

SAN FRANCISCO EXISTING COMMERCIAL BUILDINGS PERFORMANCE REPORT

2010-2014



SF Environment

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A Department of the City and County of San Francisco



**ULI Greenprint Center
for Building Performance**

A UNIQUE MARKET FOR SUSTAINABLE REAL ESTATE



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Introduction



This report summarizes the results of the San Francisco Existing Commercial Buildings Energy Performance Ordinance since inception. The goals of this report are to inform industry stakeholders, highlight trends in the local market, and provide recommendations for policy and efficient operations.

The building sector is the largest energy user in the United States, accounting for approximately 40 percent of all energy consumed,¹ and for 52 percent of greenhouse gas emissions in San Francisco.² Energy use is the single largest controllable cost in building operations, and tracking energy performance is a critical first step in managing energy consumption and making improvements. Both the public and private sectors have taken steps to measure and benchmark environmental performance data. Currently 15 U.S. cities, including San Francisco, have implemented a mandatory benchmarking and disclosure policy.

For this report, the San Francisco Department of the Environment (SFE) has partnered with ULI Greenprint Center (ULI Greenprint), a global collective of real estate owners and investors that have committed to voluntary energy

benchmarking since 2009. SFE and ULI Greenprint are collaborating to analyze data trends, share lessons learned and best practices between mandatory and voluntary benchmarking, and provide recommendations for future efforts.

Commercial buildings subject to San Francisco's energy benchmarking and audit requirements between 2010 and 2014 have demonstrated positive economic and environmental trends:

- Energy use has decreased by 7.9 percent and source emissions have decreased by 17 percent among properties that consistently comply.
- Energy audits for over 800 buildings have identified \$60.6 million in opportunities for cost-effective energy efficiency investments, with a net present value of \$170 million.

Energy benchmarking data used for this analysis has been released to San Francisco's OpenData platform, located at data.sfgov.org. In addition to this report, SFE and ULI Greenprint will release sector-specific follow up analysis in the months ahead.

Project Collaborators

San Francisco Department of the Environment

The mission of the San Francisco Department of the Environment (SFE) is to create visionary policies and innovative programs that promote social equity, protect human health, and lead the way toward a sustainable future.

San Francisco's innovative green building program aims to address the challenges of climate change and resource stewardship while enhancing the economic and social health of the city. The green building team is a technical resource for standards setting and project development; facilitates training for building professionals; educates and builds stakeholder support for green building policies; and administers the first mandatory energy benchmark and audit program in California, the results of which are published in this report.

Urban Land Institute (ULI)

Founded in 1936, the Urban Land Institute is a nonprofit organization with the mission of providing leadership in the responsible use of land and in creating and sustaining thriving communities worldwide.

ULI Greenprint Center for Building Performance

ULI Greenprint is a worldwide alliance of leading real estate owners, investors, and strategic partners committed to improving the environmental performance of the global real estate industry. Through voluntary measurement, benchmarking, knowledge sharing, and education, ULI Greenprint and its members strive to reduce greenhouse gas emissions by 50 percent by 2030, in line with the goals of the Intergovernmental Panel on Climate Change.

ULI Greenprint members collectively use the Greenprint Environmental Management Platform to track, report, benchmark, and analyze energy, emissions, water, and waste performance for properties, funds, and portfolios. Each year, a consolidated view of the portfolio of participating properties is published in the *Greenprint Performance Report™* which informs members of their environmental progress. Recognizing the importance of localized benchmarking and the meaningful feedback it can provide to building owners, ULI Greenprint has partnered with SFE to produce this report.

Unique Market for Sustainable Real Estate



San Francisco enjoys many strengths that make it a remarkable and perhaps unique market for commercial-building energy performance. California and San Francisco have a strong history of energy and green building policy spanning nearly a half century. This history has influenced the culture of San Francisco's government and real estate communities, where a desire exists to conserve resources (both natural and financial) and continuously improve environmental performance.

San Francisco is a compact, densely populated city with a thriving economy led by the finance, tourism, and technology sectors. San Francisco is a top-three real estate market in the United States³, with total investment of more than \$13 billion in 2014.⁴ The culture of the community—including tenants—has prompted real estate owners to strive for recognition for environmental performance: 64 percent of San Francisco's 93 million square feet properties certified under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program have achieved Gold or Platinum certification, and 85 million square feet have been certified under the Environmental Protection Agency (EPA) ENERGY STAR program.⁵

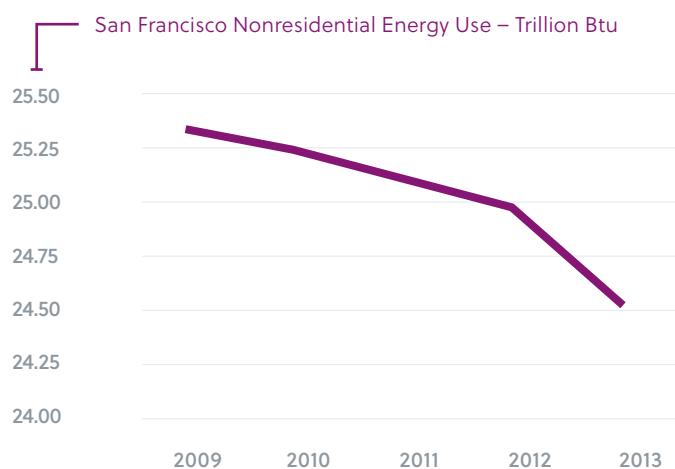
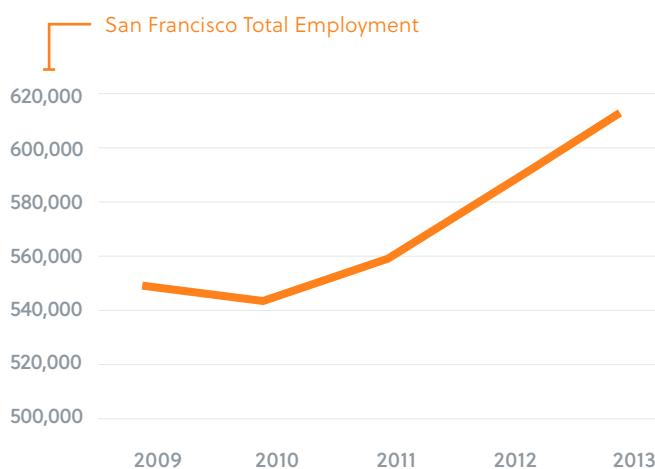
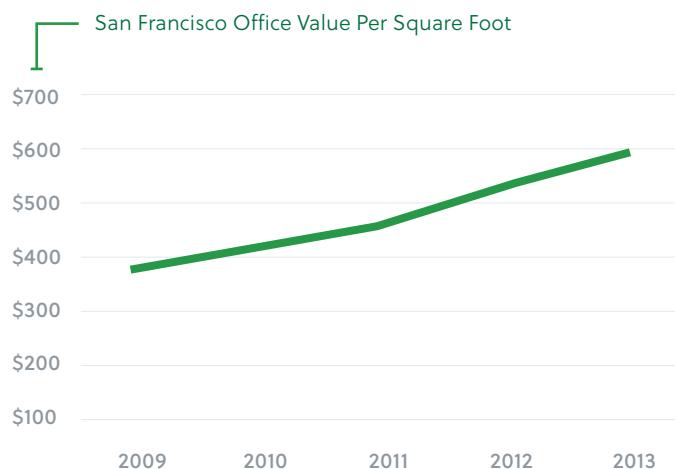
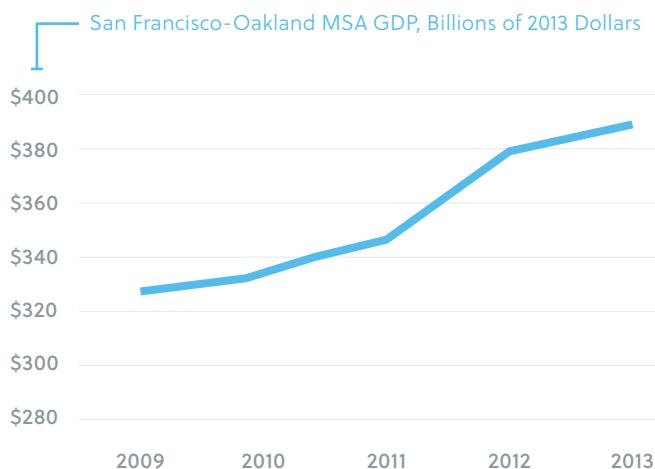
This confluence of factors makes the city a unique market for green building policies and programs and contributed

to San Francisco being recognized with top overall marks by the Siemens/Economist Intelligence Unit's U.S. and Canada Green Cities Index and honored by the World Green Building Council with a Leadership Award for Best Green Building Policy.^{6,7} In 2014 and 2015, San Francisco was ranked #2 in CBRE's National Green Building Adoption Index.⁸

The San Francisco market has experienced significant economic expansion while simultaneously reducing primary energy use and emissions. From 2009 to 2013, the gross domestic product (GDP) of the San Francisco metropolitan statistical area (MSA) increased 19 percent.⁹ Within San Francisco, commercial real estate value increased by nearly 80 percent,¹⁰ the total number employed increased 11 percent,¹¹ and energy use in commercial buildings declined 2 percent.¹²

These trends parallel the explosive growth in the use of green building labels in the market, which has been observed to be a factor in market valuation.¹³ Voluntary market leadership, incentive programs, and major upgrades to building codes each contribute to this remarkable outcome. Further study and tracking is recommended to confirm if this trend continues and understand how other markets might replicate San Francisco's successes.

Energy Use and Economic Growth: Decoupled



The role of government as an environmental leader in California – and in San Francisco in particular – is a contributing factor. San Francisco's climate action strategy is crystalized as "0-50-100, Roots"—a framework aiming for zero waste citywide by 2020, 50 percent of all trips made by sustainable modes, 100 percent of energy consumed coming from renewable sources, and carbon returned to the ground, where it belongs, through carbon sequestration.

In order for the city's 100 percent renewable energy goal to be achievable, the building stock must be extraordinarily efficient. The City's assets for achieving energy efficiency include California's Title 24 Energy Standards for both existing and new buildings; more than ten years of delivering the San Francisco Energy Watch incentive program, which aids business and multifamily properties with energy upgrades; GreenFinanceSF PACE financing; and numerous services and incentives from Pacific Gas & Electric Company (PG&E) for ratepayers.

San Francisco Benchmarking and Disclosure Policy

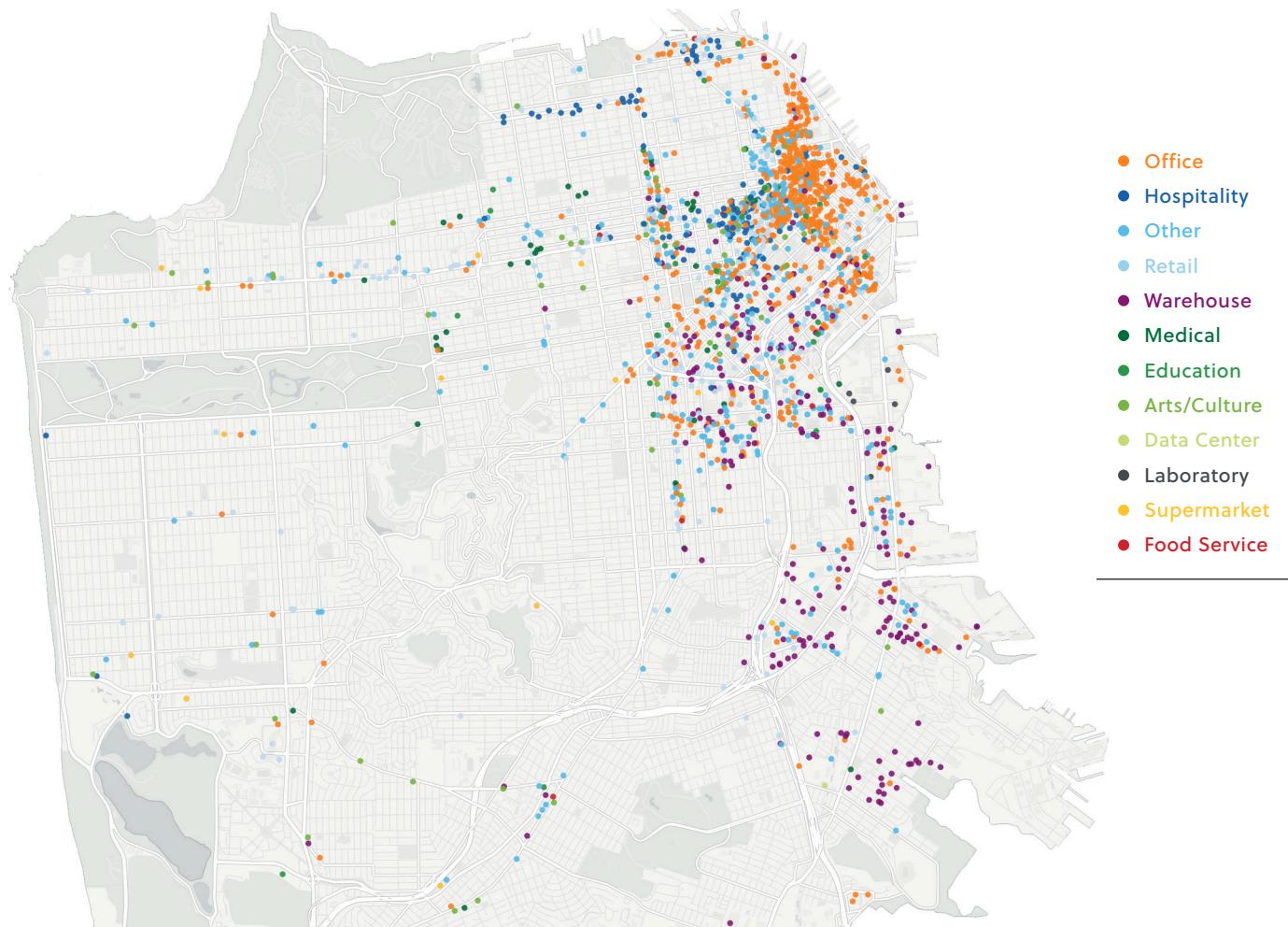


Passed in 2011, the Existing Commercial Buildings (ECB) Energy Performance Ordinance, requires annual energy benchmarking, periodic energy efficiency assessments, and public disclosure of benchmarking information for commercial buildings with 10,000 square feet or more of heated or cooled space. The energy efficiency assessment or retrocommissioning must be performed by a qualified professional at least once every five years, and must include the entire building. The ordinance was informed by the recommendations of the Mayor's Task Force on Existing Commercial Buildings and aims to empower owners, operators, managers, and occupants with strategic data to control utility costs, and to motivate owners to seize the benefits of energy efficiency for their business and buildings.

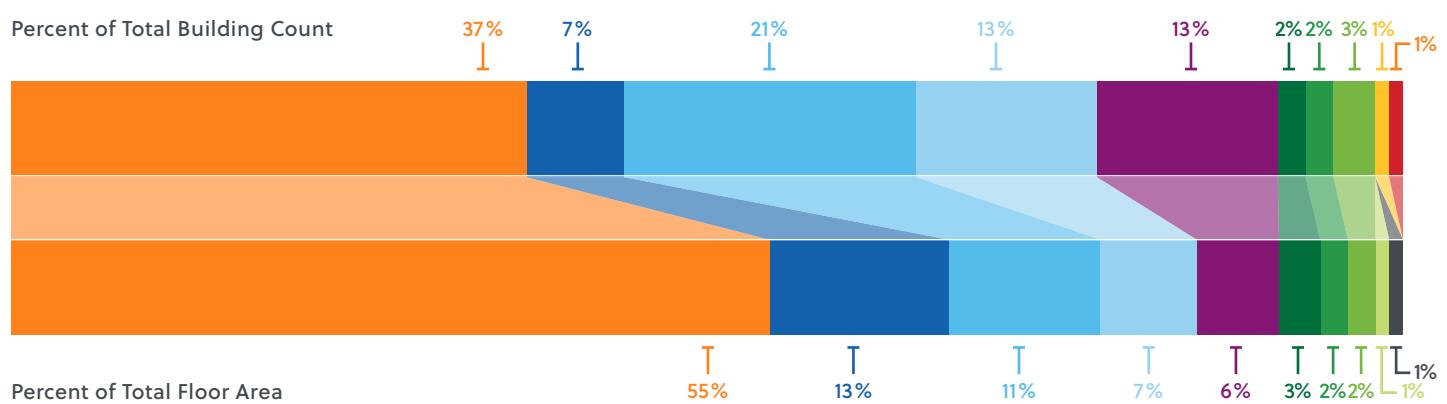
To phase in the new policy, initial reporting deadlines were staggered by square footage, starting with the largest buildings. As of 2013, all nonresidential buildings 10,000 square feet and larger have been required to annually benchmark their energy use through ENERGY STAR Portfolio Manager. As a result, decision makers are able to make peer comparisons, and audits provide actionable options for cost-effective improvements.

Building Stock

PROPERTY TYPES BY LOCATION



PROPERTY TYPE AREA VS. TOTAL BUILDING COUNT

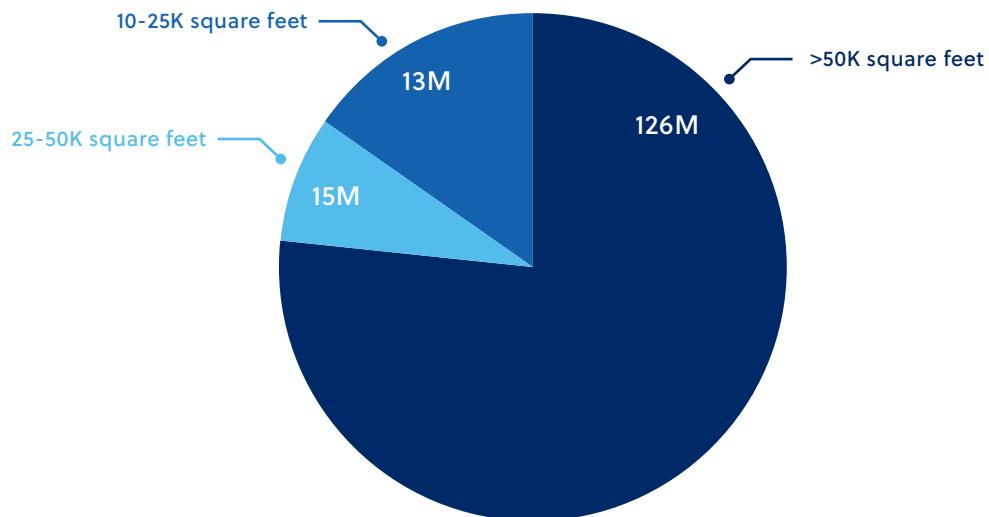


This report focuses on the 1,847 private sector buildings in San Francisco subject to the ECB ordinance. Additionally, 465 municipal facilities and schools are benchmarked annually – as detailed in a separate report by the San Francisco Public Utilities Commission, the city's water and wastewater utility, which provides electricity to public facilities, as well as water and wastewater services.¹⁴

Buildings subject to the ECB ordinance comprise 12 property/use types: arts & culture, data center, education, food service, hospitality, laboratory, medical, office, retail, supermarket, warehouse, and other. Office buildings dominate the market, constituting 55 percent (84.5 million square feet) of affected floor area. The building space governed by the ECB ordinance has risen as it has phased in:

- **2010:** Only buildings larger than 50,000 square feet were required to report—a total of 125.6 million square feet, or 81 percent of total affected floor area.
- **2011:** Buildings larger than 25,000 square feet were required to report, adding 15 million square feet, or 9.6 percent of floor area.
- **2012 and beyond:** Buildings larger than 10,000 square feet were required to report, adding 13 million square feet (8.4 percent of floor area), for a total of 153.6 million square feet subject to the ordinance.

TOTAL AFFECTED FLOOR AREA, BY BUILDING SIZE



Large commercial buildings are concentrated in San Francisco's downtown neighborhoods. The Financial District, South of Market (SOMA), North Beach, and Civic Center areas are home to nearly 77.3 million square feet of commercial office space, 18.4 million square feet of hospitality, and 7.2 million square feet of retail. The largest concentration of warehouses, 2.9 million square feet, is in the Bayview neighborhood, in the city's southeastern quadrant.

After commercial office space at 55 percent, other significant segments of the market are hospitality at 13 percent, retail at 7 percent, and warehouse at 6 percent.

Report Terms

COOLING DEGREE DAY (CDD)—a measure of how many degrees air temperature was higher than a specific base temperature (typically 65 degrees F) on a given day.

ENERGY STAR—a joint program of the U.S. Environmental Protection Agency and the Department of Energy to identify and promote energy efficient products.

ENERGY STAR PORTFOLIO MANAGER—an interactive energy management tool which allows building owners to track and assess energy and water consumption for a single building or across an entire portfolio.

ENERGY STAR SCORE— a 1-to-100 index that compares a building to similar properties nationwide, accounting for regional climate variation, intensity of use, and other key factors. A score of 50 indicates median energy performance; 75 or higher is a prerequisite for recognition for top performance. Not all property types and mixtures of uses are eligible for an ENERGY STAR score.

ENERGY USE INTENSITY (EUI) – annual energy consumption divided by gross floor area. EUI may be calculated as Site EUI (energy used on site divided by floor area), or Source EUI (site energy use plus transmission, delivery, and production losses, divided by floor area).

FULL-TIME EQUIVALENT (FTE) — the number of employees working an eight hour interval that aggregates up to a 40 hour week, e.g., one employee working eight hours five days per week equals one FTE, as does two employees working four hours five days per week. This does not include visitors such as clients or customers, but may include subcontractors and volunteers.

GREENHOUSE GAS (GHG) EMISSIONS—carbon dioxide (CO₂) and other gases released into the atmosphere as a result of energy consumption at the property. Emissions are expressed in carbon dioxide equivalent (CO₂e), which normalizes global warming potential of each gas to an equivalent quantity of carbon dioxide.

HEATING DEGREE DAY (HDD)—a measure of how many degrees air temperature was lower than a specific base temperature (typically 65 degrees F) on a given day.

LIKE FOR LIKE—a year-over-year comparison of properties that have complete data available for each year in the analysis.

WEATHER NORMALIZED—Portfolio Manager adjusts energy use data to account for periods that are hotter or colder than average (based on heating and cooling degree days).

Benchmarking Compliance

This report contextualizes San Francisco's first public release of energy benchmark data under the ECB ordinance, providing analysis of five years of energy use history. Unless otherwise noted, figures refer to 2014 benchmark data, which were required by law to be reported by April 2015. At the time of writing, benchmark reports have been accepted for 72 percent of floor area, and compliance is anticipated to reach 82 percent by year-end.

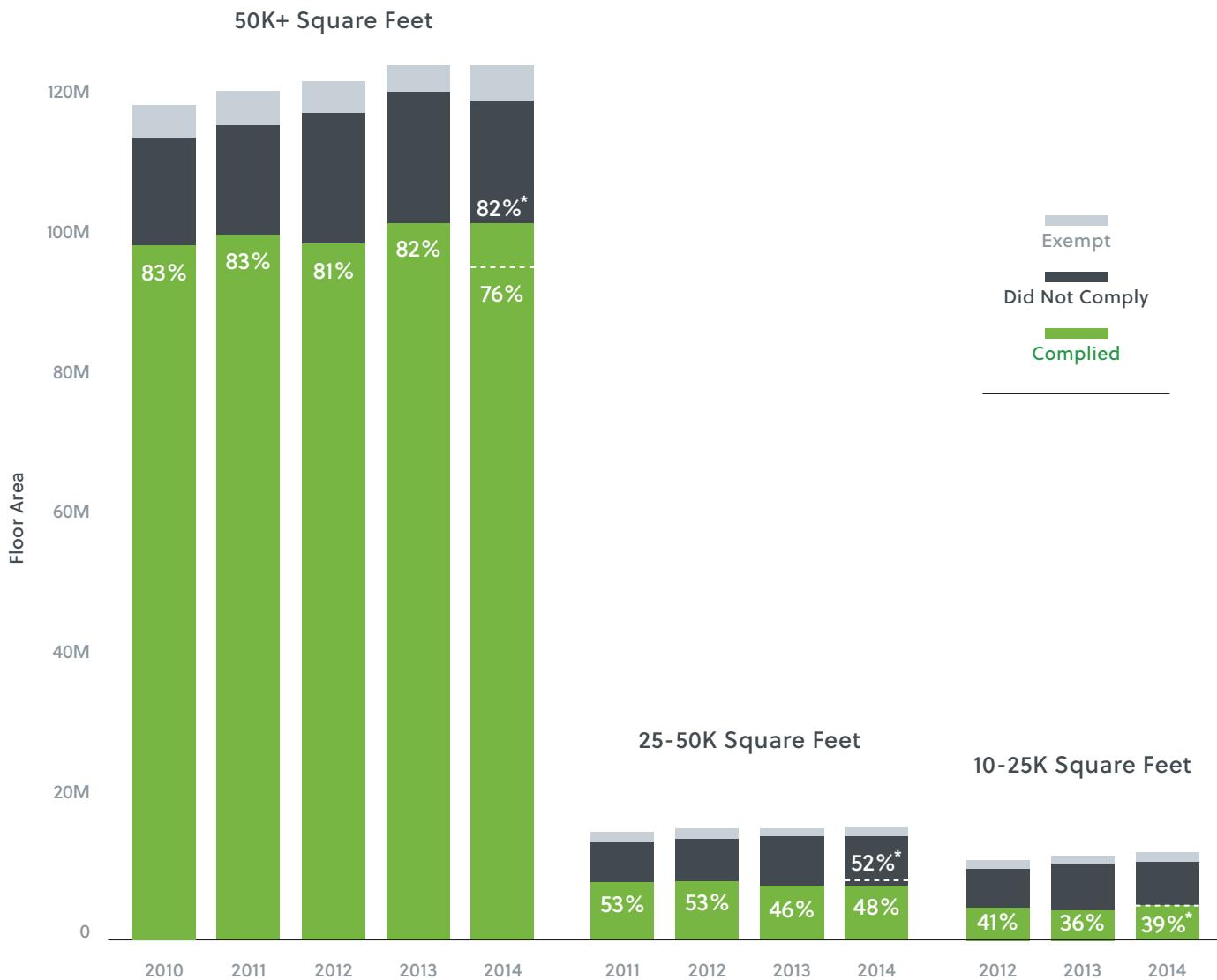
San Francisco has a unique approach, which stems from the pragmatic goal of attempting to collect as much data as possible. Unlike other U.S. cities that adopted benchmarking policies before 2015, in California, utilities and regulators have interpreted state laws as requiring consent of all separately metered tenants before an owner can obtain energy use information, and in San Francisco, 48 percent of buildings affected by the ordinance have two or more energy meters. Because owners can have legitimate difficulty obtaining the data essential to compliance, SFE has not yet issued fines for late benchmark reports, and instead provides technical assistance, written notifications, and public censure in the form of display of noncompliance on the city's open data portal (DataSF.org).

PG&E, the investor-owned utility serving San Francisco's private sector buildings, has been a key partner in energy benchmarking. PG&E served on the Task Force on Existing Commercial Buildings; the utility also sponsors a Portfolio Manager helpdesk, regular hands-on benchmarking seminars, and numerous webinars. PG&E was the first utility in the nation to offer customers direct upload of energy-use data to Portfolio Manager. Nonetheless, the requirement of tenant consent is a source of considerable friction, diverting owner and manager attention to processing forms rather than energy management.

As a result of these circumstances, SFE continues to collect data from building owners for 2014 and previous years. However, compliance (and enforcement) is anticipated to ramp up in the coming year. At the time of writing, the California legislature has voted to replace the state's Assembly Bill 1103 transactional energy performance disclosure law (1) requiring utilities to provide commercial and multifamily building owners with explicit legal authority to obtain monthly whole building energy use, by fuel type, and (2) enabling the California Energy Commission to institute annual commercial benchmarking statewide.



ANNUAL COMPLIANCE RATES (BY FLOOR AREA)



Buildings can receive one of three benchmark statuses: complied, did not comply, and exempt. Reasons for exemption in a given year include vacancy, major renovation, and (most common) a sale or lease transaction. Under the current data access regime, a building owner that does not collect historical energy-use data from a tenant before termination of the lease or from an owner at time of sale may have no means of obtaining benchmarking data for the period up to the transaction. Affected floor area has increased over the years due to growth of stock, renovation and occupancy of long-vacant properties, and sale of properties occupied by the city.

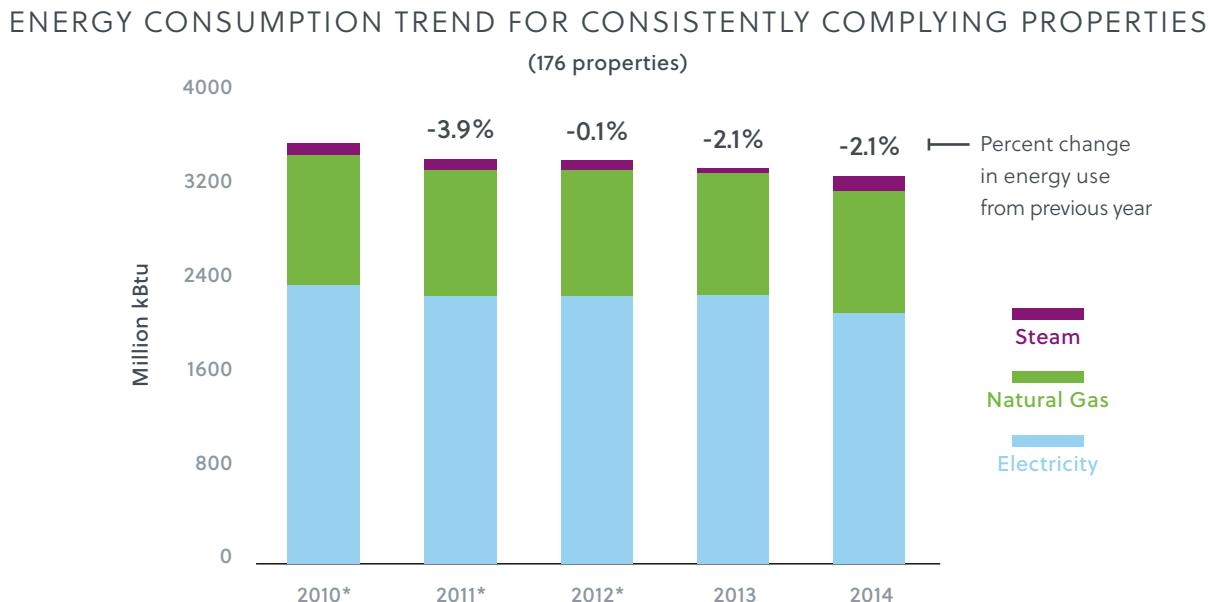
SFE enforcement outreach has targeted the largest buildings, which represent the lion's share of energy consumption. Given greater attention and resources for obtaining tenant consent to share energy use data, it is not surprising that compliance is higher for large buildings (over 50,000 square feet) than for smaller facilities. To support compliance for buildings of all sizes, SFE operates a help desk, has provided more than 90 training sessions, and continues to adjust its message and outreach.

Benchmarking Results

Trends in energy consumption

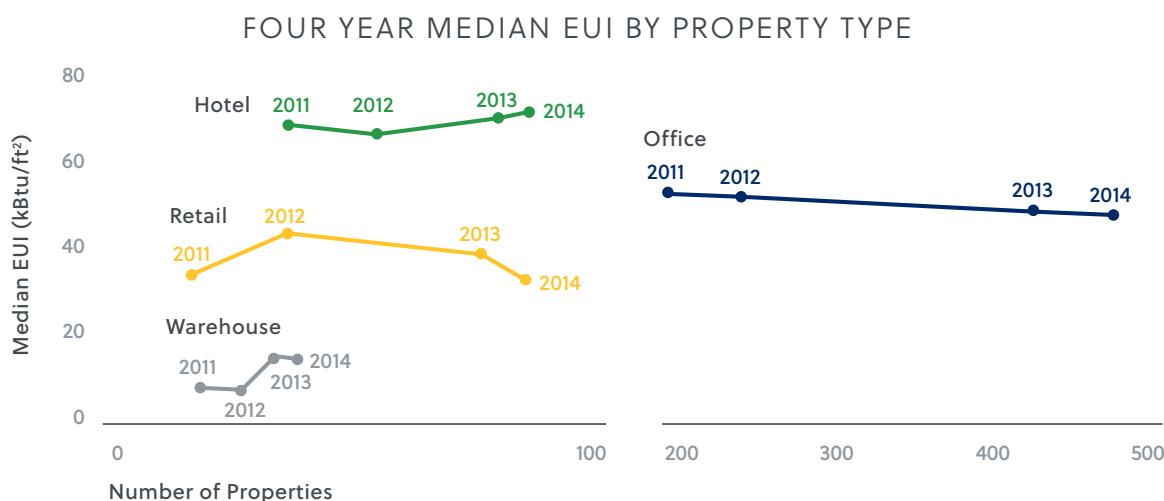
A key question in benchmarking programs is, does measurement beget management? Benchmarking establishes a baseline for comparison and tracks progress against that baseline, both for an individual building owner and across the entire stock. The cohort of 176 properties that have

benchmarked energy use consistently over the past five years demonstrated regular year-over-year savings with a 7.9 percent overall reduction—strong progress toward San Francisco's energy reduction goals as stated in "San Francisco's Climate Action Strategy – 2013 Update."



As additional office properties have joined the program over the years, median site energy use intensity (EUI) for the cohort of all benchmarked buildings has decreased. Hotel, retail, and warehouse properties, however, do not show a clear trend in EUI. This could be attributable to the increasing number of

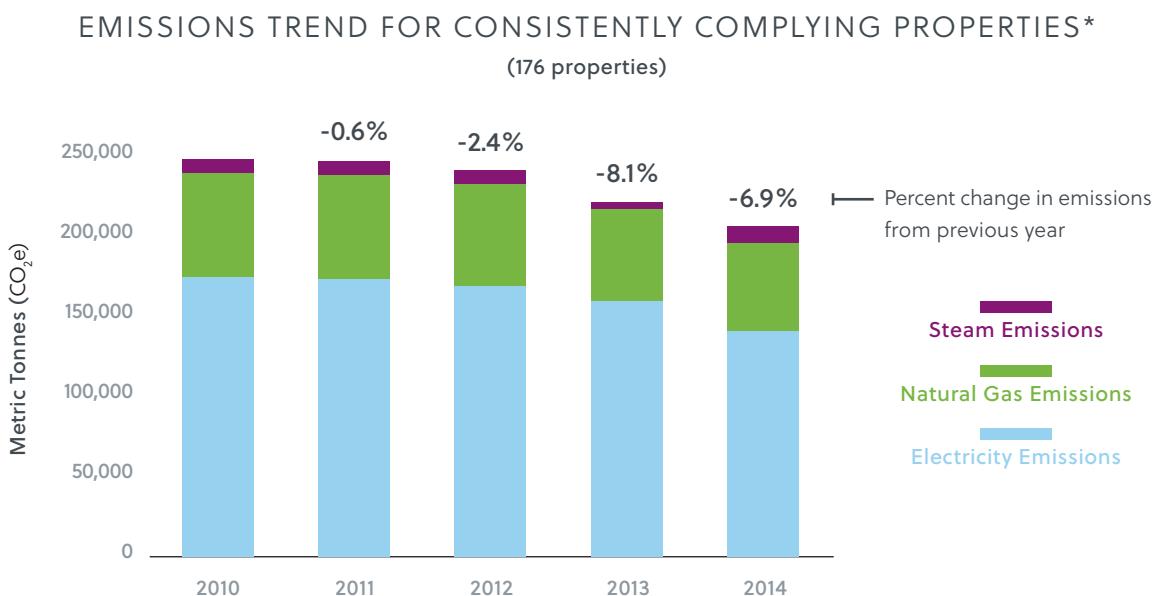
high-energy-intensity properties reporting in those sectors, and to changes in consumption due to increasing activity at the properties—i.e. more retail shoppers and more hotel guests, as noted in the "Unique Market for Sustainable Real Estate" section.



Trends in Emissions

San Francisco committed to meeting and surpassing Kyoto Protocol targets by 20 percent, and ICF International has verified community-wide Scope 1 and 2 emissions in 2012 were 23 percent lower than in 1990.¹⁵ Just over half of San Francisco's greenhouse gas (GHG) emissions come from energy used in the city's residential and commercial buildings. Reductions in emissions from buildings have come from both cleaner electricity supply and more efficient operations.¹⁶

GHG emissions from the buildings benchmarked in 2014 are estimated by Portfolio Manager to be 494,000 metric tonnes—equivalent to emissions from 104,000 passenger vehicles or the combustion of 1.1 million barrels of oil. For the benchmarked buildings in 2014, electricity accounts for 68 percent of GHG emissions, natural gas for 27 percent, and steam for 6 percent. Office properties account for 280,556 metric tonnes, or 57 percent of the total emissions. From 2010 to 2014, the cohort of consistently complying properties source GHG emissions declined by 16.9 percent - a significant improvement. Energy audits document significant opportunities for energy-use efficiency and reductions while continued progress toward California's Renewable Portfolio Standard goals reduce emissions per unit of electricity consumed.¹⁷



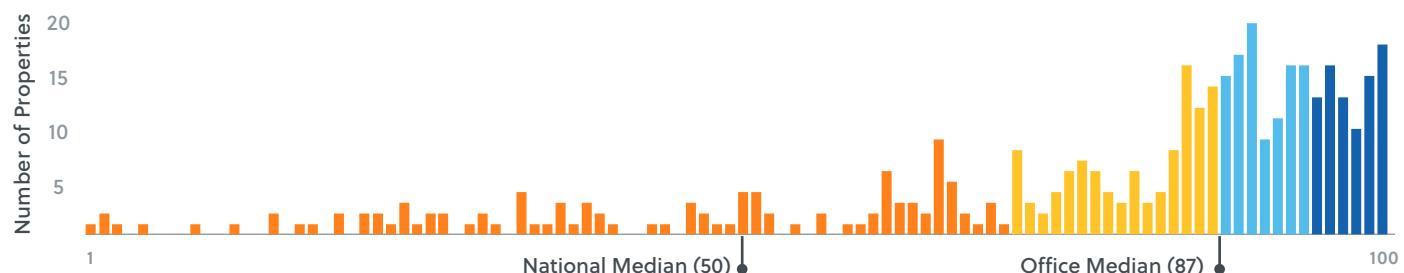
*Emissions by type are calculated using the PG&E 2013 emissions factors for electricity and natural gas. The steam emissions factor is a general factor used by the U.S. Environmental Protection Agency and applied to data in Portfolio Manager.

Office Benchmarking Results

In a robust economy with high occupancy and growing property values, median reported office site energy use intensity is 27 percent below the national median, and the median ENERGY STAR score is 87 on a scale from 1-100. Nonetheless, audits have identified considerable opportunity for ongoing improvement.

PROPERTY TYPE	OFFICE
# of Properties	479
SF of floor area	70,618,411
Energy Like for Like 2013-2014 (418 properties)	-3.3%
Total GHG Emissions (MT CO ₂ e)	278,843
Compliance Rate	84%

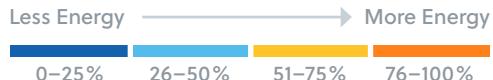
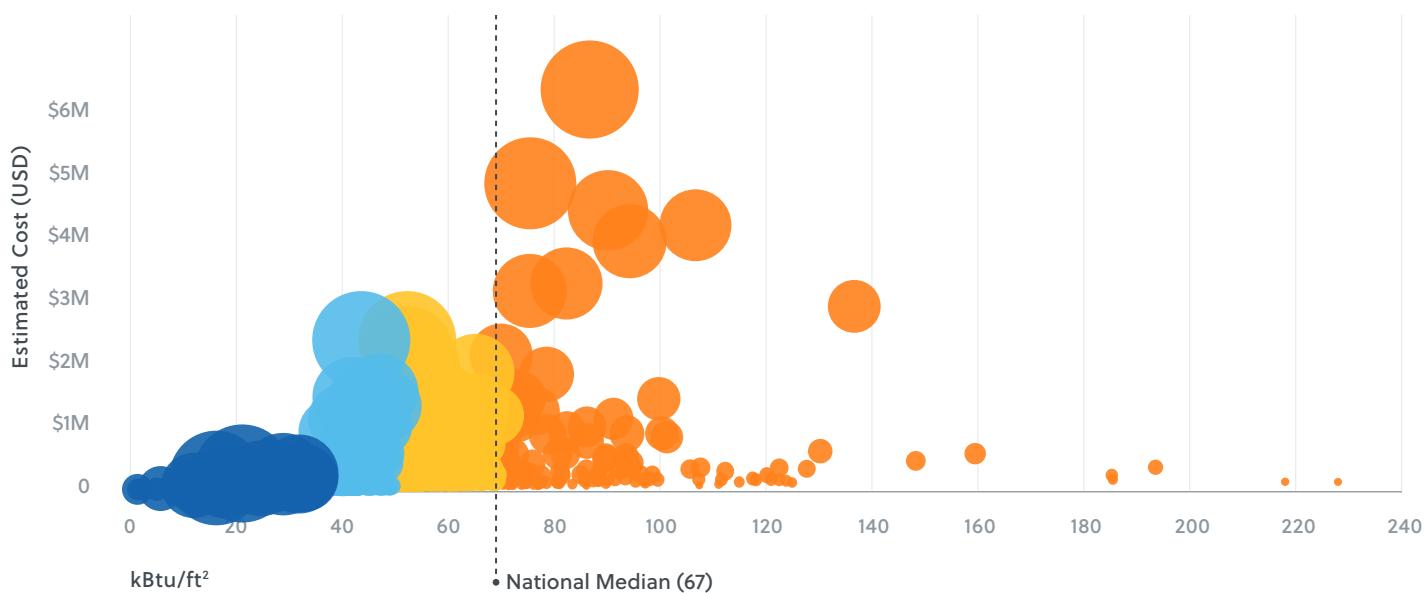
ENERGY STAR SCORE DISTRIBUTION



ENERGY USE INTENSITY



ESTIMATED UTILITY COSTS/SITE EUI



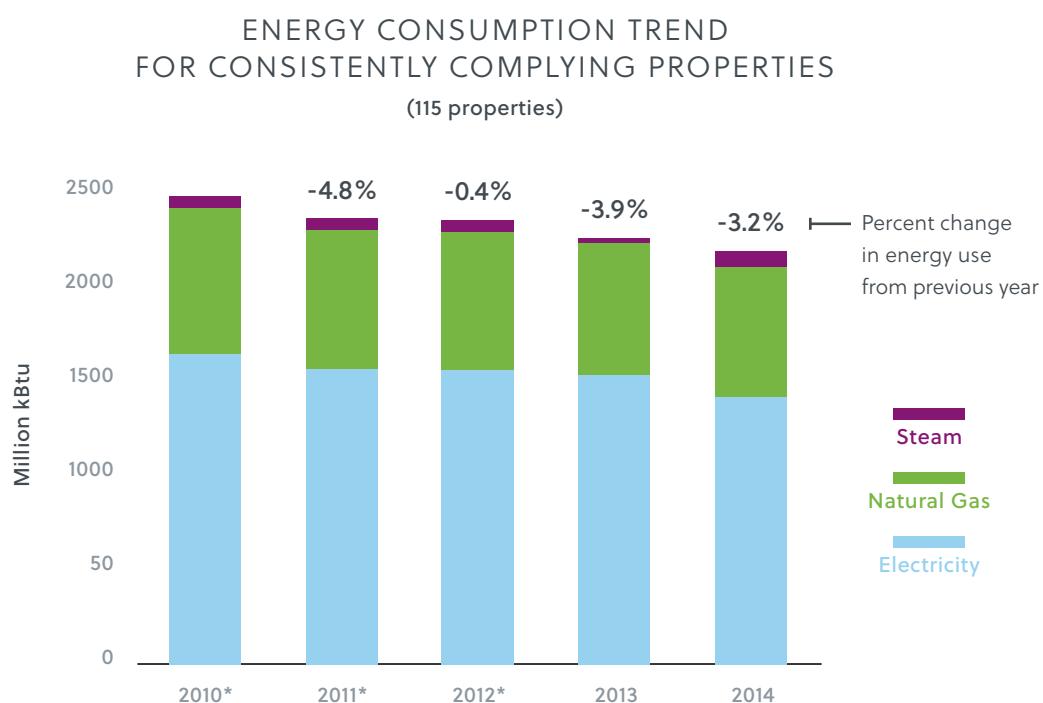
For office properties, size generally correlates with energy use. The largest 10 percent of participating office properties account for 50 percent of reported energy use in the overall sample.

While many properties are performing better than the national median, a handful of outliers are particularly energy-use intensive. These outliers tend to be relatively small, so in most cases absolute consumption is modest, but they may have the opportunity to make improvements and perform more like other small buildings.

ULI Greenprint estimated energy cost per kBtu for all benchmarked facilities by extrapolating from energy cost per commodity reported to ULI Greenprint by its members in San Francisco. The resulting cost per kBtu aligned with the average utility costs per kBtu for energy consumed in San Francisco.

Trend for Consistently Complying Office Properties

An 11.8 percent (286 million kBtu) reduction in energy consumption was observed across the 115 office properties that consistently reported energy data from 2010 to 2014. This is a considerable improvement; office is both the largest sector analyzed and showed the strongest overall reduction. An annual average reduction of approximately 3 percent for existing buildings is greater than the baseline reduction estimated by the Existing Commercial Buildings Task Force (1.3 percent) and is reasonably consistent with the task force's suggested goal of 2.5 percent annual average reduction.

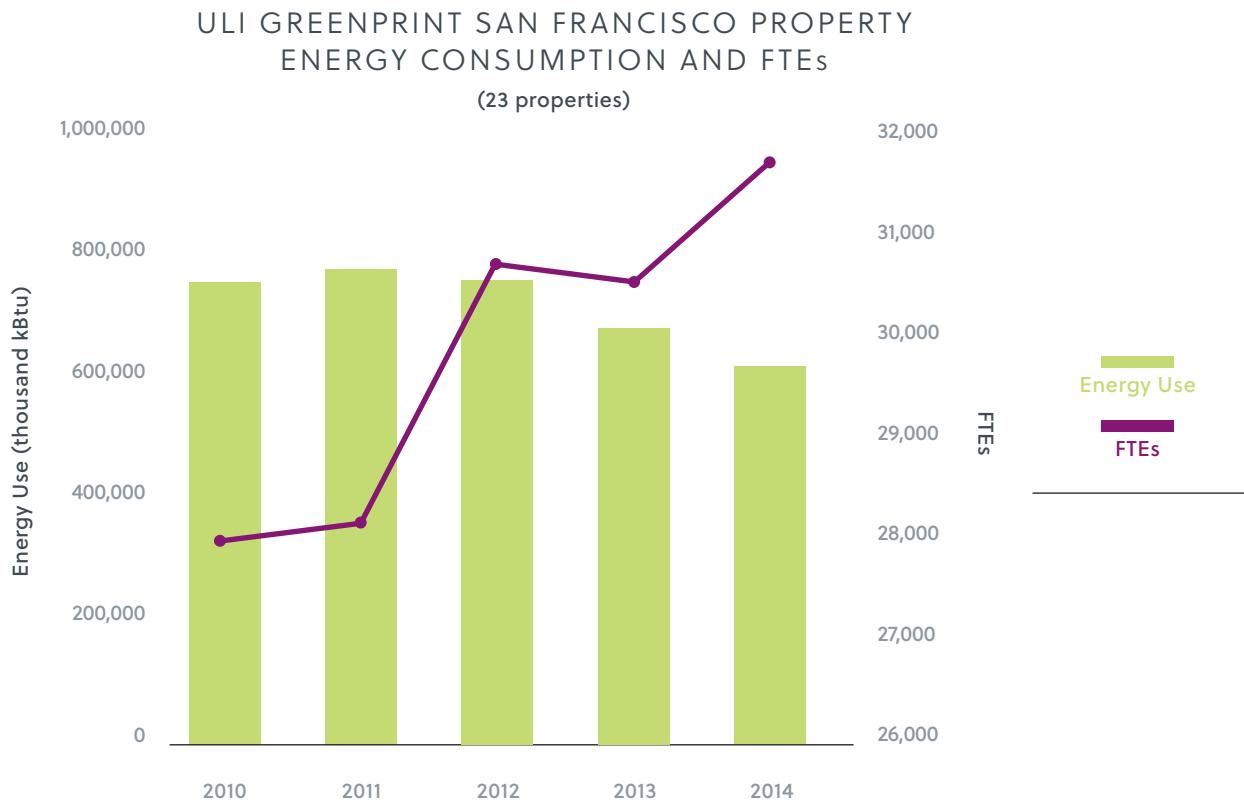


* The mix of energy sources for 2010–2012 is based on reported averages from 2013 and 2014; only total energy intensity (kBtu/ft²) was collected in 2010–2012.

Office Occupancy and Energy Consumption

The number of people using a building is a major driver of energy consumption; for example, more people working in a building requires a larger number of computers, each consuming more power while contributing to heating, cooling, and ventilation loads. SFE currently collects little data on building occupant density, but local market experts indicated occupant density is increasing rapidly in the San Francisco market, following—and perhaps leading—the national trend.

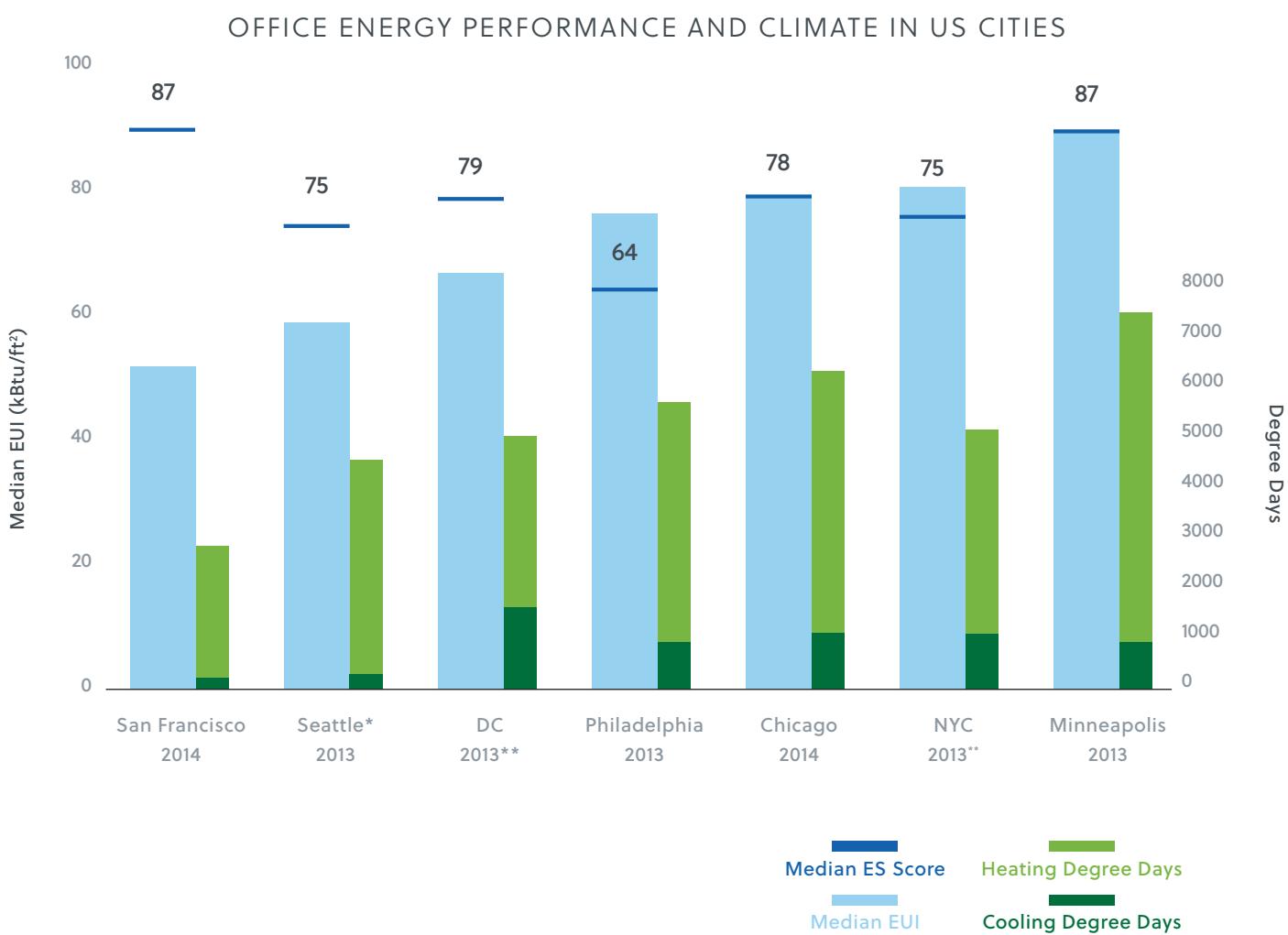
ULI Greenprint, which collects detailed information from over 5,000 participating properties worldwide analyzed data from 23 member office properties in San Francisco and provided aggregate results to SFE for this report. Local ULI Greenprint members report that full-time equivalent occupants (FTE) per building increased 13 percent from 2010 to 2014 and net energy use declined 18 percent, resulting in a nearly 28 percent decrease in energy use per FTE. This complements the macro-level trend of improving economic and environmental metrics observed in Unique Market for Sustainable Real Estate with micro-level evidence the same phenomenon in major facilities in the local market.



Comparison with Other Cities

Compared with other cities that have published benchmarking results, San Francisco office buildings reported the lowest median EUI (49 kBtu/ft²) and one of the highest median ENERGY STAR scores (87). EUI is a strong factor in ENERGY STAR Score calculations, but a variety of other factors affect a property's score. It is critical to note that among the 15 U.S. local governments with benchmarking policies, San Francisco has the mildest climate. The ENERGY STAR scoring method

considers both climate – local long term average weather summarized in heating degree days (HDD) and cooling degree days (CDD) – and weather (temperature variations from long term average during the performance year). In San Francisco's mild climate, energy consumption in commercial office towers is frequently more driven by internal loads than heat exchange through the envelope, a trend that is enhanced by California's strong energy codes.



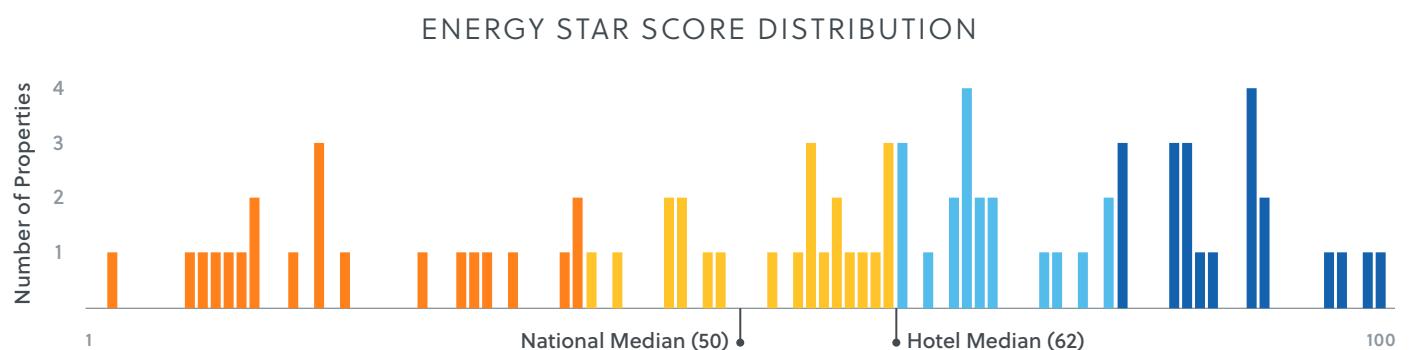
* Not weather normalized

** Calculated from city-published open datasets. Official figures may differ slightly

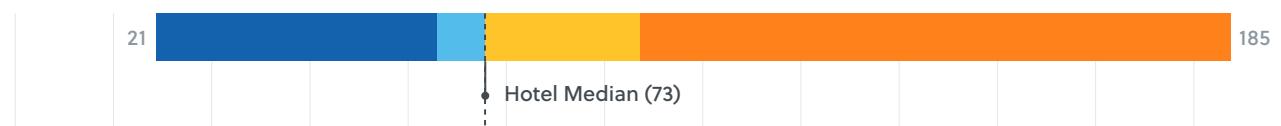
Hotel Benchmarking Results

The hotel sector in San Francisco is performing better than the national median in terms of ENERGY STAR score, but is on par with the national median with regards to EUI, which is consistent with the city's position as a top U.S. travel destination. From 2012 to 2014, the number of tourists traveling to the city increased by 7 percent and the number visitors by 14 percent.¹⁸ The local hotel occupancy rate in 2014 was 87 percent,¹⁹ significantly above the national average of 64 percent.²⁰ A large number of rooms and workers per San Francisco hotel likely contributes to the average EUI values combined with high ENERGY STAR scores.

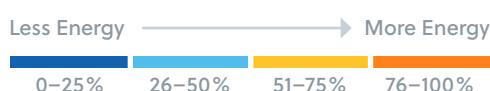
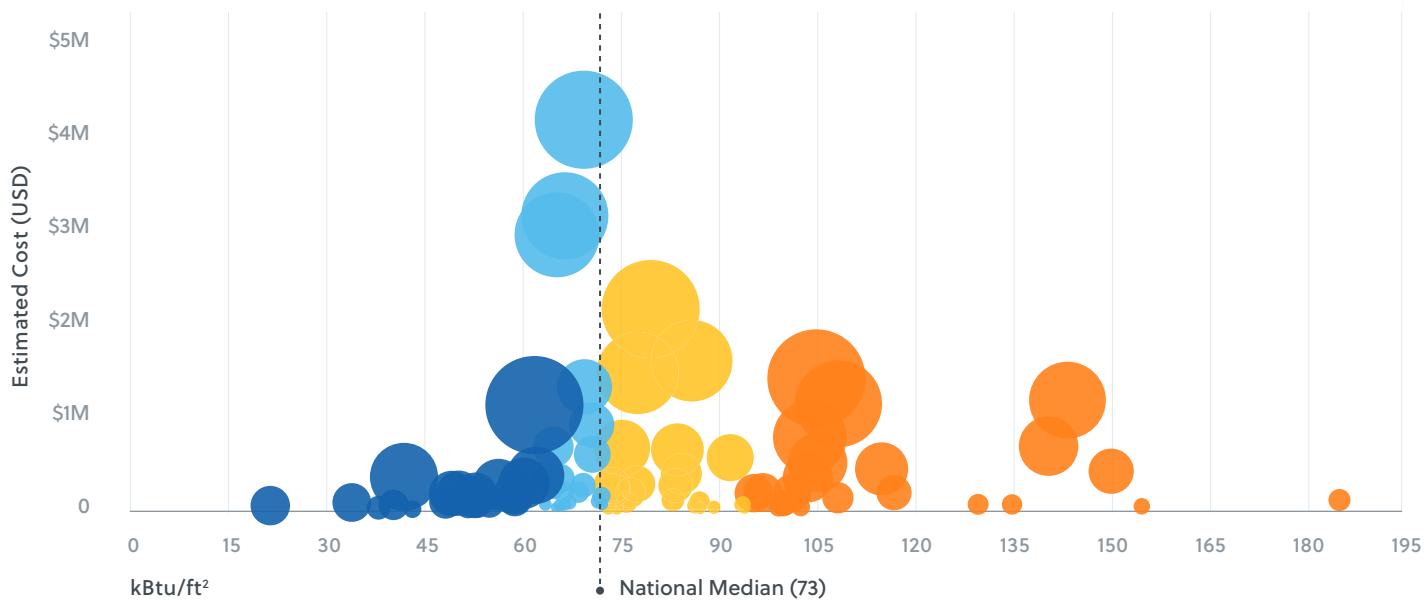
PROPERTY TYPE	HOTEL
# of Properties	88
SF of floor area	16,607,305
Energy Like for Like 2013-2014 (80 properties)	-3.6%
Total GHG Emissions (MT CO ₂ e)	71,427
Compliance Rate	94%



ENERGY USE INTENSITY



ESTIMATED UTILITY COSTS/SITE EUI



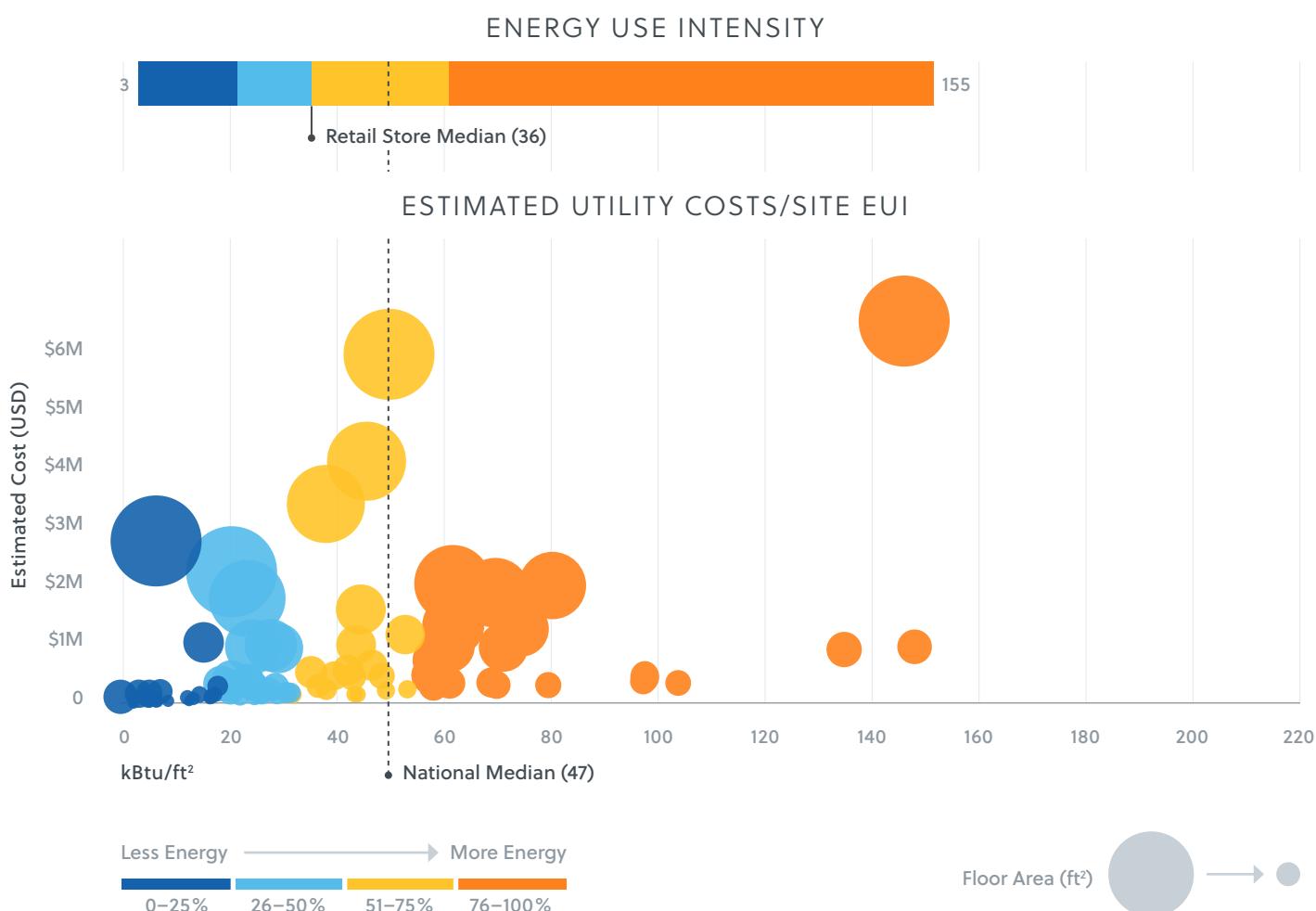
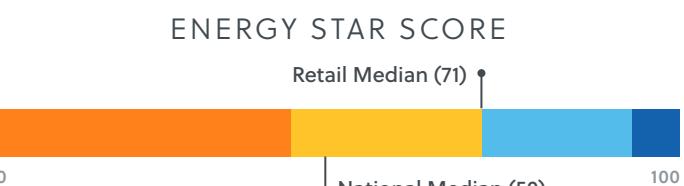
Retail Benchmarking Results

As noted in "Unique Market for Sustainable Real Estate," the San Francisco retail market is strong, and many retailers are seeking opportunities to expand into the city. With strong demand and limited development of new retail space, vacancy is low and rents continue to rise.²¹ Due to the importance of lighting to retail energy use, incentive programs and codes have prioritized installation of LED in recent years, which likely contributed to the declining reported median EUI for the sector from 2012 to 2014.

PROPERTY TYPE	RETAIL STORE	ENCLOSED MALL*
# of Properties	81	4
SF of floor area	4,839,913	723,825
Energy Like for Like 2013-2014 (72 retail stores, 4 enclosed mall properties)	-5.9%	-2.3%
Total GHG Emissions (MT CO ₂ e)	14,718	2,386
Compliance Rate	49%	

*Excluded due to limited data

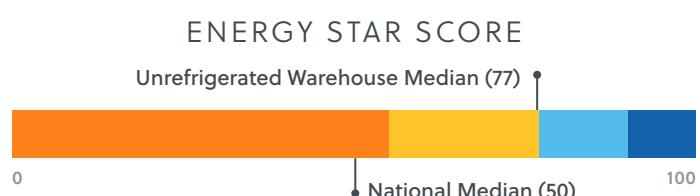
No consistent relationship was observed between retail building size and energy use per square foot, but as would be expected, smaller retail properties consume less energy overall than large ones, resulting in lower energy costs. However, a handful of outliers exhibit particularly high energy consumption and relative costs. These properties should be prioritized for outreach based on audit results in order that they can develop a program to improve performance and cut energy expenses.



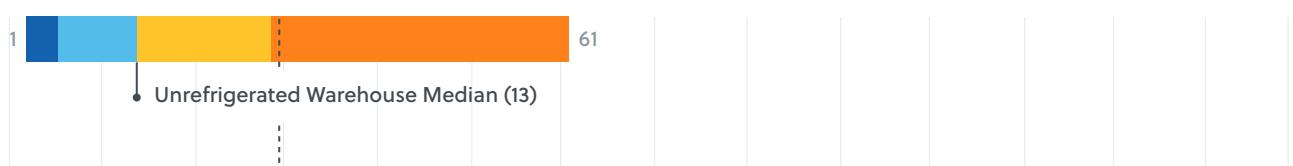
Warehouse Benchmarking Results

Demand for warehouse space in San Francisco has grown each year. Economic recovery and rising consumer spending have led to a low 5 percent vacancy rate. The current average asking rent is up 26 percent from 2011 and 5 percent from the previous record high in 2007.²² Unrefrigerated warehouses perform much better than the national median EUI and have a high median ENERGY STAR score for the sector. Refrigerated warehouses also perform better than the national median EUI, possibly due to both strong local energy codes and the city's mild climate. Refrigerated warehouses also report a low median ENERGY STAR score, potentially due to the small sample size.

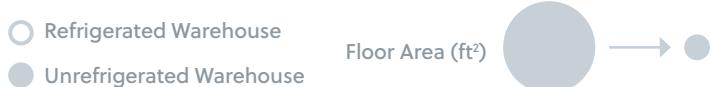
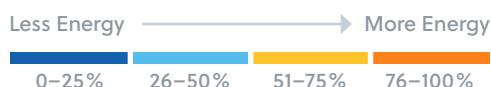
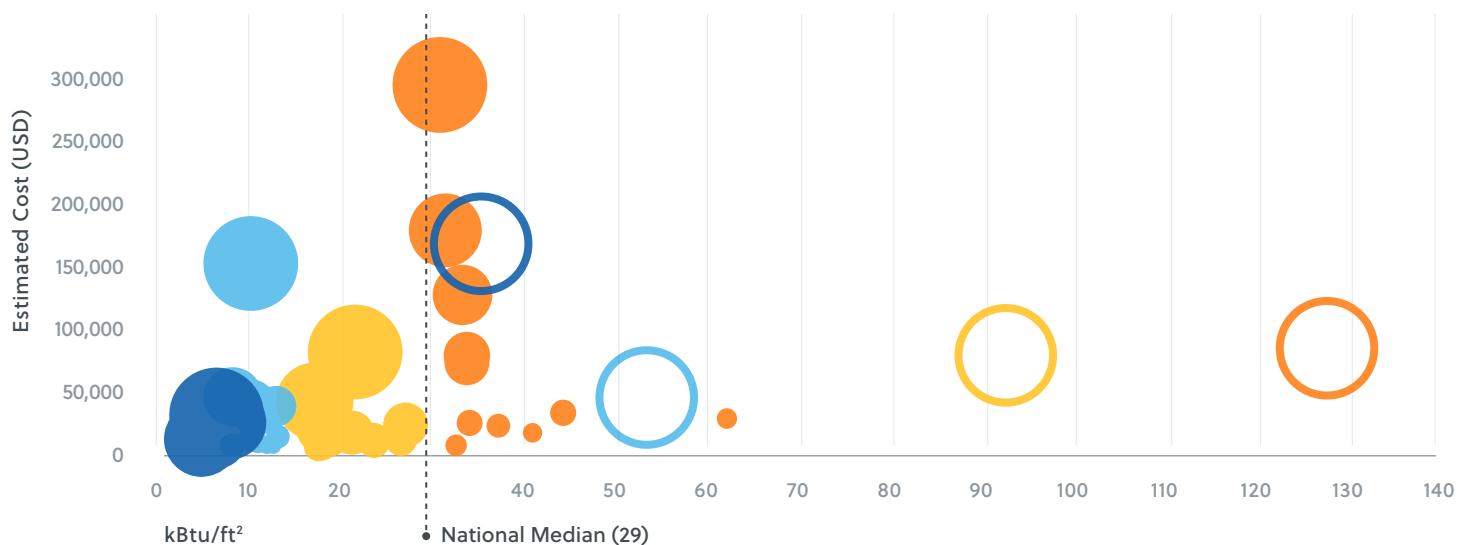
PROPERTY TYPE	UNREFRIGERATED WAREHOUSE	REFRIGERATED WAREHOUSE
# of Properties	44	4
SF of floor area	3,188,098	200,572
Energy use, like-for-like change, 2013–2014 (38 unrefrigerated warehouse, 1 refrigerated warehouse property)	-3.4%	9.0%
Total GHG Emissions (MT CO ₂ e)	3,177	777
Compliance Rate	43%	



ENERGY USE INTENSITY



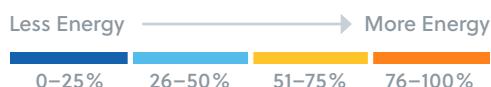
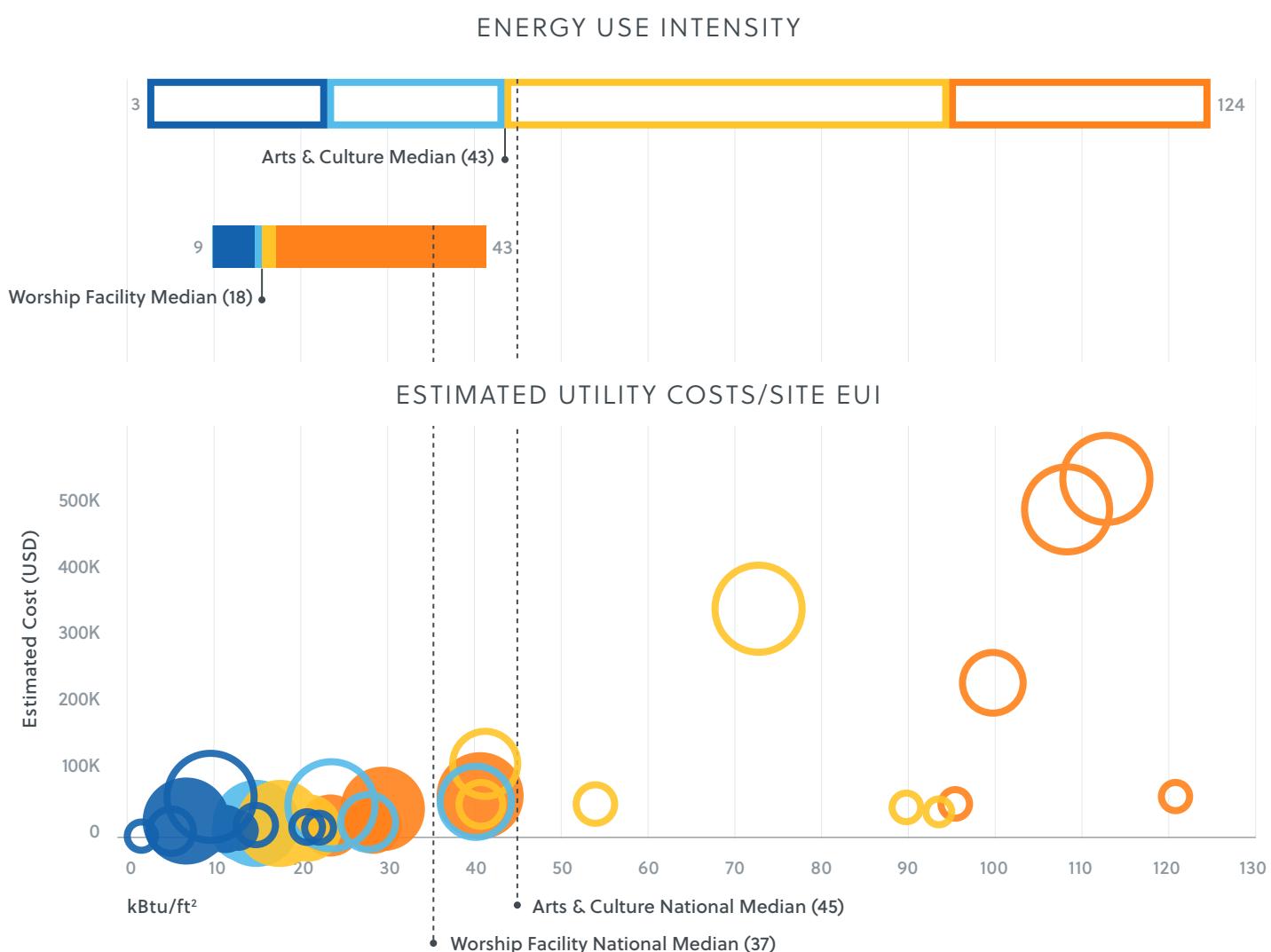
ESTIMATED UTILITY COSTS/SITE EUI



Arts & Culture Benchmarking Results

Arts and culture facilities are major features of the San Francisco market, and the number of museums and theater performances in this culturally dense city continue to increase. The median ENERGY STAR score of worship facilities (the segment eligible for a score) is 89.

PROPERTY TYPE	ARTS & CULTURE	WORSHIP FACILITY
# of Properties	21	17
SF of floor area	956,807	455,101
Energy Like for Like 2013-2014 (18 arts & culture, 16 worship)	-1.6%	-2.6%
Total GHG Emissions (MT CO ₂ e)	3,827	498
Compliance Rate	61%	



Audit Results

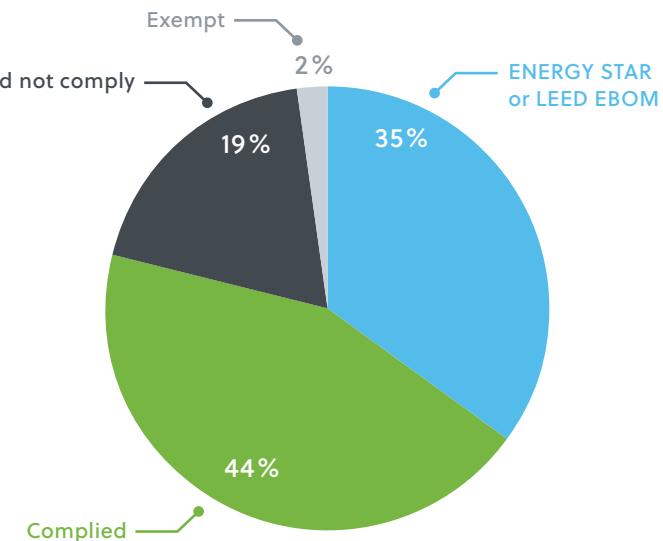


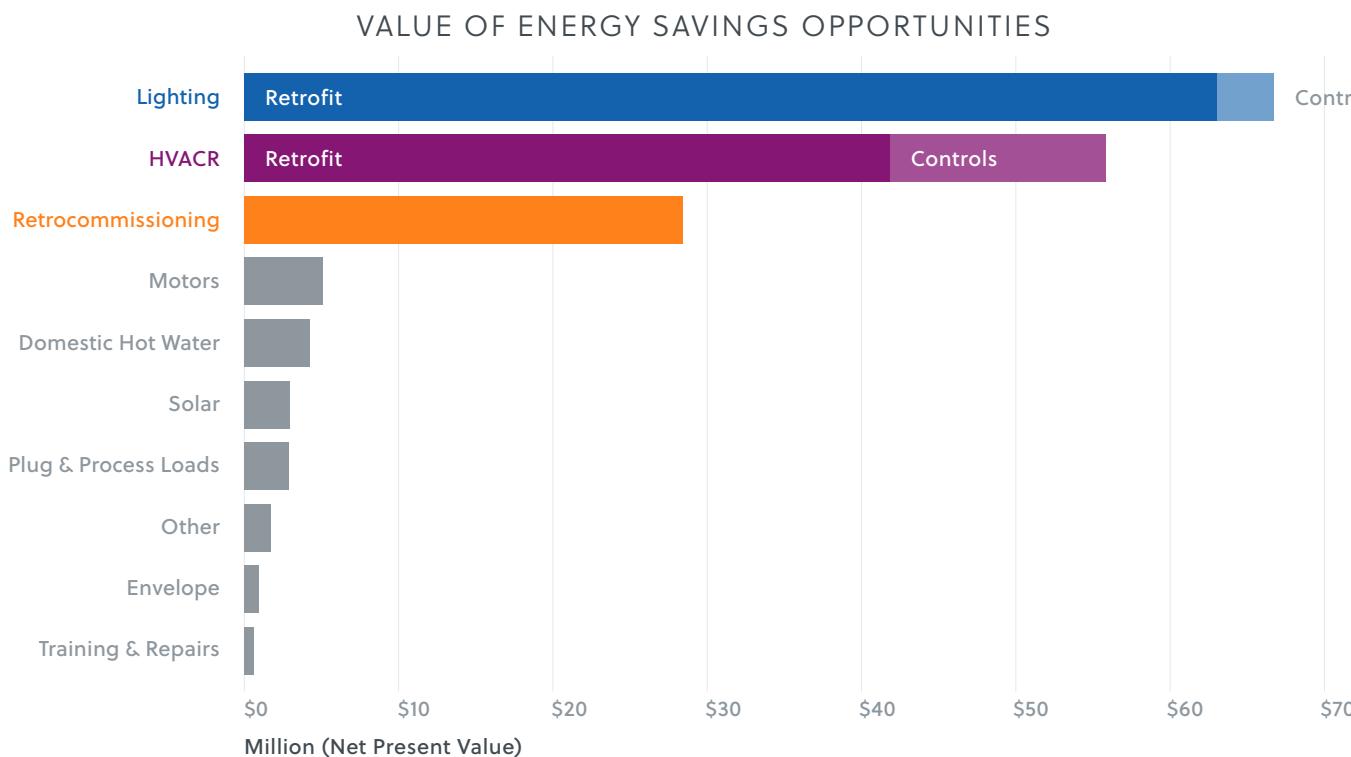
Benchmarking is a foundation for energy management, but is only the starting point to achieving energy savings. Members of San Francisco's Task Force on Existing Commercial Buildings agreed that in order to be motivated to cut energy use and GHG emissions, owners, managers, and tenants must have an actionable proposal itemizing the energy—and money—they can save. The ECB ordinance requires that affected buildings have a qualified professional assess energy efficiency opportunities in the entire facility, including leased space, every five years. Buildings of 50,000 gross square feet or larger are required to undergo an ASHRAE "Level 2" assessment or retrocommissioning (see inset), while 10,000- to 49,999-square-foot facilities are required to receive a "Level 1" assessment—simpler and commensurate with typical scale and complexity of smaller buildings. Sites that maintain third-party operational certifications based on measured performance (ENERGY STAR or LEED for Existing Buildings Operations & Maintenance) are exempt because they show ongoing evidence of effective energy management.

Audits required by the ordinance generally are not subsidized by utility ratepayer programs; the investment is borne by the building owner. In this context, compliance with the audit

requirement has been remarkable: 79 percent of affected floor area in San Francisco has either undergone an audit in the past five years or earned operational certifications. Over 80 percent of the 67 million square feet assessed by a professional received a Level 2 audit for energy efficiency opportunities. While the ordinance recognizes a range of potential qualifications for energy assessment professionals, owners have a strong preference for professional engineers (PE): two-thirds of audits have been performed by licensed PEs.

AUDIT COMPLIANCE BY FLOOR AREA





Energy audits are necessarily flexible—a balance between time and effort, potential savings and cost. The systems employed in a building are the product of use, vintage of construction, codes, fashions of engineering and construction, and eccentricities created through renovations both major and minor through the years. Similarly, financial assumptions in an energy efficiency upgrade proposal are informed by owner priorities and investment criteria, and ideally current capital market metrics.

In the 817 buildings assessed by September 2015, more than \$60.6 million in cost-effective energy efficiency investment opportunities were identified by the auditors, which were estimated to yield \$25 million in annual savings and capture \$170 million in net present value over the lifetime of the projects. If implemented, these projects would cut annual electricity consumption by 150 GWh and save 1.4 million therms of natural gas per year, with a portfolio-wide payback of three years.

Audit Data Cleansing

Energy efficiency measures in audits submitted to SFE were standardized in three ways:

1. For each measure, auditors quantified costs and benefits, categorized by systems affected (in a defined data hierarchy) and provided a brief description (unstructured data).
2. SFE reviewed each measure to allow for correction of omissions and errors and verification of atypical results.
3. Net present value for each measure was recalculated by SFE:
 - a. The duration of benefits for each measure was standardized in accordance with California's reference Database of Energy Efficiency Resources (DEER).²
 - b. A five percent discount rate was applied.
 - c. Energy and cost savings estimated by energy service professionals were not changed.
 - d. All reported measures with negative net present value were omitted, and estimated benefits were assumed to be solely attributable to energy savings.³



Audits have been valuable for real estate decision makers and the city. Stakeholders, particularly owners, managers, and tenants, receive actionable proposals for energy-saving capital and operational improvements, which are backed in part by the \$1 billion that California ratepayers invest in energy efficiency annually through utility incentives or other financial mechanisms. In the process, the city receives critical leads on energy efficiency opportunities, which it is following up on by offering incentives and installation quality assurance through the San Francisco Energy Watch program and access to off-balance sheet capital via the GreenFinanceSF property-assessed clean energy (PACE) financing program. Audit data inform the offerings, opportunities, barriers, and policy tools needed to keep San Francisco on the path to energy optimization.

Levels of Energy Audits

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) defines levels of thoroughness in energy efficiency assessments. Increased effort yields greater specificity and certainty, as well as increased energy savings and assessment cost.

Preliminary Energy Use Analysis: Compare energy use per square foot to similar buildings. (San Francisco Department of the Environment requires this step to include review and validation of Portfolio Manager data.)

Level 1: Audits identify rough costs and savings for no-cost and low-cost energy saving opportunities, and highlight potential capital improvement, based on a site inspection and analysis of historic energy use.

Level 2: Audits identify no-cost and low-cost opportunities, with significant engineering analysis of energy efficiency measures—taking into consideration financial plans and capital-intensive energy savings opportunities.

Level 3: Audits provide detailed engineering and financial analysis of major capital investments. While a Level 3 is sometimes referred to as “Investment Grade,” it is common to base a go/no-go decision on a Level 2 assessment.

Opportunities



The information collected through the ECB ordinance has created a foundational data set to raise awareness, increase transparency, and accelerate continued adoption of energy efficiency best practices and technologies. This regulation and the results outlined in this report speak to the general leadership of the community – city, private sector, and utility – in advancing effective energy management practices. However, there are many opportunities to increase the power of the data and the productivity of the legislation. While the analysis presented in this document is a collaboration, this section differs. The following are constructive suggestions from ULI Greenprint to SFE.

Outreach

ULI Greenprint encourages SFE to continue to scale up outreach efforts. Considerable resources are available: the agency maintains a help desk that addresses issues specific to reporting and data quality. PG&E also offers a helpdesk focused on data access and provides six to ten in-person, hands-on benchmarking training sessions each year, an on-demand webinar, and click-by-click guide to benchmarking. However, though the city provided considerable training at the launch of the ordinance (at least 30 training events in each of the first three years), there remains considerable opportunity to reinvigorate outreach content and engage more building owners, operators, and contractors—particularly small buildings—in benchmarking and data quality. The goal of increased outreach would be to saturate the market with information about benchmarking and increase the amount and quality of submitted data.

Providing feedback, best practices, and lessons learned on data collection, the decision making process, and implementation of environmental performance improvements could help motivate participation. Providing more positive recognition, such as an award from the mayor for best performers to facilities that improve the most, and those that comply most consistently, can also stimulate participation.

Additional Metrics

SFE should consider collecting additional data of interest, such as occupancy, utility costs, water consumption, and the energy mix at each property. With the exception of water and energy costs, the data are already entered in ENERGY STAR Portfolio Manager and should be collected to provide crucial context for performance data. Additional data can help the SFE correlate changes in performance with other metrics, enabling a deeper examination of trends, which can help inform policies and support further efficiencies.

As an example, ULI Greenprint collects FTE data alongside energy and water data. This allows members to benchmark performance and understand shifts in resource consumption attributable to changes in how their properties are occupied. This is relevant where the historic design standards associated with offices are shifting and workplaces become more dynamic, with fewer traditional offices, more common areas, and a higher worker density.

Accelerate Data Collection and Publication

Given that the legislature has acted to ameliorate the structural problems with data access (vis à vis Assembly Bill 802), ULI Greenprint recommends that SFE institute a more formal disclosure schedule. The schedule should include a deadline for submitting the data for compliance, a timeline for data quality review, and a release date for the data and formal reporting. This suggestion will help the data more readily support a market transformation around building energy use.

Multifamily and Mixed Use

San Francisco's policy does not currently apply to large residential properties. Collecting consent from each resident, particularly considering ongoing churn of leases, is challenging for building owners under current California information practices. However, more than two-thirds of San Francisco housing units are in properties with five or more units. Mixed-use properties with residential space constitute not only a substantial portion of the city's existing built environment, but also the predominant program in the development pipeline. There is an opportunity to work with utilities to provide aggregate data in multitenant occupied properties. As the state appears to be moving to mitigate the problem of data access for these properties, ULI Greenprint recommends that San Francisco expand data requirements to apply to all large buildings, as is being done successfully in New York City, Seattle, and other major US cities with energy benchmarking requirements.

Appendix

Data Cleansing

Benchmarking data are reported by building owners through ENERGY STAR Portfolio Manager. Factors influencing data quality include manual data entry, requirement to renew consent after installation of “smart” meters (which are in ongoing deployment), tenant or electrical-system reconfiguration, omission of meters, or unfamiliarity with the Portfolio Manager user interface. All benchmark reports are reviewed by SFE staff at the time of submission, and incomplete reports are not accepted. Energy audits provide a second level of third party review of benchmark data. Nonetheless, as in all U.S. city benchmarking regimes, data cleansing was necessary for meaningful analysis.

Properties reporting exceptionally high or low energy intensities (below 1 kBtu/ft² or over 1,000 kBtu/ft², in line with the U.S. Department of Energy Building Performance Database cleansing standard) were omitted, as were properties reporting gross floor area of less than 100 square feet or over 7 million square feet. To compare data from one year to the next, properties with large year-over-year changes in total energy use (examples included a reported increase of 100 percent or a decrease of 80 percent) were also excluded. After cleansing, 75 percent of the benchmark reports received were accepted as complete and reasonable by SFE. In this report, all cited energy-use data are weather normalized by site consumption.

Notes

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² San Francisco Department of the Environment (2013) Climate Action Strategy Update http://sfenvironment.org/sites/default/files/engagement_files/sfe_cc_ClimateActionStrategyUpdate2013.pdf.

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⁵ GBIG (2015) Green Building Information Gateway Place: San Francisco CA <http://www.gbig.org/places/25804>.

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⁷ World Green Building Council (2012) Government Leadership Awards http://www.worldgbc.org/files/1213/9510/0082/leadership_award_winners_booket_web.pdf.

⁸ CBRE (2015) National Green Building Adoption Index <http://www.cbre.com/o/international/RGRCEN/Pages/Home.aspx>.

⁹ US Bureau of Economic Analysis <http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#>.

¹⁰ National Council of Real Estate Investment Fiduciaries (NCREIF) reference

¹¹ California Employment Development Department and the Bureau of Labor Statistics, Quarterly Census on Employment and Wages. [#sthash.NG2qbIKx.dpuf](http://sfbarometer.weebly.com/economic-indicator-sources-and-notes.html).

¹² PG&E Green Communities (2014)

¹³ See, for example Eichholtz, Quigley, Kok (2013) The Economics of Green Building; Kok, Jennen (2012) The Impact of Energy Labels and Accessibility on Office Rents; World Green Building Council (2013) The Business Case for Green Building.

¹⁴ SFPUC (2014) Energy Benchmark Report for San Francisco Municipal Buildings, 2013 <http://sfwater.org/modules/showdocument.aspx?documentid=6271>.

¹⁵ Press Release of Mayor Ed Lee (2015) San Francisco Exceeds Greenhouse Gas Emissions Reduction Goal <http://www.sfmayor.org/index.aspx?recordid=783&page=846>.

¹⁶ San Francisco (2013) Climate Action Strategy Update. www.sfenvironment.org/cas.

¹⁷ California Public Utilities Commission (2015) California Renewables Portfolio Standard (RPS) <http://www.energy.ca.gov/portfolio/>.

¹⁸ San Francisco Tourism: Volume, Spending, & Characteristics. <http://sfced.org/wp-content/uploads/2015/04/Data-Statistics-Tourism-Overview-Apr-2015.pdf>.

¹⁹ San Francisco Tourism: Hotel Occupancy Rate and other Features. http://sfced.org/wp-content/uploads/2015/06/Data-Statistics-Hotel-Occupancy-Rate-Update-Apr-2015-Updated_Version.pdf.

²⁰ PricewaterhouseCoopers. Hotel Occupancy Continues to Surprise in 2015 According to PwC US Average Daily Rate Growth Expected to Accelerate in 2016. <http://www.pwc.com/us/en/press-releases/2015/hotel-occupancy-continues-to-surprise-in-2015.jhtml>.

²¹ Cushman & Wakefield. Marketbeat Retail Snapshot, San Francisco, CA Q4 2014. http://www.cushmanwakefield.com/~media/marketbeat/2015/02/SanFrancisco_AMERICAS_MarketBeat_Retail_Q42014.pdf.

²² DTZ. San Francisco Bay Area Commercial Real Estate, 2015 Forecast. <http://www.ctbt.com/flippingbook/forecast2015/index.html>.

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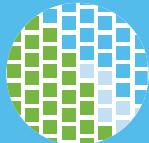




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