CITY OF LOS ANGELES

CALIFORNIA

KAREN BASS
MAYOR

DEPARTMENT OF
PUBLIC WORKS

BUREAU OF
ENGINEERING

TED ALLEN, PE
CITY ENGINEER

1149 S. BROADWAY, SUITE 700
LOS ANGELES, CA 90015-2213

http://eng.lacity.org

December 5, 2024

The Honorable City Council
c/o Holly L. Wolcott
City Clerk
Room 360, City Hall

COUNCIL FILE NOS. 21-1039 & 21-0683: Relative to developing a Building Decarbonization Work Plan for the City's existing building stock and identifying City facilities for near-term installation of distributed energy generation systems.

COUNCIL FILE NOS. 21-1039-S2: Relative to ensuring all future City-owned sites, facilities, or park-sites are built to be net-zero projects that maximize solar energy generation and battery energy storage on site.

COUNCIL FILE NOS. 22-0530: Relative to conducting an analysis on the electrical load impact and upgrades needed for all City (municipal) facilities, in order to prepare all City buildings and facilities for full electrification and decarbonization.

SUMMARY

This report seeks approval for the Decarbonization Workplan and the Year 1 Decarbonization Workbook projects, including the allocation of available funding to identified projects. Additionally, this report provides an update on the Pilot Decarbonization and Distributed Energy Generation Systems - Phase I Projects and the status of the Council File No. 21-1039-S2 and Council File No. 22-0530 directives.

RECOMMENDATION

That the City Council, subject to the approval of the Mayor,

1. RECEIVE AND FILE the "Los Angeles Existing Municipal Building Decarbonization Workplan" report (Attachment No. 1) and its framework for decarbonization through electrification and the promulgation of solar and battery-distributed energy systems (DER) into the City's existing municipal buildings.

2. APPROVE the Decarbonization Workplan's Year 1 Workbook projects (Attachment No. 2), recommended project delivery methods, and reallocation of $22,609,938 within the BOE Special Services Fund No. 682, Department No. 50, Account No. 50YVKV, 50YVKW, 50YVKX, 50YVKY, 50YVKZ, and 50VVHE previously allocated for the fiscal year 2023-24 Phase II Pilot Building Decarbonization Project.

3. DIRECT all City departments, working in consultation with BOE, participate in the transition of gas-powered assets to electric assets and equipment that has reached the end of its useful life as outlined in this workplan, contingent on funding for differential costs, and participate in the proactive development of equipment replacement processes that account for emergency failures. Any deviation from meeting the City's electrification goals is subject to approval from the City Engineer.

4. AUTHORIZE the City Engineer or designee to make technical corrections to the recommendations to effectuate the intent of the City Council.

5. AUTHORIZE the City Engineer or designee, with concurrence from the Municipal Facilities Committee (MFC), to evaluate and make adjustments as needed to the project list in the case of an unforeseen condition requiring a change of facilities.

BACKGROUND

The City of Los Angeles' Existing Municipal Building Decarbonization Workplan Project, referred to as the Decarbonization Workplan here onward, was initiated by the BOE as requested by City Council per Council Files 21-1039 and 21-0683, which essentially asks the BOE to develop a strategy to decarbonize all of the City's existing municipal building stock and identify City facilities for near-term installation of distributed energy generation systems to achieve carbon neutrality without offsets by 2035.

A Task Order Solicitation No. 65 was issued to Tetra Tech/Glumac on April 23, 2023, by BOE. The scope of work fell under four main tasks, which required the consultant team to analyze and evaluate the most cost-effective and impactful approach to the decarbonization of existing buildings, develop a prioritization methodology, and create project lists consisting of a year-by-year workplan to decarbonize the City's entire existing building stock of nearly 980 facilities, including program delivery recommendations and a complete program cost analysis. In addition, the Decarbonization Workplan has identified recommended Year 1 Workbook projects, created an overall maintenance strategy, conducted a jobs impact analysis, and developed a greenhouse gas (GHG) emissions tracking tool for building decarbonization projects.

The Decarbonization Workplan focused on four categories of decarbonization measures to eliminate GHG emissions at the City's existing municipal buildings as follows: (1) *Major Renovations and Building Retrofits* to electrify natural gas equipment and invest in energy efficiency upgrades during major renovations and building replacements; (2) *Building Electrification* to replace natural gas equipment with all-electrified technologies; (3)

Energy Efficiency measures of building upgrades including LED lighting retrofits, high-efficiency equipment, and retro-commissioning; and (4) *Distributed Energy Resources* which involves energy projects including on-site solar photovoltaics (PV), battery energy storage systems (BESS) and microgrid controls. Refer to Attachment No. 1, page 46 for further details.

The **City of Los Angeles' Existing Municipal Building Decarbonization Workplan (Attachment No. 1)** has been prepared based on the above criteria and with input and coordination from all City departments, particularly the General Services Department (GSD) and the Department of Recreation and Parks (RAP). This workplan excludes the proprietary departments of the Los Angeles Department of Water and Power (LADWP), Los Angeles World Airports (LAWA), and Port of Los Angeles (POLA) as part of its building inventory.

DISCUSSION

I. CF 21-1039 & CF 21-0683: Final City of Los Angeles' Existing Municipal Building Decarbonization Workplan (Attachment No. 1):

The City of Los Angeles has established robust climate action goals and is committed to achieving carbon-neutral municipal operations by 2045, with a goal of 2035 for municipally owned buildings. The City owns and operates roughly 980 buildings, totaling over 22 million square feet, which account for 34% of the City's municipal GHG emissions. Reliable and resilient municipal buildings support public services and critical emergency operations. Decarbonizing municipal buildings will improve infrastructure and yield multiple benefits, including addressing the urgent need for climate action, improving the resilience of vulnerable communities, and leading the way for the private sector.

Further necessitating municipal decarbonization efforts, the South Coast Air Quality Management District (SCAQMD) amended rule 1146.2, which now mandates zero emissions boilers for capacities 2000 MBH (thousands of BTU per hour) and under for new equipment and existing units. Once a natural gas unit has exceeded its equipment life and the compliance date has passed, it must be replaced with a zero-emissions alternative. Compliance will roll out between 2026 and 2033, depending on the unit type and size. The Decarbonization Workplan aligns the City with the SCAQMD's new mandates.

KEY FINDINGS

The Decarbonization Workplan outlined in this report provides a pathway for the City to achieve carbon-neutral operations by 2035. Through this project, several key findings were identified:

1. Los Angeles has a pathway for carbon-neutral municipal buildings by 2035 if the effort is funded. The path includes prioritizing capital investments in building electrification projects, targeting the largest natural gas demands at 25 sites that account for 50% of building natural gas usage, and aligning project delivery

to science-based GHG emissions reduction goals with interim natural gas reduction goals by 2030 and 2035.

2. Los Angeles ideally should target to electrify 80 buildings each year starting in FY 24-25. Every year, the City delays implementation, the annual number of projects required increases by 10%. Therefore, achieving 2035 carbon neutrality requires scaling and accelerating implementation efforts. This will require additional staff, resources, funding, and new project delivery methods, as well as significant coordination and collaboration between multiple City departments. A dedicated BOE Building Decarbonization Team is recommended to manage the program.

3. Aligning decarbonization projects with infrastructure replacement needs avoids early equipment retirement, supports deferred maintenance projects, and prioritizes fiscal responsibility. The Workplan should also leverage external funding, grants, rebates, and new financing mechanisms, such as a building decarbonization and resilience bond and/or implementation of design/build portfolio projects using the federal government's Energy Savings Performance Contracts (ESPC). Refer to Attachment No. 1, page 61 for further details.

4. The Decarbonization Workplan provides the opportunity to improve the resilience of community cooling centers and emergency service operations, and to create new local jobs in the green economy. The scope and scale of the Decarbonization Workplan supports Los Angeles' greater sustainability, climate action, and resiliency goals, further leading the way by example for the private sector to follow while spurring investment in building decarbonization.

Prioritization Methodology
The project prioritization framework includes four critical criteria: GHG emissions reduction, infrastructure needs, cost-effectiveness, and equitable investment. Prioritizing cost-effective, impactful projects that address existing infrastructure needs at buildings in disadvantaged communities will enable the City to effectively address climate change in an equitable manner. Refer to Attachment 1, page 49.

Project Delivery Methods
The decarbonization workplan provides a comprehensive implementation strategy comprised of multiple project delivery methods for implementing decarbonization measures. This provides flexibility to accommodate the unique needs of individual building projects and provides the opportunity to leverage external financing mechanisms as appropriate. All project delivery methods will prioritize replacing HVAC systems that have reached the end of their useful life. These end-of-life project delivery methods include: (1) Capital Improvement Projects; (2) Equipment Replacement Projects - RAP/GSD; (3) Portfolio Design-Build; and (4) Portfolio Solar Projects. Refer to Attachment No. 1, page 58.

The Report outlines a process for a year-by-year facility selection in coordination with GSD and RAP. BOE will seek the approval of the MFC as the oversight committee for the year-by-year facility list, delivery, and funding method. Refer to attachment no 1, page 122. Additional Attachment No. 5 includes a Slide-Deck of the Decarbonization Workplan and Year 1 Workbook presentation.

II. Year 1 Workbook

The recommended Year 1 workbook projects (Attachment No. 2) prioritize sites with high potential for GHG emissions reduction, and projects that will establish a framework for the City to scale implementation efforts in subsequent years. These projects were identified as priority sites by the various user departments due to their urgent repair needs. The BOE Equity Index and the citywide equity index developed by the CAO were the initial data sources used to understand and ensure the distribution of equitable investment.

BOE anticipates that during the project implementation phase, certain facilities may need to be replaced due to unforeseen conditions. BOE will communicate to the MFC when such adjustments are warranted.

III. Status of Pilot Decarbonization and Distributed Energy Generation Systems - Phase I Projects (CF 21-1039 & CF 21-0683):

On May 27, 2022, the City Council approved the allocation of $28,589,000 of UB Renewable funds from Fiscal Year 2021-2022 to fund building decarbonization work for nine (9) pilot City facilities directed by the action of Council File No. 21-1039. Subsequently, on December 9, 2022, the City Council allocated an additional $2,407,965 to address recent construction cost escalation. The scope of work for these projects is a combination of full building electrification, solar photovoltaic (PV) installations, battery energy storage installations, lighting upgrades, building envelope upgrades, new roofing, and ADA compliance where applicable. BOE commenced preliminary work in July 2022, with the design start dates staggered to meet in-house staff availability in 2023. The Phase I Pilot Projects Status (Attachment No. 3) shows the current status of the nine Phase I Pilot projects.

IV. Revised Phase II Proposed Pilot Decarbonization and Distributed Energy Generation Systems Projects (CF 21-1039 & CF 21-0683):

In October 2023, the City Council allocated and transferred $22,609,938 to BOE to fund five (5) Phase II Decarbonization Pilot Projects. Based on what BOE has learned from Phase I pilot projects and the development of the Decarbonization Workplan report, BOE recommends that the Phase II Pilot projects be combined with the Year 1 Workplan projects for better project delivery. Refer to Attachment No. 2 for Year 1 Workplan projects.

V. Summary of all Decarb-Related Funds allocated to BOE (CF 21-1039, CF 21-1039-S1 & CF 22-0530:

The City Council allocated various building decarbonization-related funding to the BOE in addition to the Workplan development and the Phase I pilot projects. The Summary of All Decarbonization-Related Funds Allocated to BOE (Attachment No. 4) itemizes all of the funding allocated via BOE’s efforts and distribution.

VI. **21-1039-S2: Analyze existing and future City-owned sites to be net-zero projects that maximize solar and energy storage on-site:**
Council File 21 -1039-S2 directs the BOE and LADWP, "…to report to Council on the necessary steps to implement the elements found within the 2022 California Building Energy Efficiency Standards update, and then make further recommendations to ensure that all future city-owned sites, facilities or park-sites are built to be net-zero projects that maximize solar energy generation and storage on-site." The motion also directs that "the Bureau of Engineering further incorporates the components in the above instructions related to maximization of ground-mount and roof-top solar within CF: 21-1039 (Decarbonization Workplan) for all future related projects".

The BOE has engaged the services of Tetra Tech/Glumac for the LA's Existing Building Decarbonization Workplan (21-1039). This Council file (21-1039-S2) and 21-1039 have overlapping work areas. Using the same contract and task order, BOE issued a Notice to Proceed (NTP) on October 3, 2024, to analyze the impact of new energy standards and the ability to maximize onsite solar and storage resources for existing and future city facilities. The consultant is now working with GSD and LADWP and has completed 10% of this new work.

VII. **Council File 22-0530: Grid Impact Study Status:**
Council File 22-0530 directs that, "…the Bureau of Engineering, with the assistance of the Department of Water and Power, General Services Department and City Administrative Office, conduct an analysis on the electrical load and upgrades needed for all city and city-proprietary departments, in order to prepare all city buildings and facilities for full electrification and decarbonization, and report back with partnership opportunities with all City agencies related to commercial electrification."

This Council file (22-0530) and 21-1039 also have overlapping work areas. Using the same contract and task order for the LA's Existing Building Decarbonization Workplan (21-1039), BOE issued a Notice to Proceed (NTP) to Tetra Tech/Glumac on October 3, 2024, to conduct an analysis on the electrical load and upgrades needed for the municipal buildings, excluding proprietary departments. The consultant is working with GSD and LADWP and has completed 10% of this work.

FISCAL IMPACT

The recommendations in this report have no direct fiscal impact. The report recommends reallocating funding previously dedicated to decarbonization to specified projects. Consideration of future funding for decarbonization projects will occur during the annual budget process.

Respectfully submitted,

D. Weintraub

Deborah Weintraub, AIA, LEED AP, Hon ASLA
Chief Deputy City Engineer

DW/ZA:ja

Box\EXE_Ready for Signature\DW\Outbox\Routed\2024\Council file no.21-1039_Rpt 7 12-04-2024.pdf

cc: Randall Winston, Office of the Mayor
Nancy Sutley, Office of the Mayor
Vahid Khorsand, Board of Public Works
Yolanda Chavez, Office of the City Administrative Officer
Patty Hubert, Office of the City Administrative Officer
Sharon Tso, Chief Legislative Analyst
Matias Farfan, Chief Legislative Analyst
Jimmy Kim, Department of Recreation and Parks
Tony M. Royster, General Services Department
Ted Allen, City Engineer

Attachments:

1. City of Los Angeles Existing Municipal Building Decarbonization Workplan Report
2. Decarbonization Workplan's - Year 1 Workbook
3. Phase I Pilot Projects Status
4. Summary of All Decarbonization-Related Funds Allocated to BOE
5. Slide Deck- Decarbonization Workplan and Year 1 Workbook

ATTACHMENT No. 1

Los Angeles' Existing Municipal Building Decarbonization Workplan

Final Report

City of Los Angeles

Existing Municipal Building Decarbonization Workplan

November 2024

Prepared by Glumac, a Tetra Tech Company

ENGINEERING
CITY OF LOS ANGELES

TABLE OF CONTENTS

1. Workplan Summary

Hollyhock House
UNESCO World Heritage Site

1.1. WORKPLAN SUMMARY

The City of Los Angeles has established robust climate action goals and is committed to achieving carbon neutral municipal operations by 2045. The City owns and operates roughly 980 buildings, totaling over 21 million square feet, which account for 34% of the City's municipal greenhouse gas (GHG) emissions[1]. Reliable and resilient municipal buildings are essential to the City and support a range of public services and critical emergency operations. Decarbonizing municipal buildings will improve infrastructure and yield multiple benefits including addressing the urgent need for climate action, improving the resilience of vulnerable communities, and leading the way for the private sector.

The Los Angeles City Council directed city departments to develop a workplan to retrofit municipally owned buildings to achieve carbon-neutral operations by 2035. In April of 2023, the City engaged a team of consultants to work with the Bureau of Engineering (BOE) to develop this plan. **The goal of this project was to develop**:

1. **Prioritization Methodology:** Criteria to prioritize investments in specific buildings.
2. **12-year Work Plan:** Year-by-year project workbook for non-proprietary department buildings.
3. **Tracking & Reporting Tool:** Centralized building decarbonization program management.

The workplan will provide the City with a strategic framework and detailed roadmap to eliminate operational GHG emissions from energy sources at existing municipal buildings through implementing decarbonization measures such as energy efficiency, electrification, solar PV, and battery energy storage. This plan aligns with the past and ongoing climate action efforts including **key principles in the LA Green New Deal**[2].

1. **Climate Action:** Commitment to the Paris Climate Agreement and to act urgently with a science-based strategy for achieving zero carbon buildings.
2. **Equity & Jobs:** Responsibility to deliver environmental justice and equity, and duty to ensure that every Angeleno has the ability to join the green economy.
3. **Lead the Way:** Resolve to demonstrate the art of the possible and lead the way, walking the walk and using the City's resources - our people and our budget - to drive change.

PLANNING PROCESS
The Existing Building Decarbonization Workplan included four primary tasks. The consultant team worked closely with the Bureau of Engineering and numerous other City departments.

Foundational Analysis	Prioritization Methodology	Jobs, Procurement, Maintenance	Tracking Tool
Review background research, existing conditions, City of LA documents and decarbonization strategies.	Establish a method for evaluating projects. Develop a pilot program and a 12-year workbook	Assess job impacts and mitigation strategies, delivery options, funding strategies and maintenance practices.	Develop a system for reporting and tracking GHG emissions, program savings and project implementation.

Figure 1: Existing Building Decarbonization Workplan Planning Process

[1] Remaining 66% of GHG emissions are from process such as water delivery and solid waste. Data from the **2022 Municipal Greenhouse Gas Inventory** and excludes emissions from LADWP power generation.
[2] The LA Green New Deal was published in 2019 and updated in 2022. **LA Green New Deal**.

PATHWAY TO CARBON NEUTRALITY

The Existing Building Decarbonization Workplan provides a pathway for the City of Los Angeles to achieve carbon neutral municipal building operations by 2035. This plan limits the total cumulative GHG emissions to levels below the science-based reduction targets established in the Paris Agreement. The cumulative reduction in GHG emissions is critical for preventing global temperature from increasing more than 1.5°C above pre-industrial levels, which is required to mitigate the worst impacts of climate change.

Figure 2 provides a GHG emissions forecast from electricity and natural gas at municipal buildings based on the recommended implementation plan. The Los Angeles Department of Water and Power (LADWP) has committed to providing 100% carbon free electricity by 2035[3] which will gradually eliminate Scope 2 electricity GHG emissions over time. Energy efficiency measures will reduce emissions in the near term while decreasing operational energy costs. It is therefore critical for the City to electrify existing buildings and fully transition away from fossil fuel based heating systems.

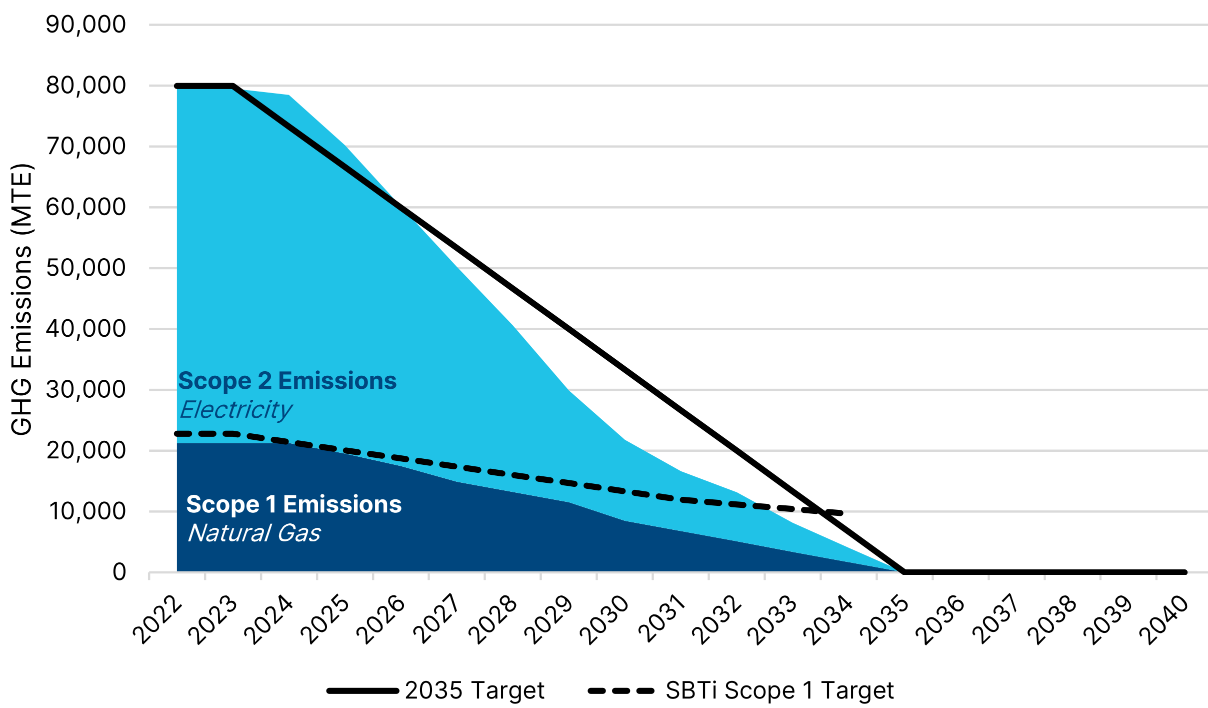


Figure 2: Existing Buildings Decarbonization Workplan GHG Emissions Forecast

[3] The LA100 study provided LADWP with a pathway to achieve 100% clean power and was approved by the Los Angeles City Council. The GHG emission forecast included in this workplan assume these targets are met.

KEY FINDINGS

The project workplan outlined in this report provides a pathway for the City to achieve carbon-neutral operations by 2035. Through this project several key findings were identified:

1. **The City of Los Angeles has a pathway for carbon-neutral municipal buildings by 2035**.
    - Prioritize capital investments in building electrification. LADWP has committed to carbon free power by 2035 and electrification projects will yield the largest emissions reduction.
    - Target the largest natural gas demand. 25 sites, or 0.5% of buildings included in the workplan, account for 50% of the City's building-related natural gas use.
    - Adopt a science-based GHG emissions reduction target compared to 2022 levels, with interim natural gas reduction goals by 2030 and 2035.
2. **Achieving 2035 carbon neutrality requires scaling and accelerating implementation efforts**.
    - Los Angeles needs to electrify 80 buildings each year starting in FY24-25, every year the City waits annual requirement increases by 10%.
    - Additional staff, resources, funding and new project delivery methods are required.
    - Success requires significant coordination and collaboration between multiple City departments.
    - A dedicated Municipal Building Decarbonization Team is recommended to manage the program and coordinate and support departments.
    - Permitting for electrification and solar PV + BESS microgrids need to be streamlined.
3. **Align projects with asset renewal needs and leverage external funding and financing.**
    - Align decarbonization projects with infrastructure needs to avoid early equipment retirement and support deferred maintenance project.
    - SCAQMD rule changes will require the City to retire gas boilers and water heaters at end of life. New natural gas equipment will not be permitted between 2026-2033.[4]
    - Pursue all available grants, leverage new financing mechanisms, and consider a building decarbonization and resilience bond.
    - Implement an Energy Savings Performance Contracts (ESPC) pilot.
4. **Municipal building decarbonization will provide greater community benefits.**
    - Support Los Angeles' greater sustainability, climate action and resilience goals.
    - Improve the resilience of community cooling centers and emergency service operations.
    - Lead the way for the private sector and spur investment in building decarbonization.
    - Create over 1,000 new local jobs in the green economy.

[4] South Coast Air Quality Management District (SCAQMD) has passed rule changes that will require zero NOx heating equipment. To comply the City will need to install electrified heating equipment at existing building.

1.2. EXISTING BUILDING PORTFOLIO

The City of Los Angeles municipal building portfolio includes over 980 facilities that support a range of crucial services including public safety, emergency management, and other community services vital for the well-being of the city of Los Angeles. Multiple departments support the operation of existing buildings in the City. The General Services Department (GSD) and Recreation and Parks (RAP) are responsible for providing general maintenance and upkeep. The Bureau of Engineering (BOE) provide a range of project management, architecture and engineering services.

The Decarbonization Workplan covers all municipal buildings outside of proprietary departments, which include the Los Angeles Department of Water and Power (LADWP), Los Angeles World Airports (LAWA), and the Port of Los Angeles. Additionally, industrial process facilities, including wastewater reclamation plants, compressed natural gas (CNG) vehicle fueling stations, and asphalt plants, were excluded from this framework. These unique facilities will be addressed through other decarbonization planning efforts within the City.

980
BUILDINGS

21M
SQUARE FEET

21
DEPARTMENTS

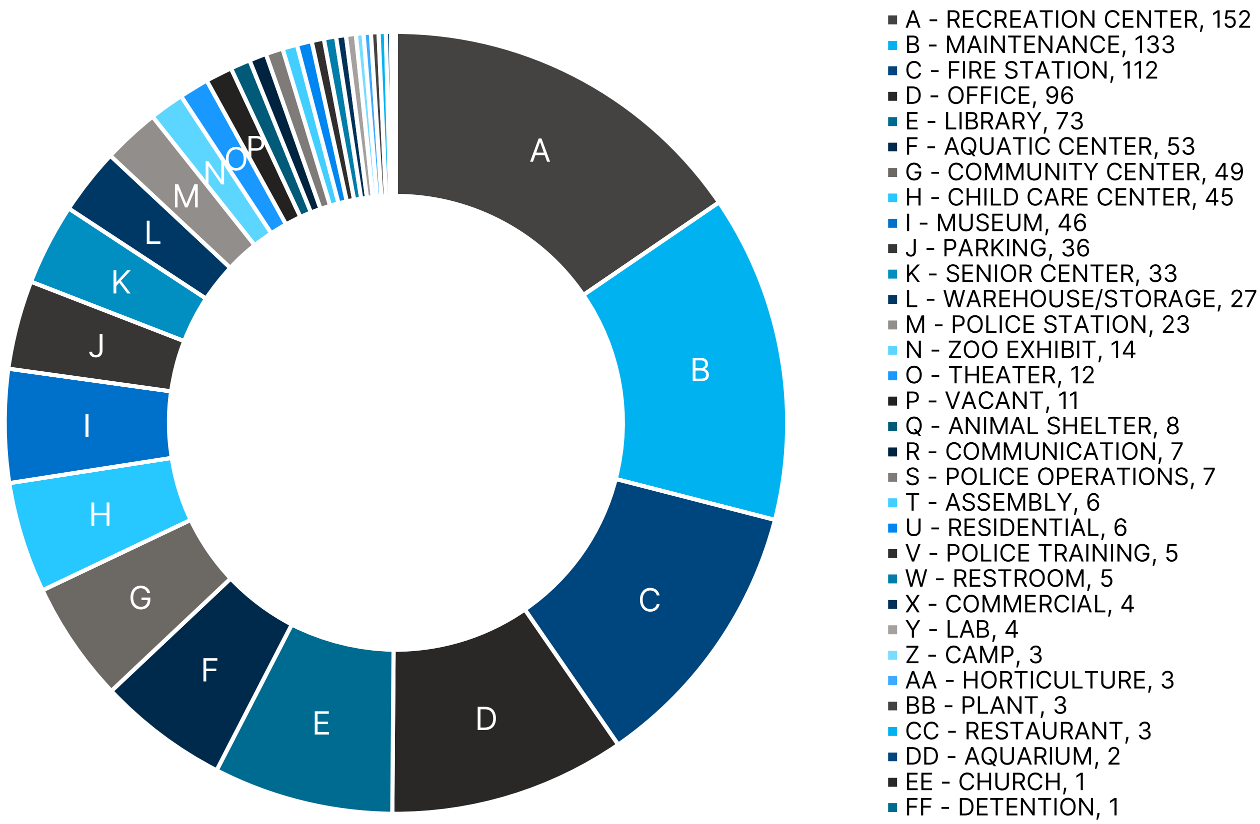


Figure 3: City of Los Angeles Existing Municipal Building Portfolio

ENERGY AND EMISSIONS

Collectively, existing municipal buildings use over 4,000,000 therms of natural gas and 212,000 megawatt-hours of electricity annually, which produce roughly 80,000 metric tons of equivalent CO2 emissions (MTE). The following chart shows historical GHG emissions from existing buildings and provides a baseline forecast. The downward trend in Scope 2 emissions is due to LADWP's carbon reduction efforts.

Natural Gas	Electricity	GHG Emissions	Energy Utilities
4,000,000 therms	**212,000** megawatt-hours	**80,000** MTE	**$68M** Costs

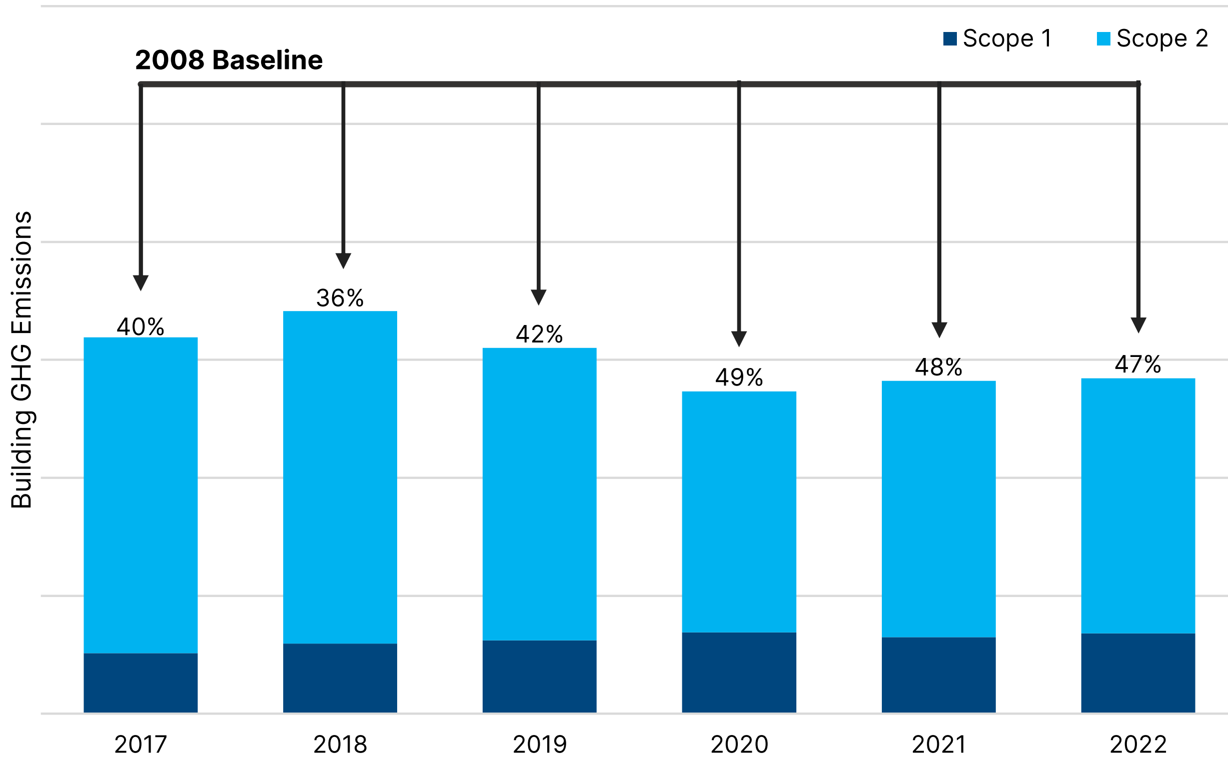


Figure 4: City of Los Angeles Building Energy Use and GHG Emissions

PILOT DECARBONIZATION PROGRAM

In 2022 the City of Los Angeles established a building decarbonization pilot program that funded decarbonization projects across a range of municipal facilities. This provided the City with the opportunity to design and implement projects on a smaller scale before addressing their entire municipal portfolio. This Pilot Program has provided the City Bureau of Engineering with various lessons learned and best practices that will guide the design of future building decarbonization projects. Refer to Appendix Section A.3 for additional information. Select findings of the pilot program include the following:

- Electrical service and panel upgrades were not required to electrify most pilot facilities
- Buildings may require reconfiguration of RTU layouts when converting to heat pumps. Heat pump units may be larger than existing units and require a larger footprint.
- Opportunities may exist to streamline the structural permitting process for rooftop unit electrification projects. It is recommended that the City:
    - Meet with LADBS to review options to improve the permitting process
    - Leverage mechanical vendors to provide stamped structural attachment details
- The City should prioritize electrification based on age and condition. One pilot building had a natural gas rooftop unit that was less than 5 years old – the unit is planned for future electrification.

Phase I Pilot

Projects are fully funded and are in various stages of design and construction. BOE provided project management and engineering design services.

Program Summary

- 8 sites (recreation centers, libraries, fire station, senior center)
- $31M funding (energy efficiency, electrification, solar)

Phase II Pilot

Projects are fully funded and have not yet started design. BOE will provide project management and engineering design services.

Program Summary

- 5 sites (municipal building, library, recreation centers, police station)
- $23M funding (energy efficiency, electrification, solar)
- $32M LADWP investment (solar PV and battery energy storage)

Balboa Sports Complex
Electrification, PV, BESS

Cypress Park Branch Library
Electrification, Efficiency, PV, BESS

Old Fire Station No. 39
Electrification, Efficiency, PV, BESS

1.3. DECARBONIZATION STRATEGY

DECARBONIZATION MEASURES[5]

The following categories of decarbonization measures are recommended to eliminate GHG emissions at City's existing municipal buildings.

Major Renovations and Building Retrofits

Measures	Electrify natural gas equipment and invest in energy efficiency upgrades during major renovations and building replacements. Target retrofitting building systems that may not be feasible to upgrade as a standalone project outside of a major renovation (ex. Constant air volume to variable air volume conversions requiring significant building disruptions).
Approach	Establish all-electric building standards. If a building is slated for renovation or replacement the new systems selected should be all electric.
Funding	Major renovations and retrofits will be funded as capital improvement projects outside of the building decarbonization program.

Building Electrification

Measures	Replace natural gas equipment with all-electrified technologies including heat pumps, electric appliances
Approach	Electrify all existing municipal buildings, aligning implementation with existing maintenance and infrastructure needs.
Funding	$1.7-2.2 billion required for electrification ($0.9-1.2 billion to replace with new natural gas equipment at end of life)

Energy Efficiency

Measures	Building upgrades including LED lighting retrofits, high efficiency equipment and retro-commissioning.
Approach	Pursue cost effective energy efficiency projects as a precursor to electrification, or in tandem with electrification projects.
Funding	$250-300 million

[5] Program costs include total project cost – construction, general contractor markups and soft costs. Additionally, BOE construction escalation rates for project implementation through 2035 and contingency have been included.

Distributed Energy Resources[6]

Measures	Energy projects including on-site solar photovoltaics (PV), battery energy storage systems (BESS) and microgrid controls.
Approach	Pursue cost-effective solar PV and BESS for critical facilities. Procure 100% clean electricity from LADWP no later than 2035.
Funding	$125-175 million

The combined effects of recommended decarbonization measures are shown in the following graphic. Major renovations and building retrofits will have a positive impact on energy use and emissions, but have been excluded from the graphic because it assumed this work would be completed outside of this workplan

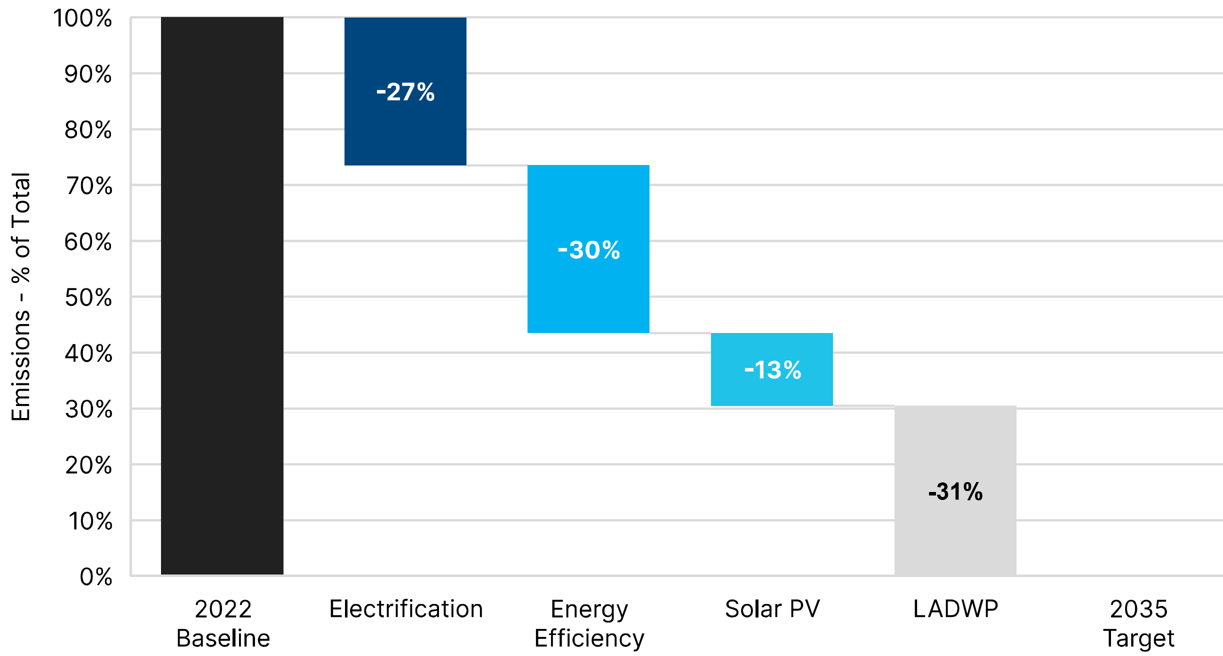


Figure 5: Building Decarbonization Measures – Emissions Reduction Waterfall

[6] Distributed Energy Resource projects can qualify for up to a 50% cash rebate through the federal Investment Tax Credit (ITC). Additional information is provided in Section 4.5 Funding & Financing.

PRIORITIZATION METHODOLOGY

Establishing a prioritization methodology was essential for the City to identify building and projects that maximize the benefits of the City's investment while achieving carbon neutral municipal building operations by 2035. This framework includes four key criteria: GHG emissions reduction, infrastructure needs, cost effectiveness and equitable investment. Prioritizing cost-effective, impactful projects that address existing infrastructure needs at buildings in disadvantaged communities will enable the City to effectively address climate change in an equitable manner.

This methodology will guide decision-making throughout the implementation of the plan, ensuring that resources are allocated where they are most needed and can deliver the greatest benefits for Los Angeles. Key performance indicators (KPIs) were established for each prioritization criteria to monitor impact and provide transparency.

Figure 6: Building Prioritization Methodology

Prioritization Criteria	Outcomes & Impact	Tactics
Emissions Reduction Prioritize projects with largest GHG emissions reduction potential.	Carbon neutrality municipal building operations by 2035. Leading by example for the private sector.	**A.** Electrify all buildings **B.** Complete LED lighting retrofits **C.** Pursue cost-effective energy efficiency and solar projects **D.** Procure 100% carbon free electricity
Infrastructure Needs Prioritize buildings with the greatest building infrastructure issues and deferred maintenance.	Improved reliability of public services and emergency operations. Greater community resilience.	**A.** Prioritize projects based on existing building infrastructure conditions **B.** Invest in cooling centers **C.** Create microgrids for community centers and critical services
Cost Effectiveness Prioritize cost effective decarbonization projects, leverage external funding & financing, and reinvest savings.	Reduced operational costs for municipal building utilities and maintenance.	**A.** Pursue all available incentives, rebates and credits **B.** Leverage cost-effective alternative funding and financing sources **C.** Submit projects for federal and California state grants
Equitable Investment Equitably invest across Los Angeles, prioritizing buildings serving disadvantaged communities.	Investment in facilities that support disadvantaged communities. Economic support for local green jobs.	**A.** Utilize the City's Equity Index and Federal Justice 40 Initiative **B.** Monitor investments and provide transparency

DELIVERY METHODS

The decarbonization workplan provides a comprehensive implementation strategy comprised of multiple project delivery methods for implementing decarbonization measures. This provides flexibility to accommodate the unique needs of individual building projects and provides the opportunity to leverage external financing mechanisms as appropriate. Building electrification and energy efficiency projects fall into two main categories: Capital Improvement Projects and Equipment Replacements. **All project delivery methods will prioritize replacing HVAC systems that have reached the end of life.**

1) Capital Improvement Projects

Complex engineering projects that require planning and engineering design.

- Boilers
- Steam
- Pool Heating
- Large Water Heaters

Delivery Approach:
BOE led projects run through existing capital improvement project processes. Leverage external consultants as needed.

Project Timeline:
Variable timeline depending on project complexity. Projects will be completed within 2-4 years after funding is approved and received.

2) Equipment Replacement Projects

Replacement of smaller natural gas equipment that has reached the end of life.

- Rooftop Units
- Small Water Heaters
- Gas Dryers
- Ovens & Ranges

Delivery Approach:
GSD and RAP led projects with technical support from BOE. Vendors to provide required engineering documents.

Project Timeline:
Short project timelines. All projects will be completed within the fiscal year if funding is approved and received.

3) Portfolio Design-Build Energy Projects

Full building upgrades at simpler facilities (fire station, library, rec center, etc).

- HVAC Systems
- Water Heaters
- LED Lighting

Delivery Approach:
Design-build project for 25-50 buildings. Option for Energy Savings Performance Contract (ESPC) with guaranteed savings and potential for external funding. BOE managed projects.

Project Timeline:
Variable timeline depending on project scale of ESPC project. Projects will be completed within 2-3 years after funding is approved and received.

4) Portfolio Solar & BESS Procurement

Combine solar PV projects across multiple sites for more competitive pricing.

- Rooftop Solar
- Carport Solar
- Battery Energy Storage Systems (BESS)

Delivery Approach:
Design-build project delivery leveraging existing on-call solar contractors list. BOE managed projects.

Project Timeline:
Projects generally completed within 1-2 years after funding is approved and received.

1.4. DECARBONIZATION WORKPLAN

The Existing Municipal Building Decarbonization Workplan signifies a significant step forward in the City of Los Angeles' commitment to science-based climate action goals and the goal of providing a more sustainable and resilient future for all Angelenos. The comprehensive workplan provides a strategic roadmap for implementing a suite of decarbonization measures, including energy efficiency upgrades, electrification of fossil fuel systems, and the deployment of solar PV and battery storage systems. Beyond reducing GHG emissions, these enhancements will improve the resilience of municipal buildings, which serve as vital community hubs and provide critical emergency services.

Recognizing the urgent need for climate action and the significant investment required, implementation of the workplan has been divided into three primary phases. Beginning in 2022, the City has piloted decarbonization projects to gather insights and best practices for the engineering and construction of all-electric existing buildings conversations. Over the next two years through 2026 the City will develop new decarbonization programs, pilot innovative financing strategies, and establish a scalable implementation framework. Subsequently, through 2035 the City aims to systematically decarbonize roughly 980 buildings, totaling 22 million square feet, which will eliminate 80,000 metric tons of GHG emissions (MTE). To facilitate this ambitious transition, it is estimated an investment of $2.2 to $2.6 billion will be required.

Workplan Phase	Pilot Projects 2022-2024 *Pilot decarbonization projects.*	Develop Programs 2024-2026 *Establish scalable framework.*	Scale Implementation 2026-2035 *Execute the building decarbonization workplan.*
Strategy	Pilot projects across a range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan.	Establish a framework and internal structure to provide program management and oversite, facilitate departmental collaboration and address training and staffing needs.	Decarbonize all existing municipal buildings, averaging ~100 buildings or 2.27 million square feet per year. Accelerate GHG emissions reductions, enhance the resilience of operations, lead the way for the private sector and serve as a model for municipal climate action.
Buildings Decarbonized	16	96	853
Funding	$54M	~$200M	~$2.0-2.4B
Key Outcomes	• Implement projects • Verify performance • Learn & establish standards	• End-of-life equipment program • External Financing, ex. ESPC • Portfolio solar PV procurement • Electrify high GHG buildings	• Eliminate fossil fuels from building heating • Convert lighting systems to 100% LED • Install 20-25 MW of solar PV • Engage the local community
Emissions Reduction	1%	18%	100%

Figure 7: Existing Building Decarbonization Workplan Strategic Framework

1 Pilot Projects
2022-2023

During the Pilot Projects phase the City will test various decarbonization measures across a diverse range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan. As of October 2024 all Phase I pilot projects were in design, under construction or completed.

Key Outcomes

- Implement decarbonization measures across a diverse set of buildings
- Monitor, evaluate and verify the performance of electrification measures
- Document best practices and lessons learned to establish City standards
- Partner with LADWP to deliver solar PV and BESS projects on City land

2 Develop Programs
2024-2025

During the Develop Programs phase the City will lay the groundwork to scale implementation efforts. Over these two years the City will establish a framework and internal structure to provide program management and oversight, facilitate collaboration between departments, and address workforce training and staffing needs.

Key Outcomes

- Establish a streamlined process for end-of-life equipment electrification
- Pilot new funding, financing and project delivery mechanisms, including ESPC[7]
- Install 2-3 MW of solar PV through a portfolio design-build procurement
- Electrify at least four of the top 25 natural gas consuming municipal sites

3 Scale Implementation
2026-2035

During the Scale Implementation phase, the City will execute the building decarbonization workplan. Over the course of nine years, the City will decarbonize 853 buildings, averaging ~100 buildings per year. This will accelerate GHG emissions reductions, enhance the resilience of operations and lead the way as a model for municipal climate action.

Key Outcomes

- Eliminate the reliance on fossil fuels for all space, pool and water heating
- Convert lighting systems to 100% LED and retro-commission large buildings
- Install an additional 20-25 MW of distributed solar PV
- Foster community engagement for a just energy transition
- Share lessons learned and successes with the greater Los Angeles community to spur private sector investments

[7] Energy Savings Performance Contracts (ESPC)

PROGRAM FUNDING
The Existing Building Decarbonization Workplan requires significant capital investment to achieve carbon neutral operations at municipal facilities by 2035. It is estimated that between $2.2 to $2.6 billion of funding will be required for the City to electrify all existing municipal buildings and achieve its energy efficiency goals ($110-120/SF). This would require $1.35 billion to replace natural gas equipment at the end of life. The cost of installing new electrified heating systems is estimated to be $1.9 billion, which will require an additional $550 million in funding. New SCAQMD regulations probit the installation and operation of various natural gas equipment, with requirements phased in between 2026 and 2033. The City will need to budget for electrification to stay compliant with air-quality regulations.

Outlined below is a preliminary recommended funding schedule that ramps up annual capital costs over time. Alternatively, the City can adopt a strategy to shift investments to early years and gradually reduce investments over time. As the next step, the City will engage with a range of internal and external financial experts to develop a detailed plan to finance these efforts.

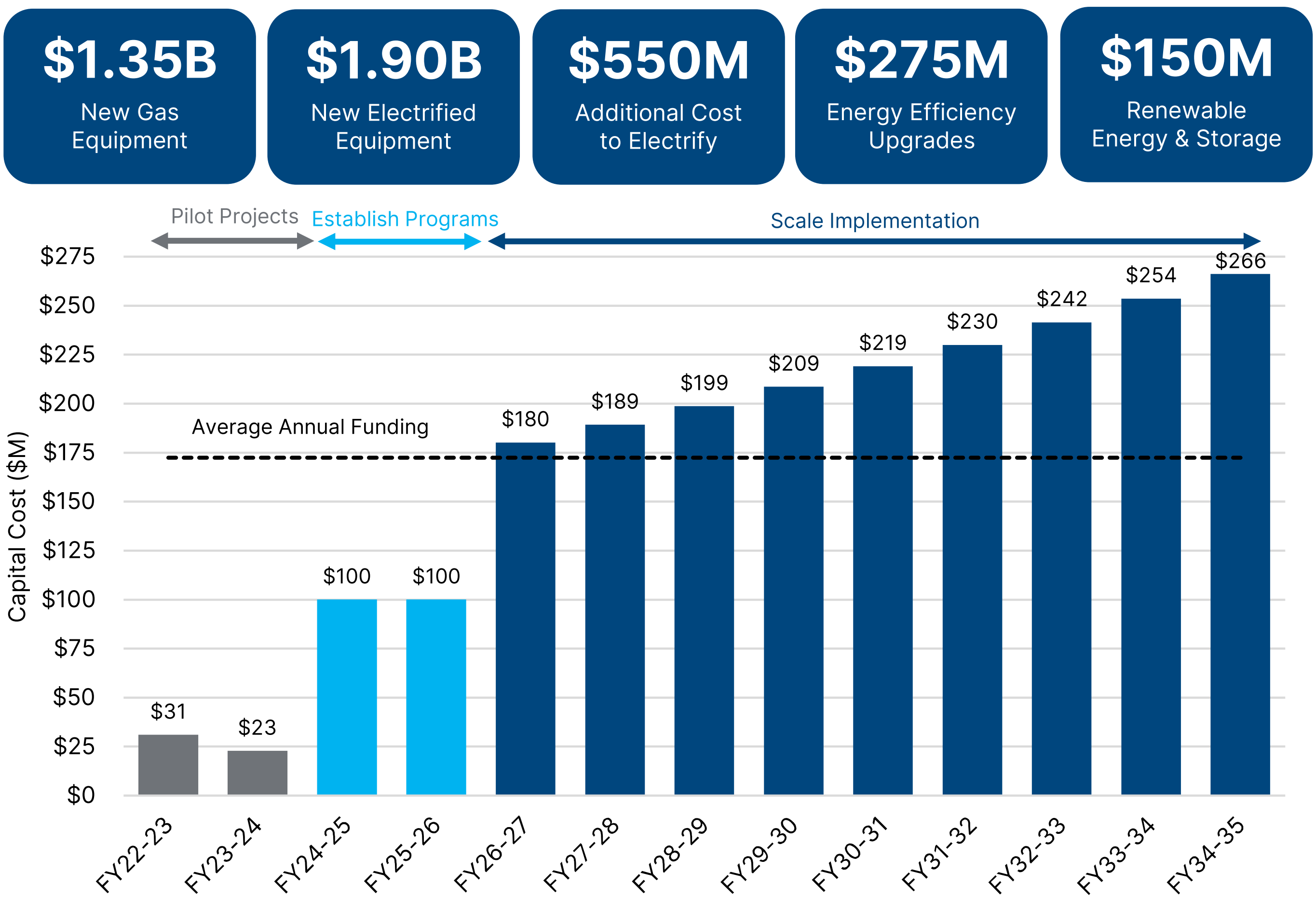


Figure 8: Building Decarbonization Workplan Annual Funding[8,9]

[8] Total program cost of $2.4 billion includes estimated construction and general escalation ($112/SF). The present value of all projects without escalation is estimated to be $1.2-$1.4 billion ($61/SF).
[9] BOE proposes that the Pilot Phase 2 funding (FY23-24) is combined with the Workplan Year 1 (FY24-25).

It is recommended that the City leverages a combination of internal funds and external funding and financing opportunities. The combined approach of increasing general funds allocated towards existing building upgrades and exploring new alternative funding and financing strategies will provide the City with the flexibility to adapt to changing financial situations.

Internal Funding	External Financing	Grants & Incentives
Existing internal city funds to support building decarbonization and retrofit projects.	New sources of external funding and financing to supplement internal sources.	Leveraging external grants and incentives to the greatest extent possible to offset costs.

Potential Sources
• General Fund
	Potential Sources
	• Energy Savings Performance Contracts (ESPC)[1]
	• Debt Financing
	• Public Private Partnerships[2]
	• Bond Measures
	• California I-Bank[3]
		Potential Sources
		• Federal Grants[4]
		  ○ Inflation Reduction Act (IRA)
		  ○ Infrastructure Investment and Jobs Act (IIJA)
		  ○ Other Programs
		• Investment Tax Credit (ITC)
		• LADWP Incentives

Recommended Application • Large, complex electrification projects • End of life equipment replacement	**Recommended Application** • Cost effective projects • Solar PV systems	**Recommended Application** • Projects aligned with specific grant requirements • Resilience projects

[1] **Energy Savings Performance Contracts (ESPC)** are a project delivery method where the City can deliver electrification and energy efficiency upgrades to a group of 25-50+ buildings through a single procurement. Public agencies can also finance the cost of building upgrades through the energy and operational cost savings achieved.

[2] **Public Private Partnerships (P3)** can potentially support decarbonizing the Civic Center district steam plant, as part of redevelopment efforts, or other larger building renovations and retrofits and new construction (ex. Convention Center).

[3] **California Infrastructure and Economic Development Bank (IBank)** provides financing for public infrastructure and can potentially be leveraged to finance building decarbonization projects.

[4] **Federal Grants** can provide significant funding for building decarbonization and resilience upgrades at municipal facilities. There are various opportunities including programs funded by the Inflation Reduction Act (IRA). Los Angeles is actively pursuing various federal grants.

YEAR 1 WORKPLAN (FY24-25)

The Year 1 Building Decarbonization Project Workplan prioritizes sites with high potential for GHG emissions reduction and projects that will establish a framework for the City to scale implementation efforts in subsequent years. Implementation of the recommended Year 1 projects is subject to available funding and budgetary considerations. The Year 1 Workplan will leverage $25M in available funds, including $22.6M allocated for Phase II Pilot Projects and $2.4M grant Energy Efficiency & Conservation Block Grant (EECGB).

Capital Improvement Projects	Provide a detailed engineering feasibility study for electrifying the Civic Center steam plant. Electrify the West Valley Police Station, Griffith Park Pool and Roosevelt Pool.
Equipment Replacement Projects	Fund and pilot end of life electrification projects for natural gas equipment through GSD/RAP led maintenance program. Use pilot projects to develop City equipment electrification standards and design guidelines.
Portfolio Design-Build[10]	Complete energy efficiency upgrades and electrify through a design-build project delivery across a portfolio of existing buildings. It is recommended the City consider an Energy Savings Performance Contract (ESPC).
Portfolio Solar Projects	Complete a pilot project to deliver solar PV arrays across multiple locations using a design-build delivery method. Leverage the City's on-call approved solar vendor list.

43	**$61M**	**2.7**
Buildings Electrified	Capital Budget	Solar PV MW

$1M	**3%**
Annual Utility Cost Savings	Portfolio Natural Gas Savings

[10] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

The following table outlines the specific projects that were identified for Year 1. The City plans to electrify a range of facilities that include an aquatics center, police station, library, fire station, community building, recreation center and senior center. The Year 1 Workplan has a total budget of $61M based on estimated capital cost. It is estimated that the City can receive $1-1.5M in utility rebates from LADWP. And additionally $5-6.5M through the Investment Tax Credit (ITC) Direct Pay provision. Collectively these projects will reduce utility costs by $1M annually, based on current utility rates.

Table 1: Recommended Existing Building Decarbonization Workplan FY24-25

Facility	Council District	Building Area (Gross SF)	Natural Gas Annual Savings (Therms)
Capital Improvement Projects ($13.0M)			
Civic Center Steam Plan *Planning Only*	14	-	-
West Valley Police Station *Pilot Phase 2*	03	32,670	16,589
Griffith Park Aquatics Center	04	4,400	377
Roosevelt Aquatics Center	14	4,418	37,032
Equipment Replacement Projects ($4.0M)			
3x RAP Facilities	Multiple	34,000	4,424
4x GSD Facilities	Multiple	65,500	7,250
Portfolio Design-Build Projects[11] ($24.5M)			
11x Libraries	Multiple	96,000	6,628
7x Fire Stations	Multiple	80,700	22,269
11x Community/Office Buildings	Multiple	249,950	31,612
7x Rec Centers/Senior Centers	Multiple	92,540	7,940
Portfolio Solar Projects ($16.5M)			
9x Solar Projects	Multiple		
TOTAL FY24-25 ($61M)		**660,824**	**134,121**

[11] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

Recommended Actions

The following actions are recommended for the City during Year 1 of the decarbonization workplan:

1. **Fund and implement projects outlined in Year 1 project workbook.**
    a. Begin planning and design of capital improvement projects.
    b. Pilot equipment replacement, ESPC and portfolio solar PV projects.
2. **Establish policies and standards that support municipal building decarbonization efforts.**
    a. Expand the municipal building electrification ordinance (BOE Special Order 04-0721) to include end-of-life equipment replacements, prohibiting the installation of new natural gas burning equipment. Exceptions for limited cases.
    b. If facilities propose adding EV chargers to existing LADWP service, require an assessment of future building electrification loads and electrical infrastructure to confirm service can accommodate both.
    c. Host a working meeting with Los Angeles Department of Building and Safety (LADBS) to review opportunities to streamline the permitting process for electrifying small rooftop units (<25 tons) and tank-type water heaters (up to 100 gallons).
3. **Develop an equipment replacement program to electrify building systems at end of life.**
    a. Pilot a $4M equipment electrification program in FY24-25. An additional $1.6M in funding is required. The City has received a $2.4M grant through the DOE Energy Efficiency and Conservation Block Grant (EECBG) Program.
    b. Establish a dedicated annual budget for electrifying equipment at end of life. Funding is required for GSD and RAP to proactively manage the risk of emergency failures.
    c. GSD, RAP and BOE to establish an equipment replacement workflow that leverages vendors to deliver electrification upgrades.
    d. BOE to develop standards, design guidelines and scope of work templates to support equipment electrification projects.
    e. GSD and RAP to develop a workforce development and staffing needs plan.
4. **Begin the process of developing an Energy Savings Performance Contract (ESPC) pilot.**
    a. Confirm City can use CA Government Code 4217.10-4217.18[12] for ESPC projects.
    b. Engage a consultant to support the procurement and delivery of ESPC pilot program.
    c. Issue an RFP and qualify a short list of Energy Service Companies (ESCOs).
    d. CAO to review internal and external financing opportunities.
5. **Engage in additional planning efforts to support building decarbonization efforts.**
    a. Provide a workforce needs assessment to better understand the internal City staffing requirements for the building decarbonization workplan.
    b. CAO to establish a long-term funding and financing strategy to support the City's municipal building decarbonization workplan.
    c. Provide funding for a phased portfolio facility condition assessment (FCA) to inventory fossil fuel assets and assess larger existing building deferred maintenance.

[12] California Government Code Section 4217.10 to 4217.18 allows public agencies in CA to enter into an ESPC agreement if it is determined that the project is in the best interest of the City and the anticipated cost savings are less than the marginal cost to the City.

2. Project Background

Van Nuys New Fire Station 39

2.1. PROJECT APPROACH

The City of Los Angeles engaged the Tetra Tech and Glumac team to develop a building decarbonization workplan aimed at mitigating the City's operational emissions from existing municipal buildings. The development of this plan included robust data collection, energy and emissions modeling, financial analysis, strategic planning, and stakeholder engagement with departments across the City. The project will result in a strategy framework and actionable roadmap to guide future implementation. The project is structured in the following four phases.

Task 1: Foundational Analysis

In this initial phase, extensive background research and stakeholder engagement was provided to establish a foundational understanding of existing conditions with the City of Los Angeles for the project. Background research included evaluating existing policies, City Council motions and previous climate action plans. Notably, the 2019 LA Green New Deal established a commitment to achieve carbon neutral city operations by 2035, including all municipal buildings. The City has since taken additional bold actions to mitigate climate change and has actively participated in the C40 Initiative, a global network of mayors taking action on climate change. The consultant team engaged various stakeholders throughout the City to gather information about the condition of existing facilities, unique needs, and building resilience needs to serve the local community.

Task 2A: Data Collection and Analysis

The next phase of the project included data collecting and an analysis of the existing building conditions. The City’s Asset Management System (AMS) maintained by the Department of General Services was leveraged to collect data and develop a building database with key information including occupancy type, square footage, department and building systems. Energy audit reports provided through the City’s Existing Building Energy and Water (EBEWE) ordinance were used to understand energy efficiency and building electrification opportunities. Additional energy assessments were conducted to develop energy savings, utility cost, and emission reduction potential across typical buildings in the City.

Task 2B: Prioritization Methodology

A prioritization methodology was established to guide the City's building decarbonization program and provide a decision making framework when evaluating individual building projects. This includes four key criteria: maximize GHG emissions reduction, address existing infrastructure needs, fund cost-effective projects, and equitably invest across the City. To develop a portfolio decarbonization plan, the consultant team assessed representative buildings and scaled the results across the City’s portfolio of 1,200 buildings. The building decarbonization criteria was applied to identify near-term projects. This framework will continue to guide decision making for the City of Los Angeles as implementation plans are revised and updated over the next 15 years to address the changing needs of the community.

Task 3: Jobs Impact Assessment, Procurement & Maintenance Strategy

A jobs impact assessment was provided to assess economic impact of the City’s building decarbonization program and to identify strategies to mitigate any negative impacts resulting from a transition away from fossil fuel-based heating systems. Additionally, the Decarbonization Workplan provides a procurement strategy, performance specifications, and cost templates to support implementing typical decarbonization measures across buildings.

Task 4: Facility Data Tracking Tool

The final tasks will provide a custom building decarbonization tracking tool that will monitor performance against the City’s key performance indicators for this program. This tool will leverage the City's AMS as a central database. The dashboard interface will include information about existing buildings and decarbonization projects at each facility. The tracking tool will allow the City to prioritize projects, track implementation, report on key performance indicators, and monitor emissions reductions across the City.

Project Outcomes & Deliverables

The outcomes of tasks one through three provide the City with a 12-year work plan for decarbonizing their facilities. This includes expanding on the existing pilot program, which is currently in progress across 15 buildings in design and construction throughout the City. Subsequent phases of the pilot program will explore alternative project delivery and financing strategies including portfolio scale solar deployment.

Throughout this process, the City has received guidance and peer review from internal and external stakeholders. The robust peer review process, integrating experts from the public and private industry, has provided valuable insight and feedback into this plan. Feedback processes and robust stakeholder engagement ensures alignment and consideration of stakeholder group priorities integrated into the implementation.

2.2. BACKGROUND INFORMATION

CITY OF LOS ANGELES

The City of Los Angeles has established ambitious goals to promote sustainability and combat climate change. By 2035, the City aims to have a 100% clean energy electric grid and to fully decarbonize all municipally owned buildings without relying on offsets. These goals align with the city's broader agenda of emphasizing equity and addressing social and environmental challenges. Ongoing research is being conducted to determine the most effective pathways to achieving the City's sustainability goals, including the LA Green New Deal, Resilient LA, Equitable Building Decarbonization Plan, the LA100 Study, and the related OurCounty Sustainability Plan (L.A. County). The Los Angeles Department of Water and Power (LADWP) also plays a vital role in the success of reaching these goals, including the development of the LA100 study and incentive programs for energy efficiency measures.

Several reports, including the LA Green New Deal, Resilient LA, the CEMO Report on Equitable Building Decarbonization, and the LA100 Equity Study, highlight the importance of equity in achieving these goals. The LA Green New Deal focuses on improving CalEnviroScreen scores, reducing asthma-related emergency department visits, and increasing the number of green jobs within the City. The CEMO Report on Equitable Building Decarbonization[13] gathered community input and recommended policies to prioritize frontline communities, public health, tenant protections, affordable housing, worker protections, and job training opportunities. The ongoing LA100 Equity Study involves gathering input from Los Angelenos to develop strategies that prioritize energy equity, justice, community health, and job opportunities. The Existing Building Decarbonization Workplan will support climate action and sustainability goals identified in these reports.

Table 2: City of Los Angeles Climate Action and Sustainability Goals

Existing Goals	Municipal Building Decarbonization Workplan
Eliminate municipal GHG emissions by 2045	Electrify building and implement efficiency upgrades.
Net zero carbon new building by 2035	Transition existing building to zero carbon by 2035. New municipal buildings will all be designed to net zero standards starting in 2022.
Reduce all building EUIs 22% by 2025; 34% by 2035; and 44% by 2050[14]	Increase scale of energy upgrades to meet EUI targets.
All-electric new construction starting 2023[15]	The workplan focuses on existing buildings, though future buildings will be subject to this requirement.
100% clean electricity by 2035	Install new on-site solar PV systems and procure 100% clean electricity from LADWP no later than 2035
Create 400,000 new green jobs by 2050	Investments will provide green jobs growth.
Leverage building decarbonization to improve public health and habitability	Improve resilience of community cooling centers which support public health and habitability.

[13] Climate Emergency Mobilization Office (CEMO) 2022 **Report on Equitable Building Decarbonization**
[14] Energy Use Intensity (EUI) is metric of energy use in kBTU normalized per building square foot, similar to miles per gallon for a vehicle.
[15] The 2022 Electric Building Ordinance 187714 requires that new construction is all electric starting in April 2023.

EXISTING PLANS AND INITIATIVES

The City of Los Angeles has implemented several sustainability plans to foster a greener and more equitable future. Outlined below is a summary of these initiatives. Refer to the appendix for additional information.

City Council Motions

Los Angeles City Council has provided various motions that support the City's commitment to decarbonizing municipal buildings and operations. These include but are not limited to 21-1039, 21-0683, 21-0432, 21-0352, 21-1042, and 21-1249 which collectively commit to the following

- Retrofit existing municipally owned buildings to achieve carbon neutral operations by 2035
- Provide 100% carbon-free electricity by 2035
- Establish a municipal energy program for solar PV, battery storage and electric vehicle charging

C40 Initiative

The City of Los Angeles is part of the C40 initiative which is a coalition of over 100 mayors across the globe committed to inclusive and science-based climate action. This commitment includes planning and delivering on a 1.5°C climate commitment and lead the way in local communities.

LA Green New Deal

The LA Green New Deal is a comprehensive sustainability plan to address climate change, economic inequality and environmental justice. The Green New Deal was published in 2019 and has been updated and amended since. This provides a strategic framework for various sustainability initiatives including water sourcing, stormwater capture, renewable energy, energy efficiency, transportation, job creation and municipal greenhouse gas emissions. The LA Green New Deal committed the City to carbon neutral municipal operations by 2045 and established specific municipal building initiatives, targets and milestones.

LA100

The LA100 Study, a collaborative effort between LADWP and the National Renewable Energy Laboratory conducted between 2017 and 2021, utilized advanced simulations and modeling to explore various pathways toward achieving 100 percent clean energy in Los Angeles by either 2035 or 2045. The Los Angeles City Council has committed to providing an equitable transition to 100% clean power by 2035 based on the results of this study. This will provide the City with a direct pathway to eliminate operational Scope 2 GHG emissions.

Resilient LA

The 2018 Resilient LA Plan developed under Mayor Garcetti in collaboration with 100 Resilient Cities focuses on climate resilience, urban heat vulnerability, seismic safety, clean energy systems, and capital planning. Equitable Building Decarbonization emphasizes community input and the inclusion of frontline communities, public health improvements, tenant and affordable housing protections, and green job opportunities. The plan prioritizes pilot projects at critical facilities, ensuring first responder facilities and essential community spaces such as cooling centers can operate during extreme conditions.

CEMO 2022 Report on Equitable Building Decarbonization

Through a series of public workshops and other community outreach efforts, a city working group engaged a diverse range of organizations to collect feedback on climate equity. A range of policy suggestions were made with the following relevant to this workplan.

- Leverage building decarbonization to improve public health and habitability
- Create worker protections and new job opportunities in green energy for frontline communities

- Utilize current decarbonization efforts to gather data on technical and financial requirements
- Design a flexible, equity-centered, multi-phased approach to building decarbonization
- Identify all new and existing possible sources of public, private, and philanthropic funding.

Equity Scorecard Development

Multiple equity-scoring methodologies are in development within the City to inform resource allocation and infrastructure development. The two methodologies referenced within this Workplan include the Infrastructure Equity Scorecard Pilot Project by the BOE and the Citywide Equity Index being developed by the CAO. See the Prioritization Criteria section for additional information.

FEDERAL, STATE AND COUNTY

FEDERAL SUSTAINABILITY PLAN

In December 2021 the White House released Executive Order 14057 which established policies to achieve 50% reduction of GHG emissions from the Federal Government operations by 2030. The action and investments to meet this policy will protect the environment, drive innovation, spur private sector investment, improve public infrastructure and create new economic opportunities. The following goals are included in the Federal Sustainability Plan. Collectively this will provide climate resilience infrastructure, operations and a sustainability focused Federal workforce.

- 100% carbon pollution free electricity by 2030 including 50 percent on a 24/7 basis
- Net zero emissions buildings by 2045 including a 50% reduction by 2032
- 100% zero emission vehicle acquisitions by 2035, including 100% light duty by 2027
- Net zero emissions procurement by 2050 including Buy Clean policy
- Net zero emissions operations by 2050, including a 65% reduction by 2030

Executive Order 14008 established the Justice40 initiative which aims to address environmental and economic inequalities by ensuring that at least 40% of the benefits from federal investments in areas such as clean energy and infrastructure reach disadvantaged communities. Funding allocations within the Inflation Reduction Act (IRA) are aligned with this initiative. There is additional funding available for Disadvantaged Communities as defined by the Federal Government.

STATE OF CALIFORNIA

The State of California has established ambitious goals to combat climate change. Executive Order N-79-20 committed to achieving carbon neutrality operations statewide by 2045. Senate Bill 100 established a legally binding goal for the state to generate 100% electricity from renewable energy sources by 2045.

The Cal EnviroScreen 4.0 tool is a digital mapping tool that assesses the burden of pollution and other vulnerabilities across California. This data visualization tool allows public officials to better develop policies, investments, and programs to address these inequalities. The Cal EnviroScreen combines environmental pollution and population socioeconomic characteristics to evaluate and rank communities. This includes 21 statewide indicators and averages scores within four main components, combining to provides a total score of up to 100.

COUNTY OF LOS ANGELES

The OurCounty Sustainability Plan developed by the LA County Chief Sustainability Office is a comprehensive and intersectional roadmap consisting of 12 goals, 37 strategies, and 159 actions aimed at promoting a range of sustainability goals in Los Angeles County. The plan aims for all new buildings and 50% of major building renovations be net-zero carbon by 2025, with a goal of 100% of major building renovations to be net-zero by 2045. Additionally, the County has established a goal of being fossil fuel-free in the future. The Revised Draft 2045 Climate Action Plan published in March 2023 establishes a target for the County to reduce GHG emissions by 83% below 2015 levels by 2045, with an aspirational goal of carbon neutrality. To support those efforts the County will develop a phased electrification plan for County facilities to remove gas infrastructure over time.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

The South Coast Air Quality Management District (SCAQMD) amended rule 1146.2 which now mandates zero emissions boilers for capacities 2000MBH and under for new equipment and existing units. Once a natural gas unit has exceeded its equipment life and the compliance date has passed, it must be replaced with a zero emissions alternative. This amendment has been passed and compliance will roll out between 2026 and 2033 depending on the unit type and size.

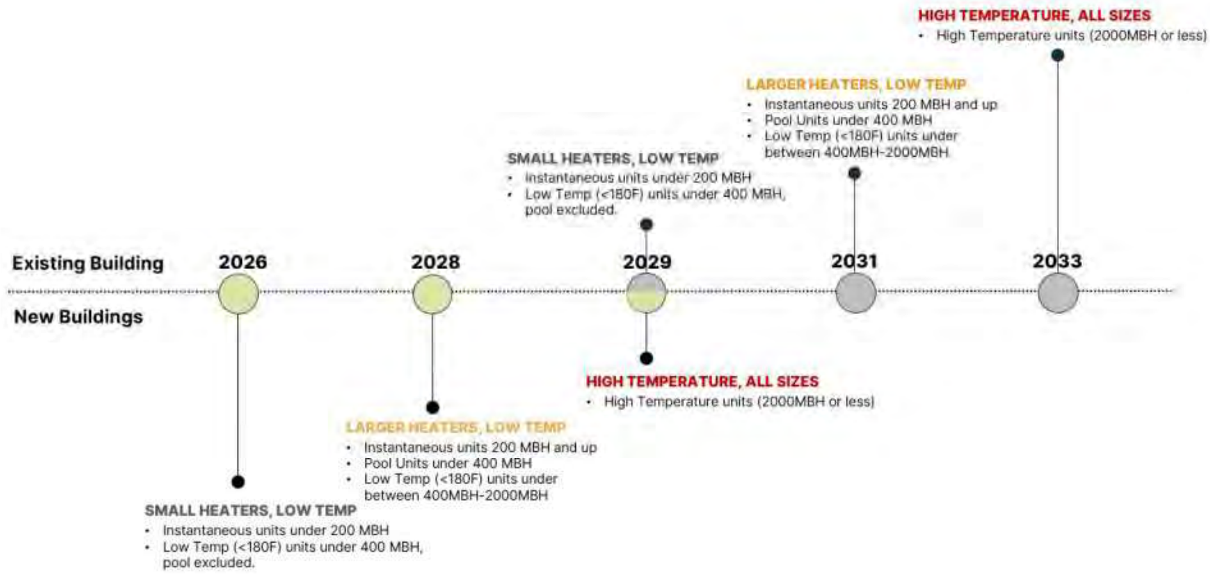


Figure 9: SCAQMD Rule 1166.2 Boiler and Water Heater Regulation Timeline

SCAQMD has also proposed amendments to residential water heaters and gas-fired furnaces. (Rules 1112 & 1111). The proposed language is still being reviewed but as it currently stands, this new proposed language would prevent installation of gas fired furnaces and residential water heaters. Unlike rule 1146.2, these amendments would not affect existing units. It is also important to note that space heating equipment such as RTU's and similar package units fall under the language of rule 1111 and will be affected.

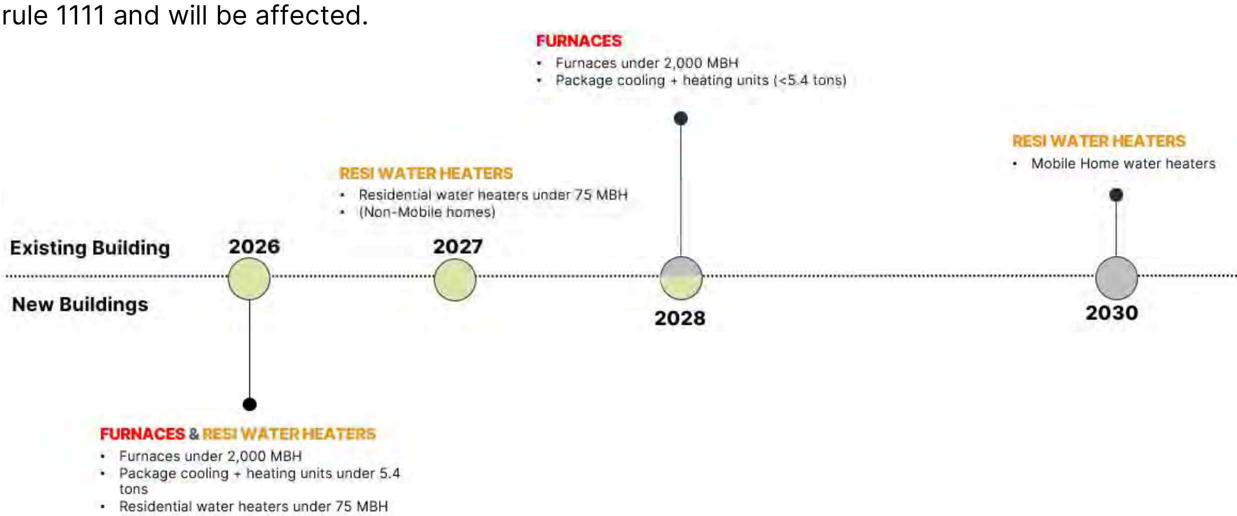


Figure 10: SCAQMD Rule 1111 and 1121 Space Heating Regulation Timeline

MUNICIPAL PEER REVIEW

The City of L.A. is not alone in their efforts to decarbonize municipal buildings, as several other major cities have set similar environmental goals. A review of building decarbonization goals and strategies is provided for a select number of cities within California and across the United States. These cities prioritize equity, energy efficiency, and sustainable practices to achieve their environmental objectives.

Table 3: Municipal Decarbonization Goals and Metrics

City	Key Goals and Metrics
Denver	• Eliminate 100% city and county GHG emissions by 2040. • 100% renewable energy for municipal operations by 2025. • 100% renewable community energy by 2030.
New York	• Carbon-neutrality city-wide by 2050. • 40% reduction from 2006 by 2025 and 50% by 2030 for municipal operations. • 100% renewable energy for all municipal buildings by 2025.
Sacramento	• Transition existing buildings to carbon-free electricity by 2045 • New construction (3 or fewer floors) all-electric by 2023 • New construction (4 or more floors) all-electric by 2026 • Zero emissions power by 2030 (Sacramento Municipal Utility District)
San Diego	• Carbon-neutrality city-wide by 2035. • 100% renewable energy by 2035. • Phase out 50% of natural gas at municipal facilities by 2030 and 100% by 2035.
San Francisco	• Net-zero emissions city-wide by 2040. • 100% renewable electricity by 2025 & 100% renewable energy by 2040. • No on-site fossil fuel emissions at large existing commercial buildings by 2035.
Washington D.C.	• Neutralize GHG emissions by 2045 • Reach carbon neutrality in government operations by 2040 • End new purchases of fossil fuel-based heating systems by 2025 • Net zero new construction and major renovations by 2027 • 100% renewable electricity by 2032 (Clean Energy DC)

3. Existing Buildings

Woodland Hills Recreations Center Pool

3.1. MUNICIPAL BUILDING PORTFOLIO

The City of Los Angeles owns and operates over 1,000 municipal buildings located throughout the city. The existing building stock includes various facilities that support both internal operations and serve as resources for the community. It is crucial for reliable building systems to provide resilient services, to ensure continued operation for public safety, emergency management, and other community services vital for the well-being of the City of Los Angeles. Facilities were constructed at various times over the past 100 years and have a wide range of existing conditions.

The Decarbonization Workplan covers all municipal buildings excluding proprietary departments. Proprietary departments include the Los Angeles Department of Water and Power (LADWP), the Los Angeles Worlds Airport (LAWA), which operates Los Angeles International Airports (LAWA), and the Port of Los Angeles. Additionally, industrial process facilities, including wastewater reclamation plants, compressed natural gas (CNG) vehicle fueling stations, and asphalt plants, were excluded from this framework. These unique facilities will be address through other planning efforts.

Municipal buildings use over 4 million therms of natural gas and 212,000 megawatt-hours of electricity annually. Based on the emissions factors from LADWP and SoCal Gas provided energy the City's municipal buildings produce roughly 120,000 metric tons of equivalent CO2 emissions (MTE) annually. Buildings account for 34% of the city's overall municipal carbon footprint. Decarbonizing municipal buildings will be a critical for the City to meet their climate action goals.

This assessment was conducted using compiled facility data, utility data and previously completed facility assessments. Additionally, each City department was consulted to gather information regarding building functions, typical operations, and department specific needs. Following a review of the compiled energy data, representative buildings for each building type were selected from the pool of buildings with energy audits already completed by the City. Information from prior audits and from the AMS and other databases formed the basis of the decarbonization recommendations.


Police Admin Building


East Valley Adult Center


North Hollywood Sewer Yard


Boyle Heights Youth Tech


North Central Animal Shelter


Central Library

BUILDING TYPES

The City of LA includes a diverse portfolio of buildings that provide various support services and community functions. All buildings within the City were categorized into the following building types. The figures and table on this page provide a breakdown of buildings based on the number of facilities and total gross square foot (GSF) area.

Table 4: Existing Municipal Building Types

Building Type	Summary	Buildings	GSF	Average GSF
Animal Shelter	Animal shelters and hospitals	8	288,600	36,100
Aquarium	Aquarium exhibition and support spaces	2	39,700	19,900
Aquatics Center	Indoor or outdoor pools	53	588,900	11,100
Assembly	Convention, conference centers, theaters	6	1,452,700	242,100
Camp	Multipurpose sport and recreational facilities	3	29,400	29,400
Childcare Center	Preschools and early education centers	44	336,400	7,600
Church	El Pueblo Historical Monument	1	6,100	6,100
Commercial	Shopping centers and golf courses	4	140,800	35,200
Communication	Emergency operations and data centers	7	21,600	3,600
Community Center	Multipurpose community buildings	49	403,400	8,200
Detention	Detention facilities or jails	1	164,200	164,200
Fire Station	Firefighter housing, equipment, and garage	112	1,437,400	12,800
Horticulture	Botanic gardens, greenhouses, and nurseries	2	23,000	7,700
Laboratory	Wet laboratory and support spaces	4	1,541,000	385,300
Library	Library facilities	73	1,396,600	19,100
Maintenance	Vehicle maintenance, often in city yards	133	1,921,200	15,000
Museum	Museums and historic residences used as museums.	46	465,700	10,600
Office	Office buildings	96	5,197,000	54,100
Parking	Parking structures.	36	2,505,100	73,700
Plant	Air treatment and water reclamation plants	3	2,000	2,000
Police Operations	Dispatch centers for emergency services	7	227,400	32,500
Police Station	Police stations	23	1,396,000	60,700
Police Training	Classrooms, shooting range, and equestrian.	5	414,200	103,600
Recreation Center	Multipurpose buildings (sports, arts, etc.)	152	1,646,200	10,800
Restaurant	Restaurants or dining spaces.	3	16,500	5,500
Residential	Housing facilities.	6	72,500	12,100
Restroom	Park restrooms.	5	11,800	2,400
Senior Center	Multipurpose senior care centers.	33	312,000	9,500
Theatre	Theaters and performing arts centers.	12	220,000	18,300
Vacant	Former public spaces no longer in use.	13	173,700	15,800
Warehouse/Storage	Maintenance yards and storage warehouses.	27	425,600	16,400
Zoo Exhibits	Zoo exhibit buildings.	14	64,700	4,600
Total		**980**	**21,300,000**	

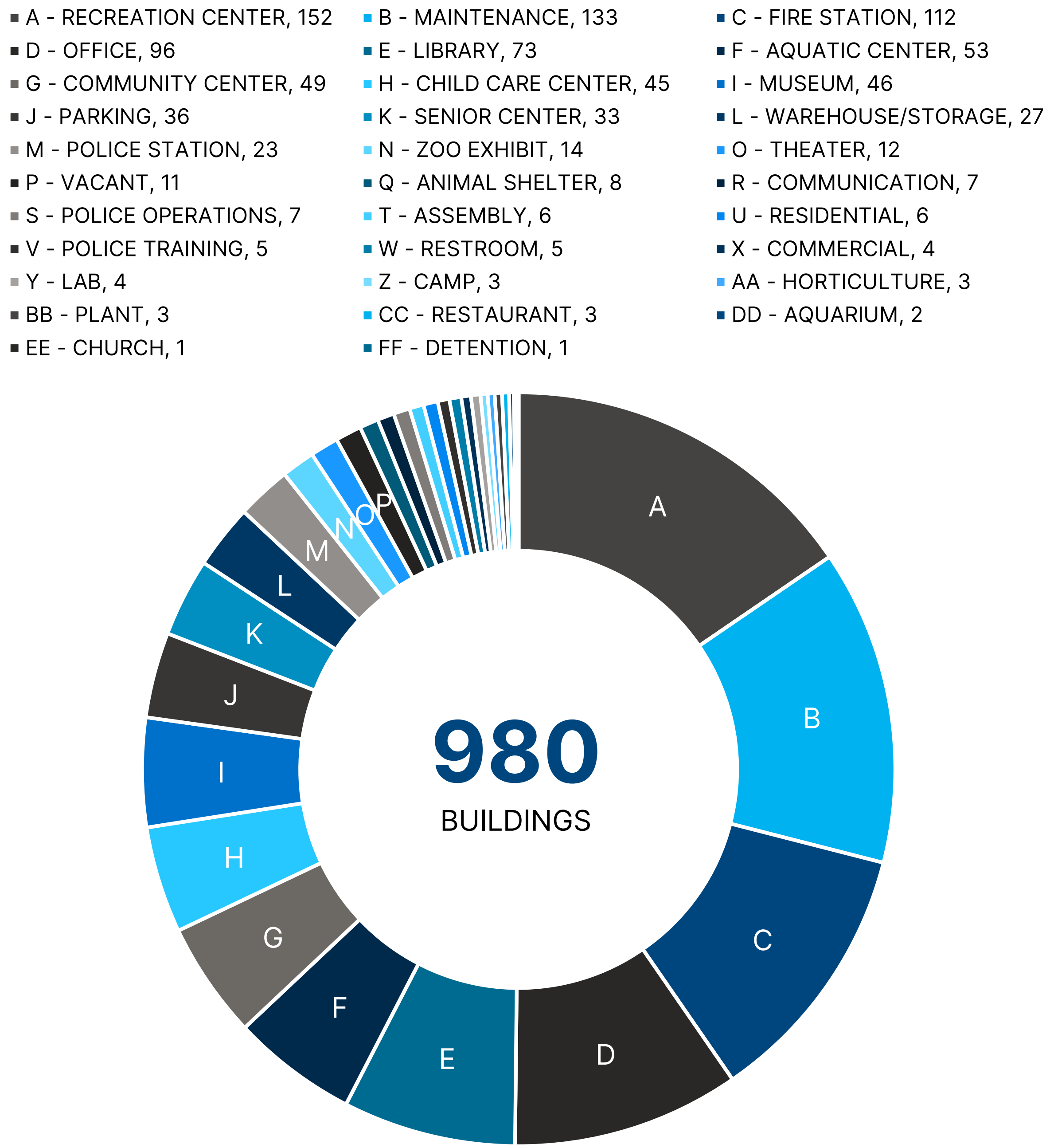


Figure 11: City of Los Angeles Existing Municipal Building Portfolio

3.2. ENERGY AND EMISSIONS

An energy inventory was compiled using 2022 utility data to establish a baseline for the energy and emissions projections output by this Workplan. Over 1600 electricity meters and 640 gas meters across the city were evaluated to determine the energy usage by individual buildings. In 2022, existing municipal buildings use over 4,000,000 therms of natural gas and 212,000 megawatt-hours of electricity annually which produce roughly 80,000 metric tons of equivalent CO2 emissions (MTE). Buildings account for 34% of the city's overall municipal carbon footprint, removing emission from LADWP electricity generation. The following chart shows historical GHG emissions from existing buildings and provides a baseline forecast.

Natural Gas	Electricity	GHG Emissions	Energy Utilities
4,000,000 therms	**212,000** megawatt-hours	**80,000** MTE	**$68M** Costs

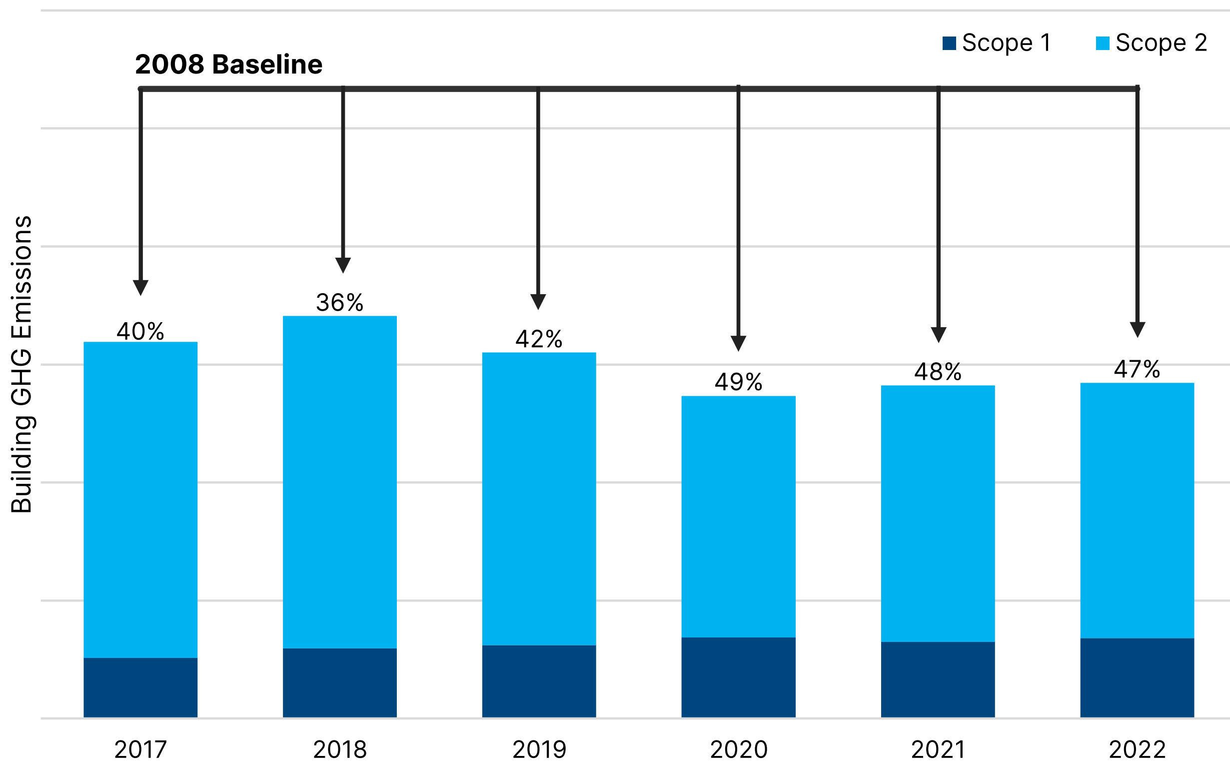


Figure 12: City of Los Angeles Building Energy Use and GHG Emissions

GHG Emissions Forecast

Greenhouse gas emissions were projected using compiled 2022 utility data and the framework established by the 2022 Municipal Greenhouse Gas (GHG) inventory developed by LASAN. Unlike the Municipal Inventory, this analysis focuses only on emissions from building operations and excludes emissions from street lighting and facility processes unrelated to building occupancies such as vehicle fueling, water reclamation and asphalt production.

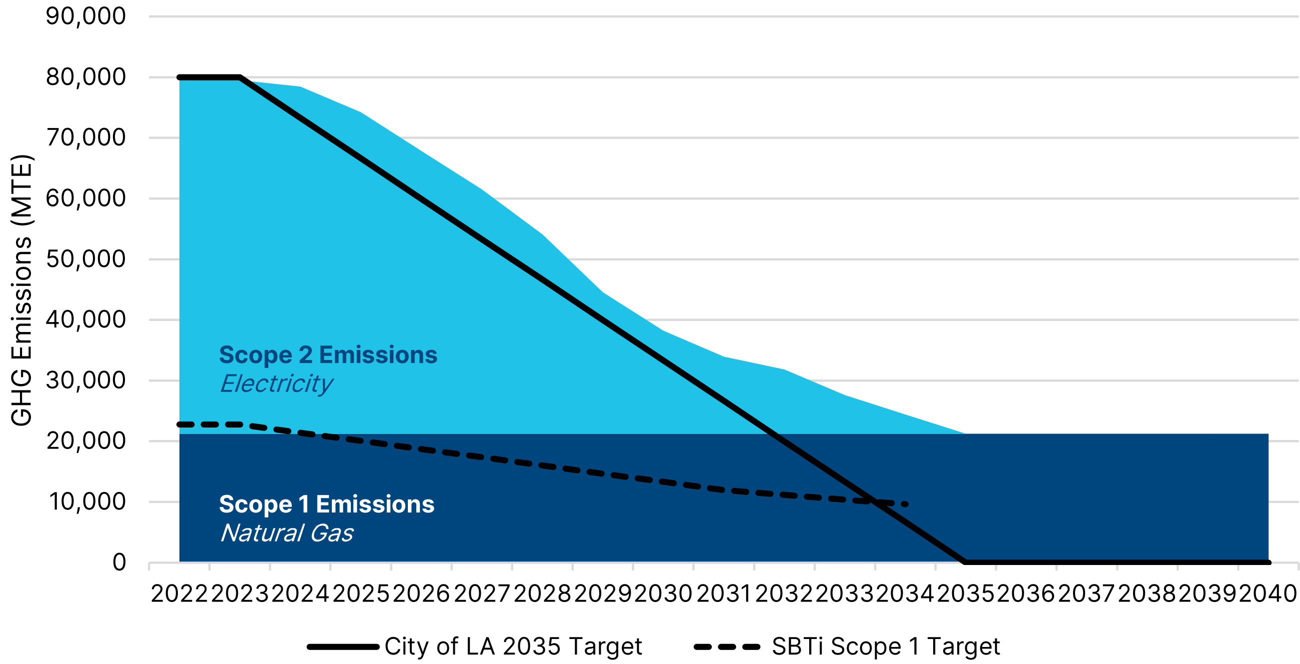


Figure 13: Business as Usual GHG Emissions - Municipal Buildings[16]

[16] Remaining 66% of GHG emissions are from process such as water delivery and solid waste. Data from the **2022 Municipal Greenhouse Gas Inventory** and excludes emissions from LADWP power generation.

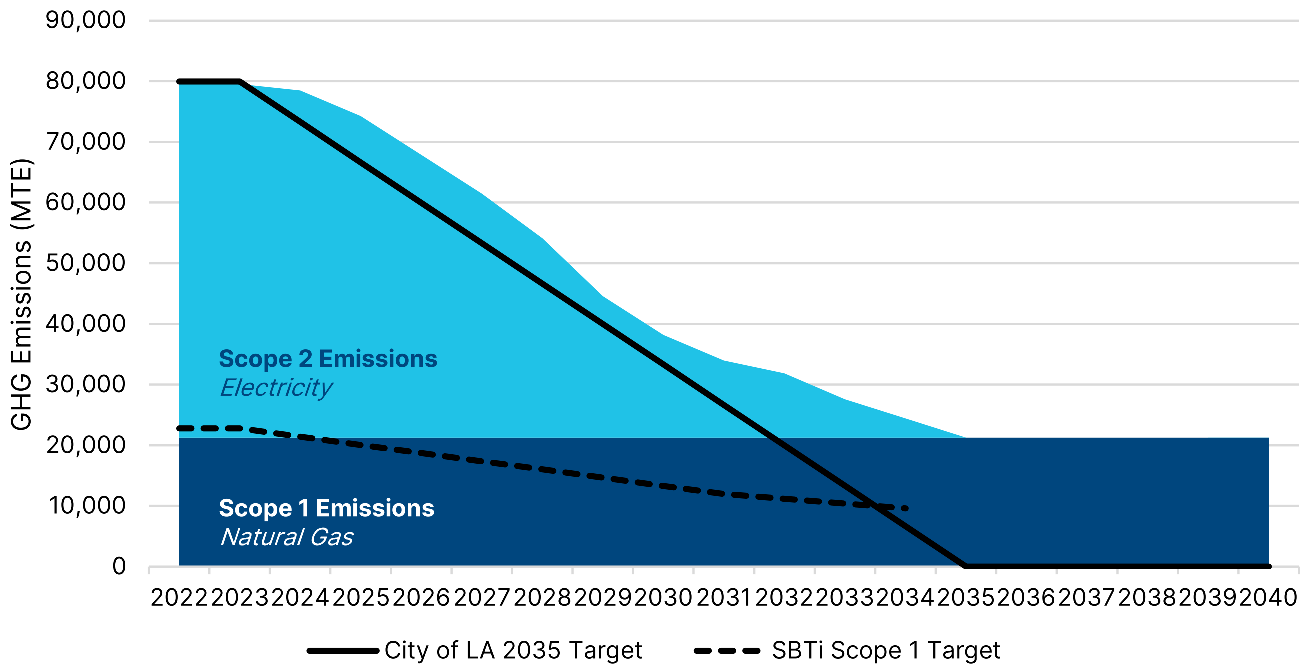


Figure 13 plots the Scope 1 and Scope 2 emissions from city-owned buildings using historical utility data for 2021 and 2022 and predictive emissions factors for future years. Emissions are quantified in terms of metric tons equivalent of CO2 (MTE). Scope 1 emissions refer to direct greenhouse gas emissions generated from building activities, such as space conditioning, lighting, and water heating. Scope 2 emissions encompass indirect emissions associated with purchased electricity.

NATURAL GAS

A natural gas inventory was provided to understand where and how natural gas is used throughout the City's facilities. Although this inventory included buildings and facilities within all City departments, project recommendations for facilities owned by non-proprietary departments – LADWP, LAWA and the Port of Los Angeles – are outside the scope of this plan. Figure 14 shows a breakdown of natural gas throughout City operated facilities. The green bars show what is included within the scope of this study.

Most natural gas is consumed at the Hyperion Wastewater Reclamation Plant and at the Los Angeles International Airport (LAX), which is operated by LAWA. These and other facilities, including asphalt plants and CNG fueling stations, that include process natural gas systems were excluded from this plan. Potential strategies for emissions reduction at these high natural gas consuming sites include renewable natural gas (RNG) procurement or production for processes that inherently require natural gas. The City has the ability to produce additional RNG at wastewater treatment facilities or other organic waste sources. Further studies for these sites are recommended. Information about these sites has been summarized in the following tables.

Within facilities covered in the Building Decarbonization Workplan, the Civic Center Steam Plant is the largest source of natural gas emissions within the City. On average the plant requires 450,000 therms of natural gas annually. This accounts for 2% of municipal natural gas and 12% of the building-related natural gas use.

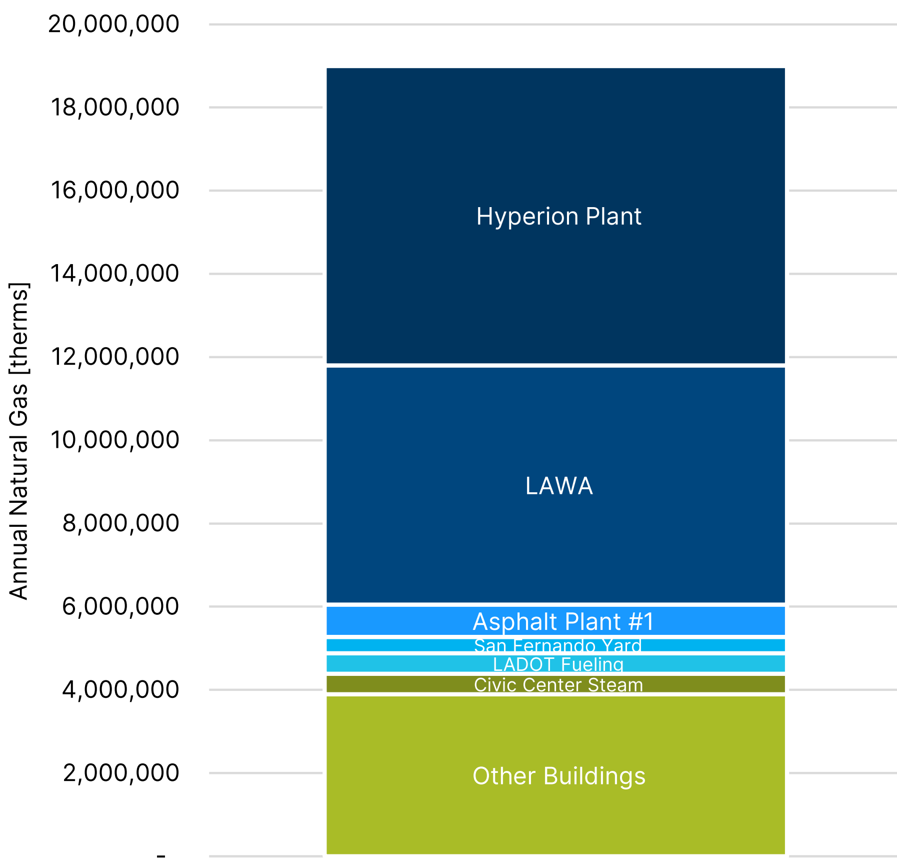


Figure 14: City of LA Municipal Natural Gas Inventory 2022

Hyperion Wastewater Reclamation Plant

Natural Gas	7,346,121 therms (38%)
Existing System	BioEnergy cogeneration system – (2x) 11.32 MW turbines
Potential Strategies	• Increased digester gas production • Cogen controls optimization • Offset with RNG production or procurement
Recommendations	Provide a cogeneration decarbonization study

Los Angeles Worlds Airports

Natural Gas	5,750,905 therms (30%)
Existing System	Central utility plant and buildings system (space heating, water heating, commercial kitchens)
Potential Strategies	• Central plant electrification • Building electrification
Recommendations	Complete an airport decarbonization workplan

Asphalt Plant #1

Natural Gas	776,083 therms (4%)
Existing System	Asphalt recycling equipment
Potential Strategies	• Electrification (feasibility to be determined) • RNG Procurement
Recommendations	Assess opportunities to reduce natural gas use

LADOT Bus Maintenance and Fueling Facility | San Fernando Yard

Natural Gas	887,289 therms (5%)
Existing System	Compressed natural gas (CNG) fueling station
Potential Strategies	• Bus electrification • Offset with RNG procurement
Recommendations	Review bus electrification timelines and assess cost of RNG procurement

TOP NATURAL GAS CONSUMING SITES
Breaking down natural gas usage within city-owned buildings, it was identified that the top 25 sites, or 0.5% of buildings, account for 50% of the City's natural gas use included in this study. Addressing these top 25 sites over the next 12 years will significantly reduce the City's greenhouse gas footprint and progress toward its 2035 carbon-neutral operations goal. Given the impact of these facilities, additional assessments and evaluations were provided for these specific facilities.

Among the buildings included in this study, the City's natural gas consumption is largely influenced by a select group of buildings. This group is primarily comprised by industrial process facilities and facilities with Compressed Natural Gas (CNG) fueling. Figure 15**Error! Reference source not found.** shows the usage breakdown of the top-consuming facilities.

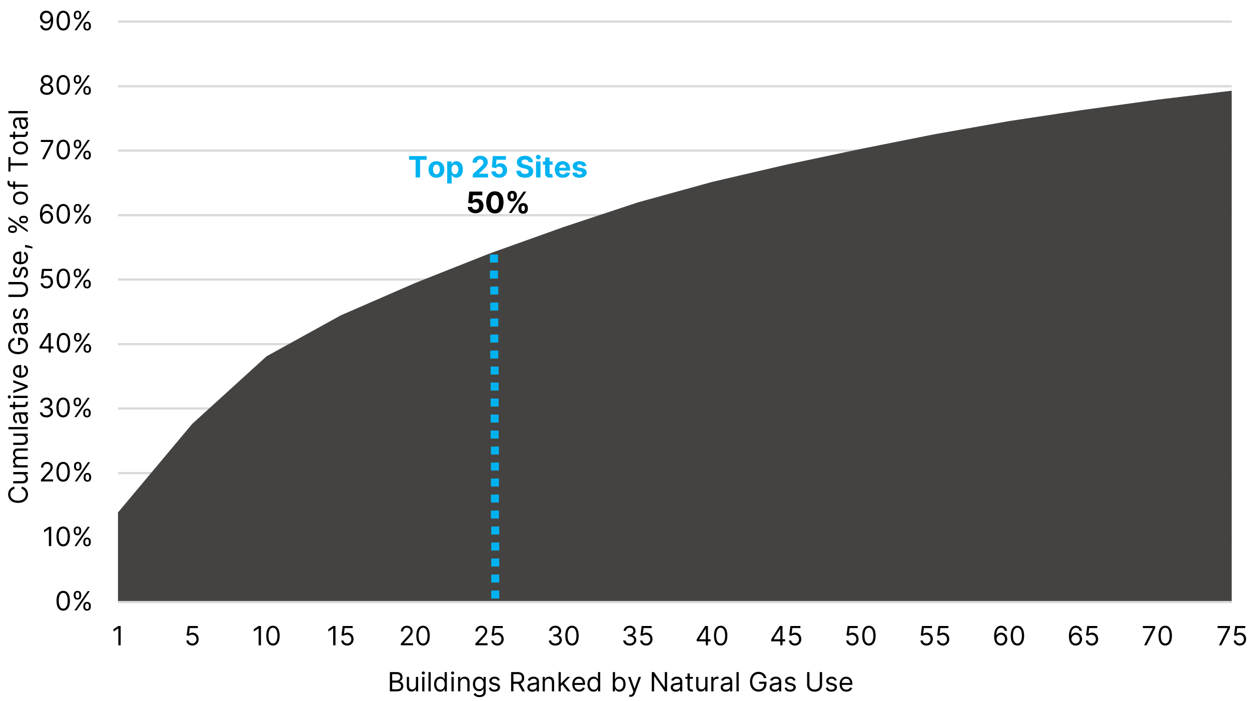


Figure 15: Municipal Buildings Cumulative Natural Gas Use.[17]

[17] Buildings are ordered based on natural gas consumption with the top site using approximately 15% of the City's total natural gas consumption. The cumulative gas use of the top 25 sites is approximately 50% of the City's total.

Table 5: Top 25 Natural Gas Consuming Sites

	Site Name	2022 Gas Usage (Therms)
1	CIVIC CENTER STEAM PLANT	491,100
2	POLICE ADMINISTRATION BUILDING (PAB)	181,700
3	HYPERION RECLAMATION PLANT BUILDINGS	153,500
4	EXPO CENTER	140,700
5	LOS ANGELES ZOO	84,900
6	VAN NUYS SHERMAN OAKS PARK AND POOL	81,400
7	CENTRAL LIBRARY	81,300
8	NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY	78,300
9	C ERWIN PIPER TECHNICAL CENTER (PIPER TECH)	72,300
10	EAST VALLEY SOLID WASTE RESOURCES FACILITY	71,900
11	VAN NUYS COMMUNITY POLICE STATION	68,900
12	LOS ANGELES CONVENTION CENTER	63,900
13	GREEN MEADOWS PARK AND POOL	55,200
14	ECHO PARK DEEP POOL	52,300
15	GLASSELL PARK AND POOL	51,900
16	AHMANSON RECRUIT TRAINING CENTER (ARTC)	46,000
17	LINCOLN PARK	41,800
18	VAN NESS REC CENTER	39,500
19	WEST VALLEY SOLID RESOURCES COLLECTION YARD	38,600
20	YOSEMITE REC CENTER	38,500
21	CENTRAL REFUSE EQUIPMENT REPAIR YARD	37,600
22	ROOSEVELT POOL	37,000
23	ELYSIAN PARK POLICE ACADEMY (LAPD POLICE ACADEMY)	36,800
24	WESTWOOD PARK AND POOL	36,000
25	CAMP SEELY	35,100
		1,971,100

ELECTRICITY

Electricity usage across the City was analyzed to identify the highest-consuming facilities. Table 6 lists the top 25 sites based on electricity usage. Collectively these sites account for 47% of electricity use at municipal buildings across the City.

Table 6: Top 25 Facilities by Electricity Usage.

	Site Name	2022 Electricity Usage (kWh)
1	LOS ANGELES CITY HALL EAST	16,194,300
2	LOS ANGELES CITY HALL	8,635,800
3	LOS ANGELES ZOO	7,598,000
4	POLICE ADMINISTRATION BUILDING (PAB)	6,834,300
5	C ERWIN PIPER TECHNICAL CENTER (PIPER TECH)	6,309,600
6	CENTRAL LIBRARY	5,852,900
7	FIGUEROA PLAZA TOWER 1	5,579,200
8	HYPERION TREATMENT PLANT BUILDINGS	4,665,400
9	PUBLIC WORKS BUILDING	4,546,500
10	EMERGENCY OPERATIONS CENTER	3,837,600
11	LOS ANGELES MALL	3,287,700
12	VAN NUYS COMMUNITY POLICE STATION	2,609,500
13	MARVIN BRAUDE - VAN NUYS CIVIC CENTER	2,555,000
14	77TH STREET COMMUNITY POLICE STATION	2,524,500
15	CENTRAL COMMUNITY POLICE STATION	2,360,500
16	VALLEY COMMUNICATION DISPATCH CENTER	2,243,300
17	METROPOLITAN DETENTION CENTER (MDC)	2,078,300
18	MISSION COMMUNITY POLICE STATION	2,024,600
19	METROPOLITAN COMMUNICATION DISPATCH CENTER	1,952,900
20	PERSONNEL BUILDING	1,733,700
21	AHMANSON RECRUIT TRAINING CENTER (ARTC)	1,676,200
22	EAST VALLEY SOLID WASTE RESOURCES FACILITY	1,540,800
23	WESTERN DISTRICT REFUSE COLLECTION YARD	1,534,900
24	HARBOR COMMUNITY POLICE STATION	1,432,700
25	NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY	1,397,700
Total Top 25 Sites by Electricity		**101,005,000**

LADWP EMISSION FACTORS

Electricity is supplied to City buildings by the Los Angeles Department of Water and Power (LADWP). On September 1, 2021 the Los Angeles City Council approved a motion 21-0352 mandating that the Department of Water and Power (DWP) transition to 100% clean energy by 2035. Estimates were provided to forecast future electricity emissions based on LADWP electricity decarbonization commitments. Figure 16 shows this estimate relative to California's pathway towards providing 100% carbon free electricity by 2045.

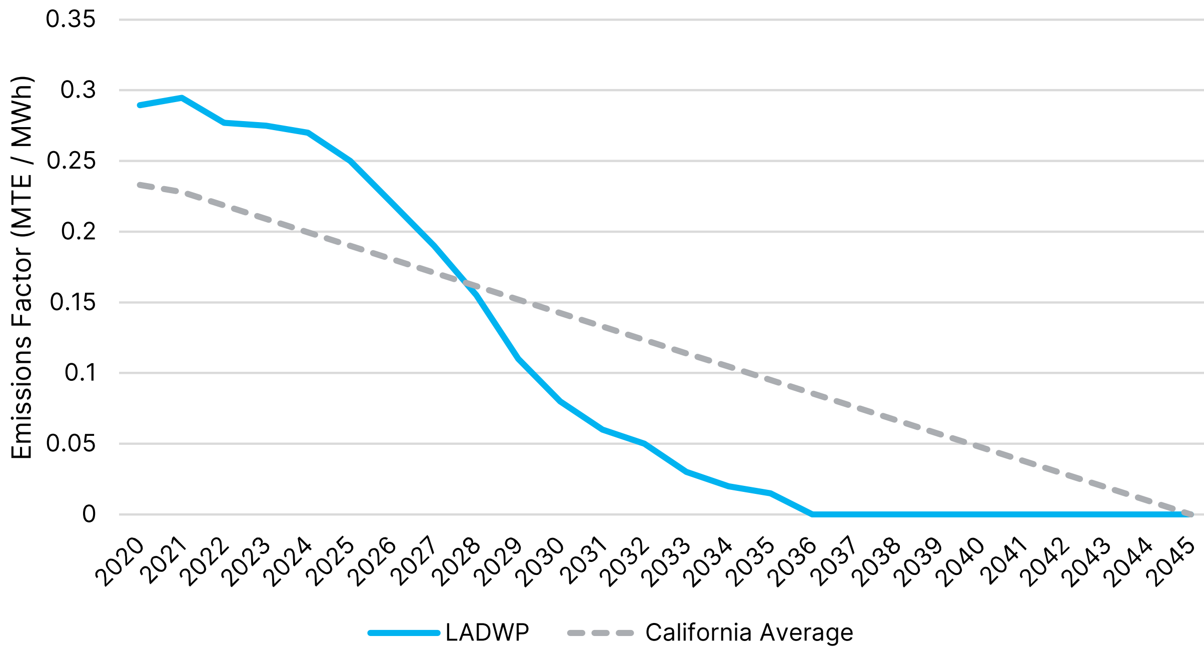


Figure 16: Electricity Emissions Factors[18]

[18] Emissions forecasts estimates are based on available power factor content labels, carbon free electricity goals, and the LA 100 study.

ENERGY USE INTENSITY

This analysis included an assessment of the average Energy Use Intensity (EUI)[19] by building type. Calculating EUI allows for better comparison of buildings of varying sizes. Figure 17 plots the average EUI of different building types by energy source.

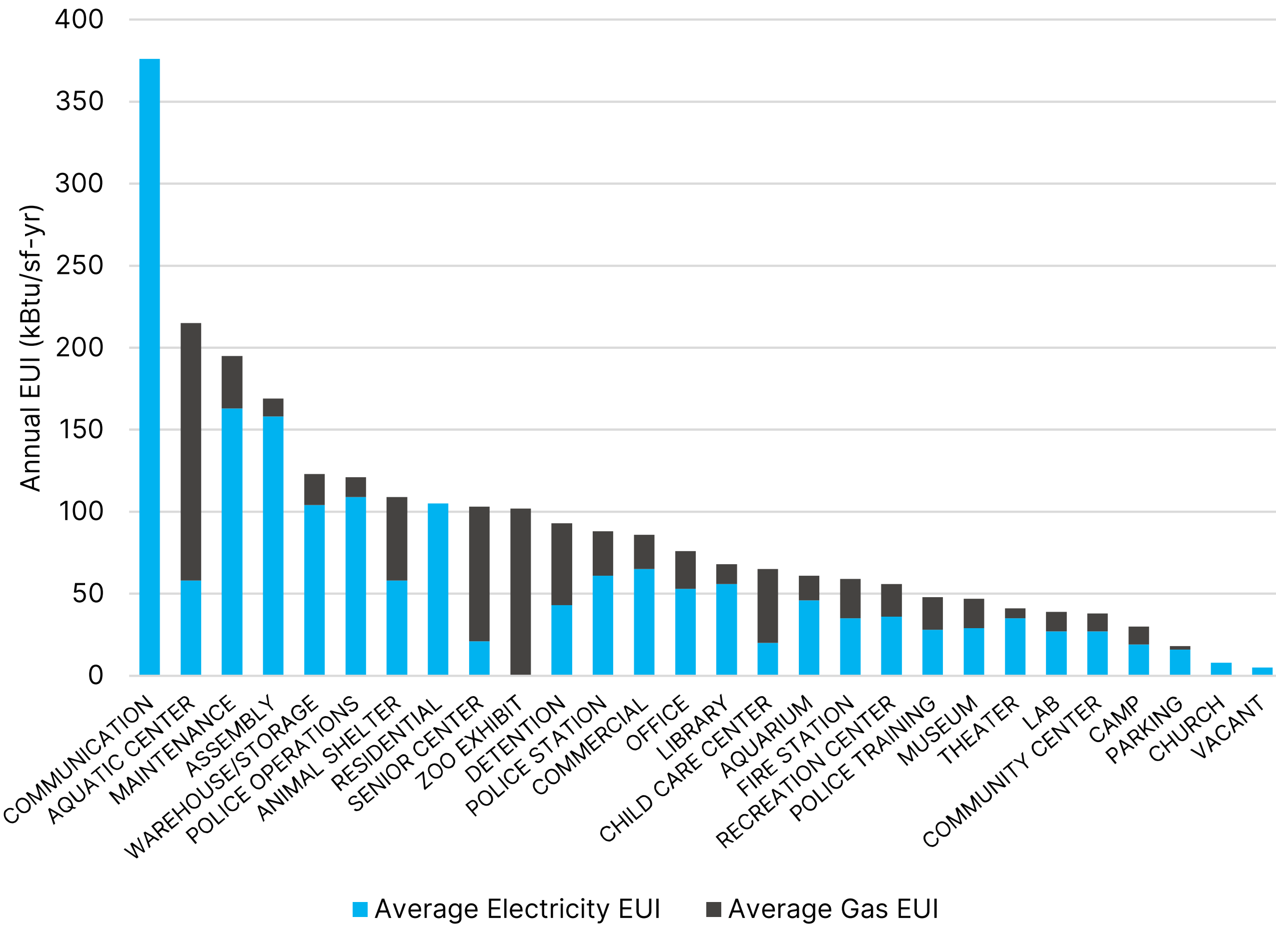


Figure 17: Representative Annual EUI by Building Type

[19] Energy Use Intensity (EUI) is metric of energy use in kBTU normalized per building square foot, similar to miles per gallon for a vehicle. A lower building EUI indicates a building is more energy efficient. A new-building commercial office building built to today's energy code might have an EUI of ~30 kBTU/SF.

Table 7: Average Building EUI Breakdown by Building Type

Building Type	Natural Gas EUI (kBTU/SF)	Electric EUI (kBTU/SF)	Total EUI (kBTU/SF)
Animal Shelter	51	58	109
Aquarium	15	46	61
Aquatic Center	157	58	215
Assembly	11	158	169
Camp	11	19	30
Childcare Center	45	20	65
Church	0	8	8
Commercial	21	65	86
Communication	0	376	376
Community Center	11	27	38
Detention	50	43	93
Fire Station	24	35	59
Lab	12	27	39
Library	12	56	68
Maintenance	32	163	195
Museum	18	29	47
Office	23	53	76
Parking	2	16	18
Police Operations	12	109	121
Police Station	27	61	88
Police Training	20	28	48
Recreation Center	20	36	56
Residential	0	105	105
Senior Center	82	21	103
Theater	6	35	41
Vacant	0	5	5
Warehouse/Storage	19	104	123
Zoo Exhibit	102	0	102

OPERATIONS & MAINTENANCE

The City's General Services Division (GSD) is responsible for maintaining most city buildings, including offices, fire stations, libraries, warehouses, and maintenance facilities. The Department of Recreation and Parks (RAP) maintains and operates its own facilities, which include recreation centers, aquatics facilities, childcare centers and other community spaces. GSD and RAP provide ongoing maintenance, repair, and replacement of building infrastructure systems. Individual departments within the City also have facilities management staff to oversee properties, identify needs, and coordinate with GSD.

Table 8: Department Responsibility Matrix – Existing Municipal Buildings

Departments	Existing Building Role
City Administrative Office (CAO)	The CAO provides internal and centralized services to the City. The CAO assists in the preparation and administration of the City budget, directs the development of work programs and provides oversight of capital projects at municipal facilities.
Bureau of Engineering (BOE)	The BOE is the lead agency for the planning, design and construction management of municipal buildings. The BOE provides various architecture, engineering and project management services.
General Servies Division (GSD)	GSD provides various centralized support services to City departments including building maintenance, construction forces, and other asset and real estate services.
Recreation and Parks (RAP)	RAP operates and maintains all City parks. RAP provides building maintenance and other asset and real estate services for buildings at parks including recreation and aquatic centers.

4. Decarbonization Strategy

Silver Lake Branch Library

4.1. IMPLEMENTATION FRAMEWORK

The following section outlines considerations for specific decarbonization project types, delivery methods for each project type, options for funding and financing, and pathways for program management. In addition to these four implementation focus areas, this section provides an overview of the project tracking tool developed specifically for the City of LA.

The average building age within the City's portfolio is 51 years. Given the aged infrastructure, equipment replacements will be necessary within the next 12 years at most buildings within the City's portfolio. With additional funding the City can implement energy efficiency upgrades and electrification projects rather than replacing equipment like for like. Specific measures with associated energy and greenhouse gas emissions savings have been identified for each building. Measures include LED lighting retrofits and electrification of HVAC systems and projects were prioritized based on the potential GHG emissions reduction, infrastructure needs, cost-effectiveness, and equitable investment.

The framework emphasizes the importance of aligning with federal and state initiatives, such as the Justice40 Initiative, to ensure that investments benefit disadvantaged communities. With an estimated investment of $2.2 to $2.6 billion over 15 years, the City plans to leverage various funding sources and delivery methods to achieve its carbon-neutral operations goal by 2035.

Building Decarbonization Implementation Framework

Decarbonization Measures	Establish specific implementation strategies for building upgrades (electrification, energy efficiency) and renewable energy (solar PV, battery storage)
Prioritization Criteria	Prioritize projects based on existing infrastructure, GHG emissions reduction and cost effectiveness. Prioritize buildings with higher equity needs (reliability and resilience).
Delivery Methods	Identify various delivery methods, applied to buildings based on existing infrastructure and complexity. Provide recommendations by building type.
Funding & Financing	Identify various delivery methods, applied to buildings based on existing infrastructure and complexity. Provide recommendations by building type.

4.2. DECARBONIZATION MEASURES

Energy efficiency and electrification measures were identified at city facilities based on building use type, energy use, age and current system types. When implementing decarbonization measures it is important to focus on energy efficiency measures to first reduce building energy consumption and demand before adding electrical load to a building with electrification projects. Efficiency measures include improvements to building performance through measures such as installing LED lighting or more efficient HVAC equipment. Electrification measures involve switching natural gas using technology to an electric alternative. Examples include replacing natural gas furnaces with electric heat pumps or replacing gas cooking equipment with induction cooktops. Summaries of the various efficiency and electrification measures are below.

Building Decarbonization Projects

Major Building Renovations

- **Envelope Upgrades**
  - Window Upgrades
  - Increased Insulation
  - Cool Roofs
- **System Replacements**
  - HVAC
  - Domestic Hot Water
  - Lighting

Energy Efficiency

- **HVAC Upgrades**
  - Air Handling Unit Retrofits
  - Equipment Replacement
  - Controls Upgrades
- **Lighting Upgrades**
  - LED Fixtures
  - Controls
- **Retro-Commissioning**

Building Electrification

- **Space Heating**
  - Boilers
  - Roof Top Units
  - Furnaces
- **Domestic Hot Water**
- **Process Equipment**
  - Pool Heating
  - Cooking
  - Laundry

Distributed Energy Resources

- **Solar PV**
  - Rooftop Array
  - Carport Array
- **Microgrid Systems**
  - Battery Storage
  - Microgrid Controls
  - Backup Generators
- **EV Charging Stations**

Figure 18: City of LA Building Decarbonization Projects

The Building Decarbonization Workplan identified over 3,000 individual energy efficiency and electrification measures that the City could implement. The following measures are broadly sorted into whole building retrofits, energy efficiency, building electrification and distributed energy resources categories.

WHOLE BUILDING RETROFITS

When a building is due for significant deferred maintenance projects or total building renovation the City should look into completing a whole building retrofit. During a whole building retrofit, projects that are not typically cost effective or are too disruptive to building occupants may become feasible. Envelope upgrades, including installing higher performing windows and increased wall or roof insulation, may offer significant energy savings, but typically are hard to justify because of cost impacts and the building downtime required. Similarly, MEP system replacement including total HVAC system replacement or total lighting system replacement typically requires a building to close for some period of time but can offer significant performance increases and energy savings. Completing these projects during a building renovation or at the same time as other significant projects can be advantageous.

ENERGY EFFICIENCY

Energy efficiency is a broad project category that includes any project targeted at increasing building performance and reducing energy consumption. HVAC specific energy efficiency projects include constant air volume (CAV) to variable air volume (VAV) retrofits, equipment replacement or repair, and controls upgrades. LED lighting fixture retrofits and control upgrades can offer significant energy savings and are typically recommended for all buildings with fluorescent lights. As buildings age their performance and operations often vary significantly from how they were originally designed or from what is considered good by today's building performance standards. Retro-commissioning (RCx) is a process to identify and correct operational deficiencies and optimize building controls and sequences of operation.

BUILDING ELECTRIFICATION

Building electrification projects involve installing electrified equipment in place of current natural gas equipment. Electrification of space heating systems will offer the largest reduction in the City's natural gas use and associated GHG emissions. Typical space heating systems include hydronic heating water provided by natural gas boilers, natural gas rooftop units, and natural gas furnaces. There are electric heat pump alternatives for each of these system types. Natural gas water heaters can be replaced by electric heat pump water heaters. Pool heating is typically a big driver of natural gas use and can be electrified with hydronic air to water heat pumps with backup heat for peak days provided by electric resistance boilers or existing natural gas boilers. Training resources may be required for city staff who are unfamiliar with installing and operating heat pump equipment.

Additional opportunities for electrification include replacing gas clothing dryers with electric dryers and gas cooking equipment with induction or other electric alternatives. Installation of induction cooktops may require departments to purchase compatible pots or pans.

DISTRIBUTED ENERGY RESOURCES

The City can curtail or offset its electricity usage through solar PV installed on building rooftops or in parking lots. Through net energy metering (NEM) the City can utilize power generated onsite to offset building electricity demand and sell power back to LADWP during periods of excess generation. At sites with high generation potential and low electricity demand the City should participate in LADWP's feed-in tariff (FiT) program. Under this program the City would essentially lease space for a solar developer to install a solar or solar + storage energy. This energy would feed into LADWP's grid and support LADWP power generation decarbonization goals, which in turn helps the City reach its decarbonization goals. Additional strategies include microgrid systems with battery energy storage or backup generators. Microgrid systems can provide resiliency during outages and battery energy storage systems can be used to reduce peak electrical demand.

The following measures have been identified for city facilities. Total funding requirements associated with each measure include construction costs, soft costs, escalation and contingency.

Efficiency – Retro-Commissioning Identify and correct operational deficiencies and optimize building controls and sequences of operation. Potential savings of 10-30% of overall building energy use.	**$30-35M**
Efficiency – LED Lighting Retrofit Retrofit of existing light fixtures with LED sources or installation of new LED fixtures with modern lighting controls. Potential savings of 50-70% of lighting electricity use.	**$220-265M**
Electrification – HVAC Systems Convert existing natural gas heating systems including rooftop units (RTUs) and natural gas boilers to an all-electric heat pump heating system. Potential savings of 60-80% for heating energy use (kBtu).	**$1.5-1.7B**
Electrification – Domestic Hot Water Heaters Convert existing natural gas water heaters to electric heat pump water heaters. Potential energy savings of 70-80% for water heating energy use (kBtu).	**$80-115M**
Electrification – Process Gas Equipment Specialty electrification measures include replacement of gas equipment such as kitchen stoves/ovens and clothes dryers with electric alternatives. Potential savings of 30-70% process energy use (kBtu).	**$50-70M**
Electrification – Pool Heating Convert existing natural gas pool heating systems to hydronic heat pump alternatives. Where existing systems are in good condition provide supplemental heat pumps. Potential energy savings of 60-70% (kBtu) for converting to heat pumps.	**$120-165M**
Energy Resources – Solar PV and Battery Storage Install rooftop or carport solar and storage through Net Energy Metering (NEM) when cost effective. Participate in LADWP Feed-in-Tariff program (FiT) for sites with high generation potential and low energy demand.	**$125-175M**
Other – Carbon Offsets Procure high quality carbon offsets or renewable natural gas (RNG) for any remaining emissions starting in 2035. Limit the amount of offsets required to the greatest extent possible.	**$0-10M**

4.3. PRIORITIZATION CRITERIA

The prioritization criteria for the City of Los Angeles municipal building decarbonization workplan encompass four key aspects: emissions reduction, infrastructure needs, cost effectiveness, and equitable investment. The prioritization criteria serve as a foundational framework to identify near-term projects and guide the City's decarbonization efforts over the next 15 years, aligning with the City's overarching climate goals. The City will leverage this framework to guide decision-making while selecting buildings and projects. Key performance indicators have been established to align with criteria and will be tracked to monitor and evaluate the success of the overall program.

Figure 19: Decarbonization Prioritization Criteria

The City of Los Angeles will apply the prioritization criteria in various ways to guide the selection and implementation of projects within the municipal building decarbonization workplan. The process included a comprehensive evaluation of all potential projects identified during the development of this workplan. As the City begins implementing projects, key performance indicators will be used to quantify and assess each project's adherence to the established criteria. Decision-making will be informed by a detailed analysis of the proposed initiatives, considering their potential to significantly reduce the carbon footprint, address infrastructure requirements, optimize resource allocation, and promote equity across diverse communities. This thorough evaluation ensures that the chosen projects align with the overarching climate goals of the city and contribute meaningfully to a sustainable and resilient future. To have the greatest impact The iterative nature of the process, including annual reviews and a five-year feedback loop, allows for adjustments based on lessons learned and evolving priorities, ensuring a dynamic and adaptive approach to building decarbonization.

Building Decarbonization Prioritization Criteria

Emissions Reduction
Prioritize projects that maximize reduction in GHG emissions.

Objective: Minimize the City's climate impacts and to lead by example in the community.

Approach: Evaluate projects based on their potential to reduce natural gas use and GHG emissions, aligning with the City's goals.

Key Performance Indicators:
- Building EUI (kBtu/sf)
- GHG Emissions (MTE)
- Natural Gas Reduction (%)

Infrastructure Needs
Prioritize buildings with the greatest infrastructure and deferred maintenance needs, focusing on HVAC systems.

Objective: Improve the condition of municipal building systems to enhance overall community resilience.

Approach: Asses the condition of existing building systems and leverage ongoing maintenance and renewal efforts.

Key Performance Indicators:
- Infrastructure Age (Years)
- Deferred Maintenance Needs ($)

Cost Effectiveness
Prioritize cost effective decarbonization projects early and reinvest savings for future projects.

Objective: Optimize the allocation of funding and financing to maximize financial returns and reinvest savings into additional decarbonization efforts.

Approach: Implement cost effective projects early and leverage external financing, grants and incentives.

Key Performance Indicators:
- Annual Utility Costs ($)
- Utility Cost Savings ($)
- Grants and Incentives ($)

Equitable Investment
Prioritize projects in disadvantaged communities and areas with the greatest needs, based on equity scores developed by the City.

Objective: Equitably invest across Los Angeles and improve the resilience of facilities serving those with the greatest needs.

Approach: Implement projects in areas with a high equity priority every year. Monitor investments and align with the Justice40 initiative.

Key Performance Indicators:
- Investment in Disadvantaged Communities (%)
- BOE Pilot Equity Index Priority Score[20]

[20] This analysis used the Bureau of Engineering Pilot Equity Index. The Citywide Equity Index, which is in development by the CAO, will be used for project prioritization in the future.

EMISSIONS REDUCTION

The Existing Building Decarbonization Workplan prioritizes projects that maximize reduction of GHG emissions from City operations. The City of Los Angeles is committed to taking impactful action to reduce greenhouse gas emissions, in alignment with emission reduction targets recommended by the International Panel on Climate Change (IPCC) and established by The Paris Agreement. To meet these goals, it is critical that the City prioritizes facilities with the greatest potential for mitigating GHG emissions. The City's strategy targets priority facilities with the highest natural gas use, and establishes various key performance indicators (KPIs) to evaluate the impact of individual projects.

High priority sites were identified based on natural gas use. The City's top 25 sites ranked by natural gas accounted for over 50% of all natural gas use across the municipal building portfolio in 2022. Addressing these sites will get the City over halfway towards their goal of eliminating Scope 1 emissions. The 12-Year Workplan sets targets for completing these decarbonization projects before 2035, with the exception of buildings with new HVAC infrastructure in very good working condition.

The following key performance indicators (KPIs) will be used to support prioritizing individual projects and monitoring performance. Strategically investing in projects that maximize emissions reduction will help keep the City on a path to meet its emissions reduction target. Total Emissions Reduction or Natural Gas Emissions Reduction potential in MTE are the simplest metrics for tracking reduction potential of a given project. Investment Effectiveness and Marginal Abatement Cost KPIs combine costs and emissions reductions to show the economic efficiency of decarbonization measures.

Emissions Reduction KPIs

Emissions Reduction (MTE) Scope 1 & 2	Total electricity and natural gas related GHG emission reduction over a 1-year period *(Electricity Savings * Average Emissions Factor[21]) + (Natural Gas Savings * Emissions Factor)*
Natural Gas Emissions Reduction (MTE) Scope 1	Total natural gas related GHG emissions reduction over a 25-year period *Natural Gas Savings * Emissions Factor*
Investment Effectiveness ($/MTE)	Capital investment required for reducing one additional unit of GHG emissions, *Capital Cost / Annual Energy Emissions Reduction*
Marginal Abatement Cost ($/MTE)	Total financial cost for reducing one additional unit of GHG emissions. *(Capital Cost – Utility Savings) / Energy Emissions Reduction*

[21] Average Emissions Factor for electricity based on estimated LADWP emission forecasts

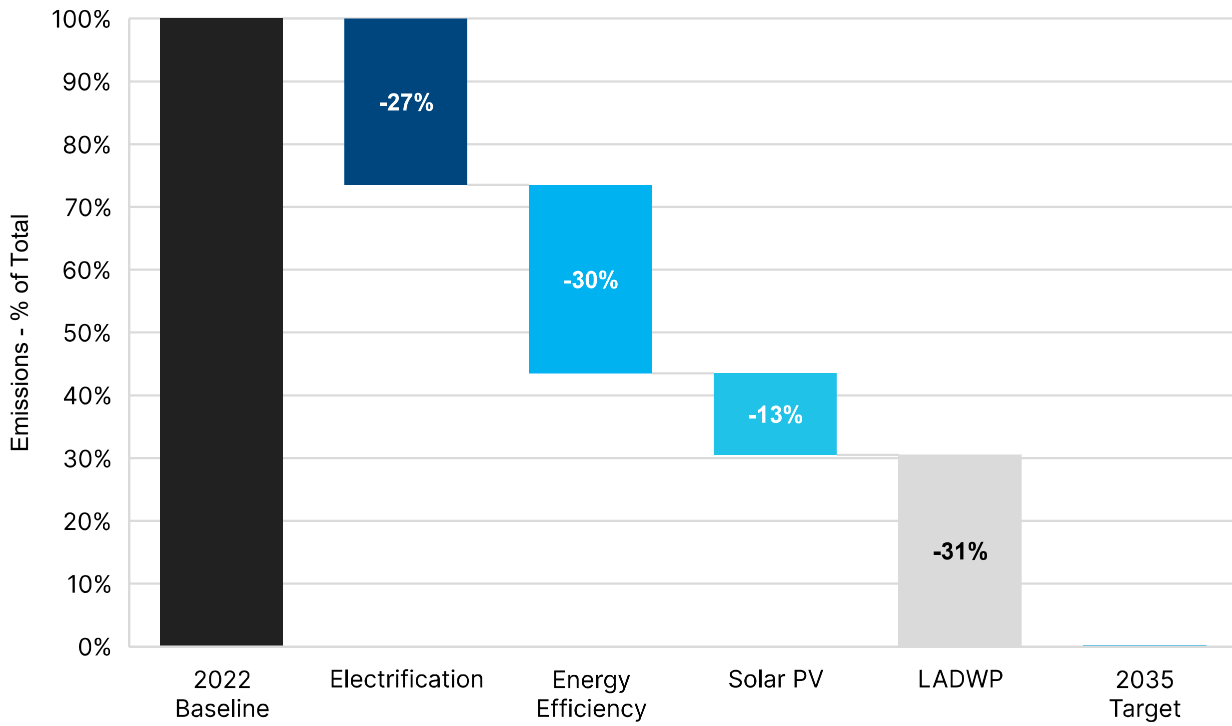


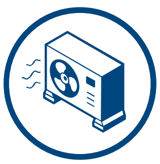
Figure 20: Building Decarbonization Measures –Emissions Reduction Waterfall

INFRASTRUCTURE NEEDS

The Building Decarbonization Workplan prioritizes buildings with the greatest infrastructure needs, primarily based on the condition of HVAC equipment. The City's municipal building portfolio has existing deferred maintenance (DM) needs with HVAC equipment at or past its expected useful life. Aligning building decarbonization projects with existing deferred maintenance and infrastructure needs is an effective strategy to meet the City's climate action goals and improve the reliability and resilience of municipal buildings. Electrifying buildings at the end of equipment life will require additional funding to cover the additional cost of electrified equipment.

The Building Decarbonization Work Plan focuses on identifying specific capital projects and end-of-life replacement projects, which will be standalone initiatives implemented by the City. Over the next 20 years, the City will also undertake other capital improvement projects, such as building renovations and replacements, to upgrade existing facilities. These larger building renewal projects will be leveraged to decarbonize some of the City's existing facilities.

Prioritization by Infrastructure Needs

	**HVAC**	• Condition of existing HVAC systems should be the primary driver for selecting buildings to undergo building decarbonization upgrades. • Small rooftop units can be electrified through an end of life equipment replacement strategy.
	**Water Heaters**	• Condition of existing water heaters is not be a primary driver for selecting a building because water heating is typically less of a driver of natural gas use than HVAC equipment. Aquatic centers are an exception. • Electrifying natural gas tank-type water heaters at typical city buildings is a simpler project and can be done as an end of life equipment replacement
	**Lighting**	• Condition of existing lighting system should be considered when prioritizing buildings. • Retrofitting fluorescent and incandescent lights with LED lights can be included as part of larger decarbonization projects or as standalone initiatives.[22]
	**Roof**	• Condition of existing roofs should be used to prioritize buildings for rooftop solar PV systems. • Roof upgrades should be included with a solar project if required.

[22] To date the City has completed LED lighting retrofits at a portion of existing municipal facilities and is leveraging the LADWP Direct Install program for targeted LED retrofits at additional properties. Continuing these lighting retrofit efforts across the City will be critical for increasing building energy efficiency.

The City currently projects a five-year capital improvement plan that is adjusted annually as priorities change. It is recommended that the GSD and RAP identify facilities with the greatest risk of HVAC failure over the next five years and prioritize those facilities. Data for the condition of HVAC systems was collected through the asset management system (AMS) and previous data collection efforts by the City. Surveys were distributed to RAP and GSD to identify facilities with the highest priority for upgrades based on the condition of existing systems. The expected useful life of mechanical HVAC systems and other building systems should be used by the City to identify whether existing building systems might need to be replaced in the near future.

It is recommended that the City complete facility condition assessments (FCAs) as part of its decarbonization program to better understand the condition of existing assets. This will include on-site visual inspection of equipment which is critical to understand the age and condition of assets across the City's portfolio. This information can be used along with industry guidelines for the expected useful life of equipment to prioritize projects, as outlined in Table 9. FCAs will improve the impact and effectiveness of the City's building decarbonization program by prioritizing the replacement of equipment that is at or nearing its end of life. Additional funding is required for the City to provide a portfolio facility condition assessment.

Table 9: Building Decarbonization Measure System Matrix

Existing System	Expected Useful Life[23]
RTU w/ Gas Furnace (‹=25 tons)	15-20 years
RTU w/ Gas Furnace (›25 tons)	15-20 years
Nature Gas Furnace Heater	18-25 years
Gas Heating Hot Water Boiler	25-30 years
Gas Water Heater (40-100 gal)	15 years
Gas Water Heater (100+ gal)	15 years
Gas Pool Heating Boiler	20-30 years
Gas Range & Oven	15 years
Gas Commercial Kitchen	15 years
Fluorescent Lighting Fixture	20 years

[23] Adopted from the BOMA Preventive Maintenance Guidebook: Best Practices to Maintain Efficient and Sustainable Buildings

COST EFFECTIVENESS

The City of Los Angeles Building Decarbonization Plan also prioritizes projects based on the cost-effectiveness of the decarbonization measures. By investing in more cost-effective energy efficiency upgrades earlier in the 12-year work plan, the City of Los Angeles can reinvest savings into additional decarbonization projects. Through assessments of representative buildings and previous energy audits of city facilities, it was determined that lighting retrofits could provide significant utility cost savings with relatively low payback. LADWP offers significant incentives through its Commercial Lighting Incentive Program (CLIP) and its Custom Performance Program (CPP). LED lighting retrofit projects can be completed as standalone portfolio projects, as the City has done to date, or through alternative delivery methods, including Energy Service Performance Contracts (ESPCs), which allow energy savings from certain decarbonization measures to fund other building upgrades. Reinvesting of energy savings into additional decarbonization efforts may not be possible given the structural deficit in the City's Utility Accounts. This will be monitored and reviewed during the decarbonization program.

A financially sustainable investment plan is crucial for the City's projects. While not all projects will have instant or very quick returns on investment or payback, the City can choose implementation strategies that ease the financial burden as much as possible. For instance, HVAC electrification projects are typically costly with longer payback periods. By aligning these projects with the end of equipment life, however, the City can leverage existing maintenance schedules and staff. In doing so, the City would pay for the additional cost of electrified equipment and can maximize the value of previous investments.

Table 10: Building Decarbonization Measure Cost Effectiveness

Decarbonization Measure	Cost-Effective Strategy
Retro-Commissioning	Prioritize RCx projects on larger buildings with newer controls infrastructure.
LED Lighting Retrofit	Implement LED retrofits across all buildings. Utilize retrofit kits where possible. Complete significant lighting upgrades during major building retrofits.
Electrification – HVAC	Align projects with infrastructure needs and equipment life cycles. Utilize utility incentive programs. For buildings with hydronic systems, engineering assessment to determine if any heating coils need to be upsized rather than replacing all.
Electrification – Water Heaters	Align projects with infrastructure needs and equipment life cycles. Utilize utility incentive programs.
Electrification – Cooking	Align projects with infrastructure needs and equipment life cycles. Utilize off the shelf equipment where possible.
Electrification – Laundry Dryer	Align projects with infrastructure needs and equipment life cycles. Utilize off the shelf equipment where possible.
Electrification – Pool Heating	Align projects with infrastructure needs and equipment life cycles. Utilize utility incentive programs. Existing pool heating equipment in good condition can be retained as a backup heat source.
Solar PV and Battery Storage	Prioritize larger solar projects and combine multiple sites during procurement.

EQUITABLE INVESTMENT

To ensure a fair distribution of the benefits of decarbonization, equitable investment was established as a key prioritization criterion. Within this Workplan, equitable investment refers to the deliberate allocation of decarbonization and energy resiliency projects in communities that disproportionately face social, economic, and environmental burdens. Equitable investment is achieved by prioritizing the implementation of projects that have the potential to alleviate these disparities in disadvantaged communities. Example equity-conscious projects include transitioning a building's equipment from natural gas to electric to improve indoor air quality in a community with poor health outcomes and upgrading a building's HVAC equipment in a neighborhood with higher heat risk. Without prioritizing equitable investment, disadvantaged communities are at risk of having to maintain natural gas infrastructure without receiving the benefits of the overall city transition to electrified buildings.[24] Projects recommended in the first years of the decarbonization workplan includes those that address the City's critical infrastructure need, or have the highest potential emissions reductions. Prioritizing investments based on equity will become increasingly more relevant for project selection in the later years of the Workplan. This balanced approach aims to both address the City's most critical deferred maintenance building needs, while improving municipal buildings' for the most vulnerable communities.

BUILDING DECARBONIZATION EQUITY MATRIX

Integrating equity with other prioritization criteria highlights the need for a systematic approach of evaluating buildings against multiple factors. As a result, a matrix methodology was developed to group buildings by two priority factors. Figure 21 provides a diagram of this methodology, showing how plotting buildings against two priority axes and identifying thresholds for each axis creates a matrix with nine categories of buildings. This methodology deems the three boxes within the upper right corner highest combined priority, the three at the bottom left as lowest combined priority, and the middle boxes as medium combined priority.

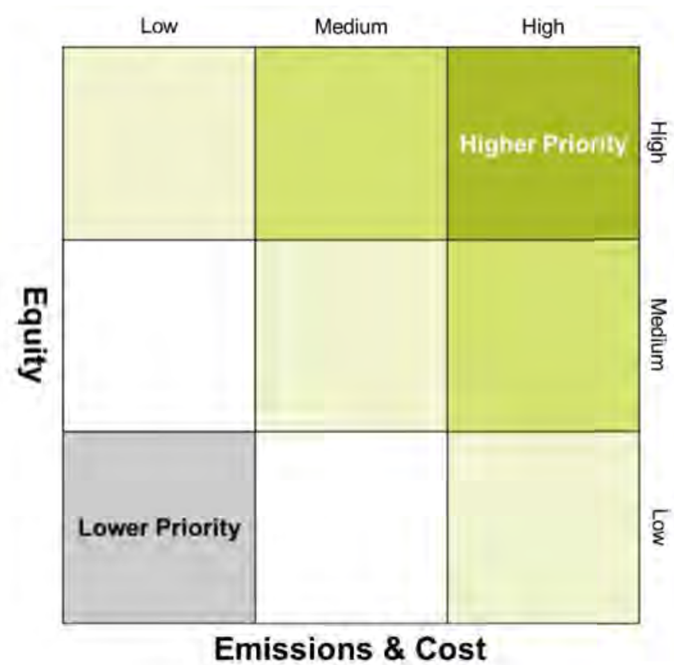


Figure 21: Decarbonization Equity Matrix

Figure 21 provides one iteration of this matrix using the BOE Pilot Equity Index Priority Score and 2022 Gas Energy Use Intensity (EUI). The Equity Index Priority Score is an output of the Pilot Infrastructure Equity Scorecard methodology developed by the Bureau of Engineering. The Scorecard uses 28 indicator fields to assess infrastructure needs for each census tract within Los Angeles. The indicators are organized into one of three domains: social, environmental, and physical infrastructure and include metrics such as income levels, education levels, access to green space, health trends and climate hazards. This methodology applies the tracts with a score between 1-8 based on their community's need for equitable investment. To systematically categorize buildings, the Workplan classifies tracts scoring 1-2 as Low Priority, 3-5 as Medium Priority, and 6-8 as High Priority. For the horizontal axis, the thresholds of 10 kBtu/sf-yr and 20 kBtu/sf-yr were used to group buildings. In this example, the box located in the upper right corner represents the buildings with the greatest gas usage per square

[24] CEMO Report on Equitable Building Decarbonization. Report on Equitable Building Decarbonization

foot and deemed the highest priority for equitable investment. Conversely, the lower left box represents buildings that neither have high equity priority nor high gas usage per square foot. When the City transitions to using the Citywide Equity Index, the threshold for medium, low and high priority tracts will be adjusted to accommodate the new scoring scale.

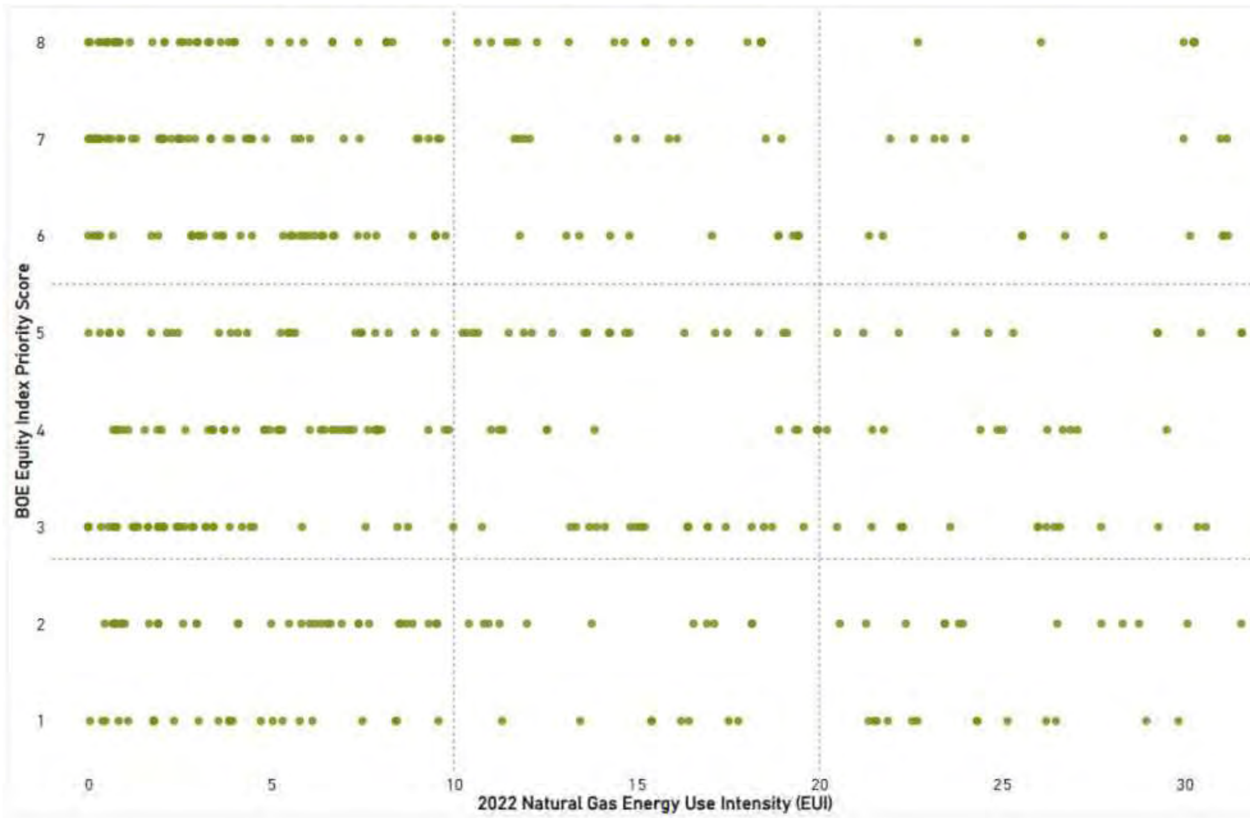


Figure 22. Equity Priority Score and Gas EUI matrix.

FEDERAL & STATE ALIGNMENT

The City of Los Angeles will align with other equitable building decarbonization and climate action frameworks including the Federal Government's Justice40 Initiative. This initiative has established a goal that 40 percent of the overall benefits of certain Federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution. The City of LA Building Decarbonization Workplan has identified buildings that fall within a location defined as a disadvantaged community by the federal government. The City will pursue funding available through the Justice40 initiative and similarly prioritize building decarbonization efforts in disadvantaged communities in Los Angeles.

Additionally, the California Energy Commission (CEC) has an Equitable Building Decarbonization Program with the goal of reducing greenhouse gas (GHG) emissions in homes and advance energy equity. The program will support efforts to improve resilience to extreme heat, air quality, energy affordability, electric grid support, and prevailing wages. Fifty percent of these funds must benefit under-resourced communities. This program can be leveraged by the City for residential buildings owner through the Los Angeles Housing Authority and other City departments.

4.4. PROJECT DELIVERY

Building electrification and energy efficiency projects within the City can be broadly categorized as an end of life equipment replacement maintenance project or a capital improvement project. This section provides an overview of project delivery methods applicable to each category of project. To successfully leverage a deferred maintenance strategy, the City will need to implement a robust end of life electrification program where electrified alternatives are installed as natural gas equipment reaches its end of useful life. For capital improvement projects, there are multiple delivery methods the City could explore, including traditional models like design-bid-build, which involves sequential phases of design, bidding, and construction, to more collaborative frameworks like design-build, where the design and construction phases occur concurrently. Refer to Appendix A.6 for additional information.

Capital Improvement Projects

Summary	Leverage existing and new funding sources to complete major capital improvement projects.
Applications	Complex decarbonization projects project including whole building retrofits and major HVAC upgrades such as natural gas boiler to air to water heat pump projects
Design	Engineering design required. Provided by BOE staff and external consultants.
Delivery	Design-Bid-Build, Design-Build, Energy Savings Performance Contract
Funding	Various funding and financing options
Advantages	Allows for the City to package decarbonization measures with other building upgrades. External project delivery allows the City to outsource engineering and construction management
Risks	Additional funding and availability of internal BOE project management and engineering staff.
Action Items	Review existing budgets and opportunities for additional funding. BOE to review staffing and develop project implementation plan for internal staff and external consultants.

Solar PV + BESS Projects

Summary	Install solar and storage systems at cost effective sites. Leverage net-energy-metering and feed-in tariff.
Applications	Buildings with resilience needs, police stations, parks, and any other cost effective sites
Design	BOE involvement and support, design by solar contractor
Delivery	Portfolio-scale procurement, design-build approach
Funding	Various internal funding or external financing options are available
Advantages	Packaging solar arrays as stand alone projects can drive more competitive pricing.
Risks	Minimal risk. City has an existing on-call contractor list of pre-qualified firms.
Action Items	BOE to issue RFP to on-call solar contractors list for portfolio design-build solar projects.

Portfolio Design-Build Projects

Summary	Design-build projects for multiple buildings. Option for Energy Savings Performance Contract (ESPC) with guaranteed savings and private financing. BOE managed projects
Applications	All energy efficiency projects and some electrification projects
Design	Design and implementation completed by turn-key design-build contractor or ESCO company.
Delivery	Design-Build delivery method
Funding	General fund or external financing options
Advantages	Long term project energy cost savings offset implementation costs. Lower upfront capital required for implementation and less burden on internal engineering and project management staff.
Risks	Project financial returns are dependent on building performance. Risk in building performing worse than projected savings.
Action Items	City to further review ESPC project delivery options and contracting considerations. CAO to review and confirm financing options available.

End of Life Equipment Replacement

Summary	Electrify equipment at end of life through existing facility maintenance and equipment replacement processes.
Applications	Smaller packaged HVAC equipment and tank-type water heater equipment replacements
Design	Vendors to provide any required drawings for permitting. Minimal engineering design required.
Delivery	Building maintenance programs led by GSD and RAP. Engineering support from BOE as needed
Funding	Internal general funds – determined by the annual budgeting process
Advantages	Aligning projects with existing equipment replacement timelines will maximize the investment effectiveness.
Risks	Emergency equipment failures may require natural gas equipment if a replacement plan is not in place. Additional funding and availability of GSD and RAP facility staff. Additional funding for costs beyond like for like replacements.
Action Items	Establish a no new natural gas equipment policy. BOE to develop technical resources for GSD and RAP. Establish streamlining heat pump RTU permitting process. Equipment manufacturers to provide training to GSD and RAP for electrified equipment replacement processes.

4.5. FUNDING & FINANCING

The implementation of the building decarbonization work plan will require a significant investment by the City of Los Angeles to meet its 2035 carbon-neutral operations goal. The City can leverage existing general funds and explore new alternative funding and financing opportunities to expedite implementation efforts. An evaluation of existing funding sources, the total cost of the program, and a review of historical investments in building upgrades were conducted to understand the baseline condition within the City. It is recommended that the City Administrative Office (CAO) provide a follow-on funding and financing review to develop a detailed, multi-year funding and financing plan for the City.

This level of investment has been noted by the facility managers as not being sufficient to meet the existing facility needs, nor will that be adequate for the City to achieve its decarbonization goals. This evaluation of the City's portfolio estimates that the implementation of the existing building decarbonization workplan will cost between $2.2 and $2.6 billion, including construction cost escalation and general inflation. The current rate at which the City is investing in building system maintenance and the decarbonization pilot program is insufficient to meet these investment needs. If the City uses the general fund dollars, it is recommended that an average of $175-225 million per year be allocated over the next 12 years. The City Council has appropriated over $54 million to support the building decarbonization pilot program. Phase I projects are currently in construction and will be completed in 2024.

To aid in funding this program the City should also consider various alternative funding and financing instruments including incentives, grants, rebates, and other tax credits available to public agencies. Table 11 provides a summary of key opportunities that the City can utilize throughout implementation. Additionally, the City should pursue competitive grant opportunities at the federal level through the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA) and with the State of California for decarbonization, climate action, and adaptation specific funding opportunities. At least 40% of funding through the IRA will be targeted towards disadvantaged communities through the Infrastructure Investment and Jobs Act, as defined by the federal government. The building decarbonization tracking tool has identified buildings within federally defined disadvantaged communities that are eligible for additional funding opportunities. It is recommended that the City prioritizes grant opportunities and justice programs to maximize investment in communities historically negatively impacted by environmental conditions.

As the next step, it is recommended that the City's Chief Administrative Officer's staff develop a comprehensive funding and financing strategy that leverages general funds, incentives, rebates, grants, and other alternative funding sources to implement the building decarbonization program. A financially sustainable implementation strategy will utilize various funding sources to mitigate the City's risks of not meeting the investments required to achieve its organizational goals.

Table 11: Building Decarbonization Funding and Financing Options

Instrument	Description	Best-Fit Projects
Internal Funding		
General Funds	The City can allocate additional general funds to finance projects.	Any project can be funded through the general fund.
Revolving Funds	Municipalities can establish revolving funds, which are dedicated pools of money that are used to finance energy efficiency projects and reinvest rebates and incentives received and utility cost savings.	Energy efficiency projects that generate a positive cash flow. The savings generated by the projects are then reinvested into the fund for future projects.
Other Traditional Methods		
Bonds	Bonds that are specifically designed to finance environmentally sustainable projects or general building projects.	Bonds are often used by Cities to fund large capital programs for buildings. Building decarbonization projects could be combined with other facility upgrade projects in the City and supported through a bond measure.
Utility Incentives	The Los Angeles Department of Water and Power provides utility incentives for energy efficiency and electrification measures. New increased incentive rates will be released in July 2024. Utility incentives are subject to change in the future and should be tracked closely.	All building decarbonization projects should pursue available utility incentives.
Government Programs		
Grants	The City can apply for grants from government agencies, foundations, or other organizations that support climate-related projects. Grants can occasionally provide a sizable portion of the required funding. Grant programs are mostly competitive and cannot be guaranteed.	Bundled projects that are in line with the goals of a particular grant. For instance, all water heater electrification projects could be bundled and completed through a grant.

Tax Credits	The Inflation Reduction Act (IRA) provides several grant and loan programs, tax credits, and other investments for clean energy and climate action, including Investment Tax Credits (ITC). The ITC now includes direct pay provisions for public entities.	Tax credits are available for renewable energy technologies and systems including solar PV, battery energy storage and thermal energy storage.
Third Party Financing		
Energy Savings Performance Contracts (ESPC)	ESPCs are agreements between an organization and an energy service company (ESCO) that provide energy efficiency upgrades and maintenance in exchange for a portion of the savings generated. ESCOs provide a guaranteed level of energy savings, which can help to mitigate some of the risks associated with the investment.	Cost effective projects that generally include HVAC systems upgrades and lighting retrofits.
Debt Financing	Municipal agencies can leverage debt financing to implement building decarbonization measures.	Cost-effective building decarbonization projects including LED lighting retrofits and solar PV projects.
Public-Private Partnerships (PPPs)	Municipal agencies can partner with private sector companies to finance energy efficiency projects. This can include energy service companies, equipment manufacturers, or other companies that can provide financing or expertise to support the projects.	Due to their complexities, PPPs are often reserved for projects that require large capital outlays, and may involve long concessions, and the surrender of ownership, labor and other elements typically held by the property owner to produce sufficient efficiency to make the arrangement "bankable".
Infrastructure-as-a-Service	Like PPPs, some private capital groups that are dedicated to climate mitigation have emerged as a funding source. These may provide more flexibility in the terms of the arrangement than a traditional PPP because investments may be mandated toward positive climate outcomes.	Projects that require flexibility or would benefit from it would be a good fit for this type of arrangement.

5. Decarbonization Workplan

Griffith Park Observatory

5.1. EXISTING BUILDING PROGRAM

The Existing Building Decarbonization Workplan provides a strategic framework and implementation roadmap for identifying decarbonization measures, prioritizing implementation and delivering projects. This chapter outlines how each of these efforts form one strategic plan.

Recognizing the urgent need for climate action and the significant investment required, the existing building decarbonization workplan has been divided into three primary phases. Beginning in 2022, the City has piloted decarbonization projects to gather insights and best practices for the engineering and construction of all-electric existing buildings conversations. Over the next two years through 2026 the City will develop new decarbonization programs, pilot innovative financing strategies, and establish a scalable implementation framework. Subsequently, through 2035 the City aims to systematically decarbonize roughly 980 buildings, totaling 22 million square feet, which will eliminate 80,000 metric tons of GHG emissions (MTE). To facilitate this ambitious transition, it is estimated an investment of $2.2 to $2.6 billion will be required.

Workplan Phase	Pilot Projects 2022-2024	Develop Programs 2024-2026	Scale Implementation 2026-2035
	Pilot decarbonization projects.	*Establish scalable framework.*	*Execute the building decarbonization workplan.*
Strategy	Pilot projects across a range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan.	Establish a framework and internal structure to provide program management and oversite, facilitate departmental collaboration and address training and staffing needs.	Decarbonize all existing municipal buildings, averaging ~100 buildings or 2.27 million square feet per year. Accelerate GHG emissions reductions, enhance the resilience of operations, lead the way for the private sector and serve as a model for municipal climate action.
Buildings Decarbonized	16	96	853
Funding	$54M	~$200M	~$2.0-2.4B
Key Outcomes	• Implement projects • Verify performance • Learn & establish standards	• End-of-life equipment program • External Financing, ex. ESPC • Portfolio solar PV procurement • Electrify high GHG buildings	• Eliminate fossil fuels from building heating • Convert lighting systems to 100% LED • Install 20-25 MW of solar PV • Engage the local community
Emissions Reduction	1%	18%	100%

Figure 23: Existing Building Decarbonization Workplan Strategic Framework

1 Pilot Projects
2022-2024

During the Pilot Projects phase the City will test various decarbonization measures across a diverse range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan.

Key Outcomes

- Implement decarbonization measures across a diverse set of buildings
- Monitor, evaluate and verify performance of electrification measures
- Document best practices and lessons learned to establish City standards
- Partner with LADWP to deliver solar PV and BESS projects on City-owned land

Projects

- *Phase I (FY22-23):* Balboa Sports, Benjamin Franklin Library, Fire Station #39, Las Palmas Sr Center, Valley Plaza Rec Center, LA Zoo Solar PV
- *Phase I (FY23-24):* West Valley Municipal Building, Northridge Library, West Valley Police Station, Ritchie Vallens Rec Center, Evergreen Rec Center

16
Buildings

$54M
Investment

1%
Emissions Reduction

TBD
Renewable Generation
MWh

40,000
Natural Gas Savings
therms

Balboa Sports Complex
Electrification, PV, BESS

Cypress Branch Library
Electrification, Efficiency, PV, BESS

Old Fire Station #39
Electrification, Efficiency, PV, BESS

2 Develop Programs
2024-2025

During the Develop Programs phase the City will lay the groundwork to scale implementation efforts. Over this two-year period the City will establish a framework and internal structure to provide program management and oversight, facilitate collaboration between departments, address workforce training and staffing needs, and develop a financial plan for program delivery.

Key Outcomes

- Establish a streamlined process for end-of-life equipment electrification
- Implement new financing and project delivery mechanisms, including energy savings performance contracting
- Install 2-3 MW of solar PV through a portfolio design-build procurement
- Electrify at least four of the top 25 natural gas consuming municipal sites
- Develop a comprehensive funding & financing strategy

Projects

- *Top 25 Sites:* City Hall, Metro Detention Center, Van Nuys Police Station, Yosemite Pool, Roosevelt Pool
- *Capital Projects:* Implement additional capital improvement projects.
- *End of Life Pilot:* Allocate at least $5M in funding annually to support equipment electrification. Project led by GSD and RAP.
- *Portfolio Solar:* Install 2.7 MW of solar PV through a portfolio solar procurement. Leverage existing on-call contracting agreement.

96
Buildings

$200M
Investment

18%
Emissions Reduction

8,000
Renewable Generation
MWh

700,000
Natural Gas Savings
therms

City Hall
Electrification, Efficiency

Yosemite Pool + Rec Center
Electrification, Efficiency

Van Nuys Police Station
Electrification, Efficiency

3 Scale Implementation
2026-2035

During the Scale Implementation phase, the City will execute the building decarbonization workplan. Over the course of nine years the City will decarbonize 874 buildings, averaging approximately 100 buildings per year. Executing the plan will accelerate GHG emissions reductions, enhance the resilience of operations and lead the way as a model for municipal climate action.

Key Outcomes

- Eliminate the reliance on fossil fuels for all space, pool and water heating
- Convert lighting systems to 100% LED and retro-commission large buildings
- Install an additional 20-25 MW of distributed solar PV
- Foster community engagement for a just energy transition
- Promote success and share lessons learned to spur private sector investments

Projects

- *Top 25 Sites:* Implement projects at all remaining sites
- *Capital Projects:* Implement all remaining capital improvement projects through combination of design-bid and design-build delivery methods
- *End of Life:* Allocate funding for end of life equipment replacements and portfolio design-build energy projects (internal or ESPC)
- *Portfolio Solar: I*nstall 20-25 MW through NEM and FiT solar programs. Partner with LADWP to install grid solar and BESS on city owned property.

874
Buildings

$2.0-2.4B
Investment

100%
Emissions Reduction

35,000
Renewable Generation
MWh

3,250,000
Natural Gas Savings
therms

Convention Center
Electrification, Efficiency, PV

Expo Center
Electrification, Efficiency

Los Angeles Zoo
Electrification, Efficiency, PV, BESS

PROJECT CATEGORIZATION
Building decarbonization projects will be categorized into the following four options.

Top 25 Sites By Natural Gas Use	Capital Improvement Projects
Buildings with the highest natural gas use will be prioritized and planned separately from other buildings. The top 25 sites ranked by natural gas use account for **52% of all natural gas use at municipal buildings**. Projects generally include complex large capital infrastructure upgrades.	Projects include complex engineering and may require significant design and engineering efforts (boiler to heat pump retrofit). Internal project management and engineering resources may be used to manage design-build or design-bid-build project delivery.
Typical Buildings • Large Buildings • Aquatic Centers • Large Maintenance Yards	**Typical Buildings** • Animal Centers • Aquatic Centers • Large Office Buildings • Police Stations
Department Roles BOE will be the lead department and provide project management services. BOE will provide additional engineering services on projects as needed and based on available staffing.	**Department Roles** BOE will be the lead department and provide project management services. BOE will provide additional engineering services on projects as needed and based on available staffing.
Delivery Methods • Traditional Design-Bid-Build • Design-Build • Progressive Design-Build	**Delivery Methods** • Traditional Design-Bid-Build • Design-Build • Progressive Design-Build
Scaling Implementation BOE will leverage external consultants and the design-build delivery method, pending availability of internal staff.	**Scaling Implementation** BOE will leverage external consultants and the design-build delivery method, pending availability of internal staff.
Funding Considerations General funds will be required for most projects. Sites generally require more significant, capital intensive infrastructure upgrades to electrify.	**Funding Considerations** General funds for capital intensive projects. ESPC delivery and financing for cost effective projects. Financing can be combined with general funds.
Equity Considerations Use BOE Equity Index Scores to identify facilities in disadvantaged communities.	**Equity Considerations** Prioritize deferred maintenance HVAC projects at community cooling centers and other emergency operation centers.

End of Life Replacement	Portfolio Solar Procurement
End-of-life equipment replacements for building systems that do not require full engineering design (ex. RTUs and water heaters). Develop guidelines and city standards to support implementation through existing maintenance practices.	Target projects at buildings with the highest natural gas use and GHG emission reduction potential. Provide solar at facilities with sufficient load and physical space to make projects cost-effective. Consider battery storage at facilities with critical operations.
Typical Buildings • Recreation Centers • Senior Centers • Branch Libraries • Fire Stations	**Typical Buildings** • Buildings on Large Sites • Large Office Buildings • Maintenance Yards
Department Roles GSD and RAP will lead equipment replacement electrification projects. BOE provide engineering support including design guidance – refer to Appendix for additional information.	**Department Roles** BOE will lead portfolio solar projects including procurement and project management. GSD and RAP support as needed.
Delivery Methods • GSD/RAP Maintenance Projects • Portfolio Design Building, including Energy Savings Performance Contract (ESPC)	**Delivery Methods** • Design-Build
Scaling Implementation GSD and RAP will require additional personnel to manage equipment replacements. ESPC may be leveraged to increase scale and speed of implementation.	**Scaling Implementation** BOE will package multiple solar PV projects and leverage existing on-call solar contractors list.
Funding Considerations Additional general funds through City's budget process. Leverage ESPC delivery and financing for other projects. Financing can be combined with general funds if needed.	**Funding Considerations** Solar PV projects with positive cash flows can consider various forms of external financing.
Equity Considerations Prioritize deferred maintenance HVAC projects at community cooling centers and other emergency operation centers.	**Equity Considerations** Assess BESS and microgrids for buildings that provide critical public and emergency services, including cooling centers.

5.2. PROJECT WORKPLAN

The Existing Building Decarbonization Workplan provides a year-by-year project workplan developed around building infrastructure needs, funding considerations, GHG emissions reductions and equity. The Existing Building Decarbonization Workplan requires the City to electrify approximately 80-100 buildings per year starting in Fiscal Year 2024-2025. Outlined below is a potential funding schedule that would allow the City to achieve it's 2035 carbon neutral city operations target. The program ramps up implementation over time as the City develops experience in building decarbonization and develops project implementation efficiencies.

It is estimated that between $2.2 to $2.6 billion of funding will be required for the City to electrify all existing municipal buildings and achieve established energy efficiency goals ($110-120/SF). The cost of installing new electrified heating systems is estimated to be $1.9 billion, which will require an additional $550 million in funding compared to life for life gas replacements. New SCAQMD regulations however will probit the installation and operation of new natural gas equipment. Outlined below is a preliminary recommended funding schedule that ramps up annual capital costs over time. Alternatively, the City can adopt a strategy to shift investments to early years and gradually reduce investments over time. As the next step, the City will engage with a range of internal and external financial experts to develop a detailed plan to finance these efforts.

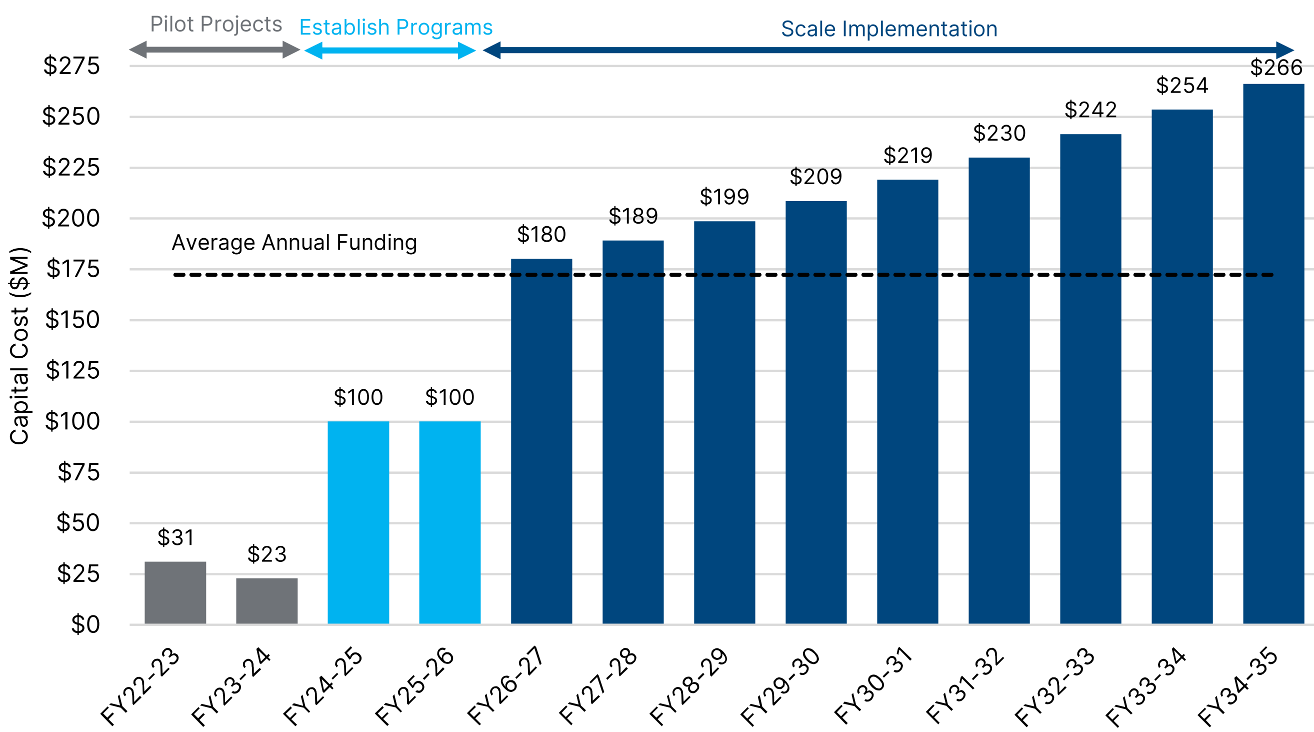


Figure 24: Building Decarbonization Workplan Funding Recommendations[25]

The City's top 25 buildings that consume the most natural gas were designated as high priority. Collectively, these sites account for roughly 50% of all natural gas use across the municipal building portfolio, based on 2022 data. By addressing these sites, the City will be over halfway towards their goal of eliminating Scope 1 emissions. The following schedule outlines the recommend year each of the top 25 sites receives funding.

[25] Funding recommendations were calculated based on total project costs with escalation.

Year 1 *FY24-25*	Civic Center Steam (Phase 1) – City Hall + LAPD Metro Detention Center, Roosevelt Pool
Year 2 *FY25-26*	Van Nuys Community Police Station, 7th Street Consolidated Yard, Expo Center Swim Stadium, Central Refuse Equipment Repair Yard
Year 3 *FY26-27*	C Erwin Piper Technical Center, Yosemmitee Pool
Year 4 *FY27-28*	Hyperion Building Heating Plant, LA Zoo, North Hollywood Fleet Service Repair Yard, Ahmanson Recruit Training Center
Year 5 *FY28-29*	Civic Center Steam (Phase 2) – City Hall South + City Hall East + LA Mall,
Year 6 *FY29-30*	Convention Center
Year 7 *FY30-31*	Police Administration Building, Glassell Park, Westwood Park
Year 8 *FY31-32*	Echo Park Pool, Van Ness Park, West Valley Solid Resources Collection Yard, LAPD Police Academy, Lincoln Park
Year 9 *FY32-33*	Central Library
Year 10 *FY33-34*	East Valley Solid Waste Resources Facility, Camp Seely, Van Nuys Sherman Oaks Park
Year 11 *FY34-35*	*NA – All Top 25 projects funded*

Figure 25: Building Decarbonization Project Workbook - Top 25 Sites[26]

[26] Civic Center Steam (Phase 2) and Convention Center year may change based on other capital building projects, respectively the Civic Center Redevelopment Plan and Convention Center Expansion.

YEAR 1 PROJECTS

The Year 1 Building Decarbonization Project Workplan prioritizes sites with high potential for GHG emissions reduction and projects that will establish a framework for the City to scale implementation efforts in subsequent years. Implementation of the recommended Year 1 projects is subject to available funding and budgetary considerations. The Year 1 Workplan will leverage $25M in available funds, including $22.6M allocated for Phase II Pilot Projects and $2.4M grant Energy Efficiency & Conservation Block Grant (EECGB).

It is recommended the City pilot new project delivery methods including Energy Savings Performance Contracts (ESPC), which will electrify and improve the efficiency of City buildings. Additionally, the City will procure solar PV arrays at multiple municipal facilities and establish a maintenance-led end of life equipment electrification program.

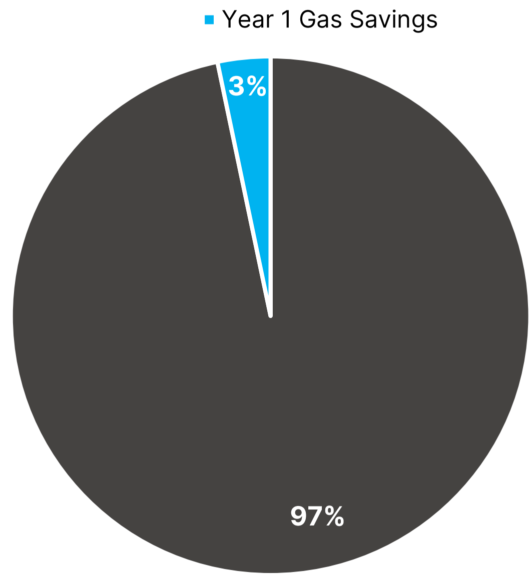


Figure 26: Year 1 Natural Gas Savings

Capital Improvement Projects	Provide a detailed engineering feasibility study for electrifying the Civic Center steam plant. Electrify the West Valley Police Station, Griffith Park Pool and Roosevelt Pool.
Equipment Replacement Projects	Fund and pilot end of life electrification projects for natural gas equipment through GSD/RAP led maintenance program. Use pilot projects to develop City equipment electrification standards and design guidelines.
Portfolio Design-Build[27]	Complete energy efficiency upgrades and electrify through a design-build project delivery across a portfolio of existing buildings. It is recommended the City consider an Energy Savings Performance Contract (ESPC).
Portfolio Solar Projects	Complete a pilot project to deliver solar PV arrays across multiple locations using a design-build delivery method. Leverage the City's on-call approved solar vendor list.

43 Buildings Electrified	**$61M** Capital Budget	**2.7** Solar PV MW
$1M Annual Utility Cost Savings	**3%** Portfolio Natural Gas Savings	

[27] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

The following table outlines the specific projects that were identified for Year 1. The City plans to electrify a range of facilities that include an aquatics center, police station, library, fire station, community building, recreation center and senior center. The Year 1 Workplan has a total budget of $61M based on estimated capital cost. It is estimated that the City can receive $1-1.5M in utility rebates from LADWP. And additionally $5-6.5M through the Investment Tax Credit (ITC) Direct Pay provision. Collectively these projects will reduce utility costs by $1M annually, based on current utility rates.

Table 12: Recommended Existing Building Decarbonization Workplan FY24-25

Facility	Council District	Building Area (Gross SF)	Natural Gas Annual Savings (Therms)
Capital Improvement Projects ($13.0M)			
Civic Center Steam Plan *Planning Only*	14	-	-
West Valley Police Station *Pilot Phase 2*	03	32,670	16,589
Griffith Park Aquatics Center	04	4,400	377
Roosevelt Aquatics Center	14	4,418	37,032
Equipment Replacement Projects ($4.0M)			
3x RAP Facilities	Multiple	34,000	4,424
4x GSD Facilities	Multiple	65,500	7,250
Portfolio Design-Build Projects[28] ($24.5M)			
11x Libraries	Multiple	96,000	6,628
7x Fire Stations	Multiple	80,700	22,269
11x Community/Office Buildings	Multiple	249,950	31,612
7x Rec Centers/Senior Centers	Multiple	92,540	7,940
Portfolio Solar Projects ($16.5M)			
9x Solar Projects	Multiple		
TOTAL FY24-25 ($61M)		**660,824**	**134,121**

[28] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

5.3. PROGRAM MANAGEMENT

The City of Los Angeles' Existing Building Decarbonization Workplan aims to establish a comprehensive program to electrify and decarbonize all municipal buildings throughout Los Angeles. This initiative will require various planning, engineering design, project management and program management services to deliver on the City's commitment to decarbonization at all municipal buildings across Los Angeles. A robust program management framework is critical for the City to stay on track to achieve its 2035 carbon neutrality goal and maximize the impact of investment in decarbonization.

The successful delivery of the building decarbonization program requires the involvement of various city departments, each which bears a key role in implementation. The Bureau of Engineering (BOE) is identified as a critical resource for program implementation. BOE staff will serve as project managers and engineers on multiple projects, leading or supporting design teams. The City should evaluate internal resources within the BOE to determine whether existing staff can deliver projects, or if additional engineering support is needed, possibly from third-party consulting firms. Additional city department roles are further summarized to the right.

The 12-year work plan provides annual project targets based on the best available information. It is advised that the City reevaluate identified projects annually for the coming year, reassessing based on established prioritization criteria. Flexibility in building and project implementation is crucial to align with the City's evolving needs over time. The prioritization criteria and overall implementation strategy offer a robust framework for guiding the City during the planning process. It is recommended that the city reevaluates the building decarbonization program every five years, updating the year-by-year projects based on lessons learned and successes from previous projects. This iterative feedback loop is critical for continually improving the program based on real-world experiences.

City Administration Office (CAO)
CAO is responsible for providing financial advisory services and will support establishing a budget for the Existing Building Decarbonization program. The CAO's roles and responsibilities include the following:

- Develop a funding strategy to implement the existing building decarbonization workplan.
- Identify and secure alternative financing options.

Bureau of Engineering (BOE)
BOE is responsible for overseeing and managing the Municipal Building Decarbonization program. The BOE's role and responsibilities include the following:

- Overall program management, including the development of annual plans, tracking, and reporting.
- Engineering design, establishment of building standards, and conducting design reviews.
- Project management and construction management/administration services.

General Services Department (GSD)
GSD is responsible for building maintenance and equipment renewal at many city facilities. While each department may use their buildings differently, GSD manages building systems and equipment. GSD also manages fleet services for much of the City. GSD's responsibilities include:

- Manage end of life equipment electrification projects
- Identify building infrastructure needs and support annual planning
- Train staff to maintenance electrified building systems
- Management City Asset Management System (AMS)

Recreation and Parks (RAP)
RAP is responsible for overseeing and maintaining recreational facilities and parks throughout the City. RAP provides planning, development, and management of community centers, sports complexes, and other recreational buildings. Responsibilities include:

- Manage end of life equipment electrification projects
- Identify building infrastructure needs and support annual planning
- Train staff to maintain electrified building systems

Other City Departments (Building Users)
City departments are responsible for supporting the building decarbonization program through collaboration with BOE, GSD and RAP. Each department has unique needs for their facilities, and they should work with GSD or RAP to determine how best to operate and utilize their buildings to help the City achieve its decarbonization goals. Within the context of the building decarbonization workplan, City departments are responsible for:

- Collaborating and communicating with RAP or GSD about equipment failures or expected equipment replacements.
- Educating building users about behaviors that promote energy efficiency.
- Facilitate relocation of staff and functions if necessary for the decarbonization project.

Los Angeles Department of Water and Power (LADWP)
LADWP will play a critical part in support of the City's municipal building decarbonization program including:

- Support the City to secure energy efficiency and electrification incentives.
- Provide municipal buildings with 100% clean electricity by 2035.

STAFFING CONSIDERATIONS

Implementing the Municipal Building Decarbonization Workplan will require additional personnel beyond the City's business as usual operations. The City should continue to review staffing levels and ensure there are resources available to support the decarbonization program. The following areas should be reviewed and monitored.

Bureau of Engineering (BOE)

It is recommended that the City create a new Municipal Building Decarbonization group within the BOE whose responsibility will be to oversee the implementation of the Municipal Building Decarbonization Workplan, as has been done for major bond design and construction programs. This will require a cohort of BOE and other city staff dedicated to this task, and dedicated to the reporting and monitoring the effort will require. Successfully implementing the municipal building decarbonization program will require close coordination with multiple departments and close oversight to ensure the selected projects align with the City's prioritization criteria. Having a dedicated program manager and staff team is crucial in maintaining cohesion, adapting to changing needs, making informed decisions and ultimately steering the City towards its climate goals.

The BOE will play a pivotal role in overseeing program management, project management, and engineering design for the multiple initiatives within the City's municipal building decarbonization program. This includes providing planning, project management and engineering design for capital improvement projects, monitoring expenditures, providing technical assistance for end-of-life equipment replacements, and providing regular reporting to oversight committees, City Council and the Mayor's office.

City Administration Office (CAO)

As the chair of the Municipal Facilities Committee (MFC), the CAO will assign staff to collaborate on the Municipal Building Decarbonization Program and prepare regular updates to the MFC. As the City's lead in the annual budget process, and for the annual recommendation of Capital and Technology Improvement Expenditure Program funding for projects, the CAO will be key in allocating and assigning funding according to approved annual spending plans.

General Services Division (GSD) and Recreation and Parks (RAP)

GSD and RAP will require additional staff to adequately support the Municipal Building Decarbonization Program. This will include personnel to lead end of life equipment electrification projects and support other project delivery options. Additional maintenance staff will be required should the City pursue ESPC projects.

On-Call Consulting Agreements

The BOE should review existing on-call consulting rosters to ensure the City has the ability to bring on external consultants with expertise in program implementation and to supplement City staff when workload requires. It is recommended that BOE establish a dedicated energy consulting and mechanical, electrical and plumbing (MEP) engineering roster for this work. This will provide the City with additional flexibility to support specialized projects and to adapt to fluctuations in work levels.

ANNUAL PLANNING PROCESS

The following planning process will be utilized by the City to develop an annual building decarbonization project plan. This process will follow the 12-Year Workplan outlined in this report, while providing the City with flexibility to adjust specific projects as the needs of the City evolve over time.

City Council, Mayor's Office, BOE[29]	City establishes a preliminary annual budget for the Municipal Building Decarbonization Program. ***August***
BOE	BOE Municipal Building Decarbonization Program Manager reviews the 12-year workplan and establishes a preliminary building decarbonization and project list. ***September***
GSD + Departments	GSD, RAP, and other departments with building operations responsibility review preliminary annual plans and provide input and suggestions based on existing infrastructure and city needs. ***October***
BOE	BOE Municipal Building Decarbonization Program Manager revises the annual plan based on feedback and provides an equity review of proposed investments. ***November***
CAO	CAO provides funding and financial reviews to identify funding sources and other alternative financing opportunities. ***December***
BOE	BOE Municipal Building Decarbonization Program Manager finalizes annual decarbonization plan ***February***
MFC	MFC reviews the annual proposed building decarbonization plan and forwards recommended action to the City Council ***March***
City Council + Mayor's Office	MFC provides an annual municipal building decarbonization plan that is submitted for approval. ***March***

[29] This will be supported by City Council Staff, Mayor's Office Staff, BOE Program Manager and other BOE Staff.

5.4. MONITORING & TRACKING

A Tracking Tool Dashboard will be provided to report on the City's decarbonization progress and aid in the selection and forecasting of decarbonization projects.

The Tracking Tool will be a PowerBI dashboard accessible on the City Intranet or within the City's existing Microsoft workspace. The dashboard will leverage the existing Asset Management Systems (AMS) including FacilityForce for GSD buildings and by Cartegraph for RAP Buildings. The building and project data stored in the Asset Management Systems will serve as the central databases for the tracking tool, with additional data sources providing baseline energy data for the buildings.

Custom project types and building data fields were added to the AMS to capture decarbonization-specific metrics. At the building level, the added fields include space heating and water heating system types, LED lighting levels and resiliency priority. At the project level, fields for project classification (LED retrofit, HVAC upgrade, renewable energy) and implementation type (capital improvement, end-of-life replacement) were added. Core features of the Tracking Tool are listed below.

1. **Workbook Development Support:** The tool will assist in the year-by-year project selection process by providing financial metrics and forecasted impacts of user-selected projects.
2. **Ongoing Project Tracking:** The tool will frequently update to synchronize with any changes made to project details, status or phase in the AMS.
3. **GHG Reduction and Savings:** The tool provides a dedicated module to track and report GHG reductions and energy savings resulting from implemented projects.
4. **AMS Data Flagging:** Inconsistencies found in the AMS regarding project implementation dates will be flagged in the tool.
5. **Scalability:** Additions made to the building portfolio will be reflected in the tool. Newly-acquired buildings and recommended projects will appear in the dashboard when AMS entries are created and added to the tool database.

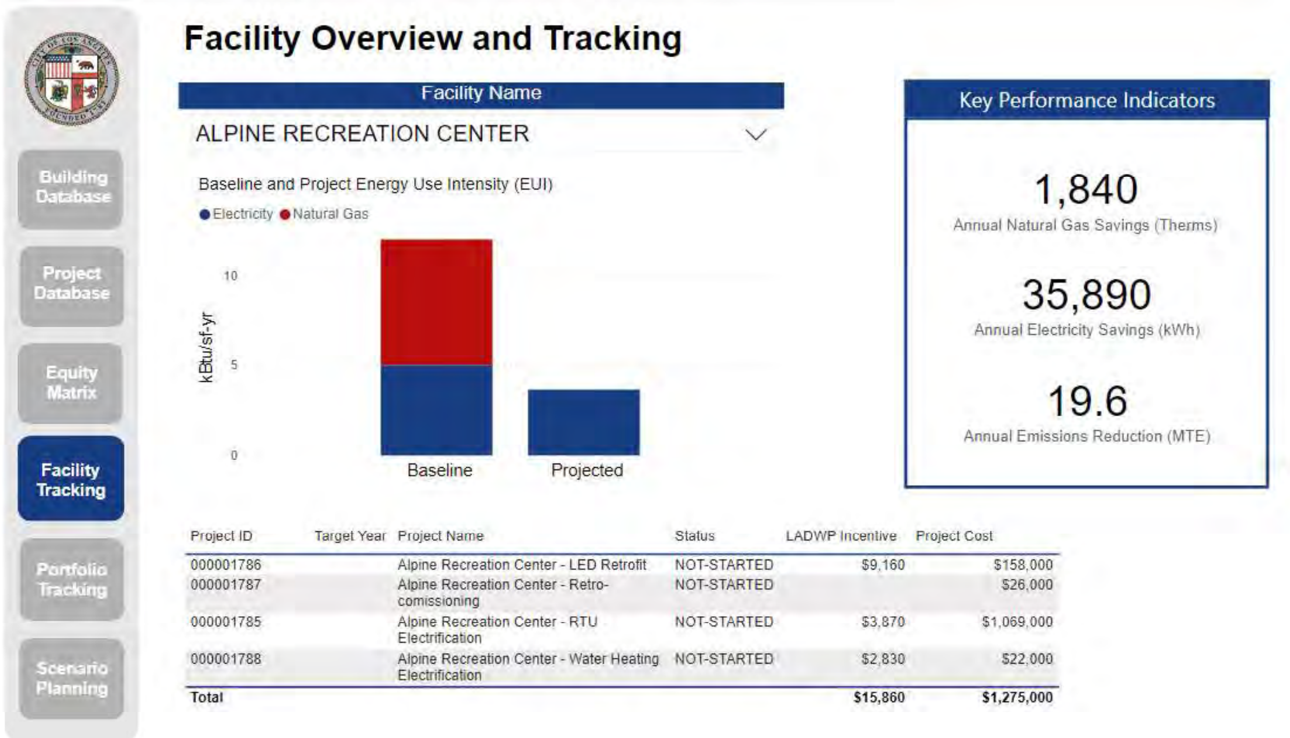


Figure 27: Tracking Tool Facility Page Mockup

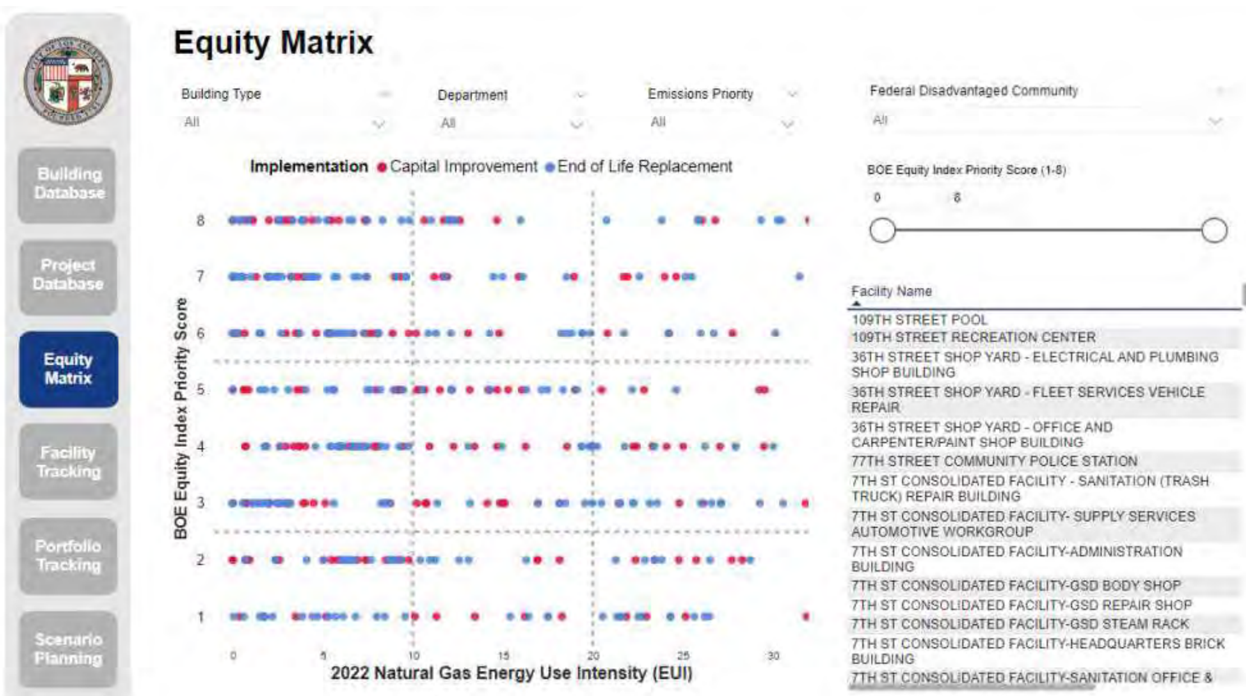


Figure 28: Tracking Tool Equity Matrix Selection Page Mockup

KEY PERFORMANCE INDICATORS

The following key performance indicators (KPIs) will be used in the tracking tool to monitor and track the City's implementation efforts through the Tracking Tool. These are aligned with the City's overarching climate action goals and the prioritization criteria established for the municipal building decarbonization program.

Table 13: City of LA Building Decarbonization Program KPIs

Category	Key Performance Indicator
Building	• All-Electric Buildings (#, %) • Buildings with 100% LED Lighting (#, %)
Energy Use	• Building EUI (kBtu/sf) • Natural Gas Use (therms) • Natural Gas Reduction (%)
GHG Emissions	• GHG Emissions (MTE) • Scope 1 GHG Emissions (MTE)
Utility Cost	• Annual Utility Costs ($) • Utility Cost Savings ($)
Resilience	• Net Energy Metered (NEM) Solar (MW) • Feed-in-Tariff (FiT) Solar (MW) • Cooling Center (#) • Microgrids (#)
Investment	• Total Investment ($) • Grants, Incentives Secured ($) • Investment in Disadvantaged Communities ($, %)

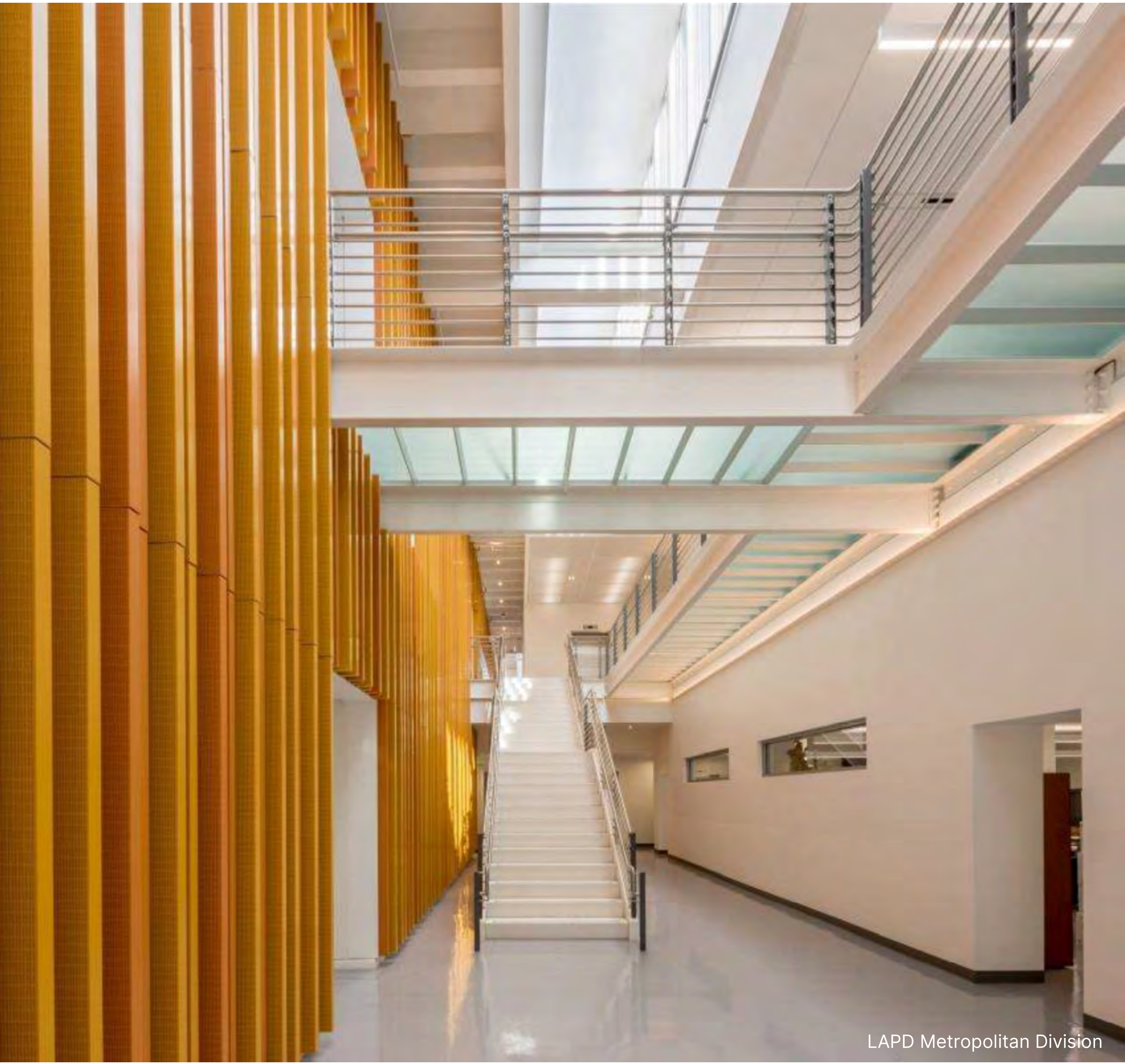
ROLES & RESPONSIBILITIES

During the development of the tracking tool the consultant team will provide key data for all municipal buildings included within the scope of this project and all of the 3600+ decarbonization projects identified. The GSD and RAP asset management system (AMS) teams has developed custom data fields in the AMS and imported data. The tracking tool will require ongoing updates to ensure information is up to date. Table 14 provides a structure for the roles and responsibilities for this effort.

Table 14: Building Decarbonization Tracking Tool - Ongoing Maintenance

Responsible Party	Responsibility	Frequency
Decarbonization Program Management Team	Review the projects recommended for the next year and assess feasibility. Provide the AMS team with updates to make to any projects.	Annually
Decarbonization Program Management Team	Review status and information for ongoing and planned projects	Quarterly (or Monthly)
Facilities Staff	When a facility is visited for maintenance request, review building systems against assumptions listed in the AMS. Provide data to the AMS team.	Ongoing
GSD and RAP AMS Analyts	Update projects and building characteristics with data provided by Decarb Project Management and Facilities Staff	Ongoing
Systems Staff	Dashboard managed by BOE and hosted on City intranet. Update access permissions as needed and address any data connection issues.	Ongoing

Appendix



LAPD Metropolitan Division

A.1. ACKNOWLEDGEMENTS

CITY OF LOS ANGELES

Office of the Mayor
Nancy Sutley
Randall Winston
Luis Gutierrez
Daniela Simunovic
Steve Baule
Michael Samulon
Lizzeth Rosales

City Council
David Giron (Council District 3)
Jackson Guze (Council District 4)
Kristen Pawling (Council District 5)

City Administrative Office (CAO)
Matthew W. Szabo
Patricia Huber
Yolanda Chavez
Jackie Wagner
David Hirano
Zina Cheng
Don Tran
Taylor Howie-Sawdon

Office of the Chief Legislative Analyst (CLA)
Sharon Tso
Matias Farfan
Rafael Prieto
Blayne Sutton-Wills

Bureau of Engineering (BOE)
Ted Allen
Deborah Weintraub
Steven Fierce
Zohra Akhter (Program Manager)
Lorraine Moreno (Project Manager)
Saro Dersaroian
Raymond Houng
Sahar Meherzad
Fidel Onate
Somayeh Abbasi
Son Voung
Katrina Forbes
Marcus Yee
Nathan Ho
Eugene San Diego
Brandon McKnight
Morgan Lytle
Isidro Flores
Diobel Enriquez
Seda Yeghiyan
Sher-Lynn Davis
Troy Younge
Abigail Zulueta
Rose Stein-Wendt

General Services Department (GSD)
Tony M. Royster
Melody McCormick
Mark Lopez
Paul Merrit
Nestor Mckenna
Christopher Thornberry
Dennis Lam
Daniel Rodriguez
Graham Harrison
Lauren Ross
Chinta Cooper
Rollin Nelson
Grace Hsieh

Recreation and Parks (RAP)
Jimmy Kim
Matthew Rudnick
Brenda Aguirre
Cathie Santo Domingo
Mariana Valdivia
Darryl Fold
Gary Lam
James Newsom
Kevin Reagan
Hill Papilla
Javier Solis
Priya Macwan
Bryan Miller
Alex Yee
Ryan March

Los Angeles Sanitation (LASAN)
Doug Walters
James Marchese
Daniel Brehm
Laura McAlister

Climate Emergency Mobilization Office (CEMO)
Marta Segura
Amy Clarke

Los Angeles Police Department (LAPD)
Leslie Herrig
Jeffrey Phillips

Los Angeles Fire Department (LAFD)
Ryon Jones
Kristin Crowley
Glenn Baham

Los Angeles Zoo
Carol Armstrong
Audrey Netsawang

Streets LA
Ana Tabuena-Ruddy
Lorena Matos

Los Angeles Public Libraries (LAPL)
Eloisa Sarao
Derrick Yoshida
Alexander Tagle

Department of Building & Safety (LADBS)
Osama Younan
Karen Panera
Benjamin Sullivan

El Pueblo de Los Ángeles
Edgar Garcia

Department of Transportation (LADOT)
Mario Interiano
Diana Gi

Los Angeles Convention Center
Emmett McOsker

Department of Cultural Affairs (DCA)
Yvonne Farrow

Department of Animal Services (DAS)
Mark Salazar
Christy Louzan
Curtis Watts

PROPRIETARY DEPARTMENTS

Department of Water & Power (LADWP)
Jason Rondou
Arash Saidi
Samer Fakhro
Stephanie Macoritto
David Stump

Los Angeles World Airports (LAWA)
Jacob Haik
Carter T Atkins

Port of Los Angeles (POLA)
Lisa Wunder

CONSULTANT TEAM
Glumac
Tetra Tech
ARC Alternative
O'Connor Construction Management, Inc.
BASE Energy
Blue Strike Environmental

PEER REVIEWERS

Dr. Leslie Shoemaker | Chief Sustainability Officer, Tetra Tech

Dan Burgoyne | Sustainability Manager, California Department of General Services

Christos Chrysilio | Chief Eco-Sustainability Officer, Los Angeles Unified School District

A.2. GLOSSARY OF TERMS

Asset Management System (AMS)	Database platforms managed by GSD and RAPand utilized by the City to track all assets and work orders. Assets include buildings and building equipment.
Battery Energy Storage System (BESS)	An integrated system that stores electrical energy in batteries, which can be discharged when needed to supply electricity to the grid or local loads.
Carbon Emissions	Carbon emissions, also known as greenhouse gas emissions – release carbon into the atmosphere. Carbon dioxide is the primary greenhouse gas emitted through human activities.
Carbon Dioxide Equivalent (CO2e)	Carbon dioxide equivalent (CO2e) is a single unit metric used to harmonize emissions from many different greenhouse gases based on their Global Warming Potential (GWP). In greenhouse gas accounting, CO2e is more accurate than CO2 alone because it covers the GWPs of all greenhouse gases that capture heat and warm our planet's atmosphere.
Carbon Footprint	A carbon footprint is the total amount of carbon dioxide released into the atmosphere due to the activities of an individual, project, organization, or nation-state.
Carbon Neutrality	Achieving a balance between the amount of carbon dioxide (CO2) emitted and the amount removed from the atmosphere, resulting in no net increase in atmospheric CO2 levels.
Decarbonization	The process of reducing or eliminating the carbon content of energy sources, industries, and transportation systems to mitigate climate change.
Distributed Energy Resources (DERs)	Decentralized energy sources and storage technologies that generate electricity or store energy close to the point of use, including solar PV, wind, batteries, and combined heat and power (CHP) systems.
Electrification	The transition from using fossil fuels to electricity as the primary energy source in sectors like domestic hot water heating and space heating. Electrification is often pursued to reduce greenhouse gas emissions.

Energy CAP	Energy CAP is the energy management software program the City of Los Angeles uses to monitor energy use and manage billing.
Energy Use Intensity (EUI)	Total annual energy consumption divided by total area, quantifying energy use per square foot, measured in kBtu/sf/yr.
Existing Buildings Energy and Water Efficiency (EBEWE)	City of Los Angeles existing building benchmarking and energy audit / retro-commissioning program.
Facility Condition Assessment (FCA)	FCAs provide a comprehensive assessment of the physical condition of existing buildings, including its structure, infrastructure and systems.
Greenhouse Gas (GHG)	Gases that trap heat in the Earth's atmosphere, contributing to the greenhouse effect. Common GHGs include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases.
Los Angeles Department of Water and Power (LADWP)	Public electric and water utility provider within the City of Los Angeles. Proprietary city department.
Microgrid	A small-scale energy system that includes distributed energy resources (DERs), such as solar panels, wind turbines, battery storage, and backup generators, designed to provide reliable and resilient power to a defined area.
Science-Based Targets Initiative (SBTi)	The Science-Based Targets initiative (scope) encourages organizations to set science-based targets in line with the Paris Agreement. They provide general as well as industry-specific guidance on how to meet these targets.
Scope 1 Emissions	Direct greenhouse gas emissions that originate from sources owned or controlled by an organization, such as emissions from combustion of fossil fuels on-site.
Scope 2 Emissions	Indirect greenhouse gas emissions associated with the consumption of purchased electricity, heat, or steam generated off-site, but used by the reporting organization.

Scope 3 Emissions	Indirect emissions that occur because of the organization's activities but are not owned or controlled by the organization. These emissions often encompass the entire lifecycle of products or services, including supply chain activities and customer use.
Renewable Natural Gas (RNG)	Renewable natural gas is a form of biogas that can be used in similar applications as natural gas. RNG can be developed from organic waste, solid waste landfills, livestock farms and other sources.

A.3. BACKGROUND INFORMATION

EXISTING CITY OF LOS ANGELES PLANS AND INITIATIVES

The City of Los Angeles has implemented several sustainability plans to foster a greener and more equitable future. Aligned with the Paris Climate Agreement, the LA Green New Deal sets ambitious targets for transitioning to renewable energy, aiming for 100% renewable power by 2045 (or 2035 for clean zero-carbon electricity). The plan also emphasizes water sourcing, stormwater capture, energy efficiency in buildings, sustainable transportation, green job creation, zero-emission city fleet vehicles, and eliminating municipal greenhouse gas emissions.

The Resilient LA Plan focuses on climate resilience, addressing urban heat vulnerability, seismic safety, clean energy systems, and capital planning. Equitable Building Decarbonization emphasizes community input and the inclusion of frontline communities, public health improvements, tenant and affordable housing protections, and green job opportunities. Various city council motions support solar and storage programs, building retrofitting, solar energy generation, carbon-free energy plans, and the expansion of sustainable infrastructure. Furthermore, the LA 100 NREL report serves as a crucial resource, providing a roadmap for the city's transition to 100% renewable energy by 2045 (or the 2035 updated goal), outlining strategies and pathways that consider local resources, technological advancements, and equitable implementation to achieve this ambitious goal. The desire for an equitable decarbonization process in Los Angeles has been emphasized, especially in the current LA100 Equity Strategies Study. Key features of each of these efforts are highlighted below.

LA GREEN NEW DEAL

The LA Green New Deal is a commitment to the Paris Climate agreement, and a plan to guide LA to be an equitable city run off 100% renewable energy. The LA Green New Deal focuses on accelerating the following targets:

- 100% clean zero-carbon electricity by 2035
- 70% of water sources locally by 2035 and capture 150,000 acre ft/yr. (AFY) of stormwater by 2035
- Reduce municipal building EUI 22% by 2025; 34% by 2035; and 44% by 2050
- 45% reduction in vehicle miles traveled per capita by 2050
- 75% of new housing units are built within 1,500 feet of transit stations by 2035
- Create 400,000 new green jobs by 2050
- Convert all city fleet vehicles to zero emissions where technically feasible by 2028
- Eliminate municipal GHG emissions by 2045
- All new buildings will be net zero carbon by 2030
- All existing buildings will be net zero carbon by 2050

To meet the municipal emissions targets, the plan commits to installing 3 MW of solar at City facilities, implementing GHG performance standards for material procurement for purchasing by City Departments, requiring all new municipally owned buildings and major renovations to be all-electric, and completing LED retrofits at all City buildings subject to the Existing Building Energy and Water Efficiency Ordinance.

Target

Reduce municipal greenhouse gas emissions 55% by 2025; 65% by 2035; and reach carbon neutral by 2045

Baseline: 16.8 million metric tons CO2e in 2008
Source: City of Los Angeles Municipal Greenhouse Gas Emissions Inventory

Target

Reduce municipal energy use 18% by 2025; 35% by 2035; and 44% by 2050*

Baseline: 3,476,841 mmBtu in 2015
Source: City of Los Angeles Municipal Greenhouse Gas Emissions Inventory
*These are 50% higher than the original targets in the 2015 pLAn when adjusted to the new baseline. The original targets also did not include 2050.

Milestones & Initiatives

2021

Install 15 MW of solar at the Port

- Support resilience through integrating solar into the microgrid at Pasha Terminal

2025

Install 3 MW of solar at City facilities

- Complete the first phase of the Green Meadows microgrid resiliency project
- Deploy a resilient battery/ solar project at the LAPD Motor Transportation Division to power EV fleet
- Complete the L.A. Zoo - LADWP solar resiliency project
- Ensure at least 1MW of solar on L.A. Convention Center Expansion
- Examine on-site renewable energy at LADWP facilities and pursue smart metering and energy management solutions

2028

Complete LED retrofits at all City buildings subject to the Existing Building Energy and Water Efficiency Ordinance

- Complete LED retrofit for terminals at the Port and Harbor Department buildings
- Complete LED retrofits at recreation centers, gymnasiums, and the L.A. Convention Center
- Control Central Library lighting with advanced energy building management software
- Finish converting all street lights to LEDs and explore auto-dimming technology

Target

Ensure all new municipally owned buildings and major renovations will be all-electric, effective immediately

ALL ELECTRIC

Figure 29: LA Green New Deal - Municipal Building Targets

BUILDING DECARBONIZATION PILOT PROGRAM

Table 15: City of LA Municipal Building Decarbonization Pilot Phase I

Building	Project Scope	Budget	Status[30]	LADWP Investment
Balboa Sports Complex	Electrification, Solar, Energy Storage	$2.1M	60% Design	-
Benjamin Franklin Library	Electrification, Efficiency, Solar, Energy Storage	$2.2M	10% Design	-
Cypress Park Branch Library	Electrification, Efficiency, Solar, Energy Storage	$3.2M	90% Design	-
Old Fire Station #39	Electrification, Efficiency, Solar, Energy Storage	$1.8M	90% Design	-
Green Meadows Rec Center	Electrification, Solar, Energy Storage	$1.6M	Removed	-
Las Palmas Senior Center	Electrification, Solar, Energy Storage	$3.5M	70% Design	-
Silverlake Branch Library	Electrification	$1.0M	70% Design	-
Valley Plaza Rec Center	Electrification, Solar, Energy Storage	$3.6M	40% Design	TBD
LA Zoo	Solar, Energy Storage	$8.0M	50% Pre-Design	TBD
	Contingency + Escalation	$4.0		
		$31.0M		TBD

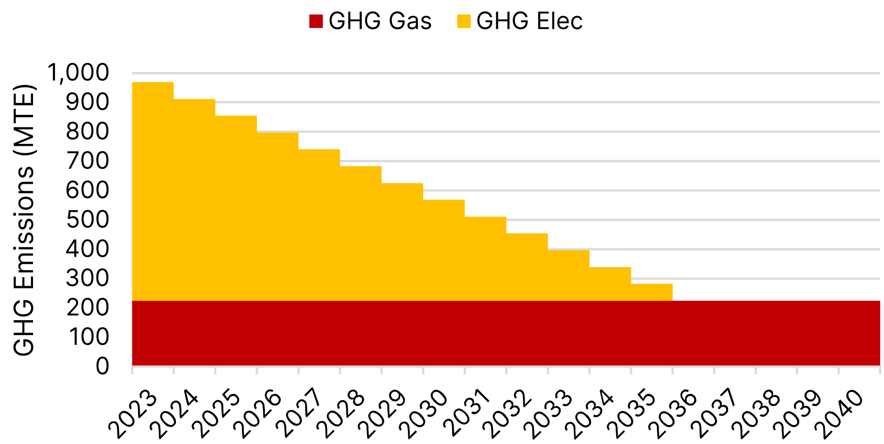
Table 16: City of LA Municipal Building Decarbonization Pilot Phase II

Building	Project Scope	City NTE Budget	Status[30]	LADWP Investment
West Valley Municipal Bldg	Electrification, Efficiency, Solar, Energy Storage	$2.4M	60% Design	$8.0M
Northridge Branch Library	Electrification, Efficiency, Solar, Energy Storage	$3.1M	10% Design	-
West Valley Police Station	Electrification, Efficiency, Solar	$8.0M	90% Design	$19.7M
Ritchie Vallens Rec Center	Electrification, Efficiency, Solar, Energy Storage	$2.2M	90% Design	$7.2M
Evergreen Rec Center	Electrification, Solar, Energy Storage	$5.8M	Removed	$3.4M
		$22.8M		$38.3M

[30] Project Status as of January 2024

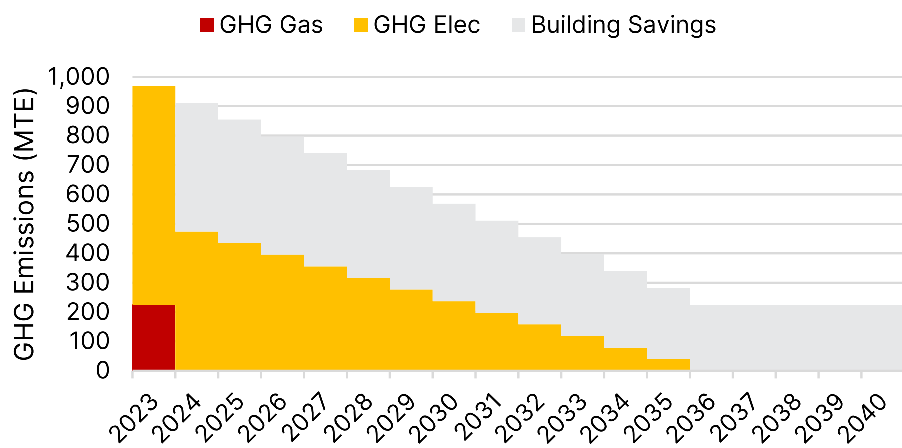
Business-as-Usual (BAU)

GHG emissions forecast for Phase I & II pilot buildings through 2040. Electricity emissions reduction from LADWP grid decarbonization efforts.



Efficiency + Electrification

GHG emissions savings from building electrification and energy efficiency projects at Phase I & II pilot projects.



Efficiency + Electrification + Solar PV

GHG emissions savings from building electrification, energy efficiency and solar PV projects at Phase I & II pilot projects.

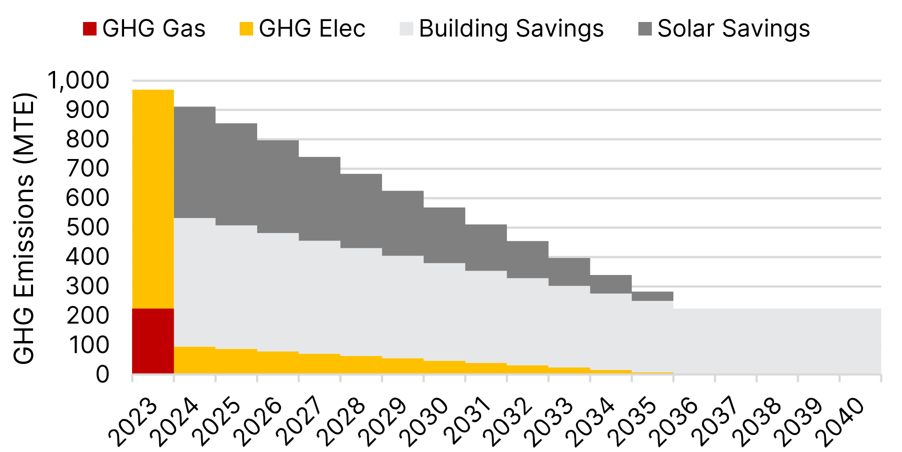


Figure 30: City of LA Municipal Building Decarbonization Pilot Phase I-II Impact

RESILIENT LA

The Resilient LA Plan outlines strategies to help the city stay safe and prepared in the changing climate. The city is part of the 100 Resilient Cities Network, and the plan builds on the innovative strategies from various partner cities. Some of the infrastructure-specific goals include developing an Urban Heat Vulnerability Index and Mitigation plan, launching retrofit pilot programs to test cooling strategies, improving seismic safety of buildings and infrastructure, developing a resilient and clean energy and smart grid system, utilizing the City Resilience index to measure and track city-wide resilience metrics, and integrating sustainability and resilience into capital planning. The plan prioritizes pilot projects at critical facilities, ensuring first responder facilities and essential community spaces such as cooling centers can continue to operate during extreme conditions.

REPORT ON EQUITABLE BUILDING DECARBONIZATION

Following the implementation of motions by the LA City Council to establish a decarbonization plan, a concerted effort was made to engage community members in the Climate Equity LA Series. This series comprised three virtual public workshops, targeted focus groups, as well as semi-structured individual and group interviews with local community advocates and subject experts. These extensive outreach methods gathered insights from a diverse range of over 250 participants, including the public, city staff and leadership, county sustainability staff, community-based organizations (CBOs), the neighborhood council, environmental and social service nonprofit organizations, low-income tenants, indigenous communities, local subject and policy experts, environmental justice advocates, and labor organizations. After gathering community input, the comprehensive report was prepared for the Climate Emergency Mobilization Commission and Office by Emma M. French, a PhD student in Urban Planning at UCLA.

The concerns raised by community members were collected and addressed through the development of the following policy suggestions:

- Include frontline communities in the design, implementation, and evaluation of all building decarbonization policies and programs
- Leverage building decarbonization to improve public health and habitability
- Embed tenant protections into building decarbonization policies and programs
- Embed affordable housing protections into building decarbonization policies and programs
- Create worker protections and new job opportunities in green energy for frontline communities
- Prioritize public funding for the decarbonization of existing residential buildings in frontline communities
- Expand education, outreach, and technical assistance relating to building decarbonization
- Utilize current decarbonization efforts to gather data on technical and financial requirements of building decarbonization
- Design a flexible, equity-centered, multi-phased approach to building decarbonization
- Identify all new and existing possible sources of public, private, and philanthropic funding to support equitable building decarbonization

EQUITABLE BUILDING DECARBONIZATION REPORT

The building decarbonization work plan will align with other equity, climate resilience, and just transition strategies within the City of Los Angeles. The CEMO Report on Equitable Building Decarbonization identified specific strategies the City can adopt to facilitate an equitable transition away from fossil fuels. Strategies were evaluated to identify areas for alignment and other best practices that the City can leverage for its municipal building decarbonization program. The CEMO report includes broader strategies within community and public facilities, some of which may not be directly relevant to this project. Table 17 below provides a summary of how the decarbonization work plan aligns with other efforts.

Table 17: Alignment with the CEMO Report on Equitable Building Decarbonization

Equitable Building Decarbonization Strategies	Municipal Building Decarbonization Workplan
Include frontline communities in the design, implementation, and evaluation of all building decarbonization policies and programs	Consider community needs when prioritizing projects in disadvantaged areas.
Leverage building decarbonization to improve public health and habitability	Prioritize HVAC electrification projects at cooling centers and consider additional building upgrades that improve occupant health
Embed **tenant protections** into building decarbonization policies and programs	Not applicable
Embed **affordable housing protections** into building decarbonization policies and programs	Not applicable
Embed worker protections and new job opportunities for frontline communities into building decarbonization policies and programs	Provide workplace development opportunities during implementation.
Prioritize public funding for decarbonization of existing residential buildings in frontline communities	Not applicable
Expand education, outreach, and technical assistance related to building decarbonization	Provide education within the City and lead by example in the community.
Leverage existing building decarbonization efforts to **gather data on the technical and financial requirements** of building decarbonization	Pilot program, annual reviews
Design a flexible, equity-centered, multiphase approach to building decarbonization	Established an equity matrix that organizes buildings into potential phases.
Identify all new and existing possible sources of **public, private, and philanthropic funding** to support equitable building decarbonization	Pursue external funding and financing options

CITY COUNCIL MOTIONS
Los Angeles City Council motions, including 21-1039, 21-0683, 21-0432, 21-0352, 21-1042, and 21-1249, highlight the city's commitment to prioritizing building decarbonization and related initiatives.

Motion 21-0352
Motion 21-0352, passed on March 31, 2021, directs the Los Angeles City Council to instruct the Department of Water and Power (DWP) to develop a Strategic Long Term Resource Plan. The goal of this plan is to achieve **100% carbon-free energy by 2035** in a manner that is equitable. The motion emphasizes prioritizing equity for environmental justice communities, defined as areas scoring at or above the 80th percentile on CalEnviroScreen. The plan should ensure that emissions are not increased at facilities located in these communities. Additionally, the motion instructs the Chief Legislative Analyst, with the assistance of the DWP, to provide a report on projects that align with all LA 100 paths. These paths outline different strategies for achieving 100% clean energy. The report should present an accelerated pathway for launching and completing these projects. Overall, the motion emphasizes the need for a strategic plan to transition to carbon-free energy, prioritizing equity for environmental justice communities and seizing opportunities for funding through the timely execution of identified projects.

Motion 21-0432
Motion 21-0432, passed on April 2, 2021, acknowledges the Los Angeles Zoo's significance as a major city-owned attraction known for wildlife conservation and visitor experience. To set an example in sustainability, the motion urges collaboration between the Los Angeles Department of Water and Power (LADWP), the Los Angeles Zoo Department, and the Bureau of Streets Services (Streets LA) to explore options for generating at least 3 MW of solar energy and 1 MW of battery storage. This innovative project aims to power the zoo and offset peak-hour energy through battery storage, while also facilitating the expansion of electric vehicle charging stations. The utilization of LADWP's Feed-in Tariff Plus program and potential public-private partnerships will ensure efficiency, cost-effectiveness, and maximum returns for the community.

Motion 21-0683
Motion 21-0683, passed on June 16, 2021, calls for a report to be submitted within 60 days. The report should include an assessment of staffing and/or contractual services required to conduct a comprehensive cost estimate, timeline, and plan for **retrofitting municipally owned buildings to achieve carbon neutrality**. The motion also requires the development of a prioritization method to identify buildings that would benefit the most from retrofits. Additionally, a procurement and funding plan is to be established for the immediate retrofitting of the top 10 high-priority buildings. These buildings will serve as a model for the decarbonization process of the remaining municipal buildings. Furthermore, the motion encourages the consideration of pursuing an energy service contract for the retrofits. The report should evaluate the advantages of such a contract and determine the appropriate procurement process that the city should undertake to retrofit the entire portfolio of municipal buildings.

Motion 21-1039,
Motion 21-1039, passed on September 21, 2021, directs the City Administrative Officer and Chief Legislative Analyst to develop a process for establishing a sustainable municipal solar and storage program. The associated budget for 2021-2022 allocates $30 million for solar PV and storage systems at city facilities, $4 million for EV charging and energy efficiency unit restoration, and $95 million for parks and recreation, potentially including solar development. The motion also requests the creation of a building decarbonization work plan, which should involve assessing renewable solar energy generation potential in existing municipal facilities and prioritizing projects for net energy metering systems, resiliency generation systems, and grid-connected systems. Furthermore, it requests the identification of up to 25 facilities, particularly in disadvantaged

communities, as strong candidates for near-term pilot distributed energy generation systems with high solar energy generation efficiency and community value.

Motion 21-1249

Motion 21-1249, dated October 26, 2021, addresses the topic of the Department of General Services' request for funding to expand solar energy, energy storage, and EV charging stations at city facilities. The motion encompasses several key components. First, it emphasizes the importance of pilot programs to test and implement solar and energy storage solutions that enhance grid reliability, provide backup power, and offset energy consumption. Second, the motion calls for the prioritization of facilities based on their suitability for various systems. Furthermore, the motion highlights the need to increase the availability and accessibility of EV chargers. It aims to install a significant number of charging stations to support the city fleet's transition to a 100% zero-emission status. Additionally, the motion emphasizes the importance of expanding solar arrays and establishing an expertise and maintenance team responsible for ensuring the proper upkeep and functionality of the solar energy systems throughout the city's facilities. Lastly, the motion sets a long-term vision for a **renewable energy-powered electric grid by 2035**.

Motion 22-1402

Motion 21-1249, dated November 2, 2022 and, provided various directives to support the Climate Action withing the City of Los Angeles. This included the following:

- Bureau of Sanitation and the Environment (LASAN) present to the Council a Community and a Municipal Greenhouse Gas Emissions Inventory to inform progress towards meeting LA's climate change goals.
- City Administrative Officer (CAO) establish a Climate Impact team, which shall support departments in the preparation of investment plans that achieve the City's goal of carbon neutrality and perform other climate-related activities referred to them
- City Administrative Officer, in consultation with both city and proprietary departments, compile a list of all programs currently active in the city that are intended to reduce emissions
- Amend the Capital and Technology Improvement and Expenditure Program (CTIEP) policy by incorporating climate change mitigation projects and specifically, carbon reduction projects as Primary Criteria within the CTIEP Project Prioritization Criteria section
- **City Administrative Officer, with the assistance of all departments and proprietary departments, prepare a study using an expert consultant, that identifies the feasibility of and investments needed to achieve carbon neutrality in municipal operations by 2035.**

LOS ANGELES DEPARTMENT OF WATER AND POWER

LA100 STUDY

The LA100 Study, a collaborative effort between LADWP and the National Renewable Energy Laboratory conducted between 2017 and 2021, utilized advanced simulations and modeling to explore various pathways towards achieving 100 percent clean energy in Los Angeles by either 2035 or 2045. The study considered three projected electricity demand scenarios: moderate, high, and stress, and four hypothetical pathways: SB100, Early and No Biofuels, Transmission Focus, and Limited New Transmission. The scenarios analyzed various factors such as energy efficiency, electrification of transportation and buildings, access to charging infrastructure, and the role of different energy sources. Each scenario provided valuable insights into the strategies and trade-offs involved in transitioning Los Angeles to a clean energy future.

Through comprehensive analysis, the study yielded several key insights:

- Elimination of GHG emissions: LADWP's power plant operations could witness a decline of 76 percent to 100 percent in greenhouse gas (GHG) emissions compared to 2020 levels. Achieving California's ambitious 100 percent carbon-free energy goal by 2045 (and the City of LA goal by 2035) would necessitate the widespread deployment of renewable and zero-carbon energy resources.
- Managing increased electric demand: With a growing population, climate change impacts, and increased electrification, effectively managing the projected rise in electricity demand is crucial. The study underscores the importance of implementing high levels of energy efficiency measures to offset this growing demand.
- Robust growth in distributed solar: Anticipating strong customer-driven demand, the LA100 Study forecasts the installation of 3 to 4 gigawatts of rooftop solar by 2045, indicating a significant surge in distributed solar energy within the region.
- Electrification's impact on local community health: The electrification of buildings and transportation offers substantial benefits to local air quality and associated health outcomes. By transitioning to electric vehicles and buildings, Los Angeles can experience significant improvements in air pollution and public health.
- Clean energy jobs and economic impact: While the economic impact on Los Angeles' overall economy is projected to be modest, the transition to clean energy is expected to generate thousands of new jobs in the clean energy sector, providing opportunities for local employment and economic growth.
- Importance of firm dispatchable electric generation: To ensure grid reliability, a significant capacity of firm, dispatchable generation is necessary within the Los Angeles Basin. This reliable power source would primarily be utilized during periods of insufficient energy production from intermittent renewables like wind and solar.
- Electrification's role in maintaining affordable rates: Achieving 100 percent clean energy with sustainable electricity rate impacts requires a significant increase in electricity sales. This can be accomplished by promoting both transportation and building electrification, ensuring a balance between clean energy goals and affordability.

LA100 EQUITY STRATEGIES INITIATIVE

LA100 Equity Strategies Initiative, announced in June 2021, is a collaborative effort between the National Renewable Energy Laboratory (NREL) and the Luskin Center for Innovation at UCLA. The study is projected to be completed by 2023. Building upon the LA100 Study, this groundbreaking initiative aims to ensure an equitable clean energy transition in Los Angeles. In cooperation with community stakeholders, LA100 Equity Strategies will examine a set of community-driven goals, including access to energy customer programs and distributed energy resources, local neighborhood power grid upgrades, assistance to renters in participating in solar, energy efficiency, and electrification programs, reducing environmental impacts of end-of-life technologies like batteries, increasing public charging infrastructure for electric vehicles, improving air quality through renewable-resource derived fuels, ensuring affordable rates and utility debt relief, addressing clean air concerns for communities near power facilities, and evaluating the impacts on housing and transportation. Through extensive community engagement, an Advisory Committee, and a Steering Committee, LA100 Equity Strategies aims to develop implementation-ready strategies that prioritize energy equity, justice, community health, and job opportunities. The outcomes of this ongoing effort will be integrated into future drafts of the LADWP Strategic Long-Term Resource Plan (SLTRP) to shape a sustainable and inclusive clean energy future for Los Angeles.

INCENTIVE PROGRAMS

LADWP Business Offerings for Sustainable Solutions Program (BOSS)

The BOSS program offers performance-based incentives and rebates for the implementation of energy efficiency and electrification measures. This is a new program that will be active starting July 1, 2024.

End Use	Maximum incentive ($/kWh)
Lighting	0.40
HVAC – Cooling[1]	0.60
HVAC – Heating[1]	0.30
HVAC – Heating (All electric)	0.65
HVAC – Ventillation[1]	0.25
Process Lighting	0.30
Appliance, Plug & Process	0.30
Domestic Hot Water	0.15
Domestic Hot Water (All electric)	0.65
Building Envelope	0.25
Whole Building[2]	0.25

Figure 31: LADWP BOSS Program Incentive Rates

LADWP Commerical Lighting and Incentive Program (CLIP)

CLIP provides incentives for the installation of newly purchased and installed energy-saving lighting and controls. The incentive levels are based on the calculated energy savings of each project, with rates ranging from $0.08 to $0.24 per kilowatt-hour (kWh) of annualized savings. To apply for CLIP, applicants must have an LADWP non-residential electric account in good standing, whose average monthly electrical use is above 200 kW, and a lighting retrofit project that achieves a minimum of 10% energy savings.

INCENTIVE LEVELS		
Category	Measures	Incentive per kWh Saved
A	Lamp-only retrofits; other Examples: Screw-in LED lamps Linear fluorescent tube only replacement	$0.08
B	Tier 1 LED fixture replacement or retrofit - Installed products do not meet one or more program requirements specified in Table 4. Examples: Non-conforming LED fixture replacement (LED and driver)	$0.08
C	Tier 2 Lighting fixture replacement or retrofit - Installed products meet ***ALL*** program requirements specified in Table 4. Examples: Fluorescent fixture retrofit. LED fixture replacement (LED and driver)	$0.24
D	Sensor-based controls Examples: Occupancy/vacancy controls Daylight controls	$0.15
E	Interactive Effects	$0.08

Figure 32: LADWP Commercial Lighting Incentive Program

LADWP Zero by Design Program

Zero by Design New Construction Incentive program encourages developers to build more sustainably by providing financial incentives for commercial and high-rise multifamily new construction projects which exceed Title 24 or industry standards. Owners can receive incentives to help offset the added costs of increasing building efficiency and design teams may also be eligible for incentives by attaining energy savings goals. This program also offers complimentary design assistance and review to aid in fulfilling the project's maximum energy potential. Express incentives are provided for the purchase and installation of high efficiency new equipment. Whole building incentives are offered for buildings composed of many systems working together separated into categories such as appliance and plug loads, building envelope, HVAC heating and cooling, indoor and outdoor lighting, food service, and more. Design team incentives are offered to reward the achievement of energy saving targets that are 10% better than Title 24 standards.

LADWP Commerical Direct Install Progrm

The Commercial Direct Install Program is available to qualifying businesses whose average monthly electrical demand is 250 kilowatts (kW) or less. The program offers the assistance of a trained Energy Service Representative (ESR) who will arrange a time to visit your business and evaluate your energy use and identify areas where you can save energy. If you agree with the recommendations, the ESR will have you sign an Authorization Form and schedule an appointment to install the equipment at a convenient time. Energy saving measures include upgrades to energy efficient lighting systems, lamps and LED exit signs.

LADWP Food Service Program

The Food service program offers equipment rebates to lower business costs. Incentives are offered for energy efficient cooking and cooking process equipment such as refrigerators, ovens, dishwashers, and other equipment. Businesses may also qualify for financial incentives with the purchase of equipment such as ovens, griddles, steam cookers, holding cabinets, glass and solid door refrigerators/freezers, and icemakers. A complete list of qualifying equipment is offered via Excel Download on the LADWP website.

FEDERAL GOVERNMENT, STATE AND COUNTY

FEDERAL SUSTAINABILITY PLAN

President Biden released Executive Order 14057 setting out a range of goals to deliver an emissions reduction pathway that is consistent with the goals of 50 percent reduction of the United States greenhouse gas emissions by 2030. The goals of this plan include: 100 percent carbon pollution free electricity by 2030 including 50 percent on a 24/7 basis; net zero emissions buildings by 2045 including a 50% reduction by 2032; 100 percent zero emission vehicle acquisitions by 2035, including 100% light duty acquisitions by 2027; net zero emissions procurement by 2050; net zero emissions operations by 2050, including a 65% reduction by 2030; climate resilient infrastructure and operations; advance environmental justice and equity focused operations; Accelerate progress through domestic and international partnerships; develop climate and sustainability focused workforce. The following are further explanations of the relevant ambitions of Executive Order 14057.

To achieve 100% carbon free electricity using a whole government approach, agencies at the forefront will work with regulators, State and local policy officials, utilities, developers, technology firms, financers and more to buy directly from utility providers, enter into power purchase agreements and develop onsite generation by leveraging Federal real property assets. Additionally, the Federal Government will seek ways to pilot and accelerate carbon-free electricity sources such as green hydrogen, modular and advanced nuclear reactors, and others. The Federal Government will also develop ways to increase its impact by working with non-Federal partners.

Executive Order 14057 also establishes a path to achieve a net-zero emissions buildings goal by 2045. This will require all new modernization projects larger than 25,000 gross square feet entering the planning stage to be designed, constructed, and operated to be net zero emissions by 2030. Federal Building Performance Standards were released, requiring agencies to cut energy use and electrify equipment and appliances to achieve zero Scope 1 emissions in 30 percent of the building space owned by the Federal government by square footage by 2030. Appendix 2 of the Federal Building Performance Standard prescriptive pathway states all agencies must implement practicable electrification by upgrading space heating, domestic and service water heating systems, as well as cooling, cooking, and backup generators used for non-emergencies, and provides prescriptive measures for space and water heating and cooling.

To achieve 100% zero emission vehicle acquisitions by 2035, including 100% light-duty acquisitions by 2027, the Federal Sustainability plan sets the Federal fleet on a path to zero-emission vehicles. Key actions include optimizing agency fleet management to enhance efficiency by planning efficient deployment of necessary charging or refueling infrastructure, energy storage technologies, and ancillary services to support vehicle-to-grid technology. Improvement of charging infrastructure is highlighted as a key action, doing so by engaging the private sector to identify cost-efficiencies and sharing charging infrastructure including workplace charging across agencies where possible with State, Tribal, and local government fleets and communities. The Federal Government will also seek ways for State, Tribal, and local government fleets to benefit from the reach and scale of Federal procurement as well as from the fleet planning and analysis tools developed to support Federal deployment.

JUSTICE40

Justice40 is an initiative part of Executive Order 14008 aiming to address environmental and economic inequalities by ensuring that at least 40% of the benefits from federal investments in areas such as clean energy and infrastructure reach disadvantaged communities.

STATE OF CALIFORNIA

CAL EnviroScreen 4.0

The Cal EnviroScreen 4.0 is a digital mapping tool employed to assess the relative burden of pollution and vulnerabilities in various geographical areas across California. Its main objective is to identify communities that may require specific policies, investments, or programs. Developed by the Office of Environmental Health Hazard Assessment (OEHHA) under the California Environmental Protection Agency, this tool utilizes two main categories—pollution burden (including exposures and environmental effects) and population characteristics (encompassing sensitive populations and socioeconomic factors)—to evaluate and rank communities. It incorporates 21 statewide indicators, assigning scores to each based on percentiles. These percentile scores are averaged within four components, and the component scores are then combined to generate a total score, with a maximum score of 100. The geographic unit used for scoring is a tract from the U.S. Census.

The indicators used are as follows:

- Pollution Burden
    - Exposures
        - Ozone Concentrations
        - PM2.5 Concentrations
        - Diesel PM Emissions
        - Drinking Water Contaminants
        - Children's Lead Risk from Housing
        - Pesticide Use
        - Toxic Releases from Facilities
        - Traffic Impacts
    - Environmental Effects
        - Cleanup Sites
        - Groundwater Threats
        - Hazardous Waste
        - Impaired Water Bodies
        - Solid Waste Sites and Facilities
- Population Characteristics
    - Sensitive Populations
        - Asthma ED Visits
        - Cardiovascular Heat Attack ED Visits
        - Low Birth Weight Infants
    - Socioeconomic Factors
        - Educational Attainment
        - Housing-burdened Low-Income Households
        - Linguistic Isolation
        - Poverty
        - Unemployment

COUNTY OF LOS ANGELES

OurCounty Sustainability Plan

The OurCounty Sustainability Plan is a comprehensive and intersectional roadmap consisting of 12 goals, 37 strategies, and 159 actions aimed at promoting sustainability in Los Angeles County. The plan was developed by the County Sustainability Council within the Chief Sustainability Office and adopted in 2019.

The 12 goals cover a wide range of sustainability aspects, including community environments, buildings and infrastructure, land use and development, a prosperous economy, ecosystems and biodiversity, parks and public spaces, fossil fuel reduction, transportation, resource consumption, food systems, inclusive governance, and funding and partnerships.

Goal 2 focuses on buildings and infrastructure. It sets targets for the year 2025, for converting 10% of heat-trapping surfaces to cool or green surfaces and reducing heat-stress emergency department visits. To achieve these targets, the plan includes conducting a countywide climate vulnerability assessment that addresses social vulnerability and using it to guide priorities. It also calls for the development of a heat island mitigation strategy, which involves implementing measures like cool pavements, green roofs, pavement reduction, and urban greening. Building shade structures at major transit stops are prioritized for communities with high heat vulnerability. The plan also aims to have all new buildings and 50% of major building renovations be net-zero carbon by 2025, with a goal of 100% of major building renovations to be net-zero by 2045. It proposes adopting green building standards and piloting high-performance building standards beyond the current LEED Gold Standard, such as Passive House, Zero Net Energy, Living Building Challenge, and WELL building standard. Additionally, the plan emphasizes the use of climate projections for weather and precipitation modeling in planning and infrastructure development, rather than relying solely on historic data.

Goal 7 centers on achieving a fossil fuel-free LA County. The targets for 2025 include a 25% reduction in total greenhouse gas emissions, the addition of 3 GW of new distributed energy resources, supplying all county facilities with 100% renewable power, and powering all unincorporated areas with 100% renewable energy. To reach these targets, the plan calls for collaboration with the City of LA and other cities to develop a sunset strategy for all oil and gas operations, giving priority to disproportionately affected communities. It also aims to develop building energy and emissions performance standards that lead to building decarbonization. The plan proposes the creation of a publicly accessible community energy map that identifies opportunities for deploying distributed energy resources and microgrids to enhance energy resiliency. Furthermore, it suggests integrating low or no-cost options for community shared solar facilities on county property, maximizing the installation of solar and energy storage systems on county property, and developing an equitable investment plan for electricity and natural gas transmission, distribution, and storage improvements while supporting local renewable sources. The plan includes targets for the installation of 60,000 new public EV charging stations, ensuring that 30% of all new light-duty private vehicles are zero-emissions vehicles, installing 5,000 EV charging stations at county facilities, and making all new non-emergency light-duty vehicle purchases zero-emission or better. It emphasizes streamlining permitting and construction of zero-emission vehicle infrastructure, installing EV chargers in disadvantaged communities, revising the county's fleet policy to prioritize zero-emission vehicles whenever feasible, and partnering with vehicle manufacturers to develop zero-emission pursuit vehicles and zero-emission fire engines through collaboration with the Los Angeles Sheriff's Department and LA Fire Department, respectively.

MUNICIPAL PEER REVIEW

The City of L.A. is not alone in their efforts to decarbonize municipal buildings, as several other major cities have set similar environmental goals. A review of building decarbonization goals and strategies is provided for a select number of cities within California and across the United States. These cities prioritize equity, energy efficiency, and sustainable practices to achieve their environmental objectives.

Table 18: Municipal Decarbonization Goals and Metrics

City	Key Goals and Metrics
San Francisco	• Net-zero emissions city-wide by 2040. • 100% renewable electricity by 2025 & 100% renewable energy by 2040. • Require zero on-site fossil fuel emissions for all large existing commercial buildings by 2035.
San Diego	• Carbon-neutrality city-wide by 2035. • 100% renewable energy by 2035. • Phase out natural gas from municipal facilities at 50% by 2030 and 100% by 2035.
New York	• Carbon-neutrality city-wide by 2050. • 40% reduction from a 2006 baseline by 2025 and 50% by 2030 for municipal operations. • 100% renewable energy for all municipal buildings by 2025.
San Luis Obispo	• Municipal operations carbon neutrality by 2030 • Community carbon neutrality by 2035 • Electrify all city buildings by 2030
Sacramento	• Transition existing buildings to carbon-free electricity by 2045 • New construction (3 or fewer floors) all-electric by 2023 • New construction (4 or more floors) all-electric by 2026 • Zero emissions power by 2030 (Sacramento Municipal Utility District)
Washington D.C.	• Neutralize GHG emissions by 2045 • Reach carbon neutrality in government operations by 2040 • End new purchases of fossil fuel-based heating systems by 2025 • Most new construction and substantial improvements will be net zero energy by 2027 • 100% renewable electricity by 2032 (Clean Energy DC)
Denver	• Eliminate 100% GHG emissions city-wide by 2040. • 100% renewable energy for municipal operations by 2025. • 100% renewable community energy by 2030.

SAN FRANCISCO

San Francisco's 2021 Climate Action Plan defines a framework to reach net-zero emissions citywide by 2040. The framework is driven by sector-based emissions targets characterized by "0-80-100-Roots". While the Climate Action Plan (CAP) defines decarbonization goals across 5 sectors, Transportation and Building Operations are the sectors with the largest contributions to city-wide emissions at 47% and 41% respectively. Municipal facilities and operations account for just 3% of citywide GHG emissions based on a 2016 emissions inventory; the city already derives 100% of energy for city-owned facilities from emissions-free electricity provided by SF Public Utilities Commission Hetch Hetchy Power System- adopted in 2010-2012. The city will continue municipal decarbonization efforts as detailed in the SF Municipal Facilities Thermal Decarbonization Study 2016; improvement projects for city-owned buildings are categorized by size and urgency. Priority projects are placed on an annual project plan timeline and analyzed at the building level using an Excel-based program "The Tool" to project the energy & emissions reduction opportunities.

SAN DIEGO

The City of San Diego has committed to a goal of citywide carbon neutrality by 2035 with their 2022 Climate Action Plan (CAP). The CAP is defined by six equity-focused strategies to reduce GHG emissions. Strategy 1: Decarbonizing Buildings represents the largest opportunity for emissions reduction. Strategy 1 defines the intent to develop a Building Code Amendment as part of the 2023 code cycle to create San Diego building and energy codes more stringent than those required in the CA State codes, this code amendment or "Reach Code" is under review pending adoption in the 2023 code cycle for implementation January 1, 2024. The city aims to lead the way for Strategy 1 efforts by meeting zero carbon emissions for municipal buildings and operations by 2035. The city aims of phase out natural gas from city facilities at 50% by 2030 and 100% by 2035. The San Diego Municipal Energy Strategy & Implementation Plan identifies five strategies for the city's role in meeting CAP goals for municipal facilities. Like the CAP, the first strategy focuses on existing buildings and outlines a framework for identifying and implementing energy efficiency retrofits for city buildings.

San Diego's Climate Action Plan is centered on equity, incorporating equity metrics in prioritization criteria for potential climate actions. San Diego's Climate Equity Index (CEI) first developed in 2019 categorizes geographical areas within the city on a scale from very low to very high access to opportunity based on 41 social, structural, and environmental indicators. The Climate Action Prioritization Tool (CLIMACT Prio) was developed by researchers at the Institute for Housing and Urban Development Studies at Erasmus University Rotterdam to conduct quantitative analysis for climate actions ranked by feasibility, community priorities, and opportunities for equitable implementation. San Diego leverages the CEI data in tandem with the CLIMACT Prio tool to study and prioritize climate actions.

NEW YORK

The City of New York has committed to achieving citywide carbon neutrality by 2050 as defined in ONENYC 2019 - 2050 Action Plan. The city has defined a 40% reduction in GHG emissions from a 2006 baseline by 2025 and a 50% reduction by 2030 for City operations as commitments in Local Law 97 Climate Mobilization Act as part of the path to carbon neutrality. The Department of Citywide Administrative Services (DCAS) identifies the city's role in the path to carbon neutrality in municipal operations with the Local Law 97 Implementation Action Plan. The plan focuses on city-owned and operated buildings as opposed to other stationary and non-stationary assets. Key actions to meet emission reduction targets for municipal buildings are defined by energy use reduction, decarbonizing municipal heating systems, expanding solar installations on municipal property to 100MW/yr by 2025, and sourcing 100% of electricity for city-owned facilities from renewable sources by 2025. DCAS has also committed to reduce emissions for fleet vehicles by 50% by 2025 and transition to all-electric fleet for non-emergency vehicles in the updated 2021 NYC Clean Fleet Plan.

SAN LUIS OBISPO
The City of San Luis Obispo Carbon Neutral Facilities Plan analyzes the City's existing facilities and fleet of vehicles to identify key actions and projects that can reduce SLO's carbon emissions and annual utility bills. San Luis Obispo published their Climate Action Plan in 2020 and committed to community carbon neutrality by 2035 and municipal operations carbon neutrality by 2030. To meet the municipal operations emissions target, the CNFP identified specific strategies to reduce emissions including energy efficiency, building electrification, electric vehicles, solar PV, microgrids and clean energy procurement. The report provided scenario options that detailed the carbon savings by implementing these strategies across various timeline options.

SACRAMENTO
The city of Sacramento identified transportation and buildings as the biggest contributors to the city's total GHG emissions. To tackle reducing emissions from buildings, Sacramento requires all new construction buildings with three or fewer floors to be all electric by January 1st, 2023, and all buildings (including those with four or more floors) to be all electric by January 1st, 2026. The city also aims to transition existing buildings to carbon-free electricity by 2045. The plan is still under development but will prioritize engaging with residents and local businesses to promote an equitable transition to carbon-free power. As part of the Climate Action and Adaptation plan currently under development, the city of Sacramento aims to support the Sacramento Municipal Utilities District (SMUD) as it implements its 2030 Zero Carbon plan, which will reduce Sacramento's total emissions even further.

WASHINGTON DC
Washington DC has committed to the Paris Climate Agreement through its "Climate Commitment Act of 2022" and Clean Energy DC plan. The district has committed to neutralizing GHG emissions by 2045, reaching carbon neutrality in government operations by 2040, and ending new purchases of fossil fuel-based heating systems and vehicles by 2025 2026. Additionally, the Clean Energy DC Building Code Amendment Act of 2022 will require all new construction or substantial improvements of covered buildings, including most commercial buildings, to be constructed to a net-zero-energy standard, beginning on January 1, 2027. DC also aims to retrofit one in five existing buildings to achieve an approximate 40% reduction in energy use, leading by example in its own buildings.

Prioritizing and selecting existing buildings for retrofits is streamlined since DC approved the Clean and Affordable Energy Act (CAEA) in 2008. The CAEA requires owners of large privately-owned commercial and multifamily buildings, and all publicly owned buildings, to report their energy consumption in EPA's ENERGY STAR® program to compare building energy use across the district's building portfolio.

DENVER
The City of Denver has committed to eliminating 100% of GHG emissions city-wide by 2040 as detailed in the 2021 Climate Protection Fund Five-Year Plan. On the path to meet this goal as part of Denver's role in carbon reductions required by the Paris Agreement, the city has set incremental reduction goals of 40% by 2025 and 65% from a 2019 baseline by 2030. Denver defined strategies for the decarbonization of the community and municipal built environment in the 2018 80x50 Climate Action Plan. The plan includes a goal to achieve 100% renewable energy for municipal operations by 2025 and 100% renewable community energy by 2030. The Energize Denver ordinance was passed in November 2021 and establishes electrification requirements for all existing commercial and multifamily building for heating and cooling equipment replacement, including increasingly stringent requirements beginning in 2023, 2025, and 2027.

A.4. PORTFOLIO DECARBONIZATION MODELING

This building energy assessment was conducted using compiled facility data, utility data and previously completed facility assessments. Additionally, each City department was consulted to gather information regarding building functions, typical operations and existing system conditions. Following a review of the compiled energy data, representative buildings for each building type were selected from the pool of buildings with energy audits completed.

DATA COLLECTION

The Decarbonization Workplan consolidated various data sources to establish a comprehensive building facilities database. This includes general information about facilities including location, building type, department, age, and size. Information about existing building systems was collected from City's Asset Management System (AMS) and previous facility technical assessments. This information is used to identify existing building systems, including HVAC systems and heating type (electricity or natural gas). Information was collected for over or around 50% of facilities, and based on building type classifications, systems were assigned for the remaining facilities.

The City of Los Angeles has a central Energy Management System (EMS), EnergyCAP, to track energy data across municipal buildings. Additionally, the City receives energy data directly from the LADWP and the SoCal Gas to provide an annual municipal GHG emission inventory. These energy data sources were merged, and meters were assigned to individual buildings based on location. In cases where the city owns multiple sites with multiple buildings and single electricity and natural gas meters, the consultant team leveraged benchmark data to allocate energy use between individual buildings. This enables the city to understand energy use on an individual building basis, prioritize projects, and ensure data quality assurance by aligning collected energy data with previous city assessments.

An inventory of natural gas was conducted to understand its usage across different building types, departments, and individual sites. It was identified that 25 sites throughout the city use 54% of building-related natural gas. This excludes natural gas used for process demand within the city, such as wastewater treatment plants, CNG fueling, and heating for the city's asphalt plants. An additional evaluation of these natural gas sources is recommended to provide a mitigation plan for those emissions. The building decarbonization work plan will identify individual projects and overarching strategies to mitigate natural gas use, reducing or eliminating 4 million terms of natural gas.

Through this process, it was found that the majority of existing buildings currently use natural gas as a primary heating source for space heating and domestic hot water. Building electrification measures were identified to electrify the building systems of all city facilities currently using natural gas. The majority of city buildings have not completed LED retrofits, presenting a significant opportunity to reduce electricity usage and generate utility savings for the city. This chapter provides an overview of the city's existing building stock and evaluates where and how energy is used throughout the city. This comprehensive valuation of the city's existing building inventory provides insights to prioritize building decarbonization efforts and work with individual building departments to decarbonize their buildings and enhance energy efficiency and sustainability.

CITY DEPARTMENTS

The buildings evaluated within this Workplan are owned by the city departments listed in Table 19 below. Figure 33 and Figure 34 show the breakdown of the building portfolio by number of buildings and gross square footage across different departments.

Table 19: City of LA Municipal Building Inventory by Department

Department Name	Buildings	GSF
Bureau of Engineering (BOE)	2	20,500
Bureau of Street Lighting (BSL)	3	32,400
Bureau of Street Services (BSS)	51	259,500
Department of Animal Services (DAS)	7	255,400
Department of Cultural Affairs (DCA)	24	233,700
Department of Transportation (DOT)	29	1,395,300
El Pueblo de Los Angeles (EL PUEBLO)	21	144,500
Los Angeles Economic and Workforce Development (EWDD)	4	95,600
General Services Division (GSD)	179	8,748,300
Harbor Department (HARBOR)	9	327,300
Information Technology Agency (ITA)	3	5,300
Los Angeles City Employees' Retirement System (LACERS)	1	70,000
Los Angeles Fire Department (LAFD)	120	1,573,300
Los Angeles Homeless Service Authority (LAHSA)	1	5,700
Los Angeles Police Department (LAPD)	67	4,445,600
Los Angeles Public Libraries (LAPL)	75	1,434,200
Los Angeles Fire and Police Pensions (LAFPP)	1	66,500
Recreation and Parks (RAP)	328	3,372,300
Sanitation (SAN)	37	299,100
Los Angeles Zoo (ZOO)	18	84,300
Total Portfolio	**980**	**21,300,000**

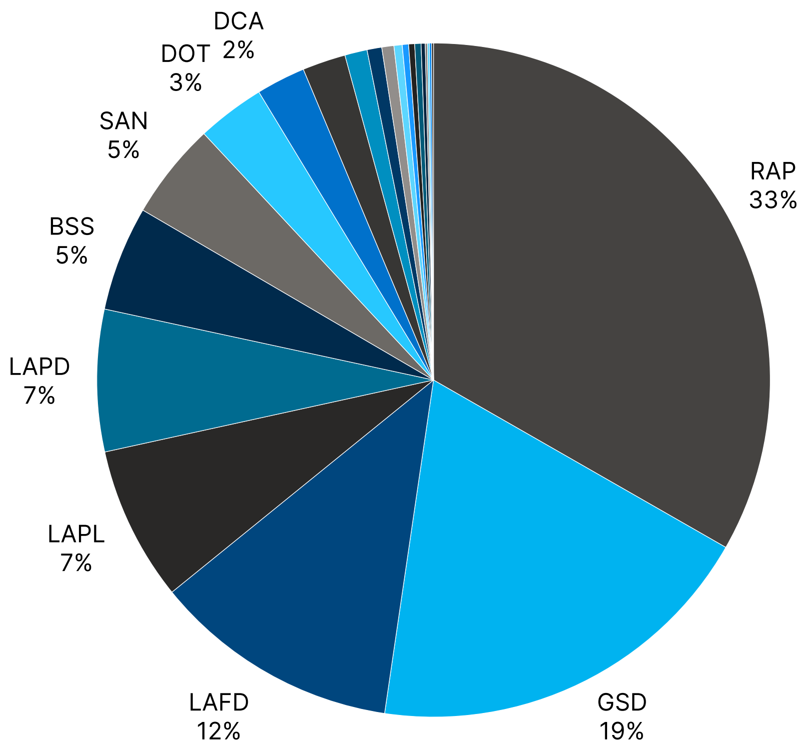


Figure 33: Building Portfolio Breakdown by Department – Building Count

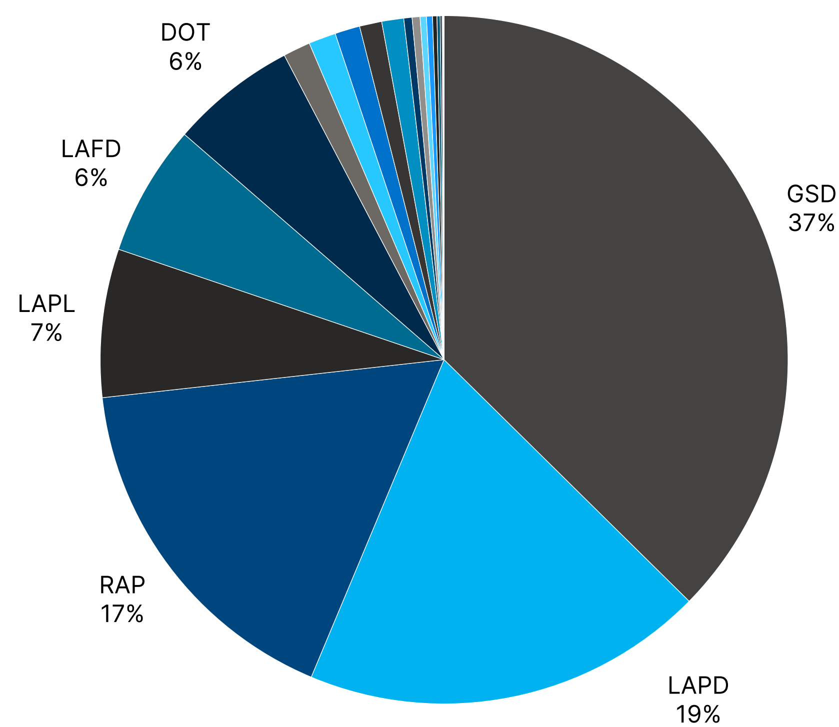


Figure 34: Building Portfolio Breakdown by Department – Gross Area

BUILDING TYPES

The City of LA includes a diverse portfolio of buildings that provide various support service and community functions. All buildings within the City were categorized into the follow building types. The figures on this page provide a breakdown of buildings based on the number of facilities and total gross square foot (GSF) area.

Table 20: Typical Building Systems by Building Type

Building Type	Typical Heating	Typical Water Heater	Other Gas Equipment
Animal Shelter	Gas RTU	Gas WH	Gas Laundry
Aquarium	Gas RTU	Gas WH	
Aquatics Center	Gas RTU	Gas WH	Gas Pool Heaters
Assembly	Gas Boilers	Gas WH	
Camp	Gas Furnace	Gas WH	Gas Cooking
Childcare Center	Gas RTU	Gas WH	Gas Cooking
Church	Gas RTU	Electric WH	
Commercial	Gas RTU	Both	
Communication	None	Electric WH	
Community Center	Gas RTU	Gas WH	
Detention	Gas Boiler	Gas WH	Gas Cooking, Laundry
Fire Station	Gas RTU	Gas WH	Gas Cooking, Laundry
Historic	Gas Unit Heater	Gas WH	
Horticulture	Gas RTU	Gas WH	
Laboratory	Gas Boiler	Both	
Library	Gas RTU	Both	Gas Cooking
Maintenance	Gas Unit Heater	Gas WH	
Museum	Gas RTU	Gas WH	
Office	Gas Boiler	Gas WH	
Parking	None	None	
Plant	Gas Boiler	Gas WH	
Police Operations	Gas RTU	Gas WH	
Police Station	Gas Boiler	Gas WH	
Police Training	Gas Boiler	Electric WH	
Recreation Center	Gas RTU	Gas WH	
Residential	Gas Unit Heater	Gas WH	
Restroom	None	Gas WH	
Senior Center	Gas RTU	Gas WH	Gas Cooking
Theatre	Gas Boiler	Gas WH	
Vacant	None	None	
Warehouse/Storage	Gas Unit Heater	Gas WH	
Zoo Exhibit Building	Gas RTU	Gas WH	

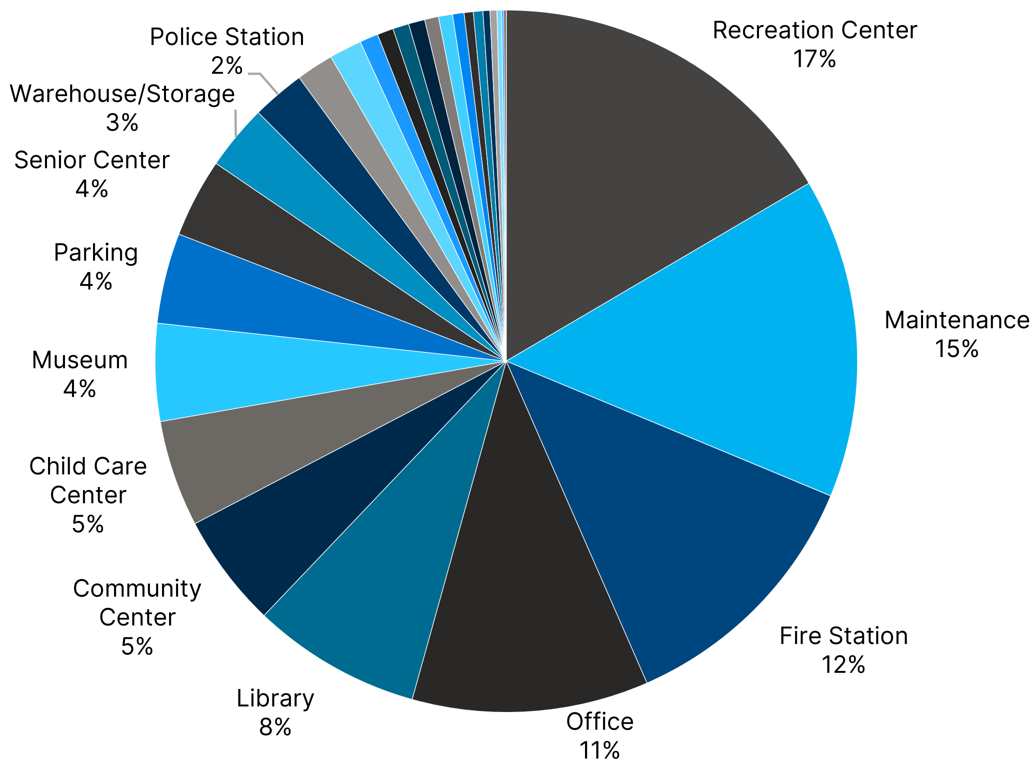


Figure 35: Building Portfolio Breakdown by Building Count

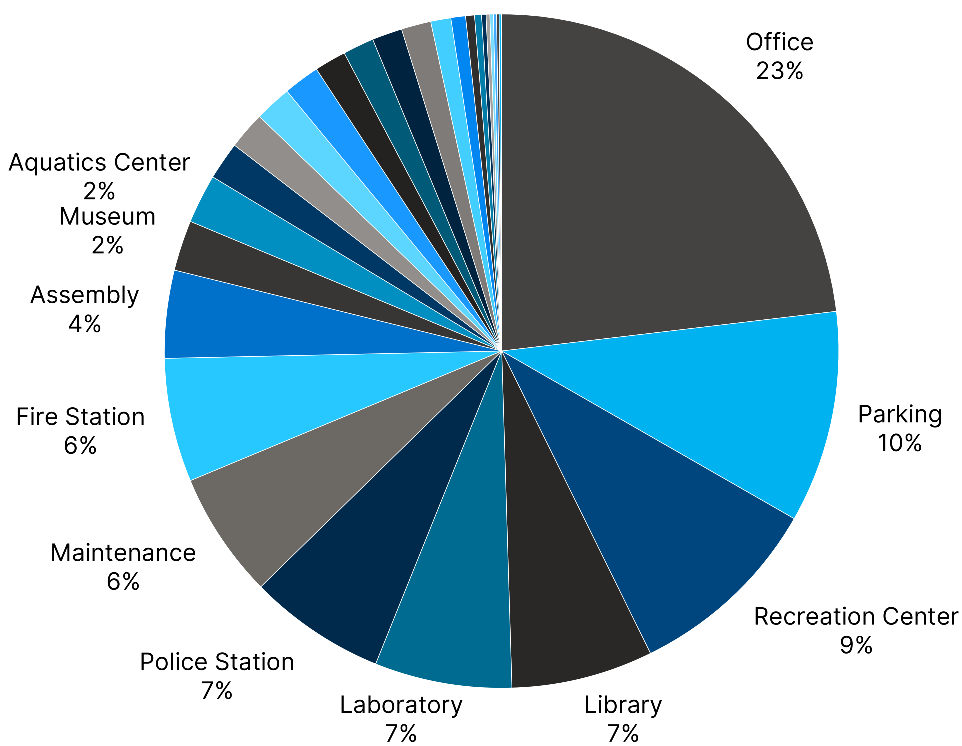


Figure 36: Building Portfolio Breakdown by Gross Area (GSF)

NATURAL GAS

An assessment of natural gas over time was provided to evaluate overall trends in energy use processes. Table 21 shows the natural gas over time for the overall portfolio of buildings. Natural gas consumption across the city has been relatively consistent over the past few years. The increase noted in 2016 was a result of the Hyperion WWP generation plant coming online. While this plant has increased the city's natural gas use and emissions, it provides critical energy resilience to the wastewater treatment plant, ensuring operation during a power outage and reducing the risk of environmental impact from the plant.

The review of 2022 gas meter usage identified a total usage as 13,151,973 therms. The Hyperion Plant, LAWA, Asphalt Plant #1, LADOT fueling stations, and San Fernando Yard were excluded from the calculated total. Table 21 below lists the electricity use by the department.

Table 21: Natural Gas Use by Department

Department	Natural Gas 2022 (therms)	2022 GHG Emissions (MTE)[31]
Recreation and Parks (RAP)	1,059,680	5,616
General Services Division (GSD)	937,580	4,969
Los Angeles Police Department (LAPD)	679,420	3,601
Los Angeles Fire Department (LAFD)	316,320	1,676
Sanitation (LASAN)	345,710	1,832
Los Angeles Public Libraries (LAPL)	163,380	866
Department of Animal Services (DAS)	145,570	772
Los Angeles Zoo (ZOO)	84,900	450
City Tourism Department	67,840	360
Bureau of Street Services (BSS)	41,100	218
Utility Service	34,060	180
Department of Transportation (DOT)	19,740	105
Personnel Dept	18,950	100
Department of Cultural Affairs (DCA)	14,740	78
El Pueblo de Los Angeles (EL PUEBLO)	10,990	58
Landscape	1,950	10
Mayor	1,520	8
Public Facilities	1,050	6
Bureau of Street Lighting (BSL)	950	5
Total	**3,945,870**	**20,910**

[31] Based on LADWP electricity emissions factors in 2022

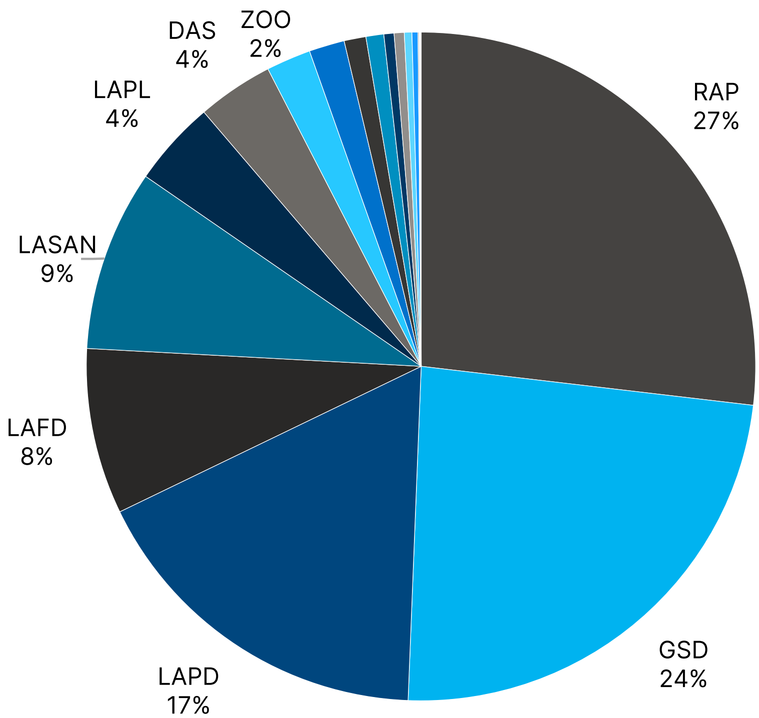


Figure 37: Natural Gas Breakdown by Department

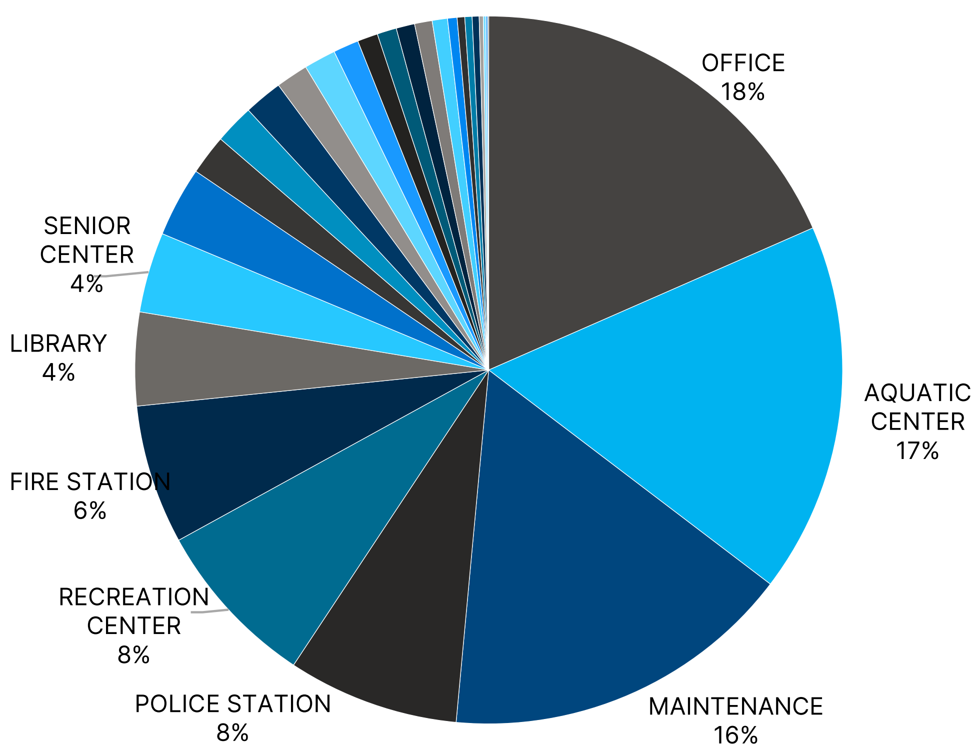


Figure 38: Natural Gas Breakdown by Building Type

ELECTRICITY

The review of 2022 electricity meter usage identified a total usage as 252,000 MWh. Street lighting and park lighting were excluded from the calculated total. Table 22 below lists the electricity use by department.

Table 22: 2022 Electricity Consumption by Department

Department	Electricity 2022 (kWh)	2022 GHG Emissions (MTE)[32]
General Services Division (GSD)	64,674,200	17,915
Los Angeles Police Department (LAPD)	45,961,700	12,731
Recreation and Parks (RAP)	32,918,100	9,118
Los Angeles Public Libraries (LAPL)	20,344,500	5,635
Los Angeles Fire Department (LAFD)	15,721,700	4,355
Sanitation (LASAN)	11,601,000	3,213
Los Angeles Zoo (ZOO)	7,598,000	2,105
Department of Animal Services (DAS)	4,436,200	1,229
Department of Transportation (DOT)	3,215,500	891
Bureau of Street Services (BSS)	2,047,700	567
Department of Cultural Affairs (DCA)	1,323,400	367
El Pueblo de Los Angeles (EL PUEBLO)	1,083,900	300
Bureau of Street Lighting (BSL)	188,200	52
Information Technology Agency (ITA)	123,500	34
Bureau of Engineering (BOE)	10,300	3
Total	**211,247,800**	**58,520**

[32] Based on LADWP electricity emissions factors in 2022

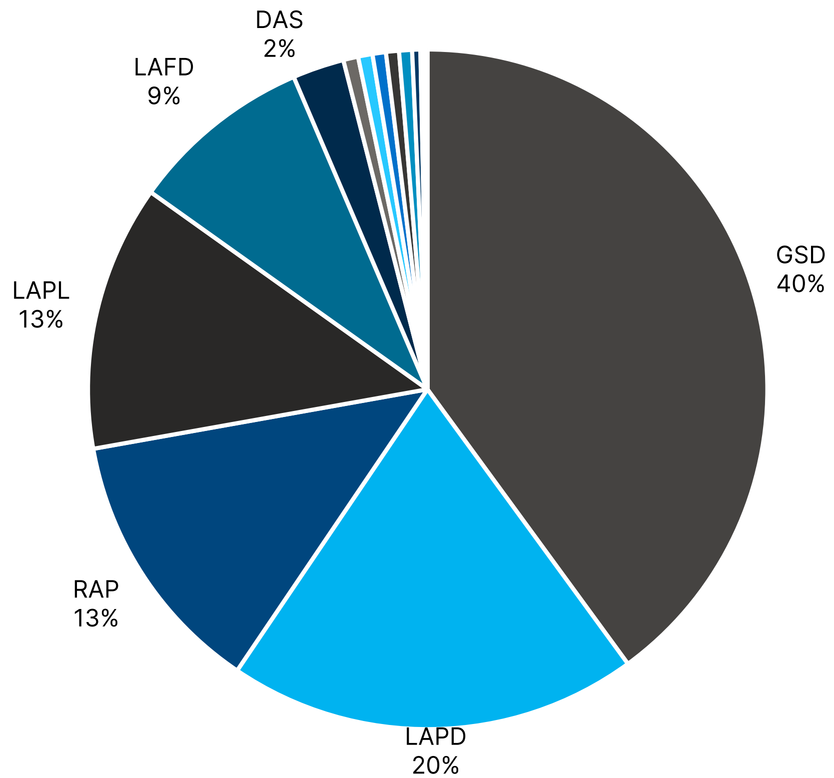


Figure 39: Electricity Use Breakdown by Department

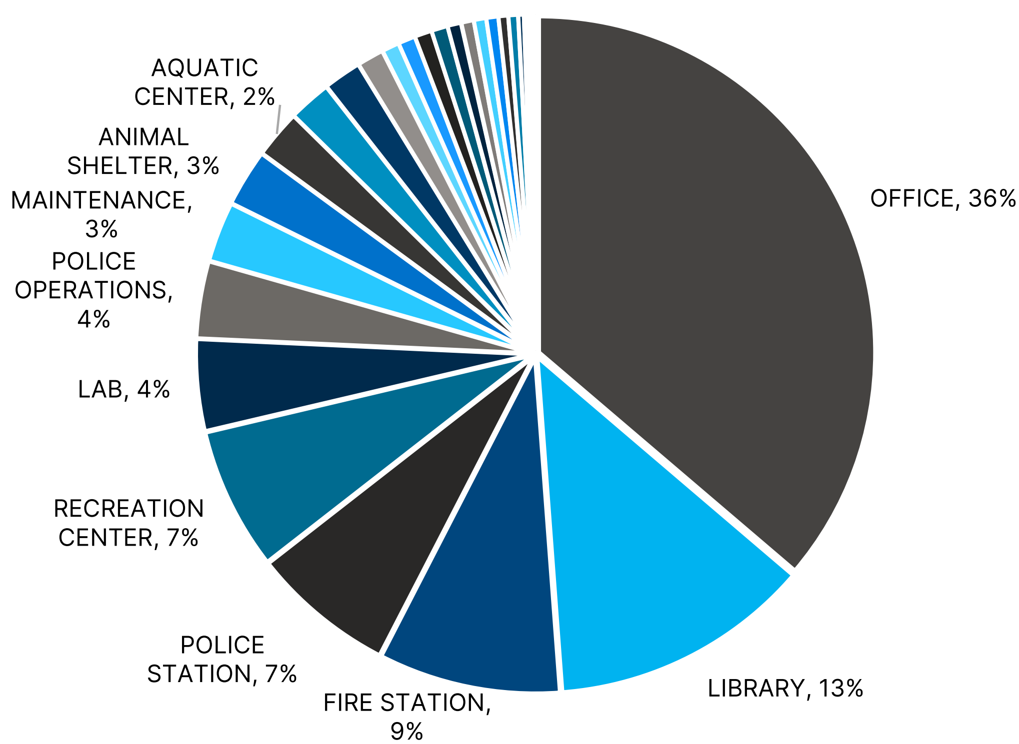


Figure 40: Electricity Use Breakdown by Type of Building

TOTAL ENERGY

Table 23: Total Energy Consumed by Building Type

Building Type	Natural Gas (MBTU)	Electricity (MBTU)	Total Energy (MBTU)	Average per Building (MBTU)
ANIMAL SHELTER	14,550	15,140	29,690	14,550
AQUARIUM	560	3,300	3,860	560
AQUATIC CENTER	75,940	12,670	88,600	75,940
ASSEMBLY	6,500	3,130	9,630	6,500
CAMP	3,820	550	4,370	3,820
CHILDCARE CENTER	1,300	1,460	2,750	1,300
COMMERCIAL	1,650	11,280	12,920	1,650
COMMUNICATION	-	4,540	4,540	-
COMMUNITY CENTER	1,460	3,280	4,740	1,460
DETENTION	4,070	7,090	11,160	4,070
FIRE STATION	30,400	48,020	78,420	30,400
HISTORIC	200	680	880	200
HORTICULTURE	-	4,260	4,260	-
LAB	8,000	24,180	32,180	8,000
LIBRARY	19,390	69,060	88,440	19,390
MAINTENANCE	175,990	17,310	193,300	175,990
MUSEUM	4,240	3,640	7,880	4,240
OFFICE	148,720	199,150	347,880	148,720
PARKING	5,280	4,550	9,840	5,280
PLANT	3,200	890	4,090	3,200
POLICE OPERATIONS	1,740	20,310	22,050	1,740
POLICE STATION	30,950	37,840	68,790	30,950
POLICE TRAINING	8,970	10,030	19,000	8,970
RECREATION CENTER	11,350	37,640	48,990	11,350
RESIDENTIAL	-	430	430	-
RESTAURANT	240	-	240	240
RESTROOM	50	300	350	50
SENIOR CENTER	2,680	4,580	7,260	2,680
THEATER	850	2,580	3,430	850
VACANT	-	150	150	-
WAREHOUSE/STORAGE	10,200	3,410	13,610	10,200
ZOO EXHIBIT	8,140	-	8,140	8,140
TOTAL	**1,314,800**	**551,490**	**1,866,290**	**1,314,800**

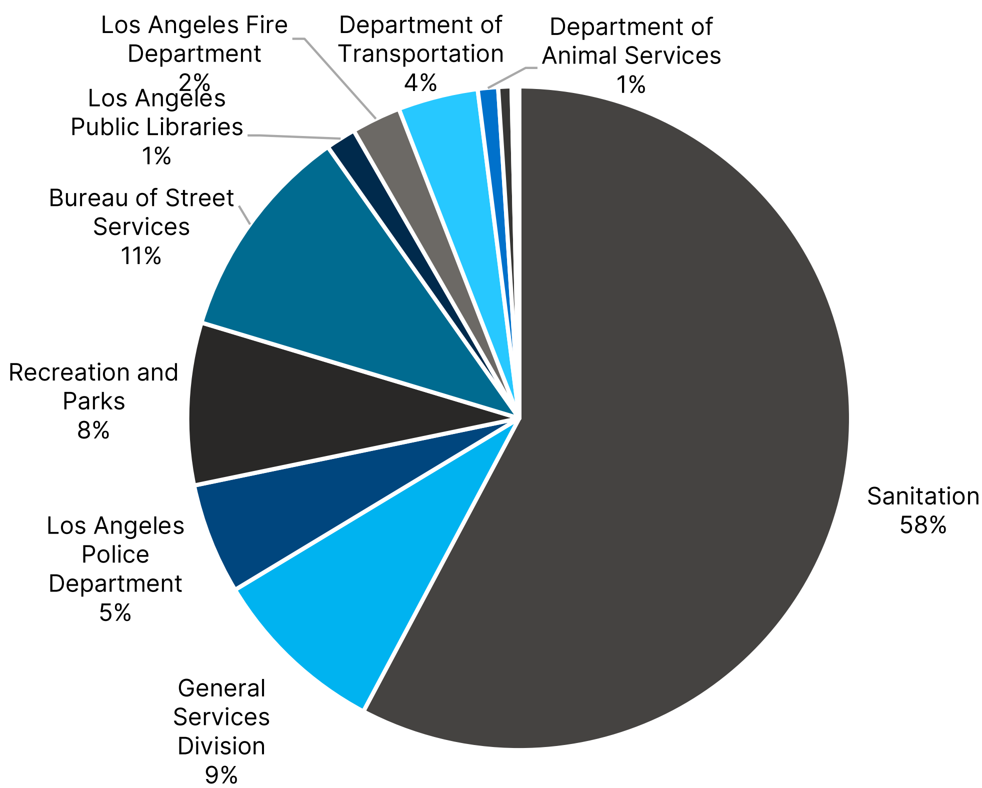


Figure 41: Energy Use Breakdown by Department

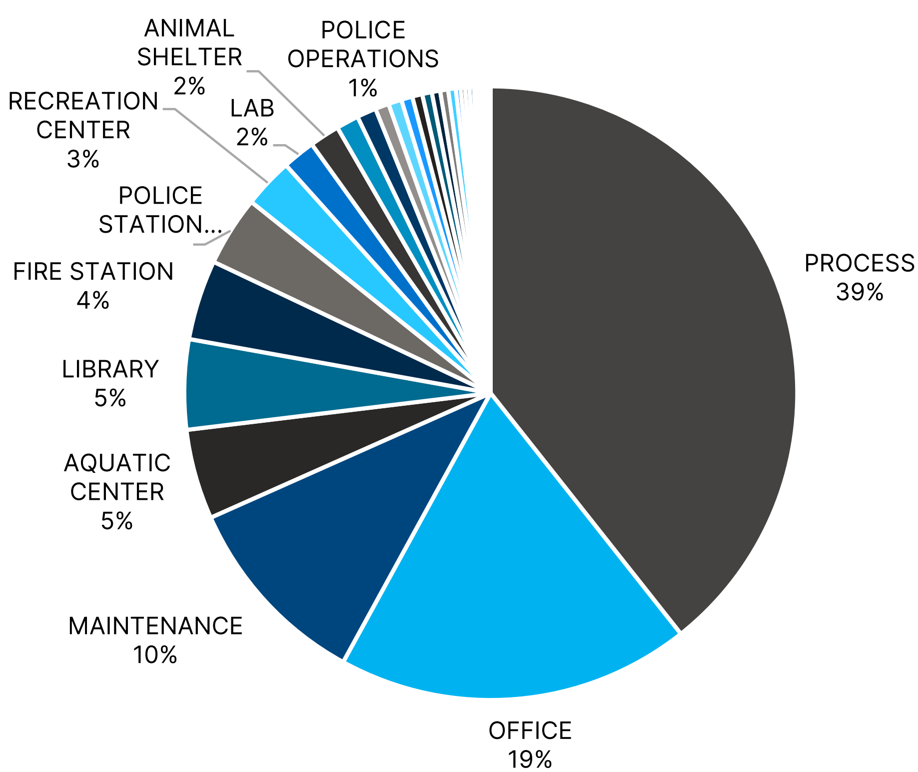


Figure 42: Energy Use Breakdown by Type of Building

DECARBONIZATION MEASURES
Individual building decarbonization measures were assigned to each building based on existing information within the asset management system, building age, department, and use type. Within each City department, many buildings are similar with typical mechanical and domestic hot water systems. Decarbonization measures associated with each building type within the City's existing portfolio are shown in the table below.

Table 24: Typical Building Decarbonization Measures by Building Type

Building Type	HVAC Electrification: Gas Rooftop Units	HVAC Electrification: Gas Boilers	HVAC Electrification: Gas Furnaces	HVAC Electrification: Gas Unit Heater	DHW Electrification	Pool Electrification	Process Gas Electrification	LED Lighting Retrofit	Retro Commissioning[33]
Animal Shelter	Y	Y			Y		Y	Y	Y
Aquarium	Y				Y			Y	
Aquatic Center	Y		Y		Y	Y		Y	
Assembly	Y				Y			Y	Y
Camp					Y		Y	Y	
Child Care Center	Y		Y		Y		Y	Y	Y
Church								Y	
Commercial	Y				Y			Y	Y
Communication								Y	
Community Center	Y		Y		Y			Y	
Detention							Y	Y	Y
Fire Station	Y	Y	Y		Y		Y	Y	Y
Historic					Y			Y	Y
Horticulture	Y				Y			Y	Y
Lab		Y			Y			Y	Y
Library	Y	Y			Y		Y	Y	Y
Maintenance	Y	Y	Y	Y	Y			Y	Y

[33] Retro Commissioning (RCx) is only recommended for larger buildings with more complex building control systems within each typical building category.

Building Type	HVAC Electrification: Gas Rooftop Units	HVAC Electrification: Gas Boilers	HVAC Electrification: Gas Furnaces	HVAC Electrification: Gas Unit Heater	DHW Electrification	Pool Electrification	Process Gas Electrification	LED Lighting Retrofit	Retro Commissioning[33]
Museum	Y	Y			Y			Y	Y
Office	Y	Y			Y			Y	Y
Parking	Y			Y	Y			Y	
Plant		Y						Y	Y
Police Operations	Y	Y			Y			Y	Y
Police Station	Y	Y			Y			Y	Y
Police Training		Y			Y			Y	Y
Recreation Center	Y	Y	Y	Y	Y			Y	
Residential								Y	
Restaurant	Y				Y		Y	Y	
Restroom					Y			Y	
Senior Center	Y				Y		Y	Y	
Theater	Y	Y			Y			Y	
Vacant	Y	Y						Y	
Warehouse/Storage				Y	Y			Y	
Zoo Building	Y				Y			Y	

A.5. PORTOLIO SOLAR PV MODELING

Refer to the supplemental appendix document for the solar study.

A.5. Portfolio Solar PV Modeling

A.6. IMPLEMENTATION FRAMEWORK DETAILS

BUILDING DECARBONIZATION MEASURES

BUILDING ELECTRIFICATION

Building electrification measures include the transition from natural gas to electrified equipment for all space heating, water heating and cooking systems at the City's municipal buildings. Natural gas is currently the primary energy source at city buildings and will be the largest source of emissions as LADWP provides cleaner electricity in the future. Electrification measures are the most critical strategy for the City to achieve the building decarbonization commitments.

Current Approach

To date, few complete HVAC electrification projects have been implemented within the city building stock. The city's current approach is to replace equipment like for like as the current equipment fails. System selection is driven by whether is funding available for the additional cost to electrify and the time anticipated for implementation. There is more of an opportunity for the city to investigate electrification for projects with larger budgets. Particular challenges the city has noted with HVAC electrification projects include:

- Getting structural approval for any added roof loads associated with larger pieces of equipment can be a lengthy process.
- Previous projects are used as references for future projects. Given that very few electrification projects have been completed to date there is little precedent to follow for new electrification projects.
- It is challenging to complete large capital improvement projects for system electrification at facilities that operate year-round like aquatic centers and libraries.
- Buildings with packaged rooftop equipment may require custom units in order to meet the required heating and airflow capacity of the space (for instance at Rec Centers)

Strategic Recommendations

It is recommended that the City complete building electrification projects at end of equipment's useful life. Approaching equipment electrification with an end-of-life phase out will allow the City to align existing deferred maintenance needs with building electrification goals. While this will be applicable to most buildings, some facilities will need to retire natural gas equipment early to meet the City's 2035 target. Larger and more complex electrification projects, like conversion from natural gas boilers to air to water heat pumps, should be timed to match other large building upgrades or align with a major building renovation.

Decarbonization Pilot Phase 2

HVAC electrification projects represent one of the largest opportunities for building decarbonization. Testing out pilot electrification projects at choice facilities will help the city develop a protocol for future HVAC electrification projects. Key recommendations include:

- Pursue LADWP Incentive funding for pilot HVAC electrification projects. LADWP is currently updating its incentives for electrification, with funding available for heating, cooling and domestic hot water system projects. Projects are eligible to receive 3-4x more incentive funding through LADWP if they are all electric versus energy efficiency only.
- Pilot design-build project delivery through an energy service performance contract (ESPC).
- Electrify smaller packaged rooftop heat pump units through existing equipment replacement processes. Candidates could include libraries, recreation centers or senior centers.
- Electrify smaller domestic hot water heaters (less than 100-gallon storage) with hybrid electric-heat pump units. Candidates could include libraries, recreation centers or senior centers.

LIGHTING RETROFITS

Lighting retrofit measures include the transition to more efficient LED lighting technologies and advanced = control systems. The majority of existing municipal buildings have light fixtures with incandescent bulbs which can use between 40-60% more electricity compared to alternative LED bulbs. Lighting retrofit measures are generally cost effective and have various benefits including emissions reductions, utility cost savings and reduced operations and maintenance needs.

Current Approach

The city has successfully completed LED lighting upgrades at a portion of its building portfolio. The current approach to completing these upgrades is to do a full fixture replacement with associated occupancy sensors and control upgrades. The city currently prefers to do full fixture upgrades rather than retrofit kits because of the complex nature of working within existing buildings and challenges faced on trial projects. Specific challenges include:

- Specialty fixtures are difficult to find retrofit kits for. Specialty fixture types include pendant and up-light fixtures commonly found at city libraries.
- The city has encountered issues with the lumen output of LED retrofit options.
- The city found that the man-hours associated with using retrofit kits were unexpectedly high because of the challenging nature of finding exact dimensions and constructability constraints of the existing fixture housing. In practice, the city found it was more economical from a labor perspective to do full fixture replacements.
- Full fixture replacements have a higher first cost, but the city found the longer lifespan associated with new fixtures justified the first cost.

Some departments have leveraged the LADWP commerical direct install lighting incentives program which provides LED retrofits at no cost to the City. This includes upgrades to existing lamps for more typical fixture types (ex. 2x2 and 2x4 troffer, can lighting, etc).

Strategic Recommendations

It is recommended that the City complete LED lighting upgrades for their entire building portfolio. Given the scale and cost to complete this effort it is recommended the City leverage LED retrofit kits and bulb replacements as an alternative approach in lieu of full fixture replacement where possible.

Decarbonization Pilot Phase 2

The city should trial retrofit kits at smaller buildings with few specialty fixture types. The city should utilize a lighting consultant and lighting equipment representative to advise on an approach for larger more complex building types. Key recommendations include:

- Trial LED retrofit kits at buildings with simple surface mount fixtures and traditional 2x2 or 2x4 fixtures. Applicable building types include Recreation Centers, Senior Centers and Small Offices.
    - Buildings identified for pilot projects: Balboa Rec Center and Valley Rec Center
- Develop a list of buildings with more unique lighting fixtures to trial a more tailored retrofit approach. Work with a lighting designer and equipment representative to determine the best approach.
- Identify buildings with over 250kW electricity demand to pursue LADWP Commercial Lighting Incentive Program (CLIP) funding.

CARBON OFFSETS

After implementing all electrification and energy efficiency projects the City may need to invest in carbon offsets to achieve carbon neutrality. If electrification projects are completed at the end of equipment life, it is likely there will be some natural gas systems remaining after 2035 due to recent equipment replacement projects (within the last 5-10) years. Should the City require some level of offsets there is a wide variety of carbon offsets the City could choose from. It is important to focus investment on "quality offsets" that are in line with the City's broad sustainability vision. It is recommended that offsets are only leveraged for small marginal emissions to minimize these costs.

Current Approach

The City currently does not have a framework or standards for carbon offsets, and does not purchase any offsets. The Los Angeles Metropolitan Transportation Authority (LA Metro) has secured a significant contract for Renewable Natural Gas (RNG) to decarbonize the bus division.

Strategic Recommendations

The City should establish a strategic offset framework to ensure any future program includes high-quality offsets. The following preliminary criteria should be considered. These have been adapted from the AVID+ Framework[34] and the University of California carbon offset program[35].

- **Additional:** Results in more carbon reductions than would've happened anyway
- **Verifiable:** Ensure the action occurs as described
- **Immediate:** Should not take decades to see the effect
- **Durable:** Reductions must realistically last at least a century
- **Plus:** Offsets should have additional non-climate benefits
- **Local:** Offset projects should benefit the local Los Angeles community

Decarbonization Pilot Phase 2

The City should investigate opportunities to produce renewable natural gas (RNG) through waste-water treatment plants or with organic waste streams.

[34] Adapted from MIT Sloan: **How to choose carbon offsets that actually cut emissions**
[35] Adapted from the University of California: **UC's Offset Project Criteria**

BUILDING DECARBONIZATION MEASURES CONSIDERATIONS

End of life replacement versus capital improvement designation applies to specific measures as well as certain building types. Smaller HVAC systems, such as rooftop units with natural gas, can be electrified as part of a general end of life replacement program if funding is available to cover additional costs. Hydronic systems such as heating hot water systems supplied by natural gas boilers, or pool heating systems with natural gas boilers, will involve significant engineering efforts to electrify and have therefore been included in the capital improvement category. It is important to note that all buildings are unique, and there will be exceptions to all project approach categorizations.

Table 25: Decarbonization Measure Considerations

Measures	Existing Equipment	Typical Approach	BOE Support	Considerations
HVAC Electrification: Heat Pump RTU (<=25 tons)	RTU with Natural Gas Heat	End of Life Replacement	3 - Engineering Review	Small units are typically packaged with internal heating and cooling coils in regular sizes. Electrical loads are typically driven by cooling with low impact converting to electric heat pump alternatives.
HVAC Electrification: Heat Pump RTU (>25 tons)	RTU with Natural Gas Heat	End of Life Replacement or Capital Improvement	2 - Engineering Support	RTUs do not require electric strip heating. Heat pump RTUs above 25 tons may require custom units due to limited manufacturer offerings. Buildings conditioned by RTUs with heating hot water coils will require capital improvement projects to disconnect from HHW system or replace boiler with AWHP.
HVAC Electrification: Split Systems or Packaged Terminal Heat Pump	Natural Gas Furnace or Similar	End of Life Replacement.	3 - Engineering Review	Buildings without cooling will see an added electrical load. Buildings with cooling likely are driven by summer cooling loads, meaning electrified heating will have a low impact. Readily available packaged equipment fits into an end of life replacement plan.
HVAC Electrification: Hydronic Air Source Heat Pumps	Natural Gas Boiler	Capital Improvement	1 - Full Engineering	Projects should follow a design-build or design-bid-build approach with significant engineering efforts required. Projects may require replacing heating coils and associated HHW piping

				infrastructure. Projects will likely require allocating space on roof or adjacent to building for mechanical equipment and associated distribution piping to new equipment space.
DHW Electrification: Tank Type Heat Pump Water Heater	Tanked Natural Gas Water Heater (up to 100 gallons)	End of Life Replacement	3 - Engineering Review	Hybrid electric heat pump units are recommended. Electrified units can be installed in the same location as existing natural gas hot water heaters with minimal space impacts. Heat pump units have slower recovery times and may require larger storage tanks. Equipment will have a small electrical load increase and will increase energy costs.
DHW Electrification: Built Up Heat Pump Hot Water Heater	Large Domestic Hot Water Boilers with Separate Storage Tank	Capital Improvement	1 - Full Engineering	Projects will likely require allocating space on roof or adjacent to building for mechanical equipment and associated distribution piping to new equipment space.
Pool Heating Electrification: Hydronic Air Source Heat Pumps	Natural Gas Boiler	Capital Improvement	1 - Full Engineering	Projects will require reengineering to interface with existing pool heating loops. Equipment is typically modular and can meet a range of required heating capacity.
Cooking Electrification: Fire Station or other Small Kitchen	Natural Gas Range & Oven	End of Life Replacement	2 - Engineering Support	Projects will typically require minimal intervention and equipment may be dropped in place of existing natural gas equipment.
Cooking Electrification: Commercial or Restaurant Kitchen	Multiple Commercial Grade Natural Gas Cooking Appliances	Capital Improvement	1 - Full Engineering	Projects will require reengineering of existing kitchen electrical infrastructure. A kitchen consultant may help verify code requirements and ensure electrified design meets user needs.
Laundry Electrification: Electric Washers and Dryers	Natural Gas Washer & Dryer	End of Life Replacement	2 - Engineering Support	May add a small electrical load to the building. Readily available off-the-shelf equipment. Increased installation cost for electrical connection.

HVAC ELECTRIFICATION – HEAT PUMP ROOFTOP UNITS

Summary

Rooftop units with natural gas furnaces should be replaced with new high performance heat pump RTUs. The efficiency of older units is significantly worse than modern heat pump units. Typical cooling efficiency for existing RTUs is a SEER between 8.5-10, whereas for a new heat pump unit the expected cooling efficiency is up to 16 SEER. Existing RTUs have a heating efficiency around 80%, or a COP of 0.8. Heat pump RTUs have a heating efficiency between 2.5-4 COP.

The replacement of packaged rooftop DX units with natural gas furnaces, or just the replacement of natural gas furnaces, with heat-pumps will in many cases be easier than the replacement of hydronic systems. Existing RTUs should be replaced at the end of their expected life with the electric heat pump alternative. Early retirement of some good condition RTUs may be necessary to meet decarbonization goals. Heat pump RTUs can usually be installed in the same location as the existing RTUs but may require a curb adaptor in some instances.

Energy & Emissions Impact

Heat pump efficiency has a coefficient of performance (COP) between 2.5 and 4.0, varying based on weather conditions, compared to 80% with existing furnaces. The greater efficiency of the heat pump unit means that in heating mode a given unit may use 60-70% less energy than its natural gas counterpart. Additionally, the heat pump not only lower emissions immediately but continues to improve emissions over the baseline as renewable electricity percentage increases with time.

Applications

Rooftop units with natural gas heating should be replaced by heat pump type RTU's.

Design Considerations

Heat pump RTUs have the following design considerations.

Existing Infrastructure	RTU replacements from natural gas heating units to heat pump heating units are typically one to one replacements without extensive supporting work. Heat pump RTU units do not have significantly higher electrical requirements as RTU's with DX cooling and gas heat. Potential replacements should consider whether the existing units are able to meet thermal comfort requirements. Existing conditions such as the condition of the curb and whether the existing unit has a power exhaust will impact the overall cost of the project. Older RTU's may not have economization capability which is now required by code for units over 2.75 tons.
Equipment Specification	RTU's with premium efficiency should be targeted. Premium efficiency units typically have a SEER above 16 and a HSPF above 8. Whenever possible, economizers should be used on RTU replacements. Economizers allow for reduced energy consumption by supplying outside air rather than conditioning return air whenever the outdoor air condition is advantageous. Additionally, RTU's with variable speed compressors should also be utilized when possible. Variable speed compressors allow for closer matching load matching and reduce how often the compressor cycles throughout the day.

	This will not only improve energy efficiency but also extend the life of the equipment. It is recommended the City leverage off-the-shelf heat pump RTUs, which are available for units 25-tons or less. Custom units to be provided for larger 30-50+ ton units until off-the-shelf products are available.
Electrical Impact	Converting from natural gas furnaces to electric heat pumps will not necessarily add electrical load if the existing RTUs have cooling. The electrical load is dependent on the equipment size and should be assessed on an individual unit basis. The addition of a power exhaust to an RTU that did not have one previously will however add some electrical load.
Historic Buildings	Heat pump RTU's have the same size and visual characteristics as typical natural gas units. Replacement with heat pump RTU's should not change the existing aesthetic characteristics of a historic building.

HYDRONIC AIR SOURCE HEAT PUMPS

Summary

Natural gas boilers should be replaced with an all-electric air to water heat pump (AWHP) system. Heat pump systems are modular and are commercially available in a variety of capacities. AWHPs pull heat from the ambient air to provide heating hot water. Heat recovery units are available for buildings that have chilled water systems.

Energy & Emissions

The efficiency of existing boilers is likely 80-85% and the coefficient of performance (COP) of AWHP units is generally between 2.5 and 4.0, varying based on weather conditions. Energy savings can be further increased by coupling a boiler replacement project and a chiller replacement with a heat recovery chiller which has a combined efficiency between 4.0 – 7.0 COP.

Applications

Air to water heat pumps should be used to replace natural gas water boilers for hydronic and pool heating systems. Heat pumps for hydronic heating can be implemented in a variety of different configurations and equipment types based on the conditions within the specific building. An electrification study should be conducted prior to implementation to assure the final electrified heating system is an optimal fit. Buildings with air-cooled chillers can potentially replace units with a heat pump unit to provide both cooling and heating from electric power sources.

Design Considerations

Heat pump RTUs have the following design considerations.

Existing Infrastructure	A primary consideration for the building operations team is the heating hot water (HHW) supply temperature reset necessary with the new system. Standard AWHPs operate with a maximum hot water supply temperature of 130°F. It has been shown that many VAV box coils and air handling unit coils function are still capable of providing 90°F supply air temperature at lower hot water temperatures. The hot water reset should be tested and verified through a commissioning process. Some buildings may require replacing VAV boxes with coils sized for 130F. The cost of VAV box upgrades has been accounted for in budgetary estimates. Higher temperature AWHPs can provide higher hot water supply water temperatures, with a max of 149°F with a max set point ideally below 140°F or less. These units have a cost premium and may have challenges with future refridgerant regulations. Proper ventilation air must be considered when determining if installation in the existing mechanical room is possible, if not, it is possible to install the AWHP on a concrete pad outside of the building it is servicing. Where structurally feasible, AWHP may be installed on a building roof.
Equipment Specification	The optimal electrified design will vary from building to building. Existing conditions such as the hot water distribution, heating coil sizes, available electric capacity, physical space, and building load

	profiles will all impact what systems are most appropriate for the given situation. The hot water supply temperature and corresponding delta-T are a pivotal factor which will drive how options development. Buildings which are unable to meeting heating demand below 130-150F will need additional effort. Ideally, the coils and distribution would be upsized where necessary to allow for adequate thermal comfort at a lower hot water supply temperature. A secondary option involves the usage of a “booster” configuration which utilizes a water-to-water heat pump to boost the temperature up to traditional values such as 180F. Such a configuration will typically be less efficient but will allow for minimal adjustments to the existing hydronics downstream of the heating plant. Additionally, newer heat pumps arriving to the market are beginning to allow for traditional temperatures from a single air source heat pump. These units do have a cost premium to them. A feasibility study should be conducted to outline the various options available to the building as well as their corresponding costs and GHG impacts.
Electrical Impact	AWHPs will require some modifications to the electrical infrastructure to support the new loads. As a cooling dominant climate, most buildings will have adequate utility electrical service to support the additional equipment. Buildings that have heating only systems and aquatic centers will require most significant upgrades and potentially a service upgrade. Electrified heating equipment will increase the peak electrical demand of the heating season. This is not expected to have signifant impacts on utility costs. Efficient equipment scheduling and sequences of operations can mitigate the added electrical demand seen from replacing gas systems with heat pump water heating.
Historic Buildings	Air source heat pumps are often placed outdoors on roofs or outdoor mechanical yards. Historic buildings may have aesthetic roofing incompatible with mechanical equipment. Alternatively, a new mechanical yard may require an enclosure that matches the overall aesthetic of the area.
Additional Equipment Requirements	Heat pumps are less efficient at low load conditions. To reduce equipment cycling at low loads considering installing a buffer tank may be advisable. The AWHP will have a primary pump and needs to be piped with a decoupler bridge to HHW distribution pumps (similar to a primary secondary arrangement). Building BMS needs to enable the AWHP and run pumps.

TANK TYPE HEAT PUMP WATER HEATER

Summary

Natural gas tank-type domestic hot water heaters should be replaced by heat pump type units. Heat pump water heaters use a refrigeration cycle to push heat from an air source to domestic hot water. These units are able to achieve high COP's of 3 to 5 in comparison to traditional electric resistance units which are only able to perform at a COP of 0.95. Depending on the existing natural gas heater, a heat pump replacement may be able to be installed within the existing footprint without major modifications.

Energy & Emissions

The typical efficiency of a gas water heater is between 80%-90%, whereas a heat pump water heater will have a peak efficiency between about 3.0 to 5.0 COP, greatly increasing efficiency and eliminating reliance on natural gas. Energy savings have been calculated assuming natural gas water heaters have a uniform energy factor (UEF) of 0.7 (the UEF accounts for stand-by energy losses) and new hybrid AWHP have a UEF of 2.8. The actual efficiency of the unit will fluctuate based on the air conditions flowing through the heat pump. Higher temperatures allow for more efficient heat pump operation and as such, heat pumps installed indoors with ambient indoor air conditions will utilize less energy.

Applications

Ideal for locations with lower hot water demand. Existing natural gas tank-type units with recovery rates lower than approximately 150 GPH at 80F rise should be considered for 1-1 heat pump replacement. Units with higher demand and required recovery rate may need a built up system with separate heat pump and tank components.

Design Considerations

Tank type heat pump water heaters have the following design considerations.

Existing Infrastructure	While natural gas and electric resistance units have tank type units in excess of 200 gallons, commercial heat pump units are currently only offered at 120 gallons and below. Additionally, these tank type heat pump water heaters have lower recovery rate offerings than their natural gas and electric resistance counterparts at similar tank sizes. Wherever possible given the tank size and recovery rate, heat pumps should replace natural gas units one for one. Existing units with larger tank sizes and high recovery rates will require further consideration of either multiple units or a built-up system. The primary consideration for a heat pump unit is how much ventilation the installation location will have. Smaller rooms may require either louvers or ducting in order for the unit to operate. Heat pump water heaters will also cool the spaces in which they are placed. This may be ideal for a mechanical room but could also be adverse for heat pumps adjacent to the occupied space.
Equipment Specification	Tank type heat pump domestic hot water heaters have efficiencies between 3.0 and 4.0. Beyond selecting a high efficiency unit, a suitable replacement should also consider the ventilation requirements of the unit.

	Electric water heaters can be considered for replacing smaller water heaters and in buildings that have very minimal domestic hot water needs.
Electrical Impact	Electric heat pump water heaters will add moderate instantaneous electrical load to buildings, though water heaters represent a relatively low portion of building energy usage, and it is unlikely there will be issues with insufficient building electrical capacity.

BUILT UP HEAT PUMP WATER HEATERS

Summary

For buildings with large natural gas water heaters with separate storage tanks, units should be replaced by electric air to water heat pump water heaters which are more efficient than natural gas boilers. AWHPs use a hydronic system to absorb or dissipate heat from air. They offer significant efficiency improvement over natural gas boilers and can have heat recovery capability. AWHPs for domestic hot water applications can produce hot water up to 150°F; however, operation can be limited by low ambient air temperature. Performance depends on outside air temperature and hot water temperature; heating COP is highest when leaving water temperature is low and outdoor air temperature is high. A built up heat pump water heater splits the tank and heating unit into multiple components rather than utilizing a single tank-type unit. Typically, a built up system is used whenever the building has large domestic hot water loads that cannot be met with an off the shelf system. However, built up systems can also be installed as a packaged skid to help reduce footprint and installation complexity.

Energy & Emissions

The typical efficiency of a gas water heater is between 80%-90%, whereas a heat pump water heater will have a peak efficiency between about 3.0 to 5.0 COP, greatly increasing efficiency and eliminating reliance on natural gas. The actual efficiency of the unit will fluctuate based on the air conditions flowing through the heat pump. Heat pumps will be installed outside so efficiencies will fluctuate throughout the year.

Applications

A built up heat pump water heater would be applicable when large natural gas systems need to be replaced with an electrified alternative. AWHPs would utilize the existing DHW distribution system. The best solution for electrification will depend upon the water demand in the building, current hot water system and distribution, and any space constraints since a heat pump water heater does have minimum space requirements for installation.

Design Considerations

Built up heat pump water heaters have the following design considerations.

Existing Infrastructure	Small commercial heat pump water heaters are similarly sized to small commercial natural gas water heaters, and in most cases can be installed in the same location, with a confirmation of airflow circulation for operation of an AWHP in that location. Buildings with large domestic hot water loads may look into larger systems such as the commercial grade Colmac or Rheem domestic hot water heat pump. These systems have larger units that are typically placed outside of a building, though some units are designed for indoor mechanical and plumbing rooms.
Electrical Demand Impact	Heat pump water heaters will add electrical load to buildings. Water heaters represent a relatively low portion of building energy usage, and it is unlikely there will be issues with insufficient building electrical capacity for most applications. This should be revied on a project by project basis.

SOLAR PV AND BATTERY STORAGE

Summary

Solar photovoltaic systems contribute to carbon reductions and energy savings if they can be implemented cost-effectively. Systems are typically installed on roofs and in parking lots as elevated carports. Ground-mounted systems are a less common option for the City, as they require more space than is typically available. Solar PV systems can contribute to City carbon reduction goals if they are implemented under LADWP's net metering program. However, if systems are implemented under LADWP's Feed-in-Tariff, the environmental attributes, including carbon savings, are owned by LADWP. Battery storage systems can reduce demand charges and provide backup of critical loads. Additionally, LADWP has programs where they will install batteries on customer sites to assist with peak load reduction and resource adequacy.

Energy & Emissions

Solar and storage systems provide a local supply of carbon free energy to offset purchases, and corresponding emissions, from utility sources. While battery storage projects do not save energy, they can reduce utility demand-related charges, and in some limited circumstances shift site loads to times of the day when cleaner electricity is available.

Applications

These projects can be implemented across the different building types in the City, with better candidates being buildings with large loads, unobstructed roofs, larger parking lots, or critical resiliency needs.

Design Considerations

Solar and battery systems are typically delivered under design-build contracts, where a selected vendor can balance the cost-effective procurement of critical equipment (e.g., solar modules and battery packs) with specific design considerations. As a result, the City should consider developing a set of performance specifications to use in the procurement and contracting phases of these projects.

The key design considerations for determining the feasibility of solar projects are the conditions of the roofs where they will be installed, the structural suitability of the building, and the electrical switchgear supplying the building. This level of due-diligence should be performed prior to procuring these systems.

MAINTENANCE STRATEGY

Staffing

Equipment utilizing heat pump technology is inherently different from natural gas fired counterparts. As a result, the skills and technical knowledge needed for maintaining this equipment is significantly different. The City of Los Angeles should begin an assessment of the workforce to ensure sites are sufficiently staffed with employees who are able to maintain and troubleshoot the new equipment. Facilities groups may need to be reorganized as an HVAC technician may have the refrigeration knowledge needed to maintain a water heater that a plumbing technician would previously had been responsible for. Additionally, heat pump technology is expected to require slightly more maintenance, especially in the near term as facilities groups are still adapting. The City of Los Angeles should consider supplementing their maintenance workforce as electrified alternatives continue to be added over time.

Training

The development of electrified workforce training should be strongly considered. Heat pump technology requires knowledge of the vapor compression cycle and how to diagnose the various stages of the refrigerant. An employee previously working on natural gas systems such as boilers and furnaces may never have had exposure to refrigeration training. These employees will need an understanding of how the heat pump operates and how to correctly maintain the equipment. Additionally, more advanced staff may need troubleshooting training for more advanced procedures such as adjusting the thermostatic mixing valve based on refrigerant superheat temperatures. The City of Los Angeles should begin expanding their refrigeration and HVAC training to include heat pump technology as well as begin cross training plumbing staff who previously may not have been trained in this area. Moreover training programs from manufacturers and non-profits should be utilized. These programs provide workforce training for various organizations, ensuring their staff are properly trained to maintain heat pumps.

ELECTRIFIED EQUIPMENT

The decarbonization workplan will have new maintenance needs for GSD and RAP. The following section provides a summary of key considerations that can be to develop a workforce development and staffing needs plan.

Table 26. Maintenance Considerations by Equipment Type

Equipment	Maintenance Considerations
Rooftop Units	Minimal change in maintenance. Existing rooftop units already have the same major components such as compressors, expansion valves, and coils.
Heat Pump Water Heaters	Slight change in maintenance. Preventative maintenance activities related to the tanks remain largely the same. However, troubleshooting activities will require heat pump knowledge.
Air-to-Water Heat Pumps	Moderate change in maintenance. This technology will require both more maintenance annually as well as training for staff.
Cooking Equipment	Lower maintenance. Electrified cooking equipment should see a reduction in overall maintenance and cleaning requirements.

Rooftop Units

Heat Pump Rooftop units fundamentally have the same components as existing rooftop units. Like a typical DX-cooling RTU, the heat pump has a compressor, expansion valve, and coils. However, the heat pump unit adds a reversing valve which allows the refrigeration components to also provide heating as opposed to only cooling as a traditional unit would. As such, heat pump RTU's should not require significant additional maintenance compared to a natural gas unit. However, the change away from natural gas fired RTU's towards heat pump RTU's will change the skills needed for maintenance. Rather than inspecting heat exchangers and burners, maintenance staff will need to inspect reversing valves and defrost capability. The reversing valve must be inspected to ensure positioning matches the corresponding stage (Cooling, heating, defrost). A stuck reversing valve will not allow for proper heat pump capability. The other RTU components such as filters, motors, and economizers will all have the same level of maintenance as the existing units. A heat pump unit will also have a defrost cycle which removes frost from the exterior of the coil, allowing the unit to operate. While the Los Angeles climate should largely be exempt from defrost conditions, staff may still need to understand this cycle for troubleshooting. In general, maintenance staff who are already familiar with fixing and maintaining air condition compressors should be well suited to diagnose heat pump units.

Heat Pump Water Heaters

Routine maintenance activities for hot water heat pumps will be nearly identical to those for traditional natural gas units. These activities include flushing tanks, scale removal, anode inspection, and valve exercise. Staff working on preventative maintenance of existing water heaters should be able to easily transition to doing these same activities on heat pump units. However, heat pump water heater troubleshooting will require additional time compared to a typical natural gas unit. The skills and technical knowledge needed to troubleshoot a heat pump unit are inherently different from those needed for a natural gas fired unit. As such, maintenance staff may need to be trained on heat pump operation and the vapor compression cycle. Staff with experience with HVAC or refrigeration compressors may be more readily suited to maintain heat pump domestic hot water units. It is recommended that the city work with equipment vendors to provide maintenance training for new heat pump hot water systems.

Air-to-Water Heat Pumps

Hydronic heat pumps will require some additional maintenance compared to a typical natural gas system. The skills and technical knowledge needed to maintain a heat pump unit are inherently different from those needed for natural gas boilers. As such, maintenance staff may need to be trained on heat pump operation and the vapor compression cycle. Staff with experience with HVAC or refrigeration compressors may be more readily suited to maintain air to water heat pump units. Air to water heat pumps require confirmation of refrigeration pressures, inspection of compressor oil levels, and calibration of heat pump superheat/sub-cooling. These heat pump maintenance activities will require more time than maintenance activities for natural gas boilers.

Cooking Equipment

Electrified cooking equipment will require less maintenance than natural gas counterparts. Natural gas cooking equipment have items such as ignition systems, pilot valves, gas lines, and burners. These parts wear over time, requiring further maintenance and replacement. Electric cooking equipment are comparatively much simpler and have fewer moving parts which can potentially fail. Electric induction cooking equipment in particular allows for lower kitchen cleaning due to how the technology heats the cookware. Rather than creating a hot surface for the cookware to be placed on, the induction equipment heats the cookware directly using an electromagnetic field. The glass ceramic surface on these units are easier to wipe clean and have less baked on spills from the lack of surface heat.

Solar PV and Battery Energy Storage

Solar and battery systems have ongoing operations and maintenance requirements. Annual preventive maintenance must be performed to comply with equipment warranty conditions. Solar systems also perform better when the modules are cleaned. Solar and battery storage systems need to be monitored so that action can be taken should the systems go offline or their performance is below expectations. While third-party contractors often perform these services, City staff must oversee the performance of these long-term operations and maintenance contracts.

EQUIPMENT REPLACEMENT

Developing a robust end of life electrification replacement plan will be integral to the City's decarbonization efforts. Under this approach, the City would integrate decarbonization measures into general ongoing facility maintenance. As existing natural gas equipment fails or reaches the end of its useful life it would be replaced with electrified alternatives. This approach is applicable for less complex building types where full engineering design is not required. To successfully implement this approach, the City will need to develop guidelines and city standards to support implementation through existing maintenance practices. End of Life equipment electrification will be led by GSD and RAP maintenance staff, with technical support from BOE.

APPLICATIONS

An end of life deferred maintenance electrification approach is applicable for smaller building systems where often off the shelf electric equipment is available. Projects may include replacing packaged natural gas heating and DX cooling rooftop top units with packaged heat pump units or replacing tank type water heaters with heat pump water heaters. While each building will be unique, building types with typically simpler system types where an end of life electrification strategy may apply include:

- Childcare and Senior Centers
- Community and Cultural Centers
- Fire Station
- Libraries
- Maintenance Yards
- Recreation Center

FUNDING CONSIDERATIONS

End of life electrification projects will require additional funding from the City to cover the cost of equipment premiums, design services and more complex installations. It is recommended the City establish a dedicated annual budget for GSD and RAP to successfully complete end of life projects. This should be in addition to funding for other critical building maintenance upgrades including fire life safety, roofs, re-piping, BAS, and fire sprinkler systems. Seeking external funding through utility incentive programs, such as LADWP's LED lighting and electrification incentives, may alleviate some of the financial burden and enhance the overall feasibility of the program. Evaluating long-term energy cost savings and environmental benefits may also increase the Net Present Value of the program and create a compelling case for funding.

DELIVERY METHODS

Internal delivery of end of life equipment replacements will be managed and led by GSD and RAP. Utilizing internal staff will allow the City to maintain direct oversight and control throughout the electrification upgrade process and is a cost-effective approach. To be successful this will require additional GSD and RAP staff to manage and oversee end of life projects. End of life equipment replacement projects were selected for measures that require minimal engineering design and can be completed using existing mechanical vendors. The BOE will provide engineering support on individual projects as needed and will additionally develop design guidelines, standards, specifications and scope of work templates.

BENEFITS

Benefits of the end of life replacement program include alignment with existing capital expenditure (capex) plans and the marginal costs of electrifying during timed replacements. By integrating electrified alternatives into the replacement strategy, the City can leverage planned capital investments to facilitate a smoother transition. Aligning with existing capex plans optimizes resource allocation and enhances overall cost-effectiveness. Electrifying during end of life replacements will allow the City to maximize equipment life cycles.

POTENTIAL RISKS

The greatest risk with an end-of-life replacement strategy is the occurrence of emergency equipment failures. In the event equipment fails and an urgent replacement needs, the City may face challenges in swiftly transitioning to electrified solutions. Mitigating this risk will require sufficient funding for proactive equipment replacements, contingency planning, additional stock of equipment, and readily available staff to support projects. Otherwise, the City may face the choice between installing new natural gas equipment or temporarily shutting down a facility. Mitigating this risk requires contingency planning to support the installation of electrified equipment during an emergency response. Ultimately the City needs to significantly increase funding for this program to proactively manage equipment replacements and stay ahead of emergency failures.

ACTION ITEMS

The City should take the following steps towards developing of an end of life electrification program:

1. **Implement an electric equipment replacement policy.** This policy involves establishing a comprehensive framework directing building operations staff towards adopting electrification practices and phasing out natural gas equipment upon failure. By instituting an all-electric replacement policy, the city sets clear guidelines for the procurement and installation of electric-powered equipment, thereby reducing dependence on fossil fuels. The city should begin working with equipment representatives to establish guidelines and processes for equipment procurement.
2. **Develop design standards and engineering support for electric equipment replacements.** Bureau of Engineering should establish equipment and design standards for end-of-life replacements, and provide project support as needed. Technical resources should include minimum performance requirements, scope of work templates, design recommendations for various existing infrastructure conditions, safety requirements, building code considerations, etc. BOE will provide engineering support on individual projects to ensure projects meet internal City requirements.
3. **Establish a maintenance program and review existing asset management budgets**. GSD and RAP currently maintain their assets. To best capitalize on equipment lifecycles and avoid early retirement, GSD and RAP should establish deferred maintenance programs and oversee equipment replacements. This required additional funding and staff to be successful. Year 1 projects include a pilot program to establish best practices and a streamlined process for replacements.

BOE TECHNICAL SUPPORT

BOE will provide various levels of support based on the complexity of the electrification projects. Outlined below is a recommend framework for BOE to support GSD and RAP.

BOE Support	Approach	Building Systems
1 - Full Engineering	Equipment replacements will run through existing processes for capital improvement projects.	• Large Gas Water Heater • Gas Boiler – Pools • Gas Boiler - Space Heating • Commerical Kitchen
2 - Engineering Support	Equipment replacement requires some level of additional engineering. BOE to review projects on a case-by-case basis and provide recommendations for engineering support services.	• Gas Packaged RTU (›25 tons) • Gas Range & Oven (Small) • Gas Dryer • Gas Furnace or Similar
3 - Engineering Review	Equipment replacements will run through GSD and RAP led electrification replacement process, with BOE support.	• Gas Packaged RTU (‹=25 tons) • Gas Water Heater (‹= 100 gal)

ROOFTOP UNITS (<25 TONS)

Existing Equipment:	Packaged RTU w/ gas pack
Electrification Strategy:	Packaged Heat Pump RTU
Typical Approach:	End of Life Replacement
BOE Approach:	3 – Engineering Review
BOE Support:	• BOE will provide best practices and general recommendations • BOE/GSD/RAP will meet with LADBS to develop a streamlined RTU permitting process
Permitting:	• Vendors provide stamped equipment attachment drawings • BOE provides building structural calcs and drawings if required
Considerations:	• RTU duct configuration • Economizer and power exhaust • Curb attachment • Space constraints • Electric strip heat (not needed)

End-of-Life Pilot Workflow

1. Equipment is identified for replacement
2. GSD/RAP documents existing building conditions (model number, duct configuration, location, etc) and department needs
3. BMD/RAP + BOE + Vendor conduct site visit and reviews as-builts
    - Mechanical will review any unique engineering considerations
    - Structure will determine if building assessment is required
4. BMD/RAP solicits equipment selections and bids from vendors
    - Vendors provided stamped MEP drawings
    - Vendors provide stamped structural submittal for equipment attachment
5. BOE reviews submittals and shop drawings to confirm acceptance
6. GSD/RAP implements project
7. GSD/RAP + BOE conducts a punch list walk to confirm the installation

WATER HEATERS (<=100 GALLONS)

Existing Equipment:	Tank-Type Water Heater
Electrification Strategy:	Hybrid Heat Pump Water Heater
Typical Approach:	End of Life Replacement
BOE Approach:	3 – Engineering Review
BOE Support:	• BOE will provide best practices and general recommendations • BOE will provide electrical engineering guidance.
Permitting:	• GSD/RAP to confirm if vendors can support electrical.
Considerations:	• Additional electrical load and connection • Room air volume • Space for exhaust and make up air • Clearance for new units • Plumbing connections

End-of-Life Pilot Workflow

1. Equipment is identified for replacement
2. GSD/RAP documents existing building conditions (model number, duct configuration, location, etc) and department needs
3. BMD/RAP + BOE + Vendor conduct site visit and reviews as-builts (if available)
    - Mechanical will review any unique engineering considerations
    - Structure will determine if building assessment is required
4. BMD/RAP solicits equipment selections and bids from vendors
    - Vendors provided stamped MEP drawings
    - Vendors provide stamped structural submittal for equipment attachment
5. BOE reviews submittals and shop drawings to confirm acceptance
6. GSD/RAP implements project
7. GSD/RAP + BOE conducts a punch list walk to confirm the installation

CAPITAL IMPROVEMENT PROJECTS

Electrifying buildings with hydronic space heating systems or other large complex systems will require a capital improvement project approach, often relying on external partners for design and project management. To successfully implement capital improvement projects the City will need to leverage existing internal and new external funding and financing sources for major upgrades. Typical projects may require significant design and engineering efforts. Internal project management and engineering resources may be used to manage design-build or design-bid-build project delivery. Approximately 20% of the City's buildings fall under the capital improvement delivery method.

APPLICATIONS

Capital improvement projects apply most directly to any buildings undergoing major renovation or whole building retrofits, and buildings with hydronic space heating systems, typically served by natural gas boilers. Conversion of hydronic systems from natural gas to low-temperature electrified systems typically requires a large-scale system redesign, often requiring upsizing of heating coils and distribution piping. Additionally, electrical distribution upgrades may be required, as well as controls recommissioning. Designating certain electrification projects as capital improvement projects will allow the city to properly assign engineering teams to them and reserve appropriate capital to finish them.

While each building will be unique, buildings where capital improvement projects are likely to apply include:

- **Aquatic Centers**: Current pool heating systems are typically large natural gas boilers, which will require significant engineering work to convert from natural gas to electric heat pump units. Electrification of pool heating equipment may require electrical upgrades as well.
- **Large Office Buildings**: These buildings are typically served by natural gas boilers or packaged air handling units with natural gas heat. Cooling is often provided by a chilled water system with air-cooled chillers. Electrifying these systems will be a significant engineering and construction effort and will make sense to designate as capital improvement. Bunding LED lighting upgrades into HVAC upgrades as one large capital improvement project will create efficiencies in the building downtime.
- **Police Stations**: Similar to large office buildings, police stations are typically served by natural gas boilers and will require significant engineering to complete a conversion to a lower temperature heat pump hot water system. Designating these projects as capital improvements will allow the city to allocate the correct resources to the project as well as allocate appropriate capital to complete other building upgrade projects. The average age of city police stations is 1986, so there may be opportunity to bundle building electrification projects with overall building improvement projects.
- **Buildings with hydronic heating systems**: Broadly, buildings with hydronic space heating systems (typically served by natural gas boilers) will fall under the capital improvement project category. These projects will have larger impacts to consider, for instance electrical infrastructure capacity, coil replacements and pipe sizing, which will make drop-in equipment replacements not feasible.

FUNDING CONSIDERATIONS

Internal Project Funding

Internal funding options for capital improvement projects include the City's generation funds, other internal sources, debt financing and building related bond measures. The City indicated that General funds will be considered the primary funding sources for this project. General funds include revenue collected by the City from various taxes and fees, and are allocated to support a wide array of city initiatives, including infrastructure improvements. Other city funding sources encompass diverse revenue streams, such as grants, donations, or specific funds designated for particular purposes, enhancing the financial pool available for capital projects. Debt financing is another avenue, allowing the city to secure funds by issuing bonds or obtaining loans, providing immediate capital while spreading the repayment over an extended period. Bond measures involve the issuance of municipal bonds, which are debt securities, enabling the city to raise substantial capital for long-term projects while being repaid through future tax revenues or assessments.

External Project Funding

External funding options for capital improvement projects include public-private partnerships and energy savings performance contracting (ESPC).

Public-Private Partnerships (P3) represent collaborative arrangements between the public sector, typically governmental entities like the City of Los Angeles, and private entities, such as corporations or investors. In this model, both parties join forces to plan, fund, design, and implement capital improvement projects. The private sector's involvement can vary, including financing, construction, operations, or maintenance of infrastructure projects. P3s often allow for the sharing of risks and responsibilities between the public and private sectors, offering innovative funding solutions while aiming to optimize efficiency and quality in project delivery. P3 project delivery is most applicable to large scale construction projects or large central utility plant projects.

Performance Contracting, specifically Energy Savings Performance Contracting (ESPC), is a financing mechanism for energy-related capital improvements. Under ESPC, the city would partner with energy service companies that guarantee energy cost savings resulting from implemented efficiency upgrades. These upgrades may include lighting retrofits, HVAC system improvements, or renewable energy installations. The energy savings achieved over time cover the project costs, minimizing initial financial outlays for the city. This arrangement ensures that the upgrades generate enough energy savings to repay the invested funds, creating a self-funded model for implementing energy-efficient measures in city infrastructure. ESPC is most applicable to HVAC upgrade or electrification projects, LED lighting retrofits, and other whole-building energy efficiency measures.

DELIVERY METHODS

Design-Bid-Build

Design-bid-build project delivery is a traditional delivery method that is widely used for City construction projects. In this approach, the project is divided into distinct phases. Initially, the design phase involves the creation of detailed plans and specifications either by the BOE or by an external consultant team. Following this, the project enters the bidding phase, where contractors competitively submit proposals based on the provided specifications. The city then selects the winning bid based on various criteria, including cost, qualifications, and experience. Once a contractor is selected, construction commences. This sequential process offers a clear separation of responsibilities among the designer, contractor, and project owner, and provides a structured framework for project development, ensuring that the design is finalized before construction begins. Design-bid-build projects typically have longer timeframes due to the sequential nature of the phases, and may require more in house or consultant staff to manage the process as well as develop the design.

Design-Build

Design-build project delivery integrates the design and construction phases into a single, collaborative process. In this approach, a single entity, typically a design-build firm, is responsible for both designing and constructing the project. The BOE or a consultant engineering team would provide project performance criteria documents or bridging documents that the hired design-build contractor builds upon. This integrated team works closely with the project owner to understand their needs and goals from the outset. Design-build emphasizes collaboration and efficiency, as the design and construction activities occur concurrently. This streamlined process often leads to faster project delivery and can result in cost savings. The City would benefit from a single point of responsibility, simplifying communication and decision-making throughout the entire project lifecycle. The streamlined process may ease the burden on City design and engineering staff.

BENEFITS

Internal Funding

Internal funding of projects benefits from a lower cost of capital, which minimizes the financial burden on the city when implementing electrification measures. This funding approach enables the bundling or packaging of various building upgrades alongside electrification projects. By combining multiple upgrades, such as energy efficiency enhancements or renewable energy installations, into a single project package, the city can streamline processes, reduce administrative costs, and optimize resources. This comprehensive approach not only facilitates the transition to electrification but also maximizes the overall impact of sustainability measures across its building infrastructure.

External Funding

External funding of capital improvement projects provides turnkey project delivery, enabling the city to implement a higher volume of projects within a shorter timeframe. By leveraging external financing, the city can engage with third-party entities that specialize in project execution, providing comprehensive turnkey solutions. This approach allows for swift and efficient project completion, as external entities manage various project aspects, including design, construction, and implementation. The city may be able to expedite the execution of multiple projects concurrently, optimizing efficiency and accelerating the overall pace of infrastructure enhancements. In particular, ESPC financing is an operational expense, not a debt obligation.

POTENTIAL RISKS

Capital improvement projects using typical delivery methods like design-bid-build or design-build face risks that are typical to most construction projects including budget overruns, project delays, or contractor performance issues. For pilot electrification projects the City may want to have direct oversight over the process to better understand project opportunities and challenges, but this may be less feasible when using external design and construction partners. Additional challenges may include funding and financing for projects. Securing adequate funding for capital improvement projects can be challenging and will require a longer planning process than simple end of life replacement projects.

ENERGY SERVICE PREFORMANCE CONTRACT (ESPC)

SUMMARY

An Energy Service Performance Contract (ESPC) is a project delivery method the City can leverage to implement energy efficiency and building decarbonization projects with minimal upfront costs. In an ESPC, an energy services company (ESCO) assumes the initial project costs and risks. The City then repays the ESCO over time through the energy savings achieved by the implemented measures. This financing mechanism allows the City to undertake comprehensive building upgrades, including HVAC system improvements, lighting retrofits, and other energy-efficient measures, without a substantial initial investment. There are both advantages and disadvantages of the ESPC process the City needs to consider and review before pursuing this approach.

FINANCIAL MODEL

ESPC project provide a cashflow structure where the savings generated by the implemented measures cover the costs of the project, including the cost of the construction, ESCO services, financing, and any required maintenance. After a contract ends all savins are accrued by the City. On less cost effective electrification projects the City can buy down the upfront costs with general funding and still leverage the ESPC model.

Figure 43: ESPC Project Cashflow[36]

[36] Adapted from the National Renewable Energy Laboratory: **ESPC Overview**

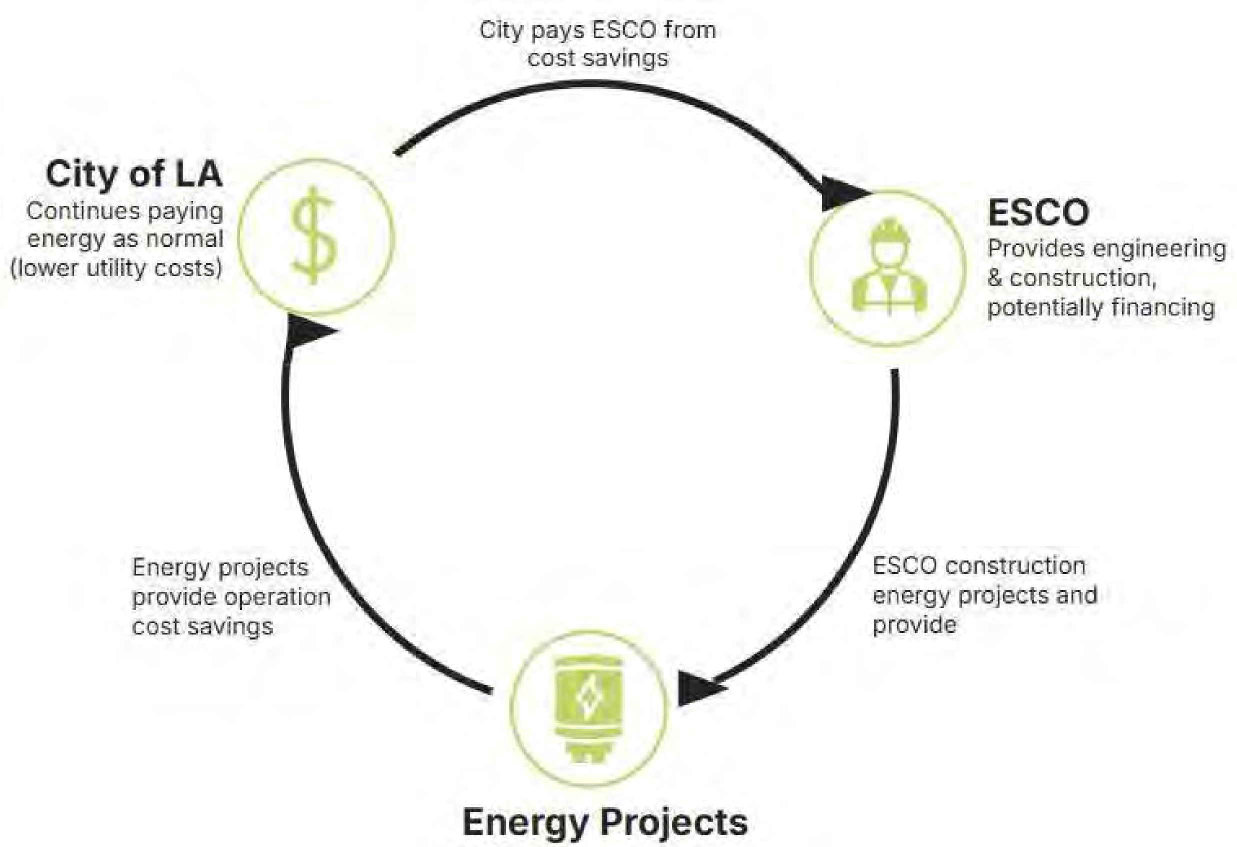


Figure 44: ESPC Financing Mechanism [36]

DELIVERY PROCESS
The following delivery process was developed by the Department of Energy (DOE) Federal Energy Management Program (FEMP) and is leveraged on all federal ESPC projects

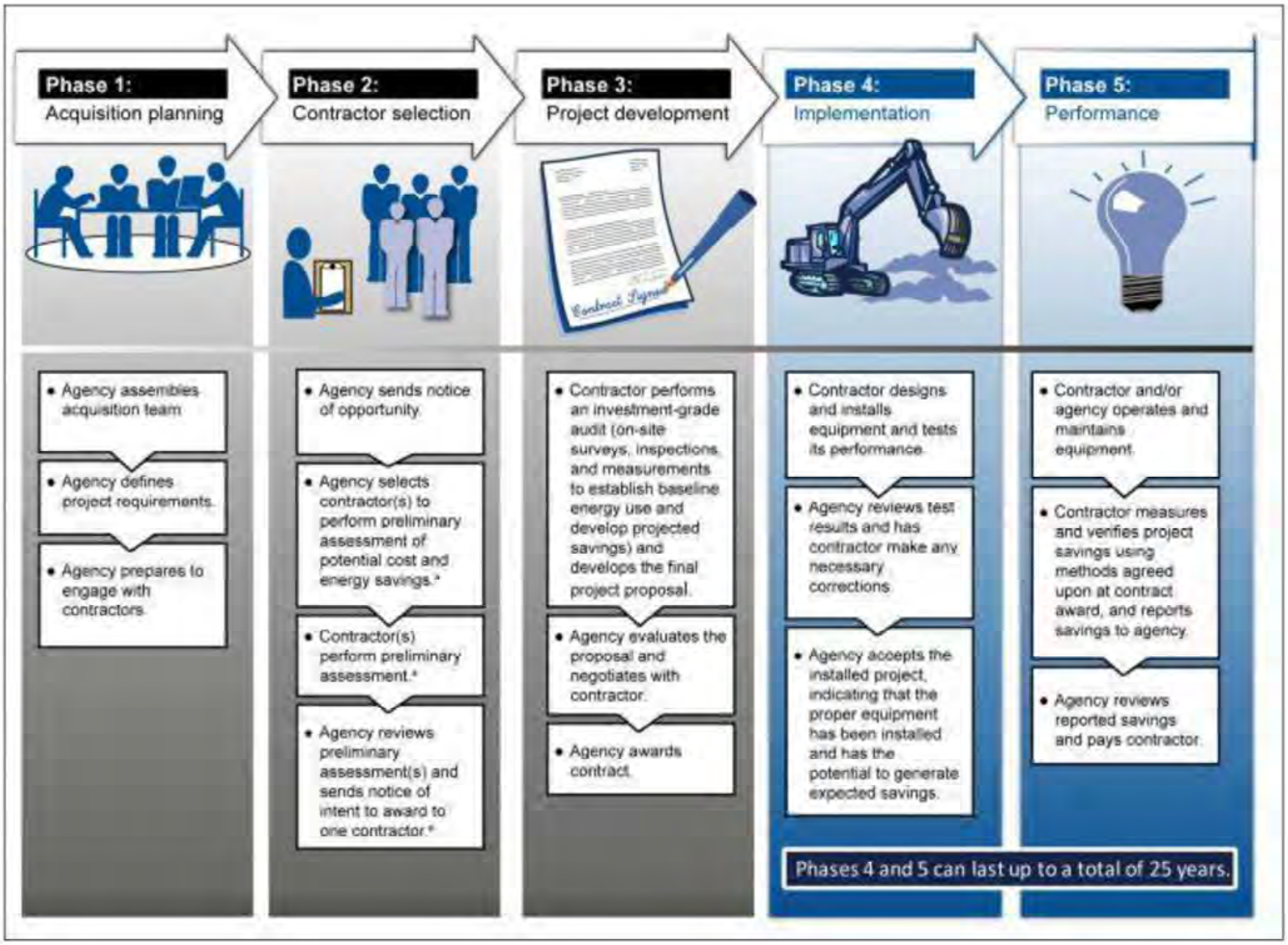


Figure 45: ESPC Project Development and Implementation Process[37]

[37] Adopted from the US Department of Energy

ESPC Advantages	ESPC Disadvantages
• **No Upfront Costs:** allows organizations to implement energy-saving measures without the need for significant upfront capital. Financing costs are covered by the ESCO • **Performance Guarantee:** ESPCs typically guarantee a certain level of energy savings. This performance guarantee provides assurance of the expected results. • **Risk Transfer:** The ESCO assumes the financial and performance risks associated with the project. If the energy savings fall short of projections, the ESCO is responsible for covering the shortfall. • **Quick Implementation:** ESPC projects can have quicker implementation timelines compared to traditional delivery methods. • **Comprehensive Upgrades:** ESPC allows for the implementation of comprehensive energy efficiency solutions, addressing various aspects such as lighting, HVAC systems, and building envelope improvements. • **Long-Term Savings:** Despite the repayment to the ESCO, the City benefits from long-term energy savings, leading to reduced operational costs over the life of the project.	• **Higher Risk:** ESPC projects have higher risks for the City. If systems are not properly maintained energy saving may not be realized. • **Contract Complexity:** ESPC contracts can be complex, involving detailed agreements between the City and the ESCO. Understanding and negotiating these contracts may require legal and technical expertise. • **Less Control:** City may have limited control over the selection of specific equipment or technologies used in the project. • **Repayment Terms:** Repayment is typically structured over a fixed period which commits the City to payments if its financial situation changes. • **Higher Costs:** ESPC generally have higher project delivery costs compared to traditional delivery methods. • **Contract Length:** ESPC contracts often have long durations to allow for the recovery of the ESCO's investment. The extended commitment may limit the City's future flexibility for a facility. • **Maintenance Requirements:** performance guarantees require the City to meet manufacturer recommended maintenance.

Risk Mitigation

The following strategies can be leveraged by the City to minimize the risk during an ESPC project.

1. **Thorough Contractor Selection**
   Provide a competitive qualification based solicitation select contractors with a proven track record, relevant experience, and a strong financial standing to minimize the risk of project failure. Establish an on-call roster of qualified firms to bid on projects.

2. **Due Diligence**
   Perform thorough due diligence before entering into an ESPC agreement, assessing proposed energy-saving measures, financial models, and performance guarantees to ensure alignment with organizational goals and expectations.

3. **Performance Metrics**
   Establish clear and measurable performance metrics in the ESPC contract, defining expected energy savings, performance benchmarks, and the methodology for measuring and verifying savings to avoid ambiguity and disputes.

4. **Legal Expertise**
   Engage legal experts with experience in ESPC contracts to navigate contract complexities and ensure well-defined terms and conditions that protect the organization's interests.

5. **Program Management**
   Engage a third-party firm with experience running ESPC programs for other public agencies to support the ESPC program. Services can include procurement support, proposal reviews, design reviews and energy savings verification.

6. **Measurement and Verification**
   The measurement and verification processes throughout the project lifecycle, regularly checking actual energy savings against projections to identify and address any performance deviations promptly.

7. **Maintenance**
   Manufacturer recommended maintenance schedules exceed the City’s standard practice due to current staffing levels. Meeting this requirement will require additional staff from GSD and RAP. Alternatively, ESCOs can provide maintenance as part of the ESPC package.

8. **Existing Resources**
   Leverage existing resources for delivering ESPC projects, including contract terms and conditions. The Department of Energy provides various toolkits that can be used by the City. These should be adopted to meet the City’s direct needs.

FEDERAL GRANTS AND INCENTIVES

Investment Tax Credit

The federal Investment Tax Credit (ITC) provides tax credits for various forms of renewable energy technologies including solar PV and battery energy storage systems. This can provide a 30% credit, in the form of a rebate, on a full installation cost of a project if the prevailing wage and apprentice requirements are met. Figure 46 outlines a full breakdown of the potential credits the City can receive. There is additional 10% bonuses meeting the domestic content thresholds of being located in an Energy Community, which is defined as a location historically dependent on fossil energy jobs and tax revenues. The City of Los Angeles meets this definition being a metropolitan statistical area (MSA) that meet both the Fossil Fuel Employment (FEE) threshold and the unemployment rate requirement[38]. This designation can change in the future based on unemployment rates relative to the national average. The CAO will be responsible for applying for and securing ITC payments.

			Start of Construction						
			2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year [a])	The later of 2035 (or three years after applicable year [a])	The later of 2036 (or four years after applicable year [a])
ITC	**Full rate** (if project meets labor requirements [b])	Base Credit	30%	26%	30%	30%	22.5%	15%	0%
		Domestic Content Bonus				10%	7.5%	5%	0%
		Energy Community Bonus				10%	7.5%	5%	0%
	Base rate (if project does not meet labor requirements [b])	Base Credit	30%	26%	6%	6%	4.5%	3%	0%
		Domestic Content Bonus				2%	1.5%	1%	0%
		Energy Community Bonus				2%	1.5%	1%	0%
	Low-income bonus (1.8 GW/yr cap)	<5 MW projects in LMI communities or Indian land				10%	10%	10%	10%
		Qualified low-income residential building project / Qualified low-income economic benefit project				20%	20%	20%	20%

Figure 46: Investment Tax Credit (ITC) Over Time[39]

Direct Pay[40]

The Inflation Reduction Act (IRA) introduced expanded investment tax credits for clean energy technologies and changed provisions that allow non-taxable entities to more easily leverage funding. The IRA included provisions for elective pay, often referred to as direct pay, where the City of Los Angeles can receive a cash payment equal to the full value of tax credits for eligible projects. Payments are provided once the clean energy system has been installed and is operational. The City can leverage direct pay for the ITC and 11 other IRA tax credits[41]. CAO to lead efforts to secure ITC Direct Pay for the City.

---

[38] MSA's is an areas that have (or had at any time after 2009) 0.17% or greater direct employment or 25% or greater local tax revenues related to the extraction, processing, transport, or storage of fossil fuel; and have an unemployment rate at or above the national average unemployment rate for the previous year.
[39] US Department of Energy Office of Energy Efficiency & Renewable Energy
[40] White House **Direct Pay Through the Inflation Reduction Act**
[41] Internal Revenue Service (IRS) **Clean Energy Tax Incentives: Elective Pay Eligible Tax Credits**

OTHER GOVERNMENT PROGRAMS

California State Grants

Municipal government agencies can apply for grants from government agencies, foundations, or other organizations that support climate-related projects. These grants can occasionally provide a sizable portion of required funding. A few examples for building decarbonization measures include:

- California Energy Commission (CEC) Energy Efficiency Incentive programs include zero- and no-interest loans and grants.
- California Energy Commission (CEC) Energy Partnership Program offers services to help identify the most cost-effective, energy-saving opportunities for buildings and new construction.
- California Energy Commission (CEC) Energy Conservation Assistance Act (ECAA) Program provides financing for energy efficiency and renewable energy projects.

Federal Grants

Financial awards provided by the federal government to support specific climate projects or initiatives.

- Department of Energy (DOE) Grants: The DOE offers a variety of grant programs that support clean energy projects, including those related to renewable energy, energy storage, and energy efficiency.
- Environmental Protection Agency (EPA) Grants: The EPA offers a variety of grant programs that support environmental projects, including those related to climate change mitigation and adaptation. Examples include the Climate Showcase Communities Program, Environmental Justice Small Grants Program and Climate Pollution Reduction Grants.

Tax Credits and Rebates

- Title 17 Innovative Clean Energy Loan Guarantee Program (Sec. 50141) - Provides an additional $40 billion of loan authority for clean energy projects eligible for loan guarantees under section 1703 of the Energy Policy Act of 2005.
- 179D for energy efficiency initiatives. Section 179D of the U.S. tax code provides a tax deduction for energy-efficient improvements in commercial buildings. Under Section 179D, eligible municipal government agencies can claim a deduction of up to $5.00 per square foot for energy-efficient improvements made to their buildings including lighting, HVAC systems and envelope improvements. Public entities can take advantage of these credits through a partnership with a developer or investor.

PROGRAM MANAGEMENT FRAMEWORKS

As the city explores different delivery and program management options, including internal management, third-party management, or a hybrid approach, it is essential to consider each option's merits. With all approaches, it is recommended the City establish an internal program management role to oversee the implementation of this workplan. In all program management scenarios, GSD and RAP will require additional staff to support the City's building decarbonization program.

Table 27: Municipal Building Decarbonization Program Management Options

	City Managed Program	Hybrid Program Management	Outside Program Management
Approach	The City takes on all aspects of the municipal building decarbonization workplan including program management, delivery and monitoring.	Combination of internal management with external consultant support for certain functions as needed.	The City engages an outside program management firm to oversee the delivery of the 12-year workplan with support from City staff.
City Staffing	Hire additional staff to deliver most or all aspects of the municipal building decarbonization workplan. This will include a BOE program manager and additional project management and engineering staff.	Hire additional staff where needed to deliver the municipal building decarbonization workplan. Additional project managers and engineers will be required.	Leverage existing City staff will support projects based on existing capacity.
Consultant Involvement	External consultants may be engaged for limited specialized tasks. • Project Based Support	External consultants are strategically utilized to fill gaps in expertise or capacity, providing flexibility and scalability. • Program Management Support • Engineering Support • Project Based Support	An external program manager will help oversee the program and bring in additional consultants as needed. This can include Program Management, Engineering, Project Management, Procurement ad Construction Management
Considerations	This approach offers maximum control for the City but will require investment to build and develop an internal team to handling the program's scale and complexity.	This approach offers a middle ground, leveraging external expertise while maintaining control over critical aspects of the program. Additional time will be required to established contracts which will slow progress.	This approach offers maximum flexibility for the City but requires careful selection of a capable third-party manager to ensure alignment with the city's goals. Additional time required to established contracts.

A.7. TOP 25 SITES BY NATURAL GAS

Table 28: City of Los Angeles - Top 25 Sites by Natural Gas Use

#	Site Name	Council District	Building Count	Primary Department	Building Maintenance	Infrastructure Priority	Target Funding Year	ROM Cost (2023)	2022 Gas Usage (Therms)
1	CIVIC CENTER STEAM PLANT	14	5	GSD	GSD	High	FY 24-25 FY 28-29	$65,000,000	491,100
2	POLICE ADMINISTRATION BUILDING (PAB)	14	1	LAPD	GSD	Medium	FY 30-31	$12,873,965	181,700
3	HYPERION TREATMENT PLANT BUILDINGS	11	2	LASAN	LASAN		FY 27-28	$9,000,000	153,500
4	EXPO CENTER	09	2	RAP	RAP		FY 25-26	$8,686,894	140,700
5	LOS ANGELES ZOO	04	18	ZOO	ZOO		FY 27-28	$5,000,000	84,900
6	VAN NUYS SHERMAN OAKS PARK AND POOL	04	2	RAP	RAP	Low	FY 31-32	$1,933,930	81,400
7	CENTRAL LIBRARY	14	1	LAPL	GSD	Low	FY 32-33	$31,737,276	81,300
8	NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY	02	3	GSD	GSD	High	FY 27-28	$3,200,000	78,300
9	C ERWIN PIPER TECHNICAL CENTER (PIPER TECH)	14	1	GSD	GSD	High	FY 26-27	$49,000,000	72,300
10	EAST VALLEY SOLID WASTE RESOURCES FACILITY	06	6	GSD	GSD	Low	FY 33-34	$4,500,000	71,900
11	VAN NUYS COMMUNITY POLICE STATION	06	3	LAPD	GSD	High	FY 25-26	$4,500,000	68,900
12	LOS ANGELES CONVENTION CENTER	09	3		Vendor	Medium	FY 29-30	$30,000,000	63,900
13	7TH ST CONSOLIDATED FACILITY	14	11	GSD	GSD	High	FY 25-26	$5,700,000	55,200
14	ECHO PARK DEEP POOL	14	1	RAP	RAP	Medium	FY 31-32	$4,567,341	52,300
15	GLASSELL PARK AND POOL	15	1	RAP	RAP	Medium	FY 30-31	$1,511,816	51,900
16	AHMANSON RECRUIT TRAINING CENTER (ARTC)	11	1	LAPD	GSD	High	FY 27-28	$13,713,439	46,000
17	LINCOLN PARK AND POOL	14	2	RAP	RAP	Medium	FY 28-29	$4,605,644	41,800
18	VAN NESS REC CENTER	18	3	RAP	RAP		FY 31-32	$2,038,950	39,500
19	WEST VALLEY SOLID RESOURCES COLLECTION YARD	12	7	GSD	GSD		FY 31-32	$2,000,000	38,600
20	YOSEMITE POOL AND REC CENTER	14	2	RAP	RAP	High	FY 26-27	$1,450,750	38,500
21	CENTRAL REFUSE EQUIPMENT REPAIR YARD	14	5	GSD	GSD	High	FY 25-26	$2,000,000	37,600
22	ROOSEVELT POOL	14	1	RAP	RAP	High	FY 24-25	$1,395,540	37,000
23	ELYSIAN PARK POLICE ACADEMY (LAPD POLICE ACADEMY)	01	1	LAPD	GSD[42]		FY 31-32	$4,905,339	36,800
24	WESTWOOD PARK AND POOL	05	2	RAP	RAP		FY 30-31	$12,173,784	36,000
25	CAMP SEELY	04		RAP	RAP	High	FY 33-34	$2,000,000	35,100

[42] Facility is not 100% maintained by GSD.

#1 – CIVIC CENTER STEAM PLANT

Ranking by Gas Use	#1
Site Summary	The Civic Center Steam Plant provides space and domestic hot water heating to City buildings located near City Hall. The plant is located in a basement in between City Hall East and South. Steam plant equipment has generally exceeded its expected useful life.
Building(s)	City Hall - 200 N Spring St Los Angeles, CA 90012 LAPD Metro Detention Center 180 N Los Angeles St Los Angeles, CA 90012 City Hall East 200 N Main St Los Angeles, CA 90012 City Hall South 111 E 1ST St Los Angeles, CA 90012 Los Angeles Mall 201 N Los Angeles St Los Angeles, CA 90012
Department	General Services Division (GSD)
Maintenance	GSD
Council District	CD#14
Total Area	2,677,208 GSF
Natural Gas	491,130 therms
Electricity	31,530,018 kWh
Equity	BOE Pilot Equity Score: N/A (Not eligible based on population) Justice40 Disadvantaged Community: Yes
Existing HVAC	Steam is produced at the central plant and distributed to building. Heat exchangers are used to convert steam to hot water for space heating. Existing plant and boilers are over 50 years old and exceed the expected useful life.
Existing Water Heating	Domestic hot water (DHW) heating is provided from steam heat exchangers at each building.
Other Gas System	N/A
Considerations	The project needs to be coordinated with Civic Center Redevelopment Plan. It is recommended the City provides a detailed engineering feasibility study to establish an implementation plan and coordinate with other redevelopment projects. Historic status of City Hall needs to be considered.
Electrification Strategy	Phased decarbonization implementation plan. • Phase 1: Disconnect City Hall and LAPD Metro Detention Center from steam system and install local rooftop heat pumps plants. Upgrade building VAV boxes to allow for 130F hot water supply.

	• Phase 2: Previous Civic Center Redevelopment planned for the demolition of buildings. An allowance for electrification was help in the decarbonization workplan in case plans change in the future.
ROM Project Cost (includes construction escalation)	Phase 1: $40,000,000 Phase 2: $70,000,000 – *include with Civic Center Redevelopment*
Funding Year	Phase 1: FY 24-25 Phase 2: FY 28-29
Project Duration	City Hall: 2 year planning and design. Up to 2 years construction

#2 – POLICE ADMINISTRATION BUILDING

Ranking by Gas Use	#2
Site Summary	The Police Administration Building (PAB) serves as the Los Angeles Police Department headquarters. The Police Administration Building consists of 10 floors of office space and was built in 2011. The building operates 24 hours per day and 365 days per week.
Building(s)	Police Administration Building 100 W 1St St. Los Angeles, CA 90012
Department	Los Angeles Police Department (LAPD)
Maintenance	GSD
Council District	CD#14
Total Area	648,859 GSF
Natural Gas	181,748 therms
Electricity	6,834,281 kWh
Equity	BOE Pilot Equity Score: N/A (Not eligible based on population) Justice40 Disadvantaged Community: Yes
HVAC System	Natural gas boilers with hydronic hot water distribution. Boilers are assumed to be in “okay” condition based on building vintage.
Water Heating System	Domestic hot water (DHW) heating system consists of a combination of electric and natural gas water heaters. Water heaters are assumed to be in “okay” condition based on building vintage.
Other Gas Systems	N/A
Considerations	
Electrification Strategy	• Electrify heating plant with heat recovery chillers and air-to-water heat pumps • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$30,000,000
Funding Year	FY 30-31

#3 – HYPERION TREATMENT PLANT BUILDINGS

Ranking by Gas Use	#3
Site Summary	The Hyperion Treatment Plant Buildings is a wastewater treatment plant operated by the City of Los Angeles Sanitation & Environment. A heating plant services multiple administration buildings at the site.
Building(s)	TSF Building (207,799 sq ft) SMF Building (83,249 sq ft) 12000 Vista Del Mar. Playa Del Rey, CA 90293
Department	Los Angeles Sanitation Department
Maintenance	SAN
Council District	CD#11
Total Area	291,000 sf
Natural Gas	153,457 therms
Electricity	4,665,435 kWh
Equity	BOE Pilot Equity Score: N/A Justice40 Disadvantaged Community: No
HVAC System	Natural gas boilers with hydronic hot water distribution. The vintage and current condition is unknown.
Water Heating System	Domestic hot water (DHW) system assumed to be natural gas water heaters. The vintage and current condition is unknown.
Other Gas Systems	N/A
Considerations	
Electrification Strategy	• Electrify heating plant with heat recovery chillers and air-to-water heat pumps • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$17,000,000
Funding Year	Fiscal Year 2027-2028

#4 – EXPO CENTER

Ranking by Gas Use	#4
Site Summary	The Los Angeles Expo Center is owned and operated by the City of Los Angeles located at Exposition Park. The Expo Center includes a large aquatic center and is operational 7 days per week.
Building(s)	• Expo Center - LA84 Foundation/John C Argue Swim Stadium 3980 South Bill Robertson Ln. Los Angeles, CA 90037 • Ahmanson Senior Citizen Center 3990 Bill Robertson Ln. Los Angeles, CA 90037
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#09
Total Area	76,465 GSF
Natural Gas	140,700 therms
Electricity	53,560 kWh
Equity	BOE Pilot Equity Score: 8 Justice40 Disadvantaged Community: Yes
HVAC System	Space heating throughout the facility is provided by natural gas. The vintage and current condition of the existing systems are unknown.
Water Heating System	Domestic hot water (DHW) heating consists of large natural gas water heaters. Vintage and condition is unknown.
Other Gas Systems	Natural gas pool heating systems.
Considerations	N/A
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems
ROM Project Cost (includes construction escalation)	$15,000,000
Funding Year	Fiscal Year 2025-2026

#5 – LA ZOO

Ranking by Gas Use	#5
Site Summary	The Los Angeles Zoo & Botanical Gardens is owned and operated by the City of Los Angeles. The Los Angeles Zoo hosts animal habitats, planted gardens, and other commercial spaces such as restaurants. The facility is operational 7 days per week.
Building(s)	5333 Zoo Dr. Los Angeles, CA 90027 • LA Zoo Building H • LA Zoo Building J • LA Zoo Building D – Restroom • LA Zoo Building Q • LA Zoo Building P • LA Zoo Building I – Dragons of Komodo • LA Zoo Building K – Gorilla Grill • LA Zoo Building R – Chimpanzees • LA Zoo Building O – Food Stand • LA Zoo Building F • LA Zoo Building E – Main Shuttle Station • LA Zoo Building N • LA Zoo Building M • LA Zoo Building L • LA Zoo Building C – Living Amphibians • LA Zoo Building G – Australia House • LA Zoo Building A – Treetops Terrace • LA Zoo Building S – Elephants of Asia
Department	Los Angeles Zoo
Maintenance	Los Angeles Zoo
Council District	CD#04
Total Area	84,250 GSF
Natural Gas	84,903 therms
Electricity	7,597,955 kWh
Equity	N/A
HVAC System	Space heating throughout the facility is provided by gas-fired RTUs. The vintage and condition of the existing RTUs are unknown.
Water Heating System	Domestic hot water (DHW) heating systems are natural gas water heaters. The vintage and condition of water heaters are unknown.
Other Gas Systems	Miscellaneous gas heating systems are also required provided for various animal enclosures and exhibits. LA Zoo includes multiple restaurants with commercial kitchens that have gas cooking.
Considerations	
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water

	• Electrify commercial kitchens and other gas systems.
ROM Project Cost (includes construction escalation)	
Funding Year	Fiscal Year 2027-2028

#6 – VAN NUYS SHERMAN OAKS PARK AND POOL

Ranking by Gas Use	#2
Site Summary	The Van Nuys Sherman Oaks Park provides indoor and outdoor recreational programs. The Park consists of sports fields, picnic areas, swimming pools, an aquatics center and a recreation center.
Building(s)	Van Nuys Sherman Oaks Recreation Center Van Nuys Sherman Oaks Pool 14201 Huston St. Los Angeles, CA 91423
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#04
Total Area	30,896 GSF
Natural Gas	81,377 therms
Electricity	423,549 kWh
Equity	BOE Pilot Equity Priority Score: 2 Justice40 Disadvantaged Community: No
HVAC System	Space heating is provided by gas-fired RTUs. Recreation center RTUs and pool building RTUs are currently considered to be in “okay” condition and “good” condition, respectively.
Water Heating System	Domestic hot water (DHW) is provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment and is considered to be in “good” condition.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump or electric water heaters at the rec center
ROM Project Cost (includes construction escalation)	$4,500,000
Funding Year	FY 33-34

#7 – CENTRAL LIBRARY

Ranking by Gas Use	#7
Site Summary	The Los Angeles Central Library serves as the headquarters for 73 branches of the Los Angeles Public Library. The Los Angeles Central Library consists of eight floors of public computers, classroom areas, and bookshelves.
Building(s)	Central Library 630 W 5th St. Los Angeles, CA 90071
Department	Los Angeles Public Library
Maintenance	GSD
Council District	CD#14
Total Area	538,000 GSF
Natural Gas	81,336 therms
Electricity	5,852,888 kWh
Equity	BOE Pilot Equity Priority Score: 3 Justice40 Disadvantaged Community: No
HVAC System	The building is heated by a central natural gas boiler plant. Cooling is provided by a central chiller plant with water-cooled chillers. The building includes air-handler units provide heating and cooling throughout the building. The exact vintage and condition of the boilers are unknown, but the boilers are currently considered to be in “good” condition.
Water Heating System	Domestic water heating system consists of a combination of electric and natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	
Considerations	Historic status of building needs to be considered
Electrification Strategy	• Electrify heating plant with heat recovery chillers and air-to-water heat pumps • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$75,000,000
Funding Year	FY 32-33

#8 – NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY

Ranking by Gas Use	#8
Site Summary	The North Hollywood Fleet Service Repair Facility is owned and operated by the City of Los Angeles and provides maintenance and repair services for City-operated vehicles.
Building(s)	North Hollywood Fleet Service Repair Facility North Hollywood Fleet Service Repair Facility – Storage and Paint North Hollywood Fleet Service Repair Facility - Warehouse 12205 Sherman Way Los Angeles, CA 91605
Department	General Services Department
Maintenance	GSD
Council District	CD#02
Total Area	63,800 GSF
Natural Gas	78,261 therms
Electricity	1,397,713 kWh
Equity	BOE Pilot Equity Score: 4 Justice40 Disadvantaged Community: Yes
HVAC System	The primary building has make up air units (MAUs) with natural gas boilers for heating. Gas rooftop units service and split systems service miscellaneous administration spaces. The vintage of the existing space heating equipment is unknown, but the existing units are currently considered to be in "poor" condition.
Water Heating System	Domestic hot water (DHW) system includes natural gas and electric water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	
Considerations	Electrification will increase electrical demand and may require additional information or service upgrades.
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump or electric units • Install air-to-water heat pump for space heating
ROM Project Cost (includes construction escalation)	$6,500,000
Funding Year	FY 27-28

#9 – PIPER TECH

Ranking by Gas Use	#9
Site Summary	The Piper Technical Center is a larger four-story building with various spaces including offices, warehouse areas, automotive repair shops, paint and wood shops, and several other vocational areas, topped by a landing area for the LAPD's helicopter squadron. The facility houses a wide variety of departments and workers from different parts of government. The building operates 24 hours per day and 365 days per week.
Building(s)	C Erwin Piper Technical Center 555 E Ramirez St. Los Angeles, CA 90012
Department	General Services Department
Maintenance	GSD
Council District	CD#14
Total Area	1,480,688 GSF
Natural Gas	72,256 therms
Electricity	6,309,598 kWh
Equity	BOE Pilot Equity Score: 0 Justice40 Disadvantaged Community: No
HVAC System	The facility has a centralized hot water plant with two 10,500 MBH gas boilers and chilled water system. Boilers are considered to be in “poor” condition. The facility has a mix of air-handler units, dual-duct systems, multi-zone units, four-pipe fan coils, two-pipe fan coils, packaged units and split systems.
Water Heating System	The facility’s domestic hot water (DHW) heating system consists of electric water heaters.
Other Gas Systems	
Considerations	Complex existing systems will require additional upfront engineering and planning to develop detailed implementation plan.
Electrification Strategy	• Electrify heating plant with heat recovery chillers and air-to-water heat pumps. Review other HVAC system to determine if any other upgrades are required. • Electrify other packaged gas systems, if applicable
ROM Project Cost (includes construction escalation)	$90,000,000
Funding Year	FY 26-27

#10 – EAST VALLEY SOLID WASTE RESOURCES FACILITY

Ranking by Gas Use	#10
Site Summary	The East Valley Solid Waste Resources Facility is a waste management complex operated by the City of Los Angeles Sanitation & Environment.
Building(s)	• Truck Wash Building • Safe Center • Container Repair Facility • Administration Building • Container Warehouse Facility • Maintenance Garage 11050 Pendleton St. Shadow Hills, CA 91352
Department	General Services Department
Maintenance	GSD
Council District	CD#06
Total Area	116,807 GSF
Natural Gas	71,880 therms
Electricity	1,540,800 kWh
Equity	BOE Pilot Equity Score: 6 Justice40 Disadvantaged Community: Yes
HVAC System	Detailed information was not available for the facility's HVAC cooling system. The facility's main HVAC heating system consists of natural gas unit heaters, boilers and rooftop units. The vintage of the existing space heating equipment is unknown, but the existing boiler units are currently considered to be in "good" condition.
Water Heating System	Domestic hot water (DHW) system includes natural gas and electric water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	
Considerations	
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump or electric units • Install air-to-water heat pump for space heating
ROM Project Cost (includes construction escalation)	$12,000,000
Funding Year	FY 33-34

#11 – VAN NUYS COMMUNITY POLICE STATION

Ranking by Gas Use	#11
Site Summary	The Van Nuys Community Police Station provides law enforcement and youth services for Sepulveda, Sherman Oaks, Valley Glen, Van Nuys, Ventura Business District, and West Van Nuys. The building operates 24 hours per day and 365 days per week.
Building(s)	Van Nuys Community Police Station 6240 Sylmar Ave. Los Angeles, CA 91401 Valley Headquarters 3-Story Parking Structure 14320 Sylvan St. Los Angeles, CA 91401
Department	Los Angeles Police Department (LAPD)
Maintenance	GSD
Council District	CD#06
Total Area	498,216 GSF
Natural Gas	68,854 therms
Electricity	2,609,515 kWh
Equity	BOE Pilot Equity Score: 7 Justice40 Disadvantaged Community: No
HVAC System	The facility's main HVAC heating system consists of packaged rooftop units, zone VAV boxes and gas boilers to provide hot water. The exact vintage of the boilers is unknown, but the boiler units are currently considered to be in "poor" condition.
Water Heating System	The facility's domestic hot water (DHW) heating system includes natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	
Considerations	
Electrification Strategy	• Install air-to-water heat pump for space heating • Upgrade packaged rooftop units • Review VAV boxes to determine if existing boxes require replacement to support 130F hot water supply • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$8,000,000
Funding Year	FY 25-26

#12 – LOS ANGELES CONVENTION CENTER

Ranking by Gas Use	#12
Site Summary	The Los Angeles Convention Center is owned and operated by the City of Los Angeles and hosts expos, trade shows, exhibitions, and conferences.
Building(s)	Los Angeles Convention Center – West Hall 801 W Pico Blvd. Los Angeles, CA 90015 Los Angeles Convention Center – South Hall & Garage 1201 S Figueroa St. Los Angeles, CA 90015
Department	General Services Department
Maintenance	Third Party Contractor (AEG)
Council District	CD#09
Total Area	1,435,082 GSF
Natural Gas	63,891 therms
Electricity	
Equity	West Hall • BOE Pilot Equity Score: 3 • Justice40 Disadvantaged Community: No East Hall and Garage • BOE Pilot Equity Score: 7 • Justice40 Disadvantaged Community: Yes
HVAC System	Heating and cooling are provided from a central utility plant with natural gas boilers. The vintage and current condition of the existing boilers is unknown.
Water Heating System	It is assumed that the domestic hot water system consists of a combination of electric and natural gas water heaters. The vintage and current condition of water heaters are unknown.
Other Gas Systems	Convention center includes commerical kitchens with natural gas cooking appliances.
Considerations	The Convention Center is pursuing a project to expand the exhibition hall. It is recommended electrification of existing natural gas system is provided as part of the larger capital. An allowance for electrifying as a stand alone project is provided below.
Electrification Strategy	• Electrify heating plant with heat recovery chillers and air-to-water heat pumps. Review other HVAC system to determine if any other upgrades are required. • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$65,000,000
Funding Year	FY 29-30

#13 – 7TH ST CONSOLIDATED YARD

Ranking by Gas Use	#13
Site Summary	Site includes various maintenance, service and office spaces that support various City departments.
Building(s)	Multiple Buildings • SANITATION (TRASH TRUCK) REPAIR BUILDING • GSD BODY SHOP • GSD STEAM RACK • STREET SWEEPER REPAIR SHOP • GSD FLEET TECHNICAL SERVICES • GSD REPAIR SHOP • TIRE SHOP • LUBE SHOP • HEADQUARTERS BRICK BUILDING • SUPPLY SERVICES AUTOMOTIVE WORKGROUP • AUTO ELECTRIC
Department	General Services Division
Maintenance	GSD
Council District	CD#14
Total Area	151,000 GSF
Natural Gas	55,162 therms
Electricity	5,852,888 kWh
Equity	BOE Equity Score: 3 Disadvantaged Community: No
HVAC System	The facility's main HVAC heating system consists of natural gas unit heaters, boilers and rooftop units. The vintage of the existing space heating equipment is unknown, but the existing boiler units are currently considered to be in "medium" condition.
Water Heating System	Domestic water heating system consists of a combination of nautral gas and electric water heaters.
Other Gas Systems	Steam and high temperature washing systems.
Considerations	
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump or electric units • Install air-to-water heat pump for space heating • Install electric heating for steam and high temp washing
ROM Project Cost (includes construction escalation)	$10,000,000
Funding Year	FY 32-33

#14 – ECHO PARK DEEP POOL

Ranking by Gas Use	#14
Site Summary	The Echo Park Deep Pool is an indoor pool facility owned and operated by the City of Los Angeles and is available for public access 7 days per week.
Building(s)	Echo Park Deep Pool 1419 W Colton St. Los Angeles, CA 90026
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#01
Total Area	30,852 GSF
Natural Gas	52,348 therms
Electricity	501,480 kWh
Equity	BOE Pilot Equity Score: 7 Justice40 Disadvantaged Community: Yes
HVAC System	Space heating throughout the facility is provided by gas-fired RTUs. The vintage of the existing RTUs is unknown, but the RTUs are currently considered to be in “poor” condition.
Water Heating System	The domestic hot water (DHW) system consists of natural gas water heaters. The vintage and current condition are unknown.
Other Gas Systems	The facility utilizes natural gas boilers for pool heating applications. The existing pool heating system is currently considered to be in “okay” condition.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center
ROM Project Cost (includes construction escalation)	$10,500,000
Funding Year	FY 31-32

#15 – GLASSELL PARK AND POOL

Ranking by Gas Use	#15
Site Summary	Glassell Park is owned and operated by the City of Los Angeles to provide indoor and outdoor recreational programs. Glassell Park consists of sports fields, picnic areas, swimming pools, community centers, and classrooms. The park is open for public access 7 days per week, but the Glassell Recreation Center is closed on Sundays.
Building(s)	Glassell Park Recreation Center Glassell Park Child Care Center Glassell Park Pool 2727 Crestmoore Pl, Los Angeles, CA 90065
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#01
Total Area	6,920 GSF
Natural Gas	51,906 therms
Electricity	409,640 kWh
Equity	BOE Pilot Equity Score: 3 Justice40 Disadvantaged Community: No
HVAC System	Space heating is provided by gas-fired RTUs. Recreation center RTUs and pool building RTUs are currently considered to be in “poor” condition.
Water Heating System	Domestic hot water (DHW) is provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment and is considered to be in “okay” condition.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump or electric water heaters at the rec center
ROM Project Cost (includes construction escalation)	$5,000,000
Funding Year	FY 30-31

#16 – AHMANSON RECRUIT TRAINING CENTER (ARTC)

Ranking by Gas Use	#16
Site Summary	The Ahmanson Recruit Training Center (ARTC) provides a training course for newly recruited Los Angeles Police Department (LAPD) officers. The ARTC consists of classrooms and training areas for tactics, firearms, and driving practice.
Building(s)	Ahmanson Recruit Training Center 5651 W Manchester Ave. Los Angeles, CA 90045
Department	Los Angeles Police Department (LAPD)
Maintenance	GSD
Council District	CD#11
Total Area	279,936 GSF
Natural Gas	46,008 therms
Electricity	1,676,192 kWh
Equity	BOE Pilot Equity Score: 1 Justice40 Disadvantaged Community: No
HVAC System	The facility's main HVAC heating system consists packaged rooftop units and gas boilers with a VAV heating system. The vintage of the equipment is unknown, but the systems are considered to be in "poor" condition.
Water Heating System	It is assumed domestic water heating system consists of a combination of electric and natural gas water heaters.
Other Gas Systems	
Considerations	
Electrification Strategy	• Install air-to-water heat pump for space heating • Upgrade packaged rooftop units • Review VAV boxes to determine if existing boxes require replacement to support 130F hot water supply • Install heat pump or electric domestic water heaters
ROM Project Cost (includes construction escalation)	$26,000,000
Funding Year	FY 27-28

#17 – LINCOLN PARK AND POOL

Ranking by Gas Use	#17
Site Summary	Lincoln Park is owned and operated by the City of Los Angeles to provide indoor and outdoor recreational programs. Lincoln Park consists of sports fields, picnic areas, swimming pools, community centers, and classrooms. The
Building(s)	Lincoln Park Recreation Center/Senior Center Lincoln Park Pool 3501 E Valley Blvd. Los Angeles, CA 90031
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#14
Total Area	44,373 GSF
Natural Gas	41,805 therms
Electricity	340,016 kWh
Equity	BOE Pilot Equity Score: 7 Justice40 Disadvantaged Community: Yes
HVAC System	Space heating throughout the buildings are provided by gas-fired RTUs. The vintage and condition of the existing RTUs is unknown, but the recreation center RTUs and pool building RTUs are currently considered to be in “poor” condition and “good” condition, respectively.
Water Heating System	Domestic hot water (DHW) is provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment and is considered to be in “good” condition.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump or electric water heaters at the rec center
ROM Project Cost (includes construction escalation)	$10,500,000
Funding Year	FY 31-32

#18 – VAN NESS PARK

Ranking by Gas Use	#18
Site Summary	The Van Ness Rec Center is owned and operated by the City of Los Angeles to provide indoor and outdoor recreational programs. The Van Ness Rec Center consists of sports fields, picnic areas, fitness areas, swimming pools, community centers, and classrooms.
Building(s)	Van Ness Child Care Center Van Ness Recreation Center Van Ness Aquatic Center 5720 2nd Ave. Los Angeles, CA 90043
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#08
Total Area	20,396 GSF
Natural Gas	41,805 therms
Electricity	201,200 kWh
Equity Considerations	BOE Pilot Equity Score: 3 Justice40 Disadvantaged Community: No
HVAC System	Space heating throughout the buildings are provided by gas-fired RTUs. The vintage and condition of the existing RTUs is unknown.
Water Heating System	Domestic hot water (DHW) is provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment. The vintage and current condition are unknown.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump or electric water heaters at the rec center
ROM Project Cost (includes construction escalation)	$5,000,000
Funding Year	FY 31-32

#19 – WEST VALLEY SOLID RESOURCES COLLECTION YARD

Ranking by Gas Use	**#19**
Site Summary	The West Valley Solid Resources Collection Yard is a waste collection complex operated by the City of Los Angeles Sanitation & Environment.
Building(s)	• Sweeper Repair Shop • Clerical Building • Locker/Lunch and Gym Facility • Building A Truck Repair • Administration Building • Building C Truck Repair • West Valley Solid Resources Collection Yard 8840 Vanalden Ave. Los Angeles, CA 91324
Department	Los Angeles Sanitation Department (LASAN)
Maintenance	GSD
Council District	CD#12
Total Area	38,230 GSF
Natural Gas	38,559 therms
Electricity	599,760 kWh
Equity	BOE Pilot Equity Score: 6 Justice40 Disadvantaged Community: Yes
HVAC System	The site HVAC system consists of various natural gas heating systems including unit heaters, rooftop units and natural gas boilers. The vintage and current condition of the existing space heating equipment are unknown.
Water Heating System	It is assumed domestic water heating system consists of a combination of electric and natural gas water heaters.
Other Gas Systems	
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump or electric units • Install air-to-water heat pump for space heating
ROM Project Cost (includes construction escalation)	$5,000,000
Funding Year	FY 31-32

#20 – YOSEMITE RECREATION CENTER AND POOL

Ranking by Gas Use	#20
Site Summary	The Yosemite Rec Center is owned and operated by the City of Los Angeles to provide indoor and outdoor recreational programs. The Yosemite Rec Center consists of sports fields, swimming pools a recreation center and aquatics center.
Building(s)	Yosemite Recreation Center Yosemite Pool 1839 & 1840 Yosemite Dr. Los Angeles, CA 90041
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#14
Total Area	24,381 GSF
Natural Gas	38,559 therms
Electricity	391,120 kWh
Equity Considerations	BOE Pilot Equity Score: 3 Justice40 Disadvantaged Community: Yes
HVAC System	Space heating throughout the buildings are provided by gas-fired RTUs. The vintage and condition of the existing system is unknown, but the RTUs are considered to be in “poor” condition.
Water Heating System	Domestic hot water (DHW) is provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment and is considered to be in “poor” condition.
Key Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas-fired RTUs with heat pump units • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump or electric water heaters at the rec center
ROM Project Cost (includes construction escalation)	$3,000,000
Funding Year	FY 26-27

#21 – CENTRAL REFUSE EQUIPMENT REPAIR YARD

Ranking by Gas Use	#21
Site Summary	The Central Refuse Equipment Repair Yard is owned and operated by the City of Los Angeles and provides maintenance and repair services for City-operated vehicles.
Building(s)	Central Refuse Equipment Repair Yard Exterior Welding Shop Steam Rack Transmission Shop Admin, Major Repair, Body, Stores, PT of Trans Shop Warehouse 2513 E 24th St. Los Angeles, CA 90058
Department	General Services Department
Maintenance	GSD
Council District	CD#14
Total Area	41,120 GSF
Natural Gas	37,552 therms
Electricity	502,017 kWh
Equity	BOE Pilot Equity Score: 3 Justice40 Disadvantaged Community: No
HVAC System	The site HVAC system consists of various natural gas heating systems including unit heaters, rooftop units and natural gas boilers. LNG/CNG truck repair shop with 100% outside air for the mechanics with a boiler reheat system and 5-6 mini split heat pumps. The vintage of the existing space heating equipment is unknown, but the existing boiler is currently considered to be in "poor" condition as presented in the facility's inventory summary.
Water Heating System	It is assumed domestic water heating system consists of a combination of electric and natural gas water heaters.
Other Gas Systems	Steam boiler for vehicle cleaning.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump or electric units • Install air-to-water heat pump for space heating
ROM Project Cost (includes construction escalation)	$3,500,000
Funding Year	FY 25-26

#22 – ROOSEVELT POOL

Ranking by Gas Use	**#22**
Site Summary	The Roosevelt Pool is owned and operated by the City of Los Angeles and is open for public access 6 days per week.
Building(s)	Roosevelt Pool 456 S Mathews St. Los Angeles, CA 90033
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#14
Total Area	4,418 GSF
Natural Gas	37,032 therms
Electricity	
Equity	BOE Pilot Equity Score: 3 Justice40 Disadvantaged Community: No
HVAC System	Space heating throughout the facility is provided by radiant gas heaters. The vintage and condition of the existing system is unknown, but the RTUs are considered to be in “poor” condition.
Water Heating System	Detailed information was not available for the facility’s domestic hot water heating system.
Other Gas Systems	The Aquatics Center includes natural gas pool heating equipment and is considered to be in “poor” condition.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas unit heaters with a split heat pump system • Install air-to-water heat pump for domestic hot water and pool heating systems at the aquatics center • Install heat pump domestic hot water heaters
ROM Project Cost (includes construction escalation)	$2,000,000
Funding Year	FY 24-25

#23 – ELYSIAN PARK POLICE ACADEMY

Ranking by Gas Use	**#23**
Site Summary	The Elysian Park Police Academy is owned and operated by the City of Los Angeles to educate future LAPD officers. The Elysian Park Police Academy consists of offices, classrooms, and training areas. Some facilities are leased and maintained by tenants.
Building(s)	Elysian Park Police Academy 1880 Academy Dr. Los Angeles, CA 90012
Department	Los Angeles Police Department (LAPD)
Maintenance	GSD
Council District	CD#01
Total Area	90,000 GSF
Natural Gas	36,829 therms
Electricity	1,172,307 kWh
Equity Considerations	BOE Pilot Equity Score: 0 (Not eligible based on population) Justice40 Disadvantaged Community: Yes
HVAC System	The site HVAC system consists of various natural gas heating systems including unit heaters, rooftop units and natural gas boilers. The vintage and current condition of the boilers are unknown.
Water Heating System	It is assumed domestic water heating system consists of a combination of electric and natural gas water heaters
Other Gas Systems	Site has a pool which is assumed to have a natural gas pool heating system.
Key Considerations	Electrification will significantly increase electrical demand. Utility service upgrade may be required.
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas boilers with air-to-water heat pump for space heating • Replace gas-fired water heaters with heat pump or electric units • Replace gas unit heaters with a split heat pump system • Replace gas pool boilers with air-to-water heat pump
ROM Project Cost (includes construction escalation)	$11,500,000
Funding Year	FY 31-33

#24 – WESTWOOD PARK AND POOL

Ranking by Gas Use	#24
Site Summary	Westwood Park is owned and operated by the City of Los Angeles to provide indoor and outdoor recreational programs. Westwood Park consists of sports fields, picnic areas, swimming pools, and community centers.
Building(s)	Westwood Recreation Center/Pool 1350 S Sepulveda Blvd. Los Angeles, CA 90024
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#05
Total Area	84,053 GSF
Natural Gas	35,997 therms
Electricity	
Equity	BOE Pilot Equity Score: 2 Justice40 Disadvantaged Community: No
HVAC System	Space heating throughout the buildings are provided by gas-fired RTUs and gas unit heaters. The vintage and condition of the existing systems is unknown.
Water Heating System	Domestic hot water (DHW) is assumed to be provided from natural gas water heaters. The vintage and current condition of the existing natural gas water heaters are unknown.
Other Gas Systems	The sites is assumed to have natural gas pool heating equipment. The vintage and current condition are unknown.
Considerations	Electrification will significantly increase electrical demand. It is expected that a utility service upgrade will be required.
Electrification Strategy	• Replace gas unit heaters with heat pump split systems • Replace gas-fired RTUs with heat pump units • Replace gas-fired water heaters with heat pump units • Replace gas pool boilers with air-to-water heat pump
ROM Project Cost (includes construction escalation)	$26,000,000
Funding Year	FY 30-31

#25 – CAMP SEELY

Ranking by Gas Use	#25
Site Summary	Camp Seely is owned and operated by the City of Los Angeles to provide outdoor recreational programs. Camp Seely consists of camping grounds, sports fields, and picnic areas.
Building(s)	Camp Seely 250 N Highway 138, Crestline, CA 92325
Department	Los Angeles Department of Recreation and Parks
Maintenance	RAP
Council District	CD#04
Total Area	Unknown due to insufficient data.
Natural Gas	35,066 therms
Electricity	
Equity	Unknown
HVAC System	The building is assumed to be heated by gas heaters. The vintage and condition of the existing systems is unknown.
Water Heating System	Domestic water heaters are unknown and assumed to be natural gas systems.
Other Gas Systems	
Considerations	Electrification will increase electrical demand and may require a utility service upgrade.
Electrification Strategy	Electrify heating and domestic hot water systems with heat pumps
ROM Project Cost (includes construction escalation)	$5,000,000
Funding Year	FY 33-34

A.8. DEPARTMENT CONSIDERATIONS

CITY DEPARTMENTS

The buildings evaluated within this Workplan are owned by the city departments listed in Table 29 below. The following sections provide detailed information for each department.

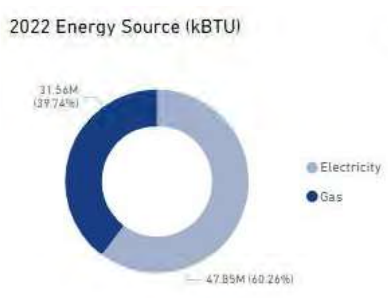
Table 29: City of LA Municipal Building Inventory by Department[43]

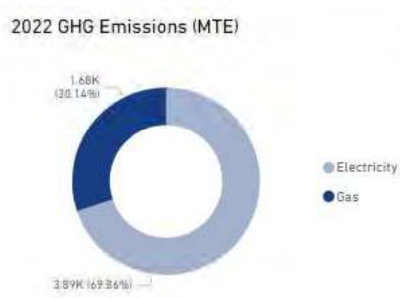
Department Name	Maintenance	Buildings	GSF	General Operations
Bureau of Engineering (BOE)	GSD	2	20,500	Research laboratory.
Bureau of Street Lighting (BSL)	GSD	3	32,400	Operations building and warehouses.
Bureau of Street Services (BSS)	GSD	51	259,500	Maintenance buildings located on yards.
Department of Animal Services (DAS)	GSD	7	255,400	Shelters for lost and abandoned animals.
Department of Cultural Affairs (DCA)	GSD	24	256,300	Community centers and theatres
Department of Transportation (DOT)[44]	GSD	29	1,395,300	Vehicle repair, offices and fueling facilities.
El Pueblo de Los Angeles (EL PUEBLO)	GSD	21	144,500	Historic buildings and attractions
Los Angeles Economic and Workforce Development (EWDD)	GSD	4	95,600	Resource centers.
General Services Division (GSD)	GSD	179	8,634,500	Municipal buildings and community centers.
Harbor Department (HARBOR)	HARBOR	9	327,300	Buildings at the seaport.
Information Technology Agency (ITA)	GSD	3	5,300	Buildings located at communication sites.
Los Angeles City Employees' Retirement System (LACERS)	GSD	1	70,000	Office building.
Los Angeles Fire Department (LAFD)	GSD	120	1,573,300	Fire stations and training centers.
Los Angeles Police Department (LAPD)	GSD	67	4,445,600	Police stations, academies and ops centers.
Los Angeles Public Libraries (LAPL)	GSD	75	1,434,200	Public libraries.
Los Angeles Fire and Police Pensions (LAFPP)	LAFPP	1	66,500	Office building.
Recreation and Parks (RAP)	RAP	328	3,372,300	Recreational, childcare, senior centers.
Sanitation (SAN)	GSD	37	299,100	Maintenance and water treatment facilities.
Los Angeles Zoo (ZOO)	ZOO	18	84,300	Buildings at the LA Zoo.
Total Portfolio		**980**	**21,300,000**	

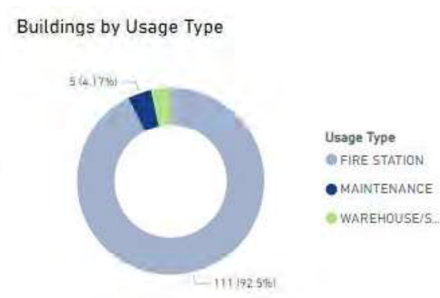
[43] Several departments were excluded from this assessment including the Housing Authority of Los Angeles (HACLA) and the Los Angeles Housing Department (LAHD) due to separate ongoing decarbonization efforts.
[44] GSD maintains 14 DOT facilities per City AMS.

LOS ANGELES GENERAL SERVICES DEPARTMENT (GSD)

Summary of Facilities	Various facilities: offices, child care centers, community centers, laboratories, maintenance facilities, museums
Typical Operating Schedule	Variable operating schedules by facility type
Critical Resilience Needs	Variable operating schedules by facility type
Typical HVAC System	Variable operating schedules by facility type
Typical Water Heaters	Variable operating schedules by facility type
Typical Lighting	Majority of the lighting is non-LED. Some facilities have begun the LED retrofit process.
Gas Process Equipment	Variable operating schedules by facility type
Other Considerations	
Recommendations	Prioritize projects based on HVAC conditions.
Number of Facilities	182
Gross Area	8,635,000 sf
Average Building Age	60 years
Average Electricity EUI	47.3 kBtu/sf-yr
Average Gas EUI	30.7 kBtu/sf-yr
Buildings with Natural Gas	89







Top 10 Buildings With Highest Natural Gas Use

Facility Name	2022 Gas Usage (Therms)
LOS ANGELES CITY HALL	205,640
CITY HALL EAST	93,420
CITY HALL SOUTH	76,930
C ERWIN PIPER TECHNICAL CENTER (PIPER TECH)	72,260
NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY	66,550
LOS ANGELES CONVENTION CENTER - SOUTH HALL	39,030
CENTRAL REFUSE EQUIPMENT REPAIR YARD-ADMIN, MAJOR REPAIR,BODY, STORES, PT OF TRANS SHOP-	33,490
MARVIN BRAUDE BUILDING (VAN NUYS CIVIC CENTER)	33,180
LOS ANGELES MALL	27,600
EAST VALLEY SOLID WASTE RESOURCES FACILITY - MAINTENANCE GARAGE	27,440
Total	**675,540**

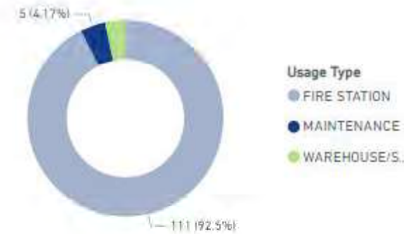
LOS ANGELES FIRE DEPARTMENT (LAFD)

Summary of Facilities	113 Fire Stations and Training Centers 3 Maintenance Buildings 4 Warehouse/Storage Buildings
Typical Operating Schedule	24/7
Critical Resilience Needs	Backup dispatch centers are of high importance.
Typical HVAC System	Living quarters are conditioned by rooftop units with gas furnaces. Vehicle bays are heating with gas radiant heaters.
Typical Water Heaters	2 gas tank-type water heaters per station
Typical Lighting	Majority of lighting is fluorescent. 13 facilities with over 80% LED retrofit complete.
Gas Process Equipment	4 sets of commercial washing/drying machines, extractors (industrial). Gas cooktops and ovens.
Other Considerations	Some stations have backup diesel generators. Dispatch stations are highly critical. Vehicle bays have heating only and can get hot.
Recommendations	Decarbonize existing gas heating systems with heat pumps and apply EEMs to increase operational efficiency. Prioritize projects based on HVAC conditions.
Number of Facilities	120
Gross Area	1,573,000 sf
Average Facility Age	47 years
Average Electricity EUI	34.4 kBtu/sf-yr
Average Gas EUI	23 kBtu/sf-yr
Facilities with Gas Use	116

2022 Energy Source (kBTU)

2022 GHG Emissions (MTE)

Buildings by Usage Type

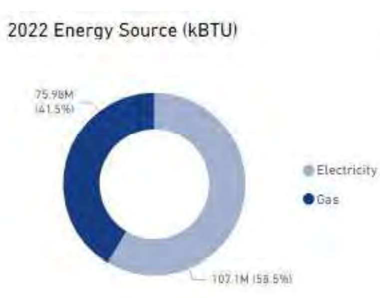


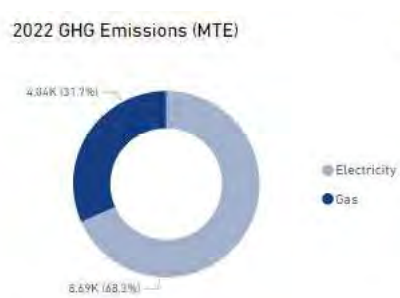
Top 10 Buildings With Highest Natural Gas Use

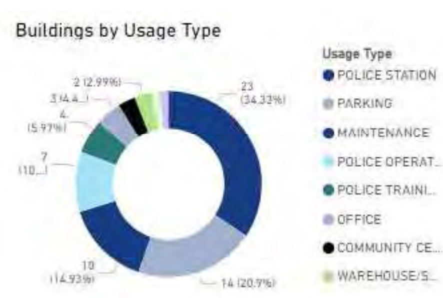
Facility Name	2022 Gas Usage (Therms)
FIRE STATION #401 SHOPS AND STORES- MAIN BUILDING	19,150
FIRE STATION #114 LAFD AIR OPERATIONS	16,360
FIRE STATION #88	10,190
FIRE STATION #04	7,330
FIRE STATION #64	6,780
FRANK HOTCHKIN MEMORIAL TRAINING CENTER	5,820
FIRE STATION #66	5,370
FIRE STATION #82	5,350
FIRE STATION #33	5,340
FIRE STATION #9	5,150
Total	**86,840**

LOS ANGELES POLICE DEPARTMENT (LAPD)

Summary of Facilities	Facilities include police stations, jails, garages, labs and training facilities.
Typical Operating Schedule	All facilities have some level of staffing 24/7. Academy and office spaces are Monday – Friday, but all stations have the capability for 24/7 operation.
Critical Resilience Needs	Dual redundancy is important, most LAPD facilities are critical, diesel generators are required at man sites
Typical HVAC System	Mainly heating hot water with gas boilers, some gas unit heaters, gas RTUs, and PTACs
Typical Water Heaters	Primarily gas water heaters, a few electric units.
Typical Lighting	30 facilities with over 50% LED retrofit complete.
Gas Process Equipment	Some older stations have a stove/oven. Jails have food warming equipment, some maintenance facilities may have laundry equipment for rags, towels, etc.
Other Considerations	LAPD facilities require continuous operations which will impact project implementation and construction schedules.
Recommendations	Prioritize projects based on HVAC conditions. Electrifying heating hot water system may require replacing VAV boxes.
Number of Facilities	67
Gross Area	4,446,000 sf
Average Building Age	30 years
Average Electricity EUI	69.9 kBtu/sf-yr
Average Natural Gas EUI	17.24 kBtu/sf-yr
Facilities with Gas Use	53





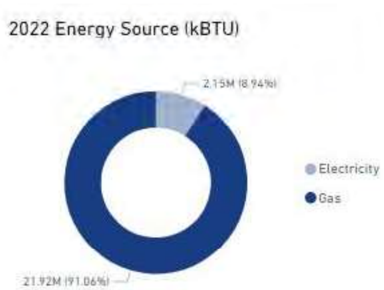


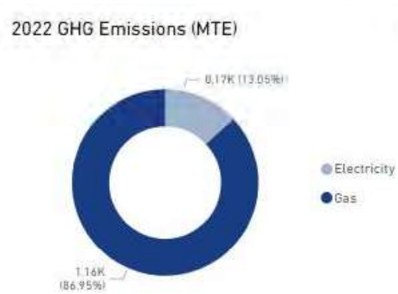
Top 10 Buildings With Highest Natural Gas Use

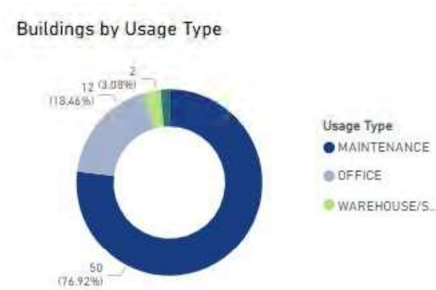
Facility Name	2022 Gas Usage (Therms)
POLICE ADMINISTRATION BUILDING (PAB)	181,750
METROPOLITAN DETENTION CENTER (MDC)	82,250
VAN NUYS COMMUNITY POLICE STATION	67,380
AHMANSON RECRUIT TRAINING CENTER (ARTC)	46,010
ELYSIAN PARK POLICE ACADEMY (LAPD POLICE ACADEMY)	36,830
77TH STREET COMMUNITY POLICE STATION	33,840
CENTRAL COMMUNITY POLICE STATION	25,600
MISSION COMMUNITY POLICE STATION	21,170
SOUTHEAST COMMUNITY POLICE STATION	18,030
WILSHIRE COMMUNITY POLICE STATION	17,310
Total	**530,170**

LOS ANGELES BUREAU OF STREET SERVICES (BSS)

Summary of Facilities	Facilities include yards, warehouses, asphalt plants.
Typical Operating Schedule	6 a.m.-3 p.m. or 6 a.m. –6 p.m. Other facilities open 24/7
Critical Resilience Needs	Facilities provide support to vehicles that support critical street services.
Typical HVAC System	Yards- mainly gas unit heaters and some packaged terminal air conditioner Warehouses- heating only with either gas unit heaters or gas boilers
Typical Water Heaters	80–100-gallon tank type water heaters
Typical Lighting	Most lighting is non-LED. 7th Steet yard was converted to LED.
Gas Process Equipment	Hot oil process heater at asphalt plants
Other Considerations	Most buildings are heating only and will require additional electrical infrastructure, possible utility service upgrade
Recommendations	Buildings generally have minimum heating demands. Consider as part of larger building maintenance and renewal efforts.
Number of Facilities	65
Gross Area	260,000 sf
Average Building Age	63 years
Average Electricity EUI	14.7 kBtu/sf-yr
Average Natural Gas EUI	6.4 kBtu/sf-yr
Facilities with Gas Use	47





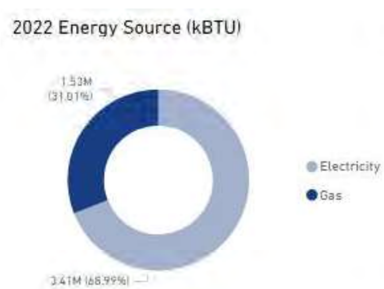


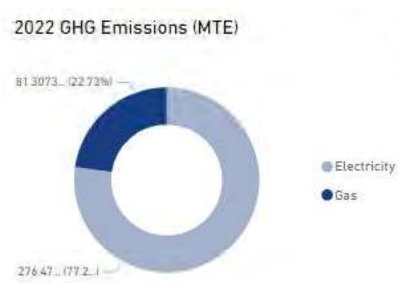
Top 10 Buildings With Highest Natural Gas Use

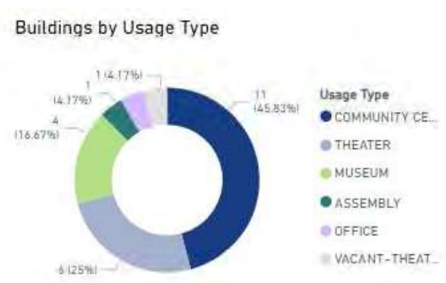
Facility Name	2022 Gas Usage (Therms)
SOUTHWEST DISTRICT STREET MAINTENANCE YARD	187,960
7TH ST CONSOLIDATED FACILITY-STREET SERVICES WAREHOUSE OFFICE	21,750
WILSHIRE DISTRICT STREET SERVICES YARD - NORTH GARAGE	1,110
WESTCHESTER DISTRICT STREET MAINTENANCE YARD - BUILDING A	1,060
GRANADA HILLS DISTRICT STREET MAINTENANCE YARD - REPAIR, GARAGE, TRUCK PORTS, AND OIL STORAGE BUILDING	1,000
VAN NUYS DISTRICT STREET MAINTENANCE YARD - GARAGE BUILDING	730
CANOGA PARK DISTRICT STREET MAINTENANCE YARD - GARAGE AND STORAGE BUILDING	600
NORTH HOLLYWOOD/STUDIO CITY DISTRICT MAINTENANCE YARD - GARAGE AND STORAGE BUILDING	570
WESTCHESTER DISTRICT STREET MAINTENANCE YARD - TRUCK PARKING AND CAR WASH	360
RESEDA/WOODLAND HILLS DISTRICT STREET MAINTENANCE YARD	350
Total	**215,490**

LOS ANGELES DEPARTMENT OF CULTURAL AFFAIRS (DCA)

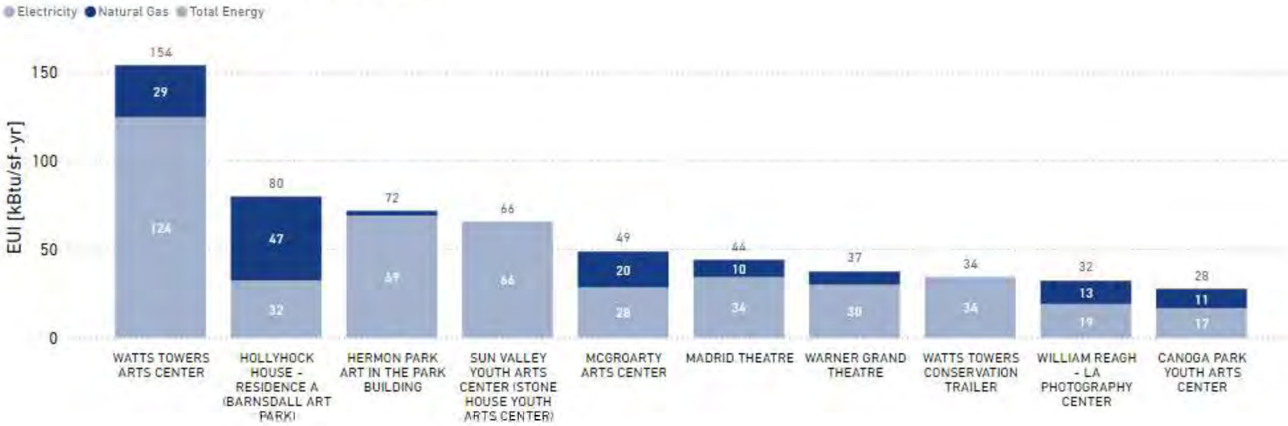
Summary of Facilities	Facilities include cultural centers, art centers, and theaters.
Typical Operating Schedule	Open 3 days a week, 3:00-5:30pm after school, Monday-Friday during winter and summer programming, two Saturdays a month
Critical Resilience Needs	Building generally do not provide critical services.
Typical HVAC System	Central heating and cooling, new MERV filters since COVID-19 pandemic, gas boilers or gas RTUs
Typical Water Heaters	Mainly gas water heaters, a few electric
Typical Lighting	Majority of lighting is non-LED. LED lighting conversion in progress for the Vision Theatre and upcoming for Taxco.
Gas Process Equipment	Vision Theatre has added a new gas line. Madrid has two gas-powered AC units.
Other Considerations	DCA is interested in solar canopies but concerned about cost. Roof replacement or repairs for the Barnsdall Art Park structures are a high priority. There are significant ongoing renovations of the theaters.
Recommendations	Consider as part of larger building maintenance and renewal efforts.
Number of Facilities	24
Gross Area	256,000 sf
Average Building Age	70.8 years
Average Electricity EUI	37 kBtu/sf-yr
Average Natural Gas EUI	11.9 kBtu/sf-yr
Facilities with Gas Use	16







2022 Top 10 Buildings by Energy Use Intensity

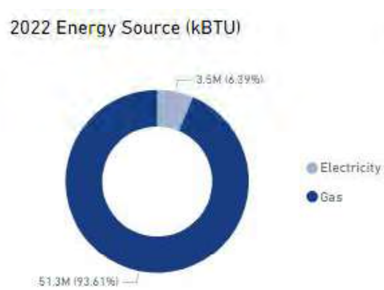


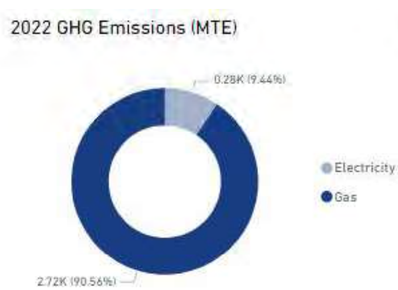
Top 10 Buildings With Highest Natural Gas Use

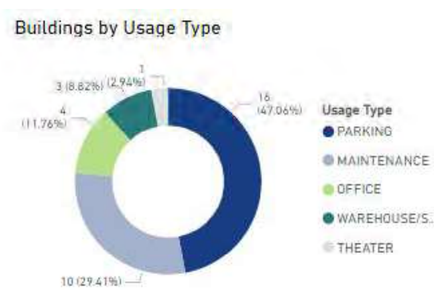
Facility Name	2022 Gas Usage (Therms)
WARNER GRAND THEATRE	2,960
HOLLYHOCK HOUSE - RESIDENCE A (BARNSDALL ART PARK)	2,370
NATE HOLDEN PERFORMING ARTS CENTER (EBONY REPERTORY THEATRE)	2,130
MADRID THEATRE	1,530
WATTS TOWERS ARTS CENTER	1,170
LOS ANGELES MUNICIPAL ART GALLERY	980
WILLIAM REAGH - LA PHOTOGRAPHY CENTER	970
MCGROARTY ARTS CENTER	600
BARNSDALL PARK - HOLLYHOCK HOUSE	510
CENTER FOR THE ARTS EAGLE ROCK	500
Total	**13,720**

LOS ANGELES DEPARTMENT OF TRANSPORTATION (DOT)

Summary of Facilities	Facilities include lots, offices, public counters, construction yards and bus maintenance yards.
Typical Operating Schedule	Some facilities are 24/7 such as parking enforcement Offices are often 9 a.m.-5 p.m.
Critical Resilience Needs	Yards are essential to provide maintenance to transportation vehicles, most LADOT facilities are considered critical
Typical HVAC System	Office spaces are typically air conditioned, additionally a few yards have some rooms with AC split units, generally older HVAC systems with mid-life equipment Mainly gas unit heaters and PTACs
Typical Water Heaters	Approximately half gas water heaters and half electric water heaters
Typical Lighting	Majority of lighting is non-LED, 2 facilities have begun the LED retrofit process.
Gas Process Equipment	Some facilities have CNG fueling stations. Natural gas from these processes were excluded.
Other Considerations	The LA Mall adjudication office has significant HVAC concerns that need to be addressed.
Recommendations	Buildings generally have minimum heating demands. Consider as part of larger building maintenance and renewal efforts.
Number of Facilities	34
Gross Area	1,395,000 sf
Average Building Age	53 years
Average Electricity EUI	
Average Natural Gas EUI	
Facilities with Gas Use	9

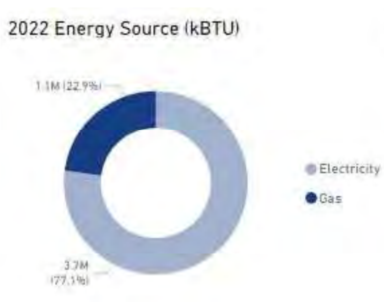


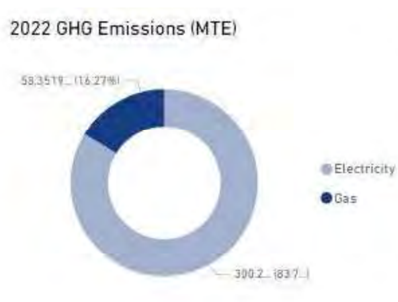


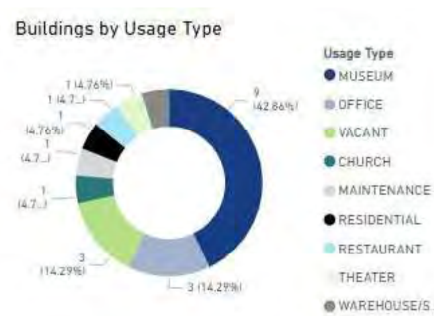


EL PUEBLO DE LOS ANGELES

Summary of Facilities	Facilities include museums, offices, and historic buildings with leased commercial spaces on ground level.
Typical Operating Schedule	Varies by building. Typically, 9am-6pm, Tuesday-Sunday.
Critical Resilience Needs	Buildings do not provide critical services.
Typical HVAC System	Mainly gas RTUs, a few gas boilers
Typical Water Heaters	Gas water heaters
Typical Lighting	Most lighting is original, non-LED
Gas Process Equipment	Within the leased commercial spaces there is natural gas cooking equipment which is managed by the lessees
Other Considerations	22-24 buildings are registered as cultural resources at the city and national level
Recommendations	Consider as part of larger building maintenance and renewal efforts.
Number of Facilities	21
Gross Area	145,000 sf
Average Facility Age	125 years
Average Electricity EUI	57.7 kBtu/sf-yr
Average Natural Gas EUI	52.9 kBtu/sf-yr
Facilities with Gas Use	4







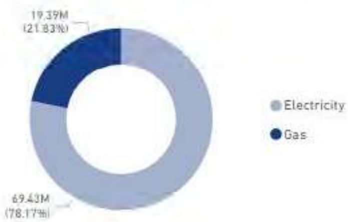
Top 10 Buildings With Highest Natural Gas Use

Facility Name	2022 Gas Usage (Therms)
EL PUEBLO DE LOS ANGELES CHINESE AMERICAN MUSEUM	9,380
EL PUEBLO DE LOS ANGELES - BISCAILUZ BUILDING	1,550
EL PUEBLO DE LOS ANGELES PLAZA SUBSTATION	50
EL PUEBLO DE LOS ANGELES PLAZA FIREHOUSE	0
Total	**10,980**

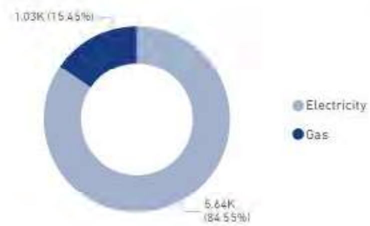
LOS ANGELES PUBLIC LIBRARY

Summary of Facilities	All facilities within this department are libraries
Typical Operating Schedule	Monday 10 a.m.-8 p.m. Tuesday 12 p.m.-8 p.m. Wednesday 10 a.m.-8 p.m. Thursday 12 p.m.-8 p.m. Friday 9:30 a.m.-5:30 p.m. Saturday 9:30 a.m.-5:30 p.m. Sunday Closed at some locations, some offer 1 p.m.-5 p.m. Cooling Centers open during summer
Critical Resilience Needs	Cooling Centers during summer months
Typical HVAC System	Rooftop units with AC cooling and gas heating 3 Cooling towers and boilers at central library Vermont has small cooling tower
Typical Water Heaters	Mainly gas heaters, some electric heaters
Typical Lighting	Most buildings have original lighting, non LED. Lighting fixtures in library stacks are atypical and more expensive to retrofit with LED fixtures.
Gas Process Equipment	Old gas ovens/ranges, trying to transition to electric ovens
Other Considerations	Most libraries are older and have a significant need for upgrades Central Library has a rare book are with specific humidity controls
Recommendations	Pursue electrification projects during equipment replacement or through larger portfolio implementation efforts.
Number of Facilities	75
Gross Area	1,434,000 sf
Average Facility Age	42 years
Average Electricity EUI	57.7 kBtu/sf-yr
Average Natural Gas EUI	11.9 kBtu/sf-yr
Facilities with Gas Use	72

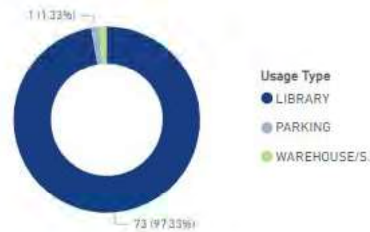
2022 Energy Source (kBTU)



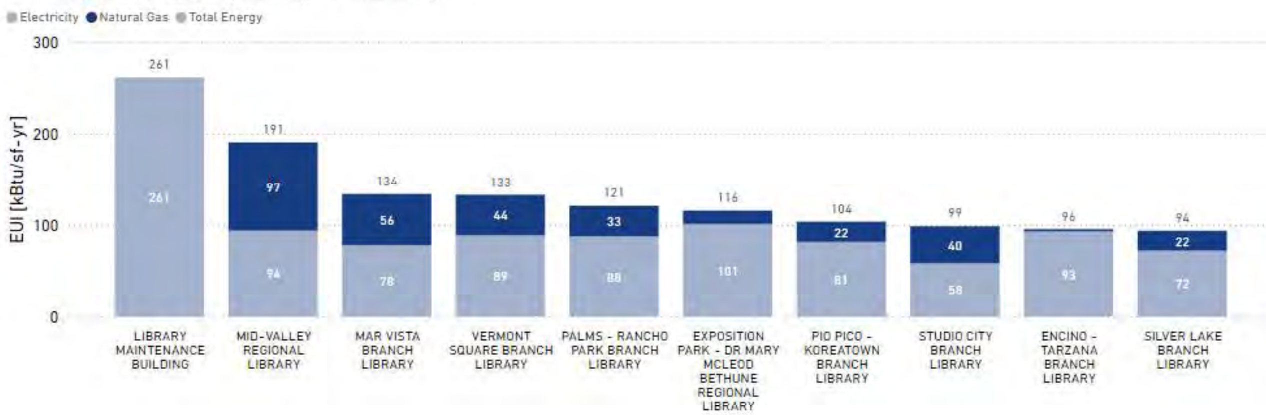
2022 GHG Emissions (MTE)



Buildings by Usage Type



2022 Top 10 Buildings by Energy Use Intensity

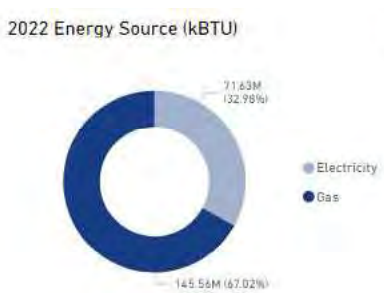


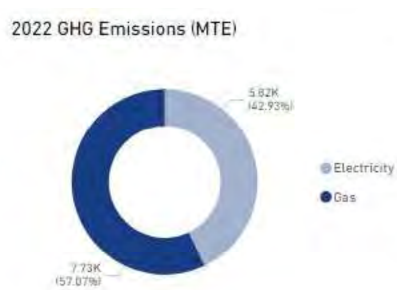
Top 10 Buildings With Highest Natural Gas Use

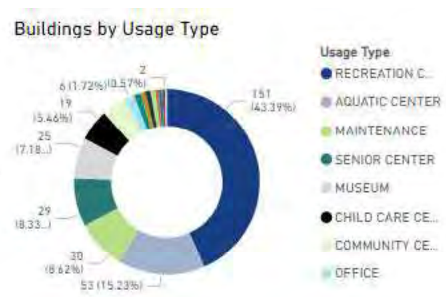
Facility Name	2022 Gas Usage (Therms)
CENTRAL LIBRARY	81,340
MID-VALLEY REGIONAL LIBRARY	27,120
MAR VISTA BRANCH LIBRARY	7,020
STUDIO CITY BRANCH LIBRARY	4,660
PIO PICO - KOREATOWN BRANCH LIBRARY	4,450
VERMONT SQUARE BRANCH LIBRARY	3,880
PALMS - RANCHO PARK BRANCH LIBRARY	3,520
GRANADA HILLS BRANCH LIBRARY	3,400
MARK TWAIN BRANCH LIBRARY	3,000
SILVER LAKE BRANCH LIBRARY	2,990
Total	**141,380**

DEPARTMENT OF RECREATION AND PARKS (RAP)

Summary of Facilities	Facilities include recreation centers, aquatic centers, and museums, as well as an observatory, aquarium, and central service yard
Typical Operating Schedule	7 days a week all year 5:30 a.m. – 10:30 p.m.
Critical Resilience Needs	Recreation centers in the Valley and South LA provide cooling in the summer. Some selected emergency operation centers
Typical HVAC System	Mainly gas RTUs, some gas unit heaters, gas boilers, furnaces, and PTACs
Typical Water Heaters	Gas water heaters
Typical Lighting	Most buildings have original lighting, non LED. Most fixtures are standard can and troffer lights.
Gas Process Equipment	Warming kitchens at most recreation centers including stove, oven, and refrigerators
Other Considerations	
Recommendations	Pursue electrification projects during equipment replacement or through larger portfolio implementation efforts. Aquatic centers will be complex and require capital improvement project.
Number of Facilities	348
Gross Area	3,329,000 sf
Average Facility Age	52 years
Average Electricity EUI	36.3 kBtu/sf-yr
Average Natural Gas EUI	53.33 kBtu/sf-yr
Facilities with Gas Use	251





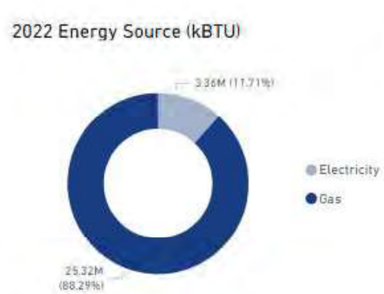


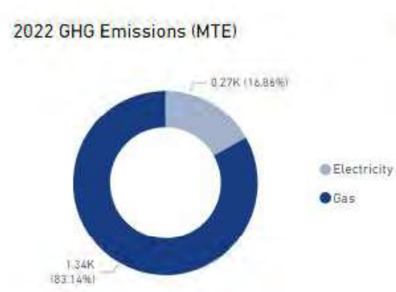
Top 10 Buildings With Highest Natural Gas Use

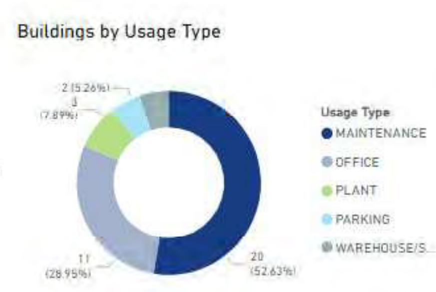
Facility Name	2022 Gas Usage (Therms)
AHMANSON SENIOR CITIZEN CENTER	140,700
EXPO CENTER - LA84 FOUNDATION/JOHN C ARGUE SWIM STADIUM	139,060
VAN NUYS SHERMAN OAKS RECREATION CENTER	81,380
VAN NUYS SHERMAN OAKS POOL	80,130
ECHO PARK DEEP POOL	52,350
GLASSELL PARK POOL	51,910
LINCOLN PARK RECREATION CENTER/SENIOR CENTER	41,810
LINCOLN PARK POOL	40,450
YOSEMITE RECREATION CENTER	38,520
VAN NESS AQUATIC CENTER	38,040
Total	**704,350**

LOS ANGELES SANITATION DEPARTMENT (LASAN)

Summary of Facilities	Offices, headquarters, maintenance yards, pumping plants, landfills, buildings that house equipment, and water treatment facilities (not included in scope)
Typical Operating Schedule	Most office and maintenance yards are standard 9-5 operations. Some facilities have extended or 24/7 operations.
Critical Resilience Needs	Facilities support the sanitation department to provide critical city services.
Typical HVAC System	Primarily gas unit heaters and gas boilers
Typical Water Heaters	Mainly gas water heaters, some electric
Typical Lighting	Most lighting is original, non LED.
Gas Process Equipment	Minimal gas process equipment.
Other Considerations	
Recommendations	Consider as part of larger building maintenance and renewal efforts. Hyperion plan is largest source of natural gas.
Number of Facilities	38
Gross Area	299,000 sf
Average Facility Age	32 years
Average Electricity EUI	Variable
Average Natural Gas EUI	Variable
Facilities with Gas Use	31







Top 10 Buildings With Highest Natural Gas Use

Facility Name	2022 Gas Usage (Therms)
HYPERION TREATMENT PLANT BUILDINGS	153,460
TERMINAL ISLAND WATER RECLAMATION PLANT	31,960
WEST VALLEY SOLID COLLECTION YARD (BUILDING C TRUCK REPAIR)	11,060
WEST VALLEY SOLID RESOURCES COLLECTION YARD-ADMINISTRATION BUILDING	8,960
LASAN NORTH DISTRICT SEWER MAINTENANCE YARD - ADMINISTRATION AND SHOPS BUILDING	8,950
WEST VALLEY SOLID COLLECTION YARD (BUILDING A TRUCK REPAIR)	6,460
WEST VALLEY SOLID RESOURCES COLLECTION YARD-LOCKER/LUNCH AND GYM FACILITY	5,260
7TH ST CONSOLIDATED FACILITY-TRUCK MAINTENANCE SHOP	4,560
7TH ST CONSOLIDATED FACILITY-SANITATION OFFICE & LOCKER ROOMS	3,230
WEST VALLEY SOLID RESOURCES COLLECTION YARD	2,930
Total	**236,830**

A.9. JOBS IMPACT ASSESSMENT

SUMMARY

The City of Los Angeles has initiated a comprehensive plan to decarbonize its municipal buildings, embracing an approach that encompasses retrofitting existing structures with energy-efficient technologies, integrating renewable energy systems, and applying green building practices in the construction of new municipal facilities. This initiative is a component of the city's broader strategy to combat climate change and promote sustainable development. By focusing on reducing greenhouse gas emissions through these measures, Los Angeles aims not only to mitigate its environmental impact but also to stimulate economic growth and job creation. The implementation of this decarbonization strategy is expected to lead to significant direct, indirect, and induced employment opportunities, fostering advancements in the local economy while contributing positively to environmental sustainability.

Our analysis, using the IMPLAN model, provides a detailed estimation of the economic and employment impacts of the decarbonization efforts within Los Angeles. The model incorporates county data, offering a broader perspective on the economic implications, and quantifies anticipated job creation and financial benefits from these initiatives. Results indicate that the City's municipal decarbonization workplan have result in annual employment gains and will increase the City's and overall output and tax revenues. These benefits significantly outweigh any potential negative job impacts from transitioning away from fossil fuel based heating systems.

Based on these findings, our recommendations include continuing investment in decarbonization, focusing on workforce development to prepare for green jobs, and enhancing stakeholder engagement to align these efforts with wider economic and workforce development objectives. This initiative not only supports Los Angeles's commitment to environmental stewardship but also underscores the potential for green infrastructure projects to drive job creation and economic resilience.

METHODOLOGY

Model

IMPLAN is a tool that provides economic impact data and analysis. It caters to a wide audience, including researchers, policymakers, business professionals, and government entities, addressing their economic data requirements. Originally developed in the 1970s, IMPLAN has evolved to become a versatile tool for economic analysis across various regions, offering insights into the economic impacts and contributions of activities within specific geographic areas through its software and data applications. Its data production and impact estimation methods are well-documented in both academic and professional circles, reflecting widely accepted practices in applied economics.

IMPLAN's model is static, focusing on backward linkages without accounting for price changes, forward linkages, or general equilibrium effects. It assumes a steady state of consumer preferences, government policies, technology, and prices, providing a snapshot of economic relationships within a specified period.

Methodology

The IMPLAN tol employs Input-Output analysis and a Social Accounting Matrix to understand the economic interdependencies within an economy. This approach tracks the flow of goods and services between industries and households, analyzing the economic consequences of different demands and the resources needed to fulfill them.

The analysis employed the IMPLAN model to estimate the direct, indirect, and induced effects of decarbonizing municipal buildings on employment in Los Angeles. The model's comprehensive economic databases and advanced modeling capabilities allowed for an assessment of both the economic interactions and ripple effects generated by the investments. Key inputs into the model included projected expenditures on decarbonization projects, expected savings on electricity and gas for the City, the specific industries involved in providing goods and services for these projects, and the current economic structure of Los Angeles.

IMPLAN produces results for one year, so all forecasted expenditures were adjusted to a present value annual average in the following way:

1. Anticipated annual spending on capital improvement, solar + storage, and equipment replacement, were taken from forecasted investment totals.
2. The present values (PV) of these investment values were calculated by discounting the annual forecasts with a 5% discount rate.
3. The PVs for these expenditures were then annualized by dividing by 12 years, spreading the benefits of both scenarios over a 12-year horizon. This allows for a direct comparison of annual impact even though the two scenarios represent two different time horizons.

$$^{PV\ investments}/_{12\ years}$$

4. Since energy savings would be realized gradually over time, the energy savings was modeled as gradually increasing to the total amount.
5. Anticipated annual electricity and natural gas cost savings were calculated by multiplying the energy reductions (reduced kWh and therms) by an electricity and gas rate plus an escalator. This yielded an annual cost savings for both electricity and gas for the City.
6. Since the energy savings of the early retirement savings would continue after 12 years, the benefits were extended to 25 years, to match savings from the end-of-life retirement plan.
7. An annualized PV for these savings were also calculated using the same process as described above.

$$^{PV\ energy\ savings}/_{12\ years}$$

8. Finally, since the model produces County numbers, the results scaled to reflect the City of Los Angeles by multiplying county results by 39%, which is the ratio of LA City to LA County

Assumptions and Inputs

Foundational assumptions embedded in IMPLAN's models include constant returns to scale, a fixed input structure, industry homogeneity, absence of supply constraints, and specific technological and production assumptions. Further, The reliability of analyses depends on the user's input definitions and awareness of the model's assumptions. The assumptions used are outlined below:

Table 30: Assumptions used in the Analysis

Input	Value	Unit
LA County Population	9.83	million
LA City Population	3.85	million
Total Investment	2,250	$
Investment timeline	2024-2035	years
Discount Rate	5%	%
Escalator	3%	%
Energy Projects (% of Total)	90%	%
Solar and Storage % of Total	10%	%
Annual Electricity Savings	4,735,250	kWh
Annual Natural Gas Savings	357,250	therms
Avg. Electricity Rate 2023	0.15	$/kWh
Avg. Natural Gas Rate 2023	1.60	$/therm

Outputs

Findings from the analysis include an anticipated number of jobs created directly, indirectly and induced. Directly created jobs are those result directly from the investments. Indirect jobs are those that are created from the economic activity stimulated by the initial spending or investment. This includes employment in the supply chain that provides goods and services to the primary project or industry and jobs created when employees in the direct and indirect sectors spend their incomes on goods and services in the broader economy. An indirectly created job is a position generated to support direct jobs, such as manufacturing goods and services needed by direct workers. Finally, induced jobs are those created by the additional personal spending of both direct and indirect workers, such as eating at a restaurant or buying goods and services with their incremental income.

Two additional impacts of the investments are also calculated. The first is the impact on production output that the investments will create, and the second is the tax implications. In both cases the impact is positive: investments in decarbonization are expected to increase City output and increase tax revenues. Input-Output (I-O) Analysis is designed to show the ripple effects of a given economic activity in other Industries and geographies through input purchases, labor payments, and trade. Production in a given Industry supports demand for production in other Industries throughout the economy, both due to supply chain spending and spending by workers.[45]

[45] https://support.implan.com/hc/en-us/articles/360038285254-How-IMPLAN-Works.

JOBS IMPACT:
The impact of the decarbonization strategies outlined in this report is summarized in the following Tables. Results are based on the category of job creation, the number of jobs, and the labor income expected to be generated from those jobs. The job creation results are the average annual jobs created, based on an annualized investment schedule. The City will see higher annual job creation if the decarbonization program investment timeline is focused on higher impact in earlier years.

Table 31: Average Annual Employment Gains (Los Angeles County)

Impact	Employment (Jobs)	Labor Income ($)
Direct	645	$49,050,000
Indirect	262	$21,000,000
Induced	255	$16,750,000
TOTAL	**1,162**	**$86,800,000**

It is expected that the municipal decarbonization program will have a small impact the fossil fule industry in Los Angeles County. These would come in the fossil fuel electric power generation and natural gas distribution sectors but are expected to be less than two full-time equivalent positions.

Table 32: Fossil Fuel Industry Jobs Impact (Los Angeles County)

Jobs Category	Employment (Jobs)
Fossil Fuel Power Generation (direct)	-0.71
Natural Gas Distribution (direct)	-1.20

Additional Financial Impacts:
Investments in decarbonization are also expected to increase the overall output of the City and County, plus provide additional tax revenue, as shown below. The output column for each scenario describes the expected incremental output that results from the decarbonization investments. Similarly, the Sub-County Taxes column indicates the expected tax revenues that will accrue to cites (including LA City) within the County.

Table 33: Average Annual Output and Tax Changes

Impact	Output ($)	Sub-County Taxes ($)
Direct	$48,616,609	
Indirect	$19,337,652	
Induced	$13,166,259	
TOTAL	**$81,120,519**	**$846,400**

CONCULSTIONS AND RECOMMENDATIONS

Decarbonizing municipal buildings in Los Angeles City presents a promising pathway to combat climate change while simultaneously boosting local employment and economic development. The findings from our IMPLAN analysis underscore the potential of green infrastructure projects to serve as a catalyst for job creation across a wide range of sectors. As Los Angeles continues to invest in sustainable and energy-efficient technologies, the economic and environmental benefits of these initiatives will play a crucial role in shaping a more resilient and prosperous future for the city.
Based on the findings, we recommend the following actions for policymakers and stakeholders:

1. **Continue Investment:** Allocate further resources to accelerate the decarbonization of municipal buildings, maximizing the employment and environmental benefits.
2. **Workforce Development:** Invest in training programs to equip the local workforce with the skills needed for green jobs, ensuring that employment benefits are fully realized.
3. **Stakeholder Engagement:** Collaborate with industry partners, community organizations, and educational institutions to align decarbonization efforts with broader economic and workforce development goals.

LOS ANGELES' EQUITABLE ENERGY TRANSITION

Los Angeles has been actively working on decarbonization strategies, and the City has assessed the employment impact of transitioning to a more sustainable and low-carbon economy. For example, initiatives such as the Green New Deal LA are aimed to create green jobs while reducing carbon emissions.[46] Los Angeles' Green New Deal, announced in 2019, sets forth an ambitious plan to transform the city into a sustainable and carbon-neutral metropolis by 2050. A key aspect of this plan is the focus on building decarbonization and its impacts on employment.

One of the Green New Deal's primary targets includes making all buildings in Los Angeles net zero carbon by 2050. This involves a comprehensive shift from conventional energy sources to renewable energy and high-efficiency electric appliances. This transition in the building sector is a significant part of the city's strategy to reduce harmful emissions and combat climate change.
A notable goal within the Green New Deal is the creation of 400,000 green jobs by 2050. These jobs are expected to emerge from various sustainable initiatives, including the transition to renewable energy sources, the electrification of transportation, and the decarbonization of buildings. The focus on green jobs aims to bolster the city's economy and provide new employment opportunities in emerging green industries.

Mayor Eric Garcetti's plan includes a commitment to uphold the Paris Climate Agreement, ensuring environmental justice and equity through an inclusive green economy, and creating pathways for residents to join the green economy with good-paying, green jobs. The Green New Deal also emphasizes leading by example within city government and showing the world what an urban Green New Deal looks like in practice.

Employment impact assessments of Los Angeles' decarbonization efforts, particularly in the transportation and building sectors, reveal significant job creation potential, although there are also challenges associated with the transition away from fossil fuels. One study entitled, "*Los Angeles Building Decarbonization: Community Concerns, Employment Impacts, and Opportunities*,"[47] addresses several critical aspects of building decarbonization in Los Angeles, focusing on the economic impact, community concerns, and employment opportunities.

[46] **https://plan.lamayor.org/sites/default/files/pLAn_2019_final.pdf**
[47] **https://www.nrdc.org/sites/default/files/los-angeles-building-decarbonization-jobs-impacts-report-20211208.pdf**.

One major concern of building decarbonization is to ensure that the transition remains equitable. The decarbonization process must prioritize vulnerable communities, including those with lower incomes and communities of color, who disproportionately suffer the effects of poor air quality and climate impacts. Policies must be centered around tenant and worker protections to avoid exacerbating existing inequalities. For instance, regulations need to be enacted to prevent landlords from passing the upfront costs of these upgrades onto renters, many of whom are already facing financial difficulties.

The employment aspect of building decarbonization is also significant. It is estimated that an ambitious efficiency and electrification program in Los Angeles could create around 18,000 new, full-time jobs over 29 years. These jobs would primarily come from the private construction market. However, it is crucial to ensure that these jobs are of high quality, with robust labor and apprenticeship standards. Public investments should be directed towards sectors with higher labor standards or include targeted hiring and capacity building for specific populations.

The Luskin Center indicates a major opportunity for job creation. This transformation, which involves energy efficiency improvements and switching from fossil fuels to electricity powered by renewable energy in residential and commercial buildings, could support more than 100,000 jobs annually over 25 years. This calculation considers the job losses in the fossil fuel industry, underscoring the net positive impact of decarbonization on employment.

BACKGROUND RESEARCH

Building decarbonization is a critical component in the global effort to combat climate change. However, the importance of building decarbonization lies not only in its environmental benefits but also in its socio-economic impacts, particularly regarding employment. When a city such as Los Angeles embarks on a building decarbonization effort, it initiates a transformative process that reshapes the urban landscape and the economy. This transition presents both challenges and opportunities in terms of employment.

Employment impacts of building decarbonization in Los Angeles may be significant. There is a potential for job loss in industries tied to traditional energy sources, such as natural gas and oil. Workers in these sectors may face uncertainty as the demand for fossil fuels diminishes. However, decarbonization efforts open up new opportunities in green jobs. These include roles in renewable energy (such as solar and wind power installation), energy efficiency retrofitting of existing buildings, and the construction of new, energy-efficient structures. These jobs not only contribute to reducing emissions but also can stimulate the local economy and provide employment opportunities in cutting-edge industries.

There is also an educational and training aspect to consider. As Los Angeles shifts towards a decarbonized urban environment, the need for skilled workers in green sectors will grow, requiring an investment in education and training programs to equip the workforce with the necessary skills to thrive in a decarbonizing economy. Understanding and managing the employment impacts of this transition is crucial for ensuring that the move towards a sustainable future is inclusive, equitable, and beneficial for all segments of society.

NATIONAL OVERVIEW: THE DECARB AMERICA RESEARCH INITIATIVE

The Decarb America Research Initiative has provided valuable insights into the potential economic impacts of nationwide decarbonization efforts, particularly focusing on job creation. One of the key findings of this initiative is the prediction of a net increase of over 2 million jobs by 2050. This projection is based on the comprehensive transition toward renewable energy sources, energy efficiency measures, and other decarbonization strategies across various sectors. [48]
According to the initiative, the sectors expected to experience significant job growth due to decarbonization include:

Manufacturing

As the demand for renewable energy technologies such as solar panels, wind turbines, and batteries for energy storage rises, the manufacturing sector is poised to see substantial growth. This sector will not only be involved in producing renewable energy equipment but also in developing energy-efficient appliances and building materials, contributing to job creation.

Construction

A major component of decarbonization involves retrofitting existing buildings to make them more energy-efficient and constructing new buildings that adhere to high energy efficiency standards. This effort requires a significant workforce, thereby boosting employment in the construction industry. This includes jobs in HVAC (heating, ventilation, and air conditioning), insulation, and sustainable building materials.

Health Care

Decarbonization efforts indirectly benefit the healthcare sector. Improved air quality and reduced pollution lead to better public health outcomes, potentially increasing demand for healthcare

[48] **https://decarbamerica.org/report/employment-impacts-in-a-decarbonized-economy/**.

services and professionals. Additionally, healthcare facilities themselves will need to adapt to more energy-efficient operations.

Education

The transition to a decarbonized economy requires a workforce equipped with new skills and knowledge. This demand will drive job growth in education, particularly in fields related to environmental science, engineering, and sustainability. Educational institutions will likely expand their offerings to include more courses and programs focused on these areas.

Entertainment

The entertainment industry, including film, television, and digital media, is increasingly adopting sustainable practices. This transition involves utilizing renewable energy sources, reducing waste, and employing sustainable production methods. The shift not only creates direct jobs in sustainable practice implementation but also promotes a culture of sustainability in content, influencing wider public awareness and behavior.

The Initiative's findings underscore the multifaceted benefits of decarbonization, extending beyond environmental impact to significant economic and social advantages. Predicted job growth across diverse sectors highlights the holistic nature of the transition to a low-carbon economy, offering opportunities for employment and innovation while steering the nation towards a more sustainable future.

ADDITIONAL CASE STUDIES

The *Decarb America Research Initiative*[49] is a national study that highlights the potential for job creation in sectors like energy efficiency, transmission & distribution, and CO2 pipelines[50]. With a focus on achieving net-zero emissions, this study foresees substantial employment growth, projecting the creation of hundreds of thousands of jobs. According to the Initiative, many of these jobs will be created through the electric vehicle sector, but many will arise through construction and green tech opportunities from building decarbonization efforts.
In addition, several major U.S. cities have undertaken employment impact assessments of decarbonization activities. Though not focused solely on the impact of decarbonization of municipal assets, the following case studies highlight several city studies that have been undertaken and their findings.

Case Study: San Francisco, California

The city of San Francisco is extremely optimistic about the employment opportunities presented by nascent decarbonization initiatives. The city estimates that executing all key actions and initiatives from the city’s climate action plan will lead to substantial and sustained increases in citywide employment and wages.

San Francisco's decarbonization efforts, particularly through increasing housing stock and green energy infrastructure, are expected to significantly boost employment. Building new homes and increasing urban density not only generate construction jobs but also enhance service sector employment by enabling more people to live and spend their incomes in the city. Additionally, green energy projects, including electrification and green hydrogen initiatives like the Angeles Link pipeline and Sea Change ferry, are set to create thousands of jobs in construction, maintenance, and research. The "*Funding San Francisco Climate Action - CLEE Report*"[51] emphasizes the employment

[49] https://decarbamerica.org/
[50] https://decarbamerica.org/report/employment-impacts-in-a-decarbonized-economy/
[51] law.berkeley.edu/wp-content/uploads/2022/11/Funding-San-Francisco-Climate-Action-Nov.-2022.pdf.

potential in active transportation and green construction apprenticeships, highlighting how climate action can drive economic growth and job creation.

Case Study: New York City, New York

New York is also seeking to foster job growth through building decarbonization, renewable energy, and sustainable development. New York's decarbonization efforts are expected to be major job growth areas. Initiatives like the *NYC Carbon Challenge*[52] and strategies from Mayor Adams' administration, including *Getting 97 Done*[53] and *PlaNYC: Getting Sustainability Done*,[54] focus on retrofitting buildings and advancing clean energy, point to employment opportunities in construction, technology integration, energy optimization, and more. The involvement of entities like the Federal Reserve Bank of New York and the New York State Energy Research and Development Authority (NYSERDA) underscores the economic potential in sustainable housing, climate tech innovations, and renewable energy projects, highlighting a future rich in job creation across diverse, sustainable sectors.

Through the *NYC Carbon Challenge*, NYC is collaborating with the real estate industry to drive sustainable development and reduce emissions. This initiative, with its focus on retrofitting buildings with energy-efficient technologies, is said to hold significant potential for job creation in construction, technology integration, and energy system optimization.
Additional initiatives that focus on climate tech innovations and renewable energy projects, and are supported through the *New York State Energy Research and Development Authority* (NYSERDA), are also expected to result in net job creation. Programs in carbon management, clean transportation, energy storage, and hydrogen suggest potential job growth in these cutting-edge sectors[55].

Case Study: Chicago, Illinois

The *Chicago Building Decarbonization Working Group Recommendations Report*,[56] developed collaboratively by the Mayor's Office, Elevate, and the Natural Resources Defense Council, outlines strategies that directly impact employment opportunities in Chicago. By focusing on reducing fossil fuel use, improving building energy performance, and providing financial and technical support, the report suggests ways to develop equitable co-benefits, including job creation within green sectors, by ensuring that Chicago's workforce actively participates in and benefits from the city's decarbonization initiatives.

Mayor Brandon Johnson's *Residential Decarbonization and Retrofit Program* is also a likely driver of employment opportunities in Chicago. By aiming to provide home upgrades for low- and moderate-income homeowners, the program generates demand for local contractors skilled in energy-efficient equipment installation[57]. This targeted approach should also create job opportunities, particularly benefiting BIPOC workers and business owners. The initiative, therefore, not only contributes to residential decarbonization but also actively supports employment within the local community.
Chicago's *Cumulative Impact Assessment*,[58] while primarily designed to understand environmental burdens, offers valuable insights into employment opportunities. The accompanying policy

[52] https://www.nyc.gov/html/gbee/downloads/pdf/NYC%20Carbon%20Challenge_2018_Progress%20Report.pdf
[53] https://climate.cityofnewyork.us/initiatives/getting-97-done/
[54] https://climate.cityofnewyork.us/initiatives/planyc-getting-sustainability-done/
[55] https://www.nyserda.ny.gov/About
[56] https://www.chicago.gov/city/en/depts/mayor/press_room/press_releases/2022/october/ChicagoBuildingDecarbonizationWorkingGroupReport.html
[57] https://www.chicago.gov/city/en/depts/mayor/press_room/press_releases/2023/july/ResidentialDecarbonizationRetrofitProgram.html
[58] https://www.chicago.gov/content/dam/city/depts/cdph/environment/CumulativeImpact/oct-update/CIA_ExecutiveSummary_9.17.23_v3.pdf

recommendations, especially those related to environmental protection and sustainable development, carry implications for job creation. This initiative underscores Chicago's holistic approach, ensuring that as the city addresses environmental concerns, it simultaneously considers and maximizes employment opportunities within sectors vital for sustainable growth.

Developing an Equitable Building Decarbonization Strategy for Chicago,[59] outlines a plan to slash emissions through energy efficiency, renewable energy, and electrification, but with a twist: prioritizing underserved communities that have suffered disproportionately from pollution and lack access to upgrades. The approach holds the potential to create thousands of "green jobs" in areas like building weatherization, renewable energy installation, and clean technology manufacturing. The report proposes key strategies including establishing a Green Bank for financing projects, offering grants and low-interest loans, and providing workforce training. It even suggests creating a central "Building Decarbonization Hub" with local branches in priority areas, ensuring everyone has access to resources and can participate in this green transformation. By following this roadmap, Chicago can pave the way for a more equitable and sustainable future, where a healthier planet goes hand-in-hand with a thriving economy and empowered communities.

Case Study: Denver, Colorado

Colorado's decarbonization efforts, as outlined by McKinsey, involve actions across several sectors, including agriculture, buildings, industry, power, and transportation[60]. These efforts are expected to require changes in practices and technologies, potentially creating new employment opportunities. For example, the agriculture sector might see changes in food production methods, while the building sector could see investments in efficient lighting and electric appliances. The industry sector may see shifts towards clean fuels and carbon capture technologies. These sector-wise transformations imply a reorientation of job skills and opportunities and can be expected to lead to extensive new job opportunities for tradespeople and other skilled professionals.

However, decarbonization efforts in the greater Denver metropolitan area will not be without employment disruption. Denver sits in the middle of the Denver-Julesburg basin, a geological formation blessed with rich oil and natural gas deposits, particularly in the north towards the Wyoming border. Employees in this sector are deeply interwoven into the economy of the greater Denver metro area. Comprehensive decarbonization efforts that shutter or reduce the operations of these plants will undoubtedly result in employment loss in this sector. That being said, the Denver oil and natural gas sector has already been contracting as a result of failure to compete on price and is likely to continue to fall even without decarbonization initiatives[61].

[59] https://www.chicago.gov/content/dam/city/progs/env/2022/Final-2022-Building-Decarb-City-Document.pdf

[60] https://www.mckinsey.com/capabilities/sustainability/our-insights/colorados-path-to-net-zero-greenhouse-gas-emissions-by-2050

[61] https://www.naturalgasintel.com/colorado-oil-natural-gas-activity-rising-but-employment-still-at-15-year-low/

A.10. COST ESTIMATES

This section provides information about cost estimate assumptions utilized in the Municipal Building Decarbonization Workplan.

COST METHODOLOGY
The City of Los Angeles has committed to carbon neutral municipal operations by 2035. Achieving this goal requires electrifying natural gas equipment and implementing energy efficiency measures at over 1,000 buildings. Cost estimates for various decarbonization measures at representative buildings types were developed by OCMI. Cost estimates for the various measures and building types were then generalized and applied across the building portfolio. Decarbonization measures and pricing approach are shown in the table below.

Decarbonization Measures	Existing Equipment Type	Pricing Metric
HVAC Electrification: Heat Pump RTU	RTU with Natural Gas Heat	$ / unit
HVAC Electrification: Split Systems or Packaged Terminal Heat Pump	Natural Gas Furnace or Similar	$ / ton
HVAC Electrification: Hydronic Air Source Heat Pumps	Natural Gas Boiler	$ / MBH
DHW Electrification: Tank Type Heat Pump Water Heater	Tanked Natural Gas Water Heater (up to 100 gallons)	$ / unit
DHW Electrification: Built Up Heat Pump Hot Water Heater	Large Domestic Hot Water Boilers with Separate Storage Tank	$ / unit
Pool Heating Electrification: Hydronic Air Source Heat Pumps	Natural Gas Boiler	$ / square foot
Cooking Electrification: Fire Station or other Small Kitchen	Natural Gas Range & Oven	$ / building
Laundry Electrification: Electric Washers and Dryers	Natural Gas Washer & Dryer	$ / building
LED Lighting Upgrade	Fluorescent or Other	$ / square foot
Solar PV	Not Applicable	$ / kW

Cost estimates provided include a general contractor markup of 43%. This markup includes overhead and profit, design contingency, escalation, bonds and market condition. Costs also include a 35% soft cost markup to account for design, project management and contingency.

Markup / Soft Costs	Percentage
General Contractor Markup	43%
Soft Cost (Labor/Non-Labor)	35%
Additional Contingency	0-30%

Additional contingency was applied to overall program costs.

COST ASSUMPTIONS

1. HVAC Electrification

Costs for various tonnages of heat pump rooftop units were provided. These costs were then generalized to an average $/ton number for use across the building portfolio.

RTU Tonnage	Total GC Cost $/Unit	Soft Cost	Total Cost	$/Ton
5	$52,629	$12,881	$65,510	$13,102.04
10	$89,410	$21,884	$111,294	$11,129.36
25	$172,159	$42,137	$214,296	$8,571.83
50	$308,486	$75,504	$383,990	$7,679.79
Average				**$10,120.76**

Costs for various MBH capacities of hydronic air to water heat pumps were provided. These costs were then generalized to a max $/MBH number for use across the building portfolio.

AWHP MBH Capacity	Total GC Cost $/Unit	Soft Cost	Total Cost	$/MBH
500	$130,585	$31,961	$162,546	$325.09
1000	$214,098	$52,402	$266,500	$266.50
2000	$354,970	$86,881	$441,851	$220.93
4000	$589,283	$144,230	$733,513	$183.38
Max				**$325.09**

Costs for various tonnage capacities of electric split systems were provided. These costs were then generalized to a max $/Ton number for use across the building portfolio.

Split System Tonnage	GC Cost $/Unit	Soft Cost	Total Cost	$/Ton
3	$17,013	$4,164	$21,177	$7,059.01
5	$25,916	$6,343	$32,259	$6,451.82
10	$44,625	$10,922	$55,547	$5,554.72
Max				**$7,059.01**

2. Domestic Hot Water Electrification
Costs for tank type and built up heat pump hot water heaters were provided. Costs were extrapolated across the building portfolio assuming a quantity of water heaters per building size and $/unit for the two water heater types.

DHW System	GC Cost	Soft Cost	Total Cost	Cost Method
Tank Type Heat Pump Hot Water Heater (40-100 gallon)	$17,412	$4,262	$21,674	$/unit
Large Built Up Heat Pump Hot Water Heater	$125,529	$30,724	$156,253	$/unit

Building Size	Quantity of WH
100	1
1,000	1
10,000	1
50,000	2
100,000	3
300,000	4

3. Pool Heating
Costs were provided for electrification of a representative pool with 4,000 MBH water heater. Cost for electrical service size upgrades were included. The representative pool heater cost was divided by the average pool square footage and then applied across the portfolio using a $/SF metric.

Pool System	GC Cost	Soft Cost	Total Cost
4000 MBH + Elec Service	$830,661	$203,309	$1,033,970

4. Cooking & Laundry
Costs for residential type cooking and laundry equipment were provided for various building types where the measures are applicable. Costs were then applied across the building portfolio as a $/building metric.

Cooking Measure	GC Cost	Soft Cost	Total Cost	Cost Method
Childcare Center	$7,306	$1,788	$9,094	$/building
Fire Station	$55,408	$13,561	$68,969	$/building
Library	$7,306	$1,788	$9,094	$/building
Restaurant	$221,632	$54,246	$275,878	$/building
Senior Center	$55,408	$13,561	$68,969	$/building

Laundry Measure	GC Cost	Soft Cost	Total Cost	Cost Method
Animal Shelter	$19,096	$4,674	$23,770	$/dryer
Fire Station	$19,096	$4,674	$23,770	$/dryer

5. Lighting

Interior and exterior lighting retrofit costs were provided for various building types as a $/SF metric.

Building Type	Interior Lighting	Exterior Lighting	Total Cost	Cost Method
Library	$6.04	$0.42	$6.46	$/SF
Maintenance	$4.83	$0.32	$5.15	$/SF
Recreation	$5.57	$0.42	$5.99	$/SF
Fire Station	$5.03	$0.42	$5.45	$/SF
Police Station	$5.23	$1.54	$6.77	$/SF

6. Solar

Project Category	Cost	Cost Method
Larger System (>500 kW)	$4.00-6.00	$/W
Smaller System (<100 kW)	$6.00-7.00	$/W

Refer to the supplemental appendix document for full cost estimates.

A.10. Cost Estimates

SUPPLEMENTAL ATTACHMENT A.5

CITY OF LOS ANGELES DECARBONIZATION

APPENDIX 5: PORTFOLIO SOLAR PV MODELING

Prepared by:
ARC Alternatives

ARC ALTERNATIVES

GLUMAC
A TETRA TECH COMPANY

INTRODUCTION

Purpose

- The purpose of this presentation is to analyze the possible implementation of solar PV projects as part of the City of Los Angeles' Decarbonization Plans.
- This initial feasibility study targets 19 sites, a combination of "representative" sites and strong solar candidates to serve as basis for our analysis.
- This report describes the scope and sites comprising the portfolio, along with the financial modeling based on recommended solar system sizes. Finally, ARC provides recommendations for next steps at the end of the report.

Table of Contents

APPROACH

APPROACH

- ARC Alternatives modeled a set of representative sites, as well as several sites that were likely to result in better financial savings outcomes
- The representative sites consist of examples of the most common building types within the City's building portfolio, as shown in the table below

Building Type	Count
Aquatic Center	54
Fire Station	114
Library	73
Warehouse/Maintenance	169
Office	106
Police	36
Recreation Center	154
Park	1
	707

- We developed an "All Sites" model to extrapolate our results to the larger set of building types in the table above
- This approach covers the most common building types and 707 of the 1021 total buildings in the master facilities database

SITE SELECTION

Building Types

- ARC Alternatives selected sites to evaluate for solar feasibility that fall into two categories. The first are representative sites covering some of the most common building types. These sites were analyzed with the intent to scale the results to the the rest of the building portfolio. The second category are a limited number of sites that are likely to result in positive financial savings, based on high electricity consumption and sufficient space to build sizable solar systems.
- Representative building types are listed below, along with key typical attributes impacting solar feasibility.
    - Police Stations: High site consumption. Large, tall buildings, but with lots of rooftop equipment. Large parking structures. Usually not enough space to offset a large percentage of site consumption.
    - Fire Stations: Moderate site consumption with compact footprint, leaving little space for solar.
    - Libraries: Low site consumption and little available space. Can usually offset a large percentage of consumption, but system sizes are on the small end of what can be build cost-effectively.
    - Municipal Buildings: Consumption highly variable, depending on size and use.
    - Recreation Centers: Low to moderate site consumption and little available space.
- Additionally, ARC evaluated the Stetson Ranch Park based on a preliminary design developed by the City. We evaluated the project under LADWP's FiT program given the minimal electricity consumption on the site.

Representative Sites

- Initially, several sites were identified as representative sites for the solar study for the City of Los Angeles.
- The goal of this selection was to choose sites that would be representative of the entire LA City portfolio, including police stations, fire stations, libraries, recreation centers, warehouses, and municipal buildings.
- The intent is to scale the modeled results from these sites across the entire portfolio, using the same utility use and system cost assumptions and resulting savings per kWh generated.

Site Name	Site Address	Building Type	LA Database Site Consumption (kWh)
West Valley Library	19036 Vanowen St, Reseda, CA 91335	Library	254,506
West Valley Police Station	19020 Vanowen St, Reseda, CA 91335	Police	1,288,532
West Valley Municipal Building	19040 Vanowen St, Reseda, CA 91335	Office	248,951
Fire Station #10	1335 S Olive St, Los Angeles, CA 90015	Fire Station	112,785
Ritchie Valens Pool	10731 Laurel Canyon Blvd, Pacoima, CA 91331	Aquatic Center	163,400
Ritchie Valens Rec Center	10732 Laurel Canyon Blvd, Pacoima, CA 91331	Recreation Center	134,120
Evergreen Recreation Center	2844 E 2nd St, Los Angeles, CA 90033	Recreation Center	97,000
Platt Branch Library	23600 Victory Blvd, Woodland Hills, CA 91367	Library	247,305
Fire Station #07	14630 Plummer St, Panorama City, CA 91402	Fire Station	151,926
Fire Station #94	4470 Coliseum St, Los Angeles, CA 90016	Fire Station	188,249
7th St Facility	2310 E 7th St, Los Angeles, CA 90023	Warehouse/Maintenance	410,661
Raymer St Yard	14832 Raymer St, Van Nuys, CA 91405	Warehouse/Maintenance	220,137
Total			**3,517,572**

"OPPORTUNITY" SITES

Additionally, ARC identified several sites that likely to have stronger financial performance. These are some of the sites with the greatest annual electricity consumption in the portfolio with sufficient space to build larger solar systems, providing economies of scale, lower costs, and better financial net benefits. Due to the higher-than-average financial performance, these sites were excluded from the representative site portfolio, to avoid swaying the average used in the extrapolation process.

Site Name	Site Address	Building Type	LA Database Site Consumption (kWh)
C Erwin Piper Technical Center	555 Ramirez St Space 475, Los Angeles, CA 90012	Office	6,309,598
Public Works	1156 S Hill St, Los Angeles, CA 90015	Office	4,546,500
Emergency Operations Center	500 E Temple St, Los Angeles, CA 90012	Office	3,837,618
Ahmanson Recruit Training Center	5651 W Manchester Ave, Los Angeles, CA 90045	Police	1,676,192
Van Nuys Civic Center	6262 Van Nuys Blvd, Van Nuys, CA 91401	Office	2,265,284
Topanga Community Police Station	21501 Schoenborn St, Canoga Park, CA 91304	Police	999,022
Fire Station #401	140 N Ave 19, Los Angeles, CA 90031	Fire Station	1,003,377
Tarzana Branch Library	18231 Ventura Blvd, Tarzana, CA 91356	Library	340,782
Total			**20,978,373**

SYSTEM SIZING

System Sizing

- Typically, the system size of solar systems are determined based on two major considerations:
    1. Required capacity to offset site consumption
    2. Capacity based on available space

- In the case of many sites within the City of LA, the primary constraint is available space, especially on sites with extensive rooftop equipment.
- The table to the right shows the capacity that fits the available space, the estimated capacity to offset 85% of the annual consumption at each site, and what ARC modeled.

Site Name	"Opportunity" Site	LA Database Site Consumption (kWh)	Solar Capacity that Fits On Site, Identified in Feasibility (kW)	Est. System Size to Offset 85% of Consumption	System Size Modeled (kW DC)	Yearly Solar Generation (kWh)	Year 1 Offset
West Valley Library		254,506	130.5	135.2	130.5	211,383	83%
West Valley Police Station		1,288,532	512.4	684.5	512.4	829,982	64%
West Valley Municipal Building		248,951	48.7	132.3	48.7	78,885	32%
Fire Station #10		112,785	27.8	59.9	27.8	44,565	40%
Ritchie Valens Pool		163,400	47.0	86.8	47.0	78,123	48%
Ritchie Valens Rec Center		134,120	51.3	71.3	51.3	85,272	64%
Evergreen Recreation Center		97,000	43.5	51.5	43.5	69,386	72%
C Erwin Piper Technical Center	Y	6,309,598	1,510.0	3,352.0	1,510.0	2,445,888	39%
Public Works	Y	4,546,500	192.3	2,415.3	192.3	306,734	7%
Emergency Operations Center	Y	3,837,618	115.7	2,038.7	115.7	184,551	5%
Ahmanson Recruit Training Center	Y	1,676,192	1,020.0	890.5	890.5	1,442,389	86%
Van Nuys Civic Center	Y	2,265,284	198.4	1,203.4	198.4	316,464	14%
Topanga Community Police Station	Y	999,022	594.6	530.7	530.7	859,674	86%
Fire Station #401	Y	1,003,377	162.3	533.0	162.3	262,892	26%
Tarzana Branch Library	Y	340,782	131.8	181.0	131.8	213,489	63%
Platt Branch Library		247,305	53.1	131.4	53.1	86,011	35%
Fire Station #07		151,926	23.5	80.7	23.5	38,065	25%
Fire Station #94		188,249	49.6	100.0	49.6	80,342	43%
7th St Facility		410,661	247.5	218.2	218.2	353,380	86%
Raymer St Yard		220,137	134.2	116.9	116.9	189,431	86%
Total		**24,495,945**	**5,294.2**	**13,013.5**	**5,054.2**	**8,176,906**	**33%**

FINANCIAL MODELING

Feed-in Tariff (FiT) Program

- The FiT program allows property owners and developers to sell the output of local eligible renewable energy projects directly to LADWP (as opposed to consuming the energy onsite to satisfy the customer's load)
- Certain sites will be more likely to be considered for FiT if site consumption is low but there is ample space. In this situation, FiT would be more advantageous than NEM if there is little energy consumption to offset from solar production.

How the Program Works | How to Apply | Reports | FAQs

LADWP will purchase energy, for a term not exceeding 20 years, from projects via a Standard Offer Power Purchase Agreement at a set price dependent on system size and location. This price includes all energy, capacity rights, and environmental attributes associated with the project.

Total = 185 MW		
In-Service 102.2 MW	Active 74.8 MW	Available 57.9 MW

Updated as of 12/01/2023

FiT Pricing Table			
Project Capacity	In-Basin Projects		Owens Valley Projects
	Solar PV	Non-PV	Solar PV
30 kW - 500 kW	14.5¢ per kWh	11.5¢ per kWh	11.5¢ per kWh
> 500 kW - 3 MW	14.0¢ per kWh	11.0¢ per kWh	Not Available
> 3 MW	13.5¢ per kWh	10.5¢ per kWh	Not Available

NEM vs. FIT

NEM (Net Energy Metering)

- Ideally, most energy generated by solar is consumed on-site
- Exported energy doesn't provide as much value
- Primary measure of savings is the value saved by purchasing less energy from the utility, called "utility savings"
- Total net benefit is measured as:
  - Utility Savings – Costs of Solar

FIT (Feed-in Tariff)

- Energy generated is sold to the utility directly at a fixed rate, paid back to generating party
- Factors include project location (in Los Angeles Basin vs. Owens Valley) within LADWP territory, along with project system size
- Total net benefit is calculated by multiplying the renewable energy generated by the credit generation rate
- Rates for Solar PV systems are below for in-Basin projects, measured in $/kWh:

Project Capacity	Solar PV ($/kWh)
30 kW - 500 kW	$ 0.145
> 500 kW - 3 MW	$ 0.140

Solar Benefit Scenarios

NEM (Net Energy Metering)

- Sites are modeled using Energy ToolBase platform, to simulate solar PV projects
- Accounts were modeled under LADWP's general service / commercial tariffs (A-1, A-2, A-3) primarily based on system size
- Based on the inputted consumption load profile and chosen tariff, ETB models the "bill before solar" of current usage, along with a projected "bill after solar" of the resulting net cost once the benefits of solar are applied
- ARC's model to calculate net benefit accounts for overall utility savings as well as the costs of solar

FIT (Feed-in Tariff)

- Net benefit is generated at a fixed rate, calculated by multiplying kWh of solar energy produced by the fixed rate
- Solar modeling is only done to project annual solar generation
- ARC's model to calculate net benefit uses these generated credits from LADWP's FIT program and accounts for the costs of solar

Financial Model Assumptions

Several assumptions were made for the financial model of the LA City solar sites. These assumptions apply across all scenarios:

- System costs were developed by building type and system type, ranging from $5.00 per watt for larger rooftop systems on warehouse facilities to $8.00 per Watt for the system at Stetson Ranch Park
  - The Stetson Ranch Park system has the highest estimated cost because the design assumes a "long-span" elevated structure, which is the most expensive system type to construct
  - Police facilities also have an assumed higher cost at $7.00 per watt because many of the systems would be a combination of rooftop and carport, with carports being constructed on the top of existing parking structures in many cases
  - System costs are lower for the "Opportunity" sites, given their larger size
- 30% Investment Tax Credit (ITC) applied to solar purchase price
- $18.50 per kilowatt O&M (operations and maintenance) fee for each site with 3% annual escalation for O&M costs
- 5% financing interest rate with a 20-year loan term is assumed for financing costs
- 3.50% annual utility escalation rate
- 0.50% annual solar degradation rate

Financial Model Limitations

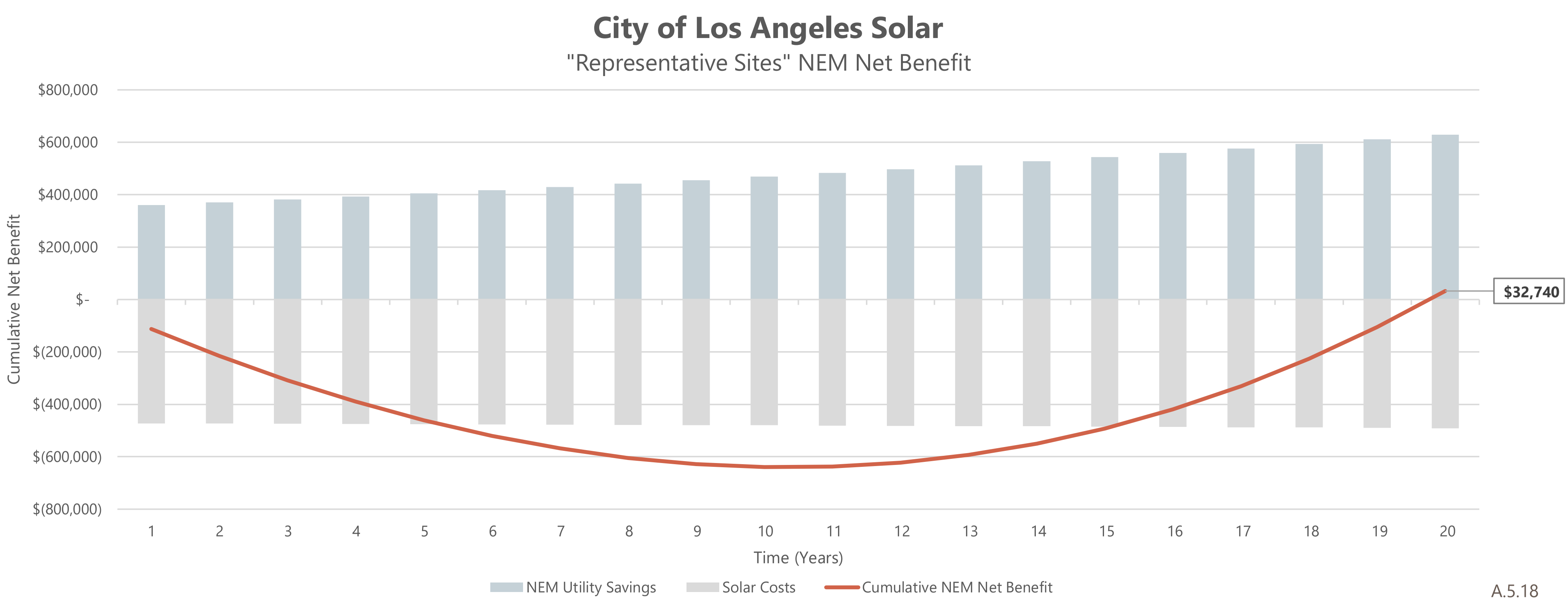
- ARC did not have access to interval data for the sites included in the study
    - We developed our own load profiles for the facilities based on available total annual consumption data
    - We continue to investigate ways to refine these estimates; however, we expect any updates to have a minimal effect on the results of the analysis
- ARC assigned each site a tariff based on annual consumption, which is likely to not be accurate in all cases
- We only examined a small portion of the Master Facilities Database, making our citywide results rough estimates only

Extrapolating Results to All Sites

- ARC developed two primary parameters for applying our modeling results to the larger set of sites
    - kWh offsets – the offsets from our modeling were applied by building type, assuming that the physical parameters limiting system size would be similar within a building class
    - Feasibility loss – we assume a percentage of the total sites would not pass a feasibility analysis if they were examined. The percentage of buildings within each building category for which solar systems would be feasible ranges from 40% for police facilities to 80% for recreation centers.
- These parameters are applied to the annual consumption from the Master Facilities Database to determine the total capacity required City wide. This capacity drives the cost and savings estimates for the All Sites model.

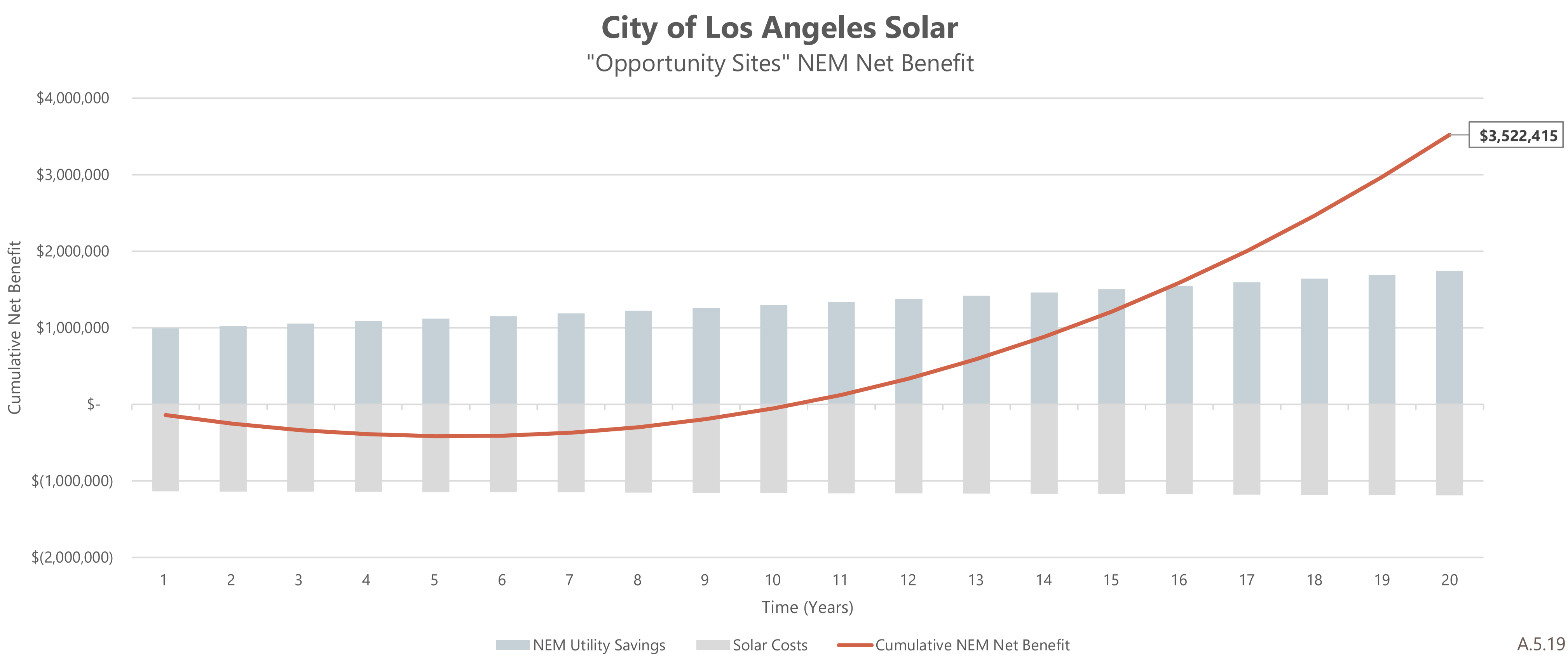
RESULTS – REPRESENTATIVE SITES MODELING

The result of the financial modeling for the 12 solar sites under Net Energy Metering is a net financial benefit of over $32,000 for the City. For most sites analyzed, the cash flows began to break even in year 10, when benefit from solar exceeded the financing and O&M costs. However, the largest site, West Valley Police Station, only becomes cash-flow positive in Year 17 due to higher pricing assumptions.



Results – "Opportunity" Sites Modeling

The result of the financial modeling for these 8 solar sites under Net Energy Metering is a net financial benefit of over $3.5 million for the City. Due to lower pricing assumptions, most of these sites begin to break-even as early as Year 4. The portfolio total becomes cash-flow-positive in Year 11.



RESULTS – ALL SITES MODELING

Using blended utility rates and avoided cost values obtained from modeling the representative set of sites, ARC created a model for the entire LA City portfolio.

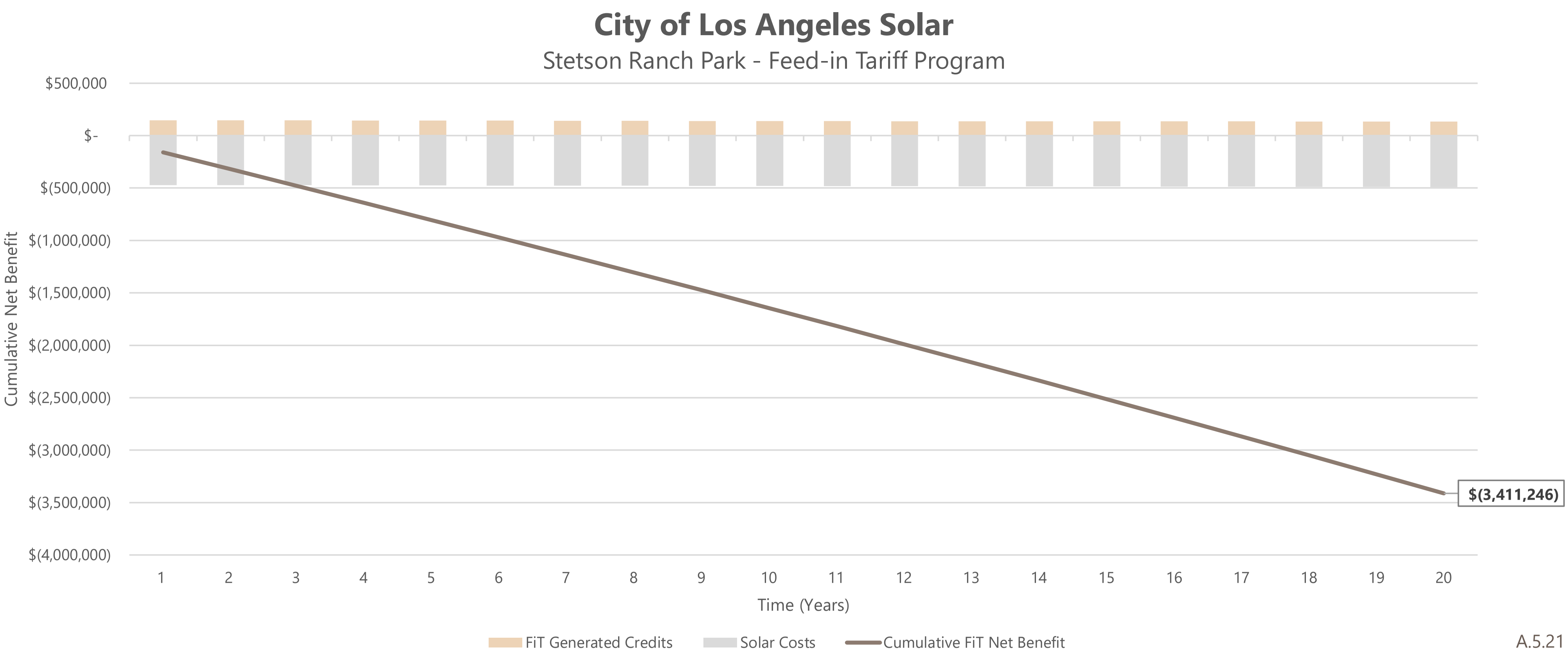
- Assumptions are consistent with the prior model assumptions (for representative sites)
- Accounts for kWh offsets and feasibility loss parameters
- Results are rough and not exact due to lack of comprehensive data and site analysis

ARC projects a potential solar capacity of 27.8 MW of solar across all facility types in the City, with an estimated capital cost of $113 million under current cost assumptions. The result is a 20-year net benefit of over $12.1 million for the City.

Site Info		Capital Cost	Site Use and Solar Production				Costs, Savings and Net Benefit				
Building Type	Total System Size (kW dc)	Up-front Solar Capital Cost	Annual Site Use (kWh)	Y1 Solar Production (kWh)	Total Site Use (kWh)	Total Solar Production (kWh)	Total Solar Costs (Financing + O&M)	Total Utility Bill Before Solar	Total NEM Utility Savings	Total NEM Bill After Solar	Total NEM Net Benefit
Aquatic Center	1,154.0	$ 4,644,966	7,965,341	1,904,147	159,306,815	36,327,141	$ (8,028,151)	$ 23,314,687	$ 9,374,959	$ 13,939,728	$ 1,346,808
Fire Station	1,561.6	$ 6,285,435	14,322,903	2,576,638	286,458,050	49,156,854	$ (10,863,466)	$ 43,915,673	$ 11,793,766	$ 32,121,908	$ 930,300
Library	5,452.1	$ 21,944,778	20,239,336	8,995,996	404,786,720	171,624,748	$ (37,928,374)	$ 94,491,660	$ 40,163,162	$ 54,328,498	$ 2,234,788
Warehouse/Maintenance	3,700.3	$ 12,951,166	14,190,454	6,105,550	283,809,080	116,481,094	$ (22,624,145)	$ 44,167,442	$ 27,258,592	$ 16,908,850	$ 4,634,448
Office	6,291.0	$ 24,220,259	65,516,613	10,380,111	1,310,332,260	198,030,760	$ (41,997,181)	$ 185,552,646	$ 46,017,576	$ 139,535,070	$ 4,020,395
Police	5,381.3	$ 26,368,383	34,461,789	8,879,149	689,235,780	169,395,556	$ (44,992,401)	$ 83,875,394	$ 39,371,348	$ 44,504,046	$ (5,621,052)
Recreation Center	4,284.4	$ 17,244,591	13,205,200	7,069,211	264,104,000	134,865,731	$ (29,804,780)	$ 61,791,189	$ 34,407,217	$ 27,383,972	$ 4,602,437
Total	**27,824.7**	**$ 113,659,578**	**169,901,635**	**45,910,803**	**3,398,032,705**	**875,881,884**	**$ (196,238,498)**	**$ 537,108,692**	**$ 208,386,621**	**$ 328,722,071**	**$ 12,148,123**

RESULTS – STETSON RANCH PARK

The result of the financial modeling for Stetson Ranch Park under the Feed-in Tariff program is a net financial loss of over $3.4 million for the City given our cost assumptions. This is due to the up-front purchase costs and financing greatly exceeding the value generated by the solar system.



MODEL BREAK-EVEN POINTS

- The primary independent variable to test and identify break-even points (the point at which the model is financially solvent for the given scenario) in the model is the cost basis of the solar systems. The cost basis is measured in $/W and is meant to be the overall cost per Watt of solar installed, accounting for materials, construction, labor, etc.
- The model results on the prior pages were run the cost assumptions stated on Page 15. However, ARC ran more simulations to find break-even points of the representative model under the current conditions. For simplicity, these values represent the average cost basis (in $/W) of all facility types in the portfolio.
  - NEM 20-year benefit break-even point: $6.05/W
  - NEM first year benefit break-even point: $4.5/W (NEM 20-year benefit is $2.3 million in this scenario)
- These break-even points will provide a reference to the financial stability of a project once pricing information becomes available from vendors in the procurement phase.

Modeling Implications

- For most of the sites analyzed, NEM projects provide a greater financial benefit than the FiT program. Therefore, ARC recommends for the City to pursue NEM solar projects for most sites. This includes all modeled representative sites, as well as all “opportunity” sites.
- For Stetson Ranch Park, the FiT program is more beneficial than NEM, so we recommend a FiT project for this site if solar is to be pursued here. The site has very low consumption yet high capacity, making it more conducive to FiT.
- If there are other sites in the city with low/negligible site consumption yet with large space for solar capacity, ARC would similarly recommend FiT for solar projects.

CARBON SAVINGS

- Beyond economic savings, the City serves to generate nearly 8.2 million kWh of solar energy annually with these 20 sites alone (includes both representative and "opportunity" sites).
- This will offset roughly 1/3 of the City's energy consumption.
- Based on the United States' national average of 0.86 lbs of CO_2 per kWh of energy produced, these solar projects will reduce the City of LA's carbon footprint by approximately 7 million lbs CO_2, or 3,180 metric tones of CO_2 (MTCO2e) in the first year alone.
  - https://www.eia.gov/tools/faqs/faq.php?id=74&t=11

Site Name	Annual Site Consumption (kWh)	Estimated Year 1 Solar Generation (kWh)	Offset Percentage	Emissions Reduced (lbs CO2e)
West Valley Library	254,506	211,383	83%	181,789
West Valley Police Station	1,288,532	829,982	64%	713,785
West Valley Municipal Building	248,951	78,885	32%	67,841
Fire Station #10	112,785	44,565	40%	38,326
Ritchie Valens Pool	163,400	78,123	48%	67,186
Ritchie Valens Rec Center	134,120	85,272	64%	73,334
Evergreen Recreation Center	97,000	69,386	72%	59,672
C Erwin Piper Technical Center	6,309,598	2,445,888	39%	2,103,463
Public Works	4,546,500	306,734	7%	263,791
Emergency Operations Center	3,837,618	184,551	5%	158,714
Ahmanson Recruit Training Center	1,676,192	1,442,389	86%	1,240,454
Van Nuys Civic Center	2,265,284	316,464	14%	272,159
Topanga Community Police Station	999,022	859,674	86%	739,320
Fire Station #401	1,003,377	262,892	26%	226,087
Tarzana Branch Library	340,782	213,489	63%	183,600
Platt Branch Library	247,305	86,011	35%	73,969
Fire Station #07	151,926	38,065	25%	32,736
Fire Station #94	188,249	80,342	43%	69,094
7th St Facility	410,661	353,380	86%	303,907
Raymer St Yard	220,137	189,431	86%	162,911
Total	**24,495,945**	**8,176,906**	**33%**	**7,032,139**

CONSIDERATIONS AND RECOMMENDATIONS

Considerations and Recommendations

- NEM projects are more beneficial than FiT projects where there is sufficient load for the solar to offset
- Many of the City's buildings are challenging sites for solar
  - Small
  - Equipment on roofs
  - Shading and other concerns
- ARC identified several sites that have good solar opportunities, primarily through economies of scale and lower costs of construction
- Assuming the desire is to build solar across many of the City's properties, we recommend the City implement an initial set of projects that are representative of the broader portfolio and not focus on the best projects
  - Procurement success is sensitive to the size of the project and construction cost drivers (like physical proximity)
  - Target should be 20-25 sites in a similar geographic location or region
  - Our Representative Sites consist of 12 sites and 1.3 MW of solar capacity
- ARC will define a set of projects to propose to the City for an initial procurement, using our representative sites plus 10-12 additional sites
- We are working to develop a "live" version of the All Sites model that will allow Glumac to change key parameters and run different scenarios

EXHIBITS

EXHIBIT A – DETAILED CASH FLOW – REPRESENTATIVE SITES

Site Information								Solar Purchase Costs				NEM Solar Savings and Benefit						
Site Name	Year	Site Usage (kWh)	System Size (kW dc)	Solar Generation	kWh Offset	Yield	Solar Capital Cost (inc. 30% ITC)	Annual Capital Financing Costs	Solar O&M Costs	Total Solar Costs	Utility Bill Before Solar	Utility Bill After Solar	Utility Savings	Avoided Cost (Value of Solar)	Blended Utility Rate	Net Benefit	Cummulative Net Benefit
Portfolio Summary Total	1	3,517,572	1,323	2,144,825	61.0%	1,622	$ 5,587,002	$ (448,315)	$ (24,466)	$ (472,782)	$ 753,418	$ 393,406	$ 360,013	$ 0.1679	$ 0.2142	$ (112,769)	$ (112,769)
Portfolio Summary Total	2	3,517,572	1,323	2,134,101	60.7%	1,614		$ (448,315)	$ (25,200)	$ (473,516)	$ 779,788	$ 409,038	$ 370,750	$ 0.1737	$ 0.2217	$ (102,766)	$ (215,535)
Portfolio Summary Total	3	3,517,572	1,323	2,123,431	60.4%	1,606		$ (448,315)	$ (25,956)	$ (474,272)	$ 807,080	$ 425,273	$ 381,808	$ 0.1798	$ 0.2294	$ (92,464)	$ (308,000)
Portfolio Summary Total	4	3,517,572	1,323	2,112,813	60.1%	1,598		$ (448,315)	$ (26,735)	$ (475,051)	$ 835,328	$ 442,133	$ 393,195	$ 0.1861	$ 0.2375	$ (81,856)	$ (389,855)
Portfolio Summary Total	5	3,517,572	1,323	2,102,249	59.8%	1,590		$ (448,315)	$ (27,537)	$ (475,853)	$ 864,565	$ 459,643	$ 404,922	$ 0.1926	$ 0.2458	$ (70,931)	$ (460,786)
Portfolio Summary Total	6	3,517,572	1,323	2,091,738	59.5%	1,582		$ (448,315)	$ (28,363)	$ (476,679)	$ 894,825	$ 477,826	$ 416,999	$ 0.1994	$ 0.2544	$ (59,680)	$ (520,466)
Portfolio Summary Total	7	3,517,572	1,323	2,081,279	59.2%	1,574		$ (448,315)	$ (29,214)	$ (477,530)	$ 926,143	$ 496,707	$ 429,436	$ 0.2063	$ 0.2633	$ (48,094)	$ (568,560)
Portfolio Summary Total	8	3,517,572	1,323	2,070,873	58.9%	1,566		$ (448,315)	$ (30,091)	$ (478,406)	$ 958,558	$ 516,315	$ 442,244	$ 0.2136	$ 0.2725	$ (36,162)	$ (604,722)
Portfolio Summary Total	9	3,517,572	1,323	2,060,519	58.6%	1,558		$ (448,315)	$ (30,993)	$ (479,309)	$ 992,108	$ 536,674	$ 455,434	$ 0.2210	$ 0.2820	$ (23,875)	$ (628,597)
Portfolio Summary Total	10	3,517,572	1,323	2,050,216	58.3%	1,550		$ (448,315)	$ (31,923)	$ (480,239)	$ 1,026,832	$ 557,815	$ 469,017	$ 0.2288	$ 0.2919	$ (11,222)	$ (639,819)
Portfolio Summary Total	11	3,517,572	1,323	2,039,965	58.0%	1,542		$ (448,315)	$ (32,881)	$ (481,196)	$ 1,062,771	$ 579,765	$ 483,005	$ 0.2368	$ 0.3021	$ 1,809	$ (638,010)
Portfolio Summary Total	12	3,517,572	1,323	2,029,765	57.7%	1,535		$ (448,315)	$ (33,867)	$ (482,183)	$ 1,099,968	$ 602,557	$ 497,411	$ 0.2451	$ 0.3127	$ 15,228	$ (622,781)
Portfolio Summary Total	13	3,517,572	1,323	2,019,616	57.4%	1,527		$ (448,315)	$ (34,883)	$ (483,199)	$ 1,138,467	$ 626,220	$ 512,246	$ 0.2536	$ 0.3237	$ 29,048	$ (593,734)
Portfolio Summary Total	14	3,517,572	1,323	2,009,518	57.1%	1,519		$ (448,315)	$ (35,930)	$ (484,245)	$ 1,178,313	$ 650,789	$ 527,524	$ 0.2625	$ 0.3350	$ 43,279	$ (550,455)
Portfolio Summary Total	15	3,517,572	1,323	1,999,471	56.8%	1,512		$ (448,315)	$ (37,008)	$ (485,323)	$ 1,219,554	$ 676,296	$ 543,258	$ 0.2717	$ 0.3467	$ 57,934	$ (492,520)
Portfolio Summary Total	16	3,517,572	1,323	1,989,473	56.6%	1,504		$ (448,315)	$ (38,118)	$ (486,433)	$ 1,262,238	$ 702,778	$ 559,460	$ 0.2812	$ 0.3588	$ 73,027	$ (419,494)
Portfolio Summary Total	17	3,517,572	1,323	1,979,526	56.3%	1,497		$ (448,315)	$ (39,261)	$ (487,577)	$ 1,306,417	$ 730,271	$ 576,146	$ 0.2911	$ 0.3714	$ 88,569	$ (330,924)
Portfolio Summary Total	18	3,517,572	1,323	1,969,628	56.0%	1,489		$ (448,315)	$ (40,439)	$ (488,755)	$ 1,352,141	$ 758,812	$ 593,330	$ 0.3012	$ 0.3844	$ 104,575	$ (226,350)
Portfolio Summary Total	19	3,517,572	1,323	1,959,780	55.7%	1,482		$ (448,315)	$ (41,653)	$ (489,968)	$ 1,399,466	$ 788,440	$ 611,026	$ 0.3118	$ 0.3979	$ 121,058	$ (105,292)
Portfolio Summary Total	20	3,517,572	1,323	1,949,981	55.4%	1,474		$ (448,315)	$ (42,902)	$ (491,218)	$ 1,448,448	$ 819,198	$ 629,250	$ 0.3227	$ 0.4118	$ 138,032	$ 32,740
Total	**T**	**70,351,446**	**1,323**	**40,918,768**	**58.2%**	**1,547**		**$ (8,966,310)**	**$ (657,423)**	**$ (9,623,733)**	**$ 21,306,428**	**$ 11,649,955**	**$ 9,656,473**	**$ 0.2360**	**$ 0.3029**	**$ 32,740**	

Exhibit A – Detailed Cash Flow – Opportunity Sites

Site Information							Solar Purchase Costs				NEM Solar Savings and Benefit						
Site Name	Year	Site Usage (kWh)	System Size (kW dc)	Solar Generation	kWh Offset	Yield	Solar Capital Cost (inc. 30% ITC)	Annual Capital Financing Costs	Solar O&M Costs	Total Solar Costs	Utility Bill Before Solar	Utility Bill After Solar	Utility Savings	Avoided Cost (Value of Solar)	Blended Utility Rate	Net Benefit	Cummulative Net Benefit
Portfolio Summary Total	1	3,517,572	1,323	2,144,825	61.0%	1,622	$ 5,587,002	$ (448,315)	$ (24,466)	$ (472,782)	$ 753,418	$ 393,406	$ 360,013	$ 0.1679	$ 0.2142	$ (112,769)	$ (112,769)
Portfolio Summary Total	2	3,517,572	1,323	2,134,101	60.7%	1,614		$ (448,315)	$ (25,200)	$ (473,516)	$ 779,788	$ 409,038	$ 370,750	$ 0.1737	$ 0.2217	$ (102,766)	$ (215,535)
Portfolio Summary Total	3	3,517,572	1,323	2,123,431	60.4%	1,606		$ (448,315)	$ (25,956)	$ (474,272)	$ 807,080	$ 425,273	$ 381,808	$ 0.1798	$ 0.2294	$ (92,464)	$ (308,000)
Portfolio Summary Total	4	3,517,572	1,323	2,112,813	60.1%	1,598		$ (448,315)	$ (26,735)	$ (475,051)	$ 835,328	$ 442,133	$ 393,195	$ 0.1861	$ 0.2375	$ (81,856)	$ (389,855)
Portfolio Summary Total	5	3,517,572	1,323	2,102,249	59.8%	1,590		$ (448,315)	$ (27,537)	$ (475,853)	$ 864,565	$ 459,643	$ 404,922	$ 0.1926	$ 0.2458	$ (70,931)	$ (460,786)
Portfolio Summary Total	6	3,517,572	1,323	2,091,738	59.5%	1,582		$ (448,315)	$ (28,363)	$ (476,679)	$ 894,825	$ 477,826	$ 416,999	$ 0.1994	$ 0.2544	$ (59,680)	$ (520,466)
Portfolio Summary Total	7	3,517,572	1,323	2,081,279	59.2%	1,574		$ (448,315)	$ (29,214)	$ (477,530)	$ 926,143	$ 496,707	$ 429,436	$ 0.2063	$ 0.2633	$ (48,094)	$ (568,560)
Portfolio Summary Total	8	3,517,572	1,323	2,070,873	58.9%	1,566		$ (448,315)	$ (30,091)	$ (478,406)	$ 958,558	$ 516,315	$ 442,244	$ 0.2136	$ 0.2725	$ (36,162)	$ (604,722)
Portfolio Summary Total	9	3,517,572	1,323	2,060,519	58.6%	1,558		$ (448,315)	$ (30,993)	$ (479,309)	$ 992,108	$ 536,674	$ 455,434	$ 0.2210	$ 0.2820	$ (23,875)	$ (628,597)
Portfolio Summary Total	10	3,517,572	1,323	2,050,216	58.3%	1,550		$ (448,315)	$ (31,923)	$ (480,239)	$ 1,026,832	$ 557,815	$ 469,017	$ 0.2288	$ 0.2919	$ (11,222)	$ (639,819)
Portfolio Summary Total	11	3,517,572	1,323	2,039,965	58.0%	1,542		$ (448,315)	$ (32,881)	$ (481,196)	$ 1,062,771	$ 579,765	$ 483,005	$ 0.2368	$ 0.3021	$ 1,809	$ (638,010)
Portfolio Summary Total	12	3,517,572	1,323	2,029,765	57.7%	1,535		$ (448,315)	$ (33,867)	$ (482,183)	$ 1,099,968	$ 602,557	$ 497,411	$ 0.2451	$ 0.3127	$ 15,228	$ (622,781)
Portfolio Summary Total	13	3,517,572	1,323	2,019,616	57.4%	1,527		$ (448,315)	$ (34,883)	$ (483,199)	$ 1,138,467	$ 626,220	$ 512,246	$ 0.2536	$ 0.3237	$ 29,048	$ (593,734)
Portfolio Summary Total	14	3,517,572	1,323	2,009,518	57.1%	1,519		$ (448,315)	$ (35,930)	$ (484,245)	$ 1,178,313	$ 650,789	$ 527,524	$ 0.2625	$ 0.3350	$ 43,279	$ (550,455)
Portfolio Summary Total	15	3,517,572	1,323	1,999,471	56.8%	1,512		$ (448,315)	$ (37,008)	$ (485,323)	$ 1,219,554	$ 676,296	$ 543,258	$ 0.2717	$ 0.3467	$ 57,934	$ (492,520)
Portfolio Summary Total	16	3,517,572	1,323	1,989,473	56.6%	1,504		$ (448,315)	$ (38,118)	$ (486,433)	$ 1,262,238	$ 702,778	$ 559,460	$ 0.2812	$ 0.3588	$ 73,027	$ (419,494)
Portfolio Summary Total	17	3,517,572	1,323	1,979,526	56.3%	1,497		$ (448,315)	$ (39,261)	$ (487,577)	$ 1,306,417	$ 730,271	$ 576,146	$ 0.2911	$ 0.3714	$ 88,569	$ (330,924)
Portfolio Summary Total	18	3,517,572	1,323	1,969,628	56.0%	1,489		$ (448,315)	$ (40,439)	$ (488,755)	$ 1,352,141	$ 758,812	$ 593,330	$ 0.3012	$ 0.3844	$ 104,575	$ (226,350)
Portfolio Summary Total	19	3,517,572	1,323	1,959,780	55.7%	1,482		$ (448,315)	$ (41,653)	$ (489,968)	$ 1,399,466	$ 788,440	$ 611,026	$ 0.3118	$ 0.3979	$ 121,058	$ (105,292)
Portfolio Summary Total	20	3,517,572	1,323	1,949,981	55.4%	1,474		$ (448,315)	$ (42,902)	$ (491,218)	$ 1,448,448	$ 819,198	$ 629,250	$ 0.3227	$ 0.4118	$ 138,032	$ 32,740
Total	**T**	**70,351,446**	**1,323**	**40,918,768**	**58.2%**	**1,547**		**$ (8,966,310)**	**$ (657,423)**	**$ (9,623,733)**	**$ 21,306,428**	**$ 11,649,955**	**$ 9,656,473**	**$ 0.2360**	**$ 0.3029**	**$ 32,740**	

Exhibit B – Layouts

West Valley Library, 19036 Vanowen St, Reseda, CA

- Total system size: 130.5 kW

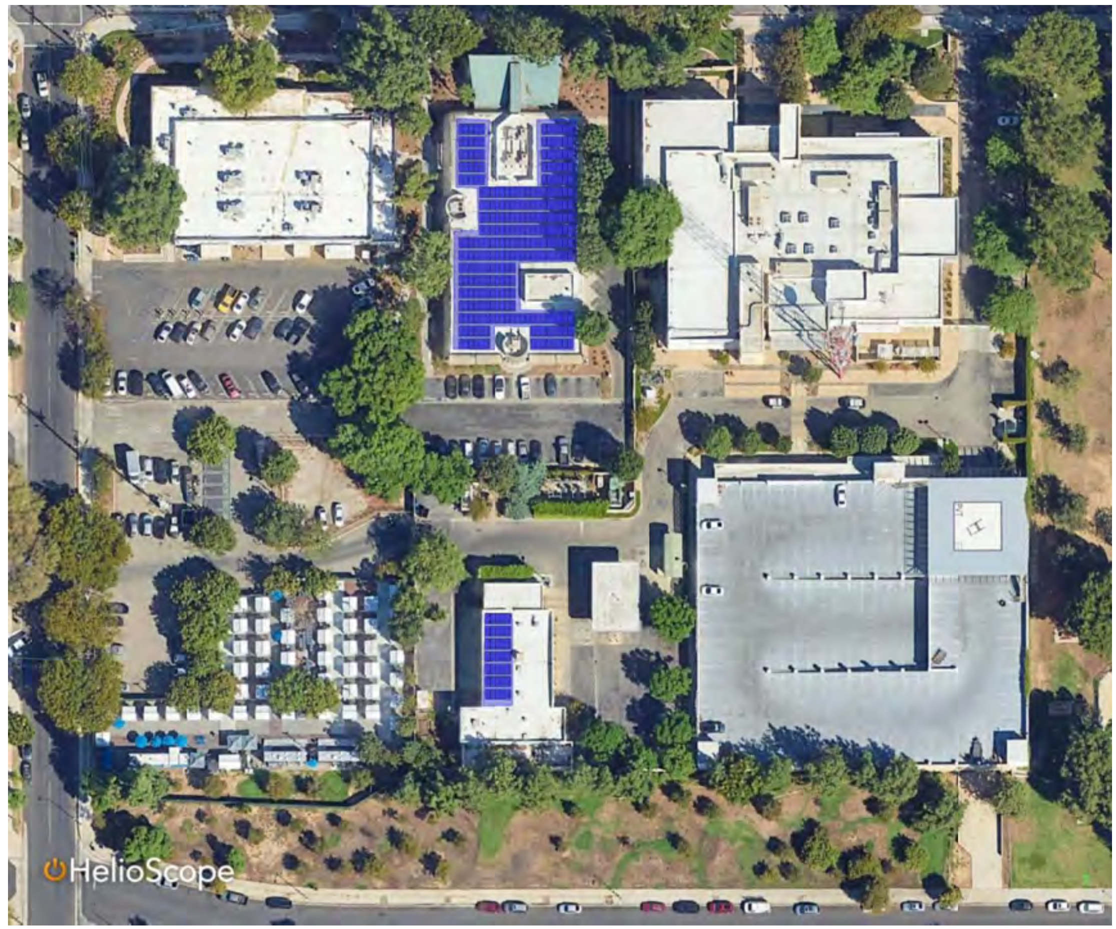


Exhibit B – Layouts

West Valley Police Station, 19020 Vanowen St, Reseda, CA 91335

- Total system size: 512.4 kW

EXHIBIT B – LAYOUTS

West Valley Municipal Building, 19040 Vanowen St, Reseda, CA

- Total system size: 48.7 kW

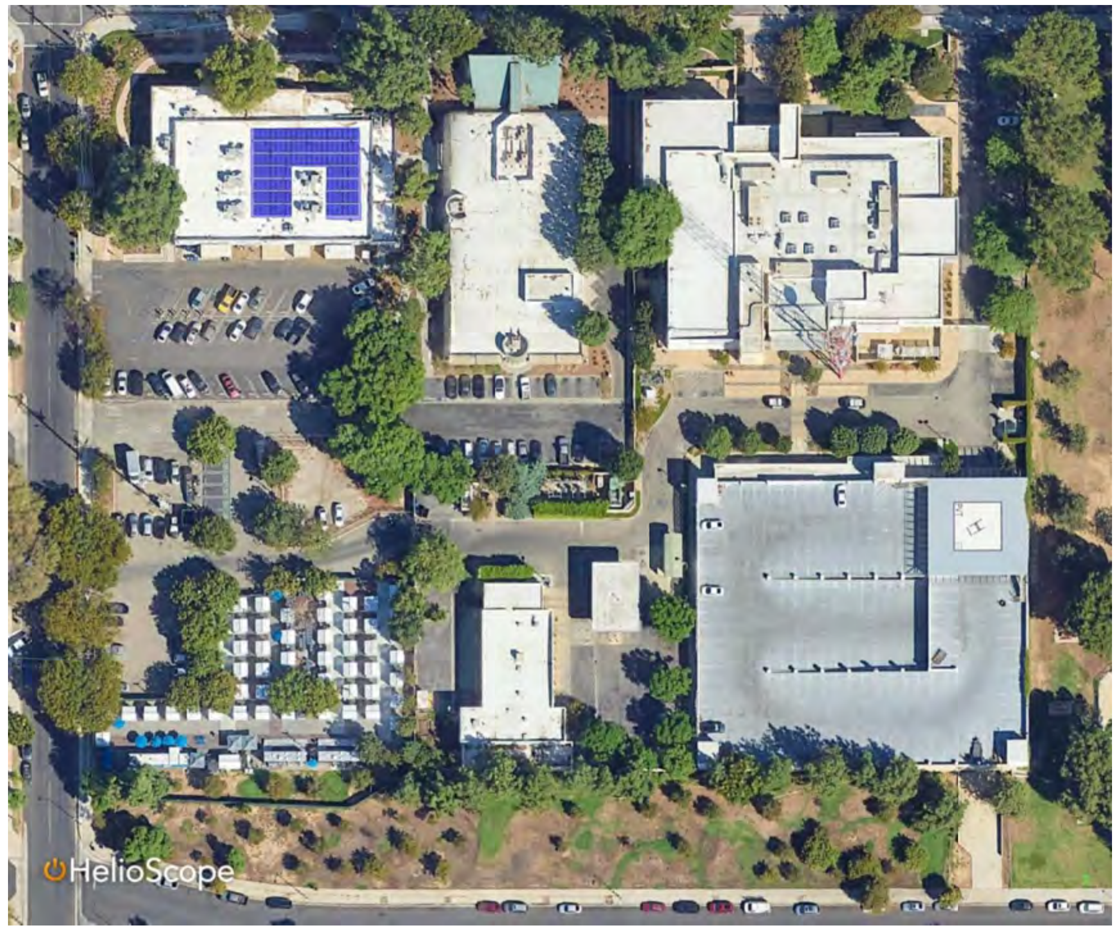


EXHIBIT B – LAYOUTS

Fire Station #10, 1335 S Olive St, Los Angeles, CA

- Total system size: 27.8 kW

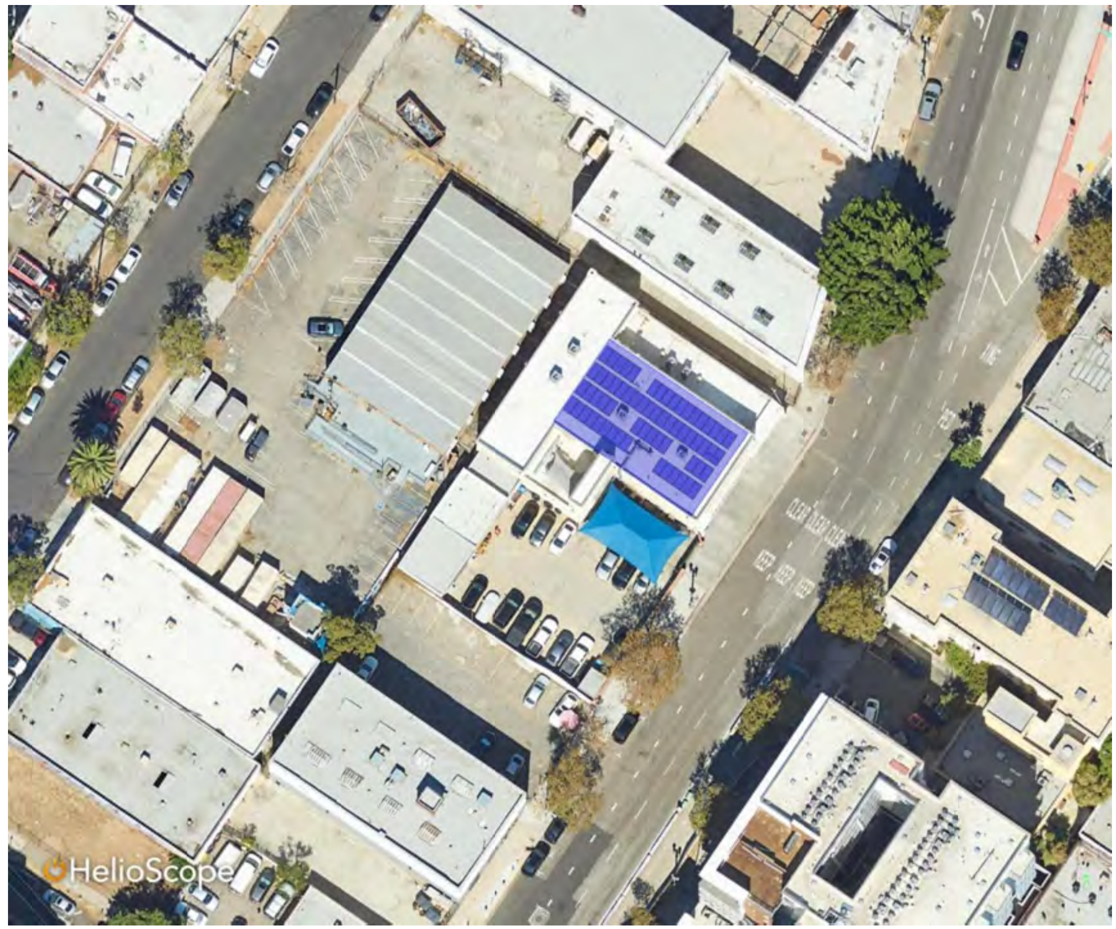


Exhibit B – Layouts

Ritchie Valens Pool, 10731 Laurel Canyon Blvd, Pacoima, CA

- Total system size: 47.0 kW

EXHIBIT B – LAYOUTS

Ritchie Valens Rec Center, 10732 Laurel Canyon Blvd, Pacoima, CA

- Total system size: 51.3 kW

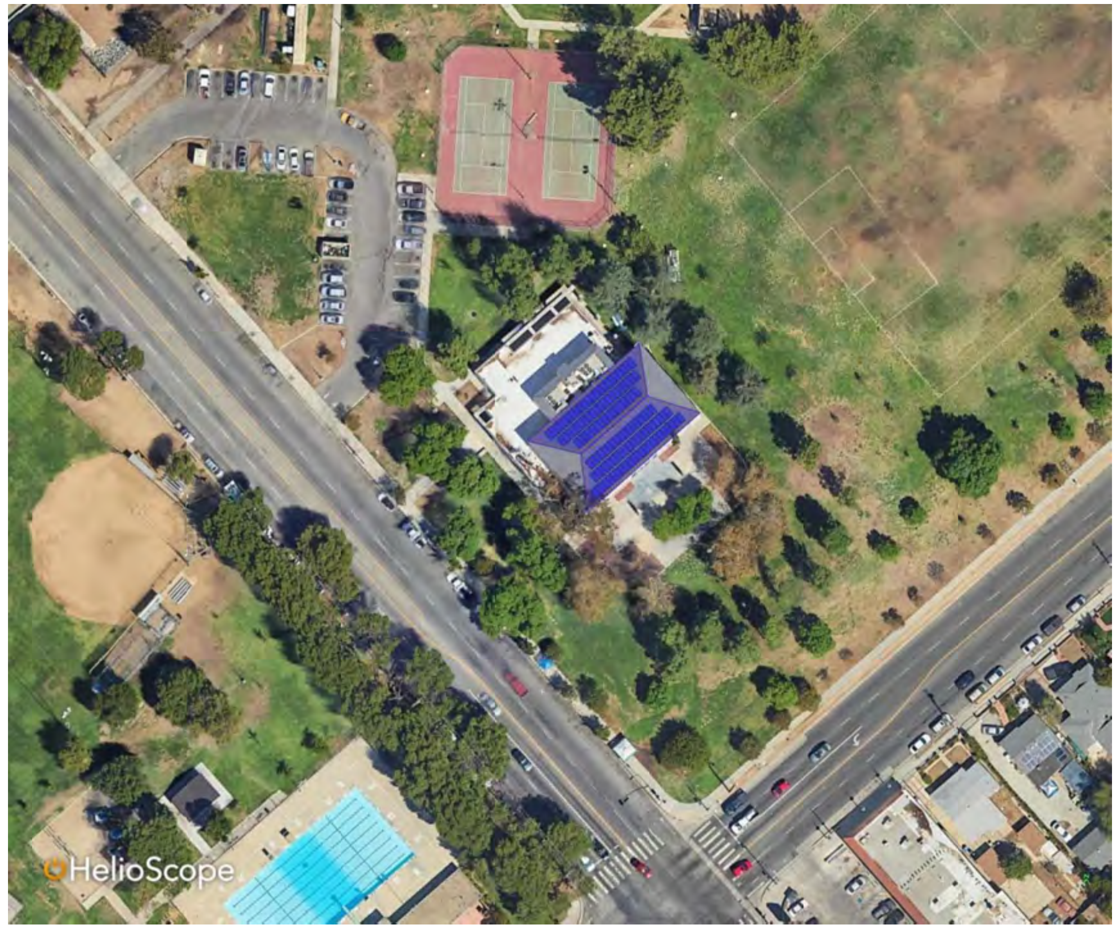


EXHIBIT B – LAYOUTS

Evergreen Recreation Center, 2844 E 2nd St, Los Angeles, CA

- Total system size: 43.5 kW

Exhibit B – Layouts

C Erwin Piper Technical Center, 555 Ramirez St Space 475, Los Angeles, CA

- Total system size: 1,510 kW

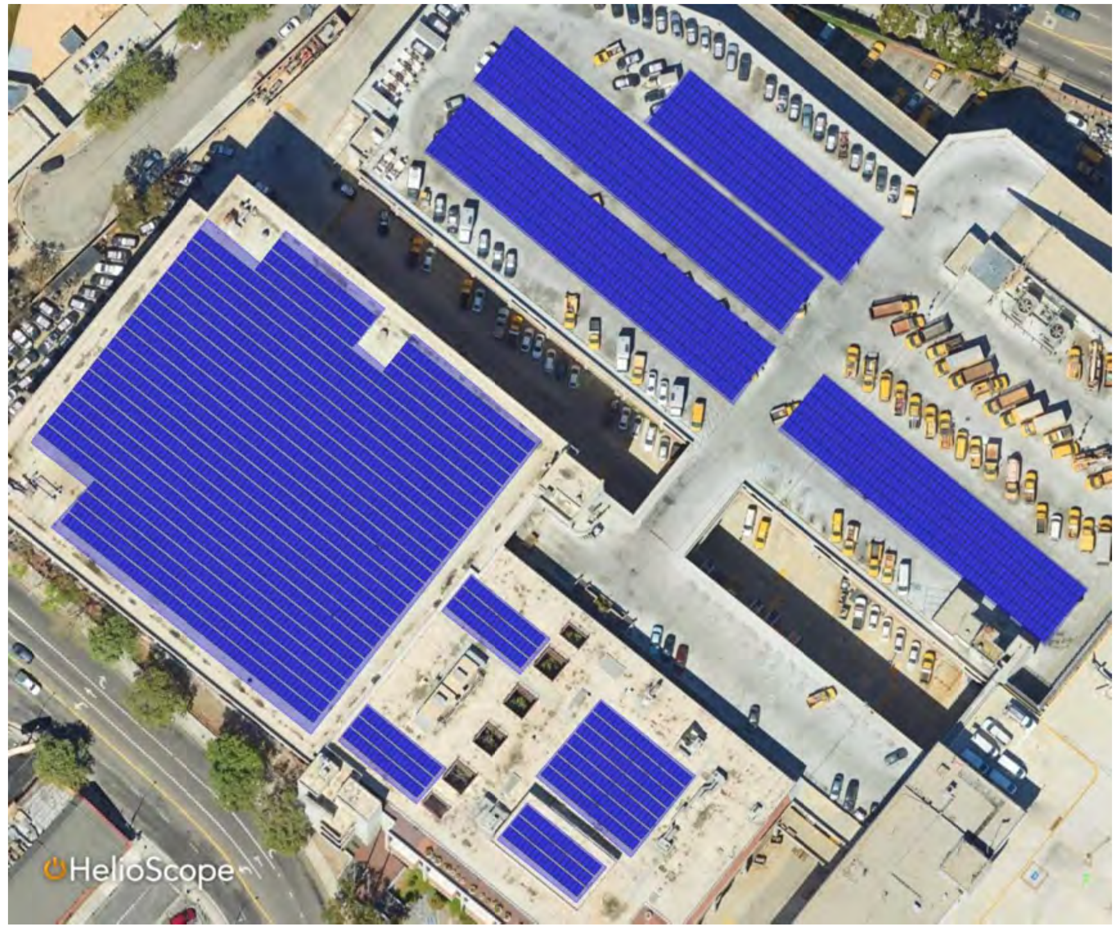


Exhibit B – Layouts

Public Works, 1156 S Hill St, Los Angeles, CA

- Total system size: 192.3 kW

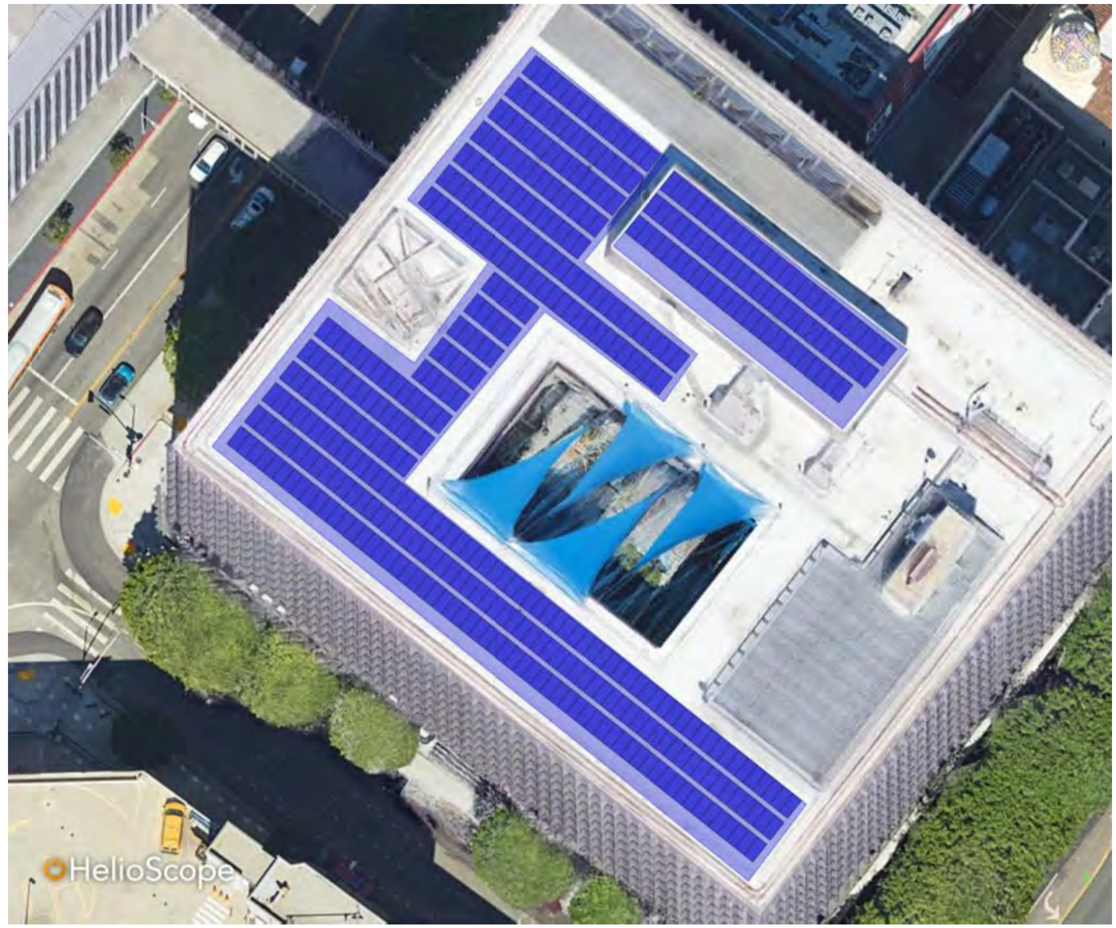


Exhibit B – Layouts

Emergency Operations Center, 500 E Temple St, Los Angeles, CA

- Total system size: 115.7 kW

EXHIBIT B – LAYOUTS

Ahmanson Recruit Training Center, 5651 W Manchester Ave, Los Angeles, CA

- Total system size: 1,020 kW

EXHIBIT B – LAYOUTS

Van Nuys Civic Center, 6262 Van Nuys Blvd, Van Nuys, CA

- Total system size: 198.4 kW

Exhibit B – Layouts

Topanga Community Police Station, 21501 Schoenborn St, Canoga Park, CA

- Total system size: 594.6 kW

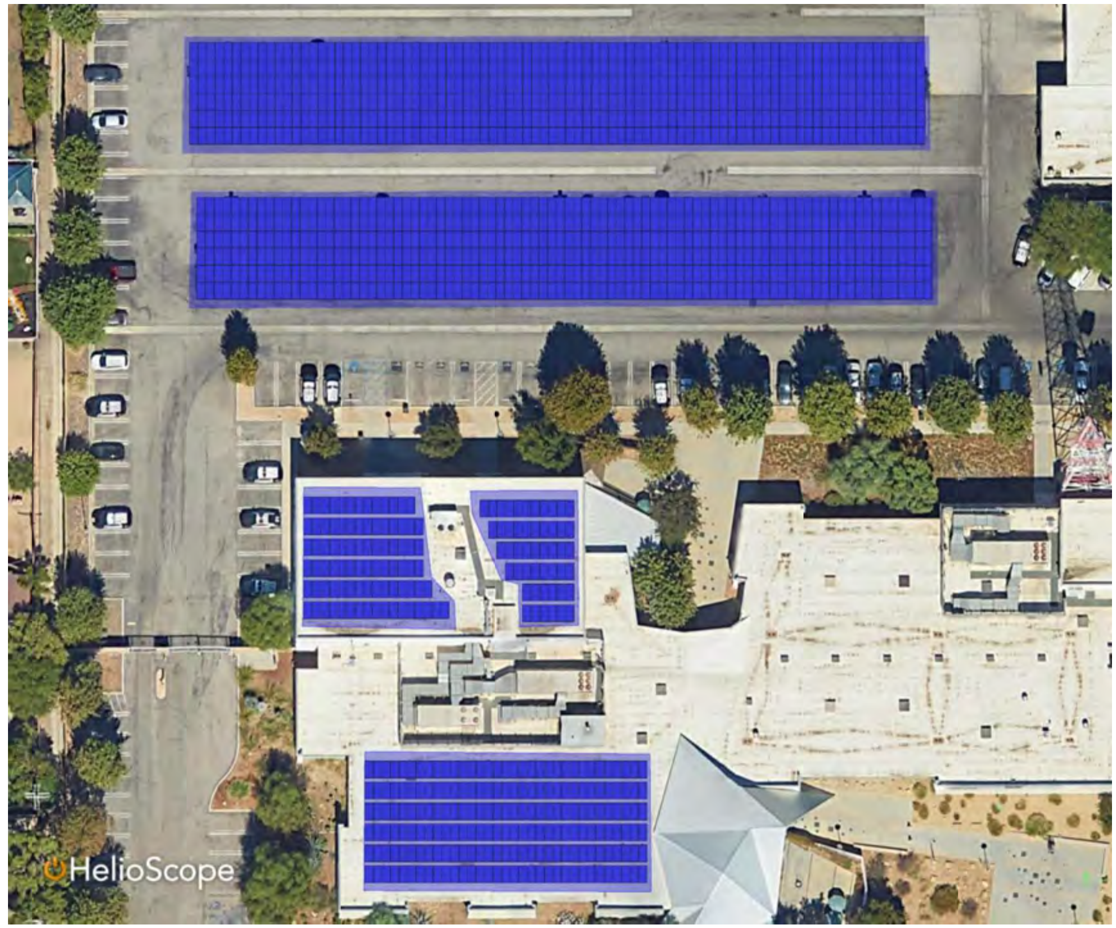


Exhibit B – Layouts

Fire Station #401, 140 N Ave 19, Los Angeles, CA

- Total system size: 162.3 kW

EXHIBIT B – LAYOUTS

Tarzana Branch Library, 18231 Ventura Blvd, Tarzana, CA

- Total system size: 131.8 kW

Exhibit B – Layouts

Platt Branch Library, 23600 Victory Blvd, Woodland Hills, CA

- Total system size: 53.1 kW

Exhibit B – Layouts

Fire Station #7, 14630 Plummer St, Panorama City, CA

- Total system size: 23.5 kW

Exhibit B – Layouts

Fire Station #94, 4470 Coliseum St, Los Angeles, CA

- Total system size: 49.6 kW

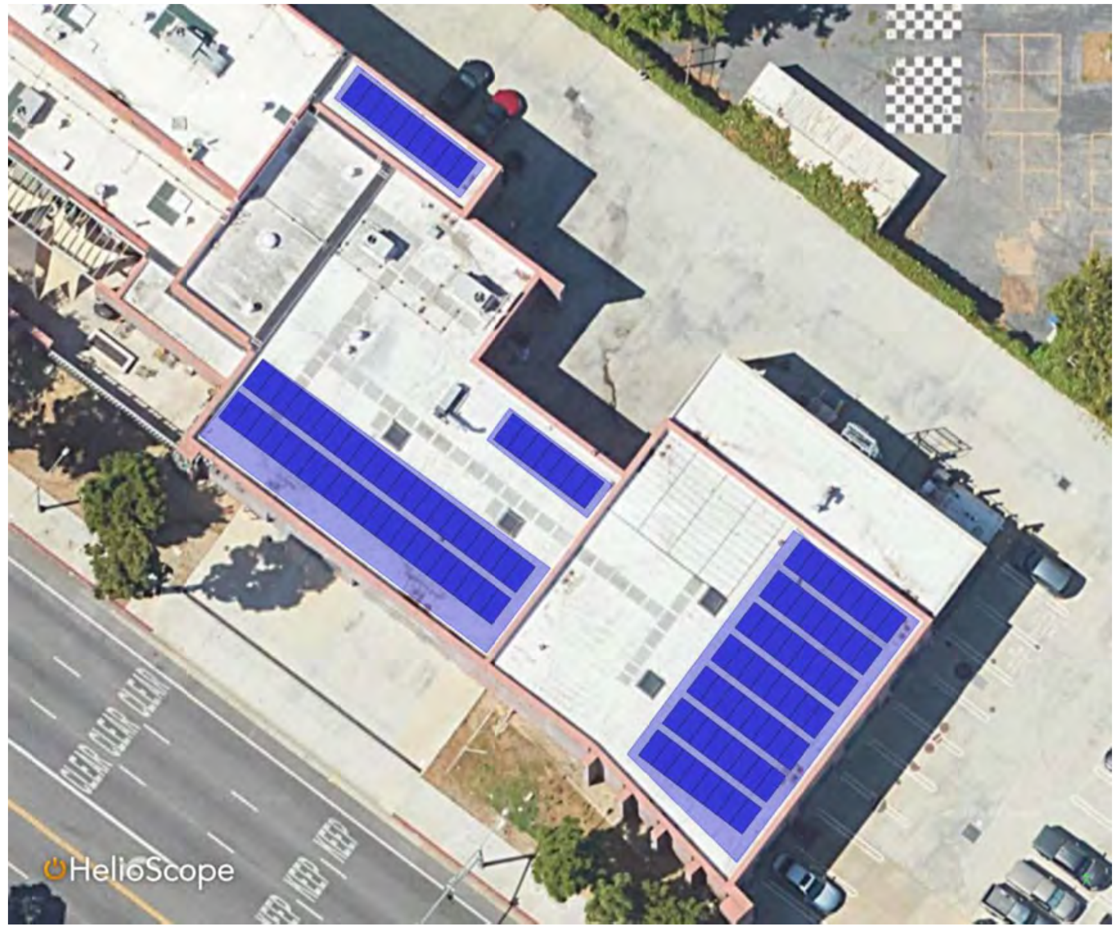


Exhibit B – Layouts

Stetson Ranch Park, 15401 Glenoaks Blvd, Sylmar, CA

- Total system size: 647.3 kW

SUPPLEMENTAL ATTACHMENT A.10

City of Los Angeles
Los Angeles Decarbonization Workplan

Los Angeles , CA

GLUMAC
PARAMETRIC LEVEL ESTIMATE-R5
OCMI JOB #: 220899
29 January 2024

COST ESTIMATE

INTRODUCTORY NOTES

This estimate is based on verbal direction from the client and the following items, received 26 September 2023:

Scope document	$ / SF across the portfolio document.

BREAKDOWN OF GENERAL CONTRACTOR MARK-UPS

NOTE: Mark-up are based on design-bid-build delivery method)

Design contingency	15%
Escalation	8%
General conditions / requirement	10%
Overhead and profit	8%
Bond	2%
Total - GC mark-ups	**43%**

Note: Unit rate of respective line items include the overhead and profit of the sub contractor. If the contract is awarded to the sub contractor directly recommend applying the design contingency, escalation and bond percentages to the direct cost.

CONSTRUCTION ESCALATION FORCAST

The below table provides OCMI's recommended Per Annum Escalation Rates specifically for the City of Los Angeles Existing Building Decarbonization Program. These escalation rates are based on OCMI's projections of construction macro-economic trends as well as the decarbonization program's specific requirements. General construction macro-economic trends, including consideration of material price trends, labor cost projections (for southern California), as well as general & sub-contractor competition, provide the baseline projected escalation. The specific requirements of the decarbonization program – namely chip-enabled device-heavy equipment needs and specialty MEP components – effectively increase the projected escalation. This is, in general, due to forecasted competition for these materials and potential supply chain restriction (domestic capacity limitations; foreign trade dynamics) in the coming years. The escalation rates provided represent reasonable, risk-considerate escalation rates to apply to highly conceptual projects for budgeting purposes at this stage.

COST ESTIMATE

Year	Per Annum Escalation rate
2024	4.75%
2025	4.50%
2026	4.25%
2027	4.25%
2028	4.25%
2029	4.25%
2030	4.25%
2031	4.25%
2032	4.25%
2033	4.25%

PARAMETRIC LEVEL ESTIMATE-R5

ELEMENT	SUGGEATED $ / UNIT
1. HVAC CONTROL UPGRADE	$ / SF
Library	$9.01
Maintenance building	$5.53
Recreation building	$8.37
2. LIGHTING RETROFIT - BULBS / RETROFIT KITS	$ / SF
Library	$6.04
Maintenance building	$4.83
Recreation building	$5.57
Fire station	$5.03
Police station	$5.23
3. LIGHTING RETROFIT - FULL UPGRADE	$ / SF
Library	$17.98
Maintenance building	$14.59
Recreation building	$16.66
Fire station	$14.57
Police station	$15.55
4. HVAC ELEC. - HEAT PUMP RTUs	$ / UNIT
5 - ton unit	$51,200
10 - ton unit	$86,732
25 - ton unit	$168,390
50 - ton unit (custom)	$303,343
Alternate add - Vibration isolated curb	
5 ton unit	$1,429
10 ton unit	$2,678
25 ton unit	$3,769
50 ton unit	$5,134
5.1. HVAC ELEC. -SPLIT SYSTEM - OPTION 1 (REPLACE EXISTING VENTILATION UNIT, HEATING ONLY)	$ / UNIT
3 - ton	$6,645
5 - ton	$8,970
10 - ton	$14,452
5.2. HVAC ELECTRIC -SPLIT SYSTEM - OPTION 2 (OUTDOOR UNIT ON THE ROOF)	$ / UNIT
3 - ton	$17,013
5 - ton	$25,916
10 - ton	$44,625
	$ / SF
6. HVAC ELCTRIC - PTHP	$2.19
7. HVAC ELECTRIC - HYDRONIC ASHPs	$ / UNIT
500 MBH system	$130,585

1,000 MBH system	$214,098
2,000 MBH system	$327,697
Alternate - sound attenuation, mechanical screen and roof equipment pad	$40,320
4,000 MBH system	$554,540
Alternate - sound attenuation, mechanical screen and roof equipment pad	$49,613
Alternate - add heat recovery if there is chilled water service including GC mark-ups	$ / UNIT
500 MBH	$131,083
1,000 MBH	$238,333
2,000 MBH	$452,833
4,000 MBH	$810,333
	$ / UNIT
8. DHW ELECTRIC - INSTANTANEOUS HOW WATER HEATER	$1,123
(Assume under sink type)	
9. DHW ELECTRIC - TANK TYPE HEAT PUMP WATER HEATER	$ / UNIT
50 gallon (residential)	$8,251
40 gallon (commercial)	$9,188
80 gallon (commercial)	$11,083
100 gallon (commercial)	$17,412
10. DHW ELECTRIC -AIR SOURCE HEAT PUMP WATER HEATER - ROOF TOP OR OUTSIDE CONDENSING UNIT	$ / UNIT
250 MBH	$69,162
500 MBH	$118,330
Add alternate - storage tank	$ / UNIT
For 250 MBH tank, assume 100 gallon	$3,818
For 500 MBH tank, assume 200 gallon	$7,199
11. POOL HEATING -ASHP	$ / UNIT
1,000 MBH	$228,338
2,000 MBH	$373,148
4,000 MBH	$606,151
Add alternate	$ / SYSTEM
Building incoming power service	$224,510
	$ / UNIT
12. PROCESS COOKING (FIRE STATION)	$55,408
	$ / UNIT
13. PROCESS -COOKING OVEN (RESIDENTIAL WITH NO FIRE PROTECTION SYSTEM)	$7,306
14. ELECTRICAL - SERVICE, PANEL UPGRADE & TRANSFORMER UPGRADE	$ / SF
Small building, 10,000 SF	
600 amp. service	$20.05
800 amp. service	$22.67
1,000 amp. service	$25.45
Medium facility, 20,000 SF	
1,000 amp. service	$16.65
1,500 amp. service	$18.82
15. SOLAR PV -ROORTOP	$ / KW
20 - 50 KW	$6,757
51 - 100 KW	$6,006
501 + KW	$4,505
16. SOLAR PV + CARPORT	$ / KW
20 - 50 KW	$9,939
51 - 100 KW	$9,152
101 + KW	$8,480

17. SOLAR PV + STORAGE	$ / KW
20 - 50 KW	$7,365
51 - 100 KW	$6,864
501 + KW	$5,649
ADDS	
Roof support system	
20 - 50 KW	$775
51 - 100 KW	$600
501 + KW	$400
Carport	
20 - 50 KW	$3,000
51 - 100 KW	$2,800
501 + KW	$2,630
18. WASHER DRYER, ELECTRIC	$ / UNIT
Residential	$8,112
Commercial	$19,096
19. VAV BOX REPLACEMENT	$ / SF
Police station	
Complete box replacement	$9.69
VAV box coil replacement	$7.33
20. BOILER REPLACEMENT, ELECTRIC	$ / SF
500 MBH system	$50,186
1,000 MBH system	$82,232
2,000 MBH system	$135,824
ALTERNATE ADDS	
Upgrade electrical service	
500 MBH	$15,000
1,000 MBH	$24,000
2,000 MBH	$43,200
	$ / SF
21. ELECTRIC UNIT HEATER - MAINTENANCE YARD / SHOP BUILDINGS	$2.92
	$ / SF
22. POLICE STATION - CHILLER REPLACEMENT	$13.52
	$ / TON
23. ELECTRIC MODULAR HEAT RECOVERY CHILLER, 200 TON	$8,168.13
21. EXTERIOR LIGHTING LED UPGRADES	$ / SF
Police department	$1.54
Office building	$0.42
Vehicle maintenance space and office	$0.32
Single story office	$0.57
Single story vehicle maintenance shop	$0.83
Single story office and classrooms	$0.90
Single story lift, repair shop	$0.23
Two story storage	$0.10
Single story, vehicle bays, repair shops and offices	$0.36
Single story offices and lockers	$1.92

PARAMETRIC LEVEL ESTIMATE-R5

OCMI JOB #: 220899 | 29 January 2024

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
1. HVAC CONTROL UPGRADE				
(Typical AV w/ HW reheat building)				
Library building	10,000	SF		
Building controller	1	EA	3,000.00	$3,000
Hot water system	15	POINTS	1,500.00	$22,500
VAV	5	EA	1,450.00	$7,250
Split AC units	3	EA	2,500.00	$7,500
Conduit and wire	10,000	SF	0.80	$8,000
Exhaust fan controls	10,000	SF	0.25	$2,500
Demolish existing controls	10,000	SF	0.25	$2,500
Asbestos abatement, disturbed area only, per location	10	EA	625.00	$6,250
Patch and repair walls / ceilings	10,000	SF	0.35	$3,500
Total direct cost at subcontractor level				**$63,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$27,090
Total cost				**$90,090**
Maintenance facility	20,000	SF		
Building controller	1	EA	4,000.00	$4,000
Hot water system	15	POINTS	1,500.00	$22,500
VAV	5	EA	1,450.00	$7,250
Roof top packaged units	2	EA	5,500.00	$11,000
Conduit and wire	20,000	SF	0.60	$12,000
Exhaust fan controls	20,000	SF	0.25	$5,000
Demolish existing controls	20,000	SF	0.20	$4,000
Asbestos abatement, disturbed area only, per location	9	EA	625.00	$5,625
Patch and repair walls / ceilings	20,000	SF	0.30	$6,000
Total direct cost at subcontractor level				**$77,375**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$33,271
Total cost				**$110,646**
Recreation building	10,000	SF		
Building controller	1	EA	3,000.00	$3,000
Hot water system	15	POINTS	1,500.00	$22,500
VAV	4	EA	1,450.00	$5,800
Roof top packaged units	1	EA	5,500.00	$5,500
Conduit and wire	10,000	SF	0.60	$6,000
Exhaust fan controls	10,000	SF	0.60	$6,000
Demolish existing controls	10,000	SF	0.25	$2,500
Asbestos abatement, disturbed area only, per location	6	EA	625.00	$3,750
Patch and repair walls / ceilings	10,000	SF	0.35	$3,500
Total direct cost at subcontractor level				**$58,550**

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$25,177
Total cost				**$83,727**
2. LIGHTING RETROFIT - BULBS / RETROFIT KITS				
(No additional controls, no infrastructure changes)				
Library building	10,000	SF		
Remove existing bulbs / clean the fixture as needed	167	EA	115.58	$19,301
Replace retrofit-kit	167	EA	111.55	$18,629
Reconnect and test	167	EA	25.65	$4,283
(Assume one fixture / 60 SF)				
Total direct cost at subcontractor level				**$42,213**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$18,152
Total cost				**$60,365**
Maintenance facility	20,000	SF		
Remove existing bulbs / clean the fixture as needed	267	EA	115.58	$30,859
Replace retrofit-kit	267	EA	111.55	$29,784
Reconnect and test	267	EA	25.65	$6,847
(Assume one fixture / 75 SF)				
Total direct cost at subcontractor level				**$67,490**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$29,021
Total cost				**$96,511**
Recreation building	10,000	SF		
Remove existing bulbs / clean the fixture as needed	154	EA	115.58	$17,799
Replace retrofit-kit	154	EA	111.55	$17,179
Reconnect and test	154	EA	25.65	$3,949
(Assume one fixture / 65 SF)				
Total direct cost at subcontractor level				**$38,927**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$16,739
Total cost				**$55,666**
Fire station	15,000	SF		

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Remove existing bulbs / clean the fixture as needed	200	EA	115.58	$23,115
Replace retrofit-kit	200	EA	122.71	$24,541
Reconnect and test	200	EA	25.65	$5,129
(Assume one fixture / 75 SF)				
Total direct cost at subcontractor level				**$52,785**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$22,698
Total cost				**$75,483**
Police station	20,000	SF		
Remove existing bulbs / clean the fixture as needed	286	EA	115.58	$33,054
Replace retrofit-kit	286	EA	114.40	$32,717
Reconnect and test	286	EA	25.65	$7,334
(Assume one fixture /70 SF)				
Total direct cost at subcontractor level				**$73,105**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$31,435
Total cost				**$104,540**

3. LIGHTING RETROFIT - FULL UPGRADE

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Library building	10,000	SF		
Remove existing light fixture	167	EA	57.16	$9,545
Remove branch wiring to remain		NOTE		
New light fixture	167	EA	598.29	$99,914
Switches and occupancy sensors	10,000	SF	0.75	$7,500
Reconnect existing wiring to new fixtures, test	167	LF	52.50	$8,768
(Assume one fixture / 60 SF)				
Total direct cost at subcontractor level				**$125,727**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$54,063
Total cost				**$179,790**
Maintenance facility	20,000	SF		
Remove existing light fixture	267	EA	57.16	$15,260
Remove branch wiring to remain		NOTE		
New light fixture	267	EA	598.29	$159,743
Switches and occupancy sensors	20,000	SF	0.75	$15,000
Reconnect existing wiring to new fixtures, test	267	LF	52.50	$14,018

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
(Assume one fixture / 75 SF)				
Total direct cost at subcontractor level				**$204,021**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$87,729
Total cost				**$291,750**
Recreation building	10,000	SF		
Remove existing light fixture	154	EA	57.16	$8,802
Remove branch wiring to remain		NOTE		
New light fixture	154	EA	598.29	$92,136
Switches and occupancy sensors	10,000	SF	0.75	$7,500
Reconnect existing wiring to new fixtures, test	154	LF	52.50	$8,085
(Assume one fixture / 65 SF)				
Total direct cost at subcontractor level				**$116,523**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$50,105
Total cost				**$166,628**
Fire station	15,000	SF		
Remove existing light fixture	200	EA	57.16	$11,431
Remove branch wiring to remain		NOTE		
New light fixture	200	EA	598.29	$119,658
Switches and occupancy sensors	15,000	SF	0.75	$11,250
Reconnect existing wiring to new fixtures, test	200	LF	52.50	$10,500
(Assume one fixture / 75 SF)				
Total direct cost at subcontractor level				**$152,839**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$65,721
Total cost				**$218,560**
Police station	20,000	SF		
Remove existing light fixture	286	EA	57.16	$16,346
Remove branch wiring to remain		NOTE		
New light fixture	286	EA	598.29	$171,110
Switches and occupancy sensors	20,000	SF	0.75	$15,000
Reconnect existing wiring to new fixtures, test	286	LF	52.50	$15,015
(Assume one fixture / 70 SF)				
Total direct cost at subcontractor level				**$217,471**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market	43%			$93,513

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
condition.				
Total cost				**$310,984**
4. HVAC ELEC. - HEAT PUMP RTUs				
5 - ton unit				
Remove existing unit, prepare for new work	1	EA	1,028.00	$1,028
New heat pump unit, high performance	1	EA	19,076.00	$19,076
Disconnect and reconnect power	1	LS	650.00	$650
Roof penetration / structural supports as needed and patch	1	LS	10,000.00	$10,000
Control system upgrades	1	LS	4,500.00	$4,500
Testing / commissioning	1	LS	550.00	$550
Total direct cost at subcontractor level				**$35,804**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$15,396
Total cost				**$51,200**
10 - ton unit				
Remove existing unit, prepare for new work	1	EA	2,036.25	$2,036
New heat pump unit, high performance	1	EA	32,991.00	$32,991
Disconnect and reconnect power	1	LS	775.00	$775
Roof penetration / structural supports as needed and patch	1	LS	18,000.00	$18,000
Control system upgrades	1	LS	6,000.00	$6,000
Testing / commissioning	1	LS	850.00	$850
Total direct cost at subcontractor level				**$60,652**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$26,080
Total cost				**$86,732**
25 - ton unit				
Remove existing unit, prepare for new work	1	EA	2,586.20	$2,586
New heat pump unit, high performance	1	EA	75,219.00	$75,219
Disconnect and reconnect power	1	LS	1,250.00	$1,250
Roof penetration / structural supports as needed and patch	1	LS	30,000.00	$30,000
Control system upgrades	1	LS	7,500.00	$7,500
Testing / commissioning	1	LS	1,200.00	$1,200
Total direct cost at subcontractor level				**$117,755**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$50,635

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total cost				**$168,390**
50 - ton unit (custom)				
Remove existing unit, prepare for new work	1	EA	3,211.75	$3,212
New heat pump unit, high performance	1	EA	147,416.00	$147,416
Disconnect and reconnect power	1	LS	1,500.00	$1,500
Roof penetration / structural supports as needed and patch	1	LS	50,000.00	$50,000
Control system upgrades	1	LS	8,500.00	$8,500
Testing / commissioning	1	LS	1,500.00	$1,500
Total direct cost at subcontractor level				**$212,128**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$91,215
Total cost				**$303,343**
Alternate add - Vibration isolated curb				
5 ton unit	1	LS	1,428.88	$1,429
10 ton unit	1	LS	2,677.89	$2,678
25 ton unit	1	LS	3,768.78	$3,769
50 ton unit	1	LS	5,134.06	$5,134

5.1. HVAC ELEC. -SPLIT SYSTEM - OPTION 1 (REPLACE EXISTING VENTILATION UNIT, HEATING (

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
3 - ton				
Remove existing ventilating unit	1	EA	596.85	$597
New ventilation unit, heat only	1	EA	2,400.00	$2,400
Upgrade electrical service	1	LS	1,200.00	$1,200
Testing / commissioning	1	LS	450.00	$450
Total direct cost at subcontractor level				**$4,647**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,998
Total cost				**$6,645**
5 - ton				
Remove existing ventilating unit	1	EA	773.38	$773
New ventilation unit, heat only	1	EA	3,600.00	$3,600
Upgrade electrical service	1	LS	1,350.00	$1,350
Testing / commissioning	1	LS	550.00	$550
Total direct cost at subcontractor level				**$6,273**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,697

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total cost				**$8,970**
10 - ton				
Remove existing ventilating unit	1	EA	1,056.23	$1,056
New ventilation unit, heat only	1	EA	6,800.00	$6,800
Upgrade electrical service	1	LS	1,500.00	$1,500
Testing / commissioning	1	LS	750.00	$750
Total direct cost at subcontractor level				**$10,106**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$4,346
Total cost				**$14,452**

5.2. HVAC ELECTRIC -SPLIT SYSTEM - OPTION 2 (OUTDOOR UNIT ON THE ROOF)

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
3 - ton				
Remove existing ventilating unit	1	EA	596.85	$597
New split unit	1	EA	7,800.00	$7,800
New electrical service	1	LS	2,250.00	$2,250
Roof repairs	1	LS	650.00	$650
Testing / commissioning	1	LS	600.00	$600
Total direct cost at subcontractor level				**$11,897**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$5,116
Total cost				**$17,013**
5 - ton				
Remove existing ventilating unit	1	EA	773.38	$773
New split unit	1	EA	12,500.00	$12,500
New electrical service	1	LS	3,300.00	$3,300
Roof repairs	1	LS	800.00	$800
Testing / commissioning	1	LS	750.00	$750
Total direct cost at subcontractor level				**$18,123**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$7,793
Total cost				**$25,916**
10 - ton				
Remove existing ventilating unit	1	EA	1,056.23	$1,056
New split unit	1	EA	24,000.00	$24,000

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
New electrical service	1	LS	3,800.00	$3,800
Roof repairs	1	LS	1,150.00	$1,150
Testing / commissioning	1	LS	1,200.00	$1,200
Total direct cost at subcontractor level				**$31,206**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$13,419
Total cost				**$44,625**
6. HVAC ELCTRIC - PTHP				
Assumptions				
Building gross area	20,000	SF		
one window unit per 1,000 SF of GFA				
Remove existing window unit	20	EA	340.40	$6,808
New window units	20	EA	816.50	$16,330
Disconnect and reconnect power	20	EA	50.00	$1,000
Miscellaneous repairs as needed, per location	20	EA	323.73	$6,475
Total direct cost at subcontractor level				**$30,613**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$13,164
Total cost				**$43,777**
7. HVAC ELECTRIC - HYDRONIC ASHPs				
500 MBH system				
Remove existing boiler	1	EA	2,311.50	$2,312
Air source heat pump, high performance	1	EA	51,519.00	$51,519
Connect to exiting HW loop in mechanical room	1	LS	1,506.50	$1,507
Extend piping to roof including insulation, Allowance	200	LF	92.40	$18,480
Roof penetration / structural supports as needed and patch	1	LS	8,000.00	$8,000
Control system upgrades	1	LS	4,500.00	$4,500
New power service including wiring and disconnect switch	1	LS	2,000.00	$2,000
Testing and commissioning, by an independent contractor	1	LS	3,000.00	$3,000
Total direct cost at subcontractor level				**$91,318**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$39,267
Total cost				**$130,585**
1,000 MBH system				

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Remove existing boiler	1	EA	3,467.25	$3,467
Air source heat pump, high performance	1	EA	91,217.00	$91,217
Connect to exiting HW loop in mechanical room	1	LS	1,475.45	$1,475
Extend piping to roof including insulation, Allowance	200	LF	127.80	$25,560
Roof penetration / structural supports as needed and patch	1	LS	14,000.00	$14,000
Control system upgrades	1	LS	7,000.00	$7,000
New power service including wiring and disconnect switch	1	LS	3,000.00	$3,000
Testing and commissioning, by an independent contractor	1	LS	4,000.00	$4,000
Total direct cost at subcontractor level				**$149,719**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$64,379
Total cost				**$214,098**
2,000 MBH system				
Remove existing boiler	1	EA	4,623.00	$4,623
Air source heat pump, high performance	1	EA	151,638.00	$151,638
Connect to exiting HW loop in mechanical room	1	LS	1,937.75	$1,938
Extend piping to roof including insulation, Allowance	200	LF	119.80	$23,960
Roof penetration / structural supports as needed and patch	1	LS	24,000.00	$24,000
Control system upgrades	1	LS	13,000.00	$13,000
New power service including wiring and disconnect switch	1	LS	4,000.00	$4,000
Testing and commissioning, by an independent contractor	1	LS	6,000.00	$6,000
Total direct cost at subcontractor level				**$229,159**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$98,538
Total cost				**$327,697**
Alternate - Add miscellaneous scope				
Sound attenuator	1	EA	7,500.00	$7,500
Mechanical screen	60	LF	175.00	$10,500
Roof top equipment pad	1	LS	6,000.00	$6,000
Total direct cost at subcontractor level				**$24,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$10,320
Total cost				**$40,320**
4,000 MBH system				
Remove existing boiler	1	EA	6,997.75	$6,998
Air source heat pump, high performance	1	EA	267,236.00	$267,236
Connect to exiting HW loop in mechanical room	1	LS	1,223.60	$1,224
Extend piping to roof including insulation, Allowance	200	LF	171.66	$34,332
Roof penetration / structural supports as needed and patch	1	LS	40,000.00	$40,000

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Control system upgrades	1	LS	24,000.00	$24,000
New power service including wiring and disconnect switch	1	LS	6,000.00	$6,000
Testing and commissioning, by an independent contractor	1	LS	8,000.00	$8,000
Total direct cost at subcontractor level				**$387,790**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$166,750
Total cost				**$554,540**
Alternate - Add miscellaneous scope				
Sound attenuator	1	EA	8,500.00	$8,500
Mechanical screen	72	LF	175.00	$12,600
Roof top equipment pad	1	LS	8,000.00	$8,000
Total direct cost at subcontractor level				**$29,100**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$12,513
Total cost				**$49,613**
Alternate - add heat recovery if there is chilled water service including GC mark-ups				
500 MBH	1	LS	131,083.33	$131,083
1,000 MBH	1	LS	238,333.33	$238,333
2,000 MBH	1	LS	452,833.33	$452,833
4,000 MBH	1	LS	810,333.33	$810,333

C. INTERIORS TOTAL

8. DHW ELECTRIC - INSTANTANEOUS HOW WATER HEATER

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
(Assume under sink type)				
Remove existing	1	EA	163.88	$164
New water heater, connect to existing service	1	EA	621.00	$621
Total direct cost at subcontractor level				**$785**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$338
Total cost				**$1,123**

9. DHW ELECTRIC - TANK TYPE HEAT PUMP WATER HEATER

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
50 gallon (residential)				
Remove existing, disconnect piping & power, prepare for	1	EA	353.05	$353

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
new unit				
New water heater connect to existing plumbing	1	EA	2,949.75	$2,950
Valves and fittings	1	LS	442.46	$442
Power service	1	LS	1,650.00	$1,650
Test and commission	1	LS	375.00	$375
Total direct cost at subcontractor level				**$5,770**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,481
Total cost				**$8,251**
40 gallon (commercial)				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	353.05	$353
New water heater connect to existing plumbing	1	EA	3,519.00	$3,519
Valves and fittings	1	LS	527.85	$528
Power service	1	LS	1,650.00	$1,650
Test and commission	1	LS	375.00	$375
Total direct cost at subcontractor level				**$6,425**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,763
Total cost				**$9,188**
80 gallon (commercial)				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	420.33	$420
New water heater connect to existing plumbing	1	EA	4,387.25	$4,387
Valves and fittings	1	LS	658.09	$658
Power service	1	LS	1,850.00	$1,850
Test and commission	1	LS	435.00	$435
Total direct cost at subcontractor level				**$7,750**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$3,333
Total cost				**$11,083**
100 gallon (commercial)				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	487.60	$488
New water heater connect to existing plumbing	1	EA	7,641.75	$7,642
Valves and fittings	1	LS	1,146.26	$1,146
Power service	1	LS	2,350.00	$2,350
Test and commission	1	LS	550.00	$550

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total direct cost at subcontractor level				**$12,176**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$5,236
Total cost				**$17,412**
10. DHW ELECTRIC -AIR SOURCE HEAT PUMP WATER HEATER - ROOF TOP OR OUTSIDE CONDI				
250 MBH				
Remove existing boiler	1	EA	2,311.50	$2,312
Air source heat pump	1	EA	20,000.00	$20,000
Connect to exiting HW loop in mechanical room	1	LS	563.50	$564
Extend piping to roof including insulation, Allowance	200	LF	84.25	$16,850
Pipe penetration through wall / floor / roof, Allowance	6	EA	535.60	$3,214
New power service including wiring and disconnect switch	1	LS	2,675.00	$2,675
Testing and commissioning, by an independent contractor	1	LS	2,750.00	$2,750
Total direct cost at subcontractor level				**$48,365**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$20,797
Total cost				**$69,162**
500 MBH				
Remove existing boiler	1	EA	805.00	$805
Air source heat pump	1	EA	35,000.00	$35,000
Connect to exiting HW loop in mechanical room	1	LS	24,518.00	$24,518
Extend piping to roof including insulation, Allowance	200	LF	84.25	$16,850
Pipe penetration through wall / floor / roof, Allowance	6	EA	25.00	$150
New power service including wiring and disconnect switch	1	LS	2,675.00	$2,675
Testing and commissioning, by an independent contractor	1	LS	2,750.00	$2,750
Total direct cost at subcontractor level				**$82,748**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$35,582
Total cost				**$118,330**
Add alternate - storage tank				
For 250 MBH tank, assume 100 gallon	1	EA	3,818.00	$3,818
For 500 MBH tank, assume 200 gallon	1	EA	7,199.00	$7,199

11. POOL HEATING -ASHP

PARAMETRIC LEVEL ESTIMATE-R5

OCMI JOB #: 220899 | 29 January 2024

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
1,000 MBH				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	1,437.50	$1,438
New water heater connect to existing, high performance	1	EA	75,850.17	$75,850
Heat exchanger	1	EA	22,500.00	$22,500
Valves and fittings	1	LS	7,585.02	$7,585
Power service	1	LS	4,500.00	$4,500
Connect to existing system, extend piping as needed	1	LS	15,000.00	$15,000
Test and commission	1	LS	1,200.00	$1,200
Upgrade electrical service for 1,000 MBH	1	LS	24,000.00	$24,000
Miscellaneous architectural, structural, patch and repair 5%, Allowance	1	LS	7,603.65	$7,604
Total direct cost at subcontractor level				**$159,677**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$68,661
Total cost				**$228,338**
2,000 MBH				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	1,719.25	$1,719
New water heater connect to existing, high performance	1	EA	127,044.33	$127,044
Heat exchanger	1	EA	35,000.00	$35,000
Valves and fittings	1	LS	12,704.43	$12,704
Power service	1	LS	5,000.00	$5,000
Connect to existing system, extend piping as needed	1	LS	22,500.00	$22,500
Test and commission	1	LS	1,350.00	$1,350
Upgrade electrical service for, 2,000 MBH	1	LS	43,200.00	$43,200
Miscellaneous architectural, structural, patch and repair 5%, Allowance	1	LS	12,425.85	$12,426
Total direct cost at subcontractor level				**$260,943**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$112,205
Total cost				**$373,148**
4,000 MBH				
Remove existing, disconnect piping & power, prepare for new unit	1	EA	2,346.00	$2,346
New water heater connect to existing, high performance	1	EA	236,558.83	$236,559
Heat exchanger	1	EA	50,000.00	$50,000
Valves and fittings	1	LS	17,741.91	$17,742
Power service	1	LS	6,500.00	$6,500
Connect to existing system, extend piping as needed	1	LS	31,500.00	$31,500
Test and commission	1	LS	1,450.00	$1,450
Upgrade electrical service for 4,000 MBH	1	EA	57,600.00	$57,600

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Miscellaneous architectural, structural, patch and repair 5%, Allowance	1	LS	20,184.85	$20,185
Total direct cost at subcontractor level				**$423,882**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$182,269
Total cost				**$606,151**
BUILDING INCOMING SERVICE				
Primary power				
Duct bank	200	LF	60.00	$12,000
Conductor assembly	200	LF	175.00	$35,000
Transformer / equipment pad, grounding	1	LS	50,000.00	$50,000
Secondary feeder	100	LF	600.00	$60,000
Total direct cost at subcontractor level				**$157,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$67,510
Total cost				**$224,510**
12. PROCESS COOKING (FIRE STATION)				
Remove existing, disconnect services & power, prepare for new unit	1	EA	500.25	$500
New induction oven / stove	1	EA	21,746.50	$21,747
Fire protection system	1	LS	6,500.00	$6,500
Electrical upgrades	1	LS	10,000.00	$10,000
Total direct cost at subcontractor level				**$38,747**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$16,661
Total cost				**$55,408**
NOTE: Assume building electrical equipment capacity is adequate for proposed replacemen				
D. SERVICES TOTAL				
13. PROCESS -COOKING OVEN (RESIDENTIAL WITH NO FIRE PROTECTION SYSTEM)				
Remove existing, disconnect services & power, prepare for	1	EA	243.80	$244

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
new unit				
New induction oven / stove	1	EA	4,864.50	$4,865
Total direct cost at subcontractor level				**$5,109**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,197
Total cost				**$7,306**
14. ELECTRICAL - SERVICE, PANEL UPGRADE & TRANSFORMER UPGRADE				
Small building, 10,000 SF	10,000	SF		
600 amp. service				
Primary feeder				
Utility transformer assume by Utility company		NOTE		
Primary conductors, assume existing remain		NOTE		
Secondary feeder				
Duct bank, assume existing to reuse				
Clean existing infrastructure	1	LS	937.25	$937
Secondary feeder, Allowance	150	LF	235.00	$35,250
Service and distribution				
Main switch gear, assume 600 amp	1	EA	30,000.00	$30,000
Panel boards	10,000	SF	2.50	$25,000
Transformer	10,000	SF	0.90	$9,000
Building feeder	10,000	SF	2.25	$22,500
Remove existing equipment as needed	10,000	SF	1.75	$17,500
Total direct cost at subcontractor level				**$140,187**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$60,280
Total cost				**$200,467**
800 amp. service				
Primary feeder				
Utility transformer assume by Utility company		NOTE		
Primary conductors, assume existing remain		NOTE		
Secondary feeder				
Duct bank, assume existing to reuse				
Clean existing infrastructure	1	LS	1,077.84	$1,078
Secondary feeder, Allowance	150	LF	275.00	$41,250
Service and distribution				
Main switch gear, assume 800 amp	1	EA	39,200.00	$39,200
Panel boards	10,000	SF	2.60	$26,000
Transformer	10,000	SF	1.00	$10,000
Building feeder	10,000	SF	2.35	$23,500
Remove existing equipment as needed	10,000	SF	1.75	$17,500

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total direct cost at subcontractor level				**$158,528**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$68,167
Total cost				**$226,695**
1,000 amp. service				
Primary feeder				
Utility transformer assume by Utility company		NOTE		
Primary conductors, assume existing remain		NOTE		
Secondary feeder				
Duct bank, assume existing to reuse				
Clean existing infrastructure	1	LS	1,218.43	$1,218
Secondary feeder, Allowance	150	LF	325.00	$48,750
Service and distribution				
Main switch gear, assume 1,000 amp	1	EA	48,000.00	$48,000
Panel boards	10,000	SF	2.70	$27,000
Transformer	10,000	SF	1.10	$11,000
Building feeder	10,000	SF	2.45	$24,500
Remove existing equipment as needed	10,000	SF	1.75	$17,500
Total direct cost at subcontractor level				**$177,968**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$76,526
Total cost				**$254,494**
Medium facility, 20,000 SF	20,000	SF		
1,000 amp. service				
Primary feeder				
Utility transformer assume by Utility company		NOTE		
Primary conductors, assume existing remain		NOTE		
Secondary feeder				
Duct bank, assume existing to reuse				
Clean existing infrastructure	1	LS	1,059.15	$1,059
Secondary feeder, Allowance	150	LF	325.00	$48,750
Service and distribution				
Main switch gear, assume 1,000 amp	1	EA	48,000.00	$48,000
Panel boards	20,000	SF	2.25	$45,000
Transformer	20,000	SF	0.75	$15,000
Building feeder	20,000	SF	2.25	$45,000
Remove existing equipment as needed	20,000	SF	1.50	$30,000
Total direct cost at subcontractor level				**$232,809**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$100,108

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total cost				**$332,917**
1,500 amp. service				
Primary feeder				
Utility transformer assume by Utility company		NOTE		
Primary conductors, assume existing remain		NOTE		
Secondary feeder				
Duct bank, assume existing to reuse				
Clean existing infrastructure	1	LS		
Secondary feeder, Allowance	150	LF	325.00	$48,750
Service and distribution				
Main switch gear, assume 1,500 amp	1	EA	67,500.00	$67,500
Panel boards	20,000	SF	2.40	$48,000
Transformer	20,000	SF	0.90	$18,000
Building feeder	20,000	SF	2.40	$48,000
Remove existing equipment as needed	20,000	SF	1.65	$33,000
Total direct cost at subcontractor level				**$263,250**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$113,198
Total cost				**$376,448**

E. EQUIPMENT AND FURNISHINGS TOTAL

15. SOLAR PV -ROORTOP

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
20 - 50 KW				
Solar panel including combiners, associated cabling, per KW	40	KW	3,200.00	$128,000
Roof support system	40	KW	775.00	$31,000
Electrical infrastructure	1	LS	30,000.00	$30,000
Total direct cost at subcontractor level				**$189,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$81,270
Total cost				**$270,270**
51 - 100 KW				
Solar panel including combiners, associated cabling, per KW	75	KW	3,000.00	$225,000
Roof support system	75	KW	600.00	$45,000
Electrical infrastructure	1	LS	45,000.00	$45,000

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total direct cost at subcontractor level				**$315,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$135,450
Total cost				**$450,450**
501 + KW				
Solar panel including combiners, associated cabling, per KW	750	KW	2,650.00	$1,987,500
Roof support system	750	KW	400.00	$300,000
Electrical infrastructure	1	LS	75,000.00	$75,000
Total direct cost at subcontractor level				**$2,362,500**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,015,875
Total cost				**$3,378,375**

16. SOLAR PV + CARPORT

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
20 - 50 KW				
Solar panel including combiners, associated cabling, per KW	40	KW	3,200.00	$128,000
Carport	40	KW	3,000.00	$120,000
Electrical infrastructure	1	LS	30,000.00	$30,000
Total direct cost at subcontractor level				**$278,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$119,540
Total cost				**$397,540**
51 - 100 KW				
Solar panel including combiners, associated cabling, per KW	75	KW	3,000.00	$225,000
Carport	75	KW	2,800.00	$210,000
Electrical infrastructure	1	LS	45,000.00	$45,000
Total direct cost at subcontractor level				**$480,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$206,400
Total cost				**$686,400**
101 + KW				

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Solar panel including combiners, associated cabling, per KW	150	KW	2,800.00	$420,000
Carport	150	KW	2,630.00	$394,500
Electrical infrastructure	1	LS	75,000.00	$75,000
Total direct cost at subcontractor level				**$889,500**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$382,485
Total cost				**$1,271,985**

F. SPECIAL CONSTRUCTION AND DEMOLITION TOTAL

17. SOLAR PV + STORAGE

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
20 - 50 KW				
Solar panel including combiners, associated cabling, per KW	40	KW	3,200.00	$128,000
Energy storage system, 4 hours back-up	160	KWh	300.00	$48,000
Electrical infrastructure	1	LS	30,000.00	$30,000
Total direct cost at subcontractor level				**$206,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$88,580
Total cost				**$294,580**
51 - 100 KW				
Solar panel including combiners, associated cabling, per KW	75	KW	3,000.00	$225,000
Energy storage system, 4 hours back-up	300	KWh	300.00	$90,000
Electrical infrastructure	1	LS	45,000.00	$45,000
Total direct cost at subcontractor level				**$360,000**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$154,800
Total cost				**$514,800**
501 + KW				
Solar panel including combiners, associated cabling, per KW	750	KW	2,650.00	$1,987,500
Energy storage system, 4 hours back-up	3,000	KWh	300.00	$900,000
Electrical infrastructure	1	LS	75,000.00	$75,000

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total direct cost at subcontractor level				**$2,962,500**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,273,875
Total cost				**$4,236,375**
ALTERNATE ADDS				
Roof support system				
20 - 50 KW	40	KW	775.00	$31,000
51 - 100 KW	75	KW	600.00	$45,000
501 + KW	750	KW	400.00	$300,000
Carport				
20 - 50 KW	40	KW	3,000.00	$120,000
51 - 100 KW	75	KW	2,800.00	$210,000
501 + KW	750	LW	2,630.00	$1,972,500

18. WASHER DRYER, ELECTRIC

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Residential				
Remove existing equipment, disconnect associated services	1	EA	449.65	$450
New washer	1	EA	1,114.35	$1,114
New dryer	1	EA	1,097.68	$1,098
Reconnect existing services, test	1	LS	353.05	$353
Clean vent and repair as necessary	1	LS	182.85	$183
New power including conduit and wire (Assume existing panel capacity is adequate)	1	LS	2,475.00	$2,475
Total direct cost at subcontractor level				**$5,673**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,439
Total cost				**$8,112**
Commercial				
Remove existing equipment, disconnect associated services	1	EA	565.23	$565
New washer	1	EA	4,493.63	$4,494
New dryer	1	EA	4,068.13	$4,068
Reconnect existing services, test	1	LS	477.25	$477
Clean vent and repair as necessary	1	LS	250.13	$250
New power including conduit and wire (Assume existing panel capacity is adequate)	1	LS	3,500.00	$3,500
Total direct cost at subcontractor level				**$13,354**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$5,742

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Total cost				**$19,096**

19. VAV BOX REPLACEMENT

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Police station	50,000	SF		
Complete box replacement				
(assume 1 VAV box / 900 SF)				
Remove existing VAV, disconnect associated services, protect for future connection	56	EA	250.13	$14,007
New VAV unit with reheat coil	56	EA	2,524.25	$141,358
Reconnect hydronic piping and power, per VAV	56	EA	1,014.88	$56,833
Air / water balance and test, complete building	50,000	SF	0.85	$42,500
Reconnect controls and test, per VAV	56	EA	1,500.00	$84,000
Total direct cost at subcontractor level				**$338,698**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$145,640
Total cost				**$484,338**
VAV box coil replacement				
(assume 1 VAV box / 900 SF)				
Remove existing VAV, disconnect associated services, protect for future connection	56	EA	250.13	$14,007
Replace VAV reheat coil	56	EA	1,052.25	$58,926
Reconnect hydronic piping and power, per VAV	56	EA	1,014.88	$56,833
Air / water balance and test, complete building	50,000	SF	0.85	$42,500
Reconnect controls and test, per VAV	56	EA	1,500.00	$84,000
Total direct cost at subcontractor level				**$256,266**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$110,194
Total cost				**$366,460**

20. BOILER REPLACEMENT, ELECTRIC

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
500 MBH system				
Remove existing boiler	1	EA	2,311.50	$2,312
New boiler	1	EA	25,000.00	$25,000
Reconnect hot water piping, replace fittings as needed	1	LS	2,357.50	$2,358
New power service including wiring and disconnect switch	1	LS	2,675.00	$2,675
Testing and commissioning, by an independent contractor	1	LS	2,750.00	$2,750
Total direct cost at subcontractor level				**$35,095**
General contractor mark-up including overhead & profit,	43%			$15,091

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
design contingency, escalation, bods and market condition.				
Total cost				**$50,186**
1,000 MBH system				
Remove existing boiler	1	EA	3,467.25	$3,467
New boiler	1	EA	45,000.00	$45,000
Reconnect hot water piping, replace fittings as needed	1	LS	3,087.75	$3,088
New power service including wiring and disconnect switch	1	LS	3,200.00	$3,200
Testing and commissioning, by an independent contractor	1	LS	2,750.00	$2,750
Total direct cost at subcontractor level				**$57,505**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$24,727
Total cost				**$82,232**
2,000 MBH system				
Remove existing boiler	1	EA	4,623.00	$4,623
New boiler	1	EA	80,000.00	$80,000
Reconnect hot water piping, replace fittings as needed	1	LS	3,208.50	$3,209
New power service including wiring and disconnect switch	1	LS	4,150.00	$4,150
Testing and commissioning, by an independent contractor	1	LS	3,000.00	$3,000
Total direct cost at subcontractor level				**$94,982**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$40,842
Total cost				**$135,824**
ALTERNATE ADDS				
Upgrade electrical service				
500 MBH	1	EA	15,000.00	$15,000
1,000 MBH	1	EA	24,000.00	$24,000
2,000 MBH	1	EA	43,200.00	$43,200
21. ELECTRIC UNIT HEATER - MAINTENANCE YARD / SHOP BUILDINGS	28,000	SF		
Demolition				
Remove existing gas unit heater	7	EA	428.05	$2,996
Gas piping system	28,000	SF	0.45	$12,600
New work				
Unit heater, electric, ~ 4KW	7	EA	1,937.75	$13,564
Power service per unit heater	7	EA	3,250.00	$22,750
(Assume existing equipment is adequate to support this				

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
scope)				
Miscellaneous cut and patch including unforeseen work, 10%	1	LS	5,191.00	$5,191
Total direct cost at subcontractor level				**$57,101**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$24,553
Total cost				**$81,654**
22. POLICE STATION - CHILLER REPLACEMENT	30,000	SF		
Demolition				
Remove existing chiller, 50 ton	2	EA	5,938.88	$11,878
Disconnect hydronic service and power, protect for new chiller connection, per chiller	2	EA	2,564.50	$5,129
Protect existing equipment during replacement, Allowance	1	LS	10,000.00	$10,000
New work				
Chiller, 50 ton, electric	2	EA	76,912.50	$153,825
Upgrade controls	1	LS	25,000.00	$25,000
Reconnect hydronic system including modifications as needed	1	LS	23,073.75	$23,074
Upgrade to electrical service, Allowance	1	LS	40,000.00	$40,000
Power service to chillers including disconnect switch, conduit and wire	2	EA	8,000.00	$16,000
Miscellaneous including unforeseen work, 10%	1	LS	25,789.90	$25,790
Total direct cost at subcontractor level				**$283,689**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$121,986
Total cost				**$405,675**
23. ELECTRIC MODULAR HEAT RECOVERY CHILLER, 200 TON				
Demolition				
Building cooling capacity	400	TON		
Remove gas boiler, 8400 MBH	2	EA	10,154.13	$20,308
Chiller, 200 ton	1	EA	12,447.00	$12,447
Safe-off power, disconnect utilities, prepare for new	1	LS	5,807.50	$5,808
New work				
Heat pump, 4,000 MBH	2	EA	180,000.00	$360,000
Heat recovery chiller, 200 ton	2	EA	750,000.00	$1,500,000
Reconnect equipment, extend piping including fittings and accessories	1	LS	186,000.00	$186,000

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Electrical service upgrade, Allowance	1	EA	96,000.00	$96,000
Miscellaneous including unforeseen work, 5%	1	LS	104,228.15	$104,228
Total direct cost at subcontractor level				**$2,284,791**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$982,460
Total cost				**$3,267,251**
NOTE: Existing infrastructure to remain.				

21. EXTERIOR LIGHTING LED UPGRADES

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Police department	26,000	SF		
Demolition				
Remove lamps	76	EA	87.40	$6,642
Clean, minor repairs, touch-up existing fixture	76	EA	130.81	$9,942
New work				
New LEP lamps	76	EA	49.39	$3,754
Conversion kit	76	EA	100.91	$7,669
Total direct cost at subcontractor level				**$28,007**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$12,043
Total cost				**$40,050**
Office building	5,000	SF		
Demolition				
Remove lamps	4	EA	87.40	$350
Clean, minor repairs, touch-up existing fixture	4	EA	130.81	$523
New work				
New LEP lamps	4	EA	49.39	$198
Conversion kit	4	EA	100.91	$404
Total direct cost at subcontractor level				**$1,475**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$634
Total cost				**$2,109**
Vehicle maintenance space and office	20,000	SF		
Demolition				
Remove lamps	12	EA	87.40	$1,049

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Clean, minor repairs, touch-up existing fixture	12	EA	130.81	$1,570
New work				
New LEP lamps	12	EA	49.39	$593
Conversion kit	12	EA	100.91	$1,211
Total direct cost at subcontractor level				**$4,423**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,902
Total cost				**$6,325**
Single story office	5,500	SF		
Demolition				
Remove lamps	6	EA	87.40	$524
Clean, minor repairs, touch-up existing fixture	6	EA	130.81	$785
New work				
New LEP lamps	6	EA	49.39	$296
Conversion kit	6	EA	100.91	$605
Total direct cost at subcontractor level				**$2,210**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$950
Total cost				**$3,160**
Single story vehicle maintenance shop	9,000	SF		
Demolition				
Remove lamps	16	EA	87.40	$1,398
Clean, minor repairs, touch-up existing fixture	11	EA	130.81	$1,439
New work				
New LEP lamps	16	EA	49.39	$790
Conversion kit	16	EA	100.91	$1,615
Total direct cost at subcontractor level				**$5,242**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$2,254
Total cost				**$7,496**
Single story office and classrooms	7,000	SF		
Demolition				
Remove lamps	12	EA	87.40	$1,049
Clean, minor repairs, touch-up existing fixture	12	EA	130.81	$1,570

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
New work				
New LEP lamps	12	EA	49.39	$593
Conversion kit	12	EA	100.91	$1,211
Total direct cost at subcontractor level				**$4,423**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,902
Total cost				**$6,325**
Single story lift, repair shop	28,000	SF		
Demolition				
Remove lamps	12	EA	87.40	$1,049
Clean, minor repairs, touch-up existing fixture	12	EA	130.81	$1,570
New work				
New LEP lamps	12	EA	49.39	$593
Conversion kit	12	EA	100.91	$1,211
Total direct cost at subcontractor level				**$4,423**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,902
Total cost				**$6,325**
Two story storage	57,000	SF		
Demolition				
Remove lamps	11	EA	87.40	$961
Clean, minor repairs, touch-up existing fixture	11	EA	130.81	$1,439
New work				
New LEP lamps	11	EA	49.39	$543
Conversion kit	11	EA	100.91	$1,110
Total direct cost at subcontractor level				**$4,053**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$1,743
Total cost				**$5,796**
Single story, vehicle bays, repair shops and offices	67,000	SF		
Demolition				
Remove lamps	46	EA	87.40	$4,020
Clean, minor repairs, touch-up existing fixture	46	EA	130.81	$6,017
New work				
New LEP lamps	46	EA	49.39	$2,272

PARAMETRIC LEVEL ESTIMATE-R5

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Conversion kit	46	EA	100.91	$4,642
Total direct cost at subcontractor level				**$16,951**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$7,289
Total cost				**$24,240**
Single story offices and lockers	6,500	SF		
Demolition				
Remove lamps	28	EA	87.40	$2,447
Clean, minor repairs, touch-up existing fixture	16	EA	130.81	$2,093
New work				
New LEP lamps	28	EA	49.39	$1,383
Conversion kit	28	EA	100.91	$2,826
Total direct cost at subcontractor level				**$8,749**
General contractor mark-up including overhead & profit, design contingency, escalation, bods and market condition.	43%			$3,762
Total cost				**$12,511**

ATTACHMENT NO. 2
Decarbonization Workplan - Year 1 Workbook


Griffith Park Pool

City of Los Angeles

Existing Municipal Building Decarbonization Workplan

Year 1 Project Workbook – FY 2024-2025

November 2024

Prepared by Glumac, a Tetra Tech Company

This document provides a summary of Year 1 projects (FY24-25) for the City of Los Angeles' Existing Municipal Building Decarbonization Plan. Refer to the full report for additional information.

BACKGROUND

LOS ANGELES CLIMATE GOALS

The City of Los Angeles has established robust climate action goals and is committed to achieving carbon neutral municipal operations by 2045. The City owns and operates roughly 980 buildings, totaling over 21 million square feet, which account for 34% of the City's municipal greenhouse gas (GHG) emissions[1]. Decarbonizing municipal buildings will improve infrastructure and yield multiple benefits to address the urgent need for climate action, improve the resilience of vulnerable communities, and lead the way for the private sector.

EXISTING MUNICIPAL BUILDING DECARBONIZATION WORKPLAN

The Los Angeles City Council directed city departments to develop a workplan to retrofit municipally owned buildings to achieve carbon-neutral operations by 2035. The workplan will provide the City with a strategic framework and detailed roadmap to eliminate operational GHG emissions from energy sources at existing municipal buildings through implementing decarbonization measures such as energy efficiency, electrification, solar PV, and battery energy storage.

The Existing Building Decarbonization Workplan included four primary tasks. The consultant team worked closely with the Bureau of Engineering and numerous other City departments.

Foundational Analysis	Prioritization Methodology	Jobs, Procurement, Maintenance	Tracking Tool
Review background research, existing conditions, City of LA documents and decarbonization strategies.	Establish a method for evaluating projects. Develop a pilot program and a 12-year workbook	Assess job impacts and mitigation strategies, delivery options, funding strategies and maintenance practices.	Develop a system for reporting and tracking GHG emissions, program savings and project implementation.

Figure 1: Existing Building Decarbonization Workplan Planning Process

The project workplan outlined in this report provides a pathway for the City to achieve carbon-neutral operations by 2035. Through this project several key findings were identified:

1. **The City of Los Angeles has a pathway for carbon-neutral municipal buildings by 2035** by prioritizing capital investments in building electrification.
2. **Achieving 2035 carbon neutrality requires scaling and accelerating implementation efforts**. Los Angeles needs to electrify 80 buildings each year starting in FY24-25.
3. **Decarbonization projects should be aligned with existing asset renewal needs** to meet climate goals and to comply with future regulations, including SCAQMD rule changes.[2]
4. **Municipal building decarbonization will provide greater community benefits** and will support Los Angeles' greater sustainability, climate action and resilience goals.

[1] Remaining 66% of GHG emissions are from process such as water delivery and solid waste. Data from the 2022 Municipal Greenhouse Gas Inventory and excludes emissions from LADWP power generation.
[2] South Coast Air Quality Management District (SCAQMD) has passed rule changes that will require zero NOx heating equipment. To comply the City will need to install electrified heating equipment at existing building.

PROGRAM FUNDING REQUIREMENTS

The Existing Municipal Building Decarbonization Workplan will require significant capital investment to achieve carbon neutral operations at municipal facilities by 2035. It is estimated that between $2.2 to $2.6 billion of funding will be required for the City to electrify all existing municipal buildings and achieve its energy efficiency goals ($110-120/SF). This would require $1.35 billion to replace natural gas equipment at the end of life. The cost of installing new electrified heating systems is estimated to be $1.9 billion, which will require an additional $550 million in funding. New SCAQMD regulations probit the installation and operation of various natural gas equipment, with requirements phased in between 2026 and 2033. The City will need to budget for electrification to stay compliant with air-quality regulations.

Outlined below is a preliminary recommended funding schedule that ramps up annual capital costs over time. Alternatively, the City can adopt a strategy to shift investments to early years and gradually reduce investments over time. As the next step, the City will engage with a range of internal and external financial experts to develop a detailed plan to finance these efforts.

$1.35B
New Gas Equipment

$1.90B
New Electrified Equipment

$550M
Additional Cost to Electrify

$275M
Energy Efficiency Upgrades

$150M
Renewable Energy & Storage

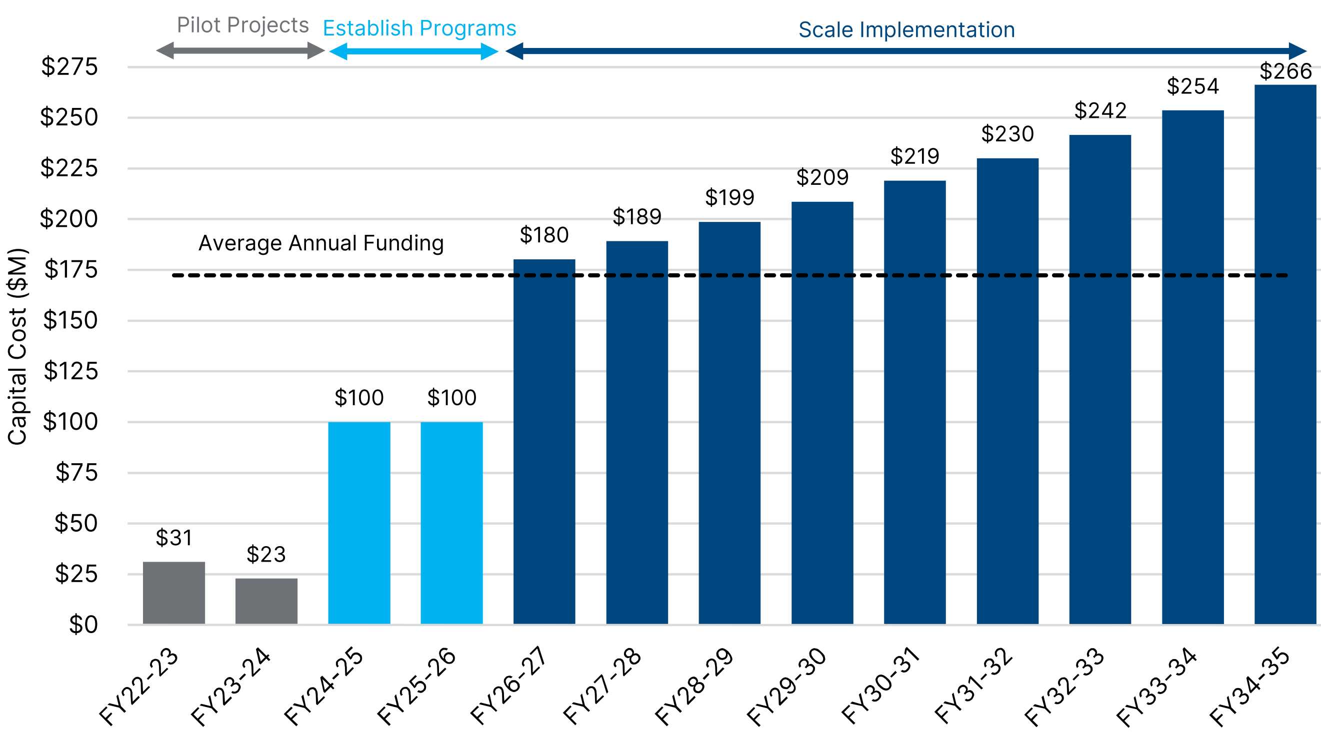


Figure 2: Building Decarbonization Workplan Annual Funding[3,4]

[3] Total program cost of $2.4 billion includes estimated construction and general escalation ($112/SF). The present value of all projects without escalation is estimated to be $1.2-$1.4 billion ($61/SF).
[4] BOE proposes that the Pilot Phase 2 funding (FY23-24) is combined with the Workplan Year 1 (FY24-25).

YEAR 1 PROJECT WORKPLAN (FY24-25)

SUMMARY

The Year 1 Building Decarbonization Project Workplan prioritizes sites with high potential for GHG emissions reduction and projects that will establish a framework for the City to scale implementation efforts in subsequent years. Implementation of the recommended Year 1 projects is subject to available funding and budgetary considerations.

Capital Improvement Projects	Provide a detailed engineering feasibility study for electrifying the Civic Center steam plant. Electrify the West Valley Police Station, Griffith Park Pool and Roosevelt Pool.
Equipment Replacement Projects	Fund and pilot end of life electrification projects for natural gas equipment through GSD/RAP led maintenance program. Use pilot projects to develop City equipment electrification standards and design guidelines.
Portfolio Design-Build[5]	Complete energy efficiency upgrades and electrify through a design-build project delivery across a portfolio of existing buildings. It is recommended the City consider an Energy Savings Performance Contract (ESPC).
Portfolio Solar Projects	Complete a pilot project to deliver solar PV arrays across multiple locations using a design-build delivery method. Leverage the City's on-call approved solar vendor list.

43	$61M	2.7
Buildings Electrified	Capital Budget	Solar PV MW

$1M	3%
Annual Utility Cost Savings	Portfolio Natural Gas Savings

[5] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

The following table outlines the specific projects that were identified for Year 1. The City plans to electrify a range of facilities that include an aquatics center, police station, library, fire station, community building, recreation center and senior center. The Year 1 Workplan has a total budget of $61M based on estimated capital cost. It is estimated that the City can receive $1-1.5M in utility rebates from LADWP. And additionally $5-6.5M through the Investment Tax Credit (ITC) Direct Pay provision. Collectively these projects will reduce utility costs by $1M annually, based on current utility rates.

Table 1: Recommended Existing Building Decarbonization Workplan FY24-25

Facility	Council District	Building Area (Gross SF)	Natural Gas Annual Savings (Therms)
Capital Improvement Projects ($13.0M)			
Civic Center Steam Plan *Planning Only*	14	-	-
West Valley Police Station *Pilot Phase 2*	03	32,670	16,589
Griffith Park Aquatics Center	04	4,400	377
Roosevelt Aquatics Center	14	4,418	37,032
Equipment Replacement Projects ($4.0M)			
3x RAP Facilities	Multiple	34,000	4,424
4x GSD Facilities	Multiple	65,500	7,250
Portfolio Design-Build Projects[6] ($24.5M)			
11x Libraries	Multiple	96,000	6,628
7x Fire Stations	Multiple	80,700	22,269
11x Community/Office Buildings	Multiple	249,950	31,612
7x Rec Centers/Senior Centers	Multiple	92,540	7,940
Portfolio Solar Projects ($16.5M)			
9x Solar Projects	Multiple		
TOTAL FY24-25 ($61M)		**660,824**	**134,121**

[6] Portfolio Design-Build Projects are assumed to be implemented through an ESPC Pilot Program. The City will also consider alternative design-build procurement options.

The Year 1 Workplan will leverage $25M in available funds, including $22.6M allocated for Phase II Pilot Projects and $2.4M grant Energy Efficiency & Conservation Block Grant (EECGB). Figure 4 outlines the funding requirements by year, broken down by delivery method.

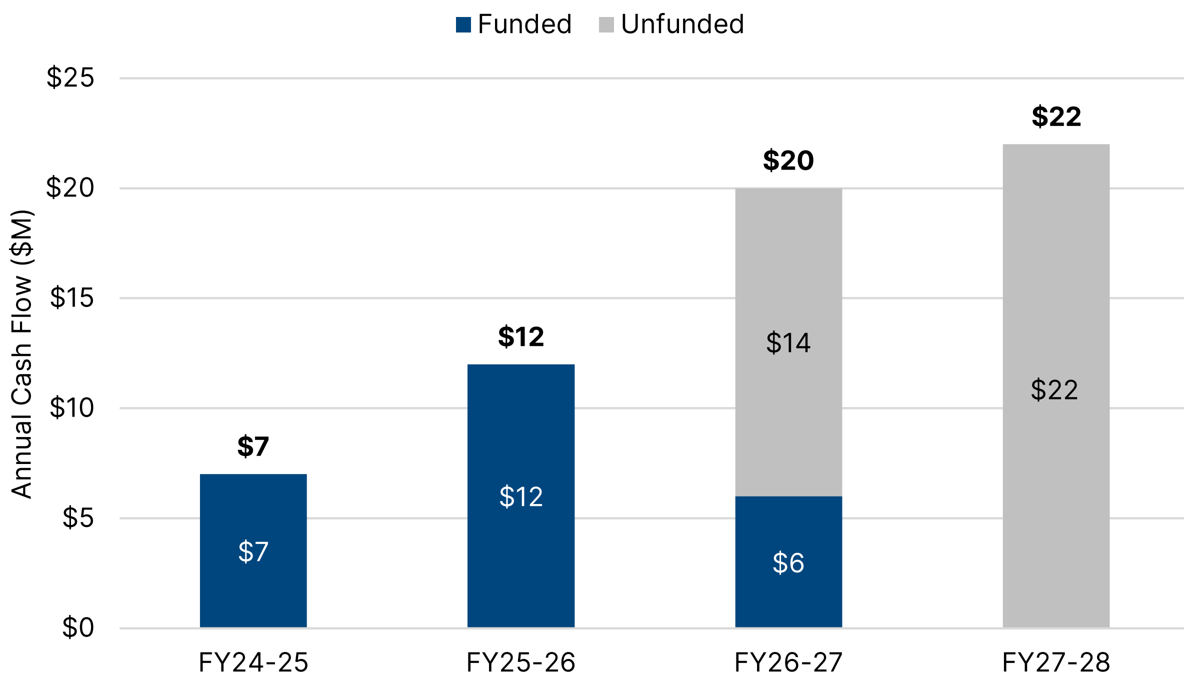


Figure 3: Year 1 Workplan Available Funding

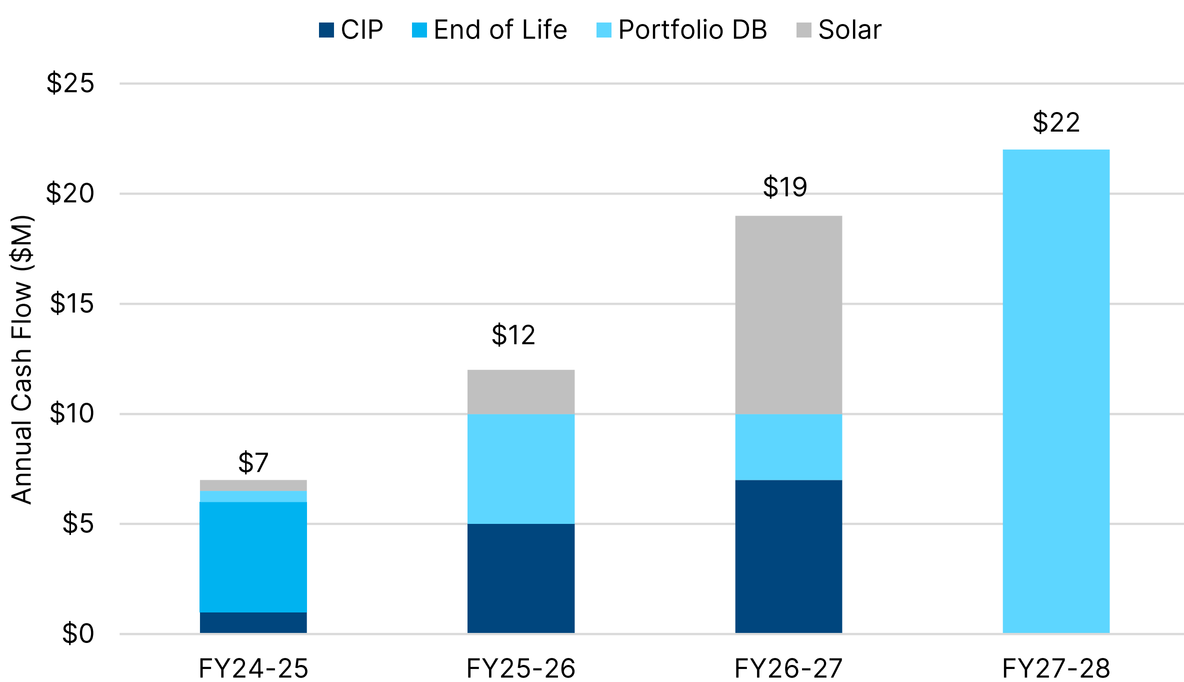


Figure 4: Year 1 Workplan Funding by Project Type

Year 1 Workbook Detailed Cost Estimate

Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION								
L1 Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2 Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES								
D1 Design Services	12.00%	$37,220,000	Project Cost	-	$4,466,400	-	-	$4,466,400
D2 Program / Project Management [2]	2.00%	$37,220,000	Project Cost	-	$744,400	-	-	$744,400
D3 Design Support Services [3]	1.00%	$37,220,000	Project Cost	-	$372,200	-	-	$372,200
D4 Client & Other City Departments [4]	1.00%	$37,220,000	Project Cost	-	$372,200	-	-	$372,200
D5 Permits & Fees	4.00%	$37,220,000	Project Cost	-	$1,488,800	-	-	$1,488,800
Subtotal Design Services					**$7,444,000**			**$7,444,000**
CONSTRUCTION COST								
C1 Capital Improvement Projects		$8,253,826	Project Cost	-	-	$8,253,826	-	$8,253,826
C2 RAP/GSD Equipment Replacement Projects		$2,634,875	Project Cost			$2,634,875		$2,634,875
C3 Portfolio Design-Build Energy Projects		$15,555,288	Project Cost			$15,555,288		$15,555,288
C4 Solar Projects		$10,476,010	Project Cost			$10,776,010		$10,776,010
Subtotal Construction Cost			Project Cost			**$37,220,000**		**$37,220,000**
FIXED FURNITURE AND COMMUNICATIONS								
O1 Communications [5]	0.00%	$37,220,000	Const Cost	-	-	$0	-	$0
O2 Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES								
S1 Construction Inspection [6]	5.00%	$37,220,000	Project Cost	-	-	-	$1,861,000	$1,861,000
S2 Construction Management [7]	5.00%	$37,220,000	Project Cost	-	-	-	$1,861,000	$1,861,000
S3 Program / Project Management [2]	4.00%	$37,220,000	Project Cost	-	-	-	$1,488,800	$1,488,800
S4 Construction Support Services [3]	0.00%	$37,220,000	Project Cost	-	-	-	$0	$0
S5 Client & Other City Dept's [4]	2.00%	$37,220,000	Project Cost	-	-	-	$744,400	$744,400
S6 Phasing / Relocation Costs	0.00%	0	$/SF per month	-	-	-	$0	$0
Subtotal Inspection/Construction Services							**$5,955,200**	$5,955,200
SUBTOTAL				**$0**	**$7,444,000**	**$37,220,000**	**$5,955,200**	**$50,619,200**
CONTINGENCIES (Project Contingency, Art Allowance) [8 & 10]	6.00%			$0	$446,640	$2,233,200	$357,312	$3,037,152
SUBTOTAL - October 2024 TOTAL COST				**$0**	**$7,890,640**	**$39,453,200**	**$6,312,512**	**$53,656,352**
ESCALATION								
E1 Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2 Annual Escalation Percentage				0.00%	3.00%	8.00%	3.00%	
E3 Total Compounded Escalation Percentage				0.00%	3.00%	16.64%	9.27%	
E4 **Total Escalation Amount**				**$0**	**$236,719**	**$6,565,012**	**$585,170**	**$7,386,902**
PROJECTED TOTAL COST				**$0**	**$8,127,359**	**$46,018,212**	**$6,897,682**	**$61,043,254**

Rev Date: **11/7/2024**

PROJECT DELIVERY METHODS

The City plans to leverage various delivery methods to implement decarbonization measures during Year 1 of the Existing Municipal Building Decarbonization Workplan.

1) Capital Improvement Projects

Complex engineering projects that require planning and engineering design.

- Boilers
- Steam
- Pool Heating
- Large Water Heaters

Delivery Approach:
BOE led projects run through existing capital improvement project processes. Leverage external consultants as needed.

Project Timeline:
Variable timeline depending on project complexity. Projects will be completed within 2-4 years after funding is approved and received.

2) Equipment Replacement Projects

Replacement of smaller natural gas equipment that has reached the end of life.

- Rooftop Units
- Small Water Heaters
- Gas Dryers
- Ovens & Ranges

Delivery Approach:
GSD and RAP led projects with technical support from BOE. Vendors to provide required engineering documents.

Project Timeline:
Projects will be completed within one year from when funding is approved and received.

3) Portfolio Design-Build Energy Projects

Full building upgrades at simpler facilities (fire station, library, rec center, etc).

- HVAC Systems
- Water Heaters
- LED Lighting

Delivery Approach:
Design-build project for 25-50 buildings. Option for Energy Savings Performance Contract (ESPC) with guaranteed savings and potential for external funding. BOE managed projects.

Project Timeline:
Variable timeline depending on project scale . Projects expected to be completed within 2-4 years after funding is approved and received.

4) Portfolio Solar & BESS Procurement

Combine solar PV projects across multiple sites for more competitive pricing.

- Rooftop Solar
- Carport Solar
- Battery Energy Storage (BESS)

Delivery Approach:
Design-build project delivery leveraging existing on-call solar contractors list. BOE managed projects.

Project Timeline:
Projects generally completed within 1-2 years after funding is approved and received.

CAPITAL IMPROVEMENT PROJECTS

Summary	Provide a detailed engineering feasibility study for electrifying the Civic Center steam plant. Electrify the West Valley Police Station, Griffith Park Pool and Roosevelt Pool.
Delivery	Projects delivered through existing Capital Improvement Project (CIP) processes, with either a design-bid-build or design-build method.
Staffing	BOE led effort (Project Management, Design) with support as needed from other departments.
Design	Engineering design will be provided by BOE staff and external consultants, pending resource availability.
Funding	$13.0 million

RECOMMENDED PROJECTS

1. Civic Center Steam Plant *– Planning & Design Only*
2. West Valley Police Station
3. Griffith Park Pool
4. Roosevelt Pool

Y1 Capital Improvement Projects

Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION								
L1 Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2 Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES								
D1 Design Services (Includes $1.5M Civic Center Steam Plant Planning & Design)	12.00%	$2,196,000	Project Cost	-	$2,196,000	-	-	$2,196,000
D2 Program / Project Management [2]	2.20%	$127,600	Project Cost	-	$127,600	-	-	$127,600
D3 Design Support Services [3]	0.30%	$17,400	Project Cost	-	$17,400	-	-	$17,400
D4 Client & Other City Departments [4]	0.00%	$0	Project Cost	-	$0	-	-	$0
D5 Permits & Fees	1.25%	$72,500	Project Cost	-	$72,500	-	-	$72,500
Subtotal Design Services	15.75%				**$3,812,000**			**$3,812,000**
CONSTRUCTION COST								
C1 Civic Center Steam Plant - Planning & Design		$0	Project Cost	-	-	-	-	-
C2 West Valley Police Station Pilot Phase 2		$2,774,000	Project Cost	-	-	$2,774,000	-	$2,774,000
C3 Griffith Park Pool		$1,513,000	Project Cost	-	-	$1,513,000	-	$1,513,000
C4 Roosevelt Pool		$1,513,000	Project Cost	-	-	$1,513,000	-	$1,513,000
Subtotal Construction Cost						**$5,800,000**		**$5,800,000**
FIXED FURNITURE AND COMMUNICATIONS								
O1 Communications [5]	0.00%	$0	Const Cost	-	-	$0	-	$0
O2 Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES								
S1 Construction Inspection [6]	3.00%	$174,000	Project Cost	-	-	-	$174,000	$174,000
S2 Construction Management [7]	3.20%	$185,600	Project Cost	-	-	-	$185,600	$185,600
S3 Program / Project Management [2]	3.00%	$174,000	Project Cost	-	-	-	$174,000	$174,000
S4 Construction Support Services [3]	0.00%	$0	Project Cost	-	-	-	$0	$0
S5 Client & Other City Dept's [4]	0.00%	$0	Project Cost	-	-	-	$0	$0
S6 Phasing / Relocation Costs	$ -	0	$/SF per month	-	-	-	$0	$0
Subtotal Inspection/Construction Services							**$533,600**	**$533,600**
SUBTOTAL				**$0**	**$3,812,000**	**$5,800,000**	**$533,600**	**$10,145,600**
CONTINGENCIES (Project Contingency, 1% Art Allowance) [8 & 10]	16.00%			$0	$609,920	$928,000	$85,376	$1,623,296
SUBTOTAL - OCTOBER 2024 TOTAL COST				**$0**	**$4,421,920**	**$6,728,000**	**$618,976**	**$11,768,896**
ESCALATION								
E1 Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2 Annual Escalation Percentage				3.00%	3.00%	8.00%	3.00%	
E3 Total Compounded Escalation Percentage				1.49%	1.49%	16.64%	7.67%	
E4 **Total Escalation Amount**				**$0**	**$65,887**	**$1,119,539**	**$47,475**	**$1,232,901**
PROJECTED TOTAL COST				**$0**	**$4,487,807**	**$7,847,539**	**$666,451**	**$13,001,797**

Rev Date: **11/7/2024**

EQUIPMENT REPLACEMENT PROJECTS

Summary	Electrify existing natural gas equipment (rooftop units and water heaters) that have reached end of life. Use pilot projects to develop City equipment electrification standards and design guidelines.
Delivery	Projects delivered through end of life equipment replacement process as outlined in the Existing Municipal Building Decarbonization Plan.
Staffing	GSD/RAP led projects with support from BOE.
Design	Permit drawings provided by GSD/RAP vendors. BOE to provide engineering support services.
Funding	$4 million

RECOMMENDED PROJECTS

1. Youth Arts Center – Old Pac Bell Building (GSD)
2. Boyle Heights Youth Tech (GSD)
3. Fleet Headquarters (GSD)
4. Street Lighting Field Operations (GSD)
5. Ramona Recreation Center (RAP)
6. Hubert Humphrey Recreation Center (RAP)
7. Sunland Senior Citizen Center (RAP)

Year 1 End of Life Replacement Projects

Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION								
L1 Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2 Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES								
D1 Design Services	12.00%	$2,436,000	Project Cost	-	$292,320	-	-	$292,320
D2 Program / Project Management [2]	2.00%	$2,436,000	Project Cost	-	$48,720	-	-	$48,720
D3 Design Support Services [3]	1.00%	$2,436,000	Project Cost	-	$24,360	-	-	$24,360
D4 Client & Other City Departments [4]	1.00%	$2,436,000	Project Cost	-	$24,360	-	-	$24,360
D5 Permits & Fees	4.00%	$2,436,000	Project Cost	-	$97,440	-	-	$97,440
Subtotal Design Services					**$487,200**			**$487,200**
CONSTRUCTION COST								
C1 End of Life Replacement - 3x RAP Facilities		$1,027,229	Project Cost	-	-	$1,027,229	-	$1,027,229
C2 End of Life Replacement - 4x GSD Facilities		$1,408,771	Project Cost			$1,408,771		$1,408,771
Subtotal Construction Cost			Project Cost			**$2,436,000**		**$2,436,000**
FIXED FURNITURE AND COMMUNICATIONS								
O1 Communications [5]	0.00%	$2,436,000	Const Cost	-	-	$0	-	$0
O2 Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES								
S1 Construction Inspection [6]	5.00%	$2,436,000	Project Cost	-	-	-	$121,800	$121,800
S2 Construction Management [7]	5.00%	$2,436,000	Project Cost	-	-	-	$121,800	$121,800
S3 Program / Project Management [2]	4.00%	$2,436,000	Project Cost	-	-	-	$97,440	$97,440
S4 Construction Support Services [3]	0.00%	$2,436,000	Project Cost	-	-	-	$0	$0
S5 Client & Other City Dept's [4]	2.00%	$2,436,000	Project Cost	-	-	-	$48,720	$48,720
S6 Phasing / Relocation Costs	0.00%	0	$/SF per month	-	-	-	$0	$0
Subtotal Inspection/Construction Services							**$389,760**	$389,760
SUBTOTAL				**$0**	**$487,200**	**$2,436,000**	**$389,760**	**$3,312,960**
CONTINGENCIES (Project Contingency, Art Allowance) [8 & 10]	6.00%			$0	$29,232	$146,160	$23,386	$198,778
SUBTOTAL - October 2024 TOTAL COST				**$0**	**$516,432**	**$2,582,160**	**$413,146**	**$3,511,738**
ESCALATION								
E1 Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2 Annual Escalation Percentage				0.00%	3.00%	8.00%	3.00%	
E3 Total Compounded Escalation Percentage				0.00%	3.00%	16.64%	9.27%	
E4 **Total Escalation Amount**				**$0**	**$15,493**	**$429,671**	**$38,299**	**$483,463**
PROJECTED TOTAL COST				**$0**	**$531,925**	**$3,011,831**	**$451,444**	**$3,995,201**

Rev Date: **11/7/2024**

PORTFOLIO DESIGN BUILD

Summary	Electrify existing natural gas equipment that have reached end of life and implement energy efficiency upgrades.
Delivery	Projects delivered through a design-build delivery method or energy savings performance contract (ESPC) process. Buildings will be combined into one or two delivery packages.
Staffing	BOE led effort (Project Management, Design Reviews) with support from other departments as needed.
Design	Engineering design provided by a turnkey design-build contractor.
Funding	$24.5 million.

RECOMMENDED PROJECTS

Libraries – 10 Buildings

1. CAHUENGA BRANCH LIBRARY
2. LINCOLN HEIGHTS BRANCH LIBRARY
3. JEFFERSON - VASSIE D WRIGHT MEMORIAL BRANCH LIBRARY
4. FELIPE DE NEVE BRANCH LIBRARY
5. MALABAR BRANCH LIBRARY
6. ROBERT LOUIS STEVENSON BRANCH LIBRARY
7. WILSHIRE BRANCH LIBRARY
8. JOHN C FREMONT BRANCH LIBRARY
9. ANGELES MESA BRANCH LIBRARY
10. ASCOT BRANCH LIBRARY

Communities Centers / Offices – 11 Buildings

1. YUCCA COMMUNITY CENTER
2. WILMINGTON MUNICIPAL BUILDING
3. EAGLE ROCK CITY HALL
4. CD 9 FIELD OFFICE (OLD JUNIPERO SERRA LIBRARY)
5. BOYLE HEIGHTS NEIGHBORHOOD CITY HALL
6. SAN PEDRO MUNICIPAL BUILDING
7. VAN NUYS MUNICIPAL BUILDING
8. CANOGA-OWENSMOUTH COMMUNITY CENTER
9. SOLEDAD ENRICHMENT CENTER AND COUNCIL DISTRICT
10. WATTS MUNICIPAL BUILDING
11. WEST VALLEY MUNICIPAL BUILDING

Fire Stations - 7 Buildings

1. FIRE STATION #79
2. FIRE STATION #01
3. FIRE STATION #21
4. FIRE STATION #63
5. FIRE STATION #37
6. FIRE STATION #71

Recreation and Senior Centers – 7 Buildings

1. RITCHIE VALENS RECREATION CENTER
2. EVERGREEN RECREATION CENTER
3. LAKE VIEW TERRACE RECREATION CENTER
4. STONEHURST RECREATION CENTER
5. MONTECITO HEIGHTS RECREATION CENTER
6. VAN NUYS SHERMAN OAKS RECREATION CENTER
7. VAN NUYS SHERMAN OAKS SENIOR CENTER

Y1 Portfolio Design-Build Energy Projects

Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION								
L1 Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2 Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES								
D1 Design Services	5.00%	$16,949,915	Project Cost	-	$847,496	-	-	$847,496
D2 Program / Project Management [2]	3.50%	$16,949,915	Project Cost	-	$593,247	-	-	$593,247
D3 Design Support Services [3]	1.00%	$16,949,915	Project Cost	-	$169,499	-	-	$169,499
D4 Client & Other City Departments [4]	0.50%	$16,949,915	Project Cost	-	$84,750	-	-	$84,750
D5 Permits & Fees	1.25%	$16,949,915	Project Cost	-	$211,874	-	-	$211,874
Subtotal Design Services					**$1,906,865**			**$1,906,865**
CONSTRUCTION COST								
C1 End of Life Replacement - 11x Libraries		$3,838,907	Project Cost	-	-	$3,838,907	-	$3,838,907
C2 End of Life Replacement - 7x Fire Stations		$2,928,680	Project Cost			$2,928,680		$2,928,680
C3 End of Life Replacement - 11x Community/Office Buildings		$5,648,048	Project Cost			$5,648,048		$5,648,048
C4 End of Life Replacement - 8x Rec/Senior Centers		$4,534,280	Project Cost			$4,534,280		$4,534,280
Subtotal Construction Cost						**$16,949,915**		**$16,949,915**
FIXED FURNITURE AND COMMUNICATIONS								
O1 Communications [5]	0.00%	$16,949,915	Const Cost	-	-	$0	-	$0
O2 Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES								
S1 Construction Inspection [6]	1.50%	$16,949,915	Project Cost	-	-	-	$254,249	$254,249
S2 Construction Management [7]	3.00%	$16,949,915	Project Cost	-	-	-	$508,497	$508,497
S3 Program / Project Management [2]	1.50%	$16,949,915	Project Cost	-	-	-	$254,249	$254,249
S4 Construction Support Services [3]	1.50%	$16,949,915	Project Cost	-	-	-	$254,249	$254,249
S5 Client & Other City Depts [4]	0.00%	$16,949,915	Project Cost	-	-	-	$0	$0
S6 Phasing / Relocation Costs	0.00%	0	$/SF per month	-	-	-	$0	$0
Subtotal Inspection/Construction Services							$1,271,244	$1,271,244
SUBTOTAL				**$0**	**$1,906,865**	**$16,949,915**	**$1,271,244**	**$20,128,024**
CONTINGENCIES (Project Contingency, Art Allowance) [8 & 10]	6.00%			$0	$114,412	$1,016,995	$76,275	$1,207,681
SUBTOTAL - OCTOBER 2024 TOTAL COST				**$0**	**$2,021,277**	**$17,966,910**	**$1,347,518**	**$21,335,706**
ESCALATION								
E1 Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2 Annual Escalation Percentage				0.00%	3.00%	8.00%	3.00%	
E3 Total Compounded Escalation Percentage				0.00%	3.00%	16.64%	9.27%	
E4 **Total Escalation Amount**				**$0**	**$60,638**	**$2,989,694**	**$124,915**	**$3,175,247**
PROJECTED TOTAL COST				**$0**	**$2,081,916**	**$20,956,604**	**$1,472,433**	**$24,510,953**

Rev Date: **11/7/2024**

PORTFOLIO SOLAR PROJECTS

Summary	Install solar and storage systems through a design-build process under the net-energy-metering (NEM) program.
Delivery	Projects combined into a package and completed through a design-build delivery method by a single contract.
Staffing	BOE led effort (Project Management, Design Reviews) with support from other departments as needed.
Design	Engineering design provided by turnkey solar contractor.
Funding	$16.5 million

RECOMMENDED PROJECTS

1. West Valley Library / Police Station / Municipal Building
2. Emergency operations center / Fire Station #04
3. Van Nuys Civic Center
4. Topanga Community Police Station
5. 7Th St Facility
6. Wilshire Community Police Center
7. Personnel Department
8. Hollywood Community Police Station
9. Balboa Sports Center

Year 1 Solar Projects

	Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION									
L1	Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2	Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
	Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES									
D1	Design Services	1.00%	$12,017,995	Project Cost	-	$120,180	-	-	$120,180
D2	Program / Project Management [2]	3.50%	$12,017,995	Project Cost	-	$420,630	-	-	$420,630
D3	Design Support Services [3]	2.00%	$12,017,995	Project Cost	-	$240,360	-	-	$240,360
D4	Client & Other City Departments [4]	0.50%	$12,017,995	Project Cost	-	$60,090	-	-	$60,090
D5	Permits & Fees	1.25%	$12,017,995	Project Cost	-	$150,225	-	-	$150,225
	Subtotal Design Services					**$991,485**			**$991,485**
CONSTRUCTION COST									
C1	West Valley Library / Police Station / Municipal Building		$3,935,019	Project Cost	-	-	$3,935,019	-	$3,935,019
C2	Emergency Operations Center / Fire Station #04		$951,925	Project Cost			$951,925		$951,925
C3	Van Nuys Civic Center		$781,989	Project Cost			$781,989		$781,989
C4	Topanga Community Police Station		$2,203,369	Project Cost			$2,203,369		$2,203,369
C5	7th St Consolidated Facility - Street Services		$894,879	Project Cost			$894,879		$894,879
C6	Wilshire Community Police Station		$724,490	Project Cost			$724,490		$724,490
C7	Personnel Department		$1,335,706	Project Cost			$1,335,706		$1,335,706
C8	Hollywood Community Police Station		$692,290	Project Cost			$692,290		$692,290
C9	Balboa Sports Center		$498,326	Project Cost	-	-	$498,326	-	$498,326
	Subtotal Construction Cost						**$12,017,995**		**$12,017,995**
FIXED FURNITURE AND COMMUNICATIONS									
O1	Communications [5]	0.00%	$12,017,995	Const Cost	-	-	$0	-	$0
O2	Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
	Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES									
S1	Construction Inspection [6]	1.50%	$12,017,995	Project Cost	-	-	-	$180,270	$180,270
S2	Construction Management [7]	1.00%	$12,017,995	Project Cost	-	-	-	$120,180	$120,180
S3	Program / Project Management [2]	1.00%	$12,017,995	Project Cost	-	-	-	$120,180	$120,180
S4	Construction Support Services [3]	0.25%	$12,017,995	Project Cost	-	-	-	$30,045	$30,045
S5	Client & Other City Dept's [4]	0.00%	$12,017,995	Project Cost	-	-	-	$0	$0
S6	Phasing / Relocation Costs	0.00%	0	$/SF per month	-	-	-	$0	$0
	Subtotal Inspection/Construction Services							$450,675	$450,675
	SUBTOTAL				**$0**	**$991,485**	**$12,017,995**	**$450,675**	**$13,460,154**
CONTINGENCIES (Project Contingency, Art Allowance) [8 & 10]		6.00%			$0	$59,489	$721,080	$27,040	$807,609
	SUBTOTAL - OCTOBER 2024 TOTAL COST				**$0**	**$1,050,974**	**$12,739,075**	**$477,715**	**$14,267,764**
ESCALATION									
E1	Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2	Annual Escalation Percentage				0.00%	3.00%	8.00%	3.00%	
E3	Total Compounded Escalation Percentage				0.00%	3.00%	16.64%	9.27%	
E4	**Total Escalation Amount**				**$0**	**$31,529**	**$2,119,782**	**$44,284**	**$2,195,595**
	PROJECTED TOTAL COST				**$0**	**$1,082,503**	**$14,858,857**	**$522,000**	**$16,463,359**

Rev Date: **11/7/2024**

ADDITIONAL INFORMATION

DECARBONIZATION WORKPLAN

The Existing Municipal Building Decarbonization Workplan signifies a significant step forward in the City of Los Angeles' commitment to science-based climate action goals and the goal of providing a more sustainable and resilient future for all Angelenos. The comprehensive workplan provides a strategic roadmap for implementing a suite of decarbonization measures, including energy efficiency upgrades, electrification of fossil fuel systems, and the deployment of solar PV and battery storage systems. Beyond reducing GHG emissions, these enhancements will improve the resilience of municipal buildings, which serve as vital community hubs and provide critical emergency services.

Recognizing the urgent need for climate action and the significant investment required, implementation of the workplan has been divided into three primary phases. Beginning in 2022, the City has piloted decarbonization projects to gather insights and best practices for the engineering and construction of all-electric existing buildings conversations. Over the next two years through 2026 the City will develop new decarbonization programs, pilot innovative financing strategies, and establish a scalable implementation framework. Subsequently, through 2035 the City aims to systematically decarbonize roughly 980 buildings, totaling 22 million square feet, which will eliminate 80,000 metric tons of GHG emissions (MTE). To facilitate this ambitious transition, it is estimated an investment of $2.2 to $2.6 billion will be required.

Workplan Phase	Pilot Projects 2022-2024	Develop Programs 2024-2026	Scale Implementation 2026-2035
	Pilot decarbonization projects.	*Establish scalable framework.*	*Execute the building decarbonization workplan.*
Strategy	Pilot projects across a range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan.	Establish a framework and internal structure to provide program management and oversite, facilitate departmental collaboration and address training and staffing needs.	Decarbonize all existing municipal buildings, averaging ~100 buildings or 2.27 million square feet per year. Accelerate GHG emissions reductions, enhance the resilience of operations, lead the way for the private sector and serve as a model for municipal climate action.
Buildings Decarbonized	16	96	853
Funding	$54M	~$200M	~$2.0-2.4B
Key Outcomes	• Implement projects • Verify performance • Learn & establish standards	• End-of-life equipment program • External Financing, ex. ESPC • Portfolio solar PV procurement • Electrify high GHG buildings	• Eliminate fossil fuels from building heating • Convert lighting systems to 100% LED • Install 20-25 MW of solar PV • Engage the local community
Emissions Reduction	1%	18%	100%

Figure 5: Existing Building Decarbonization Workplan Strategic Framework

1 Pilot Projects
2022-2023

During the Pilot Projects phase the City will test various decarbonization measures across a diverse range of building types and departments. This phase provides a critical learning opportunity and will inform the City's broader decarbonization workplan. As of October 2024 all Phase I pilot projects were in design, under construction or completed.

Key Outcomes

- Implement decarbonization measures across a diverse set of buildings
- Monitor, evaluate and verify the performance of electrification measures
- Document best practices and lessons learned to establish City standards
- Partner with LADWP to deliver solar PV and BESS projects on City land

2 Develop Programs
2024-2025

During the Develop Programs phase the City will lay the groundwork to scale implementation efforts. Over these two years the City will establish a framework and internal structure to provide program management and oversight, facilitate collaboration between departments, and address workforce training and staffing needs.

Key Outcomes

- Establish a streamlined process for end-of-life equipment electrification
- Pilot new funding, financing and project delivery mechanisms, including ESPC[7]
- Install 2-3 MW of solar PV through a portfolio design-build procurement
- Electrify at least four of the top 25 natural gas consuming municipal sites

3 Scale Implementation
2026-2035

During the Scale Implementation phase, the City will execute the building decarbonization workplan. Over the course of nine years, the City will decarbonize 853 buildings, averaging ~100 buildings per year. This will accelerate GHG emissions reductions, enhance the resilience of operations and lead the way as a model for municipal climate action.

Key Outcomes

- Eliminate the reliance on fossil fuels for all space, pool and water heating
- Convert lighting systems to 100% LED and retro-commission large buildings
- Install an additional 20-25 MW of distributed solar PV
- Foster community engagement for a just energy transition
- Share lessons learned and successes with the greater Los Angeles community to spur private sector investments

[7] Energy Savings Performance Contracts (ESPC)

PROGRAM FUNDING

It is recommended that the City leverages a combination of internal funds and external funding and financing opportunities. The combined approach of increasing general funds allocated towards existing building upgrades and exploring new alternative funding and financing strategies will provide the City with the flexibility to adapt to changing financial situations.

Internal Funding	External Financing	Grants & Incentives
Existing internal city funds to support building decarbonization and retrofit projects.	New sources of external funding and financing to supplement internal sources.	Leveraging external grants and incentives to the greatest extent possible to offset costs.

Potential Sources
• General Fund
	Potential Sources
	• Energy Savings Performance Contracts (ESPC)[1]
	• Debt Financing
	• Public Private Partnerships[2]
	• Bond Measures
	• California I-Bank[3]
		Potential Sources
		• Federal Grants[4]
		  o Inflation Reduction Act (IRA)
		  o Infrastructure Investment and Jobs Act (IIJA)
		  o Other Programs
		• Investment Tax Credit (ITC)
		• LADWP Incentives

Recommended Application • Large, complex electrification projects • End of life equipment replacement	**Recommended Application** • Cost effective projects • Solar PV systems	**Recommended Application** • Projects aligned with specific grant requirements • Resilience projects

[1] **Energy Savings Performance Contracts (ESPC)** are a project delivery method where the City can deliver electrification and energy efficiency upgrades to a group of 25-50+ buildings through a single procurement. Public agencies can also finance the cost of building upgrades through the energy and operational cost savings achieved.

[2] **Public Private Partnerships (P3)** can potentially support decarbonizing the Civic Center district steam plant, as part of redevelopment efforts, or other larger building renovations and retrofits and new construction (ex. Convention Center).

[3] **California Infrastructure and Economic Development Bank (IBank)** provides financing for public infrastructure and can potentially be leveraged to finance building decarbonization projects.

[4] **Federal Grants** can provide significant funding for building decarbonization and resilience upgrades at municipal facilities. There are various opportunities including programs funded by the Inflation Reduction Act (IRA). Los Angeles is actively pursuing various federal grants.

ENERGY SERVICE PERFORMANCE CONTRACT (ESPC)

SUMMARY

An Energy Service Performance Contract (ESPC) is a project delivery method the City can leverage to implement energy efficiency and building decarbonization projects with minimal upfront costs. In an ESPC, an energy services company (ESCO) assumes the initial project costs and risks. The City then repays the ESCO over time through the energy savings achieved by the implemented measures. This financing mechanism allows the City to undertake comprehensive building upgrades, including HVAC system improvements, lighting retrofits, and other energy-efficient measures, without a substantial initial investment. There are both advantages and disadvantages of the ESPC process the City needs to consider and review before pursuing this approach.

FINANCIAL MODEL

ESPC project provide a cashflow structure where the savings generated by the implemented measures cover the costs of the project, including the cost of the construction, ESCO services, financing, and any required maintenance. After a contract ends all savins are accrued by the City. On less cost effective electrification projects the City can buy down the upfront costs with general funding and still leverage the ESPC model.

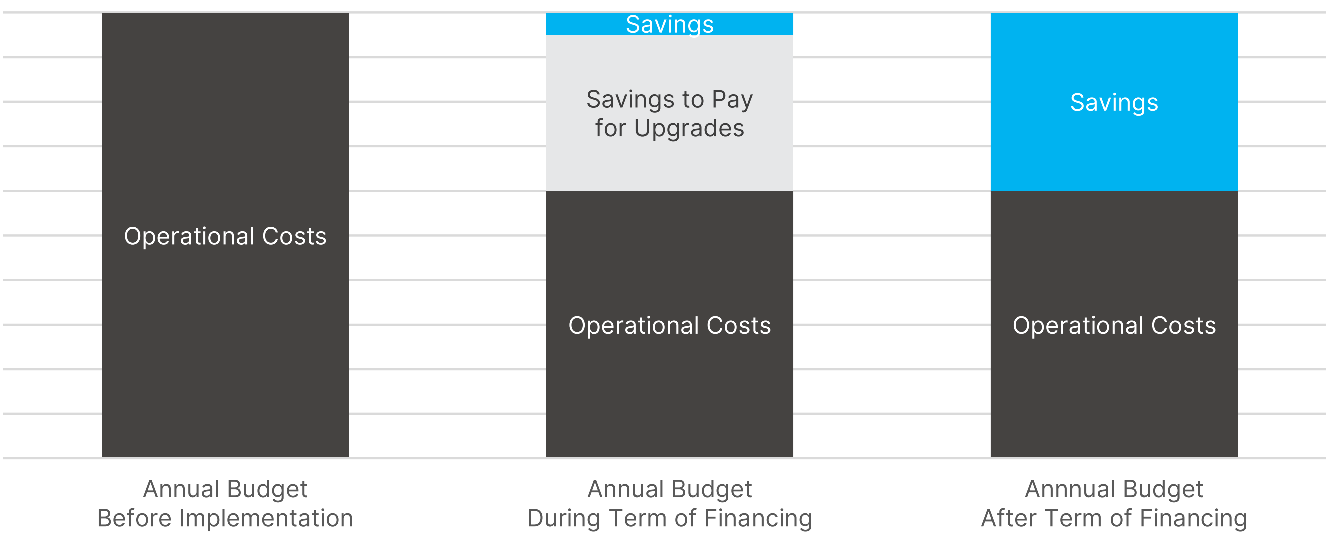


Figure 6: ESPC Project Cashflow[8]

[8] Adapted from the National Renewable Energy Laboratory: **ESPC Overview**

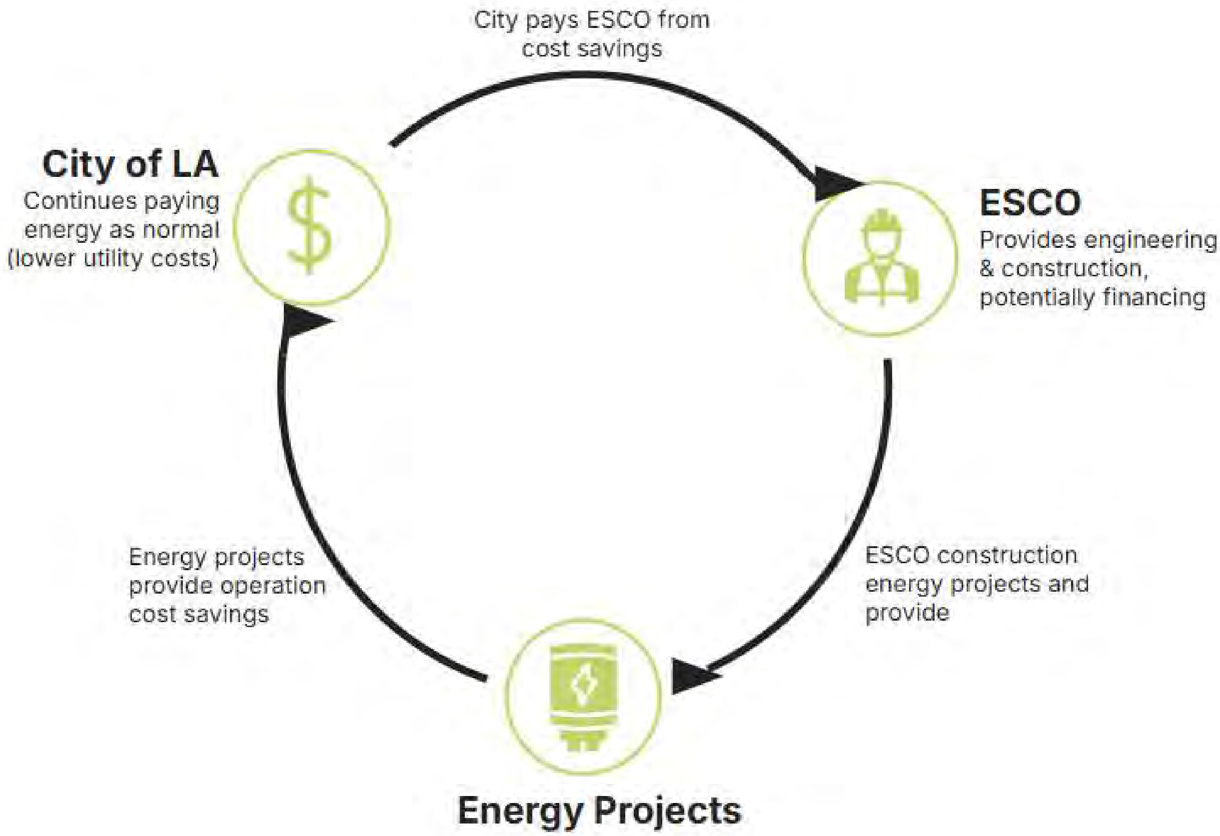


Figure 7: ESPC Financing Mechanism [8]

DELIVERY PROCESS

The following delivery process was developed by the Department of Energy (DOE) Federal Energy Management Program (FEMP) and is leveraged on all federal ESPC projects

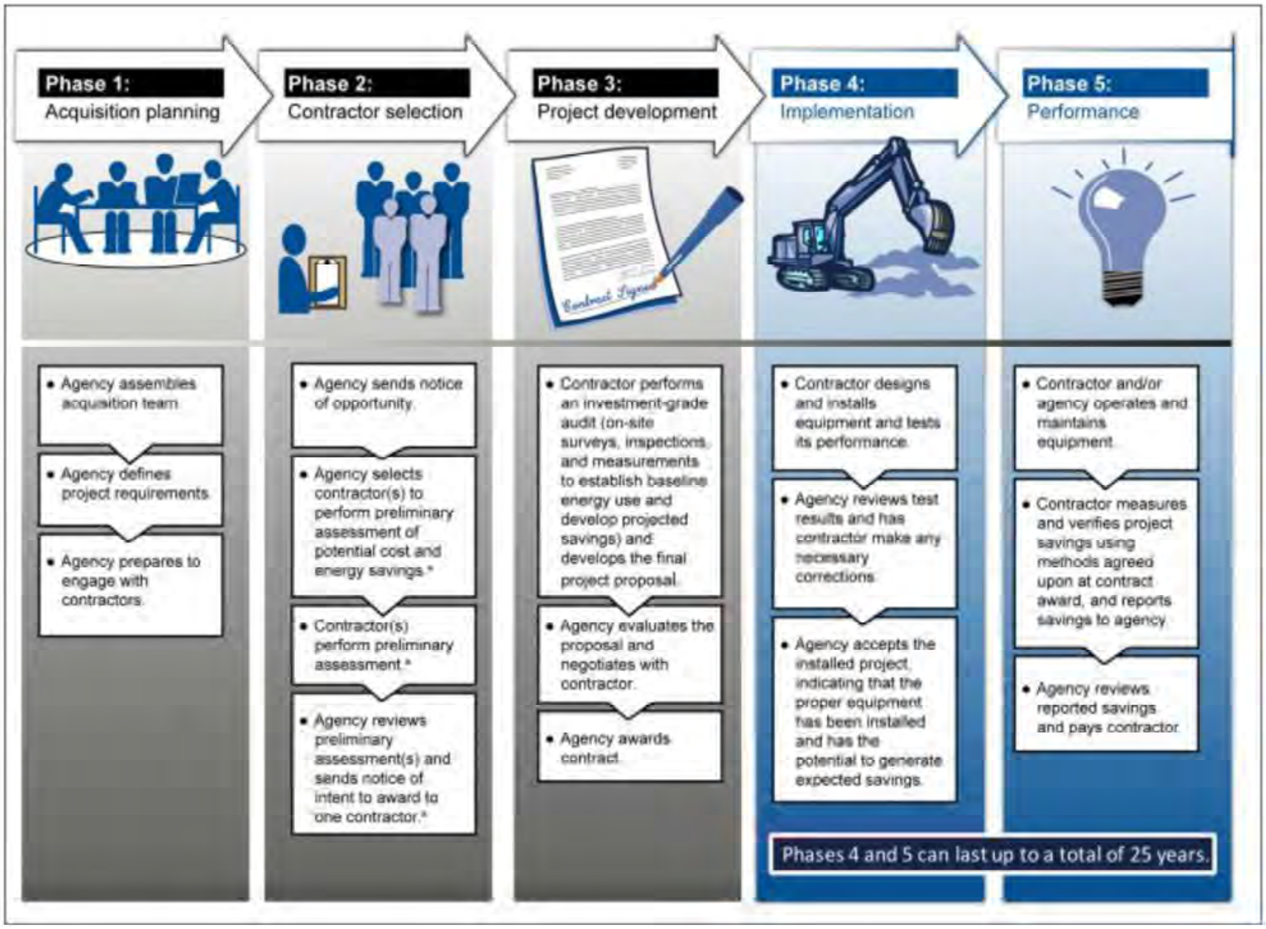


Figure 8: ESPC Project Development and Implementation Process[9]

[9] Adopted from the US Department of Energy

PORTFOLIO SOLAR PV FUNDING

The Year 1 Workplan includes a portfolio solar project to install 2.75 MW of solar PV across nine locations on a variety of building types. The solar systems will general 4.7 MWh annually and offset 49% of electricity demand across the buildings. This will reduce utility cost by roughly $850,000 during the first year of operation and $35 million over the 25-year life cycle. Outline below show the specific sites identified within the City.

Site Name	Site Address	Building Type	LA Database Site Consumption (kWh)	System Size Modeled (kW DC)	Yearly Solar Generation (kWh)	Energy Use Offset
West Valley Library / Police Station / Municipal Building	19036 Vanowen St, Reseda, CA 91335	Multiple	1,791,989	804.7	1,400,500	78%
Emergency Operations Center / Fire Station #04	500 E Temple St, Los Angeles, CA 90012	Multiple	4,438,839	231.6	393,900	9%
Van Nuys Civic Center	6262 Van Nuys Blvd, Van Nuys, CA 91401	Office	2,265,284	224.4	395,500	17%
Topanga Community Police Station	21501 Schoenborn St, Canoga Park, CA 91304	Police	999,022	526.9	922,900	92%
7th St Facility	2310 E 7th St, Los Angeles, CA 90023	Warehouse	410,661	223.3	382,200	93%
Wilshire Community Police Station	4861 Venice Blvd., Los Angeles, CA 90019	Police	820,098	148.5	257,400	31%
Personnel Department	700 E Temple St, Los Angeles, CA 90012	Office	773,641	333.3	567,400	73%
Hollywood Community Police Station	1358 Wilcox Ave, Los Angeles, CA 90028	Police	742,386	141.9	249,000	34%
Balboa Sports Center	17017 Burbank Blvd, Encino, CA 91316	Recreation Center	365,880	114.4	202,000	55%
Total			**9,725,301**	**2,749.0**	**4,770,800**	**49%**


West Valley Library


West Valley Municipal Building


Fire Station #04


West Valley Police Station


Emergency Operations Center


Van Nuys Civic Center


Topanga Police Station


Wilshire Police Station


Hollywood Police Station

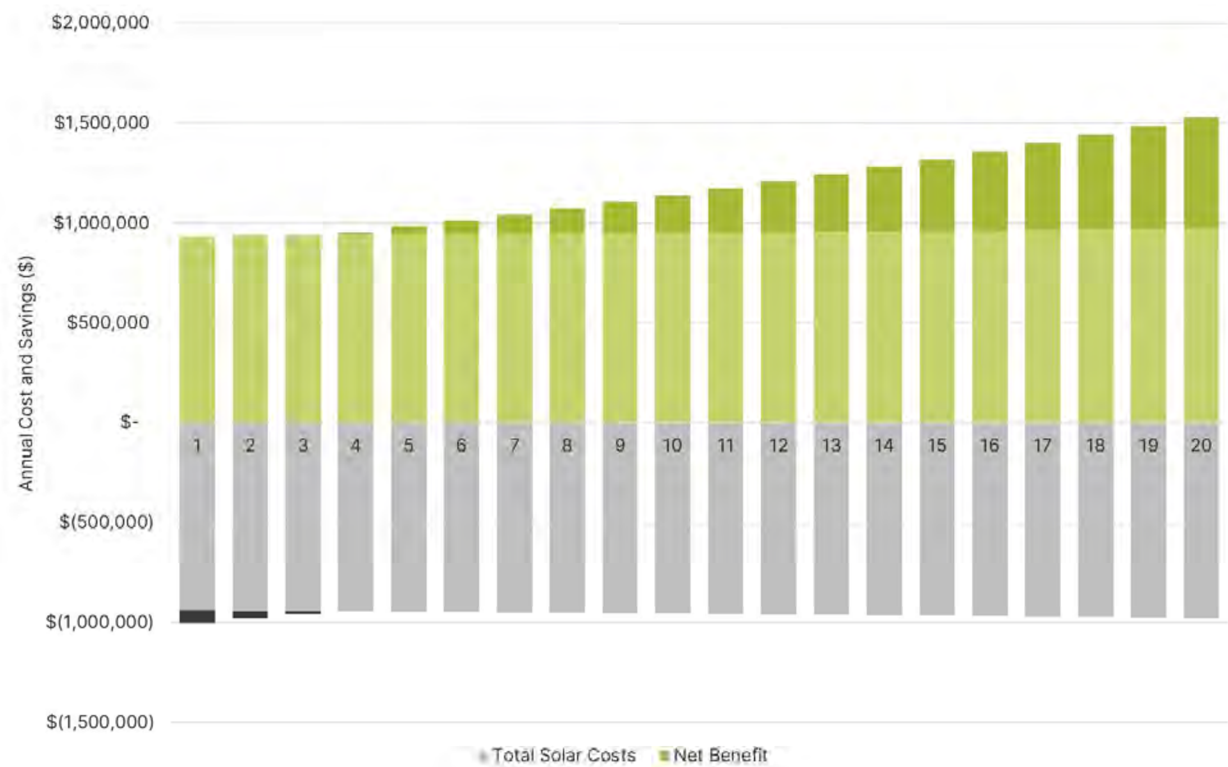

7th St Maintenance Facility


Personnel Department


Balboa Sports Center

EXTERNAL FUNDING OPPORTUNITIES

The portfolio solar PV projects identified in the Year 1 workplan are cost effective and have the potential to leverage external funding and financing solutions. The following diagram shows the forecasted cash flow for the recommended solar projects with external funding sources. With external funding the City will see a cumulative savings of $4.3 million over the 20 years loan term and $12.3 million over the 25 year lifecycle of the system.



Financial Model Assumptions

- $6,000/kW system cost
- 30% Investment Tax Credit (ITC)
- 20-Year Financing Period at 4.5% Interest
- 3.5% utility escalation
- $18.5/kW maintenance with 3.5% escalation
- 0.5% Annual Solar Degradation

ATTACHMENT No. 3

Phase I Pilot Project Status

Phase I Pilot Project Status

	Facility/Project Name	Scope of Work	Lead Agency	Current Status
CD 6	Balboa Sports Complex *17015 Burbank Blvd*	Electrification + Solar + Energy Storage	BOE	Design Complete. 27% Bid and Award
CD 14	Benjamin Franklin Branch Library *2200 East 1st St*	Partial Electrification +Solar + Energy Storage	BOE	60% Design
CD 1	Cypress Park Branch Library *1150 Cypress Ave*	Electrification + Solar + Energy Storage + Energy Upgrade	BOE	60% Construction
CD 6	Old Fire Station No. 39 *14415 Sylvan St*	Electrification + Solar + Energy Storage + Energy Upgrade	BOE	30% Construction
CD 9	[1]Lankershim Art Center Phase III Theater & Decarbonization *5108 N Lankershim Blvd*	Electrification + Solar + Energy Storage	BOE	Pre-Design
CD 13	Las Palmas Senior Citizen Center *1820 N Las Palmas Ave*	Electrification + Solar + Energy Storage	BOE	91% Design
CD 13	Silverlake Branch Library *2411 Glendale Blvd*	Electrification	BOE	10% Construction
CD 2	Valley Plaza Recreation Center *12240 Archwood St*	Electrification + Solar + Energy Storage	BOE/ LADWP	Design Complete. 20% Bid and Award
CD 4	LA Zoo Solar PV System *5333 Zoo Drive*	Solar + Energy Storage	BOE/ LADWP	Design-Build project. Pre-design complete. 60% Bid and Award phase

[1] The Green Meadows Recreation Center was replaced with Lankershim Art Center due to the Green Meadows Recreation Center equipment not having reached end-of-useful-life.

ATTACHMENT No. 4

Summary of All Decarbonization-Related Funds Allocated to BOE

Summary of All Decarbonization-Related Funds Allocated to BOE

Council File	Date Approved	Description	Funds Allocated by Council	Status
21-1039	05/03/22	Decarbonization Workplan TOS 65	$500,000	100% work completed
21-1039	05/03/22	Phase I Decarbonization Pilot Project Funds	$26,990,000	
		Balboa Sports Complex Decarbonization	*$2,100,000*	*In Bid&Awards*
		Benjamin Franklin Library Decarbonization	*$2,200,000*	*In Design*
		Cypress Park Branch Library Decarbonization	*$3,150,000*	*In Construction*
		Fire Station No. 39 Decarbonization	*$1,800,000*	*In Construction*
		Lankershim Art Center Decarbonization	*$1,600,000*	*In Design*
		Las Palmas Senior Citizen Center Decarbonization	*$3,500,000*	*In Design*
		Silverlake Branch Library Decarbonization	*$1,040,000*	*In Construction*
		Valley Plaza Recreation Center Decarbonization	*$3,600,000*	*In Bid&Awards*
		LA Zoo Solar PV System Decarbonization	*$8,000,000*	*In Bid&Awards*
21-1039	05/03/22	Other Building Decarb Workplan Costs Including 1% for Art, BOE Staff Costs, and Program Contingency	$1,599,000	
21-1039	11/23/22	Decarb Project Construction Cost Escalation	$2,407,965	
21-1039	11/23/22	Database Maintenance	$250,000	In- Progress
21-1039-S2	12/01/22	Analyze existing & future City-owned sites to be net-zero projects that maximize solar & energy storage on-site	$50,000	In-Progress
22-0530	11/23/22	Grid Impact Study	$100,000	In-Progress
21-1039	01/26/24	Phase II Decarbonization Pilot Project Funds	$22,609,938	*Moved to Year-1 Workplan*
		West Valley Municipal Building	*$2,400,000*	*Moved to Year-1 Workplan*

	West Valley Police Station, Parking & Repair Garage Bldgs.	*$8,000,000*	*Moved to Year-1 Workplan*
	Ritchie Valens Recreation Center	*$2,200,000*	*Moved to Year-1 Workplan*
	Evergreen Recreation Center	*$5,800,000*	*Moved to Year-1 Workplan*
	Northridge Branch Library	*$3,100,000*	*Moved to Year-1 Workplan*
	Other Building Decarbonization Work Plan Costs, Including 1% for Art, and Program Contingency	*$1,109,938*	*Moved to Year-1 Workplan*

ATTACHMENT No. 5

Slide Deck- Decarbonization Workplan and Year 1 Workbook

Portfolio Decarbonization Planning

Los Angeles Existing Municipal Building Decarbonization Workplan Report and Year 1 Workbook Package

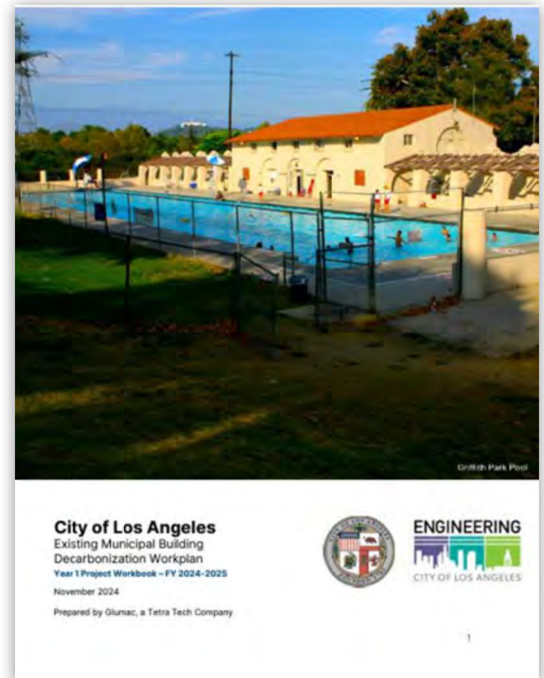
Presentation to the:

Energy and Environment Committee

ENGINEERING CITY OF LOS ANGELES

GLUMAC

December 2024



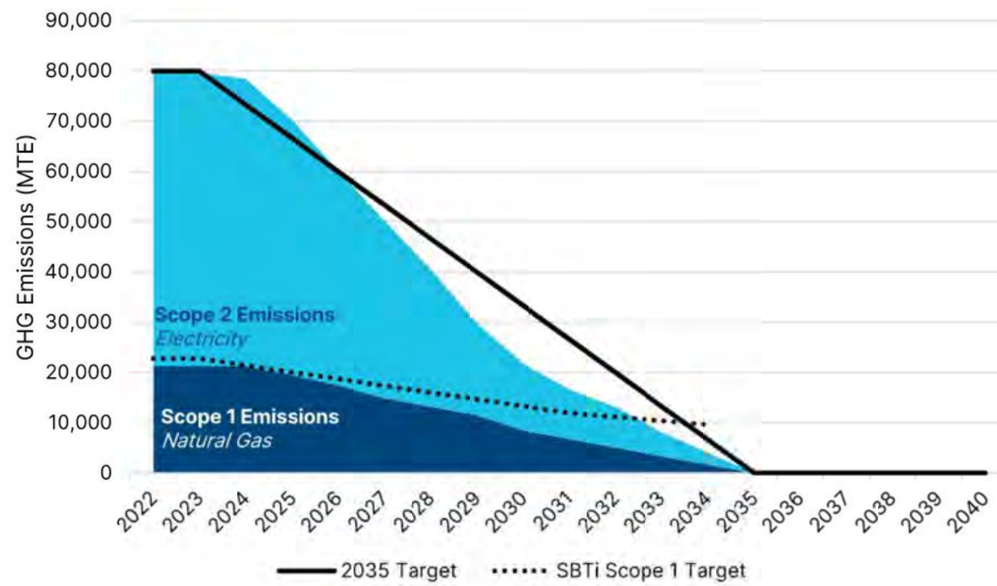
City of Los Angeles
Existing Municipal Building Decarbonization Workplan
November 2024

Prepared by Glumac, a Tetra Tech Company

1

Municipal Buildings GHG Emissions Forecasts

Pathway for the City of Los Angeles to decarbonize municipal building operations by 2035.



1. Emissions forecast is based on projects outlined in the Existing Building Decarbonization Workplan.
2. Municipal buildings includes all City owned facilities in non-proprietary departments. Excludes process operations including asphalt plants, wastewater treatment and CNG fueling.
3. Electricity emission factors based on LADWP's to provide 100% clean power by 2035 under LA1000. .

Municipal Existing Building Decarbonization Workplan Key Findings

1 Los Angeles has a pathway to achieve carbon-neutral municipal building operations by 2035.

- Prioritize building electrification and cost-effective energy efficiency and solar projects.
- Target buildings with the largest natural gas use – 25 sites account for 50% of annual use.
- Establish science-based reduction targets, with interim reduction commitments.

2 Achieving the 2035 commitment requires significantly scaling and accelerating implementation

- Requires electrifying 80 buildings annually starting in FY24-25, every year the City waits annual requirement increases by 10%.
- Decarbonization workplan will require additional staff, resources and funding, and new project
- delivery methods.
- Workplan recommends establishing a dedicated BOE Building Decarbonization Program Team.
- Success will still require significant coordinate and collaboration between multiple City departments.

3 A financially sustainable program aligns with existing buildings needs and can leverage external source.

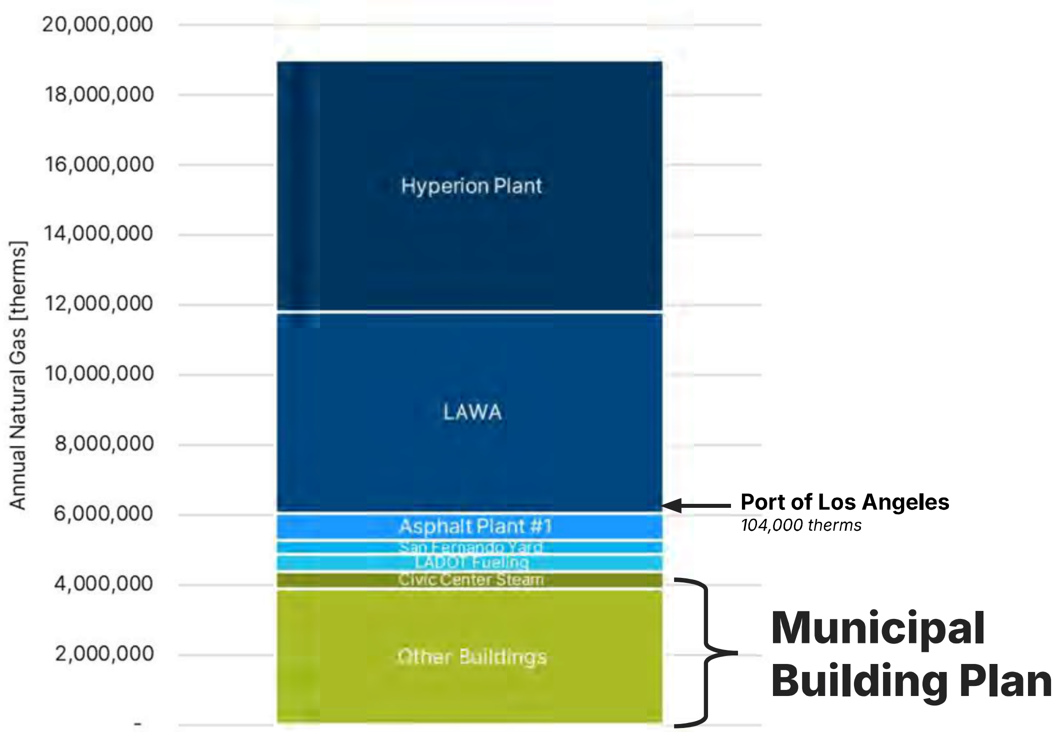
- Align decarbonization projects with deferred maintenance and infrastructure needs, avoid early
- equipment retirement.
- Pursue all available grants, leverage new financing mechanisms and consider building
- decarbonization/resilience bond.
- Implement Energy Savings Performance Contracts (ESPC) projects – CAO to determine financing approach.

4 Municipal building decarbonization will provide important community benefits.

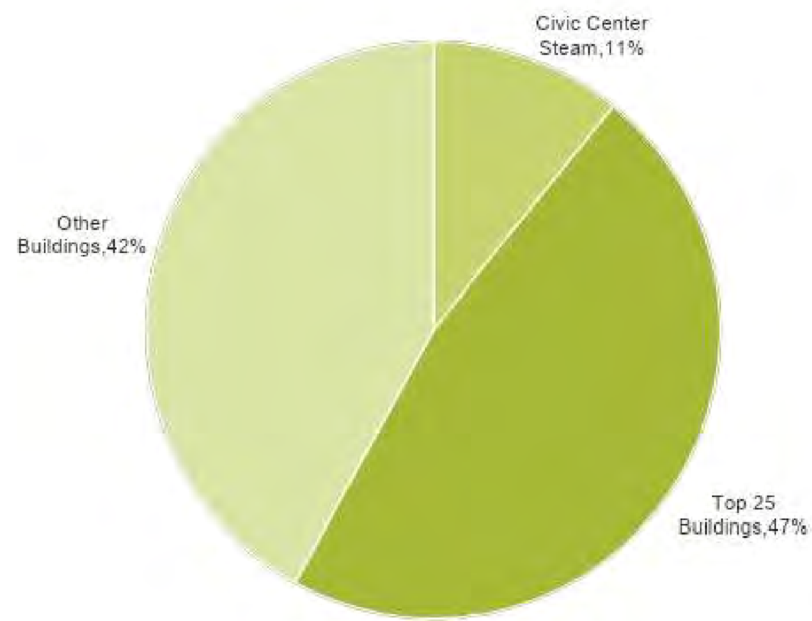
- Enhanced resilience of community cooling centers, emergency services and other critical operations.
- Lead the way and spur investment in the private sector.
- Create new local jobs in the green economy.

The Existing Building Decarbonization Workplan covers all non-proprietary buildings which use roughly 4 million therms of natural gas annually.

LASAN 2022 GHG Inventory



Municipal Existing Building Decarbonization Plan



The Municipal Building Decarbonization Workplan does not cover proprietary city departments including LAWA, POLA and LADWP. Natural gas for those departments are included above. Consumption for the Port of Los Angeles is ~100,000 Therms annually.

City of Los Angeles Building Portfolio

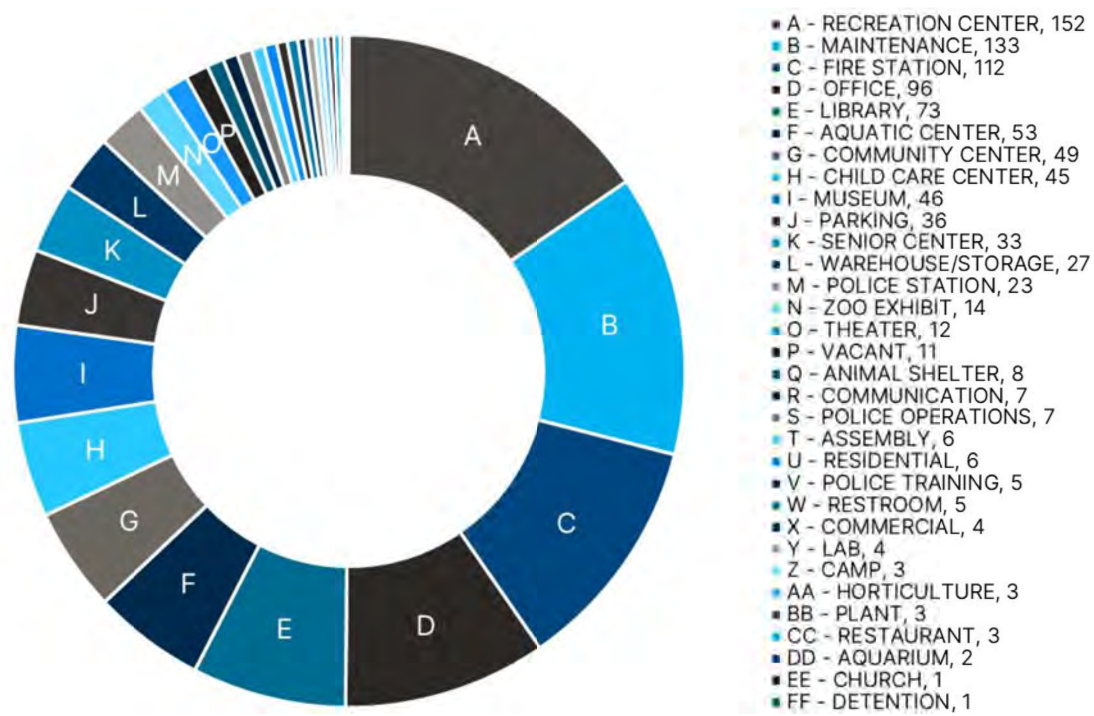
Key Takeaways

1. City operates a **diverse portfolio of existing buildings** providing various critical services.
2. Buildings account for **34% of municipal emissions** - 100,000 MTE in 2022.
3. Electrification is critical – LADWP to provide **100% clean power by 2035.**
4. **25 sites use 50% of natural gas** use for all municipal buildings.
5. Scope 1 emissions reduction targets in line with **science-based target**

980
Buildings

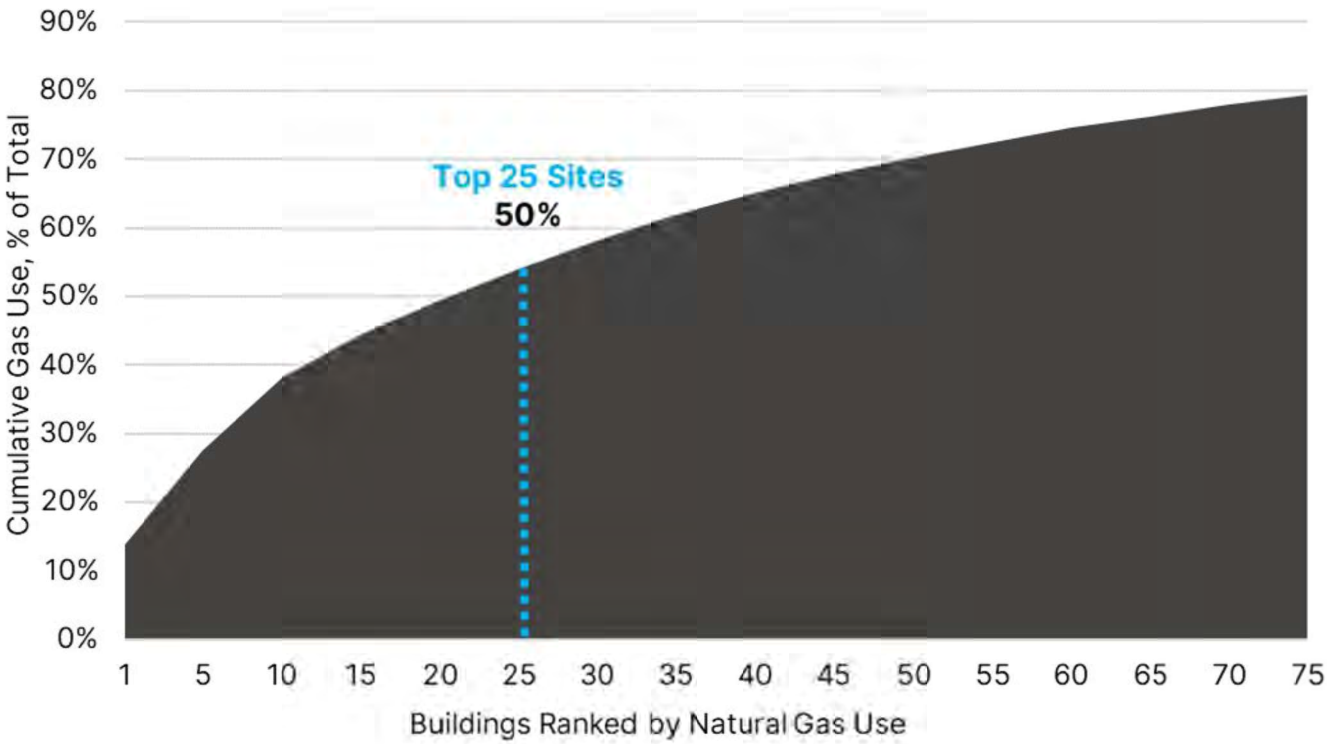
21M
Square Feet

$68M
Annual Utility Cost



Existing Building Portfolio by Building Type

Los Angeles will prioritize decarbonizing the top 25 sites which account for over 50% of annual natural gas use from all municipal buildings.



Excludes sites with process gas use including Asphalt Plant #1 (776,083 therms), LADOT CNG Fueling (493,303 therms), San Fernando Street Maintenance (393,986 therms) and Southwestern District Steet Maintenance (187,957 therms).

A.7. TOP 25 SITES BY NATURAL GAS

Table 28: City of Los Angeles - Top 25 Sites by Natural Gas Use

#	Site Name	Council District	Primary Department	Building Maintenance	Infrastructure Priority	Target Funding Year	ROM Cost (2023)	2022 Gas Usage (Therms)
1	CIVIC CENTER STEAM PLANT	14	GSD	GSD	High	FY 24-25 FY 28-29	$65,000,000	491,100
2	POLICE ADMINISTRATION BUILDING (PAB)	14	LAPD	GSD	Medium	FY 30-31	$12,873,965	181,700
3	HYPERION TREATMENT PLANT BUILDINGS	11	LASAN	LASAN		FY 27-28	$9,000,000	153,500
4	EXPO CENTER	09	RAP	RAP		FY 25-26	$8,686,894	140,700
5	LOS ANGELES ZOO	04	ZOO	ZOO		FY 27-28	$5,000,000	84,900
6	VAN NUYS SHERMAN OAKS PARK AND POOL	04	RAP	RAP	Low	FY 31-32	$1,933,930	81,400
7	CENTRAL LIBRARY	14	LAPL	GSD	Low	FY 32-33	$31,737,276	81,300
8	NORTH HOLLYWOOD FLEET SERVICE REPAIR FACILITY	02	GSD	GSD	High	FY 27-28	$3,200,000	78,300
9	C ERWIN PIPER TECHNICAL CENTER (PIPER TECH)	14	GSD	GSD	High	FY 26-27	$49,000,000	72,300
10	EAST VALLEY SOLID WASTE RESOURCES FACILITY	06	GSD	GSD	Low	FY 33-34	$4,500,000	71,900
11	VAN NUYS COMMUNITY POLICE STATION	06	LAPD	GSD	High	FY 25-26	$4,500,000	68,900
12	LOS ANGELES CONVENTION CENTER	09		Vendor	Medium	FY 29-30	$30,000,000	63,900
13	7TH ST CONSOLIDATED FACILITY	14	GSD	GSD	High	FY 25-26	$5,700,000	55,200
14	ECHO PARK DEEP POOL	14	RAP	RAP	Medium	FY 31-32	$4,567,341	52,300
15	GLASSELL PARK AND POOL	15	RAP	RAP	Medium	FY 30-31	$1,511,816	51,900
16	AHMANSON RECRUIT TRAINING CENTER (ARTC)	11	LAPD	GSD	High	FY 27-28	$13,713,439	46,000
17	LINCOLN PARK AND POOL	14	RAP	RAP	Medium	FY 28-29	$4,605,644	41,800
18	VAN NESS REC CENTER	18	RAP	RAP		FY 31-32	$2,038,950	39,500
19	WEST VALLEY SOLID RESOURCES COLLECTION YARD	12	GSD	GSD		FY 31-32	$2,000,000	38,600
20	YOSEMITE POOL AND REC CENTER	14	RAP	RAP	High	FY 26-27	$1,450,750	38,500
21	CENTRAL REFUSE EQUIPMENT REPAIR YARD	14	GSD	GSD	High	FY 25-26	$2,000,000	37,600
22	ROOSEVELT POOL	14	RAP	RAP	High	FY 24-25	$1,395,540	37,000
23	ELYSIAN PARK POLICE ACADEMY (LAPD POLICE ACADEMY)	01	LAPD	GSD[42]		FY 31-32	$4,905,339	36,800
24	WESTWOOD PARK AND POOL	05	RAP	RAP		FY 30-31	$12,173,784	36,000
25	CAMP SEELY	04	RAP	RAP	High	FY 33-34	$2,000,000	35,100

Prioritization framework will support decision making to develop impactful annual project portfolios.

Prioritization Criteria	Outcomes & Impact	Tactics
Emissions Reduction Prioritize projects with largest GHG emissions reduction potential.	*Carbon neutrality municipal building operations by 2035. Leading by example for the private sector.*	**A.** Electrify all buildings **B.** Complete LED lighting retrofits **C.** Pursue cost-effective energy and solar **D.** Procure 100% carbon free electricity
Infrastructure Needs Prioritize buildings with the greatest building infrastructure issues and deferred maintenance.	*Improved reliability of public services and emergency operations. Greater community resilience.*	**A.** Prioritize based on existing infrastructure **B.** Invest in cooling centers **C.** Create microgrids at and critical facilities
Cost Effectiveness Prioritize cost effective decarbonization projects, leverage external funding & financing, and reinvest savings.	*Reduced operational costs for municipal building utilities and maintenance.*	**A.** Pursue available incentives, rebates, credits **B.** Leverage alternative funding and financing **C.** Submit projects for federal and state grants
Equitable Investment Equitably invest across Los Angeles, prioritizing buildings serving disadvantaged communities.	*Investment in facilities that support disadvantaged communities. Economic support for local green jobs.*	**A.** Invest in disadvantaged communities – City's Equity Mapping and Justice 40 **B.** Program transparency

The Existing Building Decarbonization Workplan will leverage multiple project delivery methods to scale implementation efforts. All electrification project delivery methods assume equipment replacement at the end of their useful life.

1 Capital Improvement	2 End of Life Equipment (RAP-GSD)	3 Performance Contracts (ESPC)[1]	4 Portfolio Solar Procurement
Complex engineering projects that require planning and engineering design. • Boilers • Steam • Pool Heating • Large Water Heaters	**Replacement of smaller natural gas equipment that has reached the end of life.** • Rooftop Units • Small Water Heaters • Gas Dryers • Ovens & Ranges	**Full building upgrades at simpler facilities (fire station, library, rec center, etc).** • HVAC Systems • Water Heaters • LED Lighting	**Combine solar PV projects across multiple sites for more competitive pricing.** • Rooftop Solar • Carport Solar
Delivery Approach: BOE led projects run through existing capital improvement projects processes.	**Delivery Approach:** GSD/RAP led project with technical support from BOE. Vendor provides	**Delivery Approach:** ESPCs are design-building projects with guaranteed savings. BOE managed projects.	**Delivery Approach:** Design-build project delivery leveraging existing on-call solar contractors list.

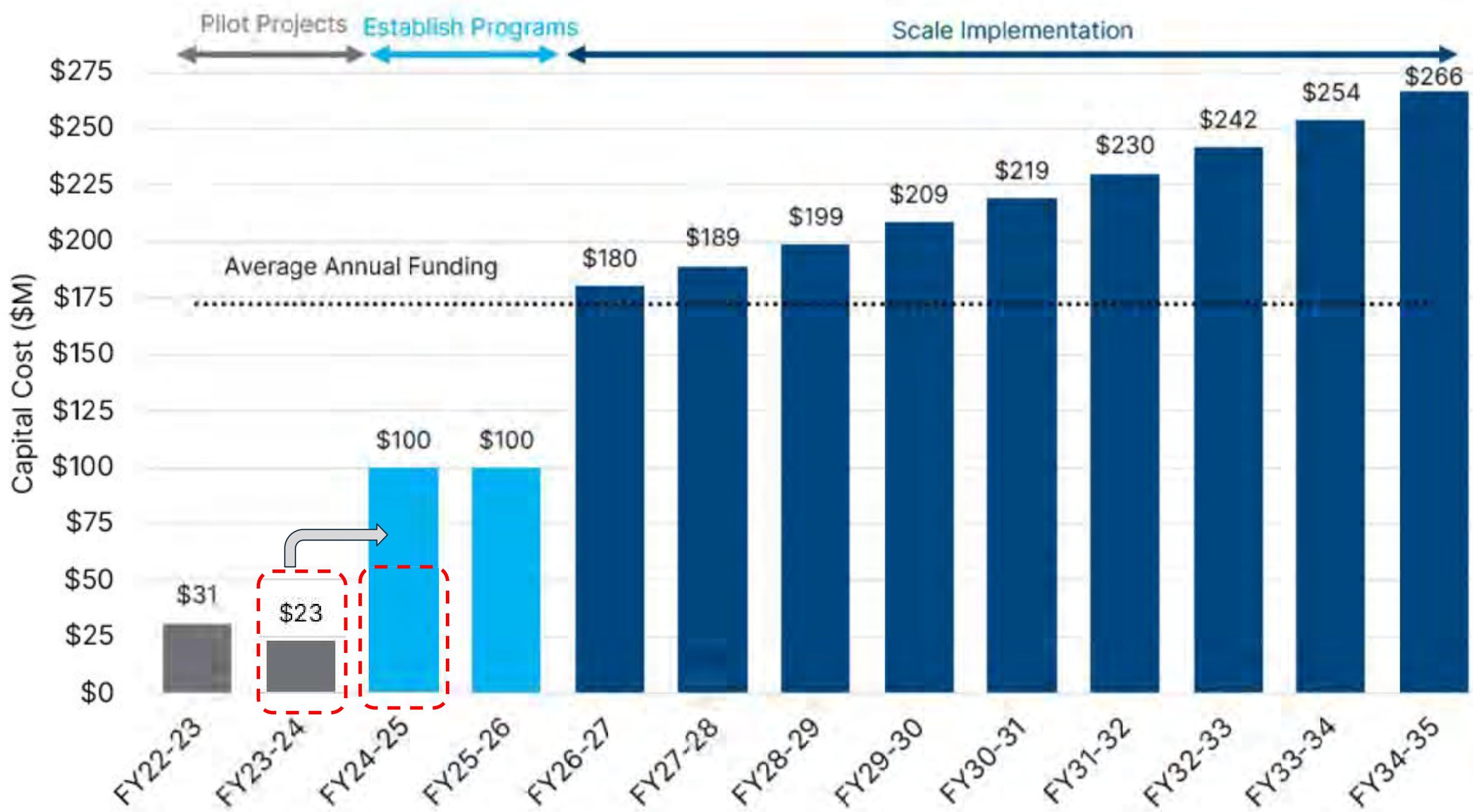
[1] Additional information provided for Energy Savings Performance Contracts (ESPC) later in presentation

HIGHLIGHT

Proposed Process for Approval of Annual Workbook

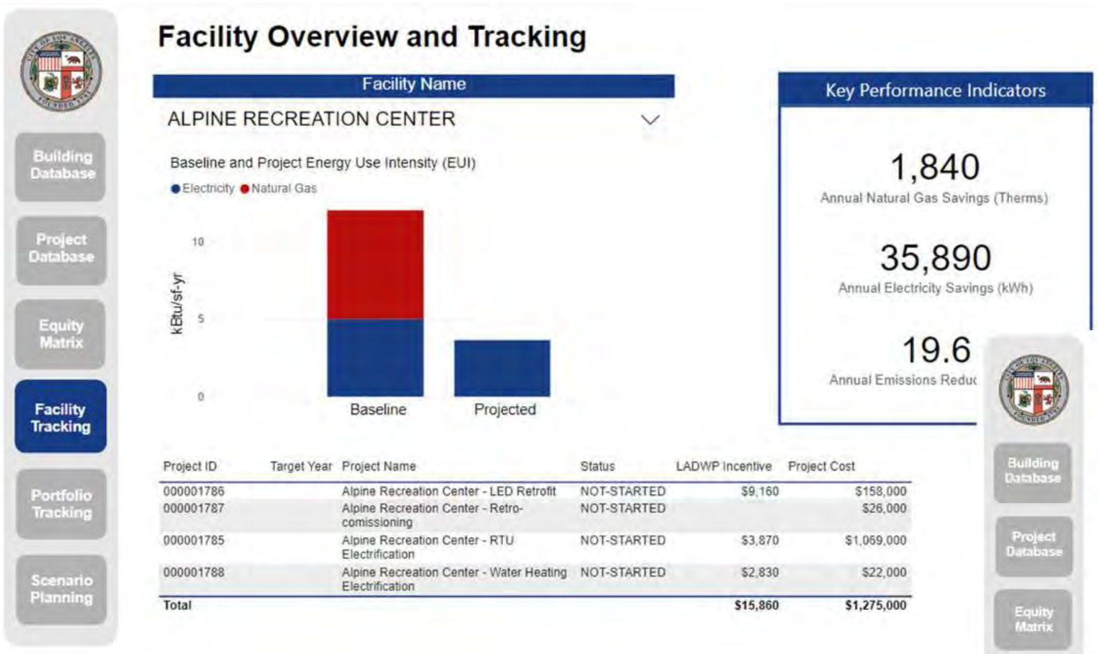
City Council, Mayor's Office, BOE[29]	City establishes a preliminary annual budget for the Municipal Building Decarbonization Program.	***August***
BOE	BOE Municipal Building Decarbonization Program Manager reviews the 12-year workplan and establishes a preliminary building decarbonization and project list.	***September***
GSD + Departments	GSD, RAP, and other departments with building operations responsibility review preliminary annual plans and provide input and suggestions based on existing infrastructure and city needs.	***October***
BOE	BOE Municipal Building Decarbonization Program Manager revises the annual plan based on feedback and provides an equity review of proposed investments.	***November***
CAO	CAO provides funding and financial reviews to identify funding sources and other alternative financing opportunities.	***December***
BOE	BOE Municipal Building Decarbonization Program Manager finalizes annual decarbonization plan	***February***
MFC	MFC reviews the annual proposed building decarbonization plan and forwards recommended action to the City Council	***March***
City Council + Mayor's Office	MFC provides an annual municipal building decarbonization plan that is submitted for approval.	***March***

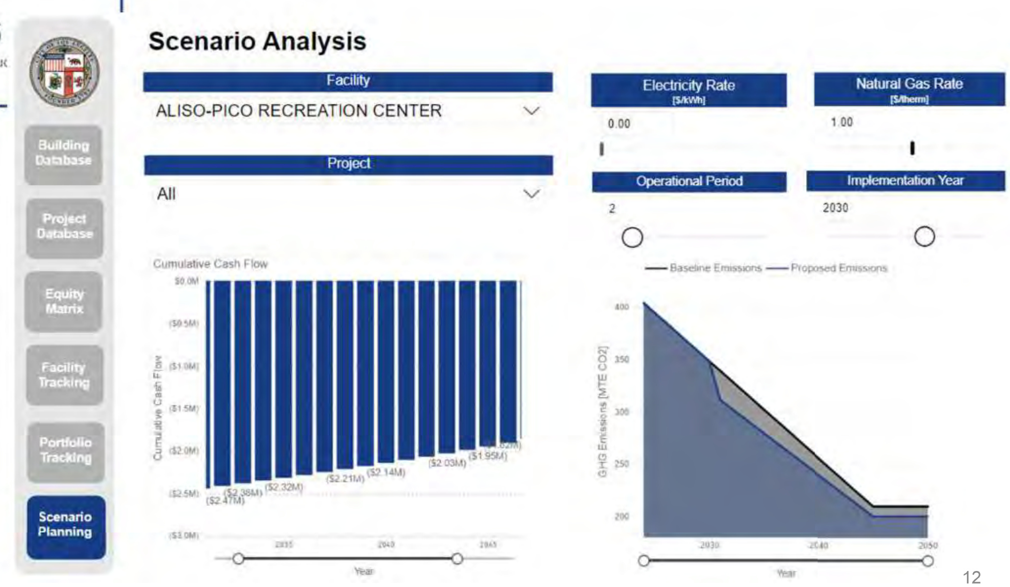
Phased decarbonization program will provide a scalable implementation framework for the City to accelerate investments through 2035.



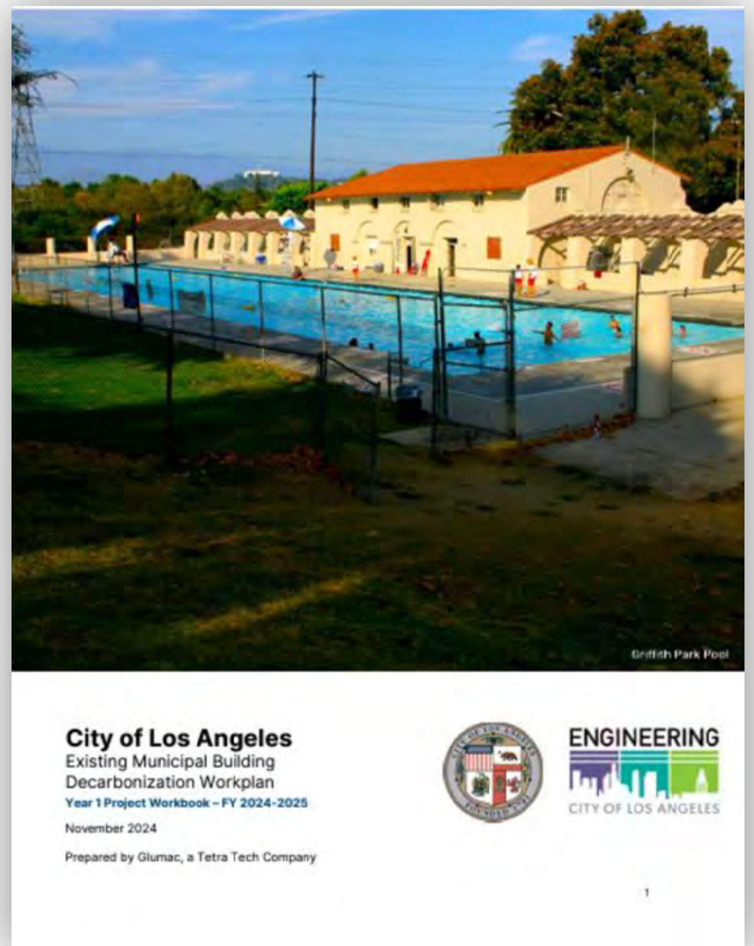
Building Decarbonization Workplan Estimated Annual Funding

Custom building decarbonization tracking tool will allow the City to monitor progress towards carbon neutrality.





Year 1 Workbook Package



Year 1 Workbook Package

Workbook also prioritizes projects to replace equipment at end of useful life.

1. **Capital Improvement:** 3 sites + city hall (planning)
2. **Equipment Replacement:** Pilot 7 sites
3. **Portfolio Design Build:** Pilot 46 sites
4. **Portfolio Solar PV:** Pilot 9 sites

Budget Breakdown

$61.1 M Total Year 1 City Project Budget over 1.5-4 yrs

$16.5 M Solar Construction Cost

$44.6 M Equipment Electrification Cost

$26.3 M Business as Usual New Natural Gas (non-electric) Equipment[3]

$18.3M Additional to Electrify [4]

Year 1 Workbook End-of-Life Recommended Projects

Facility	Council District	Building Area (SF)	City Budget ($)	Business as Usual[3] ($)	Annual Natural Gas Savings (Therm)
1. Capital Improvement Projects ($13.0M) (Scope: Electrification + LED Lighting upgrade; Duration: 2-3 years)					
Civic Center Steam Plant - Planning & Design*	14		$1,500,000	-	-
West Valley Police Station Pilot Phase 2	3	32,670	$5,500,000	$4,000,000	16,589
Griffith Park Pool	4	4,400	$3,000,000	$350,000	377
Roosevelt Pool*	14	4,418	$3,000,000	$350,000	37,032
2. RAP/GSD Equipment Replacement Projects ($4.15M) (Scope: Electrification; Project Duration 1-1.5 yrs)					
3x RAP Facilities	Multiple	34,000	$1,750,000	$1,400,000	4,424
4x GSD Facilities	Multiple	65,500	$2,400,000	$2,000,000	7,250
3. Portfolio Design-Build Energy Projects[1] ($24.5M) (Scope: Electrification + Potential LED Lighting; Project Duration: 4 yrs)					
11x Libraries	Multiple	96,000	$5,550,000	$4,150,000	6,628
7x Fire Stations	Multiple	80,700	$4,250,000	$3,200,000	22,269
11x Community/Office Buildings	Multiple	249,950	$8,150,000	$6,000,000	31,612
7x Rec Centers/Senior Centers	Multiple	92,540	$6,550,000	$4,800,000	7,940
Sub-total Electrification Budget			**$41,650,000**	**$26,250,000**	**134,121**
4. Solar Projects[2] ($16.5M) (Scope: Solar PV; Project Duration: 1-1.5 yrs)					
9x Solar Projects	Multiple		$16,500,000	-	-
Sub-total Solar Budget			**$16,500,000**		
PROGRAM CONTINGENCY 5%			**$2,900,000**	$1,300,000	-
TOTAL YEAR 1 WORKBOOK BUDGET			**$61,050,000**	**$27,550,000**	

1. Portfolio Design-Build Energy Projects can be delivered through the Energy Savings Performance Contract (ESPC) delivery method or another internally managed project delivery method. ESPC can leverage private funding.
2. Solar PV project budget is the net cost assuming the City is able to meet the requirements of the ITC. ITC can provide up to 50%can be paid out after installation Solar projects can leverage private financing.
3. Cost for like-for-like replacements with new gas equipment.
4. Cost difference for building electrification.
5. $38M Max. Potential 3rd party investment

Year 1 Decarbonization Projects

LIBRARIES
- NORTHRIDGE BRANCH LIBRARY (PILOT PH. II) (CD12)
- CAHUENGA BRANCH LIBRARY (CD13)
- LINCOLN HEIGHTS BRANCH LIBRARY (CD1)
- JEFFERSON - VASSIE D WRIGHT MEMORIAL BRANCH LIBRARY (CD10)
- FELIPE DE NEVE BRANCH LIBRARY (CD10)
- MALABAR BRANCH LIBRARY (CD14)
- ROBERT LOUIS STEVENSON BRANCH LIBRARY (CD14)
- WILSHIRE BRANCH LIBRARY (CD13)
- JOHN C FREMONT BRANCH LIBRARY (CD5)
- ANGELES MESA BRANCH LIBRARY (CD8)
- ASCOT BRANCH LIBRARY (CD9)

MUNICIPAL/OFFICE BUILDINGS
- YUCCA COMMUNITY CENTER (CD13)
- WILMINGTON MUNICIPAL BUILDING (CD15)
- EAGLE ROCK CITY HALL (CD14)
- CD 9 FIELD OFFICE (OLD JUNIPERO SERRA LIBRARY) (CD9)
- BOYLE HEIGHTS NEIGHBORHOOD CITY HALL (CD14)
- SAN PEDRO MUNICIPAL BUILDING (CD15)
- VAN NUYS MUNICIPAL BUILDING (CD6)
- CANOGA-OWENSMOUTH COMMUNITY CENTER (CD3)
- SOLEDAD ENRICHMENT CENTER AND COUNCIL DISTRICT (CD14)
- WATTS MUNICIPAL BUILDING (CD15)
- WEST VALLEY MUNICIPAL BUILDING *(PILOT PH. II)* (CD3)
- **YOUTH ARTS CENTER- OLD PAC BELL BLDG**
- **BOYLE HEIGHTS YOUTH TECH**
- **CIVIC CENTER STEAM PLANT- PLANNING & DESIGN** (CD14)

MAINTENANCE & OPERATIONS
- **FLEET HEADQUARTERS**
- **STREET LIGHTING FIELD OPERATIONS**

FIRE STATIONS
- FIRE STATION #79 (CD15)
- FIRE STATION #01 (CD1)
- FIRE STATION #21 (CD9)
- FIRE STATION #63 (CD11)
- FIRE STATION #37 (CD5)
- FIRE STATION #71 (CD5)
- FIRE STATION #38 (CD15)

Delivery Method
- **Capital Improvement (4)**
- **GSD RAP End of Life (7)**
- Portfolio Design Build (36)

POLICE
- **WEST VALLEY POLICE STATION *(PILOT PH. II)* (CD3)**

AQUATICS CENTERS
- **GRIFFITH PARK POOL (CD4)**
- **ROOSEVELT POOL (CD14)**

RECREATION CENTERS
- RITCHIE VALENS RECREATION CENTER *(PILOT PH. II)* (CD7)
- EVERGREEN RECREATION CENTER *(PILOT PH. II)* (CD14)
- LAKE VIEW TERRACE RECREATION CENTER (CD7)
- STONEHURST RECREATION CENTER (CD7)
- MONTECITO HEIGHTS RECREATION CENTER (CD1)
- VAN NUYS SHERMAN OAKS RECREATION CENTER (CD4)
- VAN NUYS SHERMAN OAKS SENIOR CENTER (CD4)
- **RAMONA RECREATION CENTER**
- **HUBERT HUMPHREY RECREATION CENTER**
- **SUNLAND SENIOR CITIZEN CENTER**

**Decarbonization and engineering planning will be provided for buildings connected Civic Center steam plant.*

Year 1 Building Solar Projects

Site Name	Site Address	Building Type	LA Database Site Consumption (kWh)	System Size Modeled (kW DC)	Yearly Solar Generation (kWh)	Energy Use Offset
West Valley Library / Police Station / Municipal Building	19036 Vanowen St, Reseda, CA 91335	Multiple	1,791,989	804.7	1,400,500	78%
Emergency Operations Center / Fire Station #04	500 E Temple St, Los Angeles, CA 90012	Multiple	4,438,839	231.6	393,900	9%
Van Nuys Civic Center	6262 Van Nuys Blvd, Van Nuys, CA 91401	Office	2,265,284	224.4	395,500	17%
Topanga Community Police Station	21501 Schoenborn St, Canoga Park, CA 91304	Police	999,022	526.9	922,900	92%
7th St Facility	2310 E 7th St, Los Angeles, CA 90023	Warehouse	410,661	223.3	382,200	93%
Wilshire Community Police Station	4861 Venice Blvd., Los Angeles, CA 90019	Police	820,098	148.5	257,400	31%
Personnel Department	700 E Temple St, Los Angeles, CA 90012	Office	773,641	333.3	567,400	73%
Hollywood Community Police Station	1358 Wilcox Ave, Los Angeles, CA 90028	Police	742,386	141.9	249,000	34%
Balboa Sports Center	17017 Burbank Blvd, Encino, CA 91316	Recreation Center	365,880	114.4	202,000	55%
Total			**9,725,301**	**2,749.0**	**4,770,800**	**49%**

Portfolio Solar Procurement

- 2.75 MW of solar PV across nine locations
- Variety of building types
- Annual solar generation of 4.7 MWh (49% offset)
- $7.3M cumulative savings over 20 years


West Valley Library


West Valley Municipal Building


Fire Station #04


Topanga Police Station


Wilshire Police Station


Hollywood Police Station


West Valley Police Station


Emergency Operations Center


Van Nuys Civic Center


7th St Maintenance Facility


Personnel Department

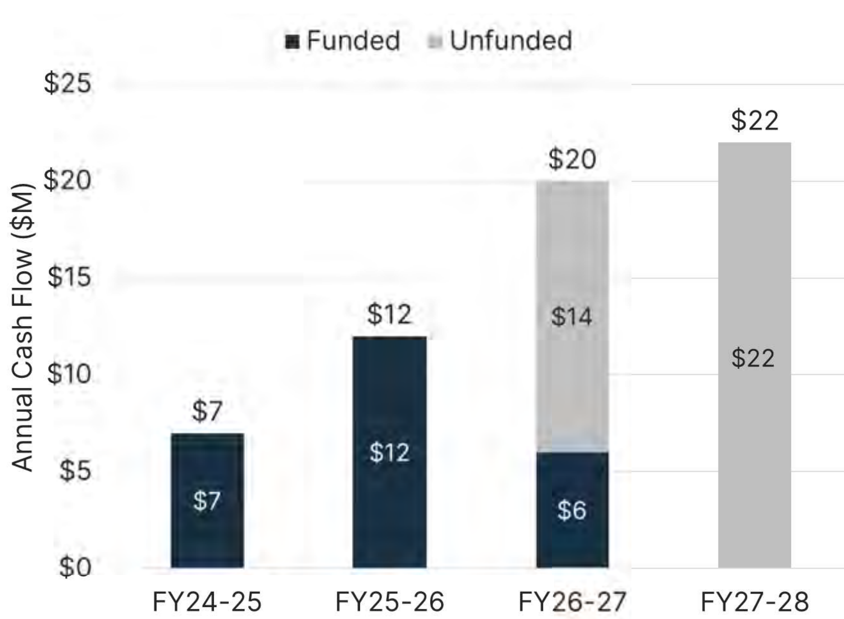

Balboa Sports Center

Year 1 Workbook Detailed Cost Estimate

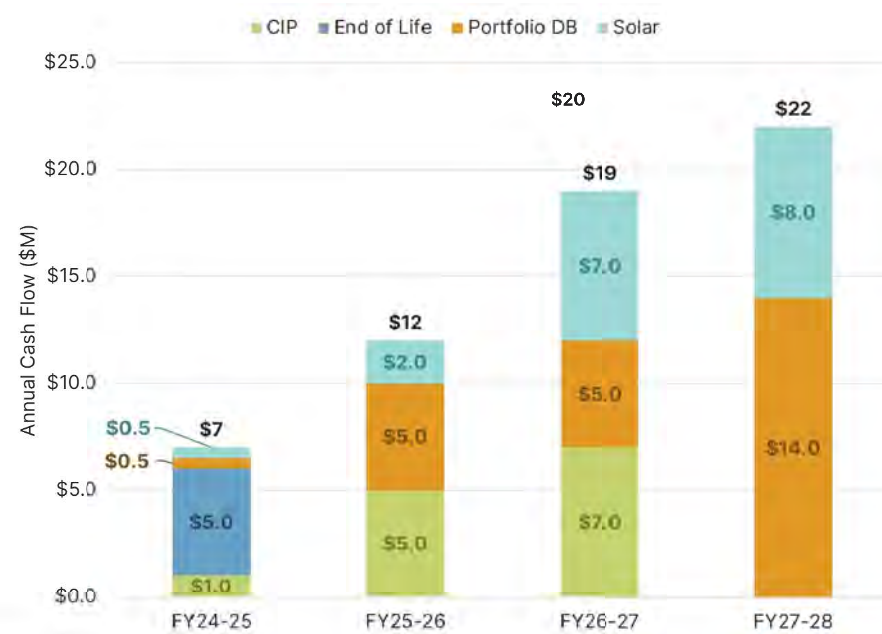
Project Work Description	Unit Price/ Multiplier	Quantity/ Amount	Units/ Mult. Desc.	Land Acquisition	Design Services	Construction Costs	Construction Services	Total Line Cost
LAND ACQUISITION								
L1 Land Purchase Amount (Priced at 1.0 Acres)	$0	0	sf (Site)	$0	-	-	-	$0
L2 Relocation [1]	0.00%	$0	Land Acq.	$0	-	-	-	$0
Subtotal Land Acquisition				**$0**				**$0**
DESIGN SERVICES								
D1 Design Services	12.00%	$37,220,000	Project Cost	-	$4,466,400	-	-	$4,466,400
D2 Program / Project Management [2]	2.00%	$37,220,000	Project Cost	-	$744,400	-	-	$744,400
D3 Design Support Services [3]	1.00%	$37,220,000	Project Cost	-	$372,200	-	-	$372,200
D4 Client & Other City Departments [4]	1.00%	$37,220,000	Project Cost	-	$372,200	-	-	$372,200
D5 Permits & Fees	4.00%	$37,220,000	Project Cost	-	$1,488,800	-	-	$1,488,800
Subtotal Design Services					**$7,444,000**			**$7,444,000**
CONSTRUCTION COST								
C1 Capital Improvement Projects		$8,253,826	Project Cost	-	-	$8,253,826	-	$8,253,826
C2 RAP/GSD Equipment Replacement Projects		$2,634,875	Project Cost			$2,634,875		$2,634,875
C3 Portfolio Design-Build Energy Projects		$15,555,288	Project Cost			$15,555,288		$15,555,288
C4 Solar Projects		$10,476,010	Project Cost			$10,776,010		$10,776,010
Subtotal Construction Cost			Project Cost			**$37,220,000**		**$37,220,000**
FIXED FURNITURE AND COMMUNICATIONS								
O1 Communications [5]	0.00%	$37,220,000	Const Cost	-	-	$0	-	$0
O2 Fixed Furniture	$0.00	0	sf Bldg Area	-	-	$0	-	$0
Subtotal Fixed Furniture and Communications						**$0**		**$0**
INSPECTION/CONSTRUCTION SERVICES								
S1 Construction Inspection [6]	5.00%	$37,220,000	Project Cost	-	-	-	$1,861,000	$1,861,000
S2 Construction Management [7]	5.00%	$37,220,000	Project Cost	-	-	-	$1,861,000	$1,861,000
S3 Program / Project Management [2]	4.00%	$37,220,000	Project Cost	-	-	-	$1,488,800	$1,488,800
S4 Construction Support Services [3]	0.00%	$37,220,000	Project Cost	-	-	-	$0	$0
S5 Client & Other City Dept's [4]	2.00%	$37,220,000	Project Cost	-	-	-	$744,400	$744,400
S6 Phasing / Relocation Costs	0.00%	0	$/SF per month	-	-	-	$0	$0
Subtotal Inspection/Construction Services							**$5,955,200**	$5,955,200
SUBTOTAL				**$0**	**$7,444,000**	**$37,220,000**	**$5,955,200**	**$50,619,200**
CONTINGENCIES (Project Contingency, Art Allowance) [8 & 10]	6.00%			$0	$446,640	$2,233,200	$357,312	$3,037,152
SUBTOTAL - October 2024 TOTAL COST				**$0**	**$7,890,640**	**$39,453,200**	**$6,312,512**	**$53,656,352**
ESCALATION								
E1 Number of Years of Escalation (from Cost Base)		1/1/2024	Cost Base	0	1	2	3	
E2 Annual Escalation Percentage				0.00%	3.00%	8.00%	3.00%	
E3 Total Compounded Escalation Percentage				0.00%	3.00%	16.64%	9.27%	
E4 **Total Escalation Amount**				**$0**	**$236,719**	**$6,565,012**	**$585,170**	**$7,386,902**
PROJECTED TOTAL COST				**$0**	**$8,127,359**	**$46,018,212**	**$6,897,682**	**$61,043,254**

Rev Date: **11/7/2024**

Total Available Funding- $25M
Previously allocated From Phase II Pilot Projects: $22.6M
Energy Conservation Block Grant (Pending final award): $2.4M



Year 1 Workbook Expenditure Plan



Expenditure Plan for Each Project Delivery Method

Year 1 Workbook Package-

POTENTIAL SAVINGS AND REBATES

REBATES

$1-1.5M
Estimated LADWP Rebates
From Completed Year-1 Projects

$5M
Estimated IRA Direct Pay Rebates
From Completed Year-1 Projects

SAVINGS

$1.0M
Annual Utility Cost Savings
From Completed Year-1 Projects

3%
Portfolio Natural Gas Savings
From Year-1 project completion

Estimated Rebates

$1-1.5M Estimated LADWP Rebates

With the building electrifications and the solar installations the payback period is approximately ~15 years resulting from Annual Utility Cost Savings

$5M Estimated IRA Direct Pay Rebates
From Completed Year-1 Projects

Estimated Savings

$1.0M Annual Utility Cost Savings *From Completed Year-1 Projects*

Year 1 Workbook Budget			
Facility	**City Budget**		
1. Capital Improvement Projects ($13.0M) (Scope: Electrification + LED Lighting upgrade; Duration: 2-3 yrs)	$13,000,000	-	–
2. RAP/GSD Equipment Replacement Projects ($4.0M) (Scope: Electrification; Project Duration 1-1.5 yrs)	$4,000,000	-	-
3. Portfolio Design-Build Energy Projects[1] ($24.5M) (Scope: Electrification + Potential LED Lighting; Project Duration: 4 yrs)	$24,500,000	-	-
4. Solar Projects[2] ($16.5M) (Scope: Solar PV; Project Duration: 1-1.5 yrs)	$16,500,000	-	-
PROGRAM CONTINGENCY 5%	$2,900,000	-	-
TOTAL YEAR 1 WORKBOOK BUDGET	**$61,050,000**	-	-
Rebates and Savings		Estimated One-time Rebates	Estimated Savings Per Year
Estimated LADWP Rebates		$1,000,000-$1,500,000	
Estimated IRA Direct Pay Rebate		$5,000,000	
Estimated Annual Utility Cost Savings			$1,000,000

Status of Phase I Pilot Projects

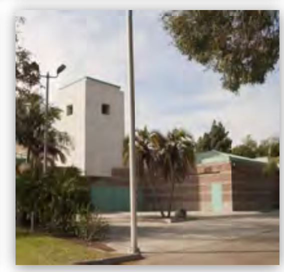
Phase I Pilot Project Status

	Facility/Project Name	Scope of Work	Lead Agency	Current Status
CD 6	Balboa Sports Complex *17015 Burbank Blvd*	Electrification + Solar + Energy Storage	BOE	Design Complete. 27% Bid and Award
CD 14	Benjamin Franklin Branch Library *2200 East 1st St*	Partial Electrification +Solar + Energy Storage	BOE	60% Design
CD 1	Cypress Park Branch Library *1150 Cypress Ave*	Electrification + Solar + Energy Storage + Energy Upgrade	BOE	60% Construction
CD 6	Old Fire Station No. 39 *14415 Sylvan St*	Electrification + Solar + Energy Storage + Energy Upgrade	BOE	30% Construction
CD 9	[1]Lankershim Art Center Phase III Theater & Decarbonization *5108 N Lankershim Blvd*	Electrification + Solar + Energy Storage	BOE	Pre-Design
CD 13	Las Palmas Senior Citizen Center *1820 N Las Palmas Ave*	Electrification + Solar + Energy Storage	BOE	91% Design
CD 13	Silverlake Branch Library *2411 Glendale Blvd*	Electrification	BOE	10% Construction
CD 2	Valley Plaza Recreation Center *12240 Archwood St*	Electrification + Solar + Energy Storage	BOE/ LADWP	Design Complete. 20% Bid and Award
CD 4	LA Zoo Solar PV System *5333 Zoo Drive*	Solar + Energy Storage	BOE/ LADWP	Design-Build project. Pre-design complete. 60% Bid and Award phase







Summary of All Decarbonization and Related Funds Allocated to BOE

Summary of All Decarbonization-Related Funds Allocated to BOE

Council File	Date Approved	Description	Funds Allocated by Council	Status
21-1039	05/03/22	Decarbonization Workplan TOS 65	$500,000	100% work completed
21-1039	05/03/22	Phase I Decarbonization Pilot Project Funds	$26,990,000	
		Balboa Sports Complex Decarbonization	$2,100,000	*In Bid&Awards*
		Benjamin Franklin Library Decarbonization	$2,200,000	*In Design*
		Cypress Park Branch Library Decarbonization	$1,100,000	*In Construction*
		Fire Station No. 39 Decarbonization	[illegible]	*In Construction*
		Lankershim Art Center Decarbonization	$1,800,000	*In Design*
		Las Palmas Senior Citizen Center Decarbonization	$3,500,000	*In Design*
		Silverlake Branch Library Decarbonization	$1,040,000	*In Construction*
		Valley Plaza Recreation Center Decarbonization	$3,500,000	*In Bid&Awards*
		LA Zoo Solar PV System Decarbonization	$6,020,000	*In Bid&Awards*
21-1039	05/03/22	Other Building Decarb Workplan Costs Including 1% for Art, BOE Staff Costs, and Program Contingency	$1,599,000	
21-1039	11/23/22	Decarb Project Construction Cost Escalation	$2,407,965	
21-1039	11/23/22	Database Maintenance	$250,000	In- Progress
21-1039-S2	12/01/22	Analyze existing & future City-owned sites to be net-zero projects that maximize solar & energy storage on-site	$50,000	In-Progress
22-0530	11/23/22	Grid Impact Study	$100,000	In-Progress

Council File	Date Approved	Description	Funds Allocated by Council	Status
21-1039	01/26/24	Phase II Decarbonization Pilot Project Funds	$22,609,938	*Moved to Year-1 Workplan*
		West Valley Municipal Building	*$2,400,000*	*Moved to Year-1 Workplan*
		West Valley Police Station, Parking & Repair Garage Bldgs.	*$8,000,000*	*Moved to Year-1 Workplan*
		Ritchie Valens Recreation Center	*$2,200,000*	*Moved to Year-1 Workplan*
		Evergreen Recreation Center	*$5,800,000*	*Moved to Year-1 Workplan*
		Northridge Branch Library	*$3,100,000*	*Moved to Year-1 Workplan*
		Other Building Decarbonization Work Plan Costs, Including 1% for Art, and Program Contingency	*$1,109,938*	*Moved to Year-1 Workplan*

Additional Information

Year 1 Projects

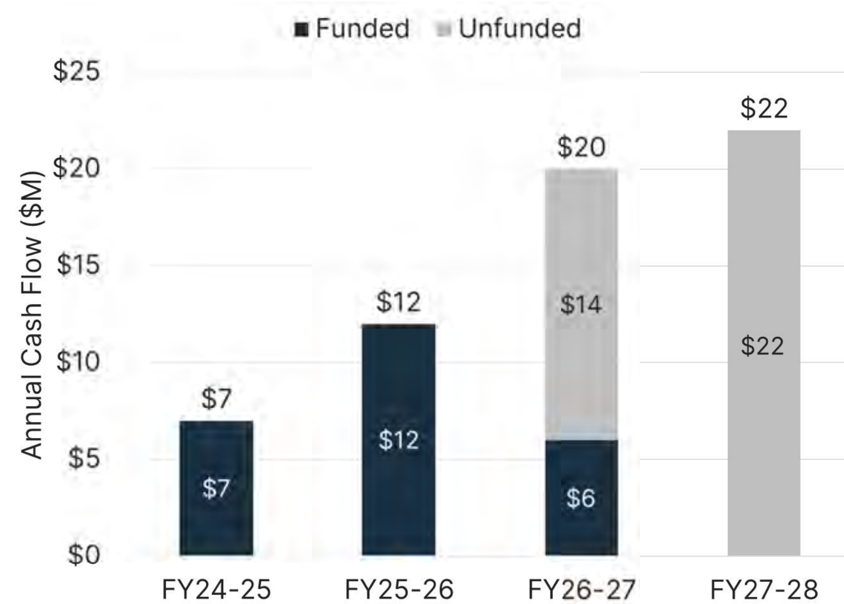
Year 1 Workbook Package Summary

Workbook prioritizes projects to electrify gas equipment at end of useful life that will require investment for continued operation and will pilot new portfolio scale project delivery methods.

- **Capital Improvement:** 3 sites + city hall (planning)
- **Equipment Replacement:** Pilot 11 sites
- **Portfolio Design Build:** Pilot 46 sites
- **Portfolio Solar PV:** Pilot 9 sites

<u>Funds Available</u>
$25M Total Fund Available
$22.6M From Pilot Project Phase II
$2.4M Energy Efficiency & Conservation Block Grant (EECBG)

<u>Budget Breakdown</u>
$61.1 M Total Year 1 City Project Budget over 1.5-4 yrs
$16.5 M Solar Construction Cost
$44.6 M Equipment Electrification Cost
$26.3 M Business as Usual New Natural Gas (non-electric) Equipment[3]
$18.3M Additional to Electrify [4]



Year 1 Workbook Expenditure Plan

Cost Breakdown of Year 1 Workbook

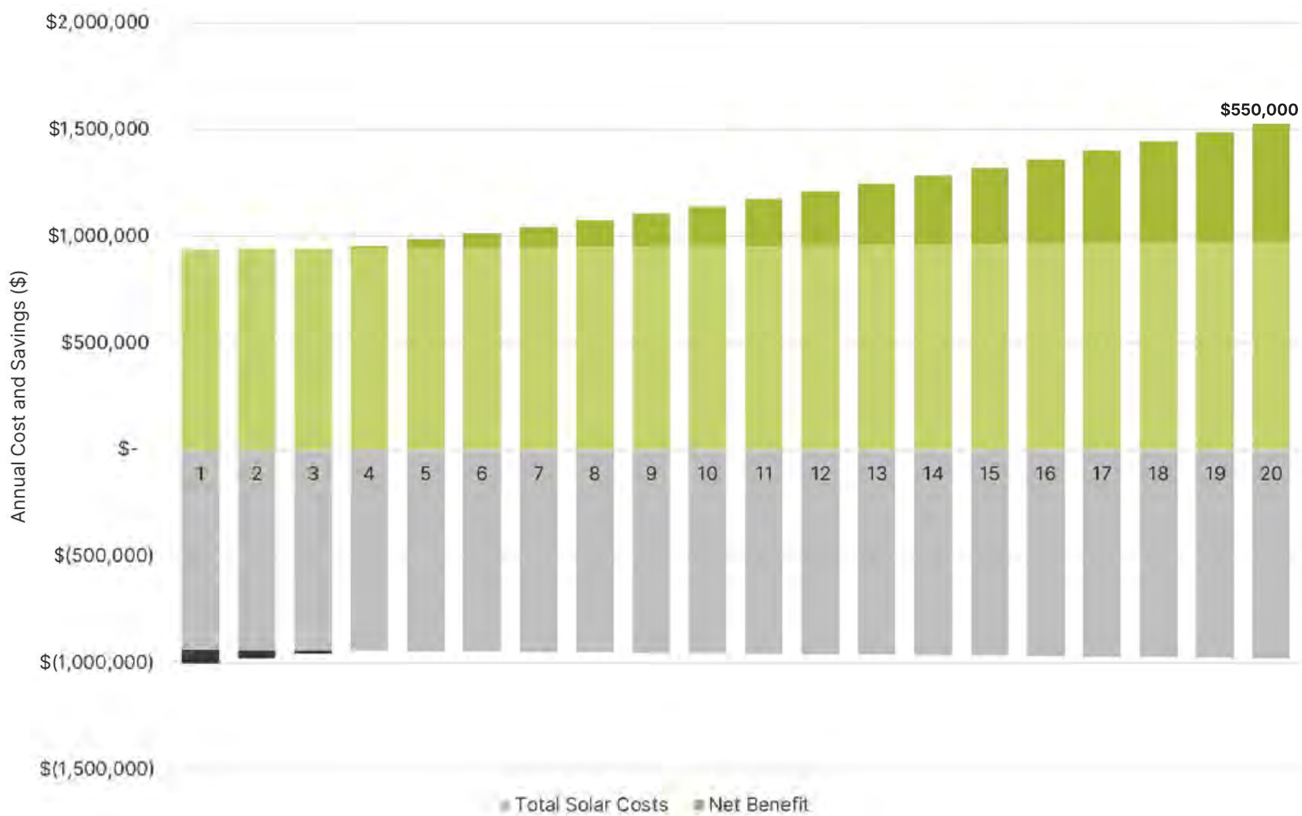
Project Phase	Capital Improvement Projects	RAP/GSD Equipment Replacement Projects	Portfolio Design Build (ESPC)	Portfolio Solar PV
Design Services	$4,300,000	$575,000	$2,000,000	$1,100,000
Construction Cost	$8,000,000	$3,000,000	$21,000,000	$14,800,000
Construction Services	$700,000	$425,000	$1,500,000	$600,000
ITC Rebate[1]	-	-	-	-$5,000,000
Total Budget	**$13,000,000**	**$4,000,000**	**$24,500,000**	**$11,500,000**

Estimated ITC Rebate: $5,000,000
Estimated LADWP Rebate[2]: $1,000,000 to $1,500,000

1. Solar PV project budget is the net cost assuming the City is able to meet the requirements of the ITC. ITC can provide up to 50% rebate. Current estimates are based on the City receiving a 30% rebate. This is paid out after construction once system is operational - bridging financing and ITC payout insurance is available to mitigate risk.
2. Estimated rebates are based on LADWP Business Offerings for Sustainable Solutions (BOSS) Program which provide an incentive of $0.65/kWh for all-electric heating systems.

Year 1 Building Solar Projects Recommended

Cash Flow of Recommended Solar Projects with External Financing



$4.3M
20-Year
Cost Savings

Portfolio Solar Procurement

- 2.75 MW of solar PV across nine locations
- Variety of building types
- Annual solar generation of 4.7 MWh (49% offset)
- $4.3M cumulative savings over 20 years

Financial Model Assumptions

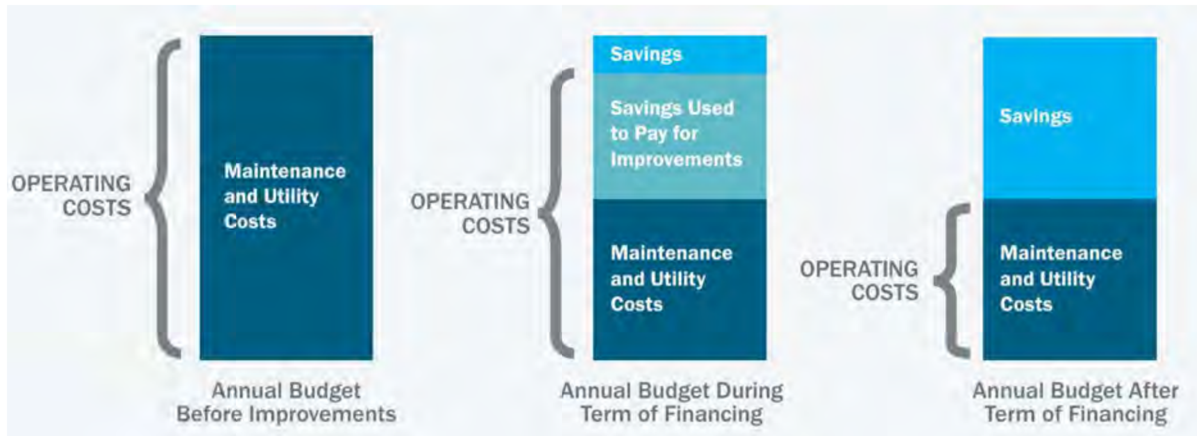
- $6,000/kW system cost
- 30% Investment Tax Credit (ITC)
- 20-Year Financing Period at 4.5% Interest
- 3.5% utility escalation
- $18.5/kW maintenance with 3.5% escalation
- 0.5% Annual Solar Degradation

Energy Saving Performance Contract (ESPC)

ESPC Definitions

Energy Savings Performance Contact (ESPC)
Contracting and project delivery process used to identify and install energy and utility improvements in existing facilities. Construction costs are repaid with cost savings from the upgrades.

Energy Services Company (ESCO)
Full-service energy engineering and construction firms that develop and implement energy savings plans for a building or portfolio of buildings, install energy-efficiency and clean-energy upgrades, and provide system maintenance and monitoring through the life of service agreements.



Consideration

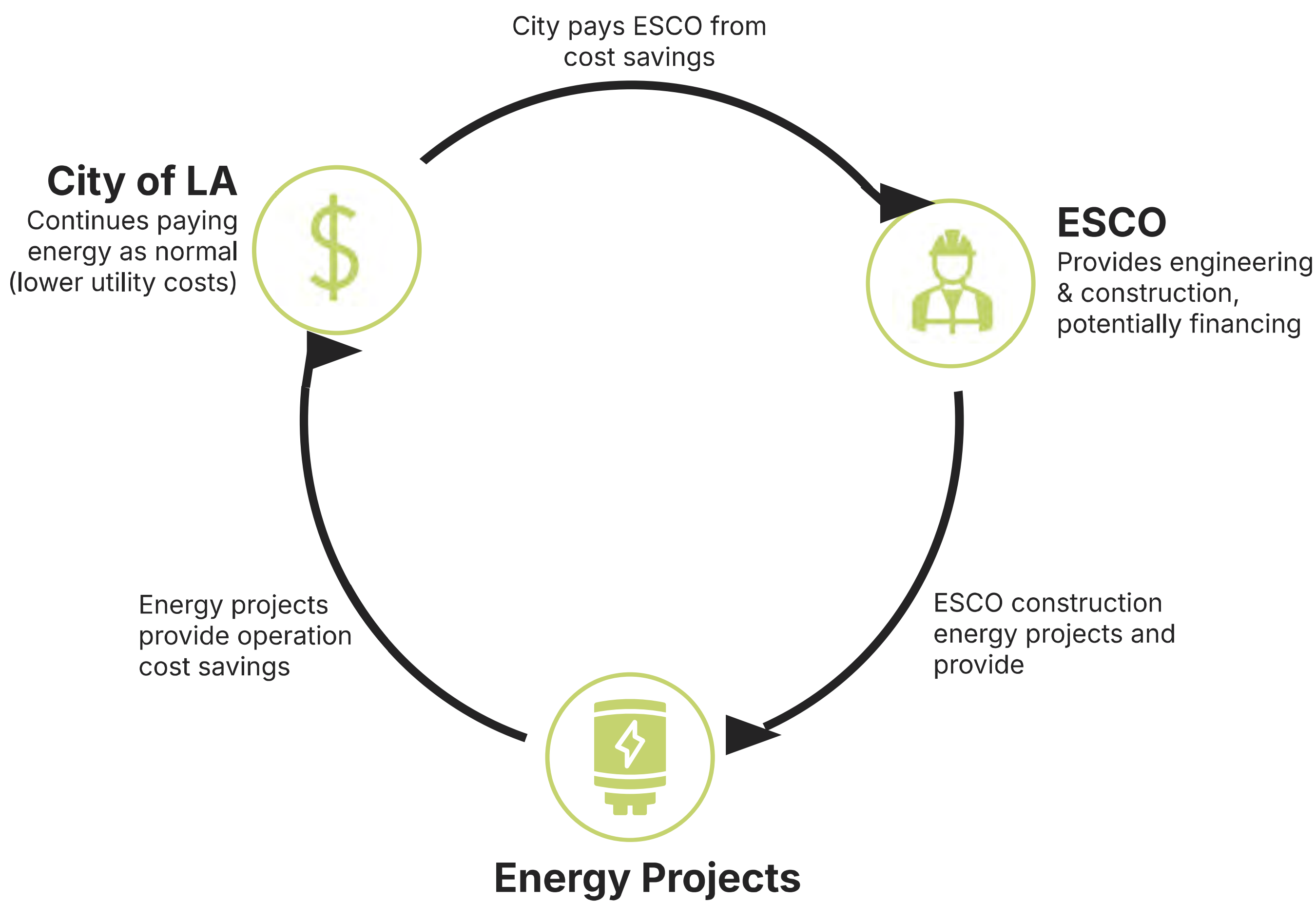
- Proven contracting, project delivery and financing method for the public sector to supports energy, water, renewable and deferred maintenance upgrades
- ESCO guarantees the energy savings, making up any shortfall
- Projects can be funded and/or financed by customer and repaid with cost savings

ESPC Summary

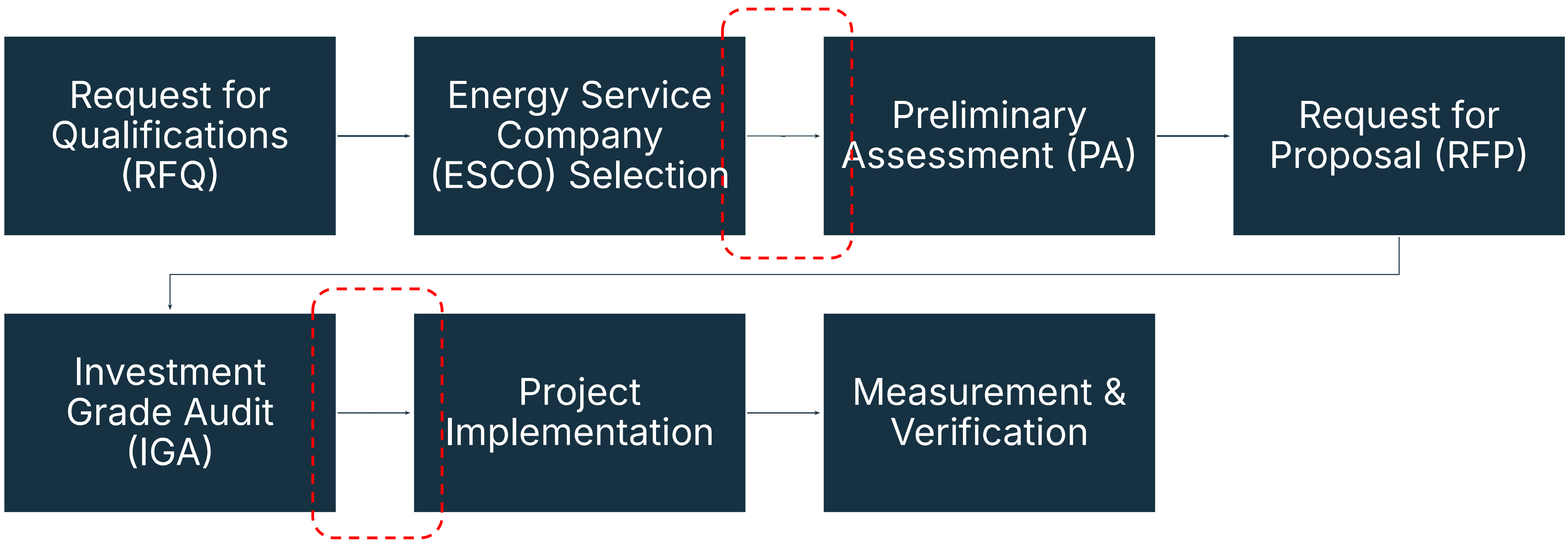
ESPC are a design-building project delivery method that are commonly leveraged by public agencies.

Advantages:

1. Quicker implementation than traditional delivery
2. Ability to scale building decarbonize efforts across a portfolio of buildings through a single contract
3. Comprehensive upgrades including multiple aspects such as lighting, HVAC, and envelope improvements.
4. Ability to finance projects through energy savings and reduce funding from City general fund.
5. ESCO assumes financial and performance risks if energy savings fall short of projections.



ESPC Project Delivery Process



End of Slides