

Audit Template: Facilitating Data-Driven Decision Making for Jurisdictions

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ABSTRACT

The Audit Template tool is a web-based interface for collecting and reporting ASHRAE Level 2 energy audit data. Based on ASHRAE Standard 211, it provides a standardized platform for collecting building data, including information on building systems, metered and delivered energy use data, as well as information on energy efficiency measures and their potential savings. Using this data, Audit Template provides an overall summary of annual building energy use, carbon emissions, and energy savings estimates for the recommended measures, and the data can be imported and exported in BuildingSync[®] XML format or through a spreadsheet. The building can also be converted to an Asset Score building to generate an asset rating and an energy model. Since 2018, over 3,000 buildings have been input into Audit Template for compliance with NYC's Local Law (LL) 87 and San Francisco's Existing Building Energy Ordinance (EBEO). New York City (NYC) worked with PNNL to import data from historic LL87 audits resulting in ~10,000 new building records added to the tool's database. Having this data represented in a standardized, machine-readable format allows cities and jurisdictions to use it for analysis and decision making. The City University of New York Building Performance Lab (CUNY BPL) and NYC are using this data to evaluate the implementation of audit recommendations by comparing them with building permit data. These data are also being evaluated to establish if automated generation of building energy models for NYC buildings is possible. This paper discusses the overall capability offered through Audit Template and BuildingSync and its applications for cities and jurisdictions looking to use a data-driven approach for informing policy development.

Introduction

This paper discusses the motivation for cities to integrate a standardized process for building energy audits into their framework for building performance policies. It demonstrates how the use of federal tools such as Audit Template and BuildingSync (Long et.al, 2021) has helped streamline data collection and reporting and hence improved the usability of the data and the subsequent data-driven decision-making process.. This paper highlights the workflow being developed by the City University of New York Building Performance Lab (CUNY BPL) to facilitate data standardization and data-driven decision making.

Motivation

Buildings are responsible for nearly 40% of annual global CO₂ emissions (Architecture 2030), and over 32% of the total US energy-related CO₂ emissions are associated with coal and natural gas-fired power plants (EIA 2020). To reduce carbon emissions due to electricity consumption in buildings, many cities have begun incorporating energy audits, retro-commissioning or retuning into their building performance standards and city ordinances (IMT 2021b). Audits assess the current state of energy systems in buildings and inform building owners and operators about possible upgrades to save energy and reduce emissions. Retro-commissioning and tune-up processes assess the operation of existing systems and identify ways to improve the same. Building energy audits and retro-commissioning are often the starting point for capital and operational improvements in buildings.

Critical to the development and enforcement of these policies is the availability of data in a standardized format. Standardization of data is beneficial for building owners, program managers (such as a city or a utility) as well as organizations evaluating and managing a portfolio of buildings. Retrofit measures identified during audits are implemented over a period of time after the audit is completed (Maxwell 2013) and providing a mechanism for data to be maintained in perpetuity supports a continuous cycle of assessment and tracking of savings through improvements over the building life cycle. Absence of a standard format for audit data can also make it challenging for program managers to use the data to understand the building stock in their territories, develop future programs or performance targets, or track improvements to the building stock over time.

Policies and Programs Driving the Need for Data Standardization

Commercial building energy audits, retro-commissioning, and tune-ups are becoming increasingly common, and in some cases required. Most of the jurisdictions requiring them have identified their reporting requirements using BSR/ASHRAE/ACCA Standard 211, Standard for Commercial Building Energy Audits (ASHRAE 2018). In addition to energy audit ordinances, building performance standards are being defined which require building owners to meet performance targets by actively improving their buildings over time. Compliance can be met by achieving a standard for performance, implementing a set of prescriptive measures, or completing alternative measures for special circumstances. Prescriptive measure pathways include solutions that allow building owners to comply with the standard by implementing energy efficiency measures and undergoing an ASHRAE Level 2 audit and retro-commissioning (EPA 2021). Standardized and interoperable data tools like Audit Template, BuildingSync, and SEED (SEED 2022) facilitate such compliance pathways and provide a mechanism for data reporting and tracking improvements over time.

San Francisco: Existing Building Energy Ordinance (EBEO). San Francisco's EBEO applies to non-residential buildings with 10,000 square feet or more of space that is heated or cooled and to multifamily residential buildings with 50,000 square feet or more of space that is heated or cooled (SFE 2022a). The Ordinance has two separate requirements: energy benchmarking and energy audits. Energy Audits by a qualified energy professional are required every five years for nonresidential buildings. The audit is required to provide the building owner with a list of specific opportunities to save money and energy in the building, as well as any rebates that may

be available. Auditors are required to use Audit Template for compliance with the EBEO for buildings 50,000 ft² and greater (SFE 2022b).

District of Columbia: Building Energy Performance Standard. District of Columbia's (DC) Department of Energy and Environment's (DOEE) 2021 Building Energy Performance Standard is based upon the median ENERGY STAR score (ESPM 2017) of reporting buildings. Buildings unable to comply via the standard pathway of ENERGY STAR score, have the option to comply via a performance pathway or a prescriptive pathway. The prescriptive pathway requires buildings to conduct an ASHRAE Level 2 energy audit to identify retrofit measures that can be implemented to meet the target energy savings goal. DC plans to use Audit Template to provide a mechanism for standardized data collection. Through BuildingSync and BEAM (NEEP 2022), DC plans on developing a mechanism for standardized data collection, exchange, and management.

NYC Policy Background. NYC has been at the forefront of energy, climate, and open data legislation related to buildings. LL84 of 2009 (NYC 2009b), as amended by LL133 of 2016 (NYC 2016), requires benchmarking of buildings over 25,000 ft²; LL87 of 2009 requires energy audits be performed every 10 years on buildings over 50,000 ft²; and LL11 of 2012 (NYC 2012) requires the publication of any comprehensive collection of data that is maintained on a computer system by or on behalf of a NYC agency. This includes building permits, benchmarking data, and more recently the results of LL87 audits that have been exported from Audit Template; all of these data are available on the NYC Open Data website (NYC 2022). NYC also passed LL97 in 2019 (NYC 2019), which set carbon emissions caps for buildings over 25,000 ft² starting in 2024. These laws were developed and passed with support from the Mayor's Office of Climate and Sustainability, now a part of the Mayor's Office of Climate and Environmental Justice (MOCEJ).

The intent of LL87 is to inform building owners of their energy consumption through energy audits, which are surveys and analyses of energy use and retro-commissioning. Reporting must include all measures that would reduce the energy use and/or cost of operating the building (NYC 2009). For each measure, the auditor is required to estimate the associated annual energy savings, the cost of implementation, and the simple payback. Along with information about energy savings opportunities, the auditor is also required to report the building's benchmarking results consistent with the United States Environmental Protection Administration (EPA) Portfolio Manager tool (ESPM 2017). Additionally, LL87 requires reporting of the breakdown of energy usage and predicted energy savings by system after implementation of the proposed measures. Auditors are required to carry out and report on a general assessment of how the major energy-consuming equipment and systems used within tenant spaces impact the energy consumption of the base building systems, based on a representative sample of spaces. This audit data has been reported to the city using the LL87 Energy Efficiency Report (EER).

The local laws detailed above mandate the NYC Department of Buildings (DOB) to gather submissions and track compliance. This collection and translation of data is a challenge, and tools like Audit Template and EPA Portfolio Manager play an important role. Prior to 2019, LL87 data were entered into an Energy Audit Data Collection spreadsheet (ADCS) and submitted to DOB, and MOCEJ would then compile that data. MOCEJ had worked previously with PNNL to harmonize the ADCS to facilitate transfer of data to Audit Template and conversion to a BuildingSync XML and a standard spreadsheet format. Drawing on PNNL's expertise, and in an effort to standardize data collection and reporting, DOB mandated all LL87

audits be entered into Audit Template starting in reporting year 2019. The import and export capability facilitated through BuildingSync, and the spreadsheet format will give city and program administrators access to the building stock analytics available in Audit Template, as well as any other tool that utilizes the BuildingSync format.

Across the U.S., cities are implementing energy efficiency policies and building performance reporting laws for energy and water use in commercial and multifamily buildings. These efforts will generate a significant amount of data that would be valuable if used to support future decision-making and performance tracking. DOE's ecosystem of data tools has been developed to help facilitate these efforts and support cities to meet these ambitious energy goals.

Audit Template

DOE Data Tools: Improving Data Standardization

Commercial building energy audits are becoming more prevalent with the advent of local ordinances and building performance standards (EPA 2020, IMT 2018); however, the format for data collection, reporting, and analysis hasn't changed substantially over the years. Most auditors have developed their own custom spreadsheets or descriptive templates or use the spreadsheet-based templates defined by a jurisdiction. These spreadsheet-based templates identify the minimum reporting requirements related to the building characteristics, envelope, lighting, and mechanical systems and include additional mechanisms for attaching site images and narrative descriptions. The data is often riddled with inaccuracies and inconsistencies due to use of incorrect units, inconsistent terminology, or use of abbreviations, which can make it difficult to use or store the data in a standard machine-readable database. An ASHRAE Level 2 audit also requires an auditor to estimate annual energy consumption by end use and fuel type and estimate energy savings for energy efficiency measures (EEMs) recommended. The process for submitting the audit report to the program manager (city or utility) is also ad hoc, generally through email. Post-submission clarifications or corrections usually involve email correspondence with limited mechanisms for tracking revisions (Taylor 2016). These mechanisms make it challenging, if not impossible, to collect and manage the data in a standardized format, making the data much less useful to program managers.

Audit Template was developed to address the lack of a standardized data format for energy audits. Audit Template is a web-based tool for reporting and documentation of commercial building energy audit data. The tool allows an auditor to document a building's ASHRAE Level 2 audit minimum reporting requirements, in accordance with Standard 211. Audit Template tool allows auditors to report audit data for specific programs or jurisdictions and program administrators have access to a 'City Dashboard' through which they can monitor submissions, review the reported data, accept the submission, and download the reported data in multiple formats including XLSX, PDF, and BuildingSync.

BuildingSync was developed to address the need for a robust and flexible schema that could seamlessly handle data from commercial building energy audits and connect various auditing platforms to a central database for data management (DeGraw et al., 2018, Long et al., 2021). A BEDES-compliant (BEDES 2022) XML schema for building energy audit data, BuildingSync supports ASHRAE Level 1, 2, and 3 audits and includes all of the information required to generate a building Asset Score (Wang et al. 2016). It allows data to be easily aggregated, compared, and exchanged between different databases and software tools used in the energy audit process.

Using Audit Template’s BuildingSync export capability, audit data can also be imported into DOE’s SEED platform, which serves as a central database for all city building energy performance data. It merges information from Portfolio Manager, Audit Template, and other city datasets. Cities can use the SEED platform to manage multiple datasets, merge data using the city’s or DOE’s Unique Building Identifier (Wang et al. 2019), perform automated quality assessments, and track progress towards citywide energy goals. DOE’s data tools platform, which includes UBID, BEDES, Audit Template, BuildingSync, and SEED, provides a workflow for auditors and energy assessors to report building asset and performance data and for cities to collect, manage, and assess that data to drive policy development and track progress towards performance goals.

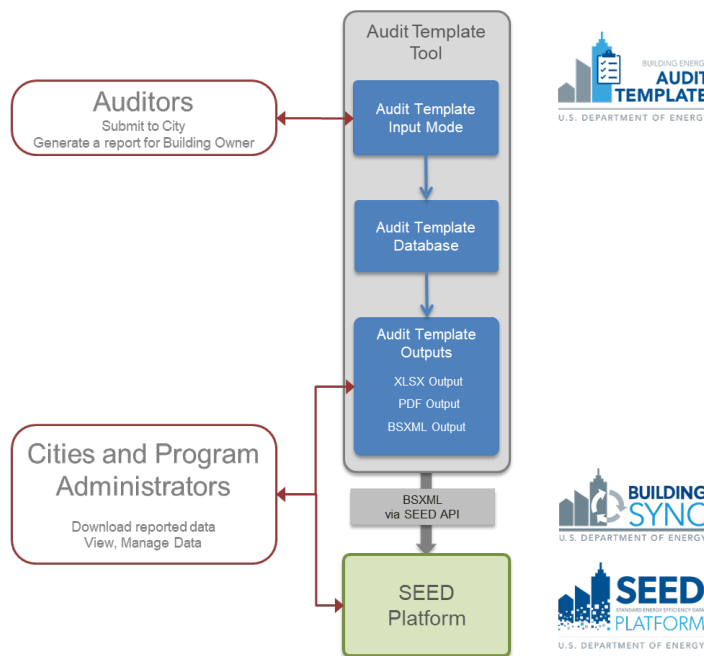


Figure 1: Audit data workflow using Audit Template, BuildingSync, and SEED

Audit Template: Level 2 Audit Data

ASHRAE Standard 211 defines three levels of energy audit, namely Level 1, 2, and 3. Level 2 audits are most commonly referenced by policies and programs for assessing building performance. A Level 2 audit includes an inventory of the building’s equipment and an estimate of the building’s energy consumption by end use and fuel type. The building’s energy consumption is required to be broken down by end use to help identify the areas with the greatest opportunities for improving efficiency. Level 2 audits also require a site-specific analysis of recommended EEMs, including expected implementation costs, expected savings, and financial metrics such as simple payback or return on investment (ROI). Further, utility rates are analyzed to see if there are opportunities to secure a lower rate. Key building personnel also are interviewed to provide insights into characteristics of the building’s operations and potential problem areas, and to define the financial and non-financial goals for the audit. Level 2 audits are ideal for building managers wishing to improve energy efficiency, understand how the whole

building is functioning, and identify the projects that will provide the greatest energy reduction at the best ROI.

Audit Template's interface includes five key sections for reporting data: (1) Audit details and contact information of key personnel; (2) Facility description; (3) Utility data and benchmarking; (4) Energy consumption by end use; and (5) Energy savings opportunities. All energy consumption and energy savings numbers are also expressed as CO₂ emissions. The facility description sections require the auditor to provide information on building use types; envelope assemblies; lighting systems and lighting controls; HVAC system configuration details, including heating type, cooling type, rated capacity and efficiency; and relevant information for service hot water systems. The utility data and benchmarking section requires information on the metering configuration of the building, 12 consecutive months of metered or delivered energy data, and benchmarking results. Audit Template calculates the annual building energy consumption by fuel type using the monthly metered and delivered energy consumption data provided and converts the same to CO₂ emissions. CO₂ emission factors for the Emissions and Generation Resource Integrated Database (eGRID) region are used to calculate the carbon emissions (EPA 2022). The emission factors may include grid gross loss, depending on the city's reporting requirements. Cities may also customize the values of the annual CO₂e emission factors for each energy type, to support their reporting requirements.

Audit Template also supports reporting of water use and water savings opportunities required for comprehensive water evaluations, as required per Section 432 of the Energy Independence and Security Act (EISA) of 2007 (EERE 2022b). The tool allows the user to identify all water-using fixtures and systems in a building (including landscape, cooling towers, and plumbing systems), characterize the usage profile and estimate the quantity of water used for these systems. In addition to the water use, an assessor can also identify the water savings opportunities in the building and estimate the total water savings and measure cost. This data will be made available in the Compliance Tracking System (CTS) spreadsheet format for federal facilities to track their performance and usage over time (DOE 2022b).

Though the standard template in Audit Template is based on ASHRAE Level 2 audit requirements, the tool can also incorporate city- or program-specific templates for data collection. Some programs with custom templates have gone beyond the ASHRAE Level 2 requirements and added additional fields to collect data on building characteristics or EEMs not specified as minimum ASHRAE Level 2 audit requirements. The tool allows for the development of custom templates to allow cities and program administrators to collect data most relevant to their jurisdiction and decision-making needs.

Once data entry is complete, Audit Template requires a submitter to affirm to an affidavit that certifies that the reported data is correct, upload any additional attachments if required by the ordinance or program they're reporting to, and submit to the program administrator.

Data in Audit Template

Since 2018, over 4000 buildings, accounting for over 400 million square feet of conditioned floor area, have reported data in Audit Template for compliance with their local audit ordinance. The sections below summarize the data sets for three key ordinances, San Francisco's EBEO, NYC's LL87, and Berkeley's energy audit ordinance.

Building Size and Age. Over 3000 buildings in NYC have reported Level 2 audit data in Audit Template for compliance with the LL87 ordinance since 2019. Data for over 600 buildings in San Francisco are available in Audit Template, submitted for compliance with the EBEO. The distribution of buildings by size (Figure 2) shows that over 80% of the data is for buildings in the range of 50,000 ft²-250,000 ft², whereas a significant portion of reported buildings in San Francisco fall in the <50,000 ft² category. Over 50% of the reported buildings in San Francisco were constructed prior to 1920, while majority of reported NYC buildings have been built later than 1920.

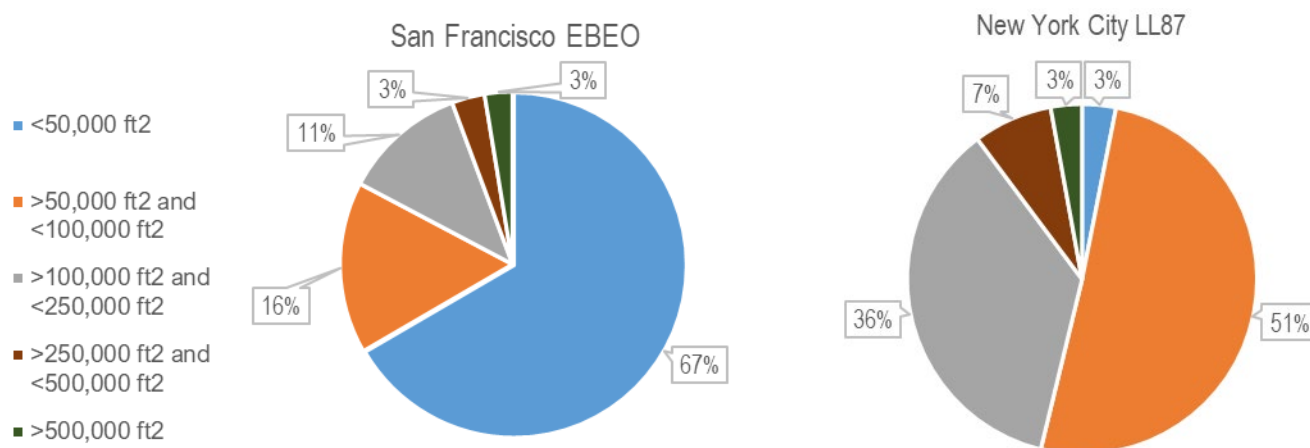


Figure 2: Distribution of Buildings by Size: San Francisco and New York City

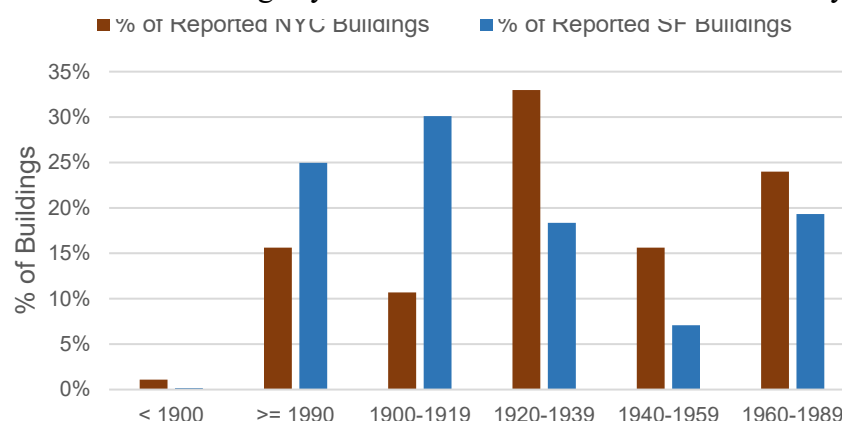


Figure 3: Distribution of Buildings by Year of Construction

Heating and Cooling System: Audit Template, following the nomenclature in ASHRAE 211, requires a user to characterize the HVAC system by specifying the heating source, cooling source and distribution equipment. This component level characterization was mapped to system types based on the user specified characteristics. Analysis of submitted HVAC data for NYC identifies the predominant HVAC system to be one pipe and two pipe steam systems followed by VRFs (Figure 4). The HVAC system types were also categorized by the use types served to identify trends between building types and HVAC systems. When categorized by predominant use types served, the data indicates one pipe and two pipe steam systems to be

predominantly serving multifamily buildings and the fan coil units, PTACs and unitary systems are serving other use types including offices, retail, and K-12 schools. Analysis of heating plant data submitted for all buildings identifies on-site steam boilers to be the main heating source followed by utility district steam (Figure 5).

LL87: Predominant HVAC System Types

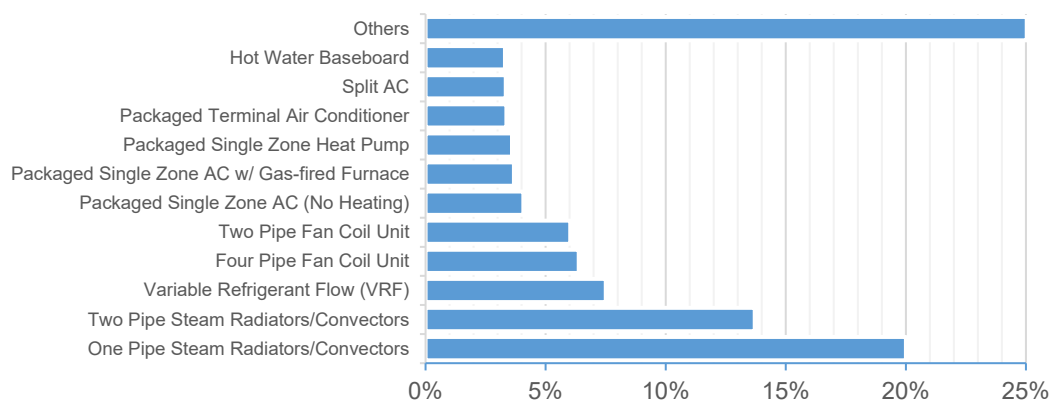


Figure 4: LL87 Predominant HVAC System Types

Heating Plants: Equipment Type

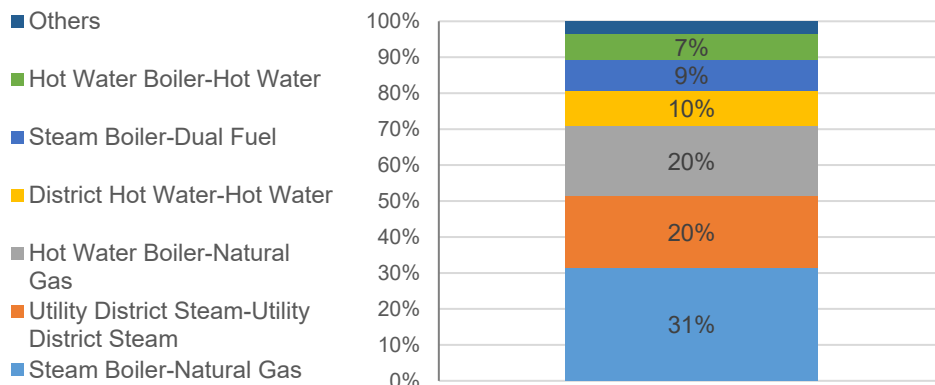


Figure 5: LL87 Heating Plant Equipment Type

Energy Efficiency Measures: Figure 6 shows the percentage of submitted buildings with measures within a specific measure category. San Francisco requires measures to have a simple payback of less than three years, hence fewer total measures and deep retrofit measures are seen. San Francisco reports have a higher percentage of lighting improvements (over 93% of buildings) which includes measures to improve lighting controls, lighting fixture upgrades and daylighting controls.

Table 1 shows the most recommended measures under the ‘Other HVAC’ category within which NYC reports include retrofit measures like installing VRFs and heat pumps and San Francisco reports include more retro-commissioning measures for calibration and sequencing. The high prevalence of boiler plant improvements in NYC reports is expected due to

the large number of HVAC systems served by central plants (Figure 4, Figure 5). ‘Building Automation Systems’ includes measures for HVAC system controls and retro commissioning and are recommended often for both cities.

Percentage Submitted Buildings by Energy Savings Measure Category

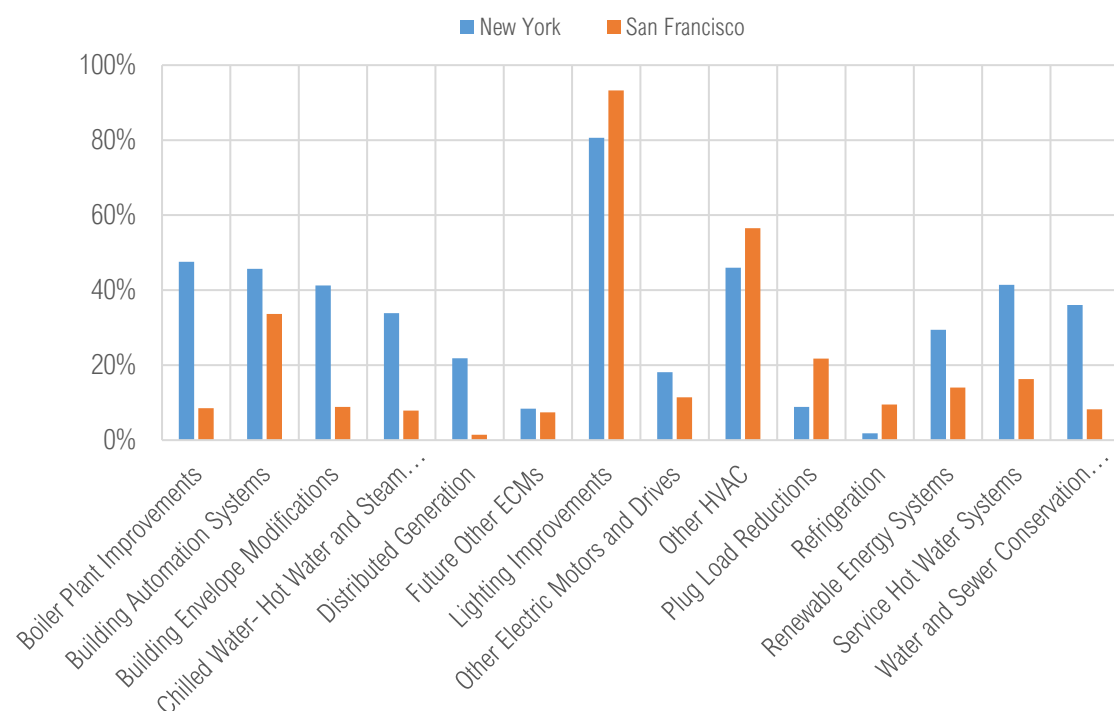


Figure 6: Number of Measures by Measure Category for New York and San Francisco

Table 1: Measures Most Frequently Recommended for Specific Measure Categories

Measure Category	Measures Recommended	Number of Buildings with the Measure Recommended	
		New York	San Francisco
Other HVAC	Install variable refrigerant flow system	34%	1%
	Upgrade operating protocols, calibration, and/or sequencing	20%	61%
	Other heating	19%	13%
	Other ventilation	14%	8%
	Install air source heat pump	13%	17%
	Add or upgrade controls	41%	54%
	Add or upgrade BAS/EMS/EMCS	39%	9%

Building Automation Systems	Upgrade operating protocols, calibration, and/or sequencing	12%	18%
	Other	5%	10%
	Convert pneumatic controls to DDC	3%	9%

NYC Analytics Using Audit Template Data

CUNY BPL, in partnership with the MOCEJ, DOB, and the NYC Department of Citywide Administrative Services Division of Energy Management (DEM) are using the data generated by Audit Template to evaluate the implementation of audit recommendations by comparing them with building permit data. The data is also being evaluated for several workflows to streamline the facility asset inventory process and the development of energy models for NYC buildings.

CUNY BPL provides project evaluation and associated technical support to both NYC public and private organizations through its Energy Data Lab (EDL) and Technical Services groups. EDL was established in 2011 through DEM sponsorship, with the initial goal of demonstrating how students from the City’s public university could play a useful role in the City’s climate mitigation efforts. Now in its 11th year, EDL has evolved from a pilot program with six interns to one that has helped shape the lives of over 100 CUNY students and launched them into predominantly green careers in the public, private, and non-profit sectors.

Using LL87 Data to Analyze NYC Audit Recommendations and Permitted Work

In 2020, CUNY BPL started analyzing LL87 data as part of a DOE-funded research project that is expected to run through 2024. CUNY BPL worked with MOCEJ and PNNL to translate and compile the 2013 to 2018 LL87 audit data that is posted on the NYC Open Data site. CUNY BPL is also analyzing more recent LL87 data under a data-sharing agreement with MOCEJ and DOB. DOB permit data from the NYC Open Data site is being used to cross-reference buildings that have been audited, the types of recommendations made for energy upgrades, and building permit applications related to certain types of work.

DOB’s publicly available data primarily includes information from permit application forms and contains very little actual data on the extent of the work being performed or specifics of the building systems and plants. Older drawing sets are part of the public record and are available for physical review at the NYC Municipal Archives, but typically very little information is collected as organized data during the permitting process (e.g., building code construction classification is not collected). The application forms contain checkboxes that applicants use to indicate general categories of work being permitted, however it is not mandatory, and applications have been identified by CUNY BPL where the work described in the free text “description” field directly corresponds to a checkbox that was not checked. CUNY BPL is investigating mechanisms to machine read construction drawing sets, identify key schedules and printed data related to energy code compliance (e.g., HVAC or motor schedules, COMcheck printouts), and translate that information to structured data. One workflow may involve using Audit Template as a platform for entry of data manually extracted from drawings or using the spreadsheet upload feature if an automated process is developed.

Other data sets collected by NYC help to fill in gaps. For example, electrical permit data collected via the DOB NOW: *Build* website include details on electrical aspects of any

equipment being installed in the building, including number of fixtures, number of motors, total motor horsepower by project, and whether boiler or HVAC wiring is involved. The NYC Department of Health and Mental Hygiene (DOHMH) collects data related to the annual certification of cooling tower maintenance, cleaning, disinfecting, and testing as required by LL77 of 2015, including make, model, and size. The NYC Department of Environmental Protection (DEP) Clean Air Tracking System (CATS) collects data related to monitoring of boiler construction and operation per Title 24 of the NYC Administrative Code, including boiler and burner make, model, and output.

In September 2021, NYC published monthly whole building electricity and natural gas consumption data for privately owned buildings over 25,000 ft² and in City-owned buildings over 10,000 ft² for 2018 and 2019, as benchmarked through EPA Portfolio Manager. These data have been used to generate linear change-point regression models and comparative analysis using a software application that CUNY BPL has been developing since 2014, named BEMA (Building Energy Modeling and Analysis). BEMA's core calculation methodologies were originally derived from research first published in the ASHRAE Inverse Modeling Toolkit (Kissock, Haberl and Claridge, 2003), with the goal of providing individual building insight and portfolio analytics, including Lean Energy Analysis (Seryak and Kissock, 2005; Berk, Ascazubi and Bobker, 2017). BEMA has also been configured to conduct measurement and verification of energy retrofits with whole facility energy data based on International Performance Measurement and Verification Protocol (IPMVP) Option C (EVO, 2021).

Figure 7 demonstrates the data flows for the project, including a PostgreSQL Data Repository under development by CUNY BPL. This includes the LL84 and LL87 data plus the additional data sets needed to accomplish the project's data storage, modeling, and analysis goals.

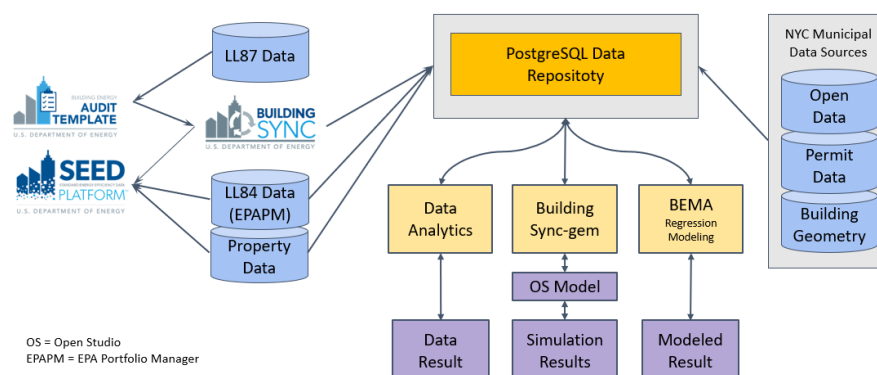


Figure 7: CUNY BPL project data flows

This exploration has uncovered additional use cases for an expanded data platform. As an example, an inventory of building-related equipment could be imported from BuildingSync files, or input directly by building owners, for compliance filings (e.g., CATS permitting or DOHMH cooling tower certification) and be linked to an electronic building permit system, including uploaded COMcheck XML files. This would facilitate a “virtual history” of the building, including an inventory of energy-related equipment over time and the ability to track annual energy and emissions performance. CUNY BPL envisions that this could have value to both the city implementing the platform and to building owners and managers.

As of the writing of this paper, public data sets and non-public data that are shared under data-sharing agreements have been collected by CUNY BPL and entered into the PostgreSQL Data Repository so that a comprehensive analysis can take place. Further, BEMA has been used to develop linear change-point regression models for all benchmarked buildings. It is anticipated that audit and benchmarking data from 2020 through 2023 will also be shared and analyzed before the project is completed in 2024. .

BuildingSync to Streamline Energy Analysis Workflows

In 2021, DEM published a LL97 Implementation Action Plan (NYC 2021) that describes the current state of NYC-owned and operated buildings and provides analysis on various pathways designed to achieve the City's LL97 mandated emissions reductions. The analysis was conducted using energy models representing a range of municipal building typologies. The models were scaled to portfolio level based on gross floor area, then bundles of EEMs were applied to each to project potential GHG emissions reductions.

The NYC Department of Information Technology & Telecommunications published a CityGML file (2016) with a 1.5 level of definition (LOD). CUNY BPL is investigating the feasibility of using the CityGML file and the LL87 audit data to develop energy models of NYC buildings. This work would build on research conducted by Braun et al. (2021) using tools like SimStadt (Nouvel 2015), URBANopt (El Kontar 2020), and BuildingSync Gem (Mosiman et al. 2020; Long et al. 2020). CUNY BPL will also be evaluating the use of Autotune for model calibration (Chaudhary 2016). While this workflow is currently targeted at buildings that have been audited under LL87, owners of smaller facilities could create BuildingSync XML files using Audit Template, export the data, and use the same workflow to develop their own energy models.

Conclusions

Cities have started recognizing the value of a standardized framework for building systems data collection. To help fill this need, Audit Template added support for San Francisco's EBEO in 2018, NYC's LL87 in 2019, and DC's BEPS in 2022. In addition to these three cities, Audit Template also supports data collection for the City of Berkeley's Building Emissions Saving Ordinance (City of Berkeley 2022), the City of Atlanta's Commercial Building Energy Efficiency Ordinance (Atlanta 2022), and Washington State's Grants program (WA 2021). Capabilities to support the Energy Independence and Security Act of 2007 for energy and water evaluations are in the process of being added to Audit Template to provide a standard mechanism for data collection and reporting through the Federal Energy Management Program's Compliance Tracking System (EERE 2022). In addition to being able to support data collection and management in a streamlined manner to support policy development in the future, Audit Template provides a unique interface where auditors and assessors are able to view and understand the city or program's reporting requirements, as they relate to energy and water audits, as well as retro-commissioning. The tool reduces the data collection burden on city officials through the built-in validation and verification capabilities of Audit Template. The recent emphasis on Building Performance Standards and a need for alternate compliance pathways has identified additional need for data standardization platforms like Audit Template, BuildingSync and SEED.

NYC began implementing building energy accountability and transparency legislation over 12 years ago and has progressed to putting limits on building GHG emissions. Building owners must comply with these regulatory policies or face penalties. The use of tools like Audit Template, which generates BuildingSync files, can facilitate compliance and provide additional benefits. Eventually, it is envisioned that standardized data will be used by multiple stakeholders to help fulfill policy goals and regulatory requirements. Having access to audit data and recommendations is a first step toward tracking the impact of policies, yet there is a critical disconnect in that the data used in tracking the implementation of such recommendations are typically recorded in building department permit application forms. Building departments are in a unique position to combine and leverage building datasets, however much of the permitting in NYC relies on images of drawing sets rather than the digital capture and storage of the inherent data in the drawing. Using Audit Template to streamline the data collection process represents a first step to enabling building departments to begin aggregating data on physical attributes of buildings. Having that data stored in perpetuity in a standardized format, through the BuildingSync export capability in Audit Template, is a critical step towards the ultimate goal of data-driven decision-making for jurisdictions.

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