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EXECUTIVE MANAGEMENT COMMITTEE
OCTOBER 16, 2025

SUBJECT: 2025 ENERGY MASTER PLAN

ACTION: ADOPT METRO'S ENERGY MASTER PLAN

RECOMMENDATION

ADOPT the Energy Master Plan recommendations (Attachment A).

ISSUE

Metro's energy supply is fundamental to sustaining operations, advancing clean energy and environmental goals, and ensuring system resiliency. Yet the external energy landscape is marked by increasing supply constraints, rising costs, and heightened vulnerability to climate-driven disruptions. At the same time, Metro's expanding portfolio of energy assets-such as electric vehicle charging infrastructure, solar panels, and energy storage systems-requires not only capital investment, but also ongoing integration through software platforms, cybersecurity protections, and a skilled workforce capable of managing and optimizing these technologies.

In this context, Metro's *2025 Energy Master Plan* (EMP) provides the agency with a timely opportunity to proactively design a comprehensive energy ecosystem plan. The EMP addresses projected energy needs, identifies cost-effective strategies for clean energy generation, and recommends targeted investments in energy management technologies and resiliency projects that will enable Metro to meet future demand while controlling costs and strengthening system reliability.

BACKGROUND

The Metro 2025 EMP represents the agency's first formal energy master planning update since the *Energy Conservation and Management Plan* (ECMP) was developed and adopted in 2011. Since that time, Metro has implemented numerous energy-related initiatives, established and made progress toward ambitious energy and climate goals, and deployed on-site renewable energy and electric vehicle charging systems across its operations.

Changing external conditions now requires a more proactive and integrated approach. Macroeconomic realities-including energy supply constraints driven by electrification demand, insufficient investment in grid infrastructure, rising energy prices, and energy technology supply chain challenges-combine with climate-driven stressors such as extreme heat, wildfire, and other severe weather events to heighten the need for comprehensive energy planning, cost

management, and resiliency.

Metro's growing need for resiliency was reinforced by the 2022 climate risk screening of assets, staff, and customers, followed by a 2023 evaluation of Metro's adaptation, continuity of operations, and resiliency measures. These findings informed the 2025 *Climate Action and Adaptation Plan* (CAAP) update. Key energy-related risks include increased grid outages and mechanical and electrical system disruptions associated with higher ambient temperatures, flooding, and storms. Metro has integrated these risks into the *All Hazards Mitigation Plan* (AHMP), which emphasizes making climate and emergency management agency-wide considerations. Consistent with the Agency-wide Continuity of Operations Plan (COOP), which identified 19 critical business units requiring rapid resumption following disruption, the EMP provides energy-focused strategies to enhance system reliability.

In parallel, Metro's *Vision 2028* and transit demand management goals further underscore the need for a proactive, dynamic energy planning framework that can sustain operational reliability, build resiliency, and mitigate potential supply or delivery constraints as ridership grows.

Metro's strategic energy and climate commitments also shape the EMP. In 2020, the Board adopted the *Moving Beyond Sustainability Plan* (MBS), the agency's 10-year sustainability plan that establishes transformative goals to reduce environmental impacts, address the climate crisis, and advance equity and resiliency across Los Angeles (LA) County. Within the MBS, Metro committed to two key energy management targets:

1. Reduce facility energy consumption by 17% by 2030, relative to the Business-as-Usual (BAU) scenario.
2. Increase on-site renewable energy generation to 7.5 MW.

While the MBS outlines strategies toward these targets, the EMP provides the holistic, integrated analysis of current and projected energy usage needed to guide achievement. Accordingly, all energy demand and renewable energy strategies in the EMP are fully aligned with and reflected in the MBS.

Metro's Board adopted CAAP in 2019, which set two agency-wide greenhouse gas (GHG) reduction targets:

1. Reduce total GHG emissions 79% by 2030 (from 2017 baseline).
2. Achieve net-zero GHG emissions by 2050.

These CAAP targets were subsequently incorporated into the MBS in 2020, reinforcing Metro's commitment to deep decarbonization. The EMP complements these efforts by advancing strategies for energy cost management, expanded procurement of carbon-free electricity, and associated energy resiliency investments that will enable Metro to meet its 2030 and 2050 GHG reduction goals.

DISCUSSION

The EMP represents a critical, timely effort to establish a comprehensive and dynamic roadmap for Metro's future energy needs. Developed to address projected increases in energy demand, costs, and resiliency challenges, the EMP provides an integrated framework to guide cost-effective investments in clean power generation, energy management technologies, and resiliency measures across Metro's system.

The EMP is built on a rigorous technical foundation. It incorporates detailed energy forecasts using an Excel-based modeling tool that integrates building- and meter-level consumption data, historic and projected energy prices, zero-emission bus (ZEB) rollout schedules, traction power demands, fleet and non-revenue electric vehicle (EV) charging, on-site solar photovoltaic (PV) generation, and current and future facility energy needs based on approved capital and operational plans. Core planning and policy documents-including the MBS*, Vision 2028, the Long -Range Transportation Plan* (LRTP), the Equity Toolkit, and the CAAP-were aligned with operational data to ensure consistency with Metro's long-term goals. Recommendations were further informed by research into energy management best practices and validated through multiple working sessions with Metro staff and community-based organizations (CBOs).

Findings

Key findings indicate that Metro's energy profile will undergo significant transformation between 2025 and 2050. Electricity demand, primarily driven by electrification of the bus fleet and system expansion, is forecast to increase from 334 GWh in 2024 to over 1,000 GWh by 2050, representing a 200% increase. Current annual energy costs of $95 million are also projected to rise substantially over this period. When accounting for utility rate escalation and increased energy consumption, total costs in 2050 could reach between $520 million under a low scenario (3% average annual rate increase) and $1.77 billion under a higher scenario (8% average annual rate increase).

The table below presents projected total energy costs for 2050 under different utility rate escalation scenarios. Year 2050 energy usage is assumed to remain constant across scenarios, while utility rates change 3 percent, 6 percent, and 8 percent per scenario.
The table also identifies the relative contribution of energy consumption growth versus utility rate escalation and inflation to the total cost increase, illustrating the impact of future rate increases on Metro's energy expenditures.

Year 2050 Cost Scenarios (Non-Cumulative)	Energy Usage (A)	Utility Rate Escalation & Inflation (B)	Total Costs (A+B)	% of 2050 Energy Cost due to Energy Usage	% of 2050 Energy Cost Due to Utility Rate Escalation &Inflation
3% average annual increase	$239.7M	$280.4M	$520.1M	46%	54%
6% average annual increase	$239.7M	$850.8M	$1.09B	22%	78%
8% average annual increase	$239.7M	$1.53B	$1.77B	14%	86%

Resiliency pressures will also intensify as electrification expands into areas with known grid supply constraints, particularly within several bus divisions and park-and-ride facilities. Current reliance on renewable diesel backup generators and uninterruptible power supply (UPS) systems provides only limited coverage, and existing solar PV systems are not paired with storage, preventing them from supplying power during outages.

While Metro has achieved 46 percent renewable electricity toward its CAAP goal of 100 percent by 2035, existing solar PV installations (currently 2.6 MW toward a 7.5 MW goal) face operational challenges related to aging equipment, weather impacts, and reactive maintenance practices. Without proactive operations and maintenance strategies, reliance on costlier utility power will increase. Similarly, energy savings and automation technologies remain under-deployed across Metro's facilities, limiting potential efficiency gains. Workforce training programs are also challenged by variability and lack of standardization in control systems, underscoring the need for expanded partnerships and skills development to support the transition to electrification and advanced energy systems.

To address these findings, the EMP identifies four primary areas of recommended action: (1) Energy Planning, (2) Energy Supply, (3) Energy Technology Deployment and Workforce Development, and (4) Stakeholder Engagement. Specific measures include establishing a centralized energy planning steering committee, standardizing operating procedures for resiliency projects, expanding and modernizing solar PV with integrated storage, upgrading building automation systems, piloting energy storage at traction power substations and bus divisions, and strengthening utility, workforce, and community partnerships. These actions are phased and structured to support incremental progress, inform future investment decisions, and provide resiliency and cost-mitigation benefits.

The EMP is intentionally designed as a dynamic, updateable resource that will evolve alongside Metro's operational and capital planning. Over the next 12-18 months, priority focus areas include ZEB division resiliency planning, traction power substation energy storage pilots, and the

development of a comprehensive implementation roadmap. These near-term actions will provide critical lessons learned, establish cost-benefit frameworks, and build institutional capacity to support broader deployment in FY27 and beyond.

Through these measures, the EMP positions Metro to proactively manage its most significant energy challenges, mitigate cost escalation, strengthen operational resiliency, and advance its commitment to a clean, equitable, and sustainable transportation system.

DETERMINATION OF SAFETY IMPACT

The recommended Board action to approve and adopt Metro's EMP will have a direct and positive impact on safety, service quality, system reliability, performance and overall customer satisfaction through increased system reliability, energy resiliency and energy cost mitigations. The EMP supports Metro's continuity of operations and reduces system vulnerability and energy independence as energy needs grow, and energy sources are homogenized.

FINANCIAL IMPACT

Impact to Budget

Adoption of the EMP will establish a framework and near-term action steps for a proactive, integrated approach to energy cost management and resiliency planning. At this time, there is no direct budget impact associated with Board adoption of the EMP. Initial funding for implementation will be drawn from existing approved budgets under the Metro Office of Sustainability, including Projects 450001: Energy Conservation Initiative, 450003: Sustainability Environment, 290009: EV Parking Equipment Program, 205697: Distributed Energy Resources, 207187: Building Automation Integration, Division 9, 208615: Non-Revenue Fleet EV Charging Program; 210805: Energy Resiliency, C Line and Division 18.

Implementation of EMP strategies may, over time, require new projects and associated capital life-of-project budgets to achieve long-term energy savings and resiliency benefits. Any such requests will be developed in coordination with relevant departments and returned to the Board for approval.

The EMP is a critical cost-management tool. With Metro's annual energy expenditures projected to rise sharply over the next 25 years, the EMP provides early visibility into future energy demand and costs, enabling proactive planning and targeted mitigation strategies. By prioritizing integrated, site-level investments-rather than piecemeal, technology-by-technology deployments, the EMP will optimize interactive benefits, reduce shared costs (e.g., design, trenching, wiring), and deliver scalable, cost-effective solutions across the system.

While not required, Metro will apply a standardized cost-effectiveness analysis to all future EMP-related projects to ensure investments deliver strong value. Existing analyses already identify Solar PV, energy storage, and energy efficiency investments as positive based on Net Present Value (NPV) and Return on Investment (ROI). More detailed, site-specific cost-effectiveness analysis will be developed beginning in FY26 to inform future budget requests.

EQUITY PLATFORM

EMP recommendations include the development of additional on-site clean energy generation, energy management and resiliency technologies at critical sites to provide local health benefits, and opportunities for continued workforce development partnerships. These recommendations will support long-term operational sustainability of the growing transit system, positively impacting Equity Focus Communities (EFCs), customers, and broader transit system users across LA County.

As part of the development of the EMP, the team engaged the Office of Equity and Race to develop a plan for community feedback to better understand the implications of the EMP strategies and recommendations. The team conducted a stakeholder outreach effort during the development of the plan with the goal of soliciting early perspectives from organizations across Metro's service area as to needs of - and insights from - local communities. This was primarily accomplished via interviewing five CBOs that had not previously engaged in other Metro sustainability or climate-related efforts that included Brotherhood Crusade, Car-Lite Long Beach, Day One, Los Angeles Neighborhood Initiative (LANI), and YMCA of Whittier.

This engagement opportunity was posted through the CBO Database and aligned with Metro's CBO Partnering Strategy. Several key recommendations were incorporated from this CBO outreach into the EMP including ongoing CBO engagement, exploring workforce development partnerships, and ensuring that energy equity indicators and benefits are communicated publicly via Metro's website and/or data dashboards.

To achieve equity objectives, the EMP recommendations include the integration of equity assessments in early project and program planning phases using the data and resources from the forthcoming Equity Toolkit, Community Demographic Profiles, and Metro's Cost Benefit Analysis (CBA) for larger capital projects. The data and insights collected from these assessments are intended to support the ongoing evaluation and continual improvement of energy equity as part of Metro's Equity Platform.

Next steps in the implementation of equity objectives as part of energy planning will include an equity assessment for the Division-18 distributed energy resource feasibility plan. Community engagement will also be part of Metro's ongoing conversation with utilities and regional energy partners including the LA100 Plan advisory group. The LA100 Plan documents are updated periodically and incorporate community input through robust outreach and engagement.

VEHICLE MILES TRAVELED OUTCOME

Vehicle Miles Traveled (VMT) and VMT per capita in LA County are lower than national averages, the lowest in the SCAG region, and on the lower end of VMT per capita statewide, with these declining VMT trends due in part to Metro's significant investment in rail and bus transit. Metro's Board-adopted VMT Reduction Targets align with California's statewide climate goals, including achieving carbon neutrality by 2045. To ensure continued progress, all Board items are assessed for their potential impact on VMT.

As part of these ongoing efforts, this item is expected to contribute to further reductions in VMT. While this item does not directly encourage transit, sharing a ride, or using active transportation, it is a vital part of Metro operations, as it supports operational resiliency, environmental and sustainability goals and cost-effective energy management strategies. Because the Metro Board has adopted an

agency-wide VMT Reduction Target, and this item supports the overall function of the agency, this item is consistent with the goals of reducing VMT.

*Based on population estimates from the United States Census and VMT estimates from Caltrans' Highway Performance Monitoring System (HPMS) data between 2001-2019.

IMPLEMENTATION OF STRATEGIC PLAN GOALS

Implementation of the EMP provides Metro with a strategic, actionable framework to evaluate and develop energy management and resiliency actions that increase system reliability, reduce long-term energy costs, and expand on-site clean energy generation. The EMP also establishes a transparent, data-driven tool for evaluating projects against strategic goals, ensuring that Metro's capital investment decisions are aligned with organizational values and deliver measurable benefits to riders, communities, and the region.

ALTERNATIVES CONSIDERED

The Board could choose not to approve the EMP, direct staff to revise the recommendations prior to implementation, or decline implementation altogether. However, not approving the EMP would significantly limit staff's ability to deliver proactive, data-driven strategies to address Metro's projected energy demand, escalating costs, and resiliency needs. Without the EMP, Metro would face increased fiscal exposure, reduced ability to mitigate energy risks, and missed opportunities to optimize investments in clean energy and resiliency.

NEXT STEPS

With Board approval of the EMP recommendations, staff will develop a comprehensive implementation plan that outlines clear next steps, defined roles and responsibilities, and measurable deliverables across all four recommended action areas. The Office of Sustainability will coordinate this process and act as the agency's Energy Management team, ensuring alignment with Metro's broader strategic goals and providing ongoing oversight.

Successful implementation will require collaboration across Metro departments, including primarily the Office of Management & Budget, Vendor/Contract Management, Capital Planning, Program Management, and Operations. This cross-functional engagement will enable more strategic and coordinated progress in energy management, cost mitigation, and resiliency planning.

Staff will provide regular updates to the Board through Metro's Annual Sustainability Report. The update will summarize progress against key performance indicators (KPIs), cost-benefit outcomes of implemented measures, and any new capital project funding requests required to advance EMP priorities. These updates will also capture lessons learned, enabling the EMP to remain a flexible, adaptive framework responsive to evolving energy, fiscal, and climate conditions.

ATTACHMENT

Attachment A - Energy Master Plan

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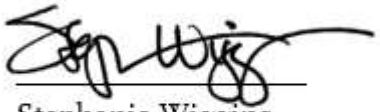

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Metropolitan Transportation Authority

Energy Master Plan

Energy Demand Forecast and Energy Management Recommended Actions

Metro®

October 2025

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INTERNAL PARTNERS	**EXTERNAL PARTNERS**
Community Relations	Burns and MacDonnell
Construction Management	Brotherhood Crusade
Countywide Planning & Development	Car-Lite Long Beach
Facilities Engineering Operations	Circlebox Ventures
Facilities/Property Maintenance	Cumming Group
Finance & Budget	Los Angeles Neighborhood Initiative (LANI)
Government Relations	LA28
Human Capital and Development	Metro Sustainability Council
Office of Equity and Race	UCLA Luskin Center/UCLA Department of Transportation
Office of the Chief Executive Officer	YMCA of Whittier
Operations (Bus and Rail)	
Planning and Development	
Procurement	
Program Management	
Purchasing	
Rail Vehicle Engineering	
Systems Engineering	
Wayside Systems Facilities Maintenance	
Vendor/Contract Management	

Executive Summary

Background

Los Angeles County Metropolitan Transportation Authority's (Metro) 2025 EMP is the Agency's first formal energy master planning update since 2010, when the Energy Conservation and Management Plan (ECMP) was developed and subsequently approved by Metro's Board in 2011. Since that time, Metro has developed and implemented numerous energy-related plans[1], established and made progress towards energy and climate goals, and built on-site renewable energy and electric vehicle charging systems.

Many large energy users and public agencies have developed EMPs to better guide their energy planning and to proactively anticipate challenges and mitigate energy constraints as they decarbonize their operations. Metro has adopted renewable energy and carbon emissions reductions goals with electrification[2] and on-site solar photovoltaic (PV) energy generation serving as key enablers to meet these targets. As progress is made towards these goals, macroeconomic realities such as energy supply constraints – driven by the demand for electrification and lagging investments in energy infrastructure – energy price increases and supply chain challenges, and climate events such as extreme heat and fire necessitate a proactive approach to energy planning, cost management and energy resiliency.

Metro's need for increased resiliency was highlighted as part of the climate risk screening of assets, staff, and customers in 2022. The screening led to a 2023 evaluation of Metro's current adaptation measures and recommendations for additional measures to address climate risks. Those findings were also incorporated into the 2025 Climate Action and Adaptation Plan (CAAP) update[3]. Key climate risks relating to energy include increased grid outages and mechanical and electrical disruptions due to increased temperatures, flooding, and storms. Metro's Agency-wide Continuity of Operations Plan (COOP) identified 19 functional business units that need to continue or resume operations as quickly as possible following an emergency.[4]Aligned with Metro's transit demand management and VISION 2028 goals, a proactive and dynamic energy planning framework is also required to support system reliability, provide resiliency and proactively mitigate potential energy constraints or energy delivery challenges due to increases in ridership.

Objectives

An energy master plan (EMP) is a comprehensive summary of an organization's current and future energy needs. EMPs are developed to identify the sources of projected changes in energy demand and to create a strategic roadmap for more effective management of energy costs and related technologies going forward. This is an opportune time to reexamine and proactively develop a subsequent comprehensive energy plan that can address Metro's projected energy capacity needs and identify cost-effective opportunities for continued investments in clean energy generation, energy management technologies and projects that support operational resiliency.

The EMP is a critical tool for proactive energy cost management, supporting cost mitigation and addressing potential fiscal cliffs. With annual energy expenditures projected to rise, proactive

[1] See Appendix A for a detailed Metro's energy-related plans
[2] The process of switching from fossil fuels such as diesel fuel and natural gas to electricity.
[3] See 2025 CAAP Update
[4] Performance Audit of Bus Operations COOP Report No. 23-SEC-P01. November 2024.

visibility into future energy costs will allow Metro time to plan and implement cost mitigation strategies while ensuring appropriate investment in operational resiliency. The 25-year forecast window allows for early identification of needed investments, enabling Metro to plan ahead and allocate funds strategically to reduce future energy costs and enhance energy resiliency.

The expected outcomes from Metro's EMP include:

1. Estimate of future total energy demand and key components of energy needs for Metro for electricity and natural gas over the next 25 years.
2. Support the identification of potential energy constraints due to electrification and opportunities for energy management; stakeholder engagement; local, county and utility energy coordination.
3. Provide best practices and high-level recommendations to support Metro's future energy management, equity, resiliency and decarbonization goals.
4. Development of new strategies to engage Metro staff, the public and stakeholders to make more cost-effective progress towards shared energy resilience goals.
5. Implementation Plan outlining defined activities, key performance indicators (KPIs) and assigned responsibilities.

Conclusions

Between 2025 and 2050, Metro's energy usage, energy costs and energy resiliency needs will significantly increase requiring a more proactive, integrated approach to energy management going forward.

Energy Forecast

- **Electric energy usage is expected to increase from 334 GWh in 2024 to more than 1,000 GWh by 2050, a 200% increase over the next 25 years**. Currently, Metro's largest energy uses come from rail propulsion (electricity) and bus fuel supply (100% RNG). Electricity will become the largest component of Metro's energy supply by 2035 as natural gas – which currently fuels Metro's buses – is phased down.
- **Metro's annual energy spend is forecasted to grow from $95M in 2024 to more than $1B in 2050**. When accounting for utility rate escalation and increased energy consumption, total costs in 2050 could range between $520 million under a low scenario (3% average annual rate increase) and $1.77 billion under a higher scenario (8% average annual rate increase).

Resiliency

- **Metro's expected electricity consumption could exacerbate existing energy supply constraints**. Energy constrained areas exist today for some Southern California Edison (SCE) and Los Angeles Department of Water and Power (LADWP) accounts, with three bus divisions and three park-and-ride locations known to have potential capacity concerns due to energy load expansion.
- **Electrification, grid supply constraints and climate-related impacts will only hasten the need for energy resiliency**. In the event of a power outage or disruption, Metro currently relies on back-up power from diesel generators and uninterruptible power supply (UPS) systems with battery banks to support communications, ventilation systems, fire alarm panels and emergency lighting. Metro's existing grid-connected solar PV systems aren't

paired with battery or other energy storage systems and thus aren't currently able to provide energy during grid outages.

Clean Energy Supply

- **Metro's energy supply mix is 46% renewable energy, demonstrating progress towards Metro's CAAP goal of achieving 100% renewable electricity by 2035.** Metro's on-site solar PV systems currently contribute 2.6MW toward the Agency's goal of 7.5MW installed capacity.
- **Expanding solar beyond the current 7.5MW goal has a positive net present value** and if paired with batteries can provide additional resiliency at critical sites.
- **Maintenance of existing solar PV is primarily reactive, addressing issues only after performance declines or failures occur – leading to reduced system reliability and higher long-term costs.** Operational performance issues at existing solar PV installations have increased reliance on more expensive utility energy to compensate for generation shortfalls.

Workforce Development

- **Continued investment in skill-building and growth of current workforce development** partnerships are necessary, in order for facilities maintenance (FM) and Metro's workforce to fully contribute to Metro's transition to clean electricity and increased electrification.
- **The variability and lack of standardization across building systems and control technologies pose barriers** to developing scalable and cost-effective workforce training programs.

Energy Management Technologies

- **Agency-wide technologies such as energy efficiency and building automation systems (BAS) have not been widely implemented**. This limited deployment reduces the potential for energy cost savings, emissions reductions and improved operational performance.

Recommended Actions

The anticipated growth in energy usage and costs, coupled with the challenges posed by grid constrained sites within Metro's operations, presents opportunities to develop more integrated and strategic approaches to energy planning, usage and management. These recommended actions, detailed in the Recommendations section, include:

Recommendation 1.0: Coordinated Energy Planning

Adopting a more coordinated and strategic approach to energy planning will require new approaches to proactive collaboration across Metro to better support the Energy Management function led by the Office of Sustainability (OOS). Creating an EMP Steering Committee with cross-departmental representation, with the OOS continuing as the coordinator and facilitator can serve to formalize energy planning coordination and enhance the efficiency and cost-effectiveness of energy data and information management. This approach would also facilitate data-driven decision-making, support utility engagement and enable the generation of more frequent and actionable progress reports on energy management outcomes.

Recommendation 2.0: Clean Energy Procurement

Metro has two opportunities to continue to increase its supply of renewable energy: through on-site generation assets such as solar PV and through utility providers' renewable energy product offerings. The EMP recommends that Metro continue expanding solar PV systems to a total of 64MW, prioritizing additional solar with battery energy storage at bus divisions to help mitigate electricity costs, support zero-emission bus charging, and provide back-up power. Increasing on-site distributed energy generation has the benefit of reducing utility costs and, when paired with energy storage, can provide resiliency and back-up power functions to support critical operations. There is an opportunity to increase the current percentage of Metro's renewable energy supply portfolio at minimal or no additional cost by leveraging clean electricity options offered by Metro's utility partners. Utilizing these options can accelerate progress toward renewable energy and greenhouse gas (GHG) reduction targets, while managing energy costs and supporting grid decarbonization efforts.

To address performance challenges in existing solar PV systems, Metro should prioritize establishing clear ownership and dedicated budget allocations for preventative operations and maintenance (O&M) across all systems.

Recommendation 3.0: Energy Technology Implementation and Workforce Development

Energy Education

The EMP outlines several recommendations on education topics to support expanding energy fluency across key staff. Energy technology and energy management systems comprise a combination of hardware (e.g. electric vehicle chargers, solar PV) and software to connect energy assets for electricity load management, manage energy efficiency optimization in buildings and support more complex energy solutions such as back-up power and off-grid energy. Understanding the functional requirements and interactive benefits of distributed energy hardware and software can be challenging. Energy technology education delivers multiple benefits including internal workforce development needs, expansion of technology partners and more cost-effective energy technology deployments. Moreover, given the significant scope of technological change and due to increasing deployment of connected and high value energy assets such as high-powered charging stations, energy security and energy asset vulnerability is a critical education topic as threats due to cyberattacks in electric mobility as well as hardware security concerns due to theft or vandalism are prevalent in the marketplace.

In addition to high level energy education topics, continued training is a foundational element of the EMP rollout. Priorities for investing in energy education and upskilling should focus on facilities management, planning staff and operations personnel. The electrification of bus and rail systems, alongside the deployment of solar energy, battery energy storage, electric vehicle supply equipment, and advanced control technologies, will introduce new job classifications, skill sets, and potentially shift responsibilities for thousands of workers. Represented employees, especially those in maintenance and operations, will require structured upskilling and retraining programs. This presents a significant opportunity for continued labor-management collaboration on curriculum development, apprenticeship pathways and continuing education for workforce development.

Future Technology Implementation

Metro is a large and complex organization supported by a variety of critical operations. As the Agency looks ahead to a more energy constrained and costly environment, where resiliency becomes increasingly important, it is essential to re-evaluate how future energy-related

technologies are planned and deployed across Metro's 21 major operating divisions, locations and its broader portfolio of sites. Moving forward, agency-wide deployments of a single technology solution (e.g., solar panels, building controls, etc.) may not be as cost-effective or efficient as compared to an integrated and phased, site-level technology implementation approach. A comprehensive, site-level approach would enable the optimization of interactive benefits from critical energy-management technologies while providing cost-effective solutions that can be refined and scaled to other priority sites.

Resiliency Cost-Benefits and Funding Mechanisms

On February 27, 2025, Metro's Board approved a motion to direct the CEO to develop a standardized cost-benefit analysis framework, using U.S. DOT analysis or a comparable methodology, for all Metro capital projects to help inform the Agency's more data-driven and transparent decision-making process for projects Metro advances. In addition to implementing Metro's standardized cost benefit framework, there are several cost-benefits as they relate to implementing the EMP recommendations and future resiliency-related investments that should be included as part of the Agency's standardized process, including the cost-benefits of resiliency and early screening for community co-benefits. Moreover, given the challenging funding climate and operational budget constraints, funding mitigation and innovative funding strategies should be identified early in the planning staging of energy-related projects.

Recommendation 4.0: Stakeholder Engagement

Metro's community partners will play an important role in the implementation of the EMP. Stakeholder involvement is critical to co-developing new training program curriculum, helping expand energy technology training and certifications and increasing the co-benefits for communities as Metro's invests more deeply in clean energy technologies and resiliency at their critical sites and divisions. As part of the development of the EMP, several community-based organizations (CBOs) were interviewed and there is a clear opportunity for Metro to extend the co-benefits and potential cost sharing of resiliency investments with external partners. Developing communications plans outlining Metro's workforce development and energy transition priorities will also increase community awareness of and proactive engagement around energy planning and resiliency investments.

Based on feedback from the development of Metro's Equity Toolkit which will be finalized later in 2025, and reinforced by a sampling of community partner feedback as part of the development of the EMP to enhance equitable outcomes, community partners have expressed the need for:

- Early collaboration
- Demonstration of collaboration benefits
- Facilitated collaboration across the project lifecycle

The recommended priorities for stakeholder engagement in support of energy planning are:

- **CBOs:** Strengthening relationships through proactive leadership and engagement with community partners around energy projects, energy technology co-benefits and opportunities for joint projects. This proactive engagement helps support the equity use indicator assessments which is included as part of the cost-benefit analyses in recommendations 3.3.

- **Workforce development partnerships:** Target workforce development partnerships that can help Metro advance internal workforce development and create broader opportunities for community equity through workforce development.
- **Communicating progress:** Ensuring that progress and community benefits are communicated on Metro's website and ESRI dashboards.

Implementation Planning: Metrics for Continuous Improvement

To capture the full benefits of these recommendations, and support continuous improvement around energy planning, it is recommended that upon adoption of the Energy Master Plan, the Agency develop a detailed 12-18 month implementation plan that incorporates:

- Expected outcomes and key performance indicators
- Clear milestones for future Board decisions and input regarding additional on-site solar, energy resiliency and energy management technologies
- Cost-Benefits fully detailed to include resiliency benefits and energy switching cost implications as well as on-going research into innovative funding to mitigate energy-related cost increases.

Approach

The EMP is organized as follows and addresses the following key questions:

SECTION	KEY QUESTIONS
Goals and expected outcomes	> How does the 2025 EMP align with and support other energy and climate planning efforts? > What were the goals and expected outcomes guiding the development of the 2025 plan?
2025 EMP context compared to 2010 baseline	> What has changed between the last formal EMP and today? > What are the key findings and organizational requirements driving future energy planning? > What are the internal challenges impacting energy management?
Industry best practices	> Which industry best practices are applicable for Metro's energy planning?
Current energy demand	> How much does Metro spend on energy? > What are the uses of energy? > How clean is Metro's energy supply content?
Future energy demand	> How does the EMP determine future energy requirements? What approach to forecasting was used (data collection and methodology)? > How much can Metro expect to pay for energy in the next 25 years? What are the cost drivers? > What opportunities are there to mitigate energy costs and support Metro's fiscal responsibility?
Energy Planning Recommendations	> What is an appropriate and achievable action plan based on future energy needs and where Metro is today? > How can Metro cost effectively invest in resiliency? > What combination of People + Processes + Technology is needed? > How should Metro engage with internal and external stakeholders to support energy planning? > What are expected outcomes for continuous improvement?
Implementation Plan and Performance Metrics	> Schedule- what are the priorities for the next 12 months look like? > Who is responsible for implementation? How do various departments coordinate going forward? > What are the Key Performance Indicators?

Table 1: Key Questions Driving the 2025 EMP's Analysis and Content

How does the 2025 EMP align with and support other energy and climate planning efforts?

The 2025 EMP is a key deliverable from the OOS, building on more than 17 years of energy-related studies and recommendations. The development of the EMP is intended to provide a long-term view of Metro's diverse array of facilities, energy uses and strategic plans to analyze and map impacts for infrastructure, energy procurement and energy management.

The EMP is a comprehensive and integrated plan that forecasts energy demand across the Agency to guide future energy planning recommendations and investments in support of the goals established in related planning and policy documents. The EMP incorporates energy forecast data into a comprehensive Excel-based modeling tool that includes both building- and meter-level energy consumption data. The EMP uses this information, combined with strategic energy planning best practices and observations across Metro's existing operations, to develop a series of action-oriented and phased recommendations to guide future strategic energy management. The EMP is intentionally designed to be dynamic resource with analyses that can and should be easily updated as Metro plans and implements recommendations.

In 2020, Metro's Board of Directors adopted the agency's 10-year strategic sustainability plan, Moving Beyond Sustainability (MBS). MBS is Metro's transformative vision to reduce the Agency's environmental impacts, address the climate crisis and create a more equitable and resilient Los Angeles County. In MBS, Metro committed to achieving two targets related to energy resource management:

1. Reduce energy consumption by 17% at facilities from the 2030 Business as Usual Scenario.
2. Increase onsite renewable energy generation to 7.5 megawatts (MW).

While MBS includes several strategies and actions intended to drive the achievement of those two targets, the EMP offers a holistic and integrated analysis capturing all of Metro's current and projected future energy usage, as well as a series of concrete recommendations intended to help drive the achievement of those targets. All energy demand and renewable energy strategies outlined in this EMP are thus also reflected in MBS.

Metro's Board adopted the agency's Climate Action and Adaptation Plan (CAAP) in 2019, which outlined thirteen specific measures toward the achievement of two GHG emissions targets:

1. Reduce total GHG emissions by 79% by 2030 (from 2017 baseline).
2. Achieve net-zero emissions by 2050.

In 2020, these CAAP targets were folded into MBS, reinforcing Metro's commitment to these emission reduction goals. In addition to the strategies and actions included in MBS, this EMP address strategies related to Metro's fleet and building electrification efforts, as well as carbon-free electricity procurement, to help drive Metro's achievement of its 2030 and 2050 GHG emissions targets.

The EMP incorporates energy-related impacts, plans and goals from a comprehensive set of planning and guidance documents including Moving Beyond Sustainability (MBS) Plan, Vision 28, Long Range Transportation Plan (LRTP), Equity Toolkit development and the CAAP.

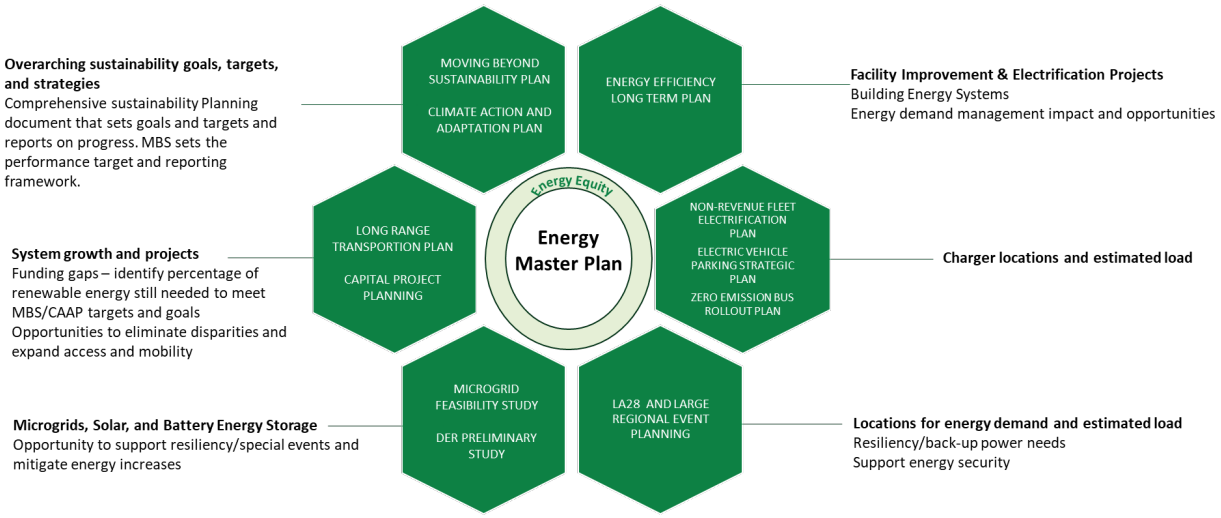


Figure 1: Energy Master Plan – Related Planning Integration

What are the goals and expected outcomes guiding the development of the 2025 plan?

Key outcomes from the development of Metro's 2025 EMP include an estimation of future total electrical energy demand (by year, demand source, and grid location), identification of potential energy constraints and opportunities for energy management, and engagement with key stakeholders. The goals of the EMP also include providing operational recommendations based on industry best practices to support Metro's future energy management, equity, resiliency and decarbonization goals.

GOALS	EXPECTED OUTCOMES – 2025 IN PROCESS	FUTURE OUTCOMES
Visibility Into Energy Investments: Identify sources of energy growth and potential supply constraints	Energy demands + energy capacity: Track and document current, planned, and future investments to identify source and location of energy consumption, peak demand, and opportunities to address energy equity.	Develop Geographic Information System (GIS) based tools.
Alignment Across Planning Efforts: Ensure alignment in data and assumptions across other related planning efforts	Agency-wide energy modeling incorporating assumptions and progress from Moving Beyond Sustainability (MBS) Plan, CAAP and capital planning.	Create standard operating procedures for more frequent and cost-effective updates.
Adaptable and Resilient Energy Planning: Data base/energy data can be updated annually as assumptions and energy needs change	Identify pathways and best practices for energy infrastructure investments to support resiliency and climate goals.	Communicate Metro's leadership in energy planning to gain state and community support.
Stakeholder and Partner Engagement: Stakeholder engagement to ensure we have support for operationalization of energy planning recommendations	Communication plan to share energy planning insights with key stakeholders.	Coordinated and more frequent engagement with utilities, community partners and regionals planning agencies.
Commitment to Energy Equity: Incorporating energy equity lens into the planning document	Incorporate CBOs and community feedback	Expand SC to increase member diversity and development of process to engage and partner on community energy projects earlier in the process.

Table 2: Energy Management Plan Goals and Expected Outcomes

What has changed between the last formal EMP and today? What are internal challenges impacting energy management?

Since the initial 2010 Energy Management and Conservation Plan (ECMP) was adopted in 2011, a lot has changed at Metro and at the state and federal level, impacting future energy planning. [5] Over the last 15 years, California has continued its clean energy leadership by developing 100% clean electricity standards, decarbonization goals and investing in light and heavy-duty vehicle electrification and infrastructure. As the energy market has transformed, challenges, such as long and costly lead times to replace aging transmission and distribution energy infrastructure, are creating constraints for scaling clean energy adoption. The acceleration of extreme climate events and resiliency requirements also add challenges at the same time as the federal government funding for clean energy projects has been curtailed.

The ECMP identified energy conservation opportunities, electric consumption and future renewable energy screening criteria and projected significant load growth due to new lines and extensions. The ECMP also projected an increase in energy usage from 2010 to 2020 showing Metro could expect a 90% increase in energy usage over that period.[6]

Advances in technology can deliver enhanced capabilities and efficiency but can also create unintended vulnerabilities as assets, organizations, and system users/customers become increasingly connected in a digital world. Paired with increased social, economic, and political instability, critical energy and government facilities can be targets for any number of bad actors, foreign or domestic, who have aims to contribute to that instability and cause harm. It is imperative that Metro incorporate energy security into evaluations and planning that protect current assets and operations and can adapt to an evolving threat and technological landscape. These plans also must synchronize holistically with the organization's efficiency, safety, and climate goals.

In addition, since 2010, the Agency has developed more than 20 energy technology studies analyzing the potential for energy efficiency, solar and microgrids (see Appendix A for list of studies) as well as foundational energy-related plans. A snapshot of several guiding plans and how they impact energy planning are outlined below.

GUIDING PLANS	IMPACT AND CONSIDERATIONS FOR FUTURE ENERGY PLANNING
10-year Sustainability Strategic Plan Moving Beyond Sustainability (MBS)	> Documents Metro's energy resource and GHG emission reduction goals and achievements —including the rollout Zero Emissions Buses (ZEBs), enrollment of electric accounts in the Clean Power Alliance (CPA), targets to increase on-site renewable energy generation, reduce electricity use, and improve overall air quality. This plan translates the high-level targets into actionable strategies, timelines, and investments that integrate renewable energy, energy efficiency, fleet electrification, and utility coordination across Metro's portfolio.

[5] *See Appendix D for summary of ECMP 2010-2020 energy forecast*
[6] *https://libraryarchives.metro.net/DB_Attachments/110930_ECMP.pdf*

GUIDING PLANS	IMPACT AND CONSIDERATIONS FOR FUTURE ENERGY PLANNING
Climate Action and Adaptation Plan (CAAP)	> Outlines strategies to reduce greenhouse gas emissions, improve climate resilience, and address environmental justice by integrating climate considerations into transportation planning, capital projects, and operations. The EMP operationalizes CAAP goals by delivering the clean energy infrastructure—such as renewable power, battery storage, energy efficiency, and resilient systems —needed to decarbonize Metro's operations, support zero-emission fleets, and ensure facilities remain functional and climate-resilient in the face of increasing heat, grid disruptions, and extreme weather. > Notes that power outages are expected to increase in the coming decades due to climate change. These outages disrupt bus, light rail, and subway services. Backup generators provide some power to critical assets but cannot support larger-scale system power loss. Power loss can leave subways and light rail inoperable, prevent electric buses from charging, and disrupt critical communications and operations systems. > Provides actions for Metro to reduce risks due to extreme heat and power outages (adapted from 2023 Climate Risk Analysis).
Electric Vehicle Parking Strategic Plan	> Blueprint for cost-effective and efficient investments in electric vehicle charging infrastructure. Charging goals provide insight into future electric energy needs.
Zero Emission Bus Master Plan and Updates	> Timeline for bus electrification and associated load electric growth load.
All Hazards Mitigation Plan	> Assessment of potential vulnerabilities across Metro's expansive network, including a range of natural and climate change-induced hazards like drought, sea level rise, extreme heat, flooding, and wildfires. This assessment encompasses not only physical infrastructure, including rail lines, stations and maintenance facilities, but also vital support systems, such as power supplies, communication networks and emergency response protocols. (Source Metro website)
ECO 2.0 Study	> Assessed cost-benefits and prioritizations for Metro's CAAP recommendations. Solar and traction power energy storage investments identified as having positive net present value.

GUIDING PLANS	IMPACT AND CONSIDERATIONS FOR FUTURE ENERGY PLANNING
Equity Toolkit	> Provides resources to better understand, assess and improve equity outcomes in communities. The datasets, equity indicators, training, and other resources support staff in assessing equity in projects. It also provides information about the important role Metro plays in fostering equitable, resilient and thriving Los Angeles communities. It can deepen understanding of equity-related topics and enhance communication with internal teams, external partners and communities.
Cost-Benefit Framework and Mitigation of potential fiscal cliff	> Provides a framework for consistent cost-benefit analyses and the need for mitigation to lessen the impact on Metro's budget.

Table 3: Guiding Plans and Their Impacts on Future Energy Planning

In addition to these guiding documents, Metro has made significant progress since 2010 in the development of new energy pathways, implementing solutions that reduce greenhouse gas emissions and increase renewable energy usage. The table below details Metro's accomplishments.

AREAS OF FOCUS	KEY ACHIEVEMENTS
Implementation of Clean Energy Pathways and energy savings	> 12 energy efficiency projects completed (recent replacement of Division 11 and 22 HVAC units and the chillers at Gateway Building). > Numerous capital projects in development with energy efficiency, and energy infrastructure features, LEED Certifications. > Cost savings recommendations identified: Fuel switching via heat pumps (HVAC) + remote building monitoring/metering to help reduce on-site visits by A/C techs.
Vehicle and Fleet Emissions Reductions	> In 2013, Metro became the first transit agency to operate electric vehicle chargers. > Installation of 126 Level 2 EV charging ports for non-revenue and public charging. 191 expected by December 2025. > Developed a Long-Range Transportation Plan (LRTP). > Adoption of engine replacements with near-zero emissions for Bus Fleets. > Achieved 65% GHG emissions reductions vs. 2017 baseline fuel by switching diesel to Compressed Natural Gas (CNG). > Zero-emission bus implementation at Division 8 / G (Orange) Line and J (Silver) Line.
Clean Energy Supply: Progress towards 100% renewable	> ~46% of Metro's 2024 energy supply was renewable. > 100% supply of Renewable Natural Gas (RNG) for CNG Buses. > Solar PV O&M Program Operational – 2.6 MW installed at seven facilities.

AREAS OF FOCUS	KEY ACHIEVEMENTS
Zero Emission Bus Master Plan and Updates	> Timeline for bus electrification and associated load electric growth load.
Data Management	> Watchwire, a cloud-based energy and sustainability management software, was implemented to aggregate all utility usage and spend data into one platform.
Resiliency	> Metro conducted a 2022 Climate Risk Screening of top vulnerabilities identified in the 2019 CAAP, noting the ways in which buses, light rail, subway, employees, and riders may be impacted by climate change. In 2023, Metro combined the climate risk screening results with adaptation options from the All Hazards Mitigation Plan, which focuses on making climate change and emergency management an agency-wide consideration.

Table 4: Metro's Key Achievements Since 2010

What internal challenges impact energy management?

Going forward, in addition to the constraints facing the broader energy and climate environment, there are internal Agency challenges that impact energy management going forward. Several of the challenges highlighted below are already in the process of being addressed. COVID-related disruptions—though rare and difficult to plan for—had a significant impact on Metro's energy planning and implementation. Capital projects were delayed or paused due to workforce limitations and supply chain disruptions. Site work was postponed, and revenue losses, coupled with emergency spending priorities, led to budget reallocations to support core transit services. Reduced building occupancy and ridership resulted in irregular energy consumption patterns, which complicated tracking and forecasting. Staff turnover and hiring challenges further stalled progress, setting back energy management goals. These disruptions led to deferred maintenance and upgrades of energy systems.

While the pandemic caused setbacks, it also underscored the need for energy resilience, remote monitoring capabilities, and flexible systems. The transition to remote work improved flexibility and demonstrated that complex planning, analysis, and coordination could be conducted effectively in a remote or hybrid environment.

The challenges around developing standardized cost-benefits metrics were addressed by Metro during the development of this plan beginning with the February 2025 Board Motion to standardize cost-benefit analysis. Follow-up coordination between the OOS and Metro's finance team has already begun. Opportunities to incorporate energy impacts and resiliency cost-benefits into Metro's standardized approaches are more fully outlined in the recommendations section. Additionally, the OOS is actively working to identify innovative sources of funding to ensure Metro can cost-effectively maintain its clean energy leadership and add needed energy resiliency to critical operations.

Coordination has already begun to engage on workforce development opportunities including ways to engage Metro's facilities management and external training partners to support energy technology implementation.

Data and information management is a critical component of strategic energy management along with cybersecurity and so the current challenges are important to highlight and are addressed more thoroughly in the energy planning recommendations. Lastly, communicating energy management planning opportunities with partners is important to find cost-effective and collaborative energy management solutions.

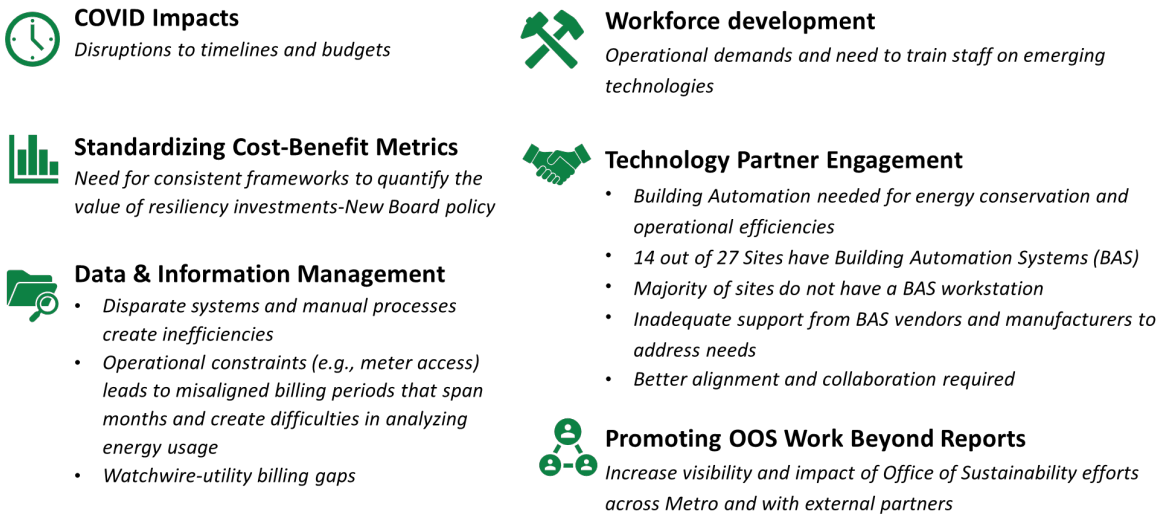


Figure 2: Internal Challenges Impacting Energy Management

What are best practices for large energy users in the development of strategic energy management plans?

Strategic energy management continues to evolve with the rapid pace of clean energy technology deployment. Many large energy users, including transit agencies, ports and airports, have committed to ambitious net zero carbon emissions goals. To achieve these targets, most of these organizations like Metro have incorporated fleet, vehicle, building and energy electrification and on-site clean energy generation as the fastest ways to decarbonize their operations. Moreover, to mitigate the impacts of climate events, these energy users are looking for ways to pair on-site clean energy generation with back-up energy storage systems to provide resiliency for their energy needs. Many large energy users like Metro have developed Hazard Mitigation plans to identify locations and critical operations most vulnerable to climate change. The output from these plans helps prioritize energy storage and on-site energy generation investments.

BEST PRACTICE	RECOMMENDED ACTION
Centralize and expand role of energy management function	> Ensure proactive energy management coordination across the organization with clear ownership and governance. Coordinate energy management with IT/OT functions to support cybersecurity and energy security requirements.
Develop clear goals and key performance indicators	> Define what success looks like and align teams with measurable outcomes.
Data-informed decision making	> Understand desired outcomes first — let that drive data collection and analytics needs.
Utility Engagement	> Plan and communicate early with utilities to reduce the risk of energy constraints. Maintain continuous engagement to mitigate potential energy demand constraints.
Dynamic Planning	> Integrated data and information management to manage evolving energy demands.
Phased and Systematic Approach to Technology Deployments	> Leverage pilots for new emerging technologies. Adapt through continuous feedback and scale. Utilize insights from early adopters in fuel switching and electrification.

Table 5: Best Practices for Large Energy Users in Developing Strategic Energy Management Plans

The National Renewable Energy Lab (NREL), National Academies of Science, Engineering and Medicine as well as early adopters of zero-emission and transit electrification including other transit agencies and airports and ports have important lessons learned that inform the recommendations outlined in this report. A full listing of energy planning best practices and use cases that informed the development of the EMP are included in Appendix F.

As large energy users begin their electrification journey - through installations of solar PV systems, vehicle charging and building heating and cooling fuel switching - they are faced with challenges such as energy supply and distribution constraints, siloed planning, competing goals and a lack of integrated data management. These distributed resources and end-users also create security challenges. While dispersed generation and users are considered lower-value targets, they also do not receive the same level of protection as consolidated resources and therefore create multiple points of vulnerability that can be exploited to cause harm to the centralized systems to which they are connected. Addressing these organizational realities and the incorporating change management will ensure a greater likelihood of success and enable more cost-effective deployment of energy management solutions. The increasing adoption of advanced energy hardware and software technologies also requires new levels of understanding and energy technology fluency, creating an opportunity to expand workforce training and broaden the technology partner ecosystem. This educational need becomes even more critical as communication standards become more complex, and cybersecurity needs increase as more distributed energy assets are deployed.

Proactive conversations with electricity providers are critical to help identify and mitigate potential energy constraints. These engagements are also valuable in identifying alternative solutions to new substations, which are costly, time-consuming, and often have negative impacts on local communities.

Taking a dynamic approach to planning is also considered a best practice, given the rapid pace of electrification and the need to develop flexible adaptation pathways and conduct “what if” scenarios that inform decision-making as the market and technology provider landscape evolves. It is also recommended that agencies develop a systematic approach to the deployment of energy management and energy resiliency technologies to accelerate results and maximize cost-effectiveness.

How much energy does Metro consume?

As part of the current energy demand modelling, the EMP characterizes current energy end uses, current renewable energy supply, on-site renewable energy generation as well as existing capacity constraints.

Calendar year 2024 was established as the baseline for Metro's current energy demand assessment. Data for this assessment was obtained through Metro's Watchwire platform, which was implemented in 2024 to centralize and aggregate utility bills from Metro's seven utility providers. The platform provides energy usage, demand, and associated costs.

As a newly implemented platform and process, some data for the 2024 calendar year was incomplete. Some of these gaps were due in part to inconsistent billing from utility providers and instances where utilities were unable to access meters, resulting in missing or delayed billing records. To address these gaps, in the absence of data, energy usage data was manually populated using available utility 15-minute utility interval data and costs were estimated using weighted average utility rates. This was done to provide a complete 2024 baseline of energy usage, with 2024 serving as the baseline and foundational year for modelling and projection purposes.

A utility capacity analysis was also conducted to assess the ability of existing infrastructure to support anticipated future electrical load growth. To inform this analysis, available utility power capacity planning maps from SCE and LADWP were used to identify local constraints and infrastructure characteristics, such as feeder capacity and substation load thresholds. These maps provide preliminary insight into potential areas of concern where existing infrastructure may already be constrained or where load growth may trigger the need for upgrades. Utility account data was used to map Metro's existing service and infrastructure to identify areas with potential energy supply constraints. In certain scenarios, a single account may be served by multiple utility feeds, and the evaluation was based on visual inspection and the relative proximity of the feeds as indicated on the maps. These sites may require further coordination with the utilities for verification. This analysis will inform future planning, helping to identify sites where further utility coordination or detailed engineering review may be required.

What are the uses of energy?

Metro's largest end uses of energy in 2024 were from rail propulsion or traction power which accounted for 65% of Metro's electricity usage (217,512 MWh) in 2024 with facilities comprising the next largest share of electricity at 20% (65,052 MWh). Facilities electricity consumption includes all divisions, Terminals and building locations. For natural gas usage, bus fueling comprises 97% (35M Therms) of natural gas usage. For bus fueling the natural gas supply is 100% RNG. The remaining 3% of natural gas end uses are facilities' HVAC and hot water heating. Data on Metro's electricity and natural gas consumption was obtained from Watchwire. Going forward this platform will function as the system of record for energy usage and expenditures.

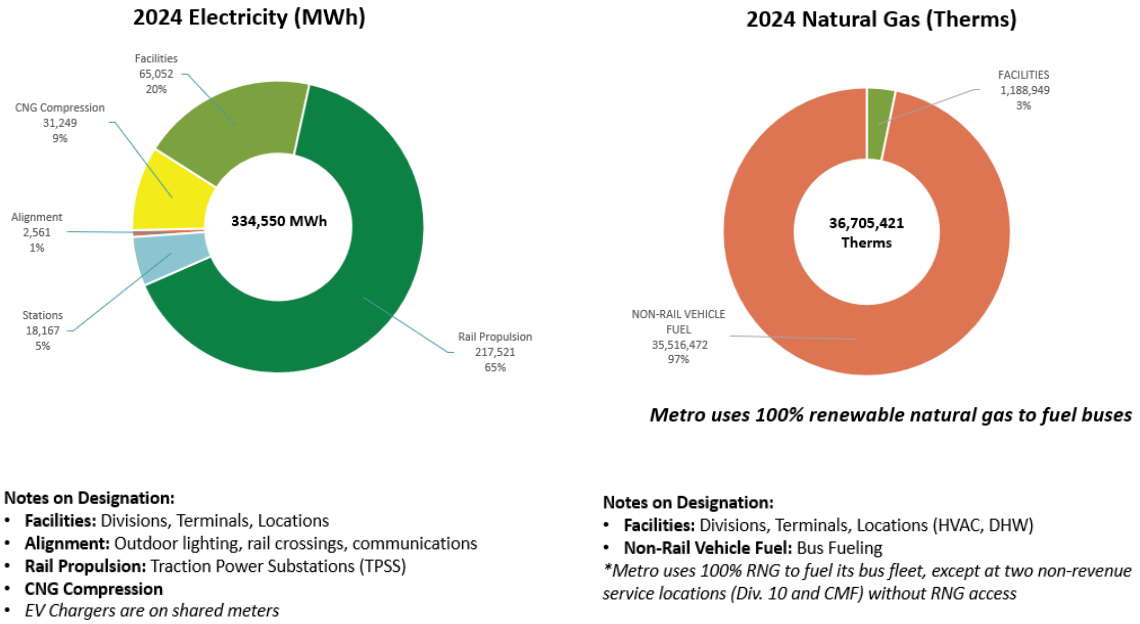


Figure 3: Metro's 2024 Energy Usage

How clean is Metro's energy supply content?

Metro's current electric energy supply mix is 46% renewable energy. Metro's internal goal is to have 100% of its electric energy supply coming from renewable energy sources by 2035 as recommended in the CAAP. To meet this goal, Metro has the option of generating 100% clean energy on-site through solar or other renewable technologies such as wind or fuel cells or through the purchase of 100% renewable energy products from utilities.

Metro is working toward a 100% renewable electricity portfolio. Currently, 46% of Metro's total electricity portfolio comes from renewable sources. This includes two main components: on-site PV and renewable energy purchased from utility partners. Metro has installed 2.6 MW of on-site solar PV to date, contributing toward its 7.5 MW installation goal. In addition, Metro purchases 100% renewable electricity for specific meters served by the CPA.

Metro procures energy from several utility partners, each with varying options to opt-up to higher renewable energy content electricity products. For selected SCE accounts that are in the CPA service area, Metro can choose to opt-out of SCE for energy procurement and receive service from CPA, although SCE remains the transmission and distribution utility for CPA accounts. California's utilities have been increasingly greening their energy supply as part of state law. California's renewable portfolio standard (RPS) was established in 2002 by Senate Bill (SB) 1078[7] with the initial requirement that 20% of electricity retail sales must be served by renewable resources by 2017. The program was accelerated with SB 350[8] and SB 100[9] implementation and the RPS was increased to 60% by 2030 and requires the state's electricity to come from carbon-free resources by 2045.

[7] *Renewables Portfolio Standard (RPS) Program*
[8] *Clean Energy and Pollution Reduction Act - SB 350*
[9] *SB 100 Joint Agency Report*

Metro can increase both its on-site energy generation and expand the percentage of 100% renewable energy it receives from utility partners. Both options are described in the recommendations section (3.2 Clean Energy Supply Recommendations).

ENERGY UTILITY	NUMBER OF ACCOUNTS	2024 ANNUAL ENERGY USAGE (GWH)	2024 CALENDAR YEAR ESTIMATED ENERGY SPEND	CURRENT RENEWABLE ENERGY % SUPPLY MIX[10]	RENEWABLE POWER OPTIONS
City of Pasadena Water and Power	17	10.5	$2M	36%	100% - available now
LAWDP	248	208	$43M	40%	Choose mix from 20% to 100% renewable supply – available now
SCE Base rate Not eligible for CPA	81	46	$12M	38%	None - program closed indefinitely
SCE Base Rate Eligible for CPA – previously opted out	27	28	$8M	38%	Re-enroll in CPA's 50% or 100% clean power options
CPA[11] 50% renewable option	21	1.5	$0.4M	50%	Opt-up accounts to 100% Green Power
CPA[12] 100% Green option	47	36	$9M	100%	n/a already at 100%
Azusa Light and Water	19	4	$1M	29%	n/a
City of Glendale Water and Power/Vernon Public Utilities	3	0.04	$.001	23-35%	n/a
LA Metro on-site solar generation	7 systems; 2.6MW	1.75		100%	n/a
TOTAL	**463**	**335**	**$77M**	**46%**	**90% potential**

Table 6: 2024 Overview of Metro's Electricity Profile

Metro has seven solar PV systems installed across seven locations, totaling 2.6MW. Most of these systems are over 10 years old, with solar PV systems having an expected useful life of 30 years. Critical components such as string inverters typically last for 10 years and microinverters and central inverters can have 20 years before requiring replacement.

[10] *Based on 2023 published power content labels*
[11] *Based on 2023 published power content labels*
[12] *Community Choice Energy Option – CPA energy procurement with SCE energy delivery*

Metro's Solar PV O&M Program launched in 2014 to proactively address performance issues and provide technical training to Metro maintenance personnel at facilities that host PV systems to support maintenance and system monitoring. Since program inception, Metro has provided over 700 hours of training to 120 personnel on topics such as annual technical refreshers on system components, safety protocols, and maintenance procedures, including PV module cleaning, inverter testing, visual inspection of system components, and system performance monitoring.

Although Metro's Solar PV O&M program has been in place for over 10 years, system performance has been impacted by a combination of routine wear and environmental factors, such as windstorms, heavy rain, and recent wildfires. Ongoing monitoring of the system generation and site inspections have identified issues caused by water intrusion, which has affected key components including inverters, fuses, and combiner boxes, resulting in corrosion, electrical faults, and reduced output. COVID-related logistics challenges, including delays in site access and inspection schedules, along with funding constraints, further limited the agency's ability to address emerging issues in a timely manner, contributing to prolonged performance degradation at some sites. A phased remediation plan is underway and anticipated to be completed in 2026 to address both routine maintenance needs and damage from recent environmental events, with repairs prioritized to restore system reliability and performance. Expected operational performance gaps are based on modeled system output that accounts for the age and expected degradation of the system, rather than using nameplate capacity. More detailed recommendations on how to approach solar PV going forward are described in the recommendations section 2.2.

LOCATION	FUNCTION	SYSTEM SIZE (KW DC) AND (AGE YEARS)	2024 EXPECTED GENERATION (KWH)	2024 ACTUAL AND ESTIMATED GENERATION (KWH)	OPERATIONAL PERFORMANCE	ESTIMATED SYSTEM UNDER-PERFORMANCE – COST IMPLICATIONS	2024 PV CONTRIBUTION TO SITE LOAD
Division 8	Bus Maintenance	247 (19)	339,533	254,226	75%	$18K	5%
Division 11	Bus Maintenance	266 (9)	354,621	247,2202	70%	$24K	9%
Division 15	Bus Maintenance	247 (19)	339,533	125,684	37%	$47K	4%
Division 18	Bus Maintenance	437 (17)	648,851	465,1552	72%	$41K	1%
Terminal 19	Regional Bus Station	89 (12)	128,056	106,020	83%	$6K	6%
Division 24	Rail Maintenance	178 (8)	235,956	97,0192	41%	$35K	1%
Central Maintenance Facility (Loc. 30)	Bus Maintenance	1,172 (15)	1,553,268	454,2152	29%	$243K	6%
Totals/ Average		**2,636**	**3,599,818**	**1,749,560**	**49%**	**$414K**	

Table 7: Metro's On-site Renewable Energy Supply

Are there any existing energy supply concerns?

2024 utility capacity was reviewed as part of this EMP to identify existing and potential supply constraints. Based on the analysis of SCE and LADWP accounts, which provide 84% of Metro's current electricity supply, there are existing energy supply capacity concerns at three bus divisions and 76 accounts have been identified as potentially having no additional service capacity. An additional 14 accounts are flagged with limited capacity concerns. The most critical locations to evaluate are identified in the table below and include ZEB facilities, which are expected to experience significant load growth due to increased fleet electrification, and EV charging stations, which are projected to see moderate to high demand as electric vehicle adoption rises and the non-revenue fleet transition evolves. Other sites with lower projected growth may include TPSSs, passenger stations, or signals and controls and may warrant attention based on specific operational needs. These accounts should be included in the utility outreach conversations outlined in the recommendations section.

LOCATION	UTILITY PROVIDER	LOAD GROWTH CONSIDERATIONS
Atlantic Station Parking Garage	SCE	EV Chargers
Division 3	LADWP	ZEB, Building Electrification, Non-Revenue and Employee EV Chargers
Division 5	LADWP	ZEB, Building Electrification, Non-Revenue and Employee EV Chargers
Division 13	LADWP	ZEB, Building Electrification, Non-Revenue and Employee EV Chargers
North Hollywood Station	LADWP	EV Chargers, LA28 Mobility Hub

Table 8: Locations with Potential Capacity Constraints

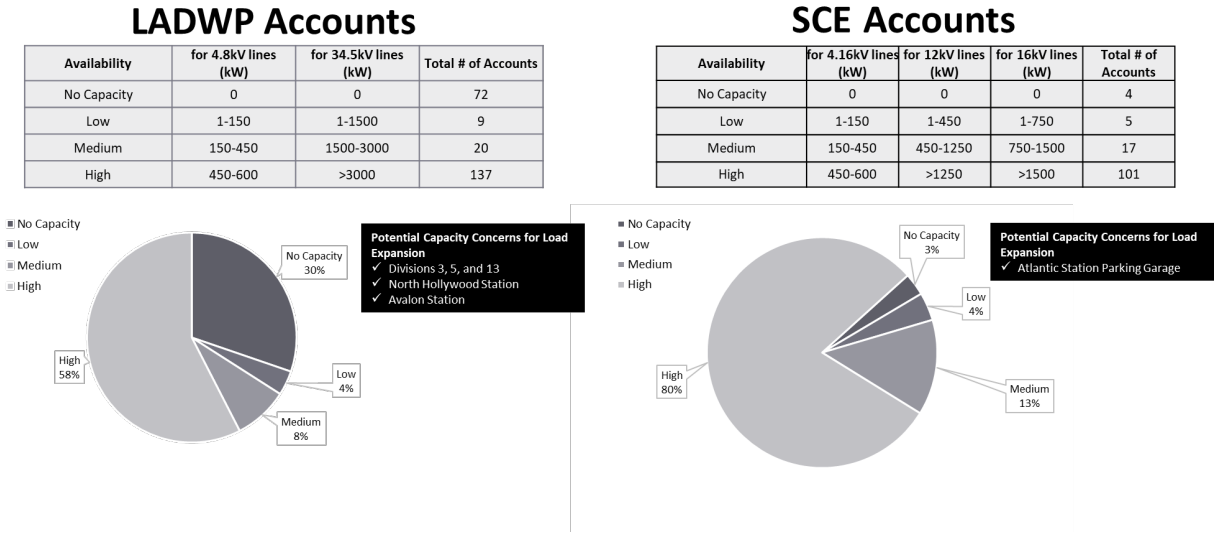


Figure 4: 2024 Utility Capacity

What approach to forecasting was used (data collection and methodology)?

Future Energy Demand

Methodology

Due to the increasing need for electricity across the Agency largely driven by bus electrification and climate goals, the future demand analysis evaluated how different electrical end uses are likely to contribute to peak demand across facilities. This peak demand analysis also informs site-specific strategies for decarbonization goals through electrification and distributed energy resource (DER) deployment. Because each end use of energy exhibits distinct daily load patterns -- solar generation peaks during midday, while ZEB charging often occurs overnight-- it was essential to disaggregate these end uses. Doing so allowed examination of how loads interact over a 24-hour period and assessment of their combined impact on system-wide and site-specific peak demand.

Summary of Future Projected Energy Cost Scenarios

ENERGY COST SCENARIO	2024	2030	2035	2050	MODELING ASSUMPTIONS
Forecast: Medium (Selected Base Case Scenario) 6% Annual Energy Cost Increase with No Cost Mitigation Strategies	$95M	$182M	$313M	$1.09B	> Models projected energy use increase based on existing capital plans, adopted strategic plans (e.g., EVPSP), and ZEB rollout > New TPSS stations for system expansion > Full ZEB roll-out by 2035 > Used 2024 actual costs and escalated 6% (medium scenario) to account for energy cost increases > Incorporates data from Metro operations, including building systems, EV charging, weather data, utility, peak demand, load patterns, and existing solar generation. > Ridership/operations data included.
Forecast: Low 3% Annual Energy Cost Increase	$95M	$156M	$229M	$520M	> Same as Base Case but assumes lower average annual energy cost increases (3%)
Forecast: Medium 8% Annual Energy Cost Increase	$95M	$201M	$384M	$1.77B	> Same as Base Case but assumes higher average annual energy cost increases (8%)
Forecast: Ultra-High 13% Annual Energy Cost Increase	$95M	$259M	$630M	$5.72B	> Same as Base Case but assumes higher average annual energy cost increases (13%)
Cost Mitigation Scenario vs. Base Case	$95M	$176M	$287M	$906M	> Full ZEB electrification by 2035 > 6% annual energy cost escalation > Solar fully implemented at all bus divisions where solar is technically feasible (64MW total) > Battery storage at 75% of TPSS sites > Energy efficiency measures implemented

Table 9: Future Projected Energy Cost Scenarios

How does the EMP determine future energy requirements?

To support this analysis, normalized average and peak 24-hour load shapes were developed for key end use categories: facilities, parking lots and garages, natural gas compression systems, transit stations, traction power systems, and alignment loads. These end-use profiles were created using high-resolution (15-minute interval) data available from 31% of modelled accounts. Although the dataset was partial, it was representative enough to serve as a strong basis for extrapolation.

Using monthly utility data from the calendar year 2024, load profiles were normalized to model current energy consumption and peak demand conditions at each property. Typical peak days were then estimated to identify load patterns across the system. The combination of normalized and scaled data offered both granularity and accuracy in understanding how energy is used and when peaks occur.

To forecast how emerging technologies and electrification strategies may impact energy use and peak demand in the future, we incorporated a wide range of additional data sources. These included typical meteorological year (TMY) weather data, EV Gateway charging session data, and ZEB ChargeSim reports, operational and implementation studies such as the EV Strategic Parking plan. A full list of assumptions is listed in Appendix D. These inputs were used to model the projected effects of space and water heating electrification, solar PV deployment, battery energy storage systems (BESS), EV charging, and ZEB charging.

To estimate energy costs increases, several sources including historical data from U.S. Federal Reserve Regional Energy Cost analyses and SCE historical rate information were used to develop low, medium, and high annual electric energy cost increase scenarios. Based on a review of historical rates and the ongoing need to upgrade California's energy distribution infrastructure to support electrification, as well as the unforeseen costs of climate impacts to the grid, four rate increase scenarios were developed: Low (3%), Medium (6%), High (8%) and Ultra-High (13%). The Medium case, reflecting a 6% projected annual energy cost increase, was selected as the Base Case for future cost projections. See Appendix D for historical data and sources.

The result is a comprehensive, facility-level view of both current and future energy demand dynamics. This approach supports the development of targeted, data-driven solutions for optimizing peak load management, improving resilience, and guiding cost-effective investment in clean energy technologies.

What are the drivers of cost?

Future Energy Demand Findings

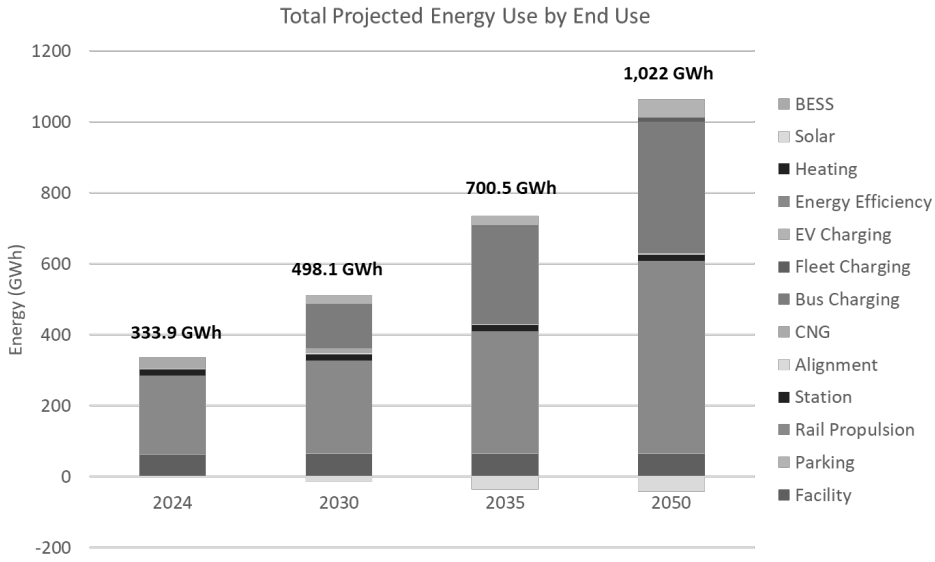
We identified key drivers of system wide energy growth as well as some opportunities to mitigate the load increases through the deployment of Energy Efficiency and Distributed Energy Resources. Rail propulsion emerged as the dominant end use across all modeled years, accounting for the largest share of total electricity consumption through 2050. Rail propulsion is projected to grow steadily over time, reflecting service expansions and ridership increases.

Bus charging was identified as the most rapidly growing end use, with significant demand acceleration expected through 2035. This trend aligns with the phased electrification of the bus fleet and the progressive installation of charging infrastructure across operating divisions. As electric bus adoption scales, charging will become a major contributor to both total energy consumption and peak demand, particularly at depots and facilities with high vehicle throughput.

> **Rail propulsion** is the dominant energy consumer throughout all years, with steady growth each year.

> **Bus charging** shows rapid growth through 2035, aligned with the phased deployment of fleet electrification and charger installation across operating divisions.

Electricity demand, primarily driven by electrification of the bus fleet and system expansion, is forecast to increase from 334 GWh in 2024 to over 1,000 GWh by 2050, representing a 200 percent increase.



Bus charging is currently occurring in 2024; however, it is served by shared meters, and the load cannot be isolated at this time.

Figure 5: Total Projected Energy Use by End Use

How much can Metro expect to pay for energy in the next 25 years?

Key findings indicate that Metro's energy profile will undergo significant transformation between 2025 and 2050. Current energy costs of $95 million are projected to rise substantially over this period.

When accounting for utility rate escalation and inflation, total costs could range from $520 million under a low-rate scenario (3% average annual increase) to $1.77 billion under a high-rate scenario (8% average annual increase) by 2050.

An ultra-high escalation scenario (13% average annual increase) was also evaluated. While this rate reflects historical increases observed with SCE from 2019-2024, it does not represent Metro's broader utility portfolio. Although a 13% trajectory is considered unlikely, it highlights the potential risks of relying on volatile utility rates and underscores the importance of adopting strategies to mitigate cost exposure.

To support planning and analysis in modeling for future fiscal years, Table 10 presents a range of utility cost escalation scenarios. These scenarios are based on historical trends[13], recent

[13] *Historic energy price increase trends over the last 20 years are summarized in Appendix D*

projections, and guidance from Metro's procurement department, providing a comprehensive view of potential utility rate increases. Each scenario is accompanied by a rationale to explain its basis and relevance.

Scenario	Rationale
Low (3%)	Represents the historical average annual increase for all utilities in the LA region over the last 10 years. This scenario assumes a conservative growth rate based on long-term trends.
Medium (6%)	**This represents SCE's historical annual increase from 2014-2024. This aligns with the current guidance provided by Metro procurement for FY26 planning. This scenario was selected as the Base Case for this analysis because it balances historical trends and future projections, making it the most realistic choice for planning purposes.**
High (8%)	Represents the average annual increase for all utilities in the LA region during the period of 2019-2024.
Ultra-High (13%)	Reflects SCE's average annual increase during the 2019-2024 period. This scenario assumes an aggressive growth rate and does not accurately reflect Metro's broader utility portfolio which includes several utilities throughout the LA region.

Table 10: Utility Cost Escalation Scenarios

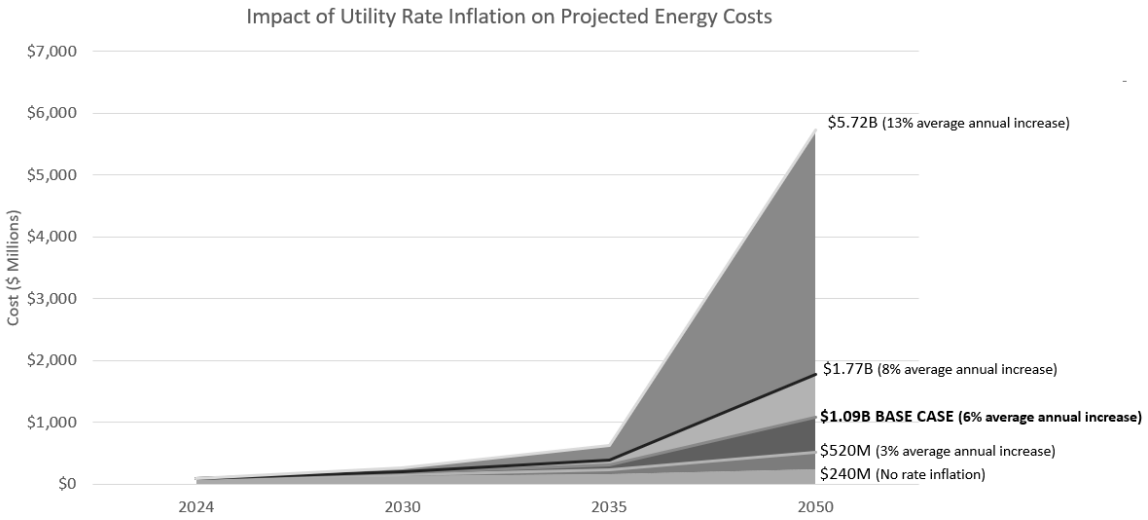


Figure 6: Impact of Utility Rate Inflation on Projected Energy Costs

Base Case Scenario

The Base Case projects Metro's total net energy costs to reach approximately $1.1 billion by 2050, assuming a continuation of current energy price increase trends of approximately 6% and the implementation of Metro's already funded or planned initiatives. Key assumptions underlying this scenario include:

- **Escalating Electric Energy Costs:** Annual electric energy and natural gas prices are assumed to rise by an average of 6% year-over-year, consistent with long-term historical utility cost trends.
- **Existing and Funded Solar Projects:** Only currently operational and fully funded solar projects are included. That totals 2.6MW of existing installed solar capacity and 1.5 MW of already planned solar. No additional solar capacity beyond those existing and already planned systems are assumed in this Base Case.
- **ZEB Fleet Rollout:** The scenario includes the full implementation of Metro's ZEB plan by 2035, which significantly increases electricity demand due to fleet electrification.
- **New TPSSs:** Energy needs related to the build-out of new TPSS to support expanded service and electrification are accounted for.
- **Non-Revenue Fleet Electrification:** The electrification of Metro's non-revenue vehicle fleet, as outlined in strategic planning documents, is assumed to proceed as planned.
- **EV Charging Expansion:** Deployment of electric vehicle charging infrastructure for public and employee use is included, as identified in strategic planning documents such as the Electric Vehicle Parking Strategic Plan.
- **Projected Annual Energy Costs:** To determine projected energy cost increases, historical energy prices were analyzed, and four average annual rates increase scenario estimates were developed: Low (3%), Medium (6%), High (8%) and Ultra-High (13%). The medium scenario of 6% was selected as the Base Case and used to project future energy costs. A summary of historical rate increases can be found in Appendix D.

While the Base Case reflects an ambitious electrification agenda aligned with Metro's sustainability commitments, it also results in a steep increase in electricity consumption and associated costs without corresponding cost control mechanisms. A full list of assumptions used in the future energy forecast are detailed in Appendix D.

The projected increase in Metro's energy costs is driven by two factors: higher electricity usage and rising electricity prices. The charts below illustrate the sources of Metro's future energy costs and show much of the projected increase is due to consumption growth versus higher energy prices. The vast majority, $851M of the projected $1.1B spend in 2050, stems from rising energy prices and the compounding effect of those increases. This Base Case estimates accounts for existing and planned solar PV, providing a modest offset to utility energy costs. As discussed in the mitigation scenario in the next section, expanding on-site solar generation presents an offers Metro an opportunity to hedge against energy price inflation and to create on-site generation that can be paired with energy storage to support operational resiliency.

The two primary utilities, LADWP and SCE, will continue to provide most of Metro's electrical power through 2050 with demand growing roughly proportionally by utility provider as shown in the graph below.

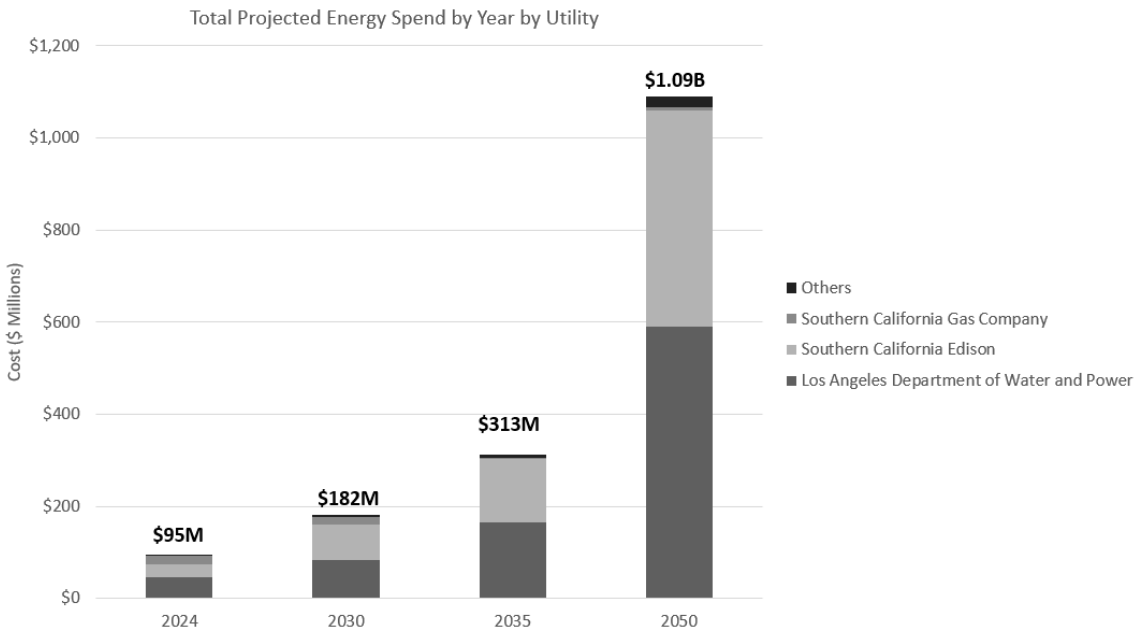


Figure 7: Total Projected Energy Spend by Year by Utility

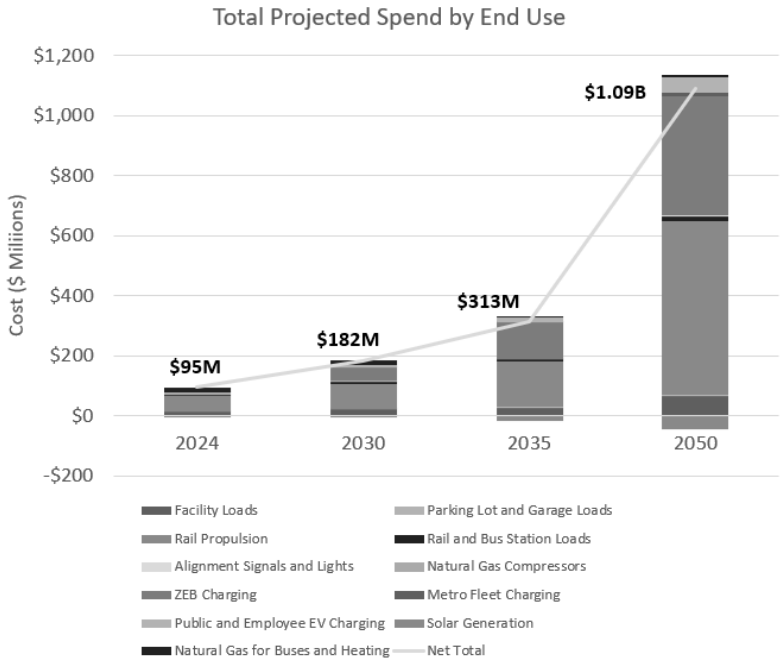


Figure 8: Total Projected Spend by End Use

Projected Energy Costs: Breakdown Due to Price Inflation and Energy Usage

The table below presents projected total energy costs for 2050 under different utility rate escalation scenarios. These scenarios illustrate the impact of utility rate escalation and inflation on Metro's total energy costs, while assuming energy usage remains constant across all scenarios. The table breaks down the projected costs into two components:

- **Energy Usage:** The portion of costs attributed to energy consumption growth.
- **Utility Rate Escalation & Inflation:** The portion of costs driven by rising utility rates and inflation.

The table highlights the contribution of each component to the total costs, emphasizing the significant role of utility rate escalation in driving future energy expenditures. This analysis underscores the importance of proactive energy planning and cost mitigation strategies to manage the agency's long-term financial impacts.

Year 2050 Cost Scenarios	2050 Energy Usage (2024 Energy Rates)	Utility Rate Inflation	Total 2050 Costs
LOW 3% average annual increase	$240M (46%)	$280.4M (54%)	$520.1M (100%)
MEDIUM **6% average annual increase** **(Selected as the Base Case)**	**$240M** **(22%)**	**$850.8M** **(78%)**	**$1.09B** **(100%)**
HIGH 8% average annual increase	$240M (14%)	$1.53B (86%)	$1.77B (100%)
ULTRA-HIGH 13% average annual increase	$240M (4%)	$5.48B (96%)	$5.72B (100%)

Table 11: Projected 2050 Energy Costs: Contributions from Energy Usage and Utility Rate Inflation

What opportunities are there to mitigate energy costs and support Metro's fiscal responsibility?

Projected Energy Costs: Mitigation Opportunities

Two comparative scenarios that illustrate Metro's projected energy expenditures through 2050 were developed. A Base Case as presented in the previous section and a Cost Mitigation Opportunity Scenario described below. This mitigation scenario was developed to assess the potential cost-benefits of additional energy technologies investments.

Opportunity Scenario

Metro can reduce its overall 2050 electric energy spend or operating expenditures by approximately $220M per year in 2050 —a 20% maximum reduction relative to the Base Case— through the strategic implementation of renewable energy, energy storage, and efficiency measures. This opportunity scenario assumes the following additional actions:

- **Expanded Solar Deployment:** Building on existing commitments, Metro could expand their onsite solar capacity to meet its 7.5 MW target and pursue installation of additional solar PV across all viable facilities and parking structures. The total technical potential for solar across all of Metro's facilities is estimated to be 64MW[14] to be confirmed based on feasibility assessments as part of the energy technology implementation recommendations described in Section 3.2.
- **Energy Efficiency Upgrades:** Implementation of the energy efficiency measures identified in the Energy Efficiency Long-Term Plan (EELTP), including lighting retrofits, HVAC improvements, and process optimization across facilities.
- **BESS:** Battery storage would be installed at 75% of new and existing TPSS sites, allowing for peak shaving, demand response participation, and improved resilience during outages or grid stress periods.
- **Advanced BASs:** Deployment of more sophisticated building energy management systems (BEMS) to optimize load control, manage HVAC and lighting schedules, and reduce unnecessary energy consumption during non-operational hours.

Together, these strategies not only reduce long-term operating costs, but also mitigate exposure to energy price volatility and enhance operational reliability. The analysis suggests that proactive investment in on-site generation, storage, and efficiency can deliver substantial lifecycle cost savings while aligning with Metro's climate and resilience goals.

Adding additional solar where feasible across Metro's operations represents the most cost-effective opportunity to reduce utility energy demand and provide a hedge against energy cost increases. With electricity rates compounding much faster than inflation, from an investment perspective, the rapid escalation means that each kWh offset by solar generation avoids a higher future expense. We are conservatively modeling future electricity rates at roughly half their recent growth rates (past 5 years), and in line with the 10-year average in Los Angeles. If the rates continue to increase at beyond our Medium scenario of 6% annually, the benefits seen from solar installations would be greater.

While the analysis presented here is based on a portfolio-wide view, actual NPV results for individual facilities can vary significantly depending on site specific factors such as ground composition, roof structural integrity, and interconnection cost. These types of costs cannot be

[14] *DER Preliminary Study. See Appendix J for a summary of additional solar deployment opportunities.*

precisely estimated until a system design is completed, and a utility interconnection application is filed. This is why taking a site-specific approach is important and is why we have created a prioritization of sites in this analysis.

Impact of Clean Energy Technologies on Annual Energy Spending: Cost Mitigation Opportunity Scenario

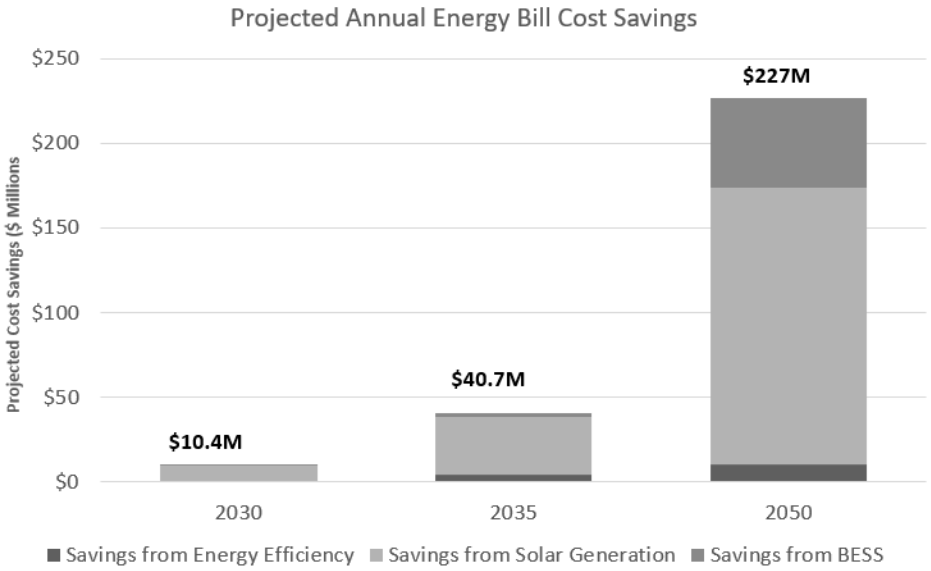


Figure 9: Projected Annual Energy Bill Cost Savings

To more fully understand the cost benefits of these mitigations, determining the net present values which include capital outlays, on-going operations and maintenance costs as well as energy savings are summarized in the table below and detailed in Appendix D. All three mitigations measures have been analyzed and are projected to generate a positive net present value (NPV) for Metro.

MITIGATION SCENARIO	NET PRESENT VALUE - 2050
Energy Efficiency – Implement Energy Efficiency Long Term Plan Recommendations	$2,413,617
Solar – Additional 61MW at Bus Divisions and Where Solar is Technically Feasibility	$171,940,480
Battery – 75% TPSS	$31,387,167

Table 12: Net Present Value of Cost Mitigation Investments

Net Present Values of Additional Solar and BESS for Traction Power Support

Net Present Value of Additional Solar

The EMP estimated the net present value of any additional solar investments. The chart below shows the net present value in 2050 of an additional 60MW of solar (for a total of 64MW) installed at 136 Metro sites. This shows that after factoring in both operating and capital expenditures Metro receives a positive benefit from additional solar[15].

[15] *NPV analysis based on ECO 2.0 and EMP rate forecasts*

SOLAR PV NET PRESENT VALUE	2050
Present Value of Capital Costs	($44,308,580)
Present Value of Maintenance and Repair Costs	($6,382,779)
Present Value of Energy Costs	$222,631,7839
Net Present Value	**$171,940,480**

Table 13: Net Present Value of Solar PV

Net Present Value of Battery Storage at Traction Power Substation Locations

A similar analysis was conducted for adding battery energy storage at TPSS sites. This shows that after factoring in both operating and capital costs, Metro receives a positive benefit from BESS at TPSS[16].

TPSS BESS NET PRESENT VALUE	2050
Present Value of Capital Costs	($21,528,464)
Present Value of Maintenance and Repair Costs	($23,251,353)
Present Value of Energy Costs	$76,266,984
Net Present Value	**$31,487,167**

Table 14: Net Present Value of TPSS BESS

The energy forecasting tool developed to provide the analyses in this plan can be used to dynamically forecast additional scenarios and to incorporate the energy impacts of new operational plans as they are approved.

[16] *NPV analysis based on ECO 2.0 and EMP rate forecasts*

Using Peak Demand Analyses to Prioritize Site-level Opportunities for Energy Resiliency

Beyond the opportunity scenario, Metro also has the option of adding BESS to key bus divisions in addition to solar PV that was already added under the Opportunity Scenario. The cost-benefit of doing this is being developed as part of pilot that's underway analyzing DER feasibility and cost-benefits. Analyzing peak electrical load demand is part of the Div-18 analysis to help determine the appropriate mix of additional energy management and energy storage technologies. The EMP analyzed peak load across all of Metro's divisions to help determine which sites to prioritize. A list of bus sites prioritized based on resiliency is listed as part of Recommendation 3.2.

The ramifications of not only bus charging, but also rail propulsion, on the peak load and energy consumption of each Division positions these sites as the highest priority for solar, energy efficiency, and BESS offsets. Division-18 is already being evaluated for cost-benefit of resiliency and energy management technologies with analysis completed by late Fall 2025.

Going forward, the Excel-based modeling tools used to develop the EMP forecasts are agnostic as to a consultant and available to be used to easily update the models and peak load analysis for prioritized divisions as new information becomes available. This analysis can also support utility conversations regarding capacity constraints and help identify the solar and battery system sizes needed.

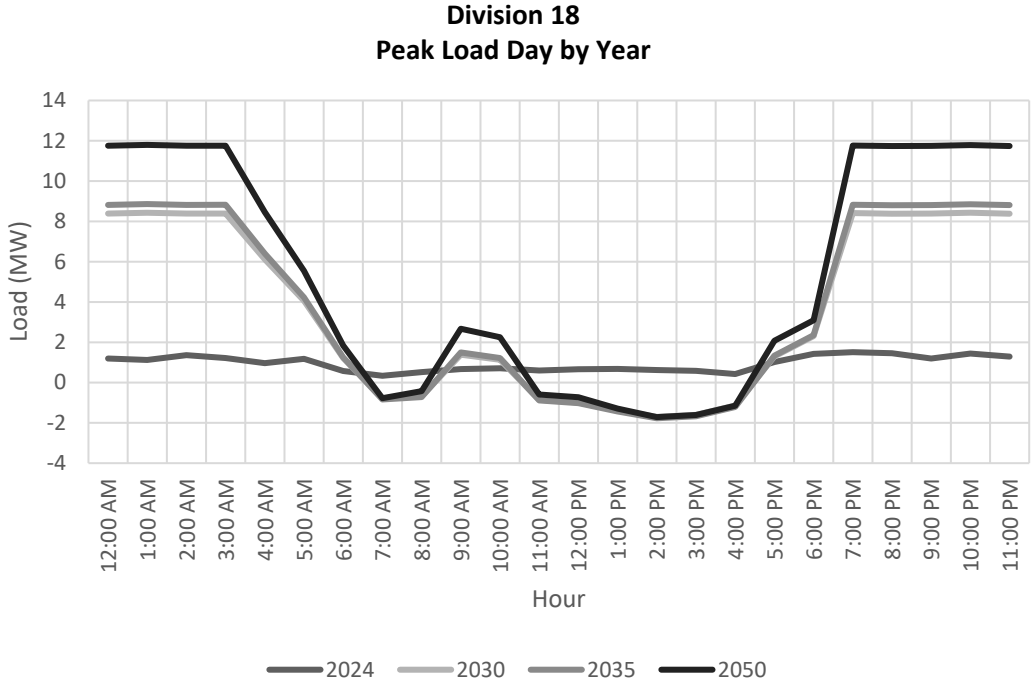


Figure 10: Division 18 Peak Load Day by Year

As outlined in the recommendations section, a full cost-benefit analysis (including installation, post installation maintenance costs and avoided customer damage costs due to resiliency measures) would need to be completed for each of the prioritized divisions. The Division 18 DER pilot will be developing this full cost-benefit analysis to be completed by December 2025. Based on the projected results from this pilot, Metro will be able to update these cost-benefit projections and better estimate the impact at scale across Metro's operations.

Energy Planning Recommendations

This section addresses the following questions:

What is an appropriate and achievable action plan based on future energy needs and where Metro is today?
How can Metro cost effectively invest in resiliency?
What combination of People + Processes + Technology are needed?
How should Metro engage with internal and external stakeholders to support energy planning?
What are the expected outcomes for continuous improvement?

Actions in Context

There are competing goals, market realities and organizational constraints that need to consider as part of Metro's future approach to energy planning. Many of these action plan recommendations require a degree of organizational change to more cost effectively manage energy costs and provide resiliency benefits going forward. The primary filters used to develop an appropriate and achievable action plan is based on next steps that can support Metro's organizational goals, operational requirements as well as energy and environmental leadership goals.

AGENCY GOALS	OPERATIONAL REQUIREMENTS	ENERGY AND ENVIRONMENTAL LEADERSHIP GOALS
> Customer Service > Safety > Security > Service > Reliability	> Cost effectiveness-mitigate fiscal cliff and support cost-benefit analysis standardization > ZEB roll-out > New Maintenance Divisions > New Bus and Rail Lines > Workforce Development > Community Engagement > Continuity of Operations	> Increase onsite renewable energy generation to 7.5 MW by 2030 > Reduce GHG emissions by 79% by 2030, zero emissions by 2050 > Reduce energy consumption by 17% at facilities vs. business-as-usual trend

Table 15: Metro's Agency Goals, Operational Requirements, and Leadership Goals

Recommendations Overview

The EMP recommendations include a snapshot of key planning activities and expected outcomes over the next 5-8 years. A detailed implementation plan with key performance metrics for the next 12-18 months is included in the proceeding Implementation section.

The recommendations focus on four priority areas of opportunity, informed by Metro's internal energy and climate goals, industry best practices, and needs for cost-effective resiliency and energy management technologies to support critical operations. The priority areas of recommendations are:

1. **Coordinated Energy Planning:** Create an energy management steering committee led by the OOS to increase energy planning collaboration and information sharing. Strengthen proactive communications with utility partners and developing standard operating procedures to better support internal planning and energy data management.
2. **Resilient and Clean Energy Supply:** Take advantage of existing opportunities more quickly to increase energy supply mix to meet Metro's renewable energy and GHG reduction goals through energy partnerships. Shore up existing on-site renewable energy generation assets and expand on-site solar to decrease energy operating costs and bolster resiliency.
3. **Energy Technology Implementation and Workforce Development:** Implement a phased and site-level technology deployment strategy to comprehensively and cost-effectively support resiliency and energy management goals. Identify opportunities for feasible expansion of solar and batteries to provide energy resiliency. In parallel, increase energy technology literacy across key functions within Metro and collaborate with the Workforce and Talent Development team to identify any additional future skill gaps due to emerging energy management and resiliency technologies.
4. **Stakeholder Engagement:** There are many important stakeholders who can support and benefit from Metro's energy planning efforts. In addition to outreach to utilities, more proactive collaboration with CBOs and local partners can strengthen Metro's energy portfolio through joint resiliency projects and workforce development opportunities.

Sequence of Recommendations

The EMP organizes these recommended actions into a phased approach for implementation of Phase 1 activities. Outlining what future phases beyond the next 18-24 months could achieve is summarized below to highlight the critical building block function of Phase I recommendations. This section of the EMP further outlines a proposed plan of action based on four recommended focus areas for Phase 1 activities.

PHASE 1 (FISCAL YEAR [FY] 2026-2027)	PHASE 2 (FY 2028-2029)	PHASE 3 (FY 2029-2030)
RECOMMENDATION 1.0: ENERGY MANAGEMENT PLANNING		
Recommendation 1.1: Develop centralized energy planning steering committee and establish report out requirements and key performance indicators **Recommendation 1.2:** Socialize EMP with utilities and energy regulatory agencies as part of on-going engagement. **Recommendation 1.3:** Develop SOPs and process requirements (International Organization for Standardization [ISO] 50001 Process Requirements; develop SOPs for energy projects technology implementation) **Recommendation 1.4:** Build data and information management backbone (interval data, submetering, BAS integration, IT needs) **Recommendation 1.5:** Update energy demand forecast based on new capital projects	Further develop data and energy management capabilities Develop capital plans for additional IT/information management needs	Expand energy management IT staff and software as more distributed energy assets and energy technology come online
RECOMMENDATION 2.0: ENERGY SUPPLY		
Recommendation 2.1: Accelerate 100% renewable energy supply **Recommendation 2.2:** Develop more robust solar expansion and O&M system **Recommendation 2.3:** Essential use designation (work with utilities to confirm rotating outage group IDs and exemption for critical accounts)	Deeper utility engagement: joint project identified, planned for and costed out to support resiliency needs and mitigate costs	Deploy joint utility projects

PHASE 1 (FISCAL YEAR [FY] 2026-2027)	PHASE 2 (FY 2028-2029)	PHASE 3 (FY 2029-2030)	Phase 2 (FY 2
RECOMMENDATION 3.0: ENERGY TECHNOLOGY IMPLEMENTATION AND WORKFORCE DEVELOPMENT			
> **Recommendation 3.1:** Develop high level internal education on energy technology; build on existing Metro, Cerritos College and ATU EV charging maintenance program to identify additional technical training needed for resiliency (solar + batteries + energy management systems) > **Recommendation 3.2:** Prioritize and evaluate high impact sites for energy technology and resiliency investments > **Recommendation 3.3**: Develop resiliency components of cost-benefit analysis framework and identify opportunities for innovative funding mechanisms	> Implement resiliency and energy management at prioritized sites > Develop planning for next phase of prioritized sites > Identify opportunities for advanced technology pilots (e.g., virtual power plants [VPP], islanding capabilities, participation in wholesale energy markets) > Integrate training on software technology for building operators	> Implement energy management system at critical sites > Pilot advanced energy technologies > Plan for vehicle/building-grid (planning with utility for vehicle expert potential at select locations) > Continue training building operations to maintain, optimize, and troubleshoot systems	
RECOMMENDATION 4.0: STAKEHOLDER ENGAGEMENT			
> **Recommendation 4.1:** Expand SC to include more community equity focused organizations > **Recommendation 4.2:** Leverage Community Partners as workforce enablers (skills and job creation) > **Recommendation 4.3:** Socialize energy goals and constraints, identify resiliency co-funding opportunities and needs with regional energy partners. > **Recommendation 4.4**: Communicate progress and community benefits of clean energy and energy resiliency investments.	> Co-develop new training programs > Identify co-development projects > Incorporate community engagement as a metric for new contracts	> Implement co-development projects	

Table 16: Phased Plan of Action for Recommendations

Recommendation 1.0: Energy Planning

Metro's energy program, now 20 years old, is led by the OOS, which oversees energy planning for the agency. Since the inception of these energy and climate programs, Metro has expanded operations and introduced new leadership focused on unifying the Agency. Future energy planning presents an opportunity to align the agency around a single, cohesive strategy aimed at reducing energy costs and increasing resiliency.

Standard Operating Procedures

Looking ahead, energy management and proactive planning will become increasingly critical due to the dynamic energy and climate environment, Metro's extensive utility meters, and energy-dependent capital projects. To address these challenges, formalized processes and Standard Operating Procedures (SOPs) and coordination are needed to more proactively connect divisional level needs and future energy impacts.

Example SOPs to Establish:

> Develop a process for determining the appropriate energy supply product (e.g., 100% renewable energy) for new electric meters, while accounting for added costs.

- Develop a process for coordinating with the utility to ensure that new meters are assigned a rotating outage ID to exempt them from outages, where applicable.
- Create guidelines for selecting energy supply products and integrating resiliency cost benefits into capital project planning.

By formalizing these processes, Metro can ensure consistency, accountability, and alignment with its broader energy and resiliency goals.

Internal Coordination and Governance

Since the approval of Metro's ECMP in 2011, the OOS has been coordinating across Metro on energy management and is best positioned to continue overseeing this function with continued support internally to continue leading annual energy forecasting, utility engagement and development of data and information management platforms. Strengthening internal coordination will be essential to proactively manage energy needs moving forward.

Key Opportunities:

- Strengthen existing partnerships (e.g., OOS, Watchwire, Procurement) to standardize utility data as the system of record.
- Establish an annual review of utility energy supply products to optimize cost-effectiveness and align with budget/rate cycles.
- Building on this existing collaboration, Metro could consider formalizing agency-wide coordination and data sharing through the formation of an Energy Steering Committee, led by OOS, to:
    - Coordinate agency-wide data sharing and SOP implementation.
    - Develop agendas for utility and regulator engagement e.g., California Air Resources Board [CARB], CPUC, Department of Energy [DOE]).
    - Report annually on energy key performance indicators (KPIs).
    - Recommend data and IT requirements to support advanced energy management and resiliency solutions.

Phased Data & Information Management:

- Initial phase: utility bills, interval data, solar system monitoring, consumption analysis. This initial data management function could be supported by the OOS and the Energy Steering Committee.
- Future phases: integration with building automation, load flexibility, ZEB charging, and microgrid systems.

Looking forward, effective coordination between energy planning and IT resources will be critical to supporting advanced technologies. Figure 11 shows how data management needs increase for each of the different phases of energy technology deployment.

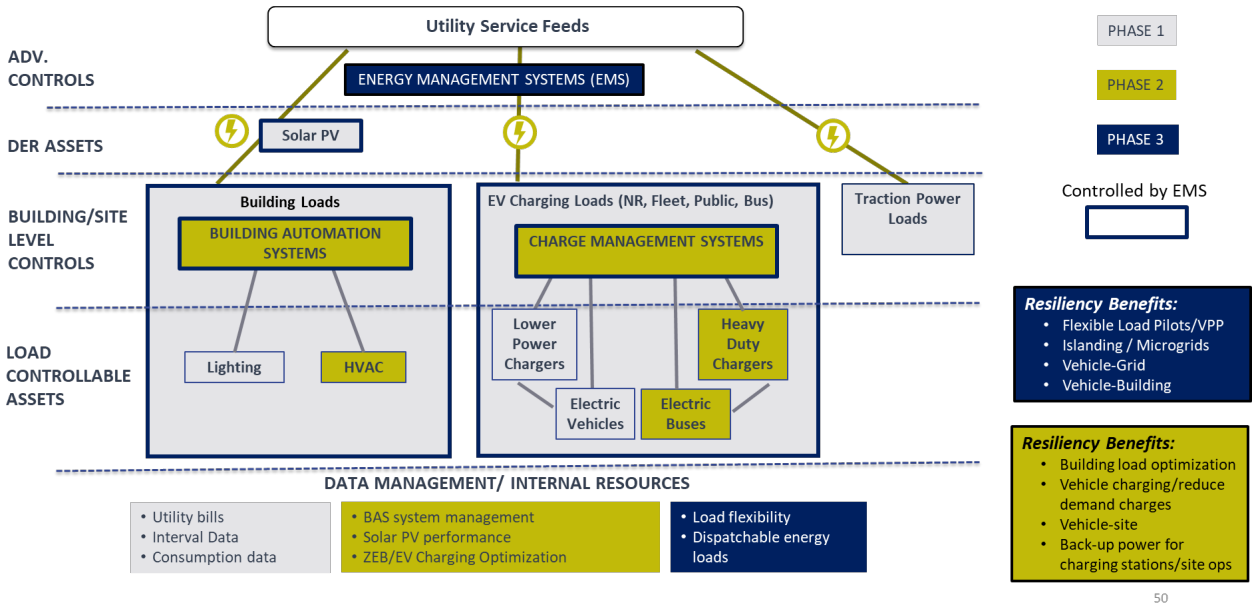


Figure 11: Data-driven Technology Management

The energy technology landscape is increasingly complicated and interactive, as Figure 11 illustrates. Multiple hardware and software technologies interact to help optimize energy usage through building and EV charging load management, optimize EV charging through charge management and optimize resiliency through energy management and control systems.

Focusing on Phase 1 of these recommendations, Table 17 describes the expected outcomes and key performance indicators.

RECOMMENDATION 1.0: FORMALIZE ENERGY PLANNING FUNCTION AND COORDINATION	EXPECTED OUTCOMES: PHASE 1 (FY 2026-2027)	KEY PERFORMANCE INDICATORS
> **Recommendation 1.1:** Develop centralized energy planning steering committee and establish reporting requirements and key performance indicators. > **Recommendation 1.2:** Socialize EMP with utilities and energy regulatory agencies as part of on-going engagement. > **Recommendation 1.3:** Develop SOPs and process requirements (ISO 50001 process requirements), develop SOPs for energy projects technology implementation. > **Recommendation 1.4:** Build data and information management backbone (i.e., interval data, submetering, BAS integration, IT needs, etc.). > **Recommendation 1.5:** Update energy demand forecast based on new capital projects or plans.	> **Develop Centralized Energy Data and Planning Tools** • Annual reporting monitoring/evaluation (verification of energy usage, energy constraints and environmental benefits) • Proactively address evolving data and process requirements • Align efforts and optimize use of division-level resources > **Better Utility Coordination and Planning** • Identify utility, state and federal support for proactive energy planning. • Foster stronger, long-term utility relationships • Gain better visibility into and planning for co-funding resiliency and energy cost-mitigation opportunities. > **Maximize opportunities and cost effectiveness of assets and investments (PV, EVSE, batteries, BAS)** • Cost + energy + resiliency benefits more easily communicated • Asset management visibility O&M • Avoid stranded or underutilized assets (immediate) • Load flexibility/shave peak demand costs (future)	> Energy planning steering committee established, meets regularly > Watchwire platform is the system of record > Annual reviews of energy spend, utility rate schedules and SOPs conducted with a report out on recommendations

Table 17: Summary of Energy Management Planning Recommendations

Recommendation 2.0: Resilient and Clean Energy Supply

Recommendation 2.1: Accelerate 100% Renewable Energy Supply

Existing Energy Supply from Utilities

As outlined in the current energy demand section, 46% of Metro's electricity is sourced from 100% renewable energy. California utilities continue to transition to cleaner energy sources in compliance with California Renewable Portfolio Standard (RPS), which mandates that 60% of the state's energy supply must come from renewable sources by 2030. Another driver is Senate Bill 100 (SB100), which establishes the goal of achieving 100% carbon-free energy by 2045. Therefore, Metro could accelerate its own renewable energy supply goal of 100% by 2035, as proposed in the CAAP, by increasing the number of utility accounts that receive 100% clean energy products. There are several options for consideration, summarized in Figure 12.

			Scenario 1 – Mix of 50% and 100%			Scenario 2 - 100% Green Power			Scenario 3 – Cost Optimization		
	2024 Annual Energy Spend	Current Renewable Energy[1]	Green Power Option	Annual Incremental Cost	Additional Annual Avoided GHG Emissions (MT CO2e)[1]	Green Power Option	Annual Incremental Cost	Additional Annual Avoided GHG Emissions (MT CO2e)[1]	Green Power Option	Annual Incremental Cost	Additional Annual Avoided GHG Emissions (MT CO2e)[1]
City of Pasadena Water and Power (PWP)	$2.4M	35.8%	**100%**	$169,953	3,980	**100%**	$169,953	3,908	**100%**	$169,953	3,908
LADWP	$45.3M	39.5%	**50%**	$3.1M	23,582	**100%**	$6.2M	47,163	No changes	N/A	N/A
SCE Base Rate *CPA Eligible, previously opted-out*	$7.6M	37.6%	**Re-enroll (27) accounts in CPA at 100%**	$846,770	6,306	**Re-enroll (27) accounts in CPA at 100%**	$846,770	6,306	No changes	N/A	N/A
CPA – Clean Power (50%) *(CPA Supply/SCE Delivery)*	$0.4M	50.0%	**Remain at 50%**	0	0	**Opt (21) accounts up to 100%**	$16,065	227	Add (6) accounts	$321,115	-74
CPA – Clean Power (100%) *(CPA Supply/SCE Delivery)*	$9.4M	100.0%	**Remain at 100%**	0	0	**Remain at 100%**	0	0	Opt (6) accounts down to CPA Clean Power (50%)	-$491,068	0
TOTAL				**$4.1M (5% increase)**	**33,867 (49% reduction)**		**$5.6M (9% increase)**	**57,676 (84% reduction)**		**$0**	**3,907 (6% reduction)**
TOTAL Utility Portfolio Renewable Energy	**45.9%**			**60%**			**91%**			**47.4%**	

[1]*Based on 2023 Power Content Labels*

Figure 12: Options for Increasing Renewable Energy Supply

Metro has the option in the next year to increase its utility clean energy supply from 46% to between 47%-90%, with annual costs ranging from $0 (cost neutral option at 47%) to $5.6M/year (90% renewable supply). Moreover, the greenhouse gas emissions reductions benefits are significant and range from a 6% to 84% reduction.

Recommendation 2.2: Develop More Robust Solar Expansion and O&M System

Existing Solar PV Systems

To ensure the long-term performance and reliability of Metro's existing solar PV systems, it is recommended that necessary repairs and system improvements be incorporated into the existing Distributed Energy Resource Capital Project, an approved capital improvement project, or establish a new capital project. This proposed capital project should address deferred maintenance needs and upgrading aging infrastructure that is contributing to underperformance. System components such as inverters, combiner boxes, and fuses have been compromised by environmental stressors, including water intrusion, corrosion, and fire-related damage—highlighting the need for targeted system improvements.

Rather than continuing with reactive repairs, this proactive capital investment approach would establish a funding mechanism to replace outdated or failing PV components with modern, high-efficiency equipment. For example, at the Central Maintenance Facility, aging central inverters would be removed and replaced with distributed string inverters, increasing system resiliency, simplifying maintenance, and improving energy output. These upgrades would also bring systems into compliance with current safety and electrical codes. A detailed summary of proposed PV system repairs and upgrades is provided in Appendix G.

To support long-term solar performance, comprehensive O&M planning is necessary. The OOS will develop and manage a comprehensive O&M plan that defines clear roles, responsibilities, and protocols to ensure accountability and foster ownership across departments—supporting a culture of continuous improvement in line with ISO 50001 standards. The pursuit of ISO 50001

certification will further provide a structured framework for tracking performance, identifying opportunities for improvement, and establishing standardized processes that ensure consistent, data-driven maintenance. Integrating solar PV systems into Metro's Enterprise Asset Management System (EAMS) will integrate these generation assets into Metro's proactive maintenance scheduling, performance tracking, and lifecycle planning. To achieve all of this, dedicated investments in the O&M program as well as workforce development will be necessary. for.

Future Solar PV Systems

In alignment with Metro's long-term sustainability and energy resilience goals, it is also recommended that the Agency expand its total installed solar capacity to 64 MW by 2050—an increase of 60 MW beyond the 4 MW already existing or planned. For new solar PV systems, it is critical to embed long-term O&M strategies, as described in the previous section, into the project development phase to prevent repeating the challenges faced with legacy systems. Integrating these strategies into the project development phase will help avoid current deficiencies, extend the productive life of future solar assets, and preserve the long-term value of past investments. This proactive approach ensures alignment with the agency's broader energy and resilience goals.

Pathway to 100% Renewable Energy Supply

Based on Metro's goal of achieving a 100% renewable energy supply by 2035, the agency can pursue two main strategies: Install additional on-site Solar PV and increase procurement of 100% renewable energy from utility providers. Based on 2024 information, Metro could purchase all available 100% renewable energy options from utilities, which would enable it to reach a 90% clean energy supply mix in the near term—well ahead of schedule. To close the remaining gap and achieve 100% renewable energy, Metro would need to install approximately 17 MW of additional on-site solar PV.

Recommendation 2.3: Increase Resiliency of Energy Supply

As part of strategic energy planning, Metro has several opportunities to engage more proactively with its utility partners to support resiliency needs and meet its clean energy and environmental goals. Since 2001, Metro's rail system has undergone significant expansions with the addition of the E Line, connecting downtown Los Angeles to Santa Monica, the "Pasadena Metro Blue Line" (now known as the A Line), and the K Line Extensions.

Metro is currently working on a plan to increase the number of meters designated as "essential use" so that Metro's critical operations, including rail, bus and operational facilities, are exempted from rotating or planned outages during periods of high energy demand. These conversations have already been initiated with utilities.

CPUC Decision 01-08-071 (2001) Adopted Rail Safety and Carriers Divisions granted exemptions for certain sections of Metro's rail tracks from rotating outages (exclusive rights-of-way, ballasted tracks, underground sections, tunnels, aerial structures, and control centers). Refer to Appendix I for the list of sites included in this CPUC Decision.

Increasing "essential use" designations will be even more critical as Los Angeles prepares to host the 2028 Olympic and Paralympic Games and key matches of the 2026 FIFA World Cup. Uninterrupted transit operations are vital to supporting mobility, safety, and emergency response throughout the region.

SCE accounts are the priority for "essential use" meters and coordination among internal Metro stakeholders (e.g., Procurement, Real Estate, Operations) should verify the list of accounts and their end uses. Once this verification is complete, Metro can begin engagement with utilities to confirm the rotating outage group ID and determine whether accounts are exempt.

Additionally, Metro should work with utilities to establish a process for managing new meters as they come online and explore the possibility of receiving approval for accounts to gain exemption on a rolling basis. The OOS is coordinating with Government Relations to determine the best approach for addressing this in discussions with the utilities. The next steps will involve addressing LADWP accounts, which will follow a similar process, informed by lessons learned during the management of SCE accounts.

Focusing on Phase 1 of these recommendations, Table 18 describes the expected outcomes and key performance indicators.

RECOMMENDATION 2.0: OPTIMIZE CLEAN ENERGY SUPPLY TO MEET CLEAN ENERGY GOALS AND RESILIENCY NEEDS	**EXPECTED OUTCOMES: PHASE 1 (FY 2026-2027)**	**KEY PERFORMANCE INDICATORS**
> **Recommendation 2.1: Accelerate 100% Renewable Energy Supply** • Green energy product opt-up • Utility product recommendations > **Recommendation 2.2: Develop More Robust Solar Expansion and O&M System** • Phased remediation system to address routine maintenance and repair existing damage • Develop PV system replacement and asset management operating procedures • Determine contracting mechanism to use for expanded solar deployment > **Recommendation 2.3: Increase Resiliency of Energy Supply** • Work with the utilities to confirm rotating outage group IDs and exemption for critical accounts	> Receive exemption from rotating outages for Metro's accounts > Improve operational resiliency > Cost effectively increase Metro's renewable energy supply from utilities from the current 45.9% toward 100% > Repair solar PV systems to get back to expected production, saving an estimated $400K per year in avoided utility costs > Optimize current solar investments and establish cost-effective O&M approach as a backbone for future solar system deployments	> Document savings on avoided utility costs > Overall system-wide average PV solar systems operational efficiency increases from 49% to at least 70% > Metro receives expanded essential use designation at critical facilities > O&M plan for solar is cost-effective and allows for desired workforce participation in system maintenance

Table 18: Summary of Energy Supply Recommendations

Recommendation 3.0: Energy Technology Implementation and Workforce Development

As Metro enters a more energy constrained environment, where resiliency is also an increasing need, it is important to re-evaluate planning for future energy-related technologies and implementation. Going forward, agency-wide deployments of a single technology, such as solar or building controls, may not be as cost-effective or efficient compared to taking an integrated

and phased approach at a site level. This comprehensive site level approach would allow for optimization of the interactive benefits of critical energy-management technologies and provide best practices and learnings that can be leveraged across other divisions.

A comprehensive approach at a site level would involve auditing and documenting the existing technologies, operational needs and future technology opportunities that could support energy management and resiliency for that location. An evaluation of the requisite skills and workforce development needs should inform the planning process. After collection and synthesis of existing conditions, an energy technology roadmap should be developed for each location, and include an initial detailed cost-benefit analysis with the resiliency and environmental benefits. The cost-benefit analysis should also identify innovative funding and/or cost mitigation opportunities to support the implementation of the energy technologies at that site. This approach supports both Metro's standardized CBA framework and identifies early in the technology feasibility and planning stages any opportunities for cost mitigation.

Once a site's energy technology roadmap, cost-benefit and funding analysis are finalized, and a capital development plan has been approved, Metro can repeat the process again for additional sites.

To support this comprehensive approach, the energy technology recommendations fall into three subcategories:

1. Internal education and workforce development
2. Site prioritization process for technology investment screening and implementation of additional solar and energy storage
3. Incorporating the cost-benefits of resiliency into Metro's standardized Cost Benefit Analysis

Recommendation 3.1: Advance Internal Education and Workforce Development

The implementation of the EMP will have wide-reaching implications for the agency's workforce of 12,108 employees, including 10,100 represented by labor unions. As the EMP initiates a major transition to electrified fleets, renewable energy systems, building automation, and advanced data infrastructure, new skills training and education are needed for deploying, maintaining and operating energy-related assets such as zero-emission buses, electric vehicle charging stations, solar PV systems and batteries/energy storage systems.

Additionally, as Metro implements the EMP, the scale and complexity of anticipated energy capital projects will have significant implications for labor, particularly under the agency's existing Project Labor Agreement (PLA) with the Los Angeles/Orange Counties Building and Construction Trades Council. These impacts are critical to understanding how the energy transition can advance workforce development, ensure equitable job access, and uphold union standards. Trainings and certifications relating to energy management, energy storage and high voltage equipment, such as EV charging stations, have already been identified as part of Metro's ZEB Workforce Development Statement of Work. Further, Metro's Talent and Workforce Development team has an existing partnership with Cerritos College to support more career pathways for electricians and electrician helpers. This partnership can be leveraged to identify additional skill gaps and priority sites for energy management technology beyond the ZEB workforce development plan.

Energy efficiency measures are the backbone of any energy management investments and empowering the facilities and maintenance staff in leading this planning would also serve as an

opportunity to identify resource and training needs in advance of future energy technology deployments. The opportunities for energy efficiency improvements as outlined in the Energy Efficiency Long Term Plan (EELTP) would be a great opportunity for facilities and maintenance staff to develop and lead the implementation planning with support from the OOS.

Figure 13 below highlights where education and workforce development opportunities can be aligned with the agency's energy strategy, ensuring that Metro's staff is trained to operate, maintain, and optimize these systems.

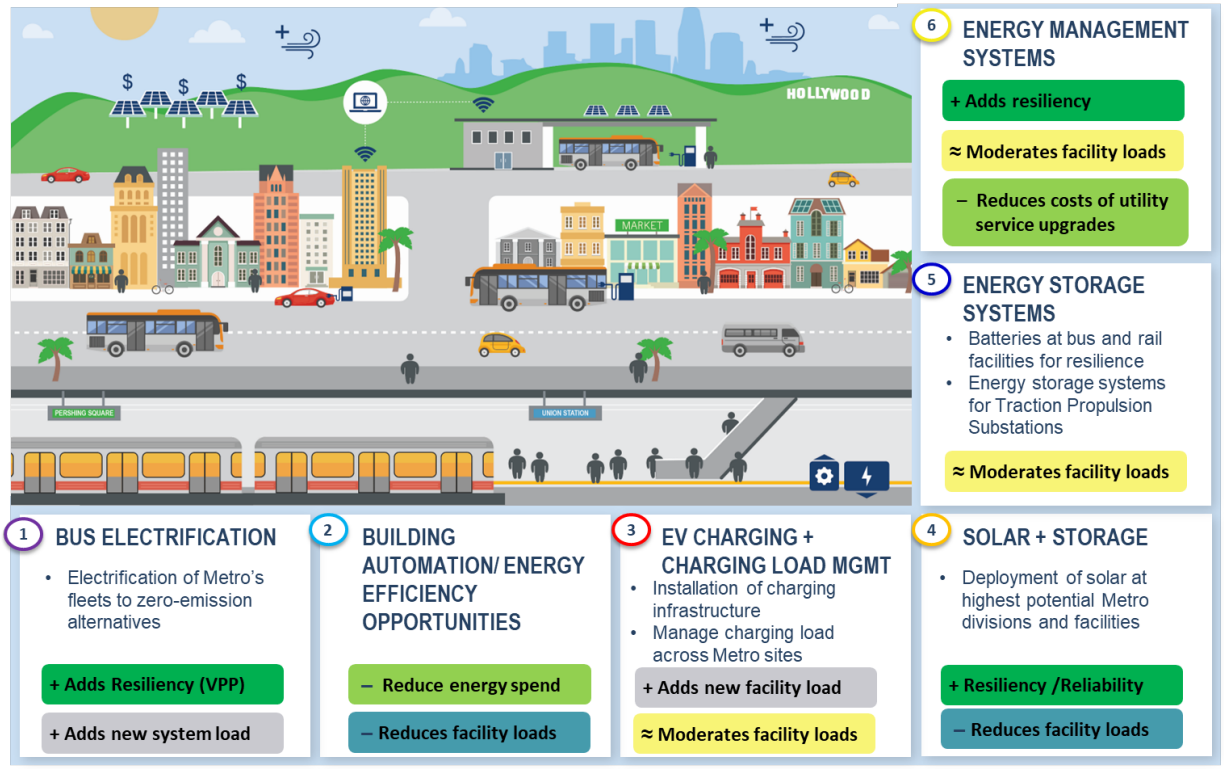


Figure 13: Energy Education - Workforce Development Opportunities

Functional Technical Training/Job Transition Opportunities

There are many specialized training and re-training needs to be addressed so that Metro's workforce can fully participate in the Agency's energy transition. Below are a few gaps to close in Metro's workforce:

> **Bus and rail operators represented by SMART** (5,197 members) will need training on the operational nuances of zero-emission buses and potentially automated charging systems. As Metro expands micro transit services, these operators may also be called upon to operate diverse vehicle types and use real-time energy monitoring tools.

> **Mechanics and service technicians represented by the ATU** (2,695 members) will be among the most directly impacted. As internal combustion engine vehicles are phased out, mechanics will need to acquire skills in high-voltage electrical systems, battery management, and digital diagnostics.

> **Transportation and maintenance supervisors** (AFSCME, 858 members) will play a critical leadership role in managing cross-functional energy infrastructure projects and coordinating

building-level energy efficiency initiatives. Their involvement in strategic planning and implementation will be vital for successful system integration.

- **Custodial and clerical employees** (TCU, 1,126 members) **and security guards** (Teamsters, 224 members) will be indirectly affected by changes to facility operations, schedules, and building access related to energy upgrades and construction timelines.

As more skill gaps are identified, Metro can leverage existing partnerships with Cerritos College and LA Trade Tech to further develop new certifications and training to support energy technology deployments.

Metro could also consider developing a series of energy-related internal education modules, beginning with foundational concepts and progressing toward advanced energy management and control technologies. A structured, phased approach will ensure that the workforce builds skills in parallel with Metro's evolving clean energy initiatives. This approach will:

- Strengthen internal coordination and collaboration across the agency.
- Inform procurement documents by embedding technical understanding into requirements.
- Enhance vendor engagement through shared knowledge and expectations.
- Build awareness of both physical and cyber risks associated with electric mobility and infrastructure – equipping staff with strategies for proactive mitigation.

Figure 14 below illustrates a phased learning progression. Early phases emphasize core concepts (EV basics, building automation, energy security), while later phases introduce more complex systems (charging load management, energy management systems, cybersecurity for e-mobility). This approach supports upskilling of the workforce while preparing the Agency to manage increasingly more integrated and sophisticated energy systems.

PHASE 1	PHASE 2	PHASE 3
EV 101 > Basics of EV and EV charging > Best practices for charging implementation > Metro's EV policy **BAS** > Computer-based system to control the building systems (e.g., heating, ventilation, air conditioning, lighting) **Energy Security and Cybersecurity** > Introduction to physical and cyber risks due to electric mobility and infrastructure connections (understanding of threats and vulnerabilities and best practices and mitigations)	**EV Charging Load Management Systems** > EV charging load management software – electricity infrastructure, charge stations, and EV communications > Load balancing systems – instruct EV chargers to deliver the right amount of energy and help offset peak demand at the charging site level, in on-site battery storage, and within campuses **Cybersecurity – e-mobility** > IT/OT strategies > Use of AI to proactively detect and manage risks	**Energy Management System** > Collection of hardware and software to monitor and control energy usage > Connects to building automation, charging management and other distributed energy resources such as solar PV, energy storage, and microgrids Advanced systems capable of supporting VPP operations (dispatching of energy, responding to real time energy prices)

Figure 14: Internal Education Topics - Recommendations

Recommendation 3.2: Implement Technology Investments - Site and Technology Prioritization

Opportunities to expand on-site clean energy generation, reduce energy costs, leverage the positive cash flow benefits of solar, and enhance resiliency through energy storage for critical operations fall into three key categories, as introduced in the Future Energy Demand Opportunity Scenario section:

- **Recommendation 3.2.1 Bus Division Resiliency Upgrades:** Develop a technology roadmap, implementation plan, and full cost-benefit analysis for integrating solar, energy storage, energy management, and building automation at prioritized bus sites summarized in the following section.
- **Recommendation 3.2.2 TPSS Energy Storage Implementation:** A pilot project is in progress to evaluate the potential of implementing energy storage at Division 11's yard TPSS, with study completion anticipated by Fall 2025. This pilot will help define the project scope, delivery pathway, and associated benefits to support broader deployment.
- **Recommendation 3.2.3 Long-Term Solar Expansion Across Metro Sites:** Expand solar-only installations across Metro's portfolio to increase clean energy generation and reduce energy costs.

A full listing of Solar PV and energy storage potential is listed in Appendix J.

Recommendation 3.2.1: Bus Division Resiliency Upgrades

Implementing a phased and site level technology deployment to support resiliency and energy management goals would yield significant advantages for Metro. Metro would screen its sites/divisions to prioritize a more comprehensive energy technology deployment plan that could include multiple technologies rather than a single measure. Focusing holistically at a site or division level would enable faster technology deployment as Metro would have the ability to validate technology viability, scalability, interoperability, user experience, and energy savings before scaling to other prioritized sites. This approach also allows for:

- Building internal understanding of technology communication standards to ensure equipment can work together effectively (part of internal education).
- Prioritizing open standards and protocols (e.g., BACnet, OpenADR, Open Charge Point Protocol) to ensure compatibility across different systems and manufacturers.
- Evaluating vendor support more effectively, including factors like regular software updates, feature enhancements, and long-term service agreements.

Metro would screen and prioritize based on the following criteria:

- **Existing energy demand and energy constraints:** Prioritize sites with high or diverse energy loads, where power disruptions would have greater operational impact and where resiliency improvements would be most beneficial.
- **Operational Fit and Cost-Effectiveness of Solar System Types:** Evaluate the feasibility and relative cost-effectiveness of different solar configurations (e.g., rooftop, carport, or superstructure) based on site layout, structural capacity, and operational requirements.
- **Resiliency Needs:** Assess whether the site serves a continuity-of-operations function, and identify climate-related risks (e.g., wildfire, flooding, extreme heat) that could impact energy reliability.

- **Existing and planned technology:** Consider the presence or planned deployment of solar PV, building energy management systems, and electric vehicle charging infrastructure to identify integration opportunities.
- **Community Equity Considerations:** Incorporate input from hyper-local community partners to ensure equitable investment and community benefit in historically underserved areas.

Applying these technology screening criteria for Solar and BESS deployments and energy management across Metro's bus division portfolio would result in this prioritization:

SITE NAME	SITE FUNCTION	PEAK DEMAND (KW)	ANNUAL CONSUMPTION (GWH)	SERVICE FEED	PROJECTED FUTURE ENERGY SUPPLY CONSTRAINTS	EXISTING PV KW DC	EXISTING PV INSTALL YEAR	EXISTING + PLANNED + ADDITIONAL PV KW	BESS	BESS INSTALL YEAR	ZEB CHARGING	EV CHARGING	EQUITY FOCUSED COMMUNITY	BUS COOP DESIGNATED BACKUP LOCALTION	CURRENT CLIMATE RISK SCREEN (HEAT FLOOD, LANDSLIDE) POWER OUTAGE IS A CASCADING IMPACT
Division 18	Bus	1.51	6.73	SCE	No	437	2007	2,399	N/A	N/A	2028	25 employee ports, 2025, 136 kW non-revenue fleet	Yes		No
Division 9	Bus	1.61	6.30	SCE	No	0	N/A	1,458	N/A	N/A	2026	27 employee ports, 2029, 129 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 8	Bus	2.97	5.16	LADWP	No	247	2005	5,035	N/A	N/A	2034	15 employee ports, 2028, 82 kW non-revenue fleet		Yes	Yes - Heat
Division 7	Bus	1.14	4.53	SCE	No	0	N/A	1,467	N/A	N/A	2028	Seven employee ports, 2027, 127 kW non-revenue fleet t		Yes	Yes - Heat
Division 2	Bus	1.96	4.10	LADWP	No	0	N/A	435	N/A	N/A	2032	15 employee ports, 2028, 82 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 5	Bus	1.64	4.09	LADWP	No	0	N/A	2,308	N/A	N/A	2030	15 employee ports, 2028, 61 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 3	Bus	1.07	3.40	LADWP	No	0	N/A	2,251	N/A	N/A	2034	15 employee ports, 2028, 61 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 15	Bus	1.28	3.37	LADWP	No	247	2005	3,505	N/A	N/A	2035	15 employee ports, 2027, 124 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 1	Bus	1.47	3.02	LADWP	No	0	N/A	1,458	N/A	N/A	2032	20 employee ports, 2026, 47 kW non-revenue fleet	Yes	Yes	Yes - Heat
Division 10	Bus	1.41	2.11	LADWP	No	0	N/A	2,896	N/A	N/A	N/A	15 employee ports, 2026, 530 kW non-revenue fleet	Yes		Yes - Heat

Table 19: Metro Bus Division Solar PV + BESS Prioritization Screening

Metro has an existing DER Capital project that will evaluate opportunities for BESS at Division 18. The results from this pilot will be shared later in the fall of 2025. The outcomes will include a technology implementation plan, accompanied by a comprehensive cost-benefit analysis, to determine the most appropriate technology investments in on-site generation, on-site energy storage, and energy management technologies to cost-effectively enhance resiliency. For Division 18, the site roadmap could look like this:

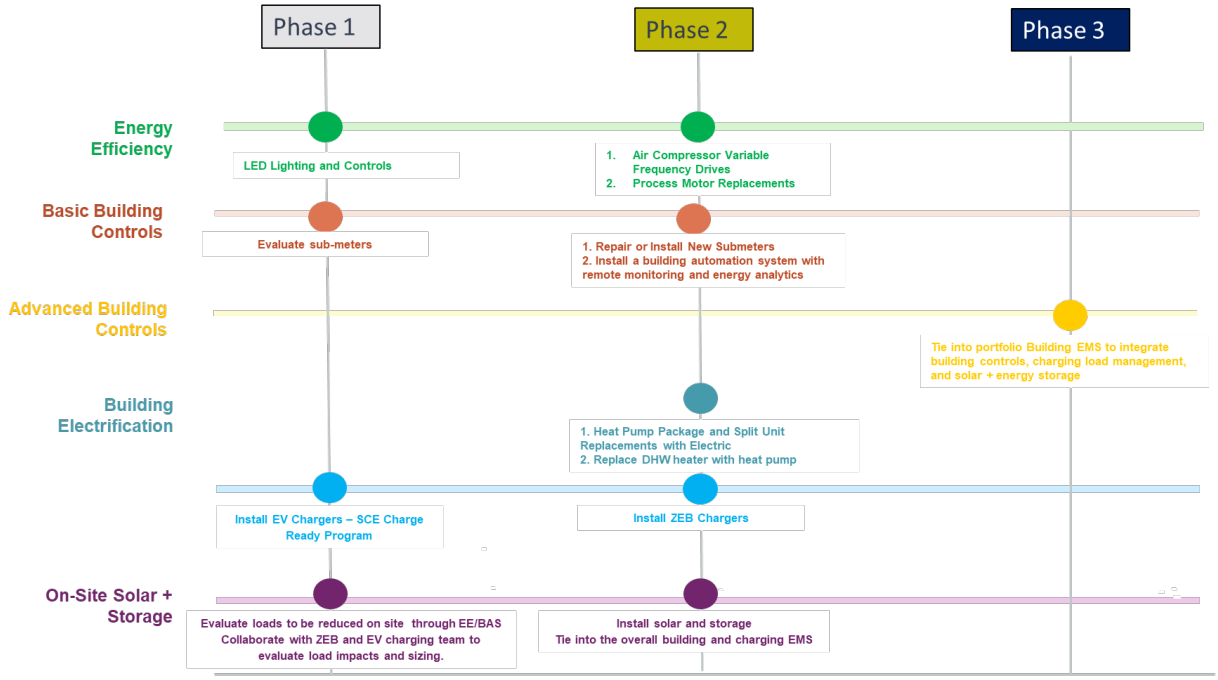


Figure 15: Division 18: Phased Technology Deployment Example

Site-level Technology Implementation Expected Outcomes: Division 18 Pilot

A key benefit of developing a comprehensive site technology roadmap would allow for the planned integration of solar and batteries (energy storage) as zero-emission bus infrastructure is being developed. Some of the benefits of integrating solar with bus charging infrastructure include:

- **Cost Efficiency:** Combining solar installation with bus charging infrastructure minimizes capital costs by leveraging shared resources (e.g., trenching, electrical connections).
- **Integrated Design:** Coordinated planning and installation reduce redundancy, cutting costs on labor, permitting, and project management.
- **Enhanced Return on Investment (ROI):** Solar power can directly offset charging costs, reducing long-term operational expenses.
- **Future-Proofing:** Integrating renewable energy with EV infrastructure aligns with sustainability goals and future energy demands.
- **Resiliency:** When combined with energy storage or other generating assets, solar can provide some backup power for bus chargers.
- **O&M:** Provides an opportunity to upskill maintenance personnel. Involving staff at the beginning stages of project development builds ownership, supports long-term maintenance

responsibility, and ensures O&M training and budgeting are integrated into the project costs.

Recommendation 3.2.2: TPSS Energy Storage Implementation

Building on previous microgrid and energy storage initiatives to support traction power, it is estimated that up to 75% of Metro's TPSS sites have potential for BESS. A full list of these sites is in Appendix J. Currently, a pilot project is underway, building on earlier studies that explored reliable and resilient power solutions for critical rail propulsion systems.

Earlier studies focused on a conceptual microgrid design, which included a DC-connected wayside energy storage system. During this phase, an energy storage system was evaluated to address low substation bus voltages and the capture of excess regenerative braking energy from trains. These studies aimed to enhance resiliency, sustainability, and economic efficiency while addressing low voltage issues caused by three-car trains. These issues required either a new TPSS or non-wire alternatives (NWA), such as a DC-connected BESS.

Operational changes, such as updates to operating plans or the planned addition of rail cars, along with TPSS growth and capital projects, have introduced new deficiencies in the wayside system. As a result, the earlier load flow analysis is no longer accurate. As part of a DER Capital project, an updated analysis of BESS potential at TPSS sites is currently in progress. This pilot will include a revised power load flow analysis to evaluate the current operating plan, identify the weakest points in the system, and model the projected benefits of implementing a BESS at the pilot location, Division 11, including determining its optimal size. The pilot is expected to conclude by December 2025. During this time, the project team will collaborate with Metro Wayside Engineering Staff to identify other potential weak points across Metro's rail network, assess the feasibility of BESS deployments, conduct cost-benefit analyses, and develop a standardized implementation plan for rolling out BESS across all suitable TPSS sites.

Recommendation 3.2.3: Long-Term Solar Expansion Across Metro Sites

In addition to Metro's existing 2.6 MW of solar and 1.5 MW of planned solar, as well as the solar that can be paired with batteries at critical bus divisions, Metro has the opportunity to expand solar installations at other locations, bringing the total potential solar capacity to 64 MW. These locations would include Rail Maintenance Divisions, Park and Rides, and Passenger Stations. The list of sites with solar potential can be found in Appendix J. It is recommended to prioritize the development of a more robust solar O&M framework before initiating this expansion. The additional solar capacity is estimated to be planned and developed beyond the initial 12–18 months of the EMP implementation plan. This timeline would also allow for determining the appropriate project delivery structure (e.g., PDBOM, PPA, or other) based on Phase 1 EMP implementation activities and the outcomes of the Division 18 pilot.

Recommendation 3.3: Resiliency Cost Benefits and Funding Mechanisms

On February 27, 2025, Metro's Board approved a motion to direct the CEO to develop a standardized cost-benefit analysis framework, using U.S. DOT analysis or a comparable methodology, for all Metro capital projects to help inform the agency's a more data-driven and transparent decision-making process for projects Metro advances. In addition to implementing Metro's standardized cost benefit framework, there are several cost-benefits as they relate to implementing the EMP recommendations and future resiliency-related investments that should be included as part of the Agency's standardized process:

- **Costs of Energy:** Reductions or increases in energy spend, including determining if any projects would require energy distribution upgrades if the project site is currently energy constrained or could become energy constrained as a result of that project.
- **Cost-benefits of Energy Storage to Provide Resiliency:** These benefits can accrue both to Metro and also community partners and include capital costs of energy resiliency, O&M costs, and quantifiable benefits of avoided costs in loss of operations or other losses due to energy supply interruptions. There are several tools that can be leveraged to support more robust resiliency cost-benefits estimates including NREL's Customer Damage Function Calculator[17]. This tool has an easy to use interface that would allow Metro to estimate the total costs associated with critical loads in the event of an outage including equipment damage, cost of back-up power and fuel, staff productivity losses and operational losses.
- **Cost-benefits to Community Partners in Line with Equity Toolkit Indicators**: Recommendation that projects that fall under EMP implementation include an early directional assessment of equity indicators and community co-benefits. This directional assessment during the planning phase would serve as an early screening opportunity to improve the efficiency of community feedback and also expand opportunities for co-benefits.
- **Cost-benefits of Carbon Reductions:** Include cost-benefit of carbon reductions and any associated environmental benefits.

A key next step would be for Metro to determine the appropriate place in the existing cost-benefit framework to and develop a process to standardize the EMP-related additional cost-benefit analyses. The OOS is already working together with Metro's finance team to coordinate on this standardized approach.

Funding Mechanisms

To support the implementation of the proposed on-site solar PV, TPSS energy storage and targeted deployment of solar + batteries at key bus divisions, Metro may need to develop a dedicated EMP Capital Annex or explore adding Solar PV to the DER existing Capital Project.

Given Metro's operating budget constraints and the challenging federal funding climate for clean energy investments, it is imperative to explore innovative approaches to mitigate cost outlays for clean energy and resiliency. Funding opportunities that are currently being investigated include:

- **Revisiting opportunities for Power Purchase Agreements (PPA), third-party ownership models, Energy-as-a-Service (EaaS), and Public-Private Partnership (P3) approaches** to finance and deploy distributed energy resources. To improve the effectiveness of future procurement efforts, Metro should develop a more robust outreach and engagement plan ahead of any solicitations. This will help ensure a sufficient number of qualified responses and increase competition. Additionally, some distributed energy resource (DER) providers are interested in integrating electric vehicle (EV) charging infrastructure into the asset mix of PPAs, offering a potential pathway to co-locate renewable energy and EV charging as part of a comprehensive, third-party financed solution.
- **Exploring opportunities to include funding for operations and maintenance costs of planned distributed energy assets**, such as EV charging infrastructure, solar PV systems,

[17] *Calculator | CDF | Results*

battery storage, and future microgrids—within progressive design-build-operate-maintain (PDBOM) contracts. To support long-term performance and workforce development, staff training requirements can be integrated into the procurement process. A phased implementation plan should also be developed to gradually increase agency-led support for O&M as internal capacity grows and cost-effectiveness improves.

> **Strategies to support funding for new solar and storage opportunities** could include adding solar and BESS in the ZEB design-build contract and could studied as part of the Division 18 DER pilot described above. Metro could also align its park and ride locations with EV charger projects and also consider mobile charging needs in support of LA28 or to provide additional EV charging capacity that can be flexibly and cost-effectively deployed as EV charging needs change.

> As part of the utility engagement process, particularly when discussing energy constrained locations and the need for essential use designations, Metro should **explore opportunities for utility co-funding**. This includes advocating for the extension or expansion of existing community microgrid programs and other distributed energy funding initiatives, even if those programs are currently fully subscribed. Proactive engagement may also help influence future program design and prioritization criteria to better align with the agency's resiliency and electrification goals.

A summary of current funding opportunities and funding mechanisms is detailed below.

	Solar	BESS	EV Charger Public	EV Charger NR Fleet & Employee	EV Charger ZEB	Electric Bus	CNG Buses
Debt-based Opportunities for Assets							
PPAs	X	X					
Loans (TIFIA, I-Banks)[1,2]	X					X	
Infrastructure Financing Districts *(funds up to Cx, does not fund O&M)*	X	X	X	X	X	X	X
Leases	X	X		X		X	X
Advertisement based charging (Volta model)			X				
Revenue Based Opportunities for Assets							
Carbon Credits[3]			X	X	X		
Tax Credits[4]		X	X	X	X	X	X
Grants		X	X	X	X	X	X
Wholesale Market	X	X			X		
Delivery Methods Opportunities							
P3s	X	X	X	X	X	X	X
PDBOM	X	X	X	X	X	X	X
Fleet-as-a-service, Charging-as-a-service	X	X	X	X	X	X	
Resiliency-as-a-service, Energy as a service	X	X	X	X	X	X	X
Other Innovative Operating Considerations							
Right sizing fleet				X		X	X
Renegotiate supplier contract						X	X

1. https://www.ibank.ca.gov/climate-financing/sectors-of-focus/

2. https://www.transportation.gov/buildamerica/financing/tifia

3. https://ww2.arb.ca.gov/news/carb-announces-latest-lcfs-updates-will-be-implemented-next-month

Increased stringency and reporting/verification requirements effective July 1, 2025. Current forward price curve for LCFS is $57 in Q4 25, increasing to $65 in Q4 2027 (as of July 22, 2025).

*4. Tax Credits: *indicates that this would need to be a partnership with a private entity as there is no tax credit for government agencies directly*

Figure 16: Summary of Current Funding Opportunities and Mechanisms

Next Steps

Recommendation 3.0 covered a wide range of topics and identified on-site generation and resiliency opportunities at nearly every Metro site. To support a phased and focused implementation approach, the priorities for the next 12–18 months will center on critical bus sites and TPSS resiliency support. These priorities include developing a comprehensive energy management roadmap, conducting cost-benefit analyses, creating an implementation schedule, making key decisions, and assessing the technology provider landscape. Additionally, lessons learned from DER and BAS pilots will be incorporated to inform the broader implementation plan and guide decision-making for FY27 activities.

RECOMMENDATION 3.0: TECHNOLOGY IMPLEMENTATION AND INTERNAL EDUCATION	EXPECTED OUTCOMES: PHASE 1 (FY 2026-2027)	KEY PERFORMANCE INDICATORS
> **Recommendation 3.1: Energy Education** • **Recommendation 3.1.1:** Develop internal education series on energy technology (e.g., open protocol communication standards, energy and cybersecurity • **Recommendation 3.1.2:** Build on Metro workforce, ATU and Cerritos College existing charging maintenance program to identify additional technical training needed for resiliency (solar + batteries + energy management systems) > **Recommendation 3.2: Prioritize and Evaluate High Impact Sites for Future Energy Technology and Resiliency Investments** • **Recommendation 3.2.1 (bus division resiliency upgrades):** Develop a technology roadmap, implementation plan, and full cost-benefit analysis for integrating solar, energy storage, energy management, and building automation at prioritized bus sites. • **Recommendation 3.2.2 (TPSS energy storage for resiliency):** Evaluate the potential of implementing energy storage across 75% of TPSS sites • **Recommendation 3.2.3 (long-term solar expansion across Metro sites):** Expand solar only installations across Metro's portfolio to increase clean energy generation and reduce energy costs. > **Recommendation 3.3: Resiliency Cost-Benefits and Innovative Funding Mechanism** • **Recommendation 3.3.1:** Include resiliency (avoided losses) benefits in standardized cost-benefits framework. • **Recommendation 3.3.2:** Identify appropriate capital planning pathways to support clean energy and resiliency investments. • **Recommendation 3.3.3:** Identify innovative funding mechanisms that can mitigate costs.	> Expanded workforce development opportunities that support equitable and just energy transition > Optimize and prioritize locations for resiliency investments > Increase cost-effectiveness through robust CBA at early planning stages > Increase effectiveness and responsiveness from technology RFPs (vendor screening) > Increase collaboration and effectiveness on technology implementation > Increase co-funding and cost mitigation on capital projects	> Address skill gaps requirements to maintain energy technology assets in a state of good repair > Training needs assessment and educational development plan created > Resiliency cost-benefit trade-offs are identified and quantified > Resiliency planned at critical sites > Higher quality vendor responses to energy technology management RFPs > Use of new funding mechanisms to support energy planning needs

Table 20: Summary of Technology and Workforce Development Recommendations

Recommendation 4.0: Stakeholder Engagement

Metro considers all who reside, work and travel within Los Angeles County to be stakeholders of our agency. Stakeholders play a crucial role in any Metro project. Listening and responding to community concerns through broad, equitable stakeholder engagement is foundational to achieving our mission of providing mobility and access to opportunity for all.

Metro's community partners will play an important role in the implementation of the EMP. Stakeholder involvement is critical to co-developing new training program curriculum, helping expand energy technology training and certifications and increasing the co-benefits for communities as Metro's invests more deeply in clean energy technologies and resiliency at their critical sites and divisions.

Based on feedback from the development of Metro's Equity Toolkit which will be finalized later in 2025, and also reinforced by a sampling of community partner feedback as part of the development of the EMP to enhance equitable outcomes include:

> Early collaboration

> Demonstrate collaboration benefits

> Facilitate collaboration across the project lifecycle

The recommended priorities for stakeholder engagement in support of energy planning are:

> **CBOs:** Strengthening relationships through proactive leadership and engagement with community partners around energy projects, energy technology co-benefits and opportunities for joint projects. This proactive engagement helps support the equity use indicator assessments which is included as part of the cost-benefit analyses in Recommendations 3.3.

> **Workforce Development Partnerships:** Target workforce development partnerships that can help Metro advance internal workforce development and create broader opportunities for community equity through workforce development.

> **Communicating Progress:** Ensuring that progress and community benefits are communicated on Metro's website and ESRI dashboards.

Recommendation 4.1: Community-Based Organizations

In addition to workforce development partnerships, Metro can expand collaboration with CBOs and the SC to support new workforce initiatives and help identify critical stakeholders and community co-benefits for more localized clean energy technology and resiliency investments. A summary of the community engagement process used for the development of the EMP is described in Appendix E.

Metro's SC could be expanded with the recommendation of adding an energy subcommittee and/or on-going energy planning standing agenda topic to support the EMP next steps. As part of the initial step of engaging with new organizations, The EMP project team conducted a stakeholder outreach process to gather insights and initial perspectives during the EMP development. The outreach process aligned with Metro's CBO Partnering Strategy[18] focusing on a primary goal of seeking CBOs to advise and consult on the EMP's scope and goals. It also was an opportunity for the project team to disseminate information to CBOs by raising awareness of

[18] *Metro CBO Partnering Strategy*

a forthcoming plan and solicit ideas for future Community Engagement approaches as the EMP moves to future implementation. The organizations that were surveyed for the EMP were also invited to join the SC.

Metro Energy Master Plan CBO Recommendations

Each of the five CBO interviews and subsequent surveys generated substantive feedback and insightful commentary. The collective insights summarized below fall into six general categories for ongoing consideration by the EMP project team.

Engage Communities Early and Meaningfully

All five participating CBOs provided some version of the feedback to engage with local communities earlier in planning processes. Early engagement was cited as an effective way to identify options and solutions that result in greater mutual benefits from Metro planned projects or initiatives. Overall, the insights shared emphasized that it is disempowering for community members and local CBOs to be invited into planning processes after decisions have been made. One participant cited "plan fatigue" to describe how communities receive notification of a completed plan where there is no opportunity to comment or help shape outcomes.

Energy Solutions Extend Beyond New Technologies

CBO participants shared clear, local perspectives on energy use, clean energy solutions and community experience during the interviews. One pointed out that energy planning is about land-use decisions, and it is critical to incorporate local level interests and advocacy positions with early engagement strategies. Given the breadth of topics the EMP addresses, the range of energy-related feedback was equally broad:

> There's no cleaner energy than walking or riding a bike.

> Expanding EV charging locations does not help with LA's car dependency.

> Consider community benefits for clean energy infrastructure: 1) appearance, 2) less disruptive and 3) co-benefits for a greater purpose.

> Electric bikes can fill the gap for longer trips and fitness benefits; Increased need for secure parking with more expensive e-bikes.

> Share clear cost versus benefit analyses of proposed energy related actions to demonstrate value and level of impact of any changes within communities.

> Consider co-locating planned electric vehicle charging with communities with nearby access to Metro trains and buses to reduce parking lot expansion and provide community co-benefits.

> Explore ways to support electric vehicle charging for multi-family and affordable housing developments.

> Focus on increasing bike lanes with seamless integration to other urban transportation interventions like Bus Rapid Transit lanes.

> Consider programs for e-bike / cargo e-bike opportunities for families as part of energy planning.

> Explore a climate/GHG public transit information source for riders like calorie counting for different transportation modes.

> Look at resiliency and reliability throughout the system. For example, conduit hardening and seeking to minimize copper and other theft that can occur with new clean energy technology.

Focus on Increasing Ridership for Reducing Energy Use

CBO participants shared recommendations for Metro to elevate increased ridership for existing public transit as a key strategy for energy reduction, sustainability and community health outcomes. These insights focused on behavioral changes over technology solutions:

> The ZEB focus is a disservice for existing transit options. It is better to get people onto the existing transit (trains/buses) system over more zero emission buses.

> Make buses feel exclusive as a higher tier of transportation than cars.

> Get bus passes into the hands of community members – increasing ridership is key.

> Stations need to be accessible for bikes, scooters, strollers and pedestrians to increase rider adoption.

> Consider bus route changes that intersect with existing community facilities/hubs.

> Fund bus shelters and make shelters specific to the communities to increase ridership (e.g. enhanced street art).

Workforce Development Partnerships Abound

Participating CBOs provided several recommendations around workforce development and training as part of building out local clean energy resources. These recommendations ranged from training youth for future careers to providing job opportunities to local communities to support ongoing maintenance of clean energy assets. Communicating through CBO partners was also highlighted as a key to success as they are the organizations doing the on-the-groundwork in communities. Many workforce training ideas were shared including:

> CBOs already offer workforce training programs to youth and people in transition. Proactive CBO partnerships can have mutual benefits for the energy transition.

> Engage young people in workforce development/job training opportunities for new technology (real, non-robot opportunities).

> Develop budgets for the maintenance of resources in underserved and "disadvantaged" communities.

> Focused workforce development with youth leadership and leverage student days for key technical topics (e.g., electrification process).

Access and Safety Remain a Top Priority

Metro's existing priority on safety and access was further reinforced throughout the interviews and survey follow-up. As one participant stated, "Metro is more useful when accessible and safer." Metro's First/Last Mile considerations were also highlighted as important in these comments:

> Ensure access to stations for cyclists (directly from bike lanes) and pedestrians alike.

> Install secure bike lockers / storage options. This is especially important with more expensive e-bikes.

> Explore how to "activate" stations – increasing safety with friendly community vibe or allowing street vendors in-station.

> Focus on bike path improvements over more parking lots.

Funding and Resources

Suggestions were also provided for funding and resource consideration to support enhanced CBO participation, project grant funding and programs and re-prioritizing funding towards projects that reduce car dependency, public transit and active transportation solutions.

> Budget for maintenance of resources in underserved and "disadvantaged" communities.

> Supporting communities with EV charging projects that add local value and maintenance workforce opportunities.

> Put money toward implementation projects over more planning.

> Explore funding that supplements limited city services.

> Budget for discretionary funding for CBOs to implement portions of LA Metro's energy planning.

> CBOs do the groundwork but need support to fully engage (e.g. grant writing help, project funding, and overhead capacity support that is limited within non-profit organizations).

Recommendation 4.2: Workforce Partnership Opportunities

The other critical stakeholder group supporting Metro's energy planning include community partners that can support internal education, technology partner engagement and also expand workforce development opportunities throughout Metro's service area through co-design of new training programs to ensure equity in access to advancement and also to support Metro's own labor management framework.

Metro's labor-management framework should be leveraged to:

> Establish **joint labor advisory committees** to guide workforce impacts and co-manage retraining resources.

> Expand existing partnerships with institutions like Cerritos College and LA Trade Tech to deliver **targeted technical certifications** in EV systems, solar PV, and energy management software.

> Use labor contract negotiations to **embed sustainability and energy transition language**, aligning job classifications and duties with the EMP's goals.

Construction Workforce Expansion and Skills Demands

The buildout of energy infrastructure is expected to increase demand for skilled trades such as electricians, laborers, HVAC technicians, solar PV installers, and control systems technicians. Through the PLAs mandated use of union labor and apprenticeship programs, Metro will be positioned to:

> Scale up its Helmets to Hardhats initiative for veterans.

> Expand opportunities for Local and National Targeted Workers, as defined by residency in economically disadvantaged areas.

> Provide thousands of hours of union apprenticeship work, of which at least 50% must be performed by Local Targeted Workers.

This alignment allows EMP projects to become a direct catalyst for career pathways in high-road green jobs, while reinforcing Metro's Construction Careers Policy. Each new capital project can serve as a training ground for future journeymen in the clean energy economy.

Equity, Inclusion, and Labor Protections

Under Metro's PLA, Metro is committed to equitable access to job opportunities for workers historically excluded from construction trades. This includes:

> Hiring a minimum of 40% of labor hours from Local Targeted Workers, with priority to residents living within five miles of the project site.

> Guaranteeing that at least 10% of labor hours are completed by Disadvantaged Workers (e.g., veterans, formerly incarcerated, single parents, or foster youth).

> Allocating 20% of labor hours to state-certified apprentices, ensuring long-term industry sustainability

Recommendation 4.3: Socialize energy goals and constraints with regional energy partners

Community engagement will also be part of Metro's ongoing conversation with utilities and regional energy partners including the LA 100 Plan advisory group. The LA100 Plan documents are updated periodically and incorporate community input through robust outreach and engagement. Sharing the EMP findings with other regional energy partners (e.g. SoCalREN, LA County) is also recommended to help identify resiliency co-funding opportunities and also to bolster support for conversations with utilities and state energy agencies.

Recommendation 4.4: Communicate Progress and Benefits of Energy Planning

A important tool to support more proactive engagement with Metro's riders, the general public and community partners involve planning for and prioritizing Metro's communications around energy usage, clean energy deployment and community co-benefits.

Some strategies that Metro could consider include:

> Development of a one-page fact sheet about the EMP post Board approval. This can be posted on the website along with the EMP report. Include visualization of metrics such as percent renewable energy, GHG reduction and capital projects in ways that are familiar with the public.

> Develop a "call to partner" targeting key regional energy planning and utility partners. Disseminate the fact sheet and EMP report to those partners from the CEO's office with an invitation and call to action around community projects and how we can scale our efforts more collaboratively.

> Leverage the SC to help communicate Metro's needs around innovative funding, make technology partners introductions and help expand project partner opportunities and support CBO engagement.

> Enhance the existing public-facing Metro Energy Dashboard to include the EMP fact sheet and report.

> Explore a way to include signage at upgraded facilities and EV charging stations to indicate clean energy or environmental benefits of projects.

RECOMMENDATION 4.0: EXPAND COMMUNITY-BASED AND WORKFORCE PARTNERSHIPS TO ACCELERATE AND STRENGTHEN ENERGY INVESTMENTS	EXPECTED OUTCOMES: PHASE 1 (FY 2026-2027)	KEY PERFORMANCE INDICATORS
> **Recommendation 4.1: Community Partners** • Expand SC to support energy goals; operationalize initial feedback from CBOs on energy planning > **Recommendation 4.2: Labor/ Workforce Development Partners** • Leverage community partners as workforce enablers (skills and job development) > **Recommendation 4.3: Regional Energy Partners** • Socialize energy goals and constraints, identify resiliency co-funding opportunities and needs > **Recommendation 4.4:** Communicate Progress and Benefits of Clean Energy and Energy Resiliency Benefits	> Extend co-benefits and cost sharing of resiliency investments > Operational approach to sharing and receiving best practices on energy technology implementation > Support workforce development and energy transition equity objectives > Increase community awareness of and engagement around energy planning and resiliency investments	> Equity considerations are developed as part of directional assessments during project planning > Community engagement is included as part of planning stage of energy-related project development > Job training partnerships expanded; training needs assessment and educational development plan created > Public facing materials about energy planning process are updated and easily available via Metro's website and other public-facing dashboards

Table 21: Summary of Stakeholder Engagement Recommendations

EMP Equity Impacts

EMP recommendations include the development of additional on-site clean energy generation, energy management and resiliency technologies at critical sites to provide local health benefits, and opportunities for continued workforce development partnerships. These recommendations will support long-term operational sustainability of the growing transit system, positively impacting Equity Focus Communities (EFCs), customers, and broader transit system users across LA County.

As part of the development of the EMP, the team engaged the Office of Equity and Race to develop a plan for community feedback to better understand the implications of the EMP strategies and recommendations. The team conducted a stakeholder outreach effort during the development of the plan with the goal of soliciting early perspectives from organizations across Metro's service area as to needs of – and insights from – local communities. This was primarily accomplished via interviewing five CBOs that had not previously engaged in other Metro sustainability or climate-related efforts. This engagement opportunity was posted through the CBO Database and aligned with Metro's CBO Partnering Strategy.

Several key recommendations were incorporated from this CBO outreach into the EMP including ongoing CBO engagement, exploring workforce development partnerships, and ensuring that energy equity indicators and benefits are communicated publicly via Metro's website and/or data dashboards.

To achieve equity objectives, the EMP recommendations include the integration of equity assessments in early project and program planning phases using the data and resources from the forthcoming Equity Toolkit, Community Demographic Profiles, and Metro's Cost Benefit Analysis for larger capital projects. The data and insights collected from these assessments are intended to support the ongoing evaluation and continual improvement of energy equity as part of Metro's Equity Platform.

Next steps in the implementation of equity objectives as part of energy planning will include an equity directional assessment for the Division-18 distributed energy resource feasibility plan. Community engagement will also be part of Metro's ongoing conversation with utilities and regional energy partners including the LA 100 Plan advisory group. The LA100 Plan documents are updated periodically and incorporate community input through robust outreach and engagement.

EMP Vehicle Miles Traveled Impacts

Vehicle Miles Traveled (VMT) and VMT per capita in Los Angeles County are lower than national averages, the lowest in the Southern California Association of Governments (SCAG) region, and on the lower end of VMT per capita statewide, with these declining VMT trends due in part to Metro's significant investment in rail and bus transit.[19] Metro's Board-adopted VMT reduction targets align with California's statewide climate goals, including achieving carbon neutrality by 2045. To ensure continued progress, all Board items are assessed for their potential impact on VMT.

As part of these ongoing efforts, this item is expected to contribute to further reductions in VMT. While this item does not directly encourage transit, sharing a ride, or using active transportation, it is a vital part of Metro operations, as it supports operational resiliency, environmental and sustainability goals and cost-effective energy management strategies. Because the Metro Board has adopted an agency-wide VMT Reduction Target, and this item supports the overall function of the agency, this item is consistent with the goals of reducing VMT.

[19] Based on population estimates from the United States Census and VMT estimates from Caltrans' Highway Performance Monitoring System (HPMS) data between 2001-2019.

Implementation Plan and Proposed Performance Metrics

Schedule- what are the priorities for the next 12 months look like?
Who is responsible for implementation? How do various departments coordinate going forward?
What are the Key Performance Indicators?

The next steps to implement Metro's EMP will involve developing a comprehensive plan that addresses all four areas of recommendations, with clearly defined next steps, ownership, and deliverables. As the draft of this plan is shared and feedback is further incorporated, additional details and refinements are expected.

At a high level, the agency can anticipate the following over the next 12–18 months, as summarized in the high-level plan below. The OOS and the EMP Steering Committee will play critical stewardship roles in driving progress and providing ongoing updates. Support and collaboration from various Metro departments and functions—including Office of Management and Budget (OMB), Procurement, Capital Planning, Program Management, and FM—will be essential to advancing in a more strategic and proactive manner. Additionally, all capital project funding mechanisms will need to be identified and planned for.

Phased implementation of the plan will be key to ensuring a systematic and cost-effective roll-out, while also providing opportunities to incorporate lessons learned into future planning phases. Over the next 12–18 months, Metro's Board and leadership can expect to see progress in each of the recommended areas, laying a strong foundation and building confidence as the agency prepares for larger capital investments in resiliency, clean energy generation, and cost-effective energy management technologies.

The benefit of this approach is that it will create an opportunity for Metro to come together as an organization, working collaboratively toward a more resilient and cost-effective clean energy future. This strategy will foster greater buy-in, stronger collaboration, and a shared understanding of the energy-related opportunities ahead.

	RECOMMENDED ACTIONS	LEAD	FY 2026-2027 KPIS	TIMING	KEY MILESTONES/ DECISIONS
RECOMMENDATION 1.0: ENERGY MANAGEMENT PLANNING					
1.1	Develop Energy Management Steering Committee	OOS, Steering Committee	Meeting frequency and committee charter established		
1.1	Quarterly meetings	OOS	Identify participants	Begin Q4 2025	Kick-off November 2025
1.2	Socialize EMP with utilities and energy regulatory agencies.	OOS	EMP forecast and energy cost and resiliency concerns communicated to key utility and state energy partners.	Winter 2025-Spring 2026	Develop engagement plan with SCE/LADWP; share EMP forecasts and energy cost concerns
1.3	Develop SOPs and process requirements for energy project implementation	OOS	Technology roadmap and implementation schedule developed for prioritized energy management sites		
1.3	Develop capital project for EMP (solar O&M, additional solar)	OOS	Solar Capital Project Developed	Late Fall 2025-June 2026	Decision point late Fall 2025 on how to fund EMP implementation
1.3	Develop full checklist for all EMP projects CBA and site screening process	OOS	Sustainability and Resiliency cost-benefit factors for Construction projects developed	In progress	Begin process with current DER pilots. Draft checklist developed December 2025. Full screening process implemented by June 2026 with capital cost projections
1.4	Build backbone data and information management requirements	OOS	Gaps identified and plan developed; ESRI dashboards developed	June 2026	Additional costs
1.5	Update energy demand forecast (annual)	OOS	Data collection process and SOP included as part of EMP steering committee	Spring 2026	Updated forecast available and annual report delivered to Board in May/June 2026
RECOMMENDATION 2.0: ENERGY SUPPLY					
2.1	Report out on essential use designation	OOS	Essential use designation expanded to requested sites	In progress	Designation received January 2026
2.2	Present recommendation and outline the process for determining an increase in renewable energy supply content	OOS, Procurement	Decision point by January 2026	January 2026	Prior to Metro budget setting

	RECOMMENDED ACTIONS	LEAD	FY 2026-2027 KPIS	TIMING	KEY MILESTONES/ DECISIONS
2.3	Finalize plan for PV O&M repairs, replacement cycle, and EAMs	OOS	Solar O&M plan completed by December with additional costs to replace system components. Integrate PV systems into EAMS	In progress	On-boarding of replacement O&M provider, Fall 2025
2.4	Develop capital project for ongoing PV O&M and replacements	OOS	O&M strategy finalization milestone (date) Percent of systems addressed System replacement completion rate (%) Preventative maintenance completion rate (%) Generation vs. expected output (%)	January - March	Informed by O&M plan for existing systems
RECOMMENDATION 3.0: ENERGY TECHNOLOGY IMPLEMENTATION AND WORKFORCE DEVELOPMENT					
3.1	Internal education workshops	OOS	Establish quarterly workshops, energy security/cybersecurity workshop held	In progress	Launch first educational webinar, Fall 2025
3.1	Metro Workforce Development	OOS/Metro Workforce/FM	Develop skills gap assessment for resiliency technologies; Develop coordination plan with FM and Union Labor	January 2026	Additional skills and training needs identified as part of existing Cerritos College workforce training plan.
3.2	Develop Division 18 energy technology and resiliency roadmap and costing	OOS	Division 18 Energy Resiliency Roadmap and Cost-Benefit analysis completed	In progress	December 2025 report out on KPIs and expected outcomes
3.2	TPSS + BESS roadmap and costing	OOS	Traction Power Substation Energy Resiliency Roadmap and Cost-Benefit analysis completed	In progress	December 2025 report out on KPIs and expected outcomes
3.2	Prioritize and evaluate high impact sites for potential resiliency and energy technology implementation	OOS	Priority sites agreed upon	Begin after Division 18 pilot (early 2026)	Identify number of sites for next phase (2-4 sites)
3.2	Building automation pilot	OOS	Cost-Benefit of building automation and enterprise wide plan developed	In progress	December 2025, identify enterprise wide implementation plan and estimated O&M cost savings

	RECOMMENDED ACTIONS	LEAD	FY 2026-2027 KPIS	TIMING	KEY MILESTONES/ DECISIONS
3.3	Develop resiliency costing and incorporate into CBA process	OOS, Finance	Agency has standardized approach to energy technology investments and can capture cost-benefits of resiliency	Incorporate CBA output from Division 18 pilot in December 2025	Document and socialize recommendation framework for EMP projects
RECOMMENDATION 4.0: STAKEHOLDER ENGAGEMENT					
4.1	Expand SC with CBOs	OOS			
4.1	Operationalize CBO feedback into equity assessment screening	OOS, Finance	Equity directional screening used in FY 2026 DER pilot projects	In progress	Use Division 18 pilot as test case for expanded CBA
4.2	Expand community workforce development partnerships	OOS, Metro FM, HR	Socialize energy technology training and workforce development needs with community education partners	January 2026 formalize	Input from DER and BAS pilots
4.3	Socialize EMP and energy goals with community partners	OOS	SC updates; fact sheet creation; communications plan	Begin January 2026	By March 2026, fact sheet and community engagement blast
4.4	Communicate progress and community benefits	OOS, DER	Communications plan developed		
4.4	Expand website and ESRI dashboard	OOS	Website and dashboards updated	Begin January 2026	Create fact sheet by December 31, 2025
4.4	Signage proposed for existing DERs/charging stations	OOS, Marketing	Signage for EV charging stations and existing solar	Begin March/April 2026	Initial signage installed by June 30, 2026

Appendices

Appendix A: List of Completed and In-Process Studies

- 2011 – Energy Conservation and Management Plan
- 2011 – Renewable Energy Policy (Needs Update)
- 2012 – Climate Action and Adaptation Plan
- 2019 – Climate Action and Adaptation Plan
- 2019 – Microgrid Phase I Feasibility Study
- 2020 – Moving Beyond Sustainability Plan
- 2020 – Building Management Systems Assessment
- 2020 – Microgrid Phase II Report
- 2021 – ZEB Master Plan
- 2020 – ESFV Distributed Energy resources opportunity study
- 2022 – Electric Vehicle Parking Strategic Plan
- 2022 - All Hazards Mitigation Plan
- 2022 – Long Term Energy Efficiency Plan 2023-2033
- 2024 – Building Automation Integration Roadmap (In Process)
- 2025 – Moving Beyond Sustainability Plan – Update pending
- 2025 – Climate Action and Adaptation Plan – Update pending
- 2025 – In progress
    - Division 18 – Battery Storage to support ZEB roll-out
    - Battery Storage to support Traction Power (in progress)
    - Building Automation System pilot

Appendix B: Data Sources

1. 2023 Metro PV Performance Report (02.16.2024)
2. 2024 Metro PV Repair Approaches Report (04.29.2024)
3. Airport Metro Connector Completion.msg
4. All-Hazards Mitigation Plan (07.13.2022)
5. ChargeSim Analysis All Divisions Report (9.12.2023)
6. Clean Power Alliance Non-Residential Rates (07.01.2024)
7. East San Fernando Valley Transit Corridor TPSS
8. Eastside Transit Corridor Phase II Project
9. Electric Vehicle Strategic Plan 2023-2028 (May 2022)
10. ElectricNG_Water Meter Validation.xslx (06.25.2020)
11. Energy Efficiency Long Term Plan 2023-2033
12. Energy Master Planning Workshop Sustainability Council (03.11.2022)
13. EVGateway LA Metro EV Charging Activity Report
14. Firm Fixed Price Contract Between Los Angeles County Metropolitan Transportation Authority and Peacock Systems (03.21.2023)
15. FM – Projects List (11.22.2024)
16. Green Power for a Green L.A.™ Program | LADWP
17. Greenbutton
18. Interval Data Account Info.xslx
19. K(C) Line Extension to Torrance TPSS Sites
20. LA Metro DER Opportunities List.xslx (10.1.2021)
21. LA Metro Priority Locations for Distributed Energy Resources Memo (06.28.2021)
22. LA Metro Proposed Forecast Assumptions (11.05.2018)
23. LADWP: Power Capacity GIS Map
24. Los Angeles County LA Metropolitan Transportation Authority Office of the Inspector General “Is LA Metro Ready for Climate Change?” (07.18.2019)
25. Los Angeles County Metropolitan Transportation Authority Energy Efficiency Long Term Plan 2022-2032
26. Los Angeles County Metropolitan Transportation Authority Final Rollout Plan (March 2021)
27. Los Angeles County Metropolitan Transportation Authority Zero-Emission Vehicle (ZEV) Purchasing Policy (12.9.2024)
28. MCP LEED Energy Model SUB 00266 Summary Page
29. Metro 2020 Long Range Transportation Plan
30. Metro Climate Action and Adaptation Plan 2019
31. Metro DER CRITERIA-Master List.xslx (06.10.2021)
32. Metro Gold Line Foothill Extension – Submittal Review Form
33. Metro NR Fleet Vehicle Procurement Plan_Delay_2024.02.04.xslx
34. Metro Operating Divisions and Other Major Facilities (2016)
35. Metro Program Management Master Schedule (January 2024)
36. METROPOLITAN TRANSIT AUTHORITY November 2024 CPA Report
37. Microgrid Feasibility Study (July 2019)
38. Microgrid Feasibility Study Phase II (June 2020)
39. Moving Beyond Sustainability, Sustainability Strategic Plan (2020)
40. Utility Power Content Labels
41. Program Management Major Capital Projects Quarterly Schedule Report (September 2024)

42. Rooftop Solar Potential & Financial Assessment for Metro Facilities in LADWP (12.10.2021)
43. Rooftop Solar Potential for Metro Facilities in LADWP (July 2022)
44. SCE Capacity Constraints.xslx
45. Southeast Gateway Line Transit Corridor Traction Power System Traction Power Substation No. 17 Site Plan (03.06.2025)
46. Systemwide Baseline Change Notice (SBCN) (11.03.2021)
47. TPBC Doc Log #15983200-2021-10-13-A
48. Transmission Generation Interconnection Planning Regions (12.06.2010)
49. USG – Projects List (11.13.2024)
50. Washington Metropolitan Area Transit Authority Zero-Emission Bus Transition Plan (March 2023)
51. Watchwire
52. Westside Purple Line Extension Section 2 Century City Constellation Station
53. Westside Purple Line Extension Section 2 Wilshire/Rodeo Station Site Plan
54. Westside Purple Line Extension Section 3 Stations Tunnels, Cross Packages, & Track
55. ZEB Capacity Upgrade Forecast (7.10.2024)
56. ZEB Program Division Electrification Detailed Schedule
57. ZEB Upgrades.msg
58. ZEB Program Quarterly Update (01.16.2025)
59. Zeroing in on Zero-Emission Buses (February 2024)

Appendix C: Modeling Methodology

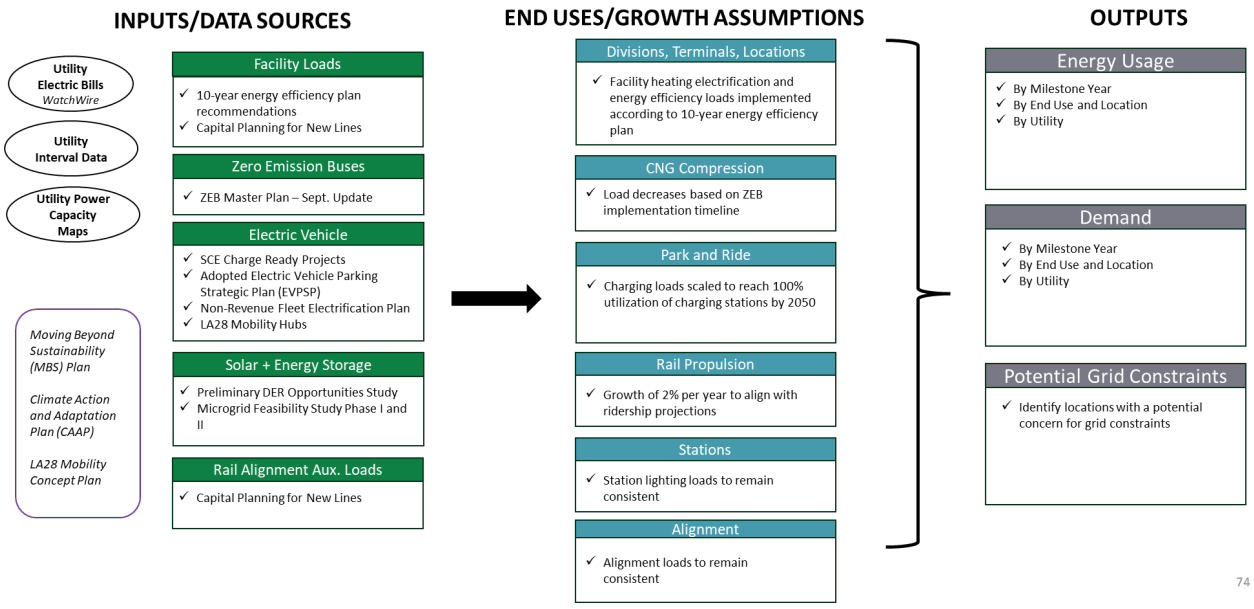


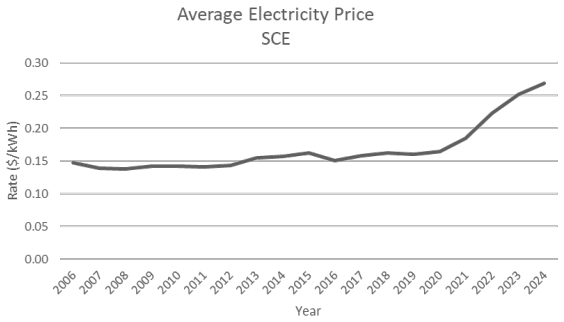
Figure 17: Modeling Methodology

Appendix D: Forecasting Assumptions

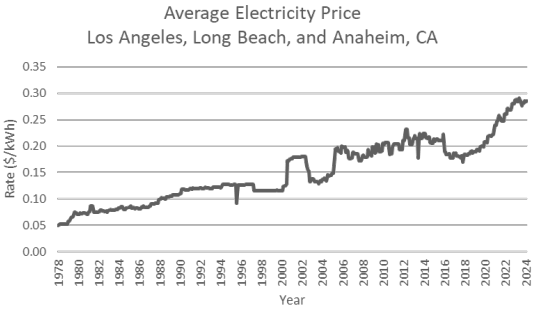
Utility Assumptions

> Assumed an overall 6% growth rate in utility costs, for electricity and natural gas. This was used based on historical average rate/inflation increases 3-13%.

Electric Energy Projected Cost Increases Due to Inflation and Rate Increases



5 years 2019-2024 13% annual increase
10 years 2014-2024 6% annual increase
18 years 3.4% annual increase



LA Region Average 2006-2024
5 years 2019-2024 8% annual increase
10 years 2014-2024 3.7% annual increase
20 years 2.8% annual increase

Figure 18: Average Electricity Prices

Sources:
https://fred.stlouisfed.org/series/APUS49A72610
https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/historical-electric-cost-data/bundled-system-average
https://www.eia.gov/todayinenergy/detail.php?id=65284
https://www.latimes.com/california/story/2024-02-28/ladwp-and-edison-bills-are-rising-what-you-can-do-to-keep-the-price-down

Solar Assumptions

> Assumed solar installation capacity would follow the "METRO DER CRITERIA -Master List" file. Installation importance was determined using a weighted scoring system based on several factors outlined in the table below.

CATEGORY	WEIGHTING SCALE
Solar Rating	> One to four (Four most potential)
Utility Costs	> One to three (Three most expensive $/kWh)
ZEB and On-route Chargers Proximity	> Zero or two (has charger installation or not)
EVSE Employee Sites Priority	> Zero or two (has charger installation or not)
EVSE Park and Ride Priority	> Zero or two (has charger installation or not)
EFC	> Zero or one (in EFC area or not)

Table 22: Weighted Scoring System for Installation Importance

> Assumed solar PV installations would be evenly distributed through 2050 and would be installed at priority site first.

- Assumed a representative temperature and solar curve for each month, that are used in heating and solar calculations. The temperature and solar curves are averages from TMY3 weather data from the Los Angeles area.

Zero Emissions Bus Assumptions

- Assumed the zero-emission bus implementation schedule provided in "Attachment E – ZEB Program Division Electrification Detailed Schedule," as presented to the Metro Board in September 2024.
- Assumed zero emission bus charging demand would follow the schedule outlined in "ZEB Capacity Upgrade Forecast" obtained from Metro Bus Operations. The one exception is Division 9 which used a "back-of-envelope" calculation to assume demand load and is not finalized.
- Zero-emissions bus charging magnitude and daily charging schedules were assumed to follow "ChargeSim Analysis All Divisions Report".
- On route chargers were assumed to be installed from "ZEB Capacity Upgrade Forecast". The estimated opening year spans a two-year period; therefore, it was assumed that chargers would be implemented at half of the sites in the first year and the remaining half in the second year.
- Assumed a 2% growth rate in bus charging loads to account for growing ridership and future bus additions.

EV Charging Assumptions

- Assumed Park and Ride charging stations and employee charging stations would be installed according to the board adopted "EV Parking Strategic Plan – P&R and Employee Sites". For locations where installation has not yet been completed, the installation year was shifted forward by two years.
- Non-renewable fleet charging capacity and installation year came from "NR Fleet Electrification Plan."

Traction Power Substation Assumptions

- Assumed a 2% growth rate in rail propulsion loads to account for growing ridership and future rail additions.
- Assumed TPSS BESS would reduce 15% of TPSS's energy consumption and reduce peak loads by 7.5%.
- Assumed 75% of TPSS would have a BESS installed by 2050, with a linear installation growth from 2026 through 2050

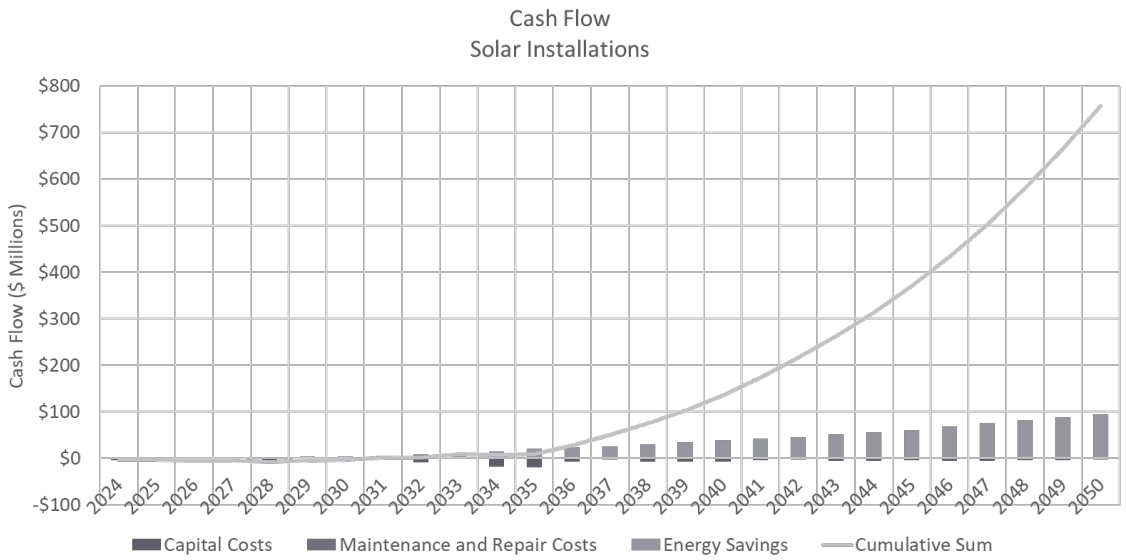


Figure 19: Cash Flow Analysis – Solar Installations

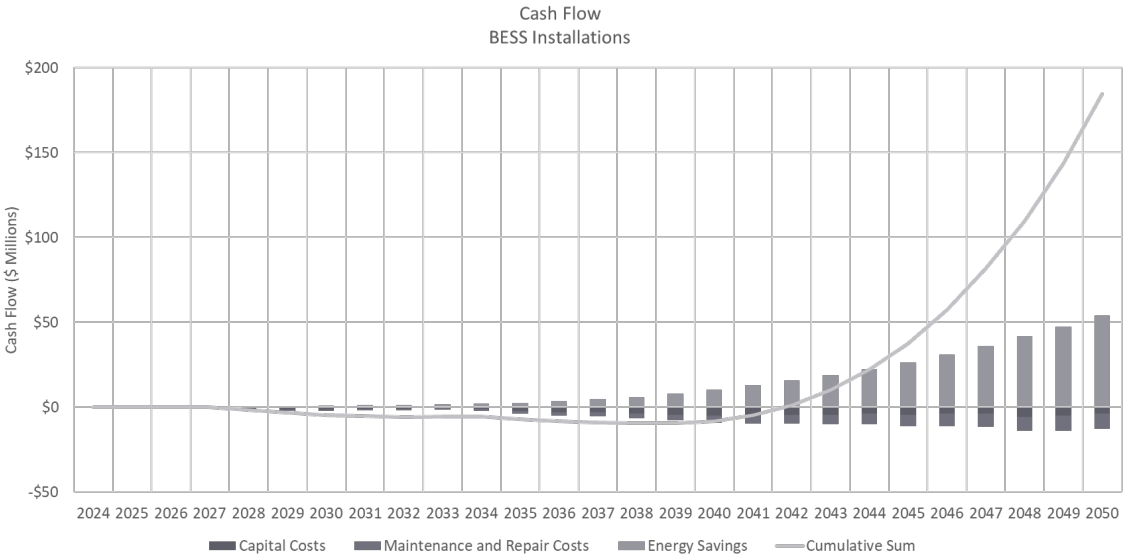


Figure 20: Cash Flow Analysis – BESS Installations

ECMP Energy Forecast 2010-2020 estimates

Metro's 2010 Energy Conservation and Management Plan projected a 90% increase in energy usage from 2010-2020. Energy cost forecasts were not provided in this report.

Table 2-4: Metro Electricity Usage Projections (kWh)

Year	Total	Inc	Existing	Expo 1	Gold Line Foothill 2A	Expo 2	Gold Line Foothill 2B	Crenshaw	Regional C
2010	177,375,129	0%	177,375,129						
2011	179,503,631	1%	179,503,631						
2012	204,112,511	15%	181,657,674	22,454,837					
2013	206,561,861	16%	183,837,566	22,724,295					
2014	223,966,825	26%	186,043,617	22,996,986	14,926,222				
2015	246,414,683	39%	188,276,140	23,272,950	15,105,336	19,760,256			
2016	249,371,659	41%	190,535,454	23,552,225	15,286,600	19,997,379			
2017	252,364,119	42%	192,821,880	23,834,852	15,470,040	20,237,348			
2018	283,158,863	60%	195,135,742	24,120,870	15,655,680	20,480,196	16,643,398	11,122,977	
2019	333,555,264	88%	197,477,371	24,410,321	15,843,548	20,725,958	16,843,118	11,256,453	46,998,495
2020	337,557,927	90%	199,847,099	24,703,245	16,033,671	20,974,670	17,045,236	11,391,530	47,562,477

Figure 21: ECMP Energy Usage Forecast 2010-2020

Appendix E: Stakeholders Consulted

Internal Metro Stakeholders

The following stakeholders were consulted and the draft analysis and recommendations were shared to receive feedback.

DEPARTMENT/FUNCTION	STAKEHOLDERS CONSULTED/INVITED	DATE(S) OF MEETING OR (EMAIL)
Office of the CEO	> Senior leadership team	> July 22, 2025 > Follow-up meetings: > August 11, 2025; August 18th; August 28th; September 15th
Procurement	> Theresa Arslanian > Joyce Percibali	> May 13, 2025
Facilities Operations	> Chris Limon > Eladio Salas > Errol Taylor > Thomas Haire > Ronald White	> May 13, 2025 > May 29, 2025
Bus Operations	> Michelle Quinn > Shaun Miller > Ryan Chan	May 12, 2025 July 31, 2025
Rail Operations	> Steve Moini > Marilyn Palacios > Diane Corral-Lopez > Christopher Reyes > Hector Guerrero > Leticia Solis > Kelvin Zan	March 11, 2025 May 27, 2025 May 27, 2025 (email)
Office of Equity and Race	> Jessica Medina > Kimberly Fisher > KeAndra Cylear-Dodds > Christopher Davis	January 15, 2025 March 10, 2025 August 13, 2025
Planning Department	> Allison Yoh	May 5, 2025 July 7, 2025
Government Relations	> Bernice Tato > Madeline Moore > Michael Turner	May 8, 2025 (email) May 13, 2025
Sustainability Council	> All members	January 2025 meeting

Table 23: Metro Stakeholders Consulted

Community Partner EMP Engagement Process

Sustainability Council

A high level summary of the EMP was shared at the January 2025 SC. SC members will be invited to provide more detailed at the end of August 2025 and their feedback will be incorporated into the final report. The OOS intends to include on-going energy master planning as a standing agenda item.

Community-Based Organizations

A request for information was sent to Metro's entire CBO database to select a small group for targeted feedback on how they would like Metro to engage with community organizations as the EMP is implemented. Five organizations were selected on the process described below. This initial feedback is intended to inform a more detailed plan of action about future engagement with community partners.

Actions, timeframe and outcomes from the EMP stakeholder engagement process included:

ACTION	TIMEFRAME	OUTCOME
Developed CBO opportunity announcement with objectives and budgets targeting 3-5 participants to receive a $500 stipend each.	March 3 – March 7, 2025	Opportunity announcement seeking compensated participation in a 1.5-hour interview and short follow-up survey.
Opportunity announcement posted on Metro CBO Database	March 11 – March 28, 2025	Received 15 responses from interested CBOs
Reviewed CBO responses against the following criteria: 1. Geographic range in Los Angeles County 2. Serving communities with an interest in, advocating for, or expanding energy related topics 3. Extending outreach beyond CBOs not normally engaged with on energy topics	March 24 – March 31, 2025	Invited 5 CBOs to participate in interviews
Conducted CBO interviews	April 14 – April 18, 2025	Project team conducted 5 CBO interviews. During the interviews, the team shared background on the EMP project, overarching goals for the EMP, other Metro resources, followed by a facilitated discussion, and questions and answers
CBO participants completed a short (6-question) survey	> April 15 – April 22, 2025	Collected additional insights, areas of interest for future partnership, and process feedback.
Stipend checks issued to CBO participants	> May 2, 2025	Confirmed stipend receipt

Table 24: EMP Stakeholder Engagement Actions, Timeframe and Outcomes

Appendix F: Best Practices – Reference Documents

SOURCE/DOCUMENT NAME	KEY TAKEAWAYS/RELEVANCE FOR METRO	LINK
A Guide to Energy Master Planning of High-Performance Districts and Communities - NREL	> Energy planning as a strategic comprehensive function > Need for utility engagement early in the process	A Guide to Energy Master Planning of High-Performance Districts and Communities - National Renewable Energy Laboratory
Foothill Transit Battery Electric Bus Evaluation: NREL Final Report (June 2021)	> Need to better coordinate ZEB delivery with charging infrastructure > Start discussions with utility partners early in the process to address demand and time-of-use charges > Need charger redundancy to avoid downtime > Develop a plan for how to provide service during an outage/emergency	NREL: Foothill Transit Battery Electric Bus Evaluation: Final Report
Electric bus charging infrastructure and microgrids: A grid edge case study Report | Wood Mackenzie	> Need to factor in operational costs > Diesel to electric has large fuel switching cost savings > Plan for depot charging with Microgrids for additional savings > AVTA followed a pattern similar to other transit agencies: Microgrids and other distributed energy resources are not often considered until after transit authority has gained experience with its first electric buses. Microgrid players may want to begin conversations with agencies during this key window after their first e-bus purchases, when potential customers are likely to be most open to learning about solutions.	Electric bus charging infrastructure and microgrids: A grid edge case study Report | Wood Mackenzie 4 Lessons From a California Transit Authority's Bus Electrification Rollout | Greentech Media
Accelerating Renewable Energy Development and Promoting Community Resiliency in Los Angeles County	> Two strategies to create greater community resiliency is through the deployment of distributed energy resources (rooftop solar paired with batteries at individual buildings) and community-level microgrids powered by renewable energy. > Ensure community benefits > Apply best practices and standards	190264.pdf
UCLA Luskin – Regional Needs Assessment (August 2021)	> Rising electricity demand across Southern California will challenge grid reliability, especially during peak summer hours > Increased high heat days forecasted in inland and low-income areas will put added strain on transit riders and infrastructure > Broad electrification efforts are expected to stress local distribution grids > Equity gaps in energy resilience highlight the need for targeted investments in disadvantaged communities	Southern California Regional Energy Needs Assessment

SOURCE/DOCUMENT NAME	KEY TAKEAWAYS/RELEVANCE FOR METRO	LINK
LA100 (NREL + LADWP)	> Electricity demand will rise 45-85% by 2045, mainly due to transportation and building electrification > Peak demand will shift to evening hours, especially with widespread EV adoption > Smart Charging and load shifting will be critical to managing costs and grid impacts > Transit agency coordination with LADWP is necessary to align charging needs with capacity > Pairing on-site solar and storage can improve resilience and energy cost control > Co-located solar and storage offers operational and cost advantages > Multiple pathways exist to reach 100% renewable energy by 2045 > All requiring large scale additions of solar, wind, geothermal, and storage > Resource adequacy and transmission reliability remain top priorities	https://www.nrel.gov/analysis/los-angeles-100-percent-renewable-study
SCE	> Net-zero by 2045 will help shape the energy landscape > SCE plans to deliver 100% carbon free electricity by 2045 > SCE forecasts 35% higher electricity demand by 2035 due to building and transportation electrification > Clean firm resources are prioritized to ensure reliable power for critical transit infrastructure, especially during evening and seasonal demand peaks	Net Zero Fact Sheet-2024
NASEM Report	> Net zero emissions by 2025 is feasible but contingent on early action and deep cuts across all sectors > Double clean electricity share to 75% by 2030 through solar, wind, nuclear, and hydro > Electrify 50% of new vehicle sales by 2030 > Reduce energy use in new buildings by 50% and old buildings by 30% by 2030 > Ensure equity and justice in deployment > Support workers and communities impacted by decarbonization > Retain grid reliability through fossil gas during transition	Accelerating Decarbonization in the United States
U.S. DOE/Energy Transitions Initiative	> Importance of phased approaches > Detail current landscape > Develop pathways > Stakeholder engagement > Develop Action Plans > Performance Metrics	Energy Transitions Playbook

Table 25: Best Practices Reference Documents

Appendix G: Summary of PV System Existing Conditions and Recommended Actions

SITE NAME	OBSERVATIONS	SHORT-TERM: RECOMMENDED REPAIRS/ACTION ITEMS	LONG-TERM, CAPITAL PLANNING (FY27): RECOMMENDED REPAIRS/ACTION ITEMS
Division 8	> Transportation Bldg. (8T): Online and generating with monitoring fully functioning > Maintenance Bldg. (8M): Remote monitoring is functional. All inverters are functioning besides inverter 6.	> Transportation Bldg. (8T): N/A > Maintenance Bldg. (8M): • Solar technician needs to investigate and repair the root cause of Inverter 6 faults • Replace Combiner Box 7 (serves Inverter 6) • Replace fuses for Strings 41 and 42 for further underlying issues. Install 10A fuse links on 13 combined strings 2	> Replace string inverters 1-11 as they fail > Remove and replace existing conduit and combiner box support sleepers with new elevated support systems (e.g., Durablok or equivalent UV-resistant, non-penetrating rooftop supports) to ensure proper cable management and structural integrity > Repair and replace all wire management components, including cable ties, clips, and trays, for conductors routed beneath PV modules and between modules and combiner boxes to ensure compliance with NEC standards > Replace all combiner boxes
Division 13	> All inverters are functioning but the Data Acquisition System (DAS) is not functional	> Remove old Sierra Wireless Raven XE Cell Modem and replace it with a new Semtech RV50X Cell Modem (includes 12 months of service)	> Rewire/relocate inverters 2-4 (string inverters on façade) > Begin budgeting for full Solectria center inverter replacement (estimated for 2030); replace as fails

SITE NAME	OBSERVATIONS	SHORT-TERM: RECOMMENDED REPAIRS/ACTION ITEMS	LONG-TERM, CAPITAL PLANNING (FY27): RECOMMENDED REPAIRS/ACTION ITEMS
Division 15	> Transportation Bldg. (15T): Remote monitoring is online with the exception of inverter 9. Some inverters are faulting, likely due to water infiltration during rain events > Maintenance Bldg. (15M): System is experiencing inverter faults and monitoring is offline. Evidence of water corrosion in a combiner box	> Transportation Bldg. (15T): • Solar technician needs to inspect and troubleshoot Inverter 9 • Combiner boxes serving inverters 8 and 10 should be replaced to address water ingress/faults • Large termination boxes that did not show signs of water ingress should be monitored annually. Any that develop leaks, corrosion on terminals, or ground faults should be replaced > Maintenance Bldg. (15M): • Install 10A fuse links on 13 combined strings • Metro IT needs to come on-site to troubleshoot why the cluster controller and inverters are not communicating with the network • Combiner boxes 6 and 7 need to be replaced	> Replace string inverters 1-11 as they fail > Remove and replace existing conduit and combiner box support sleepers with new elevated support systems (e.g., Durablok or equivalent UV-resistant, non-penetrating rooftop supports) to ensure proper cable management and structural integrity > Repair and replace all wire management components, including cable ties, clips, and trays, for conductors routed beneath PV modules and between modules and combiner boxes to ensure compliance with NEC standards > Replace all combiner boxes
Division 18	> The existing Fat Spaniel Communication Gateway is outdated and needs replacement to get communications back online	> Remove the old Fat Spaniel Communications Gateway and install new DAS with device monitoring, data storage, and maintenance for 5 years	> Replace Satcon central inverter with string inverters (roof and parking structure) > Possible shade structure(s) for string inverter(s) on building roofs

SITE NAME	OBSERVATIONS	SHORT-TERM: RECOMMENDED REPAIRS/ACTION ITEMS	LONG-TERM, CAPITAL PLANNING (FY27): RECOMMENDED REPAIRS/ACTION ITEMS
Terminal 19	> Modules are in good condition with some vegetation growth causing shading on the southern portion of the array. Overall, module shading (from vegetation, light poles) explains performance deficiencies reported on monitoring platform in all but 4 microinverters. > 4 microinverters are not functional; respective solar modules are not producing	> Remove vegetation overgrowth, where possible > Replace 4 Enphase microinverters (under warranty)	N/A
Division 24	> The conduit is incorrectly sized and causing the system to trip during operation	> The team is reviewing options to address the incorrectly sized conduit	> Rewire/run conduit to adequately accommodate system (under tracks) > Begin budgeting for full Solectria inverter replacement (approximately 2030); replace as fails
CMF	> Completed combiner boxer replacement training in May 2025. FM staff are completing the replacement of combiner boxes > The site has a history of internet access problems with the customer LAN	> Install four new cellular modems in the existing DAS boxes	> Design system with string inverters > Remove central inverters 1-4 and install string inverters > Replace combiner boxes, as needed

Table 26: Metro's Existing PV System Conditions and Recommended Actions

Appendix H: Glossary of Terms Used

TERM	DEFINITION
Building Automation System (BAS)	An integrated network of hardware and software designed to monitor, control, and optimize a building's mechanical, electrical, and plumbing systems. BAS typically manages systems such as HVAC (heating, ventilation, and air conditioning), lighting, security, and energy management, providing centralized control and automation to improve efficiency, comfort, and operational performance.
Charge Management	The control, monitoring and optimization of charging processes for electric vehicles. Charge management software efficiently manages charging times, controls energy loads, and optimizes charging during off-peak hours to minimize costs.
Distributed Energy Resources (DER)	Small-scale, localized energy systems that provide power to specific sites or operations. DERs include both energy generation and storage systems, which can be connected to electric grids or operate independently. Examples include solar PV systems, EV charging stations, microgrids and batteries for energy storage.
Electric Vehicle Supply Equipment (EVSE)	Charging stations that provide electric power to recharge electric vehicle batteries. EVSE facilities the transfer of electricity from the grid or other sources to the vehicle.
Electrification	The process of converting energy-consuming devices from non-electric sources to electricity, such as transitioning from gas-powered systems to electric-powered systems.
Energy Management System	A combination of software and hardware tools that manage and distribute energy flows between connected distributed energy resources (DERs) to optimize energy use.
Fuel switching	The replacement of technologies that consume one type of fuel (e.g., natural gas or diesel) with technologies that consume a different type of fuel (e.g., electricity). Examples include switching from diesel-powered vehicles to electric vehicles or replacing a natural gas heating system with an electric air-source heat pump.
Load Management	The active control and optimization of power consumption through software and automated systems to reduce energy costs and improve efficiency.
Microgrid	Small-scale power grid that operates independently to generate electricity for a localized area. Microgrids typically include some type of energy generation (e.g., solar PV, wind or fuel cells), energy storage and control software (microgrid controller) to manage energy distribution. Microgrids can function as part of a grid-connected system or an off-grid system, with defined electrical boundaries that allow them to act as a single controllable entity.

TERM	DEFINITION
Power Purchase Agreement (PPA)	A long-term contract between an energy generator and an energy user. Under a PPA, a third party installs energy assets, and the customer purchases the energy output from the system for a specified period.
Solar Photovoltaic (PV) system	A system of one or more solar panels combined with an inverter and other hardware that converts sunlight into electricity. Solar PV systems are considered renewable energy because their input source, the sun, is naturally replenished. They are also referred to as clean energy because the conversion process does not require carbon-based or fossil fuels. Solar PV systems can operate as part of a utility grid-connected system or an off-grid system.
Virtual Power Plant (VPP)	Systems that aggregate distributed energy resources to create a flexible energy network. VPPS use cloud-based software to connect to and manage energy use across multiple buildings or sites.

Table 27: Glossary of Terms

ABBREVIATIONS / ACRONYMS

BAS	Building Automation System
BEMS	Building Energy Management System
BESS	Battery Energy Storage System
CAAP	Climate Action and Adaptation Plan
CBO	community-based organizations
CNG	Compressed Natural Gas
COOP	Continuity of Operations Plan
CPA	Clean Power Alliance
CPUC	California Public Utilities Commission
DER	Distributed Energy Resource
EaaS	Energy-as-a-Service
EAMS	Enterprise Asset Management System
ECMP	Energy Conservation and Management Plan
EE	Energy Efficiency
EELTP	Energy Efficiency Long Term Plan
EFC	Equity Focused Communities
EV	Electric Vehicle
FY	Fiscal Year
GHG	Greenhouse Gas
HVAC	Heating, Ventilation, and Air Conditioning
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LA28	2028 Summer Olympic and Paralympic Games
LADWP	Los Angeles Department of Water and Power
LRTP	Long Range Transportation Plan
MBS	Moving Beyond Sustainability
NPV	Net Present Value

NREL	National Renewable Energy Lab
OOS	Office of Sustainability
O&M	operations and maintenance
P3	Public-Private Partnership
PDBOM	Progressive Design Build Operate and Maintain
PPA	Power Purchase Agreement
PV	Photovoltaic
RPS	Renewable Portfolio Standard
RNG	Renewable Natural Gas
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SOP	Standard Operating Procedure
TPSS	Traction Power Substation
UPS	Uninterruptible Power Supply
VMT	Vehicle Miles Traveled
ZEB	Zero Emissions Buses

Appendix I: SCE Accounts with Essential Use Designation

PROPERTY NAME	ESSENTIAL USE DESIGNATION STATUS	EXEMPTION CRITERIA	TOTATING OUTAGE ID
Willow TPSS/Willow Street Station	CPUC Decision 01-08-071	Exclusive ROW, Ballasted Track	N001
Firestone TPSS/Firestone Station	CPUC Decision 01-08-071	Exclusive ROW, Aerial	N001
Wardlow TPSS/Wardlow Station	CPUC Decision 01-08-071	Exclusive ROW, Ballasted Track	N001
Florence TPSS/Florence Station	CPUC Decision 01-08-071	Exclusive ROW, Aerial	N001
Slauson TPSS/Slauson Station	CPUC Decision 01-08-071	Aerial	N001
Artesia TPSS/Artesia Station	CPUC Decision 01-08-071	Ballasted Track	N001
Compton TPSS/Compton Station	CPUC Decision 01-08-071	Ballasted Track	N001
Del Amo TPSS/Del Amo Station	CPUC Decision 01-08-071	Aerial	N001
Dominguez TPSS	CPUC Decision 01-08-071	Aerial	N001
Imperial TPSS	CPUC Decision 01-08-071	Ballasted Track	N001
Piru TPSS/Railroad Signals	CPUC Decision 01-08-071	Ballasted Track	N001
Crenshaw TPSS	CPUC Decision 01-08-071	Ballasted Track	N001
SANTA FE AVE TPSS (TPSS10/SFS125)	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
Wright Rd TPSS	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
Western Ave. TPSS (TPSS 85)	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
Vermont TPSS/Vermont-Athens Station (TPSS 6)	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
Long Beach TPSS	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
Hawthorne Bl TPSS/HAWTHORNE/LENNOX STATION	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
El Segundo TPSS	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
DIVISION 22 TPSS A (Hawthorne Yard TPSS)	CPUC Decision 01-08-071	Exclusive ROW	N001
Bellflower TPSS	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
Norwalk TPSS	CPUC Decision 01-08-071	Ballasted Track (Median)	N001

PROPERTY NAME	ESSENTIAL USE DESIGNATION STATUS	EXEMPTION CRITERIA	TOTATING OUTAGE ID
Lakewood TPSS	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
MARSH AV TPSS	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
Douglas TPSS (TPSS 19)/ Douglas Station	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
Paramount TPSS (TPS14/SFS145)	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
WILMINGTON TCCB	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
C LINE - MISCELLANEOUS SIGNALS, STOPS, LIGHTS	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
Division 11 TPSS and Facility	CPUC Decision 01-08-071	Ballasted Track, Aerial	N/A
DIVISION 22 TPSS B and Facility	CPUC Decision 01-08-071	Ballasted Track, Exclusive ROW	N001
REDONDO BEACH STATION	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
EL SEGUNDO STATION	CPUC Decision 01-08-071	Ballasted Track, Aerial	N001
CRENSHAW BLVD/I-105 STATION	CPUC Decision 01-08-071	Ballasted Track (Median)	N001
PARAMOUNT TC&B STATION	CPUC Decision 01-08-071	Ballasted Track (Median)	N001

Table 28: Metro SCE Accounts with Essential Use Designations

Appendix J: Summary of Metro Sites with Solar PV and BESS Potential

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
DIVISION 1	Bus	1.47	3.02	Los Angeles Department of Water and Power	No	0	N/A	1458	2032	1458	N/A	N/A	2032
DIVISION 10	Bus	1.41	2.11	Los Angeles Department of Water and Power	No	0	N/A	2896	2032	2896	N/A	N/A	N/A
DIVISION 11	Rail	1.97	8.60	Southern California Edison	No	0	N/A	837	2046	837	N/A	N/A	N/A
DIVISION 12	Facility	0.20	0.13	Southern California Edison	No	0	N/A	0	0	0	N/A	N/A	N/A
DIVISION 14	Rail	0.69	3.04	Southern California Edison	No	0	N/A	512	2047	512	N/A	N/A	N/A
DIVISION 15	Bus	1.28	3.37	Los Angeles Department of Water and Power	No	247	2005	3505	2035	3752	N/A	N/A	2035
DIVISION 16	Rail	0.01	0.04	Los Angeles Department of Water and Power	No	0	N/A	901	2043	901	N/A	N/A	N/A
DIVISION 18	Bus	1.51	6.73	Southern California Edison	No	437	2007	2399	2028	2836	N/A	N/A	2028
DIVISION 2	Bus	1.96	4.10	Los Angeles Department of Water and Power	No	0	N/A	435	2032	435	N/A	N/A	2032
DIVISION 20	Rail	3.37	11.88	Los Angeles Department of Water and Power	No	0	N/A	1022	2038	1022	N/A	N/A	N/A
DIVISION 21	Rail	0.71	2.59	Los Angeles Department of Water and Power	No	0	N/A	306	2045	306	N/A	N/A	N/A
DIVISION 22	Rail	1.48	5.03	Southern California Edison	No	0	N/A	452	2047	452	N/A	N/A	N/A
DIVISION 24	Rail	1.77	8.86	Southern California Edison	No	178	2016	1395	2047	1573	N/A	N/A	N/A
DIVISION 3	Bus	1.07	3.40	Los Angeles Department of Water and Power	Yes	0	N/A	2251	2034	2251	N/A	N/A	2034
DIVISION 4	NR Vehicle	0.20	0.41	Southern California Edison	N/A	0	N/A	1815	2039	1815	N/A	N/A	N/A
DIVISION 5	Bus	1.64	4.09	Los Angeles Department of Water and Power	Yes	0	N/A	2308	2030	2308	N/A	N/A	2030
DIVISION 7	Bus	1.14	4.53	Southern California Edison	No	0	N/A	1467	2028	1467	N/A	N/A	2028
DIVISION 8	Bus	2.97	5.16	Los Angeles Department of Water and Power	No	247	2005	5035	2034	5282	N/A	N/A	2034
DIVISION 9	Bus	1.61	6.30	Southern California Edison	No	0	N/A	1458	2026	1458	N/A	N/A	2026
A LINE C LINE - TRACTION POWER SUBSTATION - 1	TPSS					0	N/A	0	N/A	0	Yes	2035	
A LINE C LINE - TRACTION POWER SUBSTATION - 2	TPSS					0	N/A	0	N/A	0	Yes	2039	
A LINE E LINE - TRACTION POWER SUBSTATION - 1	TPSS					0	N/A	0	N/A	0	Yes	2031	
A LINE - TRACTION POWER SUBSTATION - 1	TPSS					0	N/A	0	N/A	0	Yes	2045	
A LINE - TRACTION POWER SUBSTATION - 10	TPSS					0	N/A	5	2046	5	Yes	2029	
A LINE - TRACTION POWER SUBSTATION - 11	TPSS					0	N/A	4	2048	4	Yes	2050	
A LINE - TRACTION POWER SUBSTATION - 12	TPSS					0	N/A	0	N/A	0	Yes	2038	
A LINE - TRACTION POWER SUBSTATION - 14	TPSS					0	N/A	4	2048	4	Yes	2041	
A LINE - TRACTION POWER SUBSTATION - 15	TPSS					0	N/A	4	2050	4	Yes	2037	
A LINE - TRACTION POWER SUBSTATION - 16	TPSS					0	N/A	6	2050	6	Yes	2041	
A LINE - TRACTION POWER SUBSTATION - 17	TPSS					0	N/A	9	2048	9	Yes	2036	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
A LINE - TRACTION POWER SUBSTATION - 18	TPSS					0	N/A	4	2046	4	Yes	2045	
A LINE - TRACTION POWER SUBSTATION - 19	TPSS					0	N/A	0	N/A	0	Yes	2045	
A LINE - TRACTION POWER SUBSTATION - 2	TPSS					0	N/A	0	N/A	0	Yes	2049	
A LINE - TRACTION POWER SUBSTATION - 20	TPSS					0	N/A	721	2043	721	Yes	2038	
A LINE - TRACTION POWER SUBSTATION - 21	TPSS					0	N/A	42	2048	42	Yes	2033	
A LINE - TRACTION POWER SUBSTATION - 22	TPSS					0	N/A	4	2046	4	Yes	2046	
A LINE - TRACTION POWER SUBSTATION - 25	TPSS					0	N/A	21	2048	21	Yes	2048	
A LINE - TRACTION POWER SUBSTATION - 26	TPSS					0	N/A	7	2047	7	Yes	2036	
A LINE - TRACTION POWER SUBSTATION - 28	TPSS					0	N/A	4	2050	4	Yes	2046	
A LINE - TRACTION POWER SUBSTATION - 29	TPSS					0	N/A	7	2049	7	Yes	2044	
A LINE - TRACTION POWER SUBSTATION - 30	TPSS					0	N/A	4	2049	4	Yes	2040	
A LINE - TRACTION POWER SUBSTATION - 33	TPSS					0	N/A	51	2048	51	Yes	2042	
A LINE - TRACTION POWER SUBSTATION - 34	TPSS					0	N/A	6	2046	6	Yes	2036	
A LINE - TRACTION POWER SUBSTATION - 35	TPSS					0	N/A	306	2045	306	Yes	2044	
A LINE - TRACTION POWER SUBSTATION - 36	TPSS					0	N/A	33	2046	33	Yes	2049	
A LINE - TRACTION POWER SUBSTATION - 37	TPSS					0	N/A	4	2045	4	Yes	2040	
A LINE - TRACTION POWER SUBSTATION - 38	TPSS					0	N/A	5	2048	5	Yes	2031	
A LINE - TRACTION POWER SUBSTATION - 39	TPSS					0	N/A	27	2046	27	Yes	2037	
A LINE - TRACTION POWER SUBSTATION - 6	TPSS					0	N/A	0	N/A	0	Yes	2032	
A LINE - TRACTION POWER SUBSTATION - 9	TPSS					0	N/A	0	N/A	0	Yes	2043	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 1	NEW TPSS					0	N/A	0	N/A	0	Yes	2040	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2041	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 3	NEW TPSS					0	N/A	0	N/A	0	Yes	2042	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 4	NEW TPSS					0	N/A	0	N/A	0	Yes	2043	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 5	NEW TPSS					0	N/A	0	N/A	0	Yes	2045	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 6	NEW TPSS					0	N/A	0	N/A	0	Yes	2046	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 7	NEW TPSS					0	N/A	0	N/A	0	Yes	2047	
AUTHORITY BILL PROJECT FOOTHILLS EXTENSION - 8	NEW TPSS					0	N/A	0	N/A	0	Yes	2048	
C LINE - TRACTION POWER SUBSTATION - 1	TPSS					0	N/A	0	N/A	0	Yes	2040	
C LINE - TRACTION POWER SUBSTATION - 10	TPSS					0	N/A	0	N/A	0	Yes	2038	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
C LINE - TRACTION POWER SUBSTATION - 11	TPSS					0	N/A	351	2043	351	Yes	2043	
C LINE - TRACTION POWER SUBSTATION - 12	TPSS					0	N/A	0	N/A	0	Yes	2042	
C LINE - TRACTION POWER SUBSTATION - 14	TPSS					0	N/A	5	2049	5	Yes	2041	
C LINE - TRACTION POWER SUBSTATION - 15	TPSS					0	N/A	918	2039	918	Yes	2028	
C LINE - TRACTION POWER SUBSTATION - 16	TPSS					0	N/A	0	N/A	0	Yes	2039	
C LINE - TRACTION POWER SUBSTATION - 17	TPSS					0	N/A	5	2050	5	Yes	2030	
C LINE - TRACTION POWER SUBSTATION - 18	TPSS					0	N/A	5	2049	5	Yes	2035	
C LINE - TRACTION POWER SUBSTATION - 2	TPSS					0	N/A	0	N/A	0	Yes	2039	
C LINE - TRACTION POWER SUBSTATION - 20	TPSS					0	N/A	6	2049	6	Yes	2042	
C LINE - TRACTION POWER SUBSTATION - 3	TPSS					0	N/A	0	N/A	0	Yes	2048	
C LINE - TRACTION POWER SUBSTATION - 5	TPSS					0	N/A	5	2046	5	Yes	2030	
C LINE - TRACTION POWER SUBSTATION - 6	TPSS					0	N/A	11	2048	11	Yes	2039	
C LINE - TRACTION POWER SUBSTATION - 7	TPSS					0	N/A	0	N/A	0	Yes	2043	
C LINE - TRACTION POWER SUBSTATION - 8	TPSS					0	N/A	0	N/A	0	Yes	2047	
C LINE - TRACTION POWER SUBSTATION - 9	TPSS					0	N/A	0	N/A	0	Yes	2028	
C LINE EXTENSION - 1	NEW TPSS					0	N/A	0	N/A	0	Yes	2034	
C LINE EXTENSION - 3	NEW TPSS					0	N/A	0	N/A	0	Yes	2036	
C LINE EXTENSION - 5	NEW TPSS					0	N/A	0	N/A	0	Yes	2038	
C LINE EXTENSION - 6	NEW TPSS					0	N/A	0	N/A	0	Yes	2039	
E LINE - TRACTION POWER SUBSTATION - 11	TPSS					0	N/A	23	2046	23	Yes	2043	
E LINE - TRACTION POWER SUBSTATION - 12	TPSS					0	N/A	0	N/A	0	Yes	2046	
E LINE - TRACTION POWER SUBSTATION - 13	TPSS					0	N/A	0	N/A	0	Yes	2048	
E LINE - TRACTION POWER SUBSTATION - 14	TPSS					0	N/A	5	2048	5	Yes	2034	
E LINE - TRACTION POWER SUBSTATION - 15	TPSS					0	N/A	4	2048	4	Yes	2047	
E LINE - TRACTION POWER SUBSTATION - 16	TPSS					0	N/A	5	2049	5	Yes	2041	
E LINE - TRACTION POWER SUBSTATION - 17	TPSS					0	N/A	0	N/A	0	Yes	2042	
E LINE - TRACTION POWER SUBSTATION - 18	TPSS					0	N/A	4	2048	4	Yes	2045	
E LINE - TRACTION POWER SUBSTATION - 20	TPSS					0	N/A	4	2048	4	Yes	2044	
E LINE - TRACTION POWER SUBSTATION - 21	TPSS					0	N/A	0	N/A	0	Yes	2037	
E LINE - TRACTION POWER SUBSTATION - 5	TPSS					0	N/A	5	2049	5	Yes	2047	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
E LINE - TRACTION POWER SUBSTATION - 6	TPSS					0	N/A	5	2049	5	Yes	2049	
E LINE - TRACTION POWER SUBSTATION - 7	TPSS					0	N/A	31	2049	31	Yes	2035	
E LINE - TRACTION POWER SUBSTATION - 8	TPSS					0	N/A	5	2049	5	Yes	2032	
E LINE - TRACTION POWER SUBSTATION - 9	TPSS					0	N/A	0	N/A	0	Yes	2050	
EAST SAN FERNANDO VALLEY - 1	NEW TPSS					0	N/A	1000	2027	1000	Yes	2040	
EAST SAN FERNANDO VALLEY - 10	NEW TPSS					0	N/A	0	N/A	0	Yes	2041	
EAST SAN FERNANDO VALLEY - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2042	
EAST SAN FERNANDO VALLEY - 3	NEW TPSS					0	N/A	0	N/A	0	Yes	2043	
EAST SAN FERNANDO VALLEY - 4	NEW TPSS					0	N/A	0	N/A	0	Yes	2044	
EAST SAN FERNANDO VALLEY - 5	NEW TPSS					0	N/A	0	N/A	0	Yes	2045	
EAST SAN FERNANDO VALLEY - 6	NEW TPSS					0	N/A	0	N/A	0	Yes	2046	
EAST SAN FERNANDO VALLEY - 7	NEW TPSS					0	N/A	0	N/A	0	Yes	2047	
EAST SAN FERNANDO VALLEY - 8	NEW TPSS					0	N/A	0	N/A	0	Yes	2048	
EAST SAN FERNANDO VALLEY - 9	NEW TPSS					0	N/A	0	N/A	0	Yes	2049	
EAST SIDE PHASE 2 - 1	NEW TPSS					0	N/A	0	N/A	0	Yes	2037	
EAST SIDE PHASE 2 - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2038	
EAST SIDE PHASE 2 - 3	NEW TPSS					0	N/A	0	N/A	0	Yes	2039	
EAST SIDE PHASE 2 - 4	NEW TPSS					0	N/A	0	N/A	0	Yes	2040	
EAST SIDE PHASE 2 - 5	NEW TPSS					0	N/A	0	N/A	0	Yes	2041	
K LINE - TRACTION POWER SUBSTATION - 1	TPSS					0	N/A	0	N/A	0	Yes	2050	
K LINE - TRACTION POWER SUBSTATION - 2	TPSS					0	N/A	61	2049	61	Yes	2035	
K LINE - TRACTION POWER SUBSTATION - 3	TPSS					0	N/A	0	N/A	0	Yes	2044	
K LINE - TRACTION POWER SUBSTATION - 4	TPSS					0	N/A	0	N/A	0	Yes	2038	
K LINE - TRACTION POWER SUBSTATION - 5	TPSS					0	N/A	0	N/A	0	Yes	2040	
K LINE - TRACTION POWER SUBSTATION - 6	TPSS					0	N/A	0	N/A	0	Yes	2029	
PLE 2 - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2028	
PLE 3 - 1	NEW TPSS					0	N/A	0	N/A	0	Yes	2029	
PLE 3 - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2030	
SEGL - 10	NEW TPSS					0	N/A	0	N/A	0	Yes	2036	
SEGL - 11	NEW TPSS					0	N/A	0	N/A	0	Yes	2037	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
SEGL - 13	NEW TPSS					0	N/A	0	N/A	0	Yes	2039	
SEGL - 14	NEW TPSS					0	N/A	0	N/A	0	Yes	2040	
SEGL - 15	NEW TPSS					0	N/A	0	N/A	0	Yes	2041	
SEGL - 2	NEW TPSS					0	N/A	0	N/A	0	Yes	2042	
SEGL - 3	NEW TPSS					0	N/A	0	N/A	0	Yes	2043	
SEGL - 4	NEW TPSS					0	N/A	0	N/A	0	Yes	2044	
SEGL - 5	NEW TPSS					0	N/A	0	N/A	0	Yes	2045	
SEGL - 6	NEW TPSS					0	N/A	0	N/A	0	Yes	2046	
SEGL - 7	NEW TPSS					0	N/A	0	N/A	0	Yes	2047	
SEGL - 8	NEW TPSS					0	N/A	0	N/A	0	Yes	2048	
SEGL - 9	NEW TPSS					0	N/A	0	N/A	0	Yes	2049	
EL MONTE TERMINAL	LOCATIONS					89	2024	550	2024	639	No	N/A	
CENTRAL MAINTENANCE FACILITY	LOCATIONS					1172	2024	0	2024	1172	No	N/A	
17TH STSMC STATION PARKING LOT	PARKING					0	N/A	31	2049	31	No	N/A	
26TH STBERGAMOT STATION	STATION					0	N/A	61	2049	61	No	N/A	
5TH ST STATION	STATION					0	N/A	31	2048	31	No	N/A	
A LINE E LINE - MISCELLANEOUS SIGNALS, STOPS, LIGHTS	ALIGNMENT					0	N/A	46	2049	46	No	N/A	
A LINE - MISCELLANEOUS SIGNALS, STOPS, LIGHTS	ALIGNMENT					0	N/A	27	2048	27	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 23	TPSS					0	N/A	5	2048	5	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 24	TPSS					0	N/A	237	2045	237	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 3	TPSS					0	N/A	60	2046	60	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 31	TPSS					0	N/A	38	2048	38	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 7	TPSS					0	N/A	5	2048	5	No	N/A	
A LINE - TRACTION POWER SUBSTATION - 8	TPSS					0	N/A	5	2046	5	No	N/A	
ALLEN STATION	STATION					0	N/A	23	2049	23	No	N/A	
AMC STATION	STATION					0	N/A	251	2025	251	No	N/A	
ANAHEIM ST STATION	STATION					0	N/A	31	2048	31	No	N/A	
ARCADIA STATION	SHARED					0	N/A	31	2049	31	No	N/A	
ARCADIA STATION	SHARED					0	N/A	31	2049	31	No	N/A	
ATLANTIC STATION	STATION					0	N/A	20	2048	20	No	N/A	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
AVALON STATION	STATION					0	N/A	405	2039	405	No	N/A	
AVIATIONLAX STATION	STATION					0	N/A	69	2048	69	No	N/A	
BALBOA STATION	STATION					0	N/A	665	2040	665	No	N/A	
BD LINE - TRACTION POWER SUBSTATION - 6	TPSS					0	N/A	24	2049	24	No	N/A	
BEVERLY GLEN - RADIO STATION	LOCATIONS					0	N/A	31	2049	31	No	N/A	
C LINE - TRACTION POWER SUBSTATION - 19	TPSS					0	N/A	7	2048	7	No	N/A	
C LINE - TRACTION POWER SUBSTATION - 4	TPSS					0	N/A	5	2048	5	No	N/A	
CANOGA STATION	STATION					0	N/A	548	2041	548	No	N/A	
CENTRAL MAINTENANCE FACILITY	LOCATIONS					1172	2009	0	N/A	1172	No	N/A	
CHATSWORTH STATION	SHARED					0	N/A	3053	2035	3053	No	N/A	
CHATSWORTH STATION	SHARED					0	N/A	3053	2035	3053	No	N/A	
COMPTON STATION	STATION					0	N/A	374	2050	374	No	N/A	
CRENSHAW BLVDI-105 STATION	STATION					0	N/A	31	2049	31	No	N/A	
DE SOTO STATION	STATION					0	N/A	18	2049	18	No	N/A	
DOWNTOWN SANTA MONICA STATION	STATION					0	N/A	76	2049	76	No	N/A	
E LINE - TRACTION POWER SUBSTATION - 10	TPSS					0	N/A	4	2048	4	No	N/A	
E LINE - TRACTION POWER SUBSTATION - 19	TPSS					0	N/A	4	2050	4	No	N/A	
E LINE - TRACTION POWER SUBSTATION - 22	TPSS					0	N/A	138	2049	138	No	N/A	
E LINE - TRACTION POWER SUBSTATION - 23	TPSS					0	N/A	4	2048	4	No	N/A	
EAST LA CIVIC CTR STATION	STATION					0	N/A	4	2048	4	No	N/A	
ECHO PARK DONALDSON LAYOVER	LOCATIONS					0	N/A	31	2050	31	No	N/A	
EXPOBUNDY STATION	STATION					0	N/A	46	2049	46	No	N/A	
EXPOCRENSHAW STATION	STATION					0	N/A	28	2049	28	No	N/A	
EXPOLA BREA STATION	STATION					0	N/A	139	2049	139	No	N/A	
EXPOSEPULVEDA STATION	STATION					0	N/A	336	2043	336	No	N/A	
EXPOUSC STATION	STATION					0	N/A	55	2050	55	No	N/A	
EXPOVERMONT STATION	STATION					0	N/A	23	2050	23	No	N/A	
EXPOWESTERN STATION	STATION					0	N/A	23	2050	23	No	N/A	
FILLMORE STATION	STATION					0	N/A	270	2046	270	No	N/A	
GRANDLATTC STATION	STATION					0	N/A	21	2048	21	No	N/A	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
HARBOR FWY STATION	STATION					0	N/A	164	2048	164	No	N/A	
HAWTHORNELENNOX STATION NORTH-WEST LOT	PARKING					0	N/A	577	2046	577	No	N/A	
HERITAGE SQUARE STATION	STATION					0	N/A	177	2040	177	No	N/A	
HIGHLAND PARK STATION	STATION					0	N/A	11	2048	11	No	N/A	
INDIANA STATION	STATION					0	N/A	15	2048	15	No	N/A	
IRWINDALE STATION PARKING GARAGE	PARKING					0	N/A	558	2044	558	No	N/A	
JEFFERSON LOOP - BUS LAYOVER	LOCATIONS					0	N/A	46	2048	46	No	N/A	
JEFFERSONUSC STATION	STATION					0	N/A	46	2050	46	No	N/A	
LA CIENEGAJEFFERSON STATION	STATION					0	N/A	221	2040	221	No	N/A	
LAKE STATION	STATION					0	N/A	28	2049	28	No	N/A	
LATTCORTHO INSTITUTE STATION	STATION					0	N/A	38	2049	38	No	N/A	
LAUREL CANYON STATION	STATION					0	N/A	12	2049	12	No	N/A	
LINCOLNCYPRESS STATION	STATION					0	N/A	280	2045	280	No	N/A	
LOCATION 110 - EAST LOS ANGELES CUST. SVC. CTR.	LOCATIONS					0	N/A	23	2050	23	No	N/A	
LOCATION 34 - VERNON YARD	LOCATIONS					0	N/A	413	2044	413	No	N/A	
LOCATION 55 - LOST AND FOUND	LOCATIONS					0	N/A	14	2045	14	No	N/A	
LOCATION 60 - RAIL OPERATIONS CONTROL	LOCATIONS					0	N/A	237	2045	237	No	N/A	
LOCATION 64	SHARED					0	N/A	237	2025	237	No	N/A	
LOCATION 66 - LIGHT RAIL MAINTENANCE OF WAY FACILITY	LOCATIONS					0	N/A	277	2048	277	No	N/A	
LOCATION 76 - HARBOR TRANSITWAY - CARSON	LOCATIONS					0	N/A	1922	2038	1922	No	N/A	
LOCATION 77 - HARBOR TRANSITWAY - PCH	LOCATIONS					0	N/A	30	2048	30	No	N/A	
MAPLE LOT - BUS LAYOVER	LOCATIONS					0	N/A	24	2048	24	No	N/A	
NORTH HOLLYWOOD STATION	STATION					0	N/A	1385	2034	1385	No	N/A	
PALM PLACE LOOP - BUS LAYOVER	LOCATIONS					0	N/A	31	2048	31	No	N/A	
PARAMOUNT TCB STATION	STATION					0	N/A	5	2048	5	No	N/A	
PICO-RIMPAU LOOP - BUS LAYOVER	LOCATIONS					0	N/A	61	2048	61	No	N/A	
PICOALISO STATION	STATION					0	N/A	45	2050	45	No	N/A	
PIERCE COLLEGE STATION	STATION					0	N/A	920	2044	920	No	N/A	
RESEDA STATION	STATION					0	N/A	671	2046	671	No	N/A	
RIO HONDO COLLEGE - RADIO STATION	LOCATIONS					0	N/A	15	2050	15	No	N/A	

Site Name	Site Function	Peak Demand (MW)	Annual Consumption (GWh)	Service Feed	Anticipated Energy Supply Constraints due to Future Growth	Existing PV kW DC	Existing PV Installation Year	Estimated PV kW DC	Estimated PV Installation Year	Existing + Currently Planned + Additional PV kW	BESS	BESS Installation Year	ZEB Charging
ROSCOE STATION	STATION					0	N/A	18	2050	18	No	N/A	
SAN FERNANDO VALLEY SERVICE SECTOR	LOCATIONS					0	N/A	46	2048	46	No	N/A	
SEPULVEDA STATION	ALIGNMENT					0	N/A	2850	2036	2850	No	N/A	
SHERMAN WAY STATION	STATION					0	N/A	511	2040	511	No	N/A	
SIERRA MADRE VILLA STATION	SHARED					0	N/A	53	2048	53	No	N/A	
SIERRA MADRE VILLA STATION	SHARED					0	N/A	53	2048	53	No	N/A	
SOUTH PASADENA STATION	STATION					0	N/A	14	2050	14	No	N/A	
SOUTHWEST MUSEUM STATION	STATION					0	N/A	31	2050	31	No	N/A	
TAMPA STATION	STATION					0	N/A	18	2050	18	No	N/A	
U.S.C. MEDICAL CENTER BUSWAY STATION	STATION					0	N/A	18	2049	18	No	N/A	
UNION STATION EAST	LOCATIONS					0	N/A	805	2042	805	No	N/A	
UNIVERSAL CITYSTUDIO CITY STATION	STATION					0	N/A	621	2040	621	No	N/A	
VALLEY COLLEGE STATION	ALIGNMENT					0	N/A	11	2042	11	No	N/A	
VAN NUYS STATION	STATION					0	N/A	763	2037	763	No	N/A	
WEST LA TRANSIT CENTER	LOCATIONS					0	N/A	11	2048	11	No	N/A	
WESTCHESTER VETERANS STATION	STATION					0	N/A	61	2050	61	No	N/A	
WILLOW ST STATION PARKING GARAGE	SHARED					0	N/A	755	2040	755	No	N/A	
WILSHIREVERMONT STATION	STATION					0	N/A	163	2049	163	No	N/A	
WILSHIREWESTERN STATION	STATION					0	N/A	129	2049	129	No	N/A	
WOODLEY STATION	STATION					0	N/A	37	2050	37	No	N/A	
WOODMAN STATION	ALIGNMENT					0	N/A	37	2049	37	No	N/A	
Division 13	DIVISION					266	2015	0	N/A	266	No	N/A	

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Item 2025-0801: Energy Master Plan
Adopt Metro's Energy Master Plan

Executive Management Committee
October 16, 2025

Metro

Key Findings

Metro's energy profile will undergo a significant transformation over the next 25 years.

> Electricity use is projected to increase 140% between now and 2050

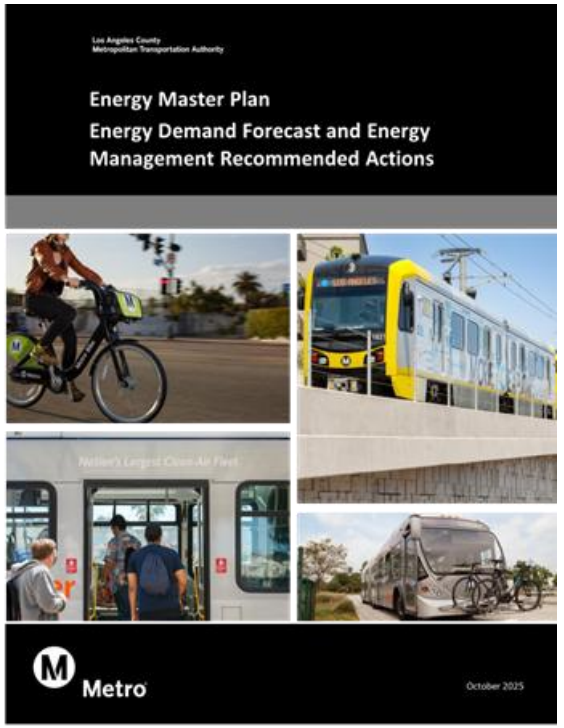
> Energy costs could escalate from $95M/year (2024) to $1BN (2050) due to higher consumption and continued rising energy prices

> Resiliency pressures will intensify as electrification expands into areas with known grid supply constraints and also due to changing climate

> Solar will continue to be a key technology to meet renewable energy goals, support resiliency and reduce energy costs

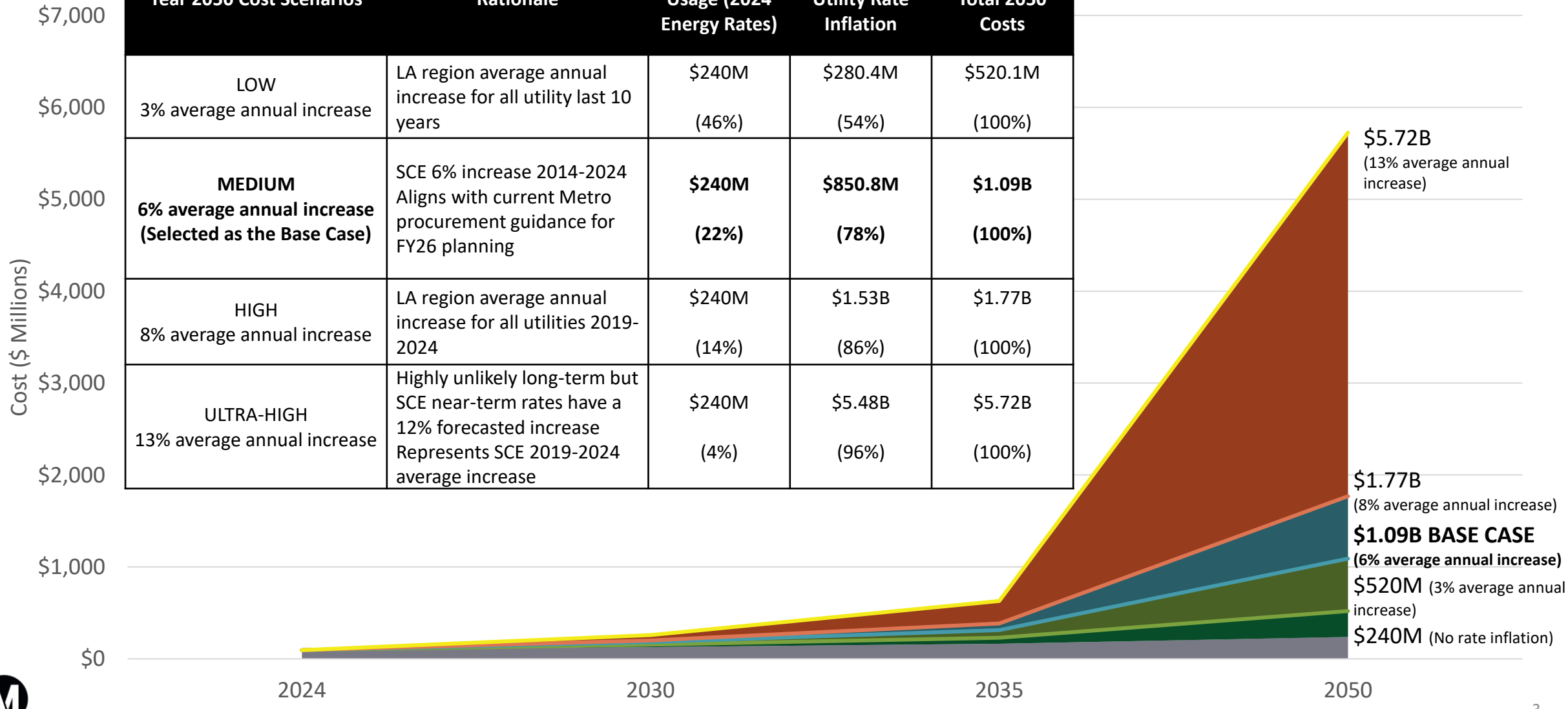
> Limited deployment of energy management and building automation currently reduces opportunities for energy cost savings

> Electrification and resiliency initiatives require new workforce training and education

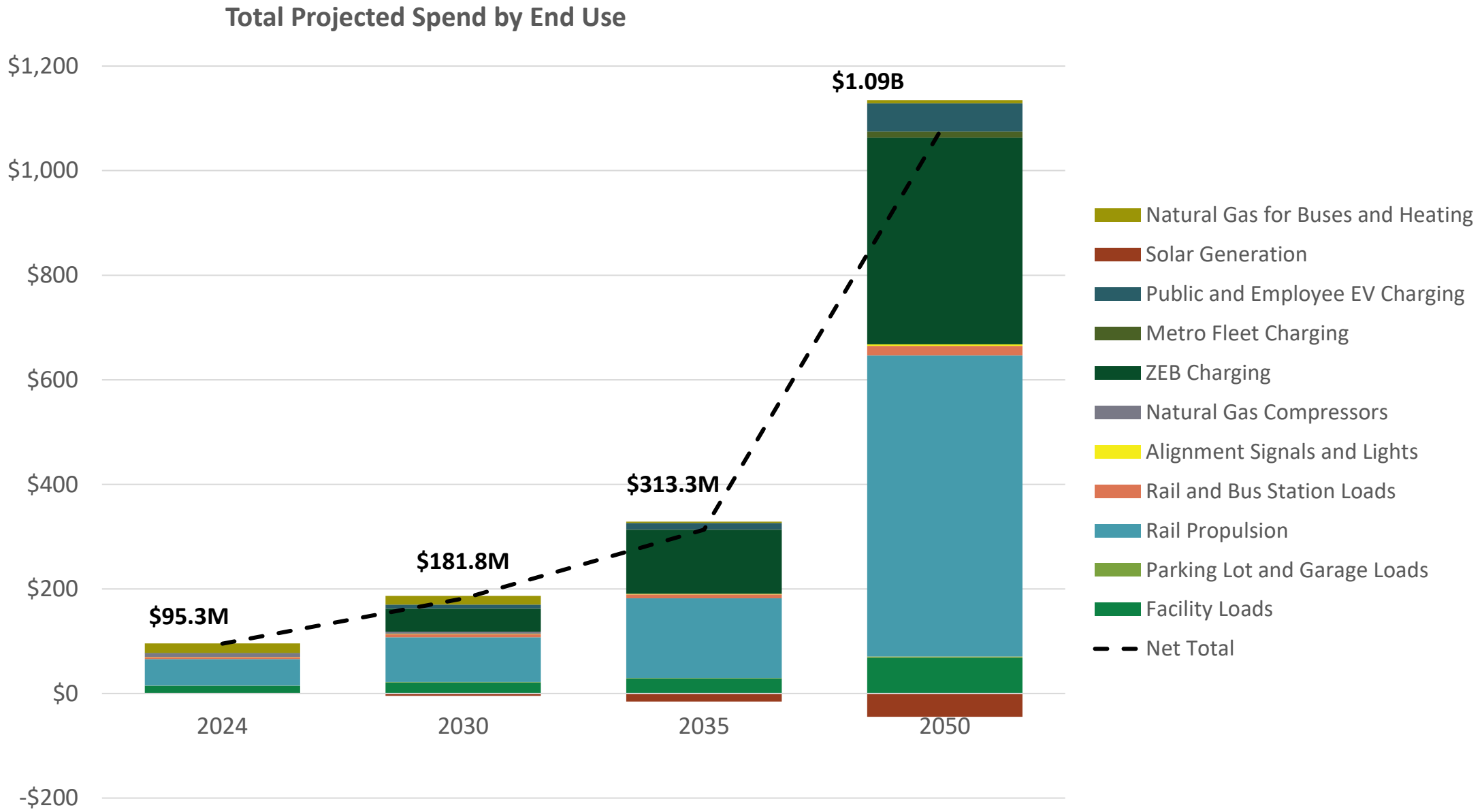


Projected Energy Costs: Impact of Rate Increases

Year 2050 Cost Scenarios	Rationale	2050 Energy Usage (2024 Energy Rates)	Utility Rate Inflation	Total 2050 Costs
LOW 3% average annual increase	LA region average annual increase for all utility last 10 years	$240M (46%)	$280.4M (54%)	$520.1M (100%)
MEDIUM **6% average annual increase** **(Selected as the Base Case)**	SCE 6% increase 2014-2024 Aligns with current Metro procurement guidance for FY26 planning	**$240M** **(22%)**	**$850.8M** **(78%)**	**$1.09B** **(100%)**
HIGH 8% average annual increase	LA region average annual increase for all utilities 2019-2024	$240M (14%)	$1.53B (86%)	$1.77B (100%)
ULTRA-HIGH 13% average annual increase	Highly unlikely long-term but SCE near-term rates have a 12% forecasted increase Represents SCE 2019-2024 average increase	$240M (4%)	$5.48B (96%)	$5.72B (100%)

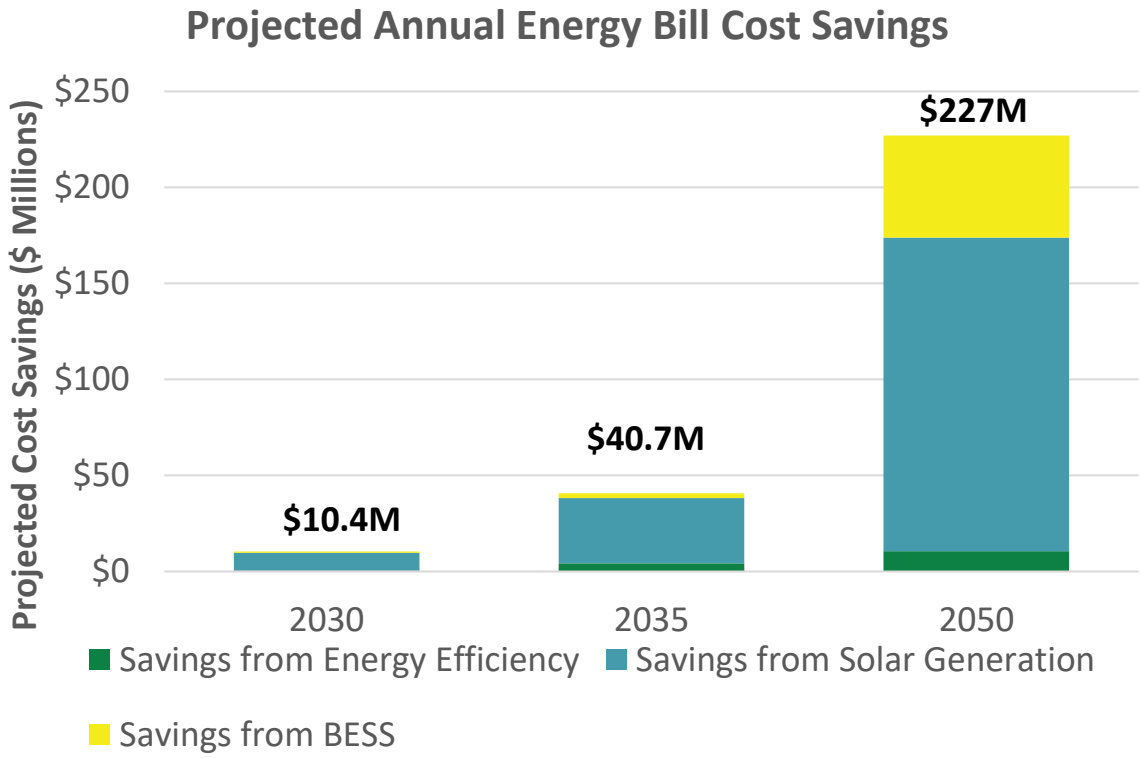


Base Case Forecast: Based on 6% annual rate inflation



Recommendations and Projected Energy Cost Savings

RECOMMENDATIONS	
Energy Planning	• Creation of energy management steering committee • Data and information management requirements to support annual energy forecasting, energy security and energy project impacts.
Energy Supply	• Increase cost-neutral utility supplied clean energy • Accelerate on-site renewable energy supply and strengthen O&M of existing systems. • Prioritize utility engagement to increase “essential use” designation at critical sites; proactively address energy costs; secure support for mitigation.
Energy Technology Deployment and Workforce Development	• **Develop comprehensive, site-level energy management plan to holistically and cost-effectively address energy and resiliency needs.** • Expand energy education to support technical training for resiliency and energy management technologies. • Webinars to socialize energy security and resiliency technologies.
Stakeholder Engagement	• Increase community-based organizations’ presence on sustainability council • Leverage regional and community energy partners for joint funding and workforce development • Communicate progress and benefits of energy planning



Development Process, Engagement & Path Forward

Data collection/data validation

Incorporate input to finalize analysis and draft plan

October 2024 | **January 2025** | **April 2025** | **July 2025** | **October 2025**

Plan goals socialization
- Sustainability Council
- Bus Ops
- Rail Ops
- Facilities Ops
- OER
- CBOs

Socialize draft recommendations and findings
- Office of the CEO
- Bus Ops
- Rail Ops
- Facilities Ops
- Procurement
- OER
- Planning
- Government Relations

Board approves plan

NEXT STEPS

Comprehensive Implementation Plan

> Define roles and responsibilities to ensure collaboration across Metro departments

> Establish measurable deliverables

> Conduct cost-benefit analysis to include resiliency considerations

> Utility engagement

Annual Report Out to the Board

> Provide updates on energy forecast updates and the cost-benefit impact of implemented measures.