



# Agenda

## Metro Sustainability Council

LA Metro HQ  
William Mulholland  
15<sup>th</sup> Floor  
One Gateway Plaza  
Los Angeles, CA

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### Agenda

- a. Welcome/Remarks: Chair (5 min)
  - b. Approval of Minutes: Chair (2 min)
  - c. Draft CAAP Overview Presentation: Andrina/Evan (15 min)
  - d. MSIP + Motion 57 Update: Alvin/Christine/Paul (15 min)
  - e. EV Implementation Plan Comment Matrix Presentation: Alvin/Andrew (20 min)
  - f. Action Items Log: Aaron (2 min)
  - g. General Public Comment (5 min)
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# Agenda

## Metro Sustainability Council

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### Agenda

- a. Welcome/Remarks: Chair (15 min)
    - Vice Chair Selection
  - b. Approval of Minutes: Chair (2 min)
  - c. LRTP Value Framework Presentation: Paul (10 min)
  - d. Green Procurement Update: Carolina/Craig (5 min)
  - e. Receive Comments for EV Implementation Plan: Andrew (5 min)
  - f. CAAP Adaptation and Resiliency Workshop: Andrina (75 min)
  - g. Action Items Log: Aaron (2 min)
  - h. General Public Comment (5 min)
- 



## MEETING MINUTES

Sustainability Council Meeting

Friday, February 8th, 2019

### a. Welcome/Introductions (Chair Small)

**Chair Small:** Announcement. Open comments per Brown Act to be held toward the end of the meeting due to time constraints. We can listen to the comments, but we cannot discuss. If discussion on a topic is desired, it can be added as a future agenda item.

**Vice Chair Nominees- Ghina Yamout, David Diaz, and Jennifer Kropke** speak to their candidacy.

Council votes.

*Jennifer Kropke selected as new Vice Chair.*

### b. Approval of Minutes (Chair Small)

No comment on minutes.

*Minutes approved.*

### c. LRTP Value Framework Presentation (Paul Backstrom)

Hardcopy presentation can be found in the agenda packet.

**Paul:** Presents the update on the LRTP Framework, including a summary of outreach efforts and the next steps of outreach. The main topics identified through Phase 1 of the outreach as top priorities are:

- Better Transit
- Less Congestion
- More Affordable
- Innovative Choices
- Safer/Complete Streets

One of the next steps is for stakeholders to rank their top priorities, which can be done by following this URL: <https://ournext.la/>

Request for suggestions on re-phrasing the name "A Mobility Plan to Access Opportunity Module."



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## Feedback and Comments

**Q (Hilda Blanco):** Are you going to include a discussion on congestion pricing?

**A (Paul):** We will not be able to present on congestion pricing because it is not in the meeting ARC.

**A (Chair Small):** However, we are thankful for this comment because we want to be informed of these discussions going on.

(NEXT TOPIC)

**Q (Belinda Faustinos):** Question regarding the lack of numerical data involved in ranking/selecting the top priorities.

**A (Paul):** There were metrics in place for this analysis, including looking at raw numbers and qualitative analysis of the spreadsheet. One of the main processes was cross-referencing keywords.

(NEXT TOPIC)

**Q (James Okazaki):** What are the specific definitions of abstract terms such as “congestion”

**A (Paul):** There are definitions in the presentation underneath each term. They can also be found online.

(NEXT TOPIC)

**Q (Joel Levin):** The committee would be interested in contributing to the discussion on congestion pricing, particularly regarding the decision on how to price.

**A (Bryan Pennington)** Congestion pricing is in very early stages, but once it is a good point, we will want involvement from the committee.

(NEXT TOPIC)

**Comment (Doug Dietrich):** Responses on top priorities will be different based on demographic. There will be subjectivity, and we will want to consider who is expressing a certain concern, as it will bring different options.

### **d. Green Procurement Update (Carolina Coppolo & Craig Reiter)**

**Carolina:** We are looking for as much feedback as possible on the Green Procurement documents. Please submit comments to Aaron Santos ([SantosAa@metro.net](mailto:SantosAa@metro.net)) by February 22<sup>nd</sup>.



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#### **e. Receive Comments for EV Implementation Plan (Andrew Quinn)**

**Andrew:** We have created a comment matrix and will be providing responses to all comments.

#### Feedback and Comments

**Q (Jennifer Kropke):** Will this comment matrix be discussed?

**A (Andrew):** We would like to share the comments with the Council. As we are on the Agenda for March 8<sup>th</sup>, we can accommodate comments then.

**Comment (Joel Levin):** It is important that we have an opportunity to discuss this collectively.

(NEXT TOPIC)

**Andrew:** Announcement. I will be joining the OEI Department, Alvin Kusumoto will continue to work on the EV Plan.

#### **f. CAAP Adaptation and Resiliency Workshop (Andrina Dominguez)**

Hardcopy presentation is included in the agenda packet.

**Andrina:** We have added an element explaining the Santa Ana winds. We are also including the latest science on extreme conditions, including drought as an exacerbating factor for heat and wildfire.

**Robert and Andrina** introduce the workshop. It will be focused on facilitating a robust and holistic discussion of draft adaptation pathways (re-capped in the presentation and slides) relevant to:

- Asset Management, O&M, Procurement
- Planning, Design, and Engineering
- Emergency Planning and Disaster Response

Council members and general public are encouraged to provide feedback by posing the following questions during the breakout sessions:

- What are the key partnerships within/beyond Metro needed to implement the adaptation pathway?
- What are the potential barriers to the pathway? Are there also potential opportunities that the pathways may open up?
- What are the other key barriers/opportunities for implementation?

*Breakout sessions.*

**Joel Levin** presents the points discussed by the “Asset Management, O&M, Procurement” Group:



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- Issues with overhead catenary rail lines sagging as a result of high heat, often causing a disruption in service
- A flexible adaptation sheet will help forecast days of extreme heat, and help identify the moment when new technology should be installed to mitigate this issue
- Agreement that service disruption on extreme heat days will be remembered by riders and may cause a decrease in ridership
- Suggestion to create a survey that will help analyze ridership loss
- It will be important to research new technologies to help with the functioning of catenary rails during heat events

**Roy Thun** presents the points discussed by the “Emergency Planning and Disaster Response” Group

- Metro should prioritize risk, and what is critical in an emergency scenario
- Key corridors to be coordinated between neighboring cities
- Metro does a good job with redundant systems—suggestion to include scenarios in which redundant systems fail in gap analysis.
- Communication plan is key in evaluation of resiliency
  - Includes communication with riders (visual aids, handouts, etc.) to help them understand how to act in an emergency
  - Communication with stakeholders
- Metro tunnels as safe havens during an emergency
- Importance of having a backup plan
  - Ex: How will metro maintain enforcement in its critical corridors if law enforcement’s attention is directed elsewhere?

**Kat Janowicz** adds a suggestion to include an action plan for restoring operations faster—what redundancy plans can be built into the system to recover as quickly as possible after an emergency.

**Ghina Yamout** presents the points discussed by the “Planning, Design, and Engineering” group:

- Recommendation that the flexible adaptation pathway for the design process can be more circular rather than a linear pathway
- Language needs to be made more consistent throughout
- Importance of analyzing specifics—how will plans for stormwater facilities be different from energy facilities?

**Bruce Reznik:** We need to focus on community assets and not just limited footprint.

**Peter Meng:** Holistic approach is key, we need to analyze roadways, infrastructure, etc.



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Recap of main comments (**Robert Kay**):

- Need to focus on communication system
- Proactive nature of this project is not coming through sufficiently, we want to be able to manage and correct in anticipation
- Need to look at the overall system and not solely focus on individual assets
- Need for systemic approach

**Andrina:** The Council will receive the draft update in Word format on or before the March 8<sup>th</sup> Sustainability Council Meeting. Members will have **2 weeks to submit feedback**. Once we receive comments, we will review and provide a revised version, including responses to comments ahead of the April meeting. A brief presentation will be held on the topic in April to go over any comment resolution still needed.

**g. Action Items Log (Aaron Santos)**

- EV Plan Agenda item to be updated

*Meeting adjourned.*



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## Metro February Sustainability Council CAAP Workshop Notes

- Planning, design, & engineering small group (kit of parts)
  - REMINDER: look for Systemwide Station Design Standards
  - Question: Concrete examples would help, pathways are a bit abstract
  - Question: Why start with kit of parts and then get to change in climate? Should start with concrete infrastructure
    - These are established standards
  - CHANGE: #1. Baseline scenario: Kit of parts (not “apply”, since we’re not carrying this out, we’re assessing it)
  - Question: Are we looking at these standards and then changing them to adapt them to climate change?
  - CHANGE: Trigger for #3 could be based on outside standards, i.e. “State has put out X standard” to make sure Metro is in line with them
  - Question: What about bus stops, since that’s how many people enter Metro’s system?
    - That would be a different pathway, but yes, the tool would be different
  - Question: Why not have a larger canopy, cooling, etc. included in the kit of parts instead of just switching out elements?
    - Step #4: room for adjustment in this measure
  - Question: Can we just assume all the extremes are coming in the future?
    - Risk assessment is needed here, too many resources to spend on that kind of retrofitting
    - Look at the most commonly used materials and analyze the carbon impact of those; this is also where green procurement would flow in
  - Feedback: Still confusing, difficult to understand
  - Question: where is the starting point?
    - For this exercise, we’re looking at infrastructure that is not yet built
  - CHANGE: Instead of saying “kit of parts”, say “Metro Design Criteria” (MRDC)
  - Feedback: go back to design standards and ask if they’re rigorous enough to respond to climate change; fill in those blanks rather than tackling design standards as a whole
    - CHANGE: Modify pathway so it’s more clear what we’re comparing to
  - Feedback: the pathway is a departmental plan (within Metro), SC just wants:
    - Step 1: Baseline
    - Step 2: Review
    - Step 3: Update plans
    - SC has things they want to implement, the adaptation pathway process is more for Metro to help carry those things out; SC just wants regular updates and stakeholder input
    - SC wants to be part of stakeholders involved in that update
  - Feedback: should also be a pathway about when design standards don’t fit a site
  - Feedback: pathway doesn’t convey the feedback mechanism that well
  - Feedback: complementary design system
  - Feedback: consider assets more broadly than the stations themselves

- I.e. water coming from the San Gabriels need to be slowed down along the way so it's not as fast when it hits the station
  - Comment: Metro should work within its parameters; their role is in protecting their assets and making sure they're designed to be resilient
  - Feedback: have transfer design guidelines in the flood control districts too, consider permeable pavements
    - Don't work in siloes
  - Comment: this is just one pathway example; are there other elements we want to include to develop pathway forward
  - Question: how has Metro thought about their assets not as things that people regularly use, but as community resources that people may use in extreme situations? (i.e. canopies for shade, misters)
    - There are certain times of the year when there is influx of people using the system, but it hasn't been intentionally well thought-out yet
  - Feedback: include stakeholder review, update this on a regular basis, don't get locked up in bureaucracy
    - Pare things down simply, get regular stakeholder input – best way to carry this out
  - Feedback: communities have the best information on what stations are the worst in terms of heat, flooding, etc., could consider this in monitoring step
    - Customer survey has been helpful in providing this; how do we make this a regular thing?
    - Could incorporate social media information at stations
  - Questions: is there discussion about having distributed energy at all these stations, energy utilization, energy efficiency? Kit-of-parts manual only mentions LED lighting
    - On the mitigation side, there are a few key measures about energy use
    - Are looking at solar panels for facilities; also need to consider whether or not they should be installed at rail stations due to safety issues, future joint development, etc.
  - Question: Metro has leadership in many areas already, should come up with ideas about how communities utilize their assets rather than just looking to other agencies; what does Metro ultimately want to get to, what does it want to be? Don't just look at its past
  - Question: why not have water-refilling stations? Low-hanging fruit
  - Question: will we also look at roadways as well as rail system?
    - We did look at roadways for risk analysis even though Metro doesn't own them
  - Summary points
    - Process outlined now is too Metro-centric
    - Graphic needs to be changed to cyclical process feedback loop-type graphic
    - Information that needs to be relayed: who's applying it, what's the plan for updating, who's involved, etc.
    - Last CAAP had very brief adaptation section; what we're trying to accomplish in this is explain how Metro would implement these adaptation ideas
    - How to embed carbon reductions, not just making climate-safe infrastructure
- Asset management, O&M, and procurement small group (overhead catenary systems)

- First reactions
  - Could we do replacements in sections to limit impacts to riders of the system?
  - How would phasing work?
  - Take advantage of project mechanisms/dynamics to get around union issues
  - Complete congruent phasing more quickly
  - In determining a metric-Metro needs to calculate the costs of disruptions to the systems- this may help make the case for changes to the system more quickly than currently anticipated
  - Metro should consider including root cause analysis in the asset management templates/ maintenance
  - What is the heat threshold of the catenary system?
  - How do we quantify values for metrics preparation?
- Other points
  - Should we provide the public with education- increase public announcements of disruptions and introduce signs at areas where there are likely to be more vulnerabilities in the system?
  - Smart materials science investigation should be pursued to find materials that reduce sagging to lines
  - Can we identify and pursue other major transit technologies that don't require catenary line?
- Key providers
  - Technology providers- Silicon Valley leadership Group
- Emergency planning & disaster response
  - Clarify the grey line – this is BAU?
  - Impact of seismic event could be far greater to Metro system than any climate stressors...how are seismic events being addressed in the context of climate adaptation?
    - Seismic events are not necessarily recognized a climate stressor, but their impacts and emergency response may be very similar so are related
  - Defining resiliency in the context of climate adaptation
  - Focus on and prioritize the systems necessary for operational continuity (e.g. energy systems for backup power, communication and IT, routes for emergency response)
    - How do these systems interact? How fast can they get back online?
    - Examine vulnerabilities, even for redundant systems
  - Testing, maintenance procedures, safety thresholds and tolerances may not be calibrated to assume risk/impact from climate change. These should be reviewed as part of gap analysis
  - Use lifecycle costing, cost of inaction, etc. to develop need/business case for action
    - Define impact to operations, ridership
  - Communication as a tool through all steps of pathway
    - Internal – decision makers, first responders
    - External – public, riders, other agencies involved in emergency response
  - For gap analysis – look at what other organizations have done, research case studies, there are many examples of good and bad planning/response.
    - Atlanta airport
    - prisons

- Use of subject matter experts and the appropriate training of personnel
  - Riders can be trained as well (ex. airport safety while waiting in security lines)
- Gap Analysis tools: RELi and “Bowtie”
- Post-event evaluation
  - After event, evaluate the human response (both internally and externally)
  - Was there panic that lead to a breakdown in planned responses?
  - Evaluate responses to anticipated events vs. unanticipated events
  - Was stress-test stressful enough?
- Subways are both hazards or places of safe refuge
  - If refuge, are there resources in place to maintain this over a specific period of time?
- Plenary report-out
  - Asset management
    - Catenary lines under extreme heat – do we tolerate a lot more breakdowns? Do we figure out how to install new technology?
    - Group decided that pathways were a good approach
    - Want to have a low threshold for breakdowns; Metro needs to be sensitive and avoid extreme delays since this will lead to loss in ridership
    - This approach is proactive in forecasting weather conditions
    - Try to figure out what other technology is out there
  - Emergency management
    - Metro should prioritize risks in their gap analysis
    - On a grander scale, they want to put bus/rail back into system; on emergency management scale, need to figure out what’s critical
      - Need to have key corridors available, which requires coordination with other local agencies
    - Metro has done a good job with redundant systems, like energy
      - What happens if you fall outside the failure tolerance of that system?
    - Have a communication plan for resiliency, not just with state/local but also with the riders
      - What are the expectations of riders in emergency situations? Think about the safety procedure on a plane – should we have visuals, handouts, announcements, etc. to inform riders?
      - What other communication issues do we need to consider?
    - Tunnels – can be a safe haven in certain situations, or a dangerous place in other situations in which we need to get people out, especially those who may be disabled
    - How do we development a Plan B for Metro? I.e. guaranteeing safety of critical corridors if law enforcement can’t help
    - What redundancy plans can we build into operations to ensure fast recovery?
  - Planning & design
    - Pathway needs to be simplified into more of a feedback loop graphic rather than this linear process

- Be more consistent with wording; describe what updates on a regular basis mean, what risk means
- Coordinate with other agencies, not just in siloes (i.e. water management)
- Look at missed opportunities, i.e. in energy
- Look outside immediate benefits (energy, water footprint), but also see how Metro assets can be community assets in creating energy/water opportunities
- Expand this to whole system, including facilities, roadways, etc.

**ATTENDEE LIST**

<b>ATTENDED</b>	<b>COUNCIL MEMBER</b>	<b>NOT ATTENDED</b>	<b>COUNCIL MEMBER</b>
Y	Kat Janowicz	N	Rita Kampalath
Y	Hilda Blanco	N	Charles Favors
Y	Thomas Small	N	Carolyn Hull
Y	Bryn Lindblad	N	Jack Sahl
Y	Kristen Torres-Pawling	N	Mark Huner
Y	Joel Levin	N	Cindy Montanez
Y	David Diaz	N	Cody Rosenfield
Y	Jennifer Kropke	N	Stephen Cheung
Y	Bruce Reznik	N	Mike Bagheri
Y	Doug Dietrich	N	Elizabeth Rhoades
Y	Anthony Brower	N	Lauren Faber
Y	Michael Kadish	N	Salem Afewroki
Y	Berwyn Salazar	N	Emily Freund
Y	Joe Ablay	N	John Williams
Y	Roy Thun	N	Pavitra Rammohan
Y	Peter Meng	N	Willy Wright
Y	Caryn Mandelbaum	N	Mehran Mazari
Y	Ghina Yamout	N	Michael Swords
Y	James Okazaki	N	Pavitra Rammohan
Y	Yareli Sanchez		
Y	Kimberly Colbert		
Y	Michael Samulon		
Y	Mark Kempton		
Y	Belinda Faustinos		
Y	Patricia Menjivar		
Y	John Harriel		



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**ATTENDEE LIST**

<b>ATTENDED</b>	<b>NON-COUNCIL MEMBER</b>	<b>NOT ATTENDED</b>	<b>NON-COUNCIL MEMBER</b>
Y	Aaron Santos	N	Debra Avila
Y	Paul Backstrom	N	Nadine Lee
Y	Carolina Coppolo	N	Cris Liban
Y	Bryan Pennington		
Y	Richard Clarke		



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	<ul style="list-style-type: none"> <li>*Introduce Green Procurement Policy topic</li> <li>*CAAP Workshop Prep</li> </ul>	<ul style="list-style-type: none"> <li>*All participants leave meeting with a basic understanding of Metro's current practices related to Green Procurement, as well as best practices in this field (related to transportation projects), and challenges related to this topic.</li> <li>*Direction provided from the Council to Metro staff on developing initial recommendations on Green Procurement Policy; additional information needs identified</li> <li>* Distribute Council assignments to prepare for the December workshop discussion.</li> </ul>
December 14, 2018	<ul style="list-style-type: none"> <li>*CAAP Update: Introduce Candidate GHG Reduction Strategies</li> <li>*Draft EV Implementation Plan</li> </ul>	<ul style="list-style-type: none"> <li>*Direction provided from Council to Metro Staff on GHG reduction strategies in a workshop format</li> <li>*All participants will leave the Council meeting with a basic understanding of Metro's current practices related to EV charging, Metro's future EV charging goals, and challenges related to this topic.</li> </ul>
January 11, 2019	<ul style="list-style-type: none"> <li>*Present draft Candidate Climate Adaptation Strategies; continue discussions re: CAAP Update</li> <li>*Present update to the Green Procurement Policy</li> <li>* GHG Inventory/Forecast</li> </ul>	<ul style="list-style-type: none"> <li>*Feedback provided by the Council to Metro staff on draft Candidate Climate Adaptation Strategies; CAAP Update</li> <li>* Provide an update and receive feedback input on the methodology and results of GHG inventory</li> </ul>
February 8, 2019	<ul style="list-style-type: none"> <li>*Adaptation &amp; Resiliency Workshop</li> <li>*Presentation on LRTP Values Framework</li> <li>* GHG Reduction Analysis</li> <li>*Draft Green Procurement</li> </ul>	<ul style="list-style-type: none"> <li>*Feedback provided by the Council to Metro staff at the Workshop</li> <li>* All participants leave meeting with a basic understanding of the LRTP development progress, including the Values Framework and provide feedback as part of the outreach effort.</li> <li>*Provide an update and receive</li> </ul>

	Policy	feedback from Council on the GHG Reduction Strategies
March 8, 2019	<p><b>*Review Draft CAAP Update and presentation</b></p> <p>*Green Procurement Policy</p> <p>*Metro Sustainability Implementation Plan (MSIP) Update (Draft) - Motion 57 Progress Update</p> <p>*EV Implementation Plan</p>	<p><b>*Draft CAAP Update and comment matrix sent to Council; presentation on Report overview, organization, key highlights and findings; request comments by 3/22; send final draft CAAP to Council on 3/29.</b></p> <p>*Feedback provided by the Council to Metro staff on the draft Green Procurement Policy</p> <p>* All participants leave meeting with a basic understanding of Metro's current progress related to Motion 57 as outlined in the MSIP update.</p> <p>*Consensus Comments received from the Council to Metro Staff on the draft EV Implementation Plan</p>
April 12, 2019	<p><b>*Final CAAP Update presentation</b></p> <p>*Adopt Green Procurement Policy</p> <p>*Receive &amp; File Update of Motion 57 to the Metro Board</p> <p><b>* County of Los Angeles Draft Sustainability Plan</b></p>	<p><b>*Presentation to the Council on the Final CAAP Update</b></p> <p>*Green Procurement Policy recommendations &amp; metrics adopted by the Council</p> <p><b>*Feedback provided by the Council on County Sustainability Plan</b></p>
May 10, 2019	<p>*Adopt Resiliency Framework</p>	<p>*Resiliency Framework recommendations &amp; metrics adopted by the Council</p>
June 14, 2019	<p>*Metro Board approval of CAAP Update &amp; Resilience Policy</p> <p>*Draft FY20 Meetings ARC</p>	<p>*All participants discuss potential policy topics for FY20 cycle</p>



# Metro Climate Action and Adaptation Plan (CAAP)

## Draft CAAP Overview— Sustainability Council



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March 8, 2019

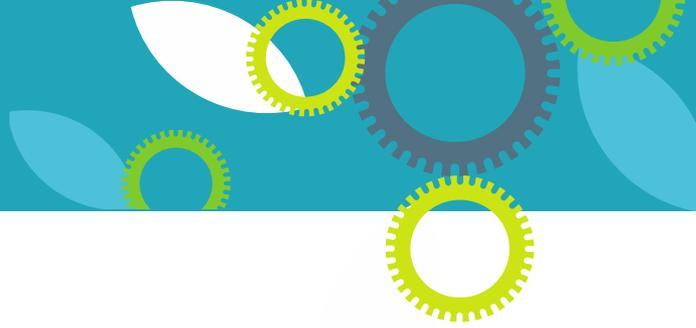
# Project Overview

Month	GHG Inventory & Forecast	GHG Reduction Measures	Adaptation	Final CAAP
Dec	(-) Completed <i>final</i> inventory and forecast estimates	(-) Held Sustainability Council Workshop (-) Completed <i>final candidate measures list</i>	(-) Completed <i>draft</i> vulnerability and criticality assessment	
Jan		(-) Complete <i>draft</i> measure analysis	(-) Present <i>preliminary results</i> to Sustainability Council	
Feb		(-) Complete <i>final</i> measure analysis/ report writing	(-) Hold Sustainability Council workshop	(-) Complete <i>draft</i> CAAP
Mar				(-) Present <i>draft</i> to Sustainability Council
Apr				(-) Present revised version to Sustainability Council for approval
May				(-) Report production (-) Sent to Board



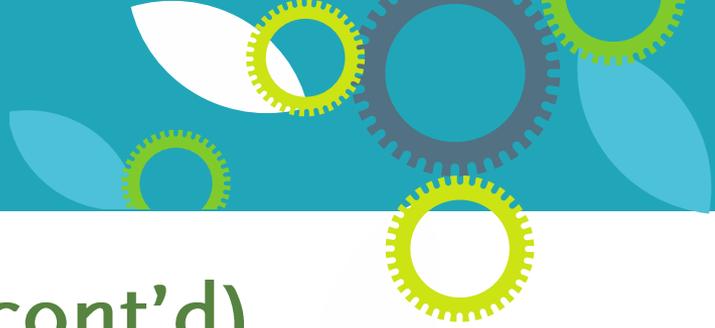
# Report Review and Organization

- **Executive Summary**
- **Chapter 1: Introduction**
- **Chapter 2: Greenhouse Gas Inventory, Forecast, and Mitigation Efforts**
- **Chapter 3: Understanding and Preparing for the Risks of Climate Change**
- **Chapter 4: Implementation Next Steps**
- **Technical Appendices: GHG Analysis Methodology, Hazard Exposure Maps, Risk Assessment Methodology**



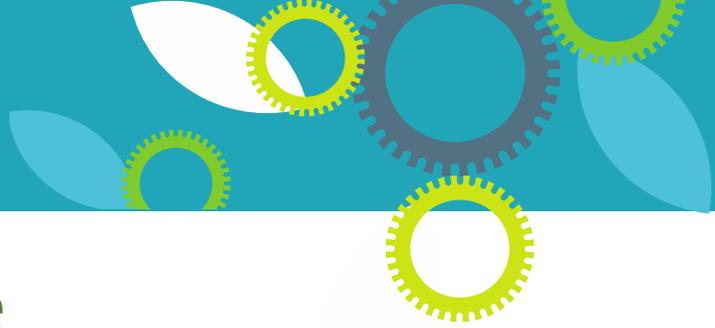
## Key Highlights and Findings

- **Since 2012: Metro’s GHG emissions have reduced by 12%. Transit use displaces > 2x the emissions than it produces**
- **“Business-As-Usual” (BAU) forecast: Metro GHG emissions reduction from 2017 levels of 57% by 2030 and 81% by 2050**
  - **Recommended GHG mitigation measures would further reduce 12% from BAU by 2030 and 50% by 2050**
- **Despite mitigation efforts, Metro faces increased risks in the future from heat, wildfire, landslide, coastal flooding, riverine flooding, and electrical outages**



## Key Highlights and Findings (cont'd)

- **Metro is approaching resiliency efforts from a systematic and flexible perspective, rather than prescribing a fixed set of adaptation actions today**
- **Key next steps include development of detailed implementation plan and timeline, and internal communication and coordination within and outside of Metro to educate on risks and key actions**



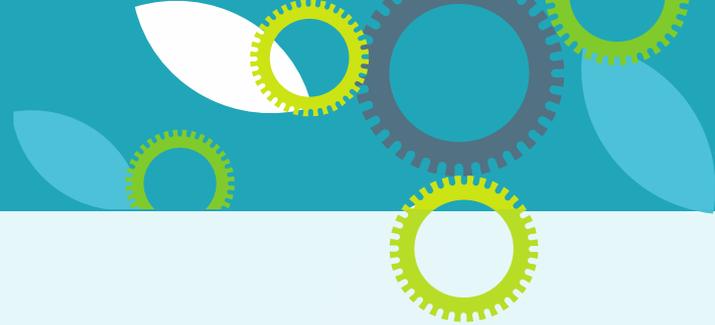
## Comments Addressed To-Date

- **Several presentations and workshops over the past months to discuss mitigation measures and approach to adaptation**
- **Feedback received during workshops, and analysis/report adjusted accordingly**
  - **Recognize co-benefits of GHG measures for buildings**
  - **Adjusted to be people-centric**
  - **Additional explanation in risk analysis for current exposure as well as wind and drought**
  - **Streamlined adaptation pathways and selected more intuitive examples**

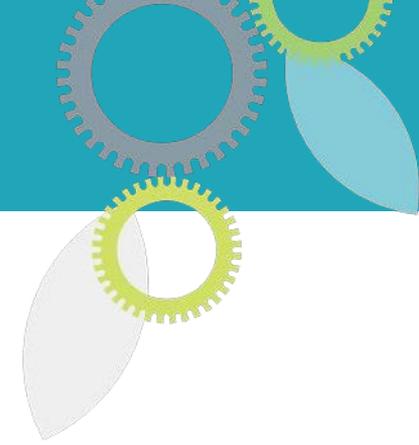
# Remaining Key Dates

Date	Item
<b>March 8</b>	Draft CAAP with Excel comment template will be sent out to Sustainability Council members via email
March 14	Stakeholder Opportunity for Engagement 12pm-2pm at Metro Headquarters
March 22	Sustainability Council members turn in comments to Metro via email
March 29	Final CAAP with responses to Sustainability Council comments will be sent out to members via email
<b>April 12</b>	Brief presentation on final CAAP and comment resolution; Sustainability Council adopts final CAAP (in Word form)
May	Report production
June	Final CAAP (formatted) to be reviewed at Board Meeting

*Bolded dates indicate Sustainability Council meetings*



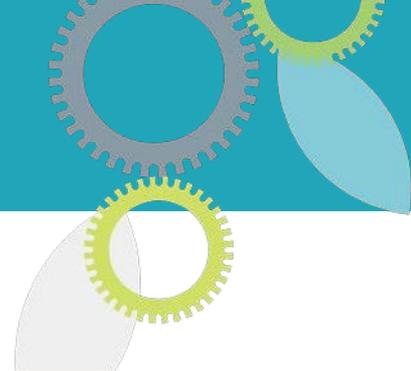
Thank you!



# 2028 Sustainability Strategic Plan

MSIP + Motion 57 Update

Sustainability Council  
March 8, 2019



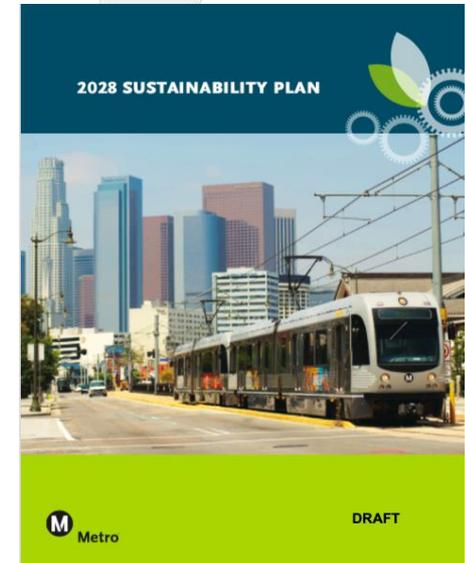
# 2028 Sustainability Strategic Plan

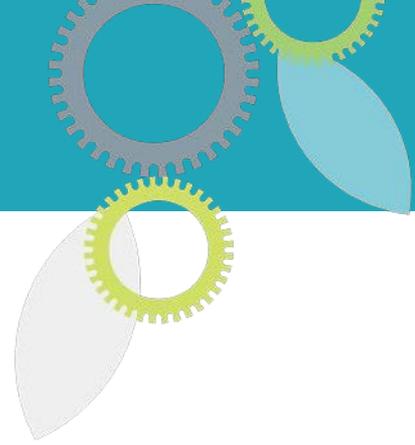
## PLAN OBJECTIVE

- Update and significantly expand the 2008 Metro Sustainability Implementation Plan (MSIP)
- Establish 10-Year Sustainability Goals and Targets
- Include Board Motion 57 requirements

## PLAN DEVELOPMENT

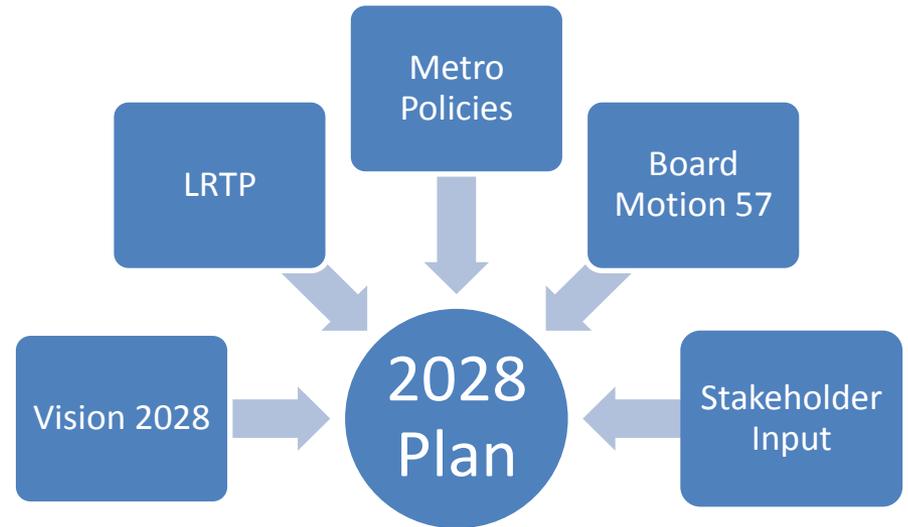
- Consolidation of Agency-wide sustainability goals and strategies
- Collaboration between Environmental Compliance and Sustainability Department (ECSD) and Countywide Planning (CWP) departments





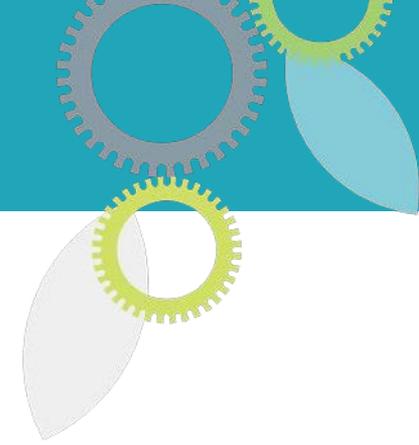
## Project Background

- An agency wide roadmap showing how Metro will achieve Sustainability Goals
- Highlights Sustainability accomplishments since 2008





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## Standards and Guidelines



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TRANSPORTATION  
ASSOCIATION*



# 2028 Sustainability Strategic Plan

## Mission and Vision

### MISSION

To facilitate a culture of sustainability in a world class transportation system that enhances the quality of life for all who live, work, and play within LA County.

### VISION

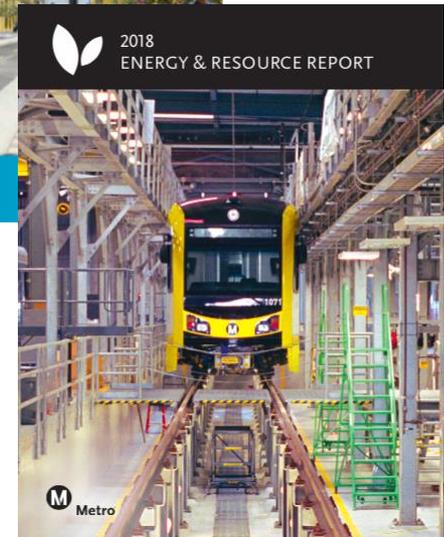
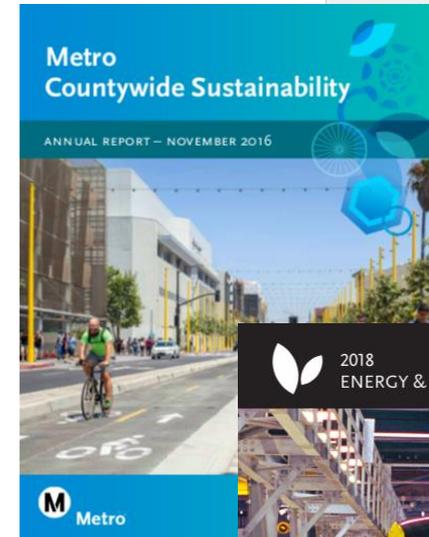
Create an organizational culture and workforce that continually integrates the principles of sustainability in all aspects of decision making and execution.

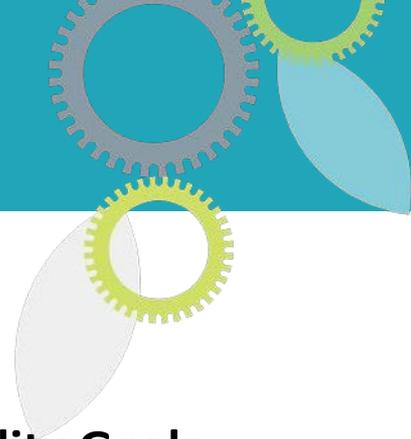


# 2028 Sustainability Strategic Plan

## RESULTS REPORTING

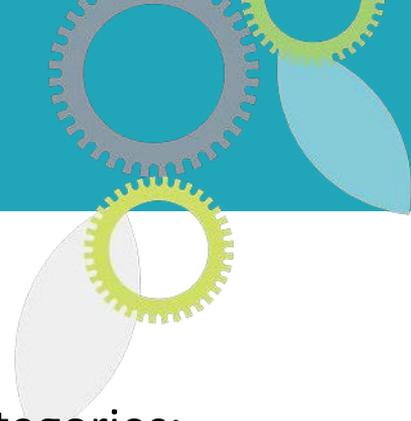
- Energy & Resource Report (2018) and Metro Countywide Planning Annual Report will be consolidated
- **NEW** report “Metro Annual Sustainability Performance Report”





## Collaborative Workshop Process

- **Internal Sustainability Workshops to establish sustainability Goals and Targets** (ECSD + CWP+ Consultant SMEs)
- **External and Stakeholder Workshops**
  - Sustainability Council Members
  - NGO Community
  - Other LA County and LA City agency staff
  - Greener Working Group
  - Sustainability Professionals
  - Community at large
- **Next External Workshop – March 12, 2019**



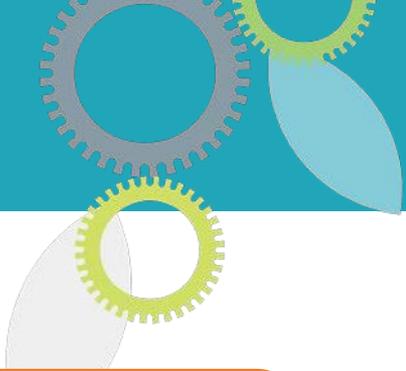
# Sustainability Categories

The Plan is organized into eight (8) sustainability program categories:

- ❖ **Energy**
- ❖ **Water**
- ❖ **Emissions and Pollution Controls**
- ❖ **Materials and Construction/Operations Optimization**
- ❖ **Climate Adaptation and Resiliency**
- ❖ **Livable Neighborhoods**
- ❖ **Equity**
- ❖ **Economic and Workforce Development**



57  
**Motion 57 Measure**



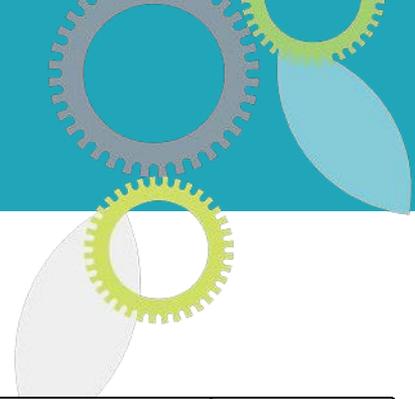
# Energy

GOALS
Optimize and Manage Metro’s Use of Energy
Decarbonize Metro’s Energy Supply

**2028 TARGETS**  
 COMMITTED | ASPIRATIONAL

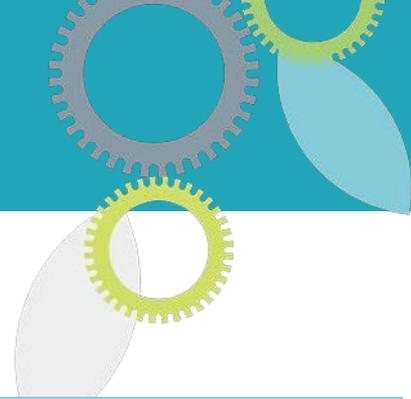
*Pending*

STRATEGIES
<b>E1</b> Implement energy efficiency projects
<b>E2</b> Optimize Building Management System (BMS) in all Divisions
<b>E3</b> Commission all projects to ensure optimal performance
<b>E4</b> Plan facilities to reduce energy during the design phase
<b>57</b> <b>E5</b> Implement on-site and off-site Renewable energy generation and energy storage
<b>57</b> <b>E6</b> Transition Metro’s energy and fuel supply
<b>57</b> <b>E7</b> Develop a Strategic Energy Management Plan (+ Energy Resiliency)
<b>E8</b> Centralize energy management and oversight for Metro
<b>57</b> <b>E9</b> Develop and implement Energy related training for Metro staff, partners, and community to advance a culture of sustainability



# Board Motion 57 Update

Motion 57 Item	Update	Status
<b>A. INCLUDE the following elements in Metro’s Annual Energy and Resource Report, related to Air Quality, Emission Reductions and Resiliency efforts</b>		
1. Efforts to reduce nitrous oxide (NOx) emissions since the approval of Measure R, with a goal of 80% NOx emissions reduction by 2025, using 2008 as a base year	<ul style="list-style-type: none"> <li>Data NOx emissions reduction data Included in 2018 Energy &amp; Resource Report</li> </ul>	<b>Complete</b>
2. An update on the progress of 2012 CAAP recommendations on how to achieve carbon emission reductions by 2025, 2035, and 2050.	<ul style="list-style-type: none"> <li>2019 Climate Action and Adaptation Plan (CAAP) update includes recommendations on emissions reduction through 2050.</li> <li>2028 Sustainability Plan (MSIP Update) will include GHG Emission reduction goals and strategies</li> </ul>	<b>In Progress</b>
3. Efforts to reduce VMT per capita in LA County	<ul style="list-style-type: none"> <li>2018 Energy &amp; Resource Report reported 3.2% VMT reduction</li> <li>2028 Sustainability Plan will include VMT reduction strategies for next 10 years</li> </ul>	<b>Complete</b>
4. Methods to increase infrastructure resiliency and reduce environmental liabilities (hazardous materials, increase fuel efficiency, energy efficient, lighting, propulsion)	<ul style="list-style-type: none"> <li>2018 Energy &amp; Resource Report reported on clean fuel conversion data, LED lighting, and propulsion usage</li> <li>2028 Sustainability Plan will set goals, targets, and strategies for fuel conversion, energy efficiency, propulsion, and resiliency for next 10 years</li> </ul>	<b>In Progress</b>
5. Efforts to reduce emissions on Metro’s vanpool program fleet	<ul style="list-style-type: none"> <li>Metro EV Implementation Plan outlines efforts to reduce emissions on Non-Revenue fleet vehicle electrification, specifically for driver relief sedans, manager sedans, and vehicle pool sedans</li> </ul>	<b>Complete</b>

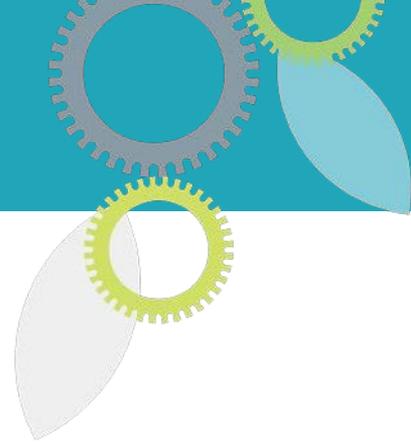


## Next Steps

Target Date	Milestone
<b>3/12/19</b>	<b>Countywide Planning External Workshop</b>
March	Complete Target Analysis
April/May	Complete Strategy and Action Development
June	Complete Draft Report
<b>July</b>	<b>Draft Report to Sustainability Council</b>
<b>August</b>	<b>Finalized Report to Sustainability Council</b>
October	Board Approves 2028 Sustainability Plan



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## Q & A



Motion 57 Item	Update	Status
<b>A. INCLUDE the following elements in Metro’s Annual Energy and Resource Report, related to Air Quality, Emission Reductions and Resiliency efforts</b>		
1. Efforts to reduce nitrous oxide (NOx) emissions since the approval of Measure R, with a goal of 80% NOx emissions reduction by 2025, using 2008 as a base	<ul style="list-style-type: none"> <li>Data NOx emissions reduction data Included in 2018 Energy &amp; Resource Report</li> </ul>	<b>Complete</b>
2. An update on the progress of 2012 CAAP recommendations on how to achieve carbon emission reductions by 2025, 2035, and 2050.	<ul style="list-style-type: none"> <li>2019 Climate Action and Adaptation Plan (CAAP) update includes recommendations on emissions reduction through 2050.</li> <li>2028 Sustainability Plan (MSIP Update) will include GHG Emission reduction goals and strategies</li> </ul>	<b>In Progress</b>
3. Efforts to reduce VMT per capita in LA County	<ul style="list-style-type: none"> <li>2018 Energy &amp; Resource Report reported 3.2% VMT reduction</li> <li>2028 Sustainability Plan will include VMT reduction strategies for next 10 years</li> </ul>	<b>Complete</b>
4. Methods to increase infrastructure resiliency and reduce environmental liabilities (hazardous materials, increase fuel efficiency, energy efficient, lighting, propulsion)	<ul style="list-style-type: none"> <li>2018 Energy &amp; Resource Report reported on clean fuel conversion data, LED lighting, and propulsion usage</li> <li>2028 Sustainability Plan will set goals, targets, and strategies for fuel conversion, energy efficiency, propulsion, and resiliency for next 10 years</li> </ul>	<b>In Progress</b>
5. Efforts to reduce emissions on Metro’s vanpool program fleet	<ul style="list-style-type: none"> <li>Metro EV Implementation Plan outlines efforts to reduce emissions on Non-Revenue fleet vehicle electrification, specifically for driver relief sedans, manager sedans, and vehicle pool sedans</li> </ul>	<b>Complete</b>
<b>B. An expansion of Metro’s Green Construction Policy to make the following improvements related to Water Conservation &amp; Green Infrastructure</b>		
1. Require all Metro construction projects implement methods to capture and treat stormwater and apply reclaimed	<ul style="list-style-type: none"> <li>2028 Sustainability Plan will set goals for agency wide water conservation &amp; reclaimed water strategies</li> <li>2018 MRDC updated requirements for stormwater</li> <li>Metro Green Construction Policy establishes requirements for mitigating air emissions from Contractor onsite equipment</li> </ul>	<b>Complete</b>
2. Require future design and construction projects (> \$5 M) to use sustainable building materials: a. Storm water & discharge runoff capture and cleaning b. Permeable pavement and surfaces c. Low carbon-intensity materials d. Recycled & local materials e. Light colored pavement & native shade trees.	<ul style="list-style-type: none"> <li>Since 2007, Metro policy and project specifications give preference to recyclable and recycled products in the selection of construction materials;</li> <li>2018 update to the Metro Rail Design Criteria (MRDC) included requirements for Low Impact Design (LID), requirements for reclaimed water; recycled materials, and CA native plants</li> </ul>	<b>Complete</b>
	<ul style="list-style-type: none"> <li>NEW Sustainable (Green) Procurement Program will include requirements for sustainable buildings materials (i.e. recycled content; permeable pavement, and low-carbon intensity materials) for construction projects</li> <li>Central Maintenance Facility (CMF) installation of permeable pavement at Cesar Chavez bus stop completion in 2019; Funding from 2014 pilot program grant</li> <li>2028 Sustainability Plan (MSIP Update) will will set goals for agency wide water conservation &amp; reclaimed water strategies</li> </ul>	<b>In Progress</b>
3. All future highway and transit projects include project specific Sustainability Coordinator to oversee resiliency and long-term sustainability requirements	<ul style="list-style-type: none"> <li>2014 Sustainability Plan Specification (00 35 63) includes the requirement for Contractor provided Sustainability Coordinator</li> </ul>	<b>Complete</b>
4. A plan to significantly increase the number, size, and scope of projects in Metro’s Urban Greening Implementation Action Plan	<ul style="list-style-type: none"> <li>The Urban Greening Plan was completed, and the plan and accompanying Urban Greening Toolkit are available on the Metro Sustainability website; staff are seeking opportunities to incorporate urban greening elements into Metro funding programs</li> </ul>	<b>In Progress</b>

Motion 57 Item	Update	Status
<b>C. Strategies to improve connectivity &amp; enhance “First-and-Last Mile” connections to our transit system, including:</b>		
1. A schedule for expanding the existing car-share pilot program to at least ten additional park and ride Metro-owned lots and/or major transit hubs in the system	<ul style="list-style-type: none"> <li>Metro's Car Share program has grown from 14 to 28 locations and from 51 to 123 parking spaces; Car Share options include Metro’s new partnership with Getaround as well as Existing services provided by Zipcar; Metro is also piloting a rideshare initiative with Via that offers on-demand rides from three Metro stations</li> </ul>	In Progress
2. An inventory of potential Metro-owned parcels that could be used to expand opportunities for active transportation links and/or “First-and-Last Mile” applications (e.g. Mobility Hubs)	<ul style="list-style-type: none"> <li>A key Transit Oriented Communities Policy goal is to Increase transportation ridership and choice by leveraging land use and urban design to encourage non-single occupant vehicle transportation options both on and off Metro property, through enhanced first/last mile options, travel demand management, and seamless transit connectivity. Through the development of the Transit Oriented Communities Implementation Plan, Metro will explore areas where Metro can lead and partners to achieve this critical TOC Policy goal.</li> </ul>	In Progress
3. A requirement, when feasible, that all future Metro-owned transit stations consider, for connectivity and ridership purposes, incorporate the following elements into their designs: <ul style="list-style-type: none"> <li>a. Walking paths</li> <li>b. Bike routes</li> <li>c. Accessibility to local neighborhoods (i.e. half-mile radius)</li> <li>d. River &amp; bicycle waterways (where applicable)</li> </ul>	<ul style="list-style-type: none"> <li>In order to realize Board direction to implement various First/Last Mile activities, Countywide Planning and Development Department structure now includes a dedicated First/Last Mile Planning group which is organized as part of a larger Transit Oriented Communities (TOC) team. This structure acknowledges that as the Metro system has expanded over the years, it is important to advance a holistic approach to transit planning that makes accessibility, equity and sustainability part of our transit corridor planning and delivery process. The First/Last Mile Planning group has a number of active projects underway, including but not limited to: Purple Line Extension sections 2 &amp; 3, Foothill extension, Crenshaw Line Airport Connector and Inglewood stations, East San Fernando Valley Transit Corridor and West Santa Ana Branch.</li> </ul>	In Progress
4. As part of Metro’s Active Transportation Strategic Plan, strive to create a Regional Active Transportation Network, in coordination with local municipalities. As an initial step, Metro should coordinate with local agencies to assess opportunities to include right of ways (utility corridors, flood channels and other corridors) in this Regional Active Transportation Network to allow for preservation and best use. Metro should also make recommendations on establishing a matching funding program to support the delivery of local first-last mile capital projects that support countywide transit ridership.	<ul style="list-style-type: none"> <li>The Active Transportation Strategic Plan (ATSP), adopted in May 2016, identifies strategies to improve and expand the active transportation network in order to improve access to transit for all patrons. This plan provides guidance to Metro and partner organizations, such as local jurisdictions, regional government and other stakeholders, in setting regional active transportation policies and guidelines to meet transportation goals and targets in support of the Regional Transportation Plan/Sustainable Community Strategy and other future planning efforts. Metro is now pursuing next steps to implementing the Active Transportation Strategic Plan; Per Board direction cities can make use of their 3% contribution to Metro rail projects to build eligible first-last mile improvements; A matching program is dependent on pending considerations for the 2% active transportation fund category in Measure M.</li> </ul>	In Progress
<b>D. Report back on the following strategies to better deploy technology and promote green jobs</b>		
1. An assessment of any necessary positions focused on technological efficiencies and improvements that would be critical to supporting Metro’s sustainability efforts	<ul style="list-style-type: none"> <li>The 2028 Sustainability Plan will address the implementation of Green Jobs in the "Economic and Workforce Development" category by establishing criteria for recruiting from diverse sources.</li> </ul>	In Progress
2. Alternative renewable energy generation technology that could be used for future bus, vehicle, rail and maintenance structures	<ul style="list-style-type: none"> <li>2018 EV Implementation Plan outlines Metro’s strategy and initiatives; 2017 purchase of 20 Chevrolet Bolts log 7,000 EV miles per month. Metro has installed over 100 smart, networked Level 2 EV chargers for public, employee, and fleet use. CAAP goal projections for EV technology is to reduce over 125 metric tons of GHG emission reductions every year.</li> </ul>	In Progress
	<ul style="list-style-type: none"> <li>Metro's biomethane fuel is being procured as an alternative fuel source; the base term of the existing contract ended in August 2018 and additional solicitations are in process. The 2019 CAAP update will incorporate plans and programs related to Metro's future Biomethane procurement strategy</li> </ul>	In Progress
	<ul style="list-style-type: none"> <li>A power purchase agreement (PPA) is being executed to install photovoltaic structures at Divisions 9, 11, 14, and 22 total 1.7 MWh generated. The 2028 Sustainability Plan will establish kWh generation goals for future onsite and offsite renewable energy installations.</li> </ul>	In Progress

Motion 57 Item	Update	Status
	<ul style="list-style-type: none"> <li>2018 MRDC and Sustainability Plan Specification updates include project requirements for renewable energy generation technology and aligns Metro requirements to the 2016 CALGreen Code, Tier 2 measures (e.g. 30% more energy efficiency).</li> </ul>	In Progress
3. Partnership and funding opportunities, including an inventive program, to maximize the use of zero or near zero emission technologies in future transit and goods movement corridors	<ul style="list-style-type: none"> <li>Metro is part of the Zero-Emission Truck Collaborative, which includes representatives from Caltrans, Port of Los Angeles, Port of Long Beach, SCAQMD, and SCAG</li> </ul>	In Progress
<p><b>An overview of the Environmental Compliance and Sustainability Department's agency-wide effort to ensure coordination in planning and implementing E. sustainability initiatives, including recommended metrics to measure challenges and successes. This includes partnering and soliciting input from non-profits and other stakeholders to ensure public participation</b></p>		
<p>The response to provide an overview of ECSD's agency-wide sustainability effort was provided in the October 20, 2016 Board Report which outlined Seven Pillars of Sustainability Planning that will form the principles for the development of a Comprehensive Sustainability Implementation Plan (Plan), an update to the 2008 Metro Sustainability Implementation Plan (MSIP). The Plan is currently being developed and titled "The Metro 2028 Sustainability Plan". The Plan is a collaboration between ECSD, CWP, and various Metro departments, as well as our local and regional partners. The Plan will capitalize on Metro's efforts already underway to jumpstart a more robust regional effort that goes beyond pilot programs and aims for widespread implementation. The following items update the specific information in the prior response with regards to the Seven Pillars of Sustainability.</p>		
1. Collaboration	<ul style="list-style-type: none"> <li>Metro continues to work with the Chief Sustainability Officers of the various jurisdictions within the County to expand on the current collaboration efforts with these jurisdictions as well as with other entities within the City and County of LA, AQMD, ARB, High Speed Rail Authority, and SCAG among others.</li> </ul>	In Progress
2. Leadership	<ul style="list-style-type: none"> <li>In 2016, the Sustainability Council was formed in response to Metro Board Motion 57. The Sustainability Council supports Metro's sustainability program by advising and providing recommendations on matters such as policies, operations, construction, and maintenance processes that further Metro's goal of delivering a sustainable transit system to LA County</li> </ul>	Complete
3. Strengthening Relationships	<ul style="list-style-type: none"> <li>Metro leverages existing best practices and programs throughout the County to incorporate into its programs and explore opportunities of collaboration specifically to address the inter-jurisdictional challenges to fully implement Green Infrastructure strategies. In 2017, Metro incorporated the CA Building Standards Code, Title 24, Part 11 CALGreen into its project specifications, and language requiring projects to comply with all local regulatory code requirements related to sustainability.</li> </ul>	Complete
4. Technical Assistance	<ul style="list-style-type: none"> <li>Metro has enhanced its training and outreach programs, Growing a Greener Workforce, Metro Environmental Construction Awareness (MECA), and Environmental Training Institute (ETI) to increase technical assistance curriculum and certifications for internal Metro trades, contractors and vendor partners, and the General Public. Metro has extended its non-profit partnerships with USGBC (GPRO, Resiliency), ISI (Envision), Theodore Payne to increase course offerings. Metro launched a robust external outreach program in 2018 to increase participation by external stakeholder and the community at large.</li> </ul>	In Progress
5. Resiliency Policy	<ul style="list-style-type: none"> <li>Metro's Resiliency Framework update is targeted for completion by June 2019.</li> </ul>	In Progress
6. Life Cycle Cost Analysis	<ul style="list-style-type: none"> <li>Life Cycle cost analysis requirements were added to Metro's Rail Design Criteria (MRDC) and Sustainability Plan Specifications (00 35 63; 13 65 00) in 2017 to ensure that project contractors submit value-added options for energy efficiency, water conservation systems, renewable energy, and other sustainable commitments. LCCA requirements incorporate O&amp;M Life cycle costs and support Metro project decisions. Additionally, Metro developed a Triple Bottom Line tool that is providing direct benefits to rail projects pursuing Envision Certification (i.e. PLE 1 obtained Envision Certification utilizing TBL tool to increase eligible points).</li> </ul>	Complete
7. End User Collaboration	<ul style="list-style-type: none"> <li>The 2028 Sustainability Plan will address these challenges to ensure attainment of the sustainability benefits that drive the conceptualization, design, construction and operations and maintenance of the final work product. The Plan includes strategies in managing the relationships and break down the barriers of operations and maintenance challenges between Metro and other end users including but not limited to cities, special jurisdictions, and joint developers</li> </ul>	In Progress

# EV Implementation Plan Comments



Metro

# Timeline

- March 2019: Review EV Implementation Plan with Council
- Spring/Summer 2019: Finalize EV Implementation Plan

# Comments

- Received 21 comments
- Provided matrix with a response to each comment
- Three broad categories of comments

# Comments

- Make the plan more ambitious in scope and rapid in its delivery
  - 2,500 chargers installed by 2023; 10,000 chargers installed by 2030
  - 600 service vehicles electrified by 2023
  - 45% EV charging requirement for all new parking spaces

# Comments

- Improvements to the plan
  - EVITP trained personnel
  - Comparing cost of charging to cost of gasoline
  - Partnering with groups to increase Metro EV charging awareness

# Comments

- Comments that are out of scope of this plan and to be addressed in other plans
  - Contracted bus electrification (CAAP, Bus Electrification Master Plan)
  - Increase renewable energy generation (CAAP)

# Discussion

- Additional comments/questions?

*Thank  
You!*



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**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
1	<p><b>Establish a timely EV Charging goal proportionate for the region: 10,000 EV chargers, as opposed to 3,700</b> (Please see page entitled EV 2028 Goals, bullet points one-three). Establish a more proportionate share of zero-emission charging in light of the LA Clean Tech Incubator Roadmap 2028 regional goal of 60,000-130,000 chargers; given LA Metro’s involvement in the Transportation Electrification Partnership which developed the Roadmap 2028 regional goal cited on the page entitled “EV Opportunities”, fourth bullet point. Additionally, the 2028 timeframe listed for EV charging installations is excessively long as our experience is as follows: 1 year for approvals/funding/initial planning, 1 year master planning/infrastructure planning, 2 years design and construction.</p> <ul style="list-style-type: none"> <li>a. 2,500 chargers installed by 2023,</li> <li>b. 5,000 chargers installed by 2025 and</li> <li>c. 10,000 chargers installed by 2030.</li> </ul>	<p>The CEC and the National Renewable Energy Laboratory (NREL) used the EVI-Pro model to estimate that between 26,192 and 36,777 Level 2 charge ports are needed at workplaces and in public places by 2025 in Los Angeles County. Today, there are about 4,350 Level 2 charge ports deployed in the County, about 3,500 of which are publicly accessible. If Metro achieves the existing goals laid out in this plan, then by 2025 they will have contributed 7-9% of the Level 2 charge ports that the CEC and NREL forecast are needed to support anticipated EV adoption. <b>In aggregate, this plan represents the largest single commitment by a single site host in Los Angeles County.</b></p> <p>Increasing the EV charging goals to 10,000 chargers would require a very significant increase in funding for EV charging at Metro. The current plan for Metro is estimated to cost between \$160 and \$172 million to implement. A conservative cost estimate for installing 10,000 EV chargers would be \$450 million. Metro currently lacks dedicated funding for an initiative at either funding level. Metro's <i>Twenty-Eight by '28</i> plan identifies 28 projects that Metro will complete by 2028 and EV charging is not one of the selected projects. Furthermore there is a funding gap of \$26 billion in the existing <i>Twenty-Eight by '28</i> plan.</p> <p>While Metro supports the LACI Roadmap 2028, there are currently no dedicated staff or funds for EV charging infrastructure projects.</p> <p>Any request for funding and expansion of EV charger scope will require Metro board approval.</p> <p>The timeline of the EV Implementation Plan was designed to allow sufficient time for Metro staff to request and receive funding and staffing approval. Metro staff have already submitted funding requests for FY 2020 to begin implementing the plan as written, and these requests have not been approved. July 1, 2020 is now the earliest date by when additional resources could be dedicated to planning for, designing, and installing new EV chargers at Metro.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
2	<p><b>Establish a goal and time frame for transition to Zero-Emission vehicles goals for the 1,200 Metro service vehicles</b> (Please see page entitled: EV Opportunities, third bullet point):</p> <p>a.50% transition of Metro service vehicles by 2023;</p> <p>b.75% by 2030 and</p> <p>c.95% by 2035; note this allows for agency flexibility.</p>	<p>Although the Non-Revenue department supports the electrification of their fleet, their funding request for additional resources to continue this process has not been approved. Metro currently has no dedicated staff or funding for electrification of the non-revenue fleet. Fleet electrification targets were developed based on vehicle type, replacement schedules, and availability of BEV replacement options.</p> <p>Any request for additional funding and expansion of EV charger scope will require board approval.</p>
3	<p><b>Establish a time frame and contracting policy for transition of all contracted buses, with priority for diesel buses.</b> Currently at least 57 diesel buses are being operated via contract with a third party. It does not appear Metro has not set a transition or plan about how to transition from the contracted providers other than “Barriers to implementation through coordination with contractors”.</p> <p>a.Transition all contracted buses to zero-emission (NOT CNG buses); including incremental goals: 50% by 2025; 75% by 2030.</p> <p>b.Transition all non-revenue vehicles to zero-emission vehicles: 50% by 2025; 75% by 2030.</p>	<p>The EV Implementation Plan addresses EV charging infrastructure deployment for Metro employees, Metro non-revenue service vehicles, and Metro transit users. The plan does not address revenue vehicles such as Metro busses or third-party contracted bus operators.</p> <p>Metro has stated bus fleet electrification goals but these are outside of the scope of the EV Implementation Plan.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
4	<p><b>Establish Key Charging Technologies for electric vehicle charging to combat “on peak” charging and take advantage of “super off-peak” charging.</b></p> <p>a.This is paramount for infrastructural planning purposes.</p> <p>b.In consideration of the way utilities, such as SCE, set rates (which involves consideration of the following things: Time of use volumetric energy pricing, demand charges and non-time related charges; as well as the charging load profile); Metro must consider and implement several energy charging strategies that utilize battery energy storage and micro-grids for time of day implications, demand response considerations, vehicle to grid usage as well sustainability and disaster preparation applications.</p> <p>c.“The more consistent (i.e., frequent and steady) the load profile, the higher the load factor and the lower the average rate”; “Understanding Electricity Pricing for Your Charging Strategy”, Robert Thomas, Pricing Design Manager, September 11, 2018; 2018 US ZEB Conference.</p>	<p>The plan tries to address the impact of charging pattern on the cost of charging. Technological opportunities that allow for managed charging and minimize cost will be fully evaluated as equipment is procured and projects implemented. To date, Metro has solely installed EV chargers that allow for remote management. Where beneficial, stationary battery storage, solar Photovoltaics, and utility programs will be utilized. Metro has completed a pilot study to evaluate the potential for vehicle to grid chargers and combining EV charging installations with battery storage and PV infrastructure. A pilot project has been planned to implement battery storage and PV infrastructure with EV charging at 2 Metro bus divisions. Metro staff requested funding for this project for FY2020 and the request was not approved.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
5	<p><b>Utilize Electric Vehicle Infrastructure Training Program (“EVITP”)-certified personnel</b> for charging installations to ensure efficacy and the intended impacts for said chargers; and as a sustainable workforce development strategy in tandem with other Metro Workforce Development Strategies, such as the Construction Careers Policy.</p>	<p>Metro will incorporate language requiring this training in new procurements and will incorporate this into the Implementation Plan.</p>
6	<p><b>Mandate Metro Parking Structure guidelines</b> requiring not only pre-wiring but more importantly 45% EV charging spots, as well as solar photo-voltaics and battery energy storage to offset electricity costs for charging while parking.</p>	<p>Metro has revised the Metro Rail Design Criteria (MRDC) to include pre-wiring and distribution equipment sizing to electrify 10% of new parking spaces which is in line with CalGreen Tier 2 requirements. ECSD has planned to provide EV chargers at all of these parking spaces upon construction completion.</p> <p>Increasing the requirement to 45% would be a significant cost burden to new capital projects at Metro, which are already cost constrained as noted earlier.</p> <p>Metro has no official estimate of the number of parking spaces under construction in the next 10 years and is shifting away from building new parking. Based on conversations with representatives from Metro's Countywide Planning department, staff currently expect Metro to construct less than 1000 parking spots in the next 10 years.</p> <p>Metro will continue to revisit these requirements as MRDC and Bus Rapid Transit Design Criteria (BRTDC) are revised.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
7	<p><b>Dedicate and/or Allocate an Metro vehicle electrification professional specifically to the EV initiative:</b> Given Metro’s climate goals and the critical nature of zero-emission vehicles in green-house gas reduction efforts, a lack of dedicated resources will stymie any well-intended efforts (Please see page entitled “EV Challenges”, bullet point four: “No dedicated staff or overarching strategies”).</p>	<p>Agreed. The plan intentionally highlights staffing and budget challenges facing plan execution. This plan, if adopted, will help to inform staffing and budgetary needs.</p>
8	<p><b>Establish Sustainability Funding Advocacy:</b> Adopting zero-emission technologies and sustainable practices will require significant investments. However, it is unclear from prior meetings to which extent there is a dedicated, over-arching comprehensive effort to procure either funding or rebates at the state, local, California Air Resources Board or Air Quality Management District to offset these costs.</p>	<p>Metro has taken advantage of funding opportunities in the past as highlighted in "Funding for EV Charging Infrastructure" and will continue to pursue funding opportunities as stated in the "Guiding Principles." It is the intent of the plan that its adoption will first inform budgetary needs so that pursuit of funding opportunities can follow.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
9	<p><b>Incentivize Angeleno commuters to ride-share or go zero-emission/electric:</b></p> <p>a.Create incentives to increase rideshare, including over-investment in public commuting (implement policies to make trains/buses more attractive);</p> <p>b.Increase the number of charging stations for employees from 10% (current goal) to 45%; and additionally, try to capture other credits, such as: later start time for EV commuters, coordination with utilities regarding employee/consumer rebates for purchase of zero emission vehicles.</p>	<p>Metro agrees about the importance of investing in public transit infrastructure to make it a more attractive option. Metro is a transit agency and its primary goal is to increase ridership and use of public transit in LA County both for the public and for Metro employees.</p> <p>EV charging provides a low emission alternative to first mile/ last mile travel and Metro supports infrastructure development for this purpose. Metro does not intend to incentivize the use of EV passenger vehicles for commuting purposes.</p> <p>As noted earlier, Metro does not have sufficient funding to meet a 45% EV charging goal.</p>
10	<p><b>Utilize accurate charging figures for planning purposes:</b> The EV Charging estimate costs are extremely high for Level 2 chargers, and inaccurate for Level 1 Chargers. The Metro determined cost per charger (at \$40,000) is more than double what the City of Los Angeles paid for electric vehicle chargers, including upgrades involved, such as transformers (Please see, page entitled EV Challenges, bullet one).</p>	<p>The updated Program Costs as identified in the EV Implementation Plan assume a construction cost of \$29,990/public Level 2 charging station and \$17,345/fleet Level 2 charger. These figures are based on Metro's previous design and construction costs. There are also additional soft costs incurred in project management and administration.</p> <p>While it is reasonable to assume some economy of scale, larger projects will require more substantial upgrades to existing electrical infrastructure. While Level 1 chargers are less expensive and require less high power electrical infrastructure, they still require panelboards, over-current protection, disconnects, conduits, and ADA improvements in line with Level 2 EVSE. Metro hopes to revise cost estimates as more project data is collected and drive project cost down by optimizing design.</p> <p>Metro competitively bids all projects in order to achieve the best possible price and quality. The Plan will be revised if costs for new procurements come in lower than previous experience.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
11	<p><b>Identify the existing funding sources</b> for both NEW as well as RETRO-FIT/Improvement projects involving sustainability as well as Climate Action Adaptation-type projects to <b>determine where additional funding is needed and potential opportunities for improvement.</b></p>	<p>Metro does not have existing funding earmarked for EV charging infrastructure. The EV Implementation Plan, if adopted, will help to inform budgetary needs.</p> <p>Metro staff actively seek out funding and financing opportunities for EV charging infrastructure. This includes, but is not limited to, funding from settlement agreements, partnership opportunities with local utilities (eg SCE Charge Ready program), and grant funding from governmental entities.</p> <p>Each funding opportunity is structured differently and requires time for Metro staff to review and determine if it is worthwhile for Metro to engage in.</p>
12	<p><b>List compilation of state, local and federal funding that are available, and to which of these, Metro has made any applications,</b> for example, California Energy Commission, California Air Resources Board, Air Quality Management District, State of California, et cetera. This will allow a comprehensive determination of which funding sources have (or alternatively have not) been tapped for purposes of resource planning.</p>	<p>Updated EV Implementation Plan identifies funding sources utilized to date by Metro in "Funding for EV Charging Infrastructure." Other opportunities are identified in "Other Initiatives in the Los Angeles Region."</p> <p>Metro staff are also developing a list of funding sources for zero emission applications, including zero emission buses and vehicles, and ensuring that Metro takes full advantage of available funding. A separate attachment has been included detailing the funding opportunities are being tracked.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
13	<p>Plug In America supports the deployment of more EV charging stations across the Metro service territory. However, <b>Plug In America strongly encourages that a portion of the Level 2 stations to be deployed are instead Level 1 charging stations.</b> Places where the vehicle might be parked for extended periods, such as park and ride lots, are some of the best places to install a Level 1 charger.</p> <p>Arguments:</p> <ol style="list-style-type: none"> <li>1. L1 charging would be sufficient for average Metro employee commute distance and charge needed.</li> <li>2. Transit survey shows distance transit users travel to station parking and duration parked would be effectively served by L1 charging.</li> <li>3. Cost of L1 EVSE is lower than L2.</li> <li>4. Lower demand charges.</li> <li>5. Low cost of charger means they need not be networked or even require payment</li> <li>6. Due to long dwell times, commuters may not be able to move their fully charged vehicle thus occupying an EV charger/space (low utilization rate). More L1 chargers could mean higher utilization rate. We strongly suggest that Metro conduct an analysis of the costs and the number of vehicles served comparing paid level 2 EVSE, free level 1 EVSE, or some combination of the two.</li> </ol>	<p>Metro park and ride dwell time is 4-10 hours according to a recent visitor survey. Longer dwell times allow for greater flexibility in rate of charge. Lower power chargers can help minimize demand charges.</p> <p>Metro requires that public charging equipment be networked so that user fees can be collected and stations monitored. There are insufficient options for networked level 1 chargers at this time.</p> <p>Further, the cost of Site Prep, Demolition, Excavation, Landscape/Irrigation, Concrete/Paving, Site Improvements and Signage/Striping are the same for level 1 and level 2 charger installation. These non-electrical costs make up about 46% of the cost of Metro projects based on independent cost estimates for five of Metro's park and ride lots. The remaining 54% is electrical work/equipment and while there are savings realized by using lower power chargers such as smaller wire gauges, conduits, transformers, breakers and panelboards, these savings range from 9% to 18% per project depending on the number of chargers installed.</p> <p>It is Metro's belief that similar savings can be achieved by integrating load management systems (LMS) into level 2 charger design. LMS allow for load sharing between multiple EVSE thus lowering the charge rate when necessary to maximize the number of vehicles that can charge simultaneously and allowing the site to build more chargers per Amp of capacity than traditional equipment sizing. Additionally, deploying LMS in conjunction with level 2 chargers will have a similar impact on managing demand charges. LMS will be further addressed in the EV Implementation Plan.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
14	<p><b>Wherever new parking will be built, EVSE pre-wiring should be included.</b></p> <p>On page 9, Metro states, “Metro lacks an inventory for the number of spaces that could become charging stations at park and ride lots. There are 25,000 public parking spaces and it would be beneficial to understand how much of that could host EV charging stations cost-effectively (without undue amounts of trenching).” To avoid this lack of inventory for future parking spaces, and the trenching costs, Metro should have a plan in place to pre-wire any new parking spaces.</p>	<p>Metro has revised the Metro Rail Design Criteria (MRDC) to include pre-wiring and distribution equipment sizing to electrify 10% of new parking spaces which is in line with CalGreen Tier 2 requirements. Metro will continue to revisit these requirements as MRDC and Bus Rapid Transit Design Criteria (BRTDC) are revised.</p> <p>It is unknown the total number of new parking stalls added at Metro properties over the next 10 years but it is likely under 1000.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
15	<p><b>Any site host cost implemented to recover overall program costs should keep the total cost to charge well below the cost of gasoline.</b></p> <p>The report notes on page 16 that, “Metro can recover some costs by charging employees and the public a small fee to access the EV charging network. Information from other sources indicate that some site hosts provide charging free of charge; however, others charge upwards of \$0.25 per kWh. ... It is important to note that the fee assessed will impact the utilization of the facility, whether it be for employees or for the general public.” To encourage greater adoption of EVs among transit riders and Metro employees, Plug In America encourages that this site host cost be kept as minimal as possible. Many consumers switch to driving electric for the fuel cost savings, but these savings will not be realized if site hosts implement high network fees or access fees in addition to the cost to charge. We encourage Metro to perform an analysis that would show the total cost to charge for a typical EV driver with an average commute compared to the cost to fuel with gasoline, and to keep the site host cost charged to EV drivers minimal. The Department of Energy eGallon calculator shows that in California, a gallon of gas is \$3.25, but the cost to charge on EV on the same equivalent ratio would be \$1.43.3</p>	<p>Metro agrees with this recommendation. A fee of \$0.25/kWh is equivalent to about \$3.15 per gallon of gasoline for a hybrid vehicle that gets 45 miles per gallon or \$2.38 per gallon for a vehicle that gets 34 miles per gallon. For the sake of reference, gasoline in the Los Angeles area has averaged between \$3.35 per gallon and \$3.42 per gallon in 2018.</p>

**LA Metro EV Implementation Plan Comment Matrix**

#	Comment	Metro Response
16	<p>Plug In America encourages Metro to work with groups such as Plug In America on the effective marketing strategies and consumer outreach and awareness of EVs.</p> <p>On page 6 of the report, it states, “Metro has developed a public-facing marketing/outreach webpage of EV charging that includes information on station locations, pricing, how to sign up for an EV Connect account, benefits of EVs, and frequently asked questions.” Likewise, on page 9 the report states, “Metro lacks formally defined marketing and outreach objectives or goals. There are some resource constraints within the internal marketing and design department (requests can take a long time).” Therefore, we strongly encourage Metro to work with EV advocacy groups such as Plug In America on effective marketing strategies. Plug In America already has FAQ on EVs and information on the benefits of EVs. We also have a new consumer engagement tool called PlugStar that helps consumers to identify the right EV for his/her driving behavior, and the right dealers to purchase the EVs from. 4 Plug In America also co-organizes large EV awareness events such as National Drive Electric Week and Drive Electric Earth Day that Metro could leverage to raise EV awareness.</p>	<p>Metro agrees with this recommendation and will include language in the Plan to this effect.</p>

## LA Metro EV Implementation Plan Comment Matrix

#	Comment	Metro Response
17	EV 2028 goal 1st goal should be to increase more Metro employees to ride transit, or drive EVs and measure that.	The EV Implementation Plan does not supersede Metro's core goals and mission. Metro employees are currently encouraged and incentivized to take transit to work. Charging stations installed for employees will not be incentivized.
18	EV Strategy Goal 3 is missing an equity component or any guiding principles on where public chargers would be installed. For equity, I suggest focusing on where people can't charge at home (b/c live in multifamily) and feeder transit service and AT infrastructure is poor so EVs needed for FLM access to transit stations.	Metro will prioritize investment in EV charging infrastructure in Disadvantaged Communities (DACs). Equity is very important to Metro and many of Metro's properties are in DACs. The charger siting tool developed with the Implementation Plan allows driver demand to be superimposed over DAC boundaries and allows Metro to select sites based on multiple criteria.
19	Plan is written if it were 2013 and not 2019. Needs to think more broadly about EV's in LA County and commercial operators. Should incorporate mobility hubs and think about the next generation of transit riders.	Metro is developing partnerships with entities such as Lyft and Uber and the need to develop mobility hubs to support that and other intermodal travel is clear. Metro will seek to identify funding opportunities that could facilitate EV mobility hubs at its stations.
20	Plan needs to incorporate renewables and energy storage.	Technologies such as stationary energy storage, solar PV, and managed charging will play an important role of reducing cost of vehicle charging. All technologies that provide value through cost-minimization and GHG reductions will be evaluated during design and procurement.
21	Needs to be more flexible and resilient.	Metro is working on resiliency efforts apart from the EV Implementation Plan. System resiliency will be addressed outside of the plan.

## Funding Sources + Opportunities for Zero Emission Buses and Charging Infrastructure\*

Program	Authority	Eligible Projects	Process	Funding	Availability	Distribution	Policy Issues / Notes	Next Steps
Carl Moyer Program ----- AB 617 (Community Air Protection Program)	CARB + SCAQMD	Transit bus replacement, repower, or conversion and charging infrastructure (new, conversion, or expansion of battery charging or alternative fuel stations)	Competitive	~ \$25-30m for SCAQMD region (based on annual average) ----- ~ \$100m for SCAQMD region (based on last year's appropriation)	Spring 2019	Annual appropriation ----- One-time Carl Moyer supplemental appropriation	*DAC/low-income requirements *Buses scored based upon pollution reduction *Can be stacked with HVIP but sequencing is critical *Procurement timeline *Funding caps / maximum eligible percentages apply and vary by source	*Need to evaluate and match eligible buses and equipment with fund source requirements *Need to identify infrastructure projects that are ready to proceed (facilities to support Silver Line electrification would be good candidates) *Ensure procurement and internal funding flexibility to take advantage of funding opportunities
Volkswagen Environmental Mitigation Trust Fund: <i>Zero Emission Transit, School, and Shuttle Buses</i>	CARB	Transit bus replacement and charging infrastructure	First-come, first-serve	Up to \$65m statewide (to be available in two increments - second increment two years after the first)	2019, after pending work-group process	One-time funding	*Requirements re: age/condition of buses being replaced * <b>Cannot</b> be stacked with other funding sources such as HVIP or Carl Moyer *DAC/low-income requirements	"
Volkswagen Electrify America Cycle 2	Electrify America (CARB Oversight)	Transit bus and shuttle charging	Competitive	\$4-6m statewide	Underway	One-time funding	*Not a promising fund source due to amounts and VW/EA scope	
SCE Medium- and Heavy-Duty Charging Infrastructure Program	CPUC + SCE	Electric infrastructure to serve charging equipment for medium- and heavy-duty vehicles		<b>At least</b> \$36m of \$343m total budget (\$242m capital - \$115m expense) must serve transit agencies in SCE region		One-time funding	*40% of budget must be spent in DACs *SCE must offer rebates of up to 50% of the cost for electric vehicle service equipment for sites in DACs that support electric transit and school buses	*Follow-up with Vehicle Technology
FTA Bus and Bus Facilities Competitive Grants	FTA	Capital projects to replace, rehabilitate, purchase or lease buses + capital projects to rehabilitate, purchase, construct or lease bus-related facilities	Competitive	\$427m nationwide for FY 2018-19 *Average grant size for FY 2017-18 was \$3.4m	Summer 2019	Annual appropriation		
FTA Low or No Emission Vehicle Program	FTA	Funding for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, leasing and/or rehabilitation of required supporting facilities	Competitive	\$85m nationwide for FY 2018-19 *Average grant size for FY 2017-18 was \$1.6m	Summer 2019	Annual appropriation		

\* Excludes HVIP - applications underway

## Funding Sources + Opportunities for Non-Revenue Fleet and Light-Duty Charging

Program	Authority	Eligible Projects	Process	Funding Amount	Funding Availability	Distribution	Policy Issues / Notes	Next Steps
Volkswagen Environmental Mitigation Trust Fund: <i>Light-Duty ZEV Infrastructure</i>	CARB	Light-duty ZEV & Hydrogen Fuel Cell Supply Equipment (L1, L2, or FC)	Competitive	Up to \$10m statewide * \$5m - charging stations * \$5m - hydrogen fueling	2019, after pending work-group process	One-time funding		*Discuss with ECSD
California Energy Commission (CEC) - Alternative & Renewable Fuel & Vehicle Technology Program (FY 19-20)	CEC + SCIP	ZEV Infrastructure	First-come, first-serve + Competitive	\$32.7m - Electric Vehicle Charging Infrastructure \$20m - Hydrogen Refueling Infrastructure \$5m - Manufacturing & Workforce Development	Mid-2019	Annual appropriation	*EVCI funds filter to Southern California Incentive Project (SCIP). *In FY 18-19 \$13m in SCIP funding was available for LA County - there are still \$4.51m remaining in first-come, first-served funding.	*Discuss with ECSD
Volkswagen Electrify America	Electrify America (CARB Oversight)	ZEV Infrastructure / Metro Community Charging	Competitive	~ \$32m for Los Angeles-Long Beach-Anaheim in Cycle 2	Underway	One-time funding	*Not proceeding due to disagreement re: terms	*N/A, monitor Cycle 3

## Funding Sources + Opportunities for Microtransit

Program	Authority	Eligible Projects	Process	Funding Amount	Funding Availability	Distribution	Policy Issues / Notes	Next Steps
Low Carbon Transportation Investments: <i>Clean Mobility Voucher Pilot Program</i>	CARB	Purchase or lease vehicles, bicycles, and other clean mobility options along with associated equipment, infrastructure, and supporting project costs (including outreach)	First-come, first-serve	FY 17-18: \$17m FY 18-19: \$15m	Application acceptance for FY 17-18 funding anticipated for late December 2019 or January 2020	Annual appropriation	*Must have DAC focus *Need to ensure Microtransit vehicle purchases and/or loans will be compatible with voucher terms of Pilot Program	*Participate in Work Group process, tentatively scheduled for April

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Meeting Date:	Status	Council Member	Comment	Metro Response
8-Feb-19	Open	Joel Levin/Hilda Blanco	Request to determine the best avenue to provide input on congestion pricing.	IN PROGRESS: Congestion pricing is a transportation demand management strategy that has been presented to the Board for consideration. Any engagement is subsequent to a Board decision to initiate a congestion pricing feasibility study and will comport with the timeline of that study.
11-Jan-19	Closed	Bruce Reznik	Request to include main comments discussed for all presentations to the meeting minutes.	DONE: Moving forward, staff will provide feedback on previous main points discussed prior to all future presentations.
14-Dec-18	Closed	Belinda Faustinos	Request to look further into partnering with other organizations to see if its feasible to provide stipends to NGO's.	DONE: Metro does not provide compensation to Council members, but would be glad to provide information.
14-Dec-18	Closed	Bruce Reznik	Request to move the Receive and File Update of Motion 57 to the Metro Board to provide sufficient time for discussion on Motion 57 Progress Update.	DONE: Receive and File Update of Motion 57 to the Metro Board has been moved to the 4/12/19 SC meeting as reflected on the ARC.
14-Dec-18	Closed	Bruce Reznik	Request to provide a list of vacant seats that did not receive nominations.	DONE: The Council's membership list provided on 1/3/19 was updated to reflect current vacant seats.
12-Oct-18	Closed	Caryn Mandelbaum/Bruce Reznik/Belinda Faustinos	The EJ seats remain vacant. To receive better participation from the EJ group, can we explore possibility on participation stipends.	DONE: Metro does not provide stipends to Council members but now that we have received two applications for the EJ vacancies, we have full primary participation in all categories from NGO's.
12-Oct-18	Open	Belinda Faustinos	Update on the RAMP/RCIS plan	IN PROGRESS: Working to schedule a meeting with Caltrans to discuss a collaborative effort on the RAMP.
12-Oct-18	Open	Michael Samulon	Encourages Metro to include an annual benchmarking against the updated path to reach numbers on the CAAP	DONE: GHG benchmarking and climate action updates are included in annual Energy & Resource Report
12-Oct-18	Closed	Joel Levin	Incorporation of LA Metro EV Implementation Plan on Meetings ARC	DONE: Has been added to the ARC for the 12/14/18 meeting.
12-Oct-18	Closed	Hilda Blanco	Thoughts on publishing the CAAP	DONE: Once CAAP is approved, it will be posted on Metro's website.
12-Oct-18	Closed	Caryn Mandelbaum	Request of a timeframe on Motion 57 updates	DONE: Motion 57 Progress Update is scheduled for the 3/8/19 meeting. We will provide monthly informal updates.
12-Oct-18	Closed	Michael Samulon	Request to provide an LRTP Toolkit	DONE: Was sent to council members on 10/24/18.