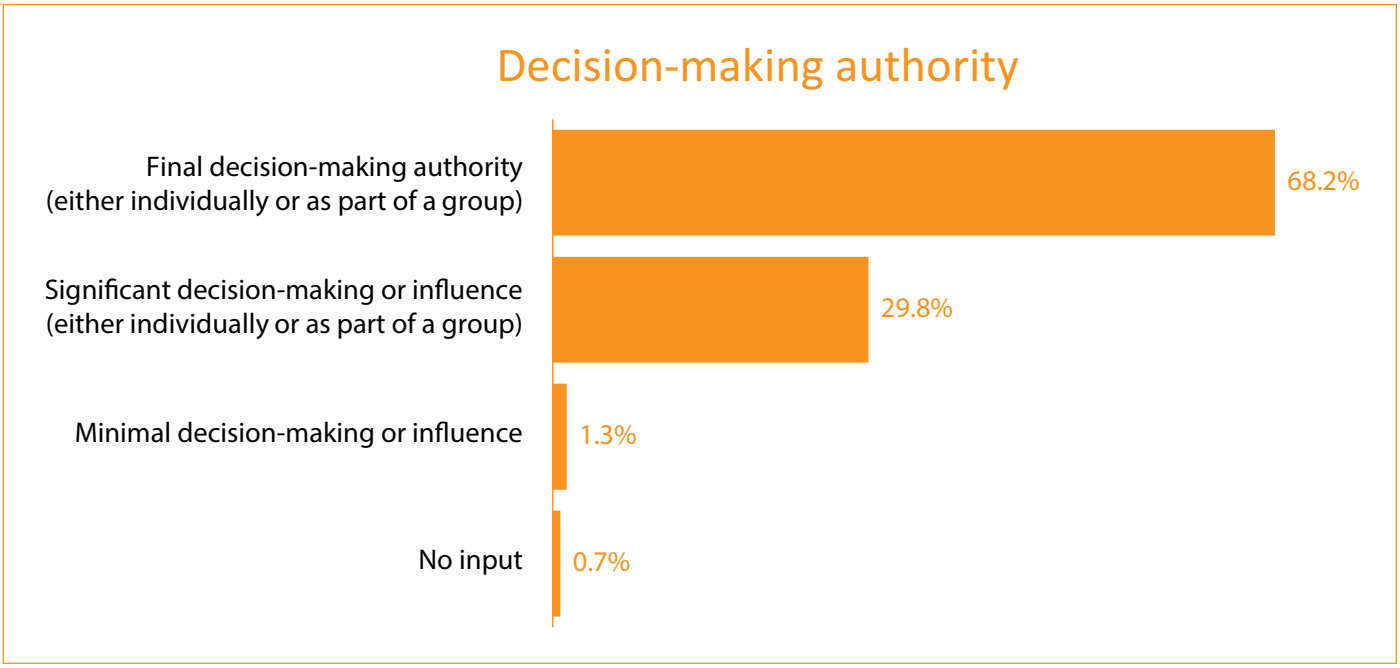
In carrying out the responsibilities of your occupation, does your role involve any of the following? [select all that apply]

Answer	Percentage	Count
Facilities management	73.5	111
Property management	65.5	99
Maintenance management	55.0	83
None of the above	0.0	0
Total number of respondents	100	151



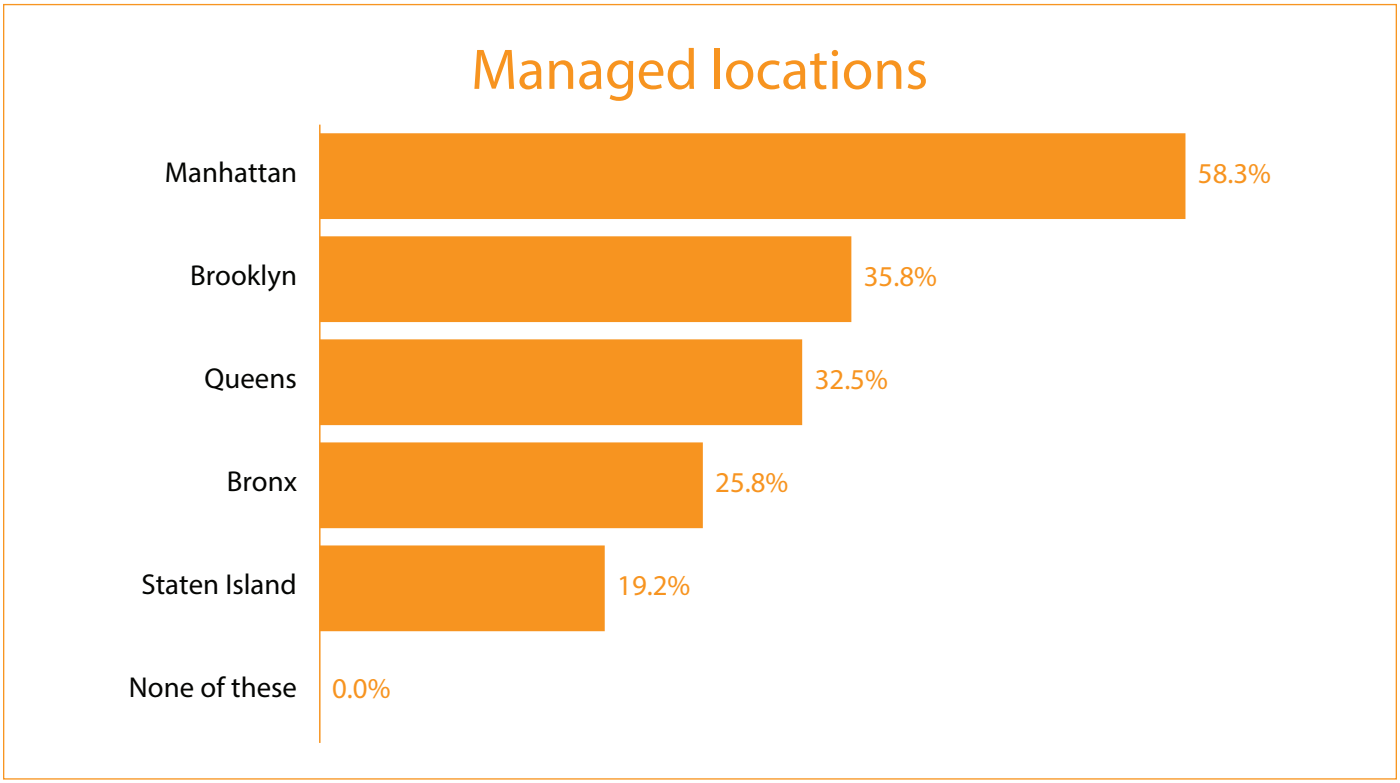
What level of decision-making authority do you have regarding energy efficiency investments in the building(s) you manage?

Answer	Percentage	Count
Final decision-making authority (either individually or as part of a group)	68.2	103
Significant decision-making or influence (either individually or as part of a group)	29.8	45
Minimal decision-making or influence	1.3	2
No input	0.7	1
Total	100	151



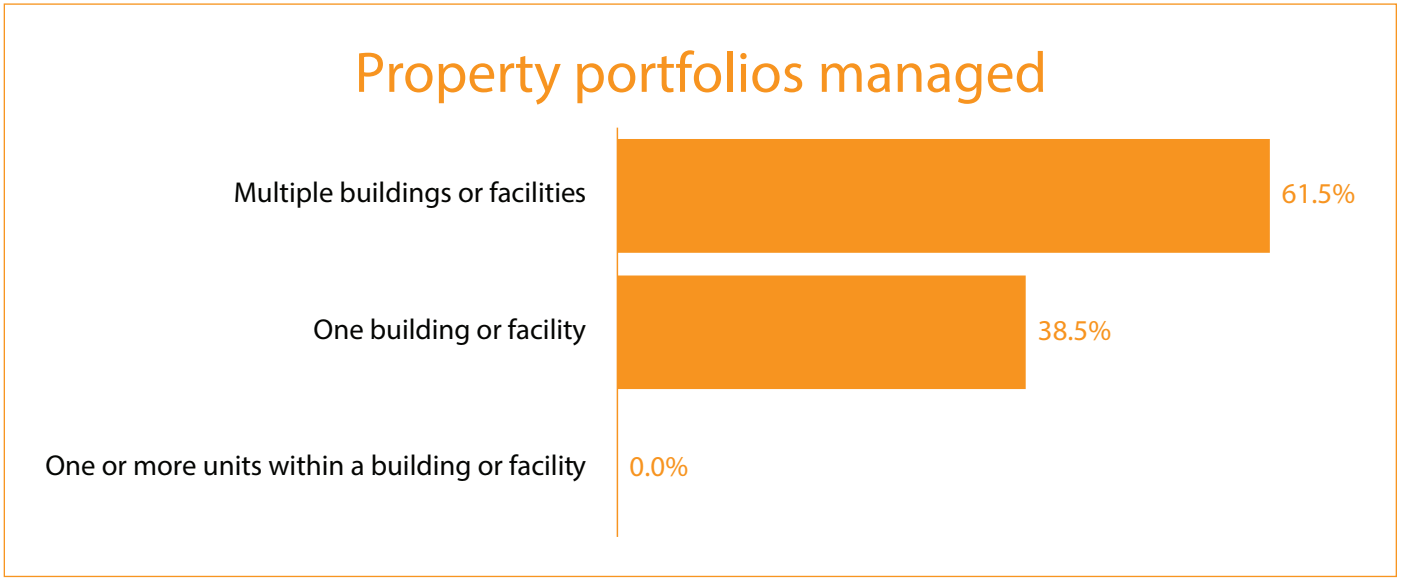
In what borough(s) are the properties you manage located? [select all that apply]

Answer	Percentage	Count
Manhattan	58.3	88
Brooklyn	35.8	54
Queens	32.5	49
Bronx	25.8	39
Staten Island	19.2	29
None of these	0.0	0
Total number of respondents	100	151



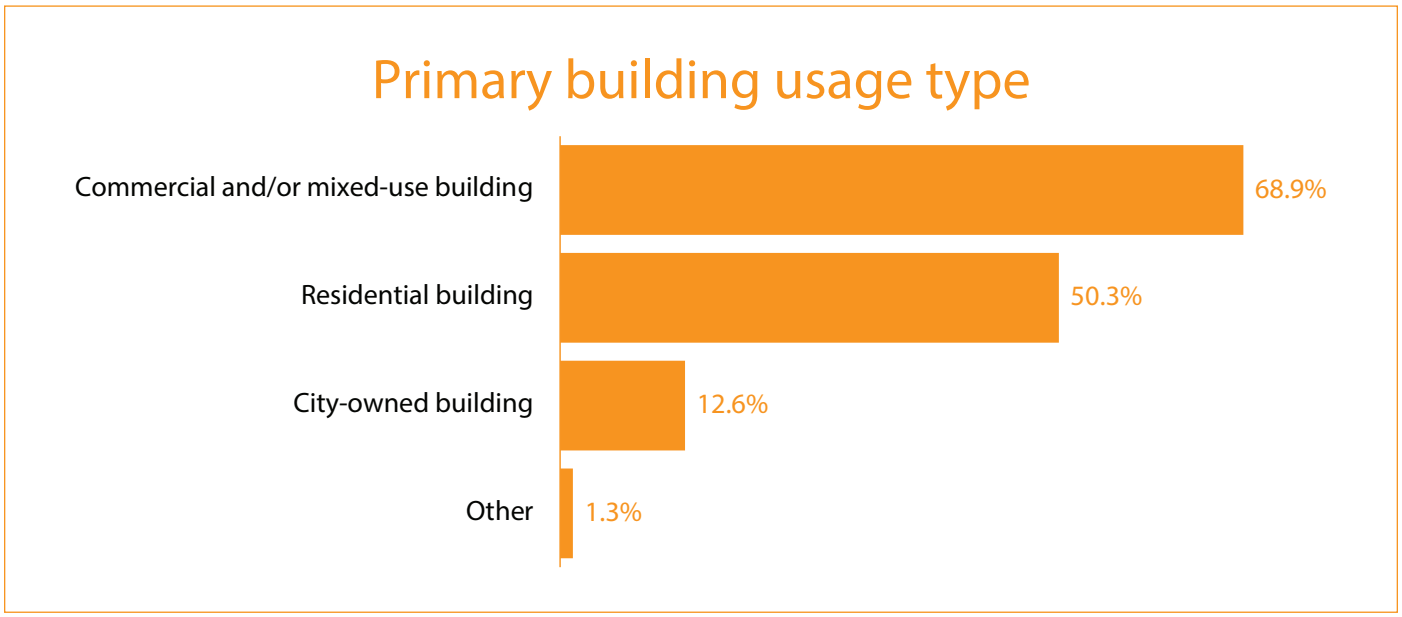
What best describes the property portfolio you manage?

Answer	Percentage	Count
Multiple buildings or facilities	61.5	88
One building or facility	38.5	55
One or more units within a building or facility	0.0	0
None of these	0.0	0
Total	100	143



From the following list, please select the primary building usage type of the facilities you manage. [select all that apply]

Answer	Percentage	Count
Commercial and/or mixed-use building	68.9	104
Residential building	50.3	76
City-owned building	12.6	19
Other (please describe)[14]	1.3	2
Total number of respondents	100	151



14 Other: "Non-profit church and school" and "Hotel"

Appendix B: Methodology

To conduct this survey, NEMA worked with EmPanel/Bizpinion, a third-party vendor of survey samples that recruits and maintains panel databases, to identify a sample of 151 facility managers of buildings 50,000 square feet and larger in New York City. EmPanel/Bizpinion contacted qualified respondents, who were invited to complete an online survey. Through this process we obtained 151 completed questionnaires.

Respondents were contacted by email. The survey topic/title was listed as "Energy Efficiency in Large NYC Buildings," followed by text directing the participant to click on the survey link. The supporting language read:

"Your prompt response is encouraged as this survey will only be available until a predetermined number of responses have been received.

"Please respond carefully to each question with true and accurate information. If [Bizpinion or Research Now] determines your responses to be consistently inaccurate or untrue, you may forfeit your Reward.

"Thank you for your continued participation in the [Bizpinion or Research Now] Panel!"

The survey was conducted by the NEMA Business Intelligence Service (NEMA/BIS) using the Qualtrics LLC SaaS survey platform.

The survey was hosted on the Qualtrics platform, but NEMA/BIS designed, coded, and managed the survey flow.

EmPanel/Bizpinion and Research Now recruited panel members, sent them invitations to participate, and compensated those who successfully completed the survey.

Survey Dates

The survey launched on March 16, 2016, and was closed on April 26, 2016.

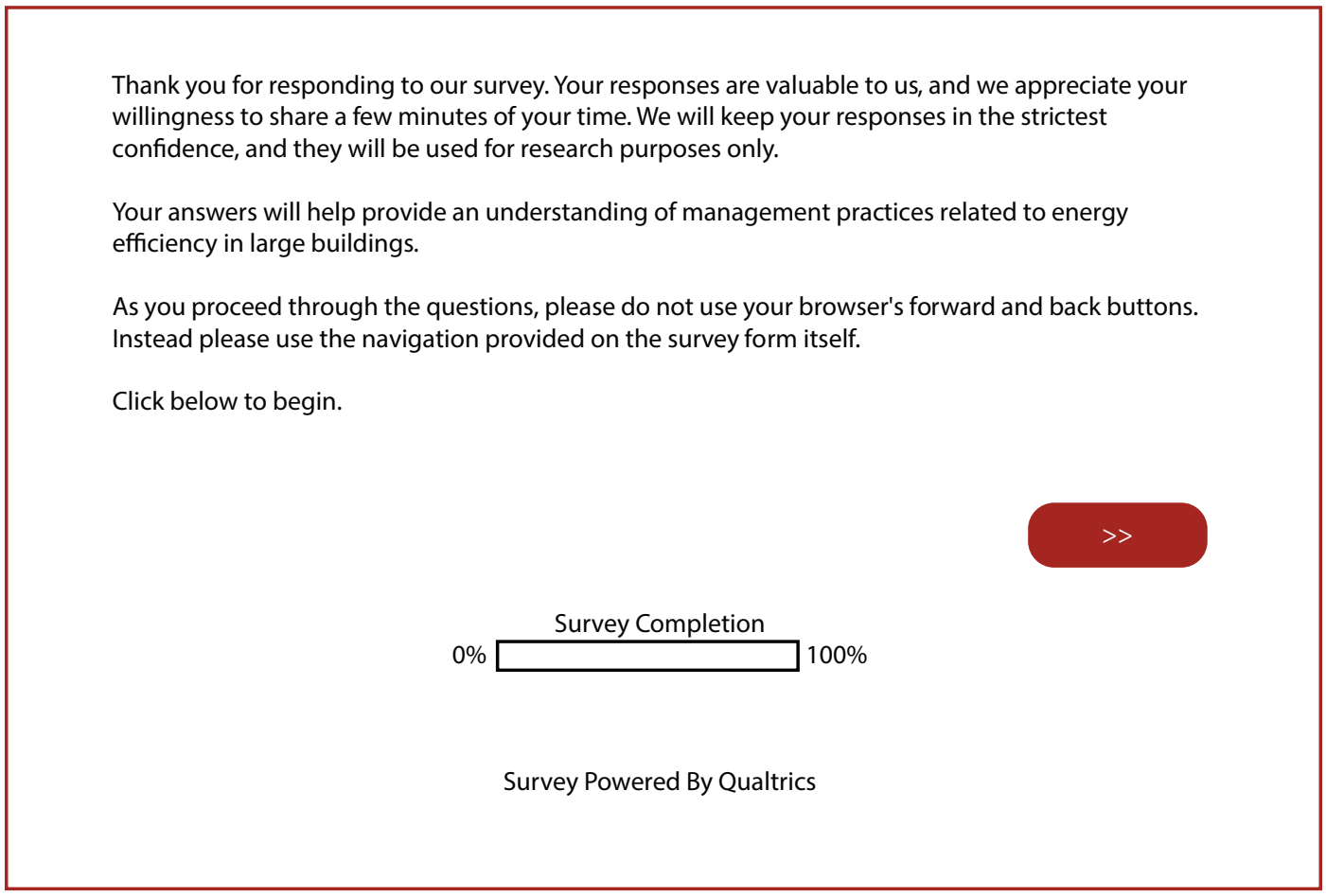
Honorarium

Participants were given an honorarium in the form of redeemable rewards points for submitting a completed, verified questionnaire.

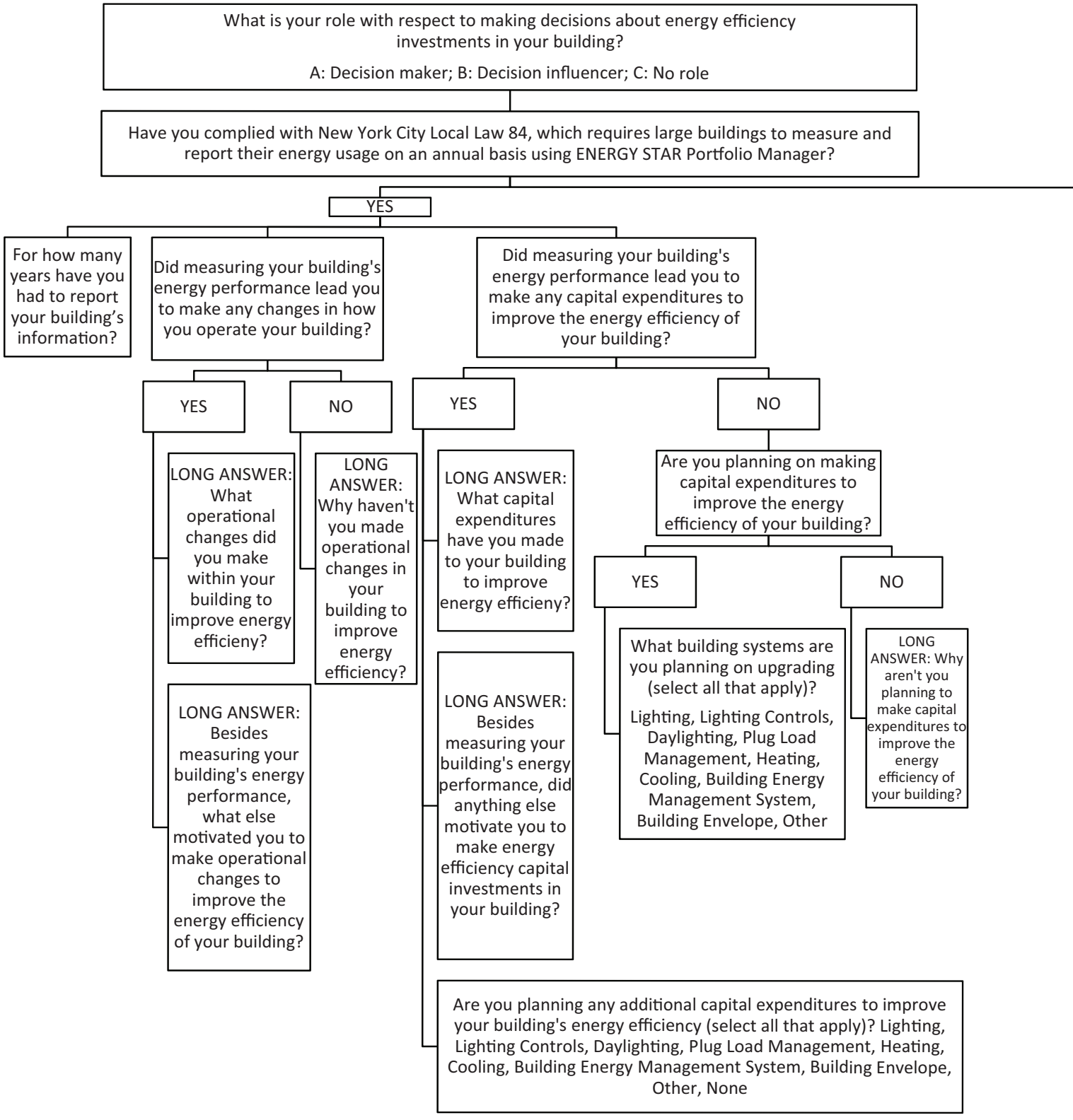
Response Rate

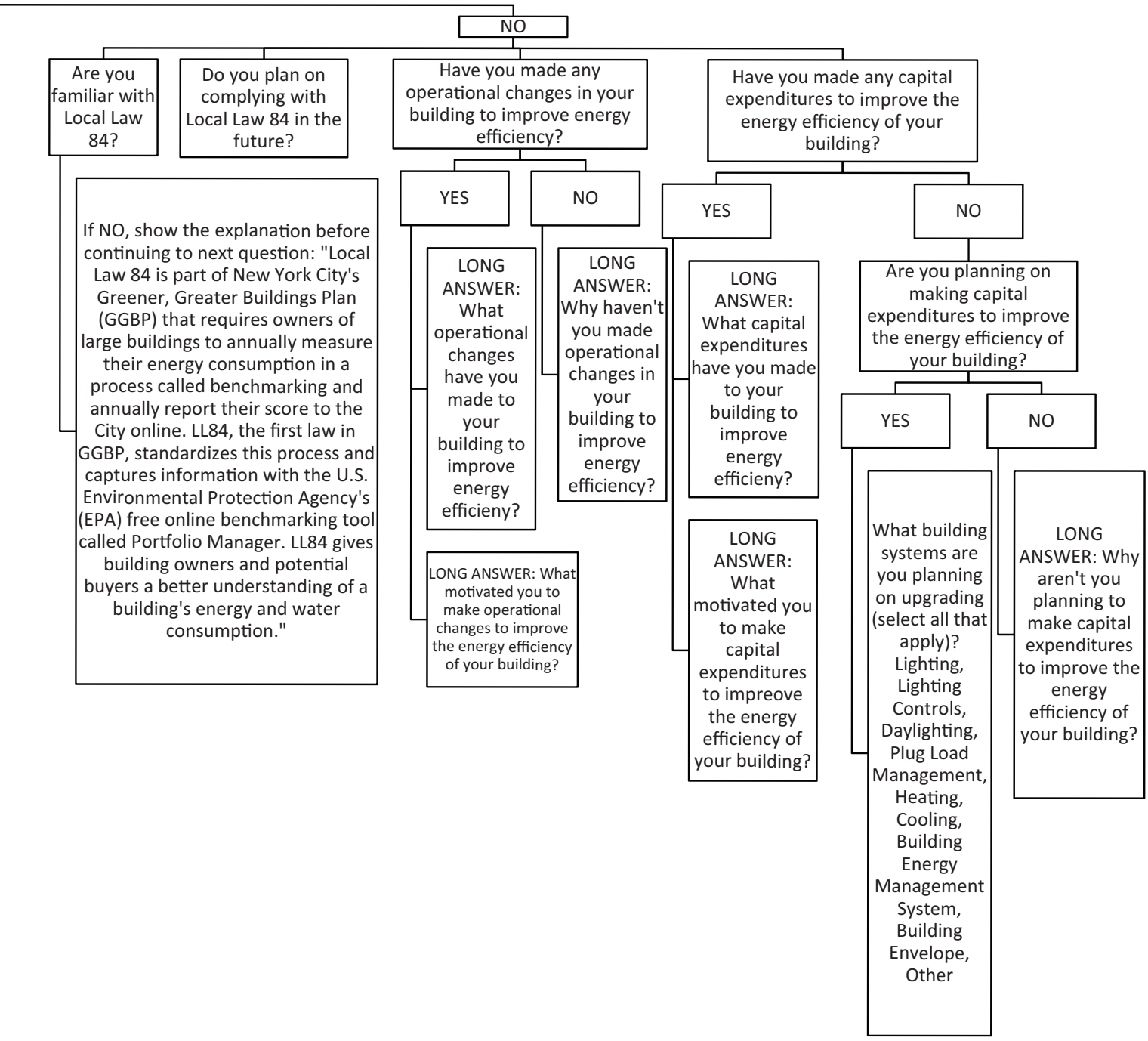
Invitations were sent to 1,767 facility, property, and maintenance managers with facilities under management in New York City. Of those who received the invitation, 218 clicked through to begin the survey, which translates to a response rate of 12.3%. Of those who started the survey, 151 passed through the screening questions and quality checks to complete the questionnaire for a 69% completion rate.

Image of Qualtrics Survey Platform



Question Flow




NO
Are you familiar with Local Law 84?
Do you plan on complying with Local Law 84 in the future?
Have you made any operational changes in your building to improve energy efficiency?
Have you made any capital expenditures to improve the energy efficiency of your building?
If NO, show the explanation before continuing to next question: "Local Law 84 is part of New York City's Greener, Greater Buildings Plan (GGBP) that requires owners of large buildings to annually measure their energy consumption in a process called benchmarking and annually report their score to the City online. LL84, the first law in GGBP, standardizes this process and captures information with the U.S. Environmental Protection Agency's (EPA) free online benchmarking tool called Portfolio Manager. LL84 gives building owners and potential buyers a better understanding of a building's energy and water consumption."
YES
NO
YES
NO
LONG ANSWER: What operational changes have you made to your building to improve energy efficieny?
LONG ANSWER: Why haven't you made operational changes in your building to improve energy efficiency?
LONG ANSWER: What capital expenditures have you made to your building to improve energy efficieny?
Are you planning on making capital expenditures to improve the energy efficiency of your building?
LONG ANSWER: What motivated you to make operational changes to improve the energy efficiency of your building?
LONG ANSWER: What motivated you to make capital expenditures to impreove the energy efficiency of your building?
YES
NO
What building systems are you planning on upgrading (select all that apply)? Lighting, Lighting Controls, Daylighting, Plug Load Management, Heating, Cooling, Building Energy Management System, Building Envelope, Other
LONG ANSWER: Why aren't you planning to make capital expenditures to improve the energy efficiency of your building?

Appendix C: Verbatim Responses

Capital Expenditures

What additional capital investments (investments in equipment) have you made in your building(s) to improve energy efficiency?

Verbatim Responses (LL84-Compliant)

- Already listed them all.
- Approved energy procedures and purchased new heating and cooling elements.
- Automatic lighting
- Better thermostats and controls. Automatic settings on temp and lighting
- boilers
- Buying Equipment which help in increasing the efficiency of energy etc.
- changed boilers and provide residents with energy saving refrigerators and light bulbs
- compact fluorescents, weather proofing, smart devices and controls, sensors
- dual fuel boiler
- electric plant; sources of natural light
- electrical installation and boiler reform
- elevators
- energy efficient appliances
- Energy star appliances, smart lighting, smart thermostats, led lights
- General upkeep of pipes, wires, and other parts of the systems that fall outside primary units.
- Had to overhaul walls to make the necessary changes. Involved a lot of in house remodeling to bring up to code.
- Heating system.
- Help with heating and cooling
- HIGER EFFICIENCY LIGHTBULBS AND THERMOSTAT CONTROLS
- HVAC upgrades, such as VAV
- I have brought more energy saving appliances for the building to cut down energy cost as well as discuss implementing solar panels on the roof of the building to further bring down the consumption of energy for the building.
- I have made the necessary requirements in order to be efficient and effective.
- I made many investments in the building
- I'm not really sure to be honest
- Improved heating and cooling automation systems
- Increase of automated controls
- Increased insulation to monitor/ help keep the temperatures down during the winter. Insulation between the floors.
- Install additional thermostats for more control over heating and cooling systems
- installed better heating controls to regulate boiler operations as well as adding separate hot water heating units
- INSTALLED ENERGY TIMERS LIKE LIGHTS AND HEATING
- Insulation
- Insulation
- insulation, LED lighting, training
- Insulation. Windows
- Investment in "green" technologies
- LED light bulbs :)
- LED LIGHTING
- lighting
- lighting, heating
- lights
- loading dock curtains
- Made all equipment energy star
- misc
- More lighting. Better location
- More use of natural light
- Motion detect light switches, new lighting fixtures, gas upgrade and more frequent HVAC cleaning and maintenance
- n/a
- N/A
- N/A
- New windows, blown in insulation
- no additional ones made
- NO MORE
- no other
- None
- none
- None
- None
- None
- none
- None
- none
- none
- None
- none
- none
- None other than the management system.
- none other than the ones I stated

- none that I can think of
- None that were not already covered by this survey in the previous question
- not sure
- Nothing
- nothing else
- nothing really came to mind at the time
- overhaul equipment
- parts of the buildings have tinted window to help keep it cool
- Replaced old windows with more modern and energy efficient ones.
- Replaced ventilation system to a more modern , are also looking at alternative energy methods
- Replacement of old windows, equipment and other items that needed to be energy efficient
- replacing light fixtures
- Replacing lighting fixtures with energy efficient bulbs, we are planning on installing new heating system this year, as well!
- Retrofitting existing buildings and replacing energy consuming equipment are critical for improving energy efficiency
- security improvements
- shading
- smart lighting and new boilers
- solar
- Solar Energy
- Solar panel
- Solar panels
- Solar panels
- solar panels
- Spent money on extra energy efficient appliances
- stability, and more cooling environment
- switched to all LED light bulbs
- The Company changes in what manner we receive energy
- They include infrastructure and key points of building management including building materials and personnel.
- updated old boilers, new lighting fixtures lower usage, thermostats
- upgraded cooling system to newer and more efficient system with more zones
- various
- Water management
- We changed all of the lighting in the main hallways to more energy efficient fixtures.
- We have invested in alternative energy like solar power and also used certain very specific software computing technology which gives agility outcome and services.
- We installed solar panels in 2 of our 3 buildings
- We replaced all of the lighting in public areas with dimmable LEDs, installed a timer system so key lights are on - but dimmed - at night, and weather-sealed all of the windows and doors, after replacing any remaining single-panes with double-panes.
- we re-vamped some of our heating units
- We switched from traditional to LED lighting and installed energy efficient appliances in all of our residential apartments.
- window replacements
- Working with some things to become most effective and efficient

Verbatim Responses (Non-compliant)

- h2o
- I am not sure
- New energy efficient Windows
- New heat exchangers that are more fuel efficient as well as new heat timers to calibrate inside temps. we also installed new energy efficient lighting in the hallways and lobby areas
- None
- none
- recycling, plumbing
- solar panels

Open-Ended Responses

LL84-Compliant

Positive Responses

- Always interested in hearing about and implementing more cost effective energy efficient programs that result in cost savings.
- Currently developing energy-saving and cost-effective solutions for commercial buildings
- Efficiency is much better than before the LL84 was implemented. I am saving on the total monthly energy bill.
- enough improvement in spending after improvements
- getting there slowly
- gold standard
- good law and I think we will see the results more clearly in the near future
- great idea that should have come about a lot earlier

- Great program
- happy to be doing more for the environment and at the same time saying more money in the long run
- Have made vast improvements in the last 2 years
- helped costs
- I don't have any comment other than us trying to go more energy efficient in the coming year.
- I feel we have done some good things to improve the energy efficiency
- I JUST LIKE SAVE ON ENERGY
- I think the LL84 inspections helped my company identify key areas of improvement for creating a more energy efficient building. The cost savings are worth it in the long run, even though the initial capital outlays can cost a lot.
- If the expenditures are equitable then they make sense, small expenditures like changing the bulbs and switching out the utilities work as well.
- In total compliance no problems at all
- it has gotten better
- it has made us more aware of wasteful spending and how to make cost saving changes
- It is a necessary implementation of codes that will be beneficial to building management in the long run.
- it is added work, but proved informative
- it is good now
- it provides stability
- It was a big change but worth it in the end
- It works ok
- It's particularly respectful to be mindful of the codes and adhere to them.
- It's very efficient.
- Its benefits the community
- It's one of the best way to govern the environment and save energy
- It's very efficient
- LL84 has been very eye-opening. Our building is older so it's hard to get a good score, but we'll keep trying to improve incrementally.
- more energy efficient now, lights air conditioners
- much more work to be done but making good progress
- My buildings are in fully compliance
- none come to mind---the LL84 is good for the environment
- Significant costs were cut with the installation of energy efficient appliances and the change of the boilers
- sources of natural light , impart awareness on the rational use of electricity, Necessary equipment off slightly
- The building has seen a decrease in energy consumption due to LL84 but I feel that more can be done. However, with the rising cost of maintaining a building in New York City, it will be a it harder to achieve those goals.
- the improvements paid off in saving money and being compliant
- The money this company has saved without employees being cost out
- There are advantages in using LL84 such as water and power consumption usage has no restrictions and in addition we can avail other facilities offered by city authorities.
- There has been an increase in our knowledge of improving our building operations.
- they are for the tenants benefit and for safety
- THINK ITS BETTER FOR THE ENVIRONMENT OVERALL
- took some to convert, but seems to more economical and efficient now
- Very easy to implement
- Very efficient and productive.
- Very good
- we and other local systems have improved
- We are compliant and ISO focused
- We are excited to be installing solar panels this year
- We are in compliance and have been for years
- We continue making our building more energy efficient every day to save cost and environment.
- We have a benchmarking where each year we have to measure our energy and water usage and reported to the EPA. We are encouraged to use energy star equipment.
- We have had no trouble complying with LL84 though I know a few people who have resisted the changes wherever possible.
- We have installed nest thermostats and changed the light bulbs to much more energy efficient models. We have seen a significant reduction in electricity usage.
- We have our flexibility in utilizing sufficient power and water supplies at the same time we look forward to have certain specific liberation and deduction in taxation.

- We want to keep up with the times and be law-abiding company complies with all the conditions , according to the Energy Efficiency Act , so we try as much as possible to pay attention to the objects are in our possession . Soon planned a large-scale event in which we are planning to convert part of our projects is completely in accordance with the law.
- we were motivated to make changes
- Well, it just makes good common sense to make the building as energy efficient as possible, and it is a wise fiscal decision on our part!
- While we've made some improvements there is still room for more.

Negative Responses

- Although we are able to follow the law, the time wasted in reporting to get certification is cumbersome.
- have no further comment on such an idiotic topic
- I don't have anything to add really except that the change to more efficient lighting in the common areas was not well received by tenants.
- I feel this is just another example of more regulation that only adds to the cost of government
- I understand why the energy efficiency standards were adapted but it was a great cost to get everything up to code
- KEEP ASKING
- LL84 is a waste of time
- Too much regulation
- Tried to improve efficiency of outdated construction. LL84 is on the right track, but not always easy to comply
- waste of time

Neutral Responses

- additional thermostats with wireless control was most efficient in both cost savings and user interaction
- All buildings are managed with high efficiency boilers that are inspected monthly. All equipment, windows, doors, heating ducts, vents, air ways etc, is properly insulated, upgraded and is checked each month to make sure it meets our companies and buildings energy efficiency needs
- Energy star appliances,
- I do not have any comments about energy efficiency or LL84 at this time.
- I do not have any specific comments
- I don't have any comments...
- I don't really have any comments
- I don't really have any comments
- I have none
- I think we should develop the management of the maintenance.
- I'm not really sure to be honest
- increment of solar usages in buildings
- Like all
- maybe in the future
- more specialized vendors
- n/a
- N/a
- N/A
- N/A
- no comment
- no comment
- no comments
- no comments
- no comments to share at this time
- None
- None
- None
- None
- none
- none
- none
- none
- none
- none
- none
- none
- none
- None
- None
- none
- None at this time.
- None right now
- None. Most were to code when acquired.
- not at this time, but thanks
- nothing
- nothing else
- Nothing really
- The building would be even more energy efficient if the windows were replaced.
- There is nothing much to comment.
- we are looking to be completed by 2018 and also install solar panels

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