



# Regional Working Group – Final Meeting

City of Fremont Municipal Fleet Electrification Study

January 26th, 2020

# Agenda & Housekeeping

- Project Background & Working Group Review (11:00a – 11:10a)
- Summary of City of Fremont Fleet & Facility Analysis Results (11:10a - 11:20a)
- Best Practices & Lessons Learned (11:20a - 11:35a)
- Q&A (11:35a – 11:50a)
- Panel Introduction (11:50a – 11:55a)
- 5 min break & Poll
- Looking Ahead: Vehicle-to-Grid Integration for Municipal Fleets (12:00p – 12:25p)
  - **Ed Burgess**, Vehicle Grid Integration Council, **David Schlosberg**, ENEL X, **John Wheeler**, Fermata Energy
- Closing (12:25p – 12:30p)

# PROJECT BACKGROUND & WORKING GROUP REVIEW

- Purpose: To help the City of Fremont think strategically about ways to achieve robust decarbonization across fleet and facilities, develop free tools & share conclusions and best practices with the region
- Topics covered in past working groups:
  - Vehicle analysis methodology & results
  - Stakeholder input on Fleet Electrification Planning Tool & Facilities Assessment Tool
  - Regional opportunities & considerations for electric vehicle infrastructure funding



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT



## NEXT STEPS FOR THE CITY OF FREMONT

1. Working to incorporate EV suitability analysis into existing vehicle replacement processes
2. Including EV infrastructure needs in Capital Improvement Plan (*unfunded*)
3. Looking to identify potential funding opportunities (e.g. new federal funding sources)

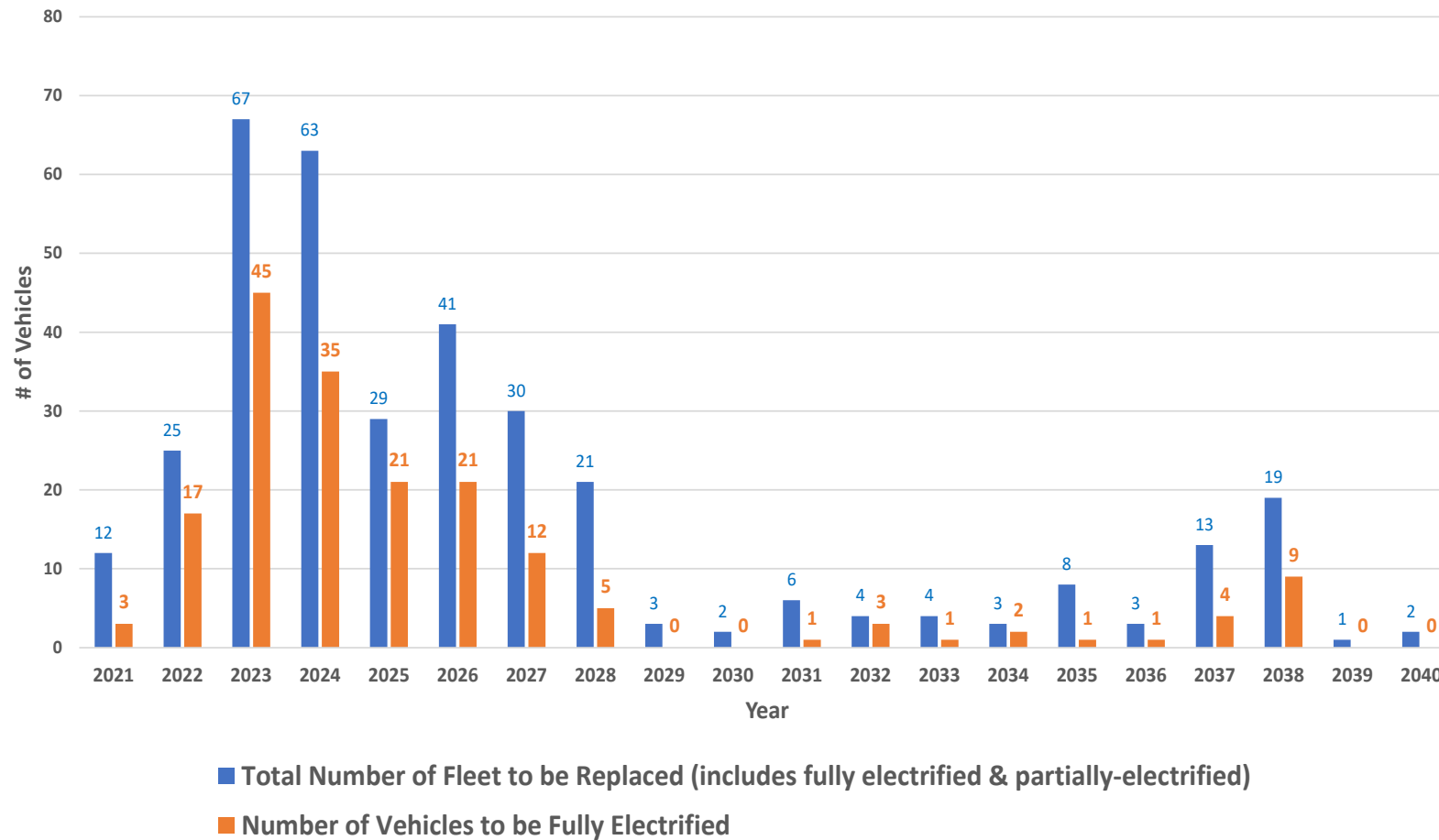


# SUMMARY OF ANALYSIS RESULTS

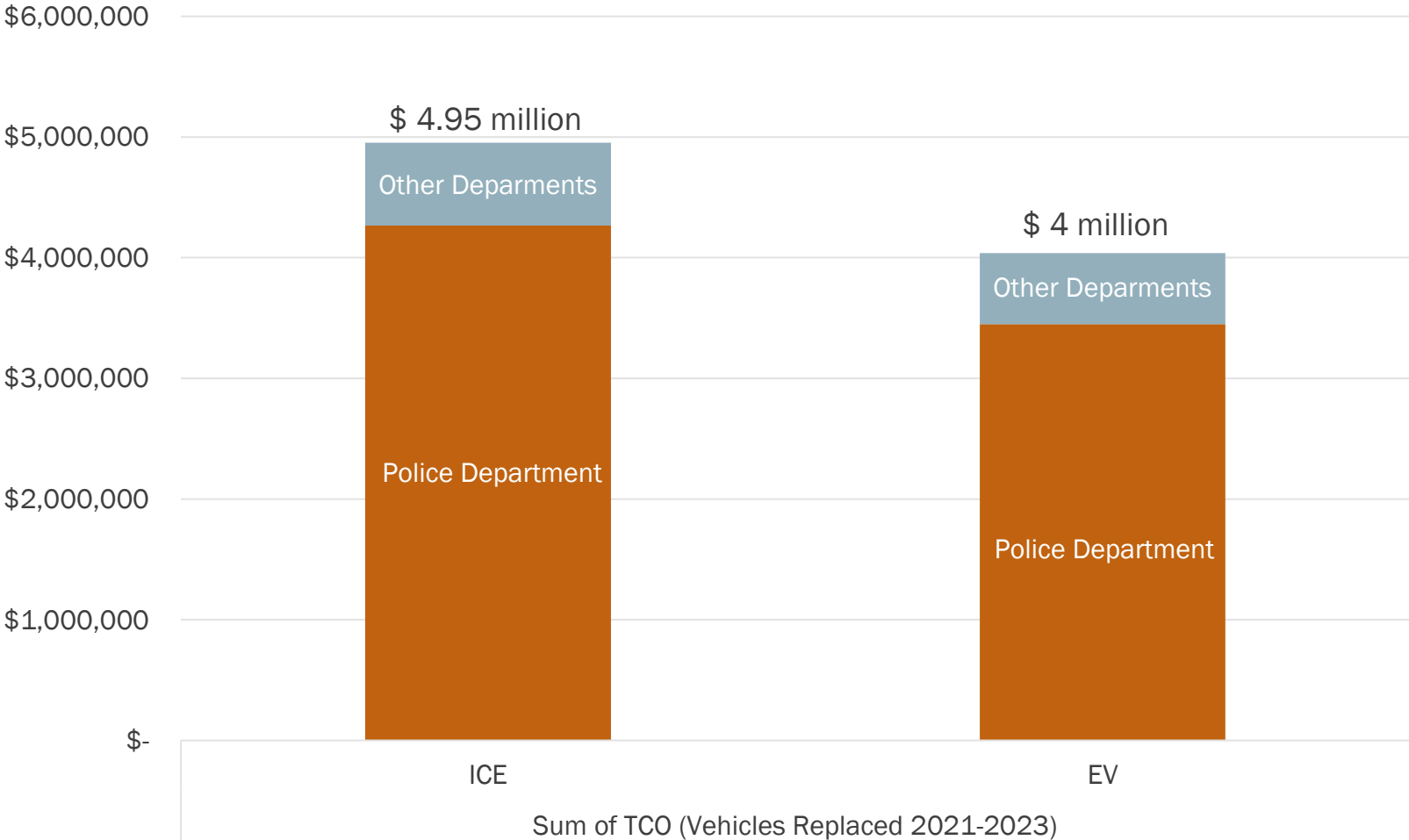
## FLEET ASSESSMENT: KEY FINDINGS

- **~1/3** of City's fleet can be replaced with EVs currently on the market, resulting in **~\$3 million in savings** during the lifetime of the vehicles
- **90% of vehicles analyzed** had at least one EV option currently available that could satisfy **100%** of the vehicles historical driving behavior
- The City can achieve a **54% reduction in fleet emissions by 2030**, even if electrification is limited to vehicles that have an equivalent EV currently on the market

# VEHICLE REPLACEMENT TIMELINE (ENTIRE STUDIED FLEET)

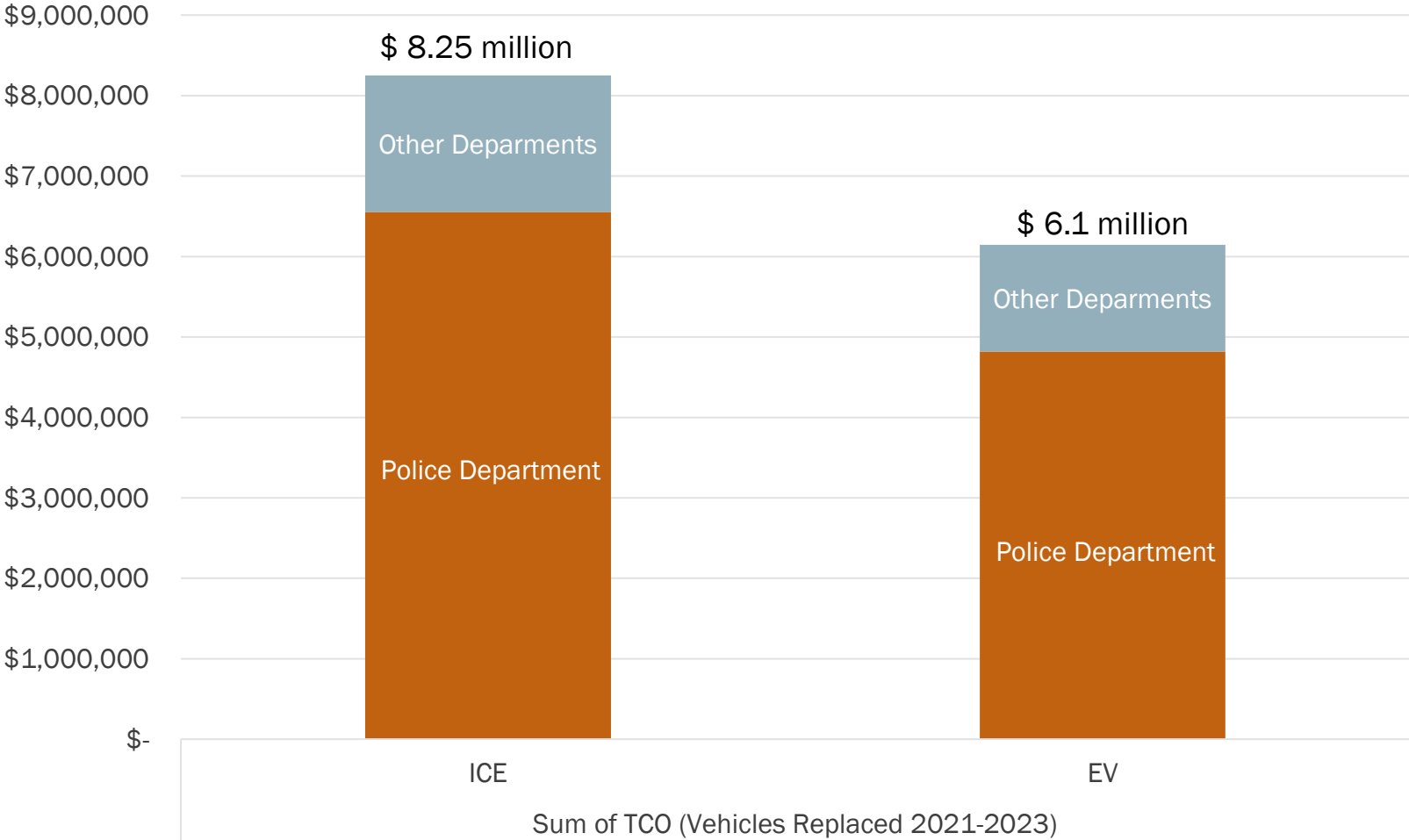


# TOTAL COST OF OWNERSHIP (VEHICLE PURCHASES, 2021 – 2023)

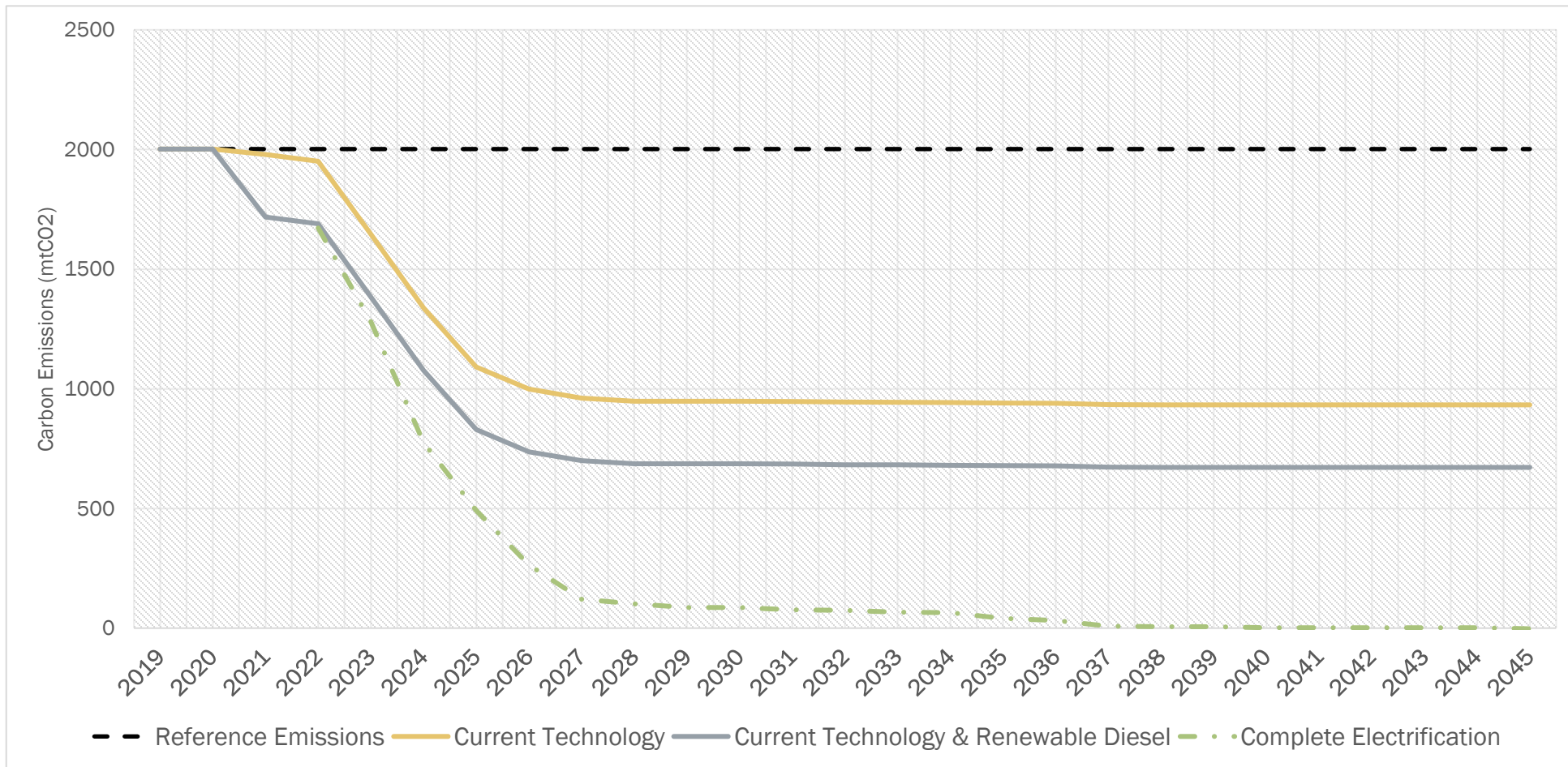




# TOTAL COST OF OWNERSHIP (VEHICLE PURCHASES, 2024 – 2030)



# CARBON EMISSIONS REDUCTIONS



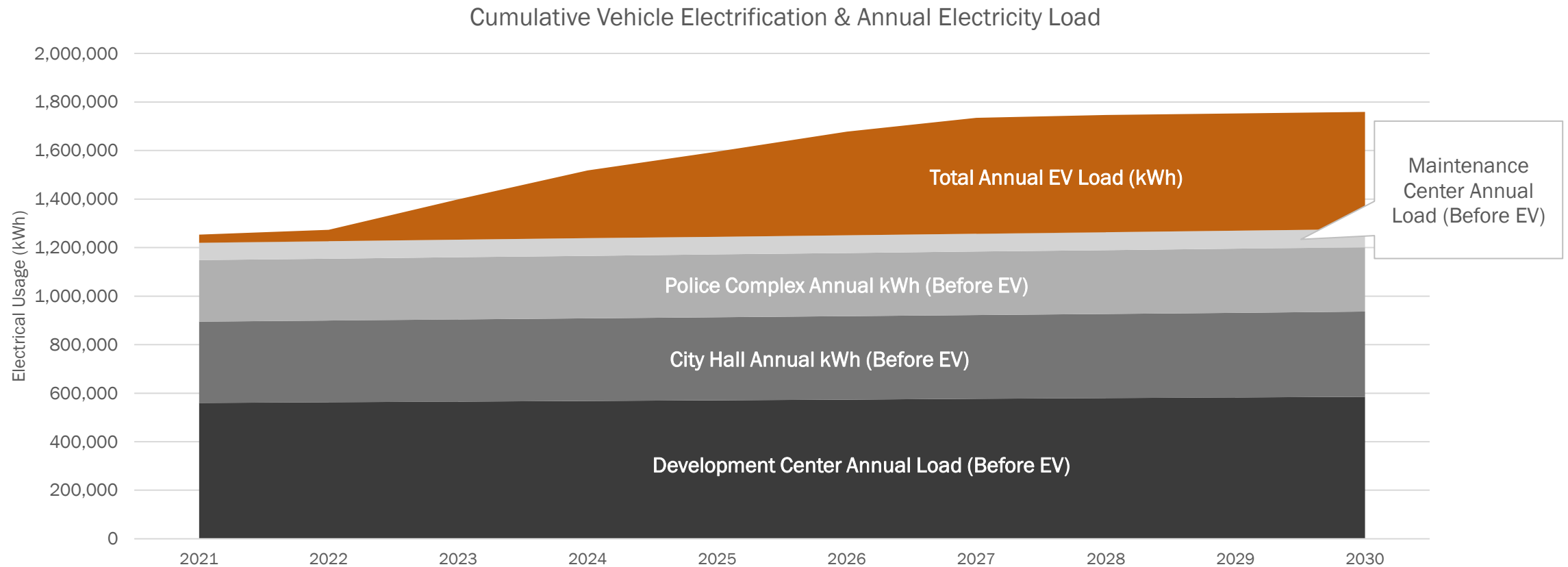


# INFRASTRUCTURE ANALYSIS & PRIORITY FACILITIES

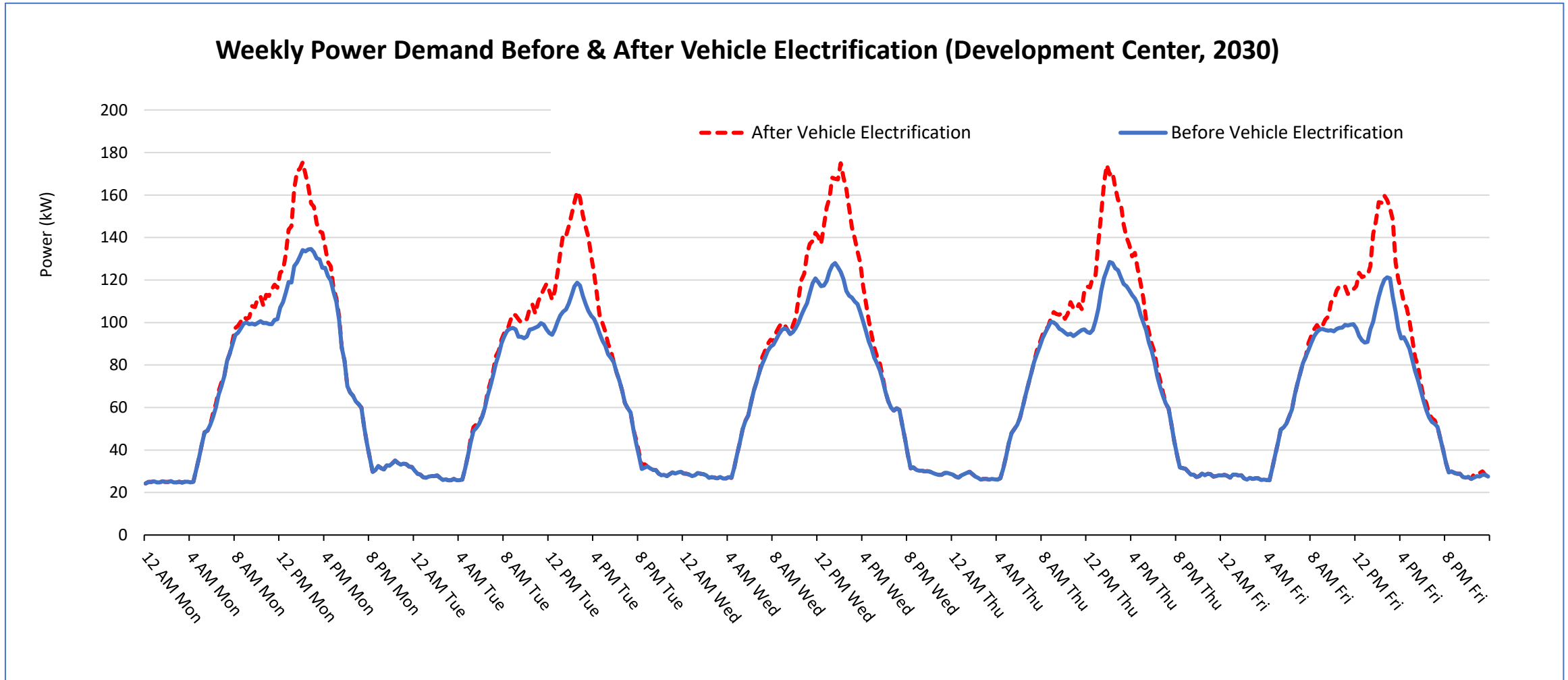
- Detailed analysis of infrastructure needs & DERs focused on four priority facilities
- Development Center, Maintenance Center, City Hall, Police Complex
- Expected electric vehicles at priority sites represent 54.9% of fleet by 2030, 63.4% by 2040.
  - Excluding pickup trucks: 38.6% & 43.5%, respectively.

# ELECTRICAL LOAD GROWTH

Expected electrification results in a 38% load growth through 2030 at priority facilities



# IMPACT OF VEHICLE ELECTRIFICATION ON LOAD PROFILE



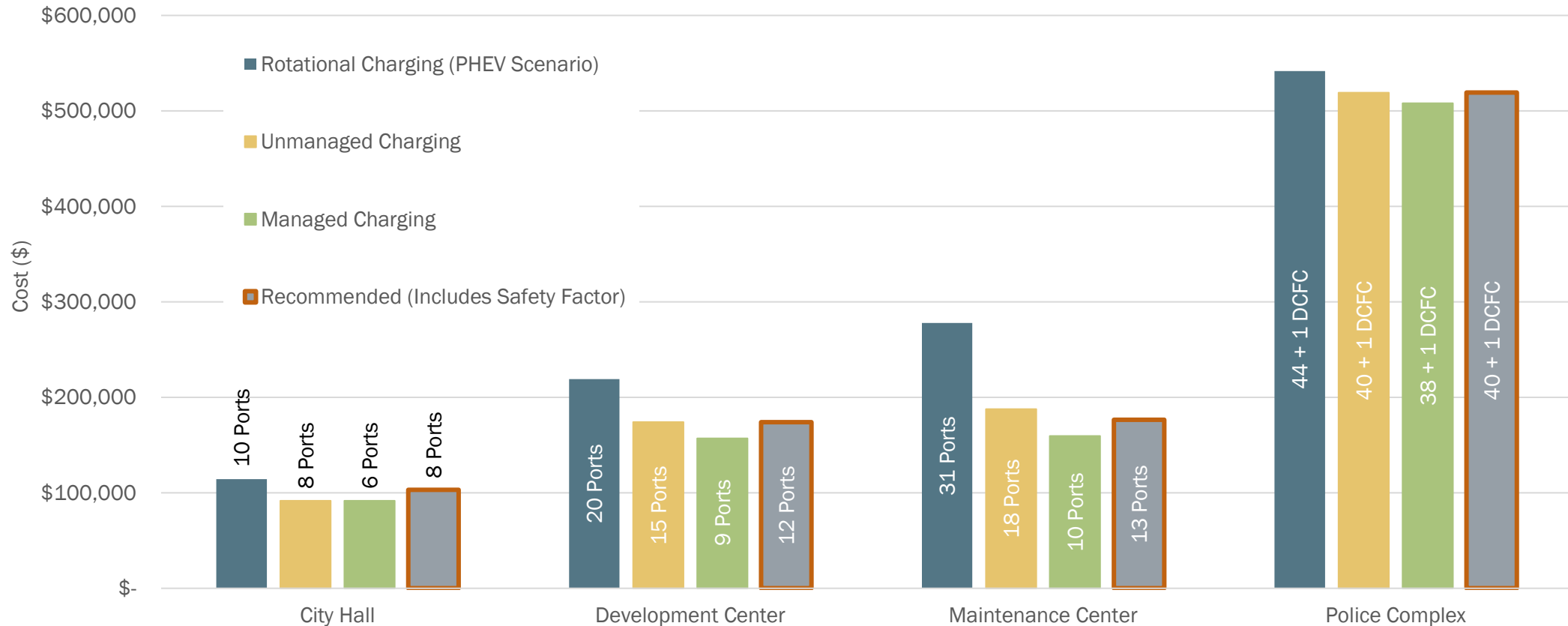
# OPERATIONAL SCENARIOS

Minimizing the infrastructure needed to provide charging needs required modeling multiple operational scenarios

- **Rotational Charging (with PHEVs):** Vehicle charging is assumed to occur during the same 8-hour period overnight and a high penetration of plug-in hybrid electric vehicles is assumed
- **Unmanaged Charging:** Vehicle charging is determined only by vehicle duty cycles. Charging begins when vehicles return to their domicile location.
- **Managed Charging:** Vehicle charging is actively managed by software to enable charging during low-cost times.

# SUMMARY OF EVI NEEDS & COSTS

Estimated Total Infrastructure & Installation Costs Through 2030



*Note: Public Works engineering costs & procurement management costs NOT included.*

# SUMMARY OF RECOMMENDED CHARGING SCENARIOS & CHARGING COSTS

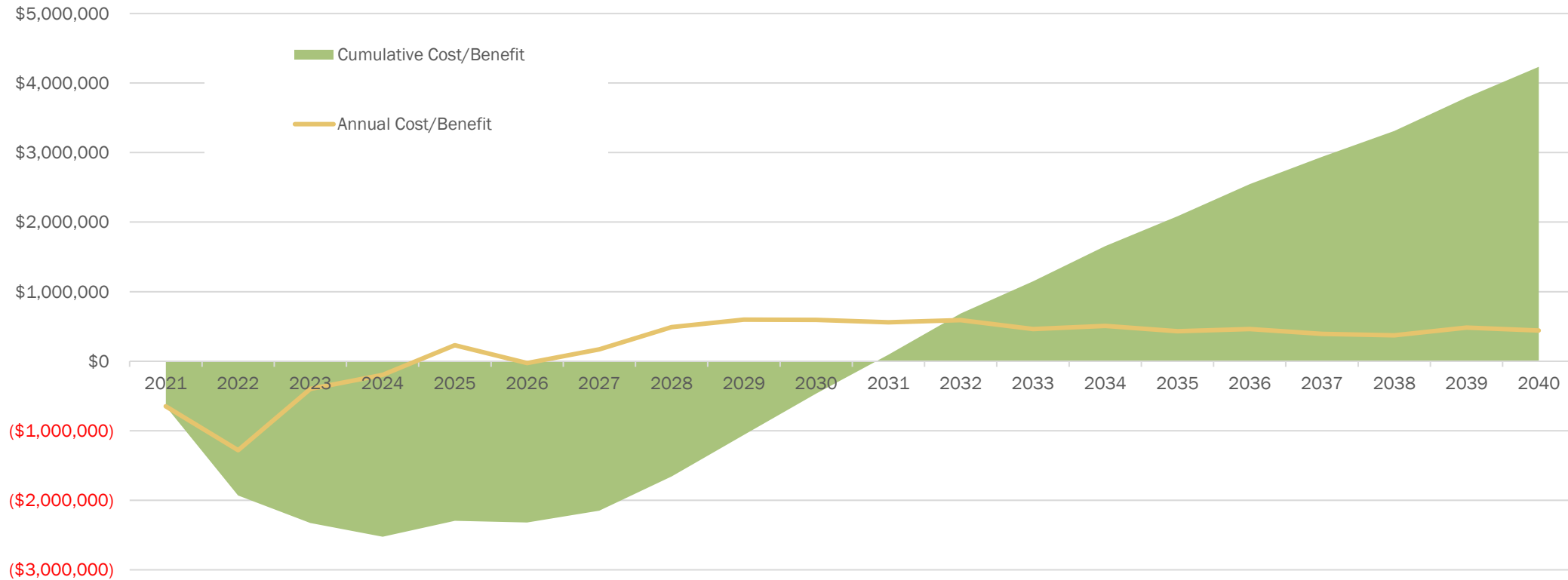
**Levelized Cost of Charging:** Total cost of serving EV load (\$) divided by the total load served (kWh).

Facility	Best Charging Strategy	10-year LCOC (\$/kWh)
Maintenance Center	<b>Metering:</b> Building meter <b>DER:</b> Existing, do not install more <b>Charge Management:</b> Managed	\$0.168
Police Complex	<b>Metering:</b> Building meter <b>DER:</b> Existing, do not install more <b>Charge Management:</b> Managed	\$0.173
City Hall	<b>Metering:</b> Separately metered EV charging <b>DER:</b> Install solar <b>Charge Management:</b> Managed	\$0.22
Development Center	<b>Metering:</b> Separately metered EV charging <b>DER:</b> Install solar <b>Charge Management:</b> Managed	\$0.182



# FLEET ELECTRIFICATION CASH FLOWS – PRIORITY SITES

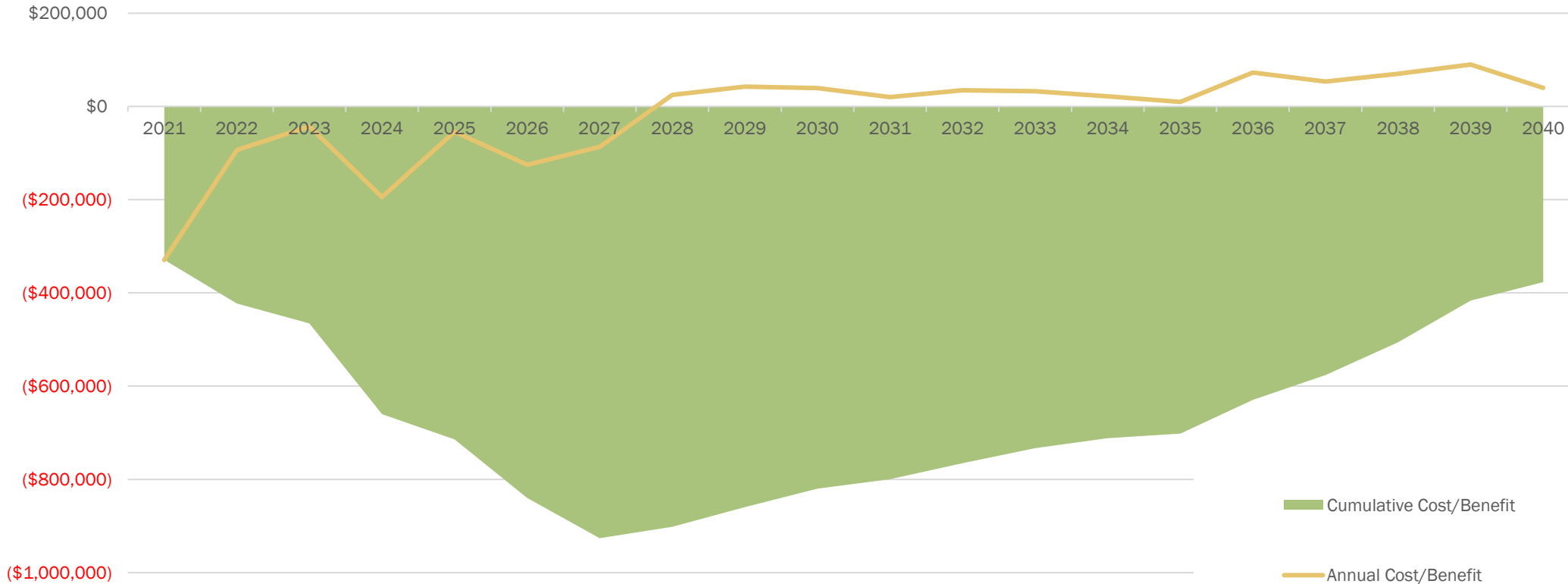
Fleet Electrification Cash Flows - All Sites



*Assumes electrification of all pick-up trucks. Does not include savings from existing solar. Assumes solar PPA. Includes procurement soft costs but does not include Public Works engineering costs.*

# FLEET ELECTRIFICATION CASH FLOWS – MAINTENANCE CENTER

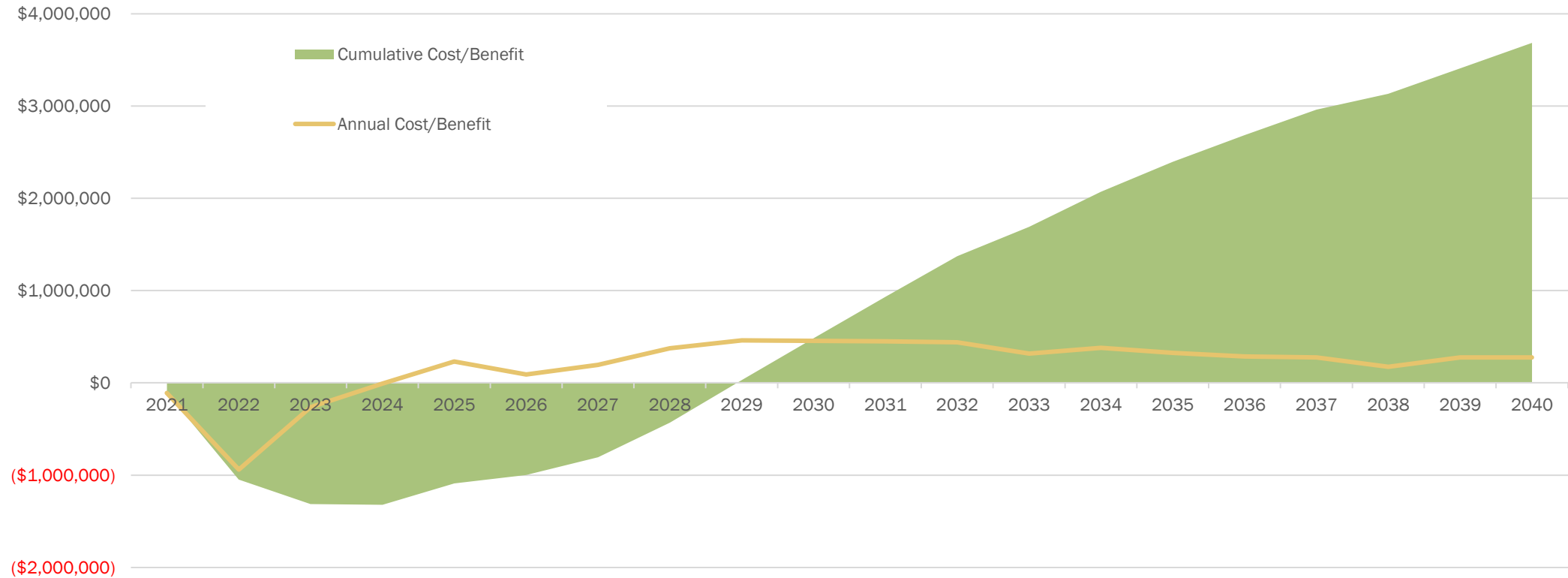
Fleet Electrification Cash Flows - Maintenance Center



*Assumes electrification of all pick-up trucks. Does not include savings from existing solar. Includes procurement soft costs but does not include Public Works engineering costs.*

# FLEET ELECTRIFICATION CASH FLOWS – POLICE COMPLEX

Fleet Electrification Cash Flows - Police Complex



*Assumes electrification of all pick-up trucks. Does not include savings from existing solar. Includes procurement soft costs but does not include Public Works engineering costs.*



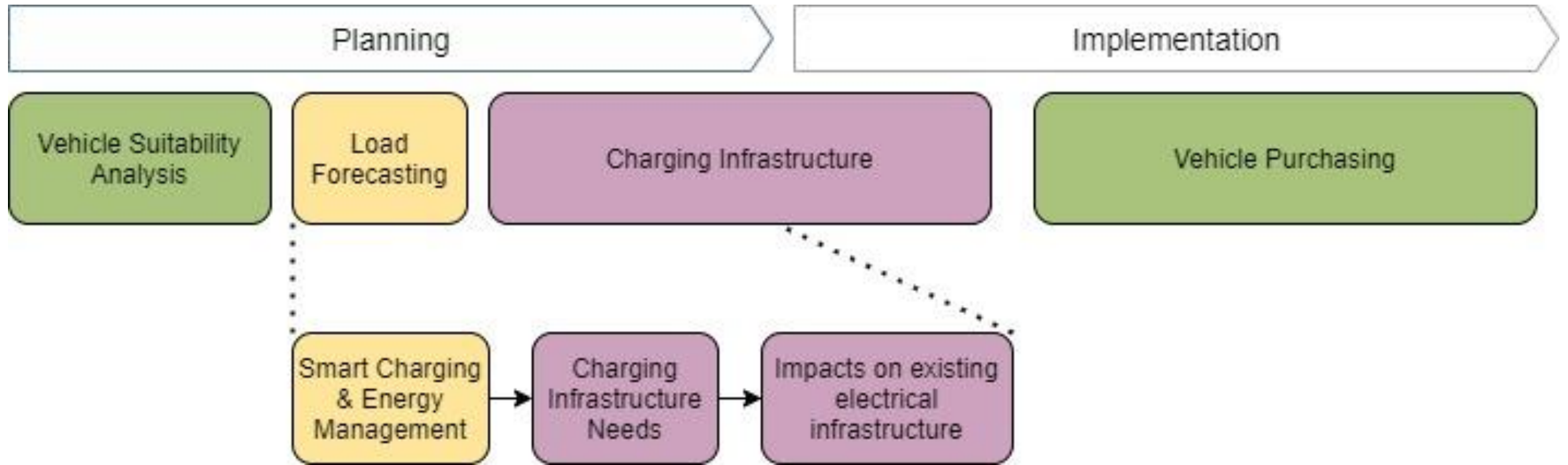
# BEST PRACTICES & LESSONS LEARNED



# 1. FRAMING FLEET ELECTRIFICATION AS A CAPITAL PROJECT

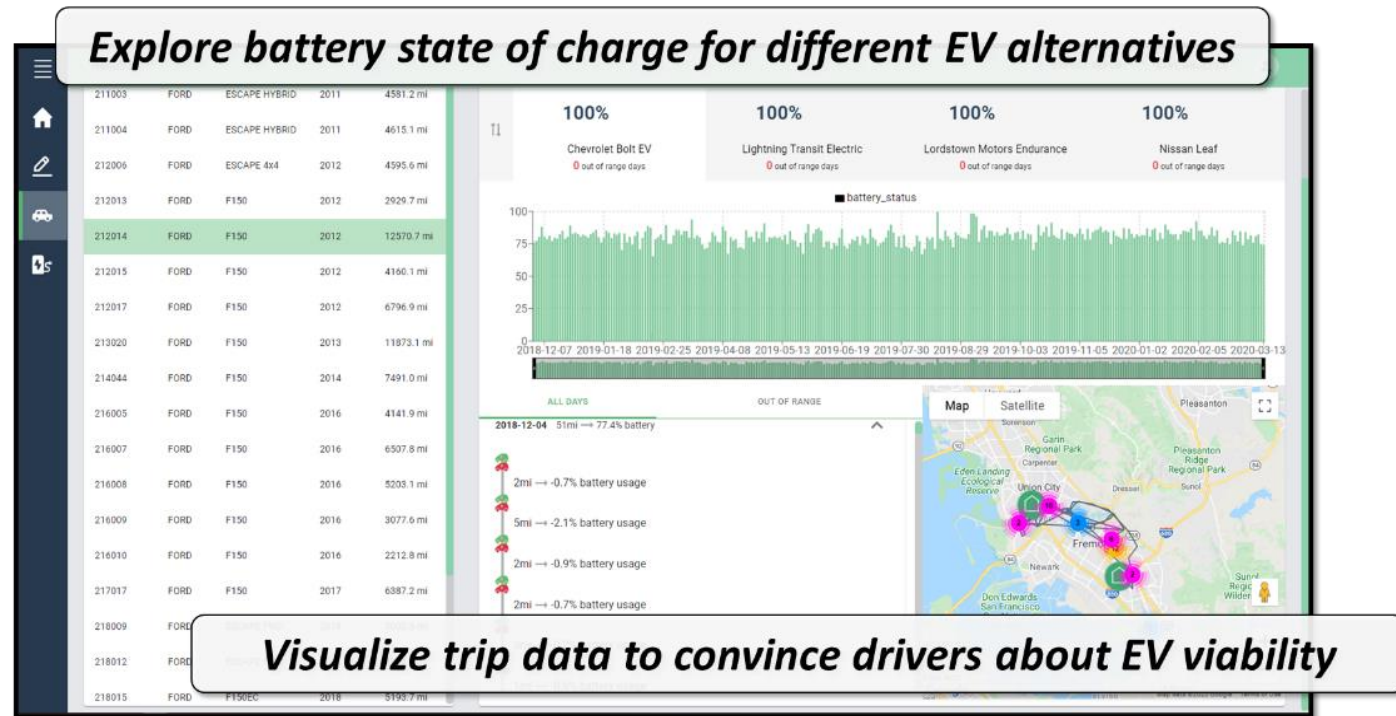
- Treating fleet electrification as a capital improvement project provides the scale required to implement it cost effectively
- Frames it as the type of project that requires significant capital investment (which it does)
- Detailed study is the catalyst that allows this paradigm shift

## 2. A PROPERLY ORDERED ANALYSIS CAN SAVE MONEY



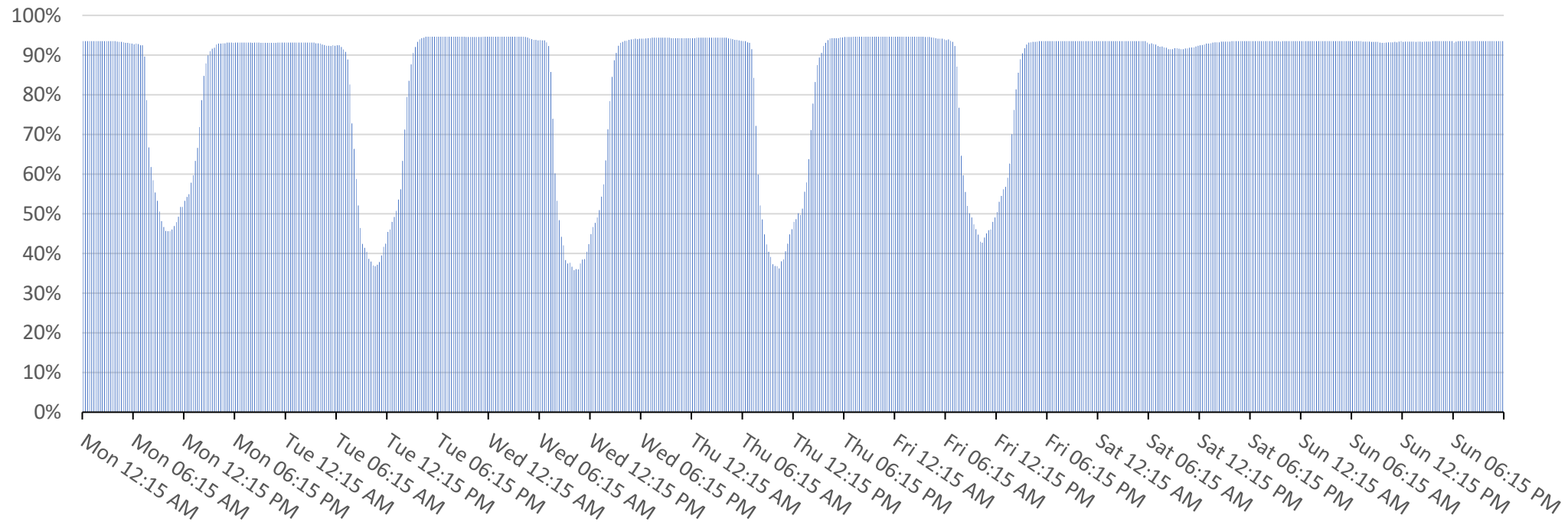
### 3. DATA MANAGEMENT IS FOUNDATIONAL

- Robust data on existing vehicles enables;
  - Accurate assessments of potential EV replacements
  - Detailed forecasting of EV charging load
- Robust data on new EVs allows for accurate fuel cost tracking



# 4. PUBLIC FLEETS ARE NOT LIKELY TO BE CHARGING CONSTRAINED\*

Percent of Vehicles Parked (Maintenance Center)



\*Police/Fire (mission critical) fleets are the exception



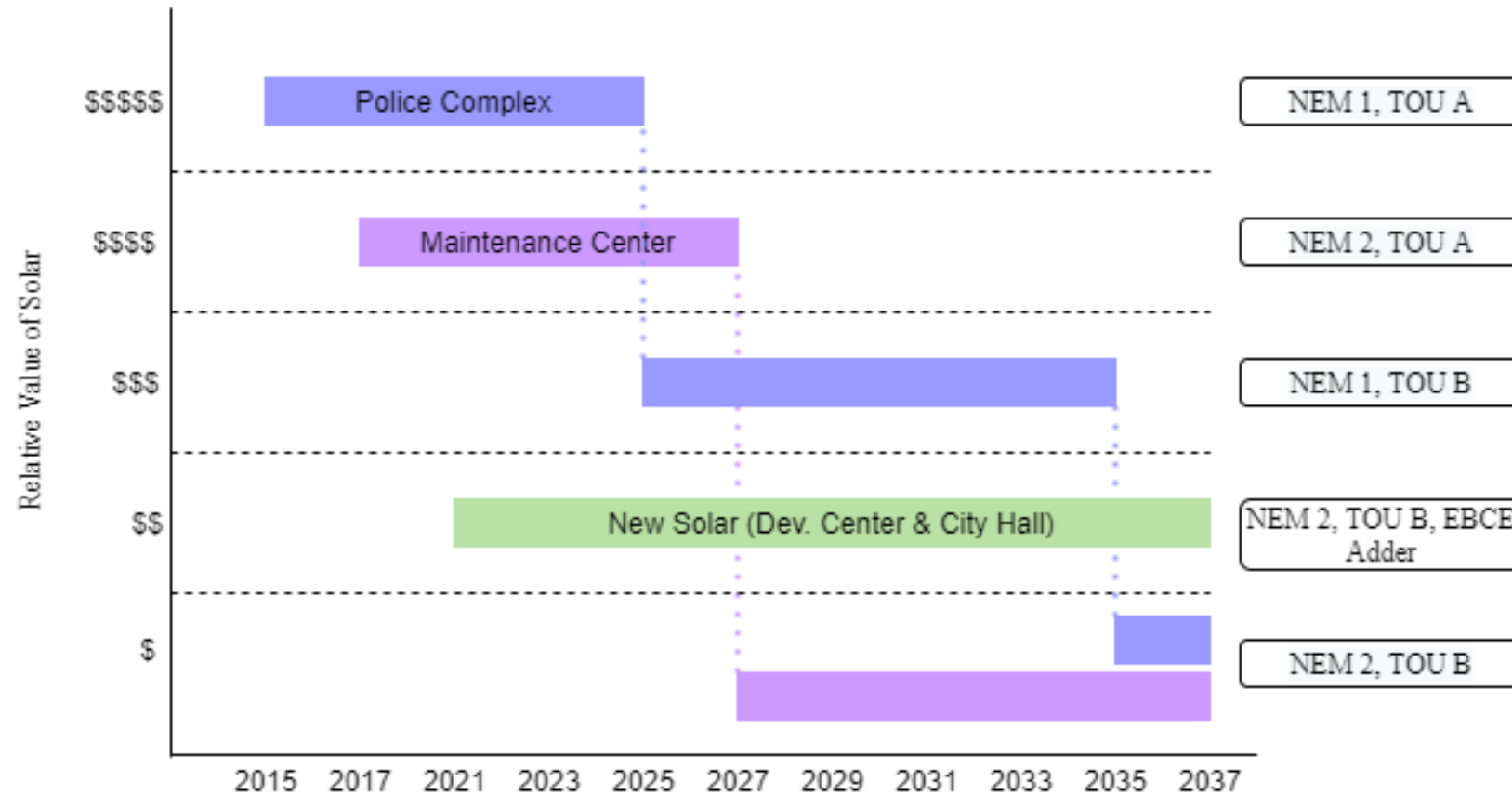


# ASSESSING THE ROLE OF SOLAR + STORAGE

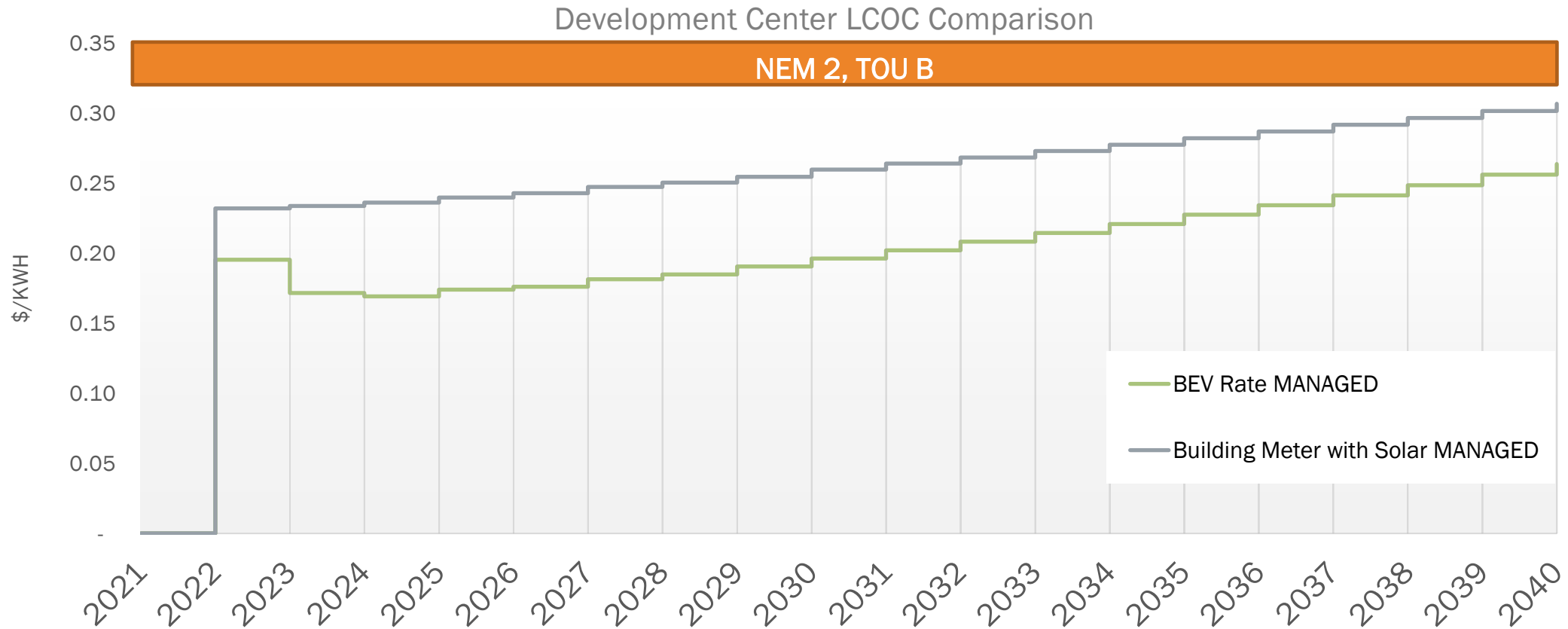
- Initial hypothesis was = a solar + storage system is a good fit to support fleet electrification and mitigate energy costs
- Result = *it depends*

# 5. UTILIZE EXISTING SOLAR TO MINIMIZE CHARGING COSTS

The value of solar drives the charging cost reduction potential of DERs.



## 6. WITHOUT EXISTING SOLAR, PG&E BEV RATE MAY BE THE MOST COST-EFFECTIVE SOLUTION



Assumes PPA escalation of 2% and utility rate escalation of 3%.

## 7. STORAGE IS SITUATIONAL

- Use of stationary battery storage as a charging cost mitigation strategy is site dependent
- On the B-10 rate, storage was not generally effective at reducing charging costs

Electric Bill Savings from DERs: Development Center

	2021	2030
Bill Reduction from PV	78%	72%
Marginal Reduction from ESS	15%	13%

- Co-benefits of storage;
  - Resilience
  - Reduction in coincident carbon emissions

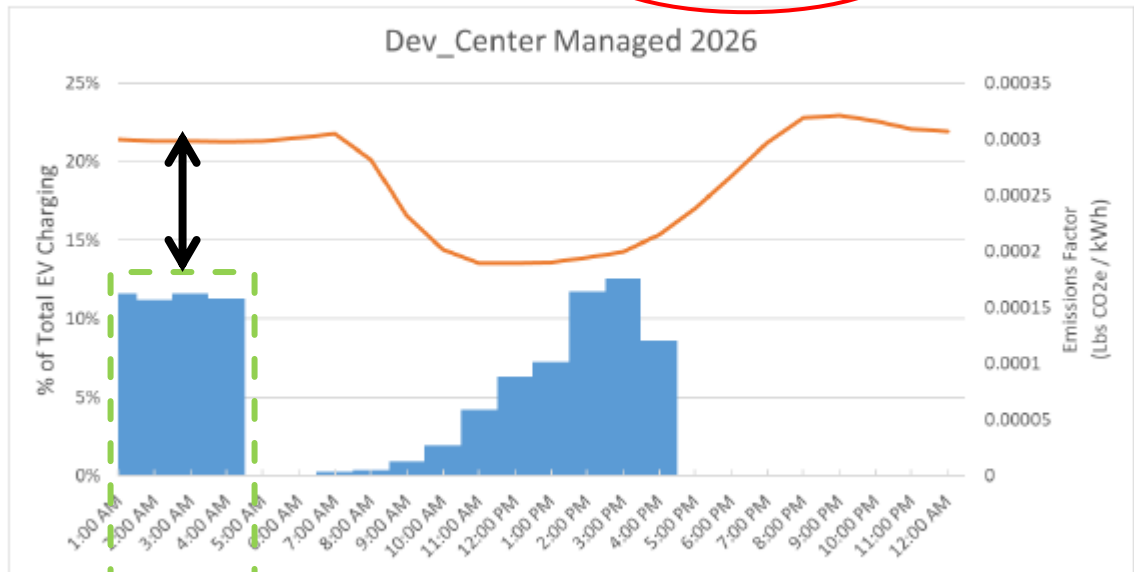
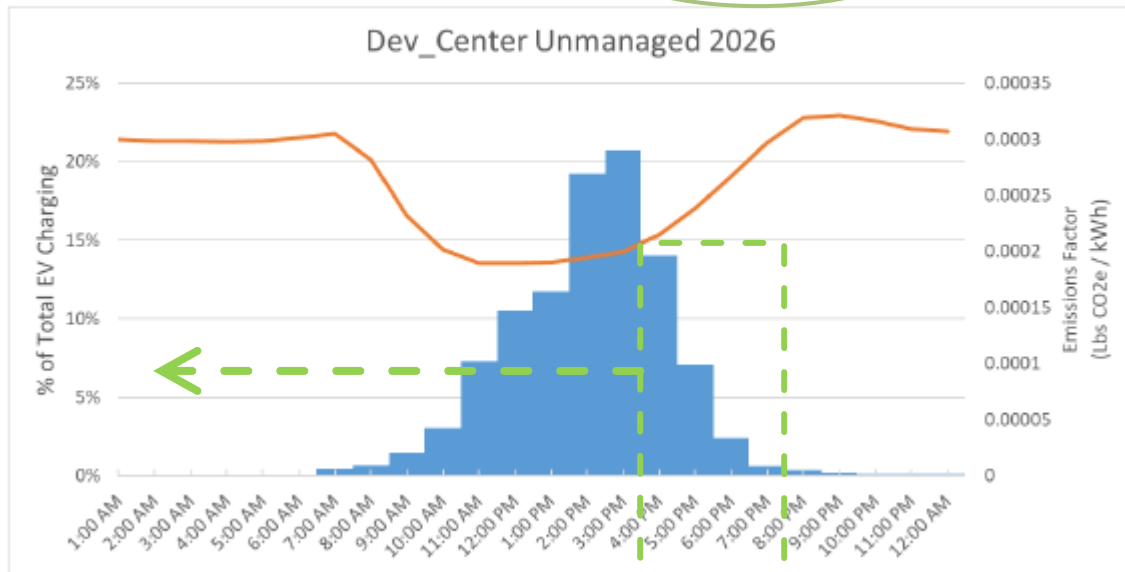
# 8. OVERNIGHT CHARGING & REAL-TIME CARBON EMISSIONS

Gasoline Emissions Equivalent = 157,268 lbs CO<sub>2</sub>e

EV FLEET AT THIS SITE REDUCES NET CARBON EMISSIONS BY ~90%

Unmanaged, 2026  
Total EV Emissions = 17,222 lbs CO<sub>2</sub>e

Managed, 2026  
Total EV Emissions = 20,510 lbs CO<sub>2</sub>e



SHIFTING TO OVERNIGHT CHARGING REDUCES COST BUT INCREASES REAL-TIME ELECTRIC EMISSIONS BY ~20%

# SUMMARY OF RESOURCES AVAILABLE/UNDER DEVELOPMENT

1. Municipal Fleet Electrification Planning Tool
2. Facilities Assessment Tool
3. Best Practices Guide (*under development*)
4. Resources on:
  - “EV First” Purchasing Policies
  - Telematics
  - Licensed EV Identification tools
  - EV Procurement
  - Smart & Managed Charging
5. Project Updates





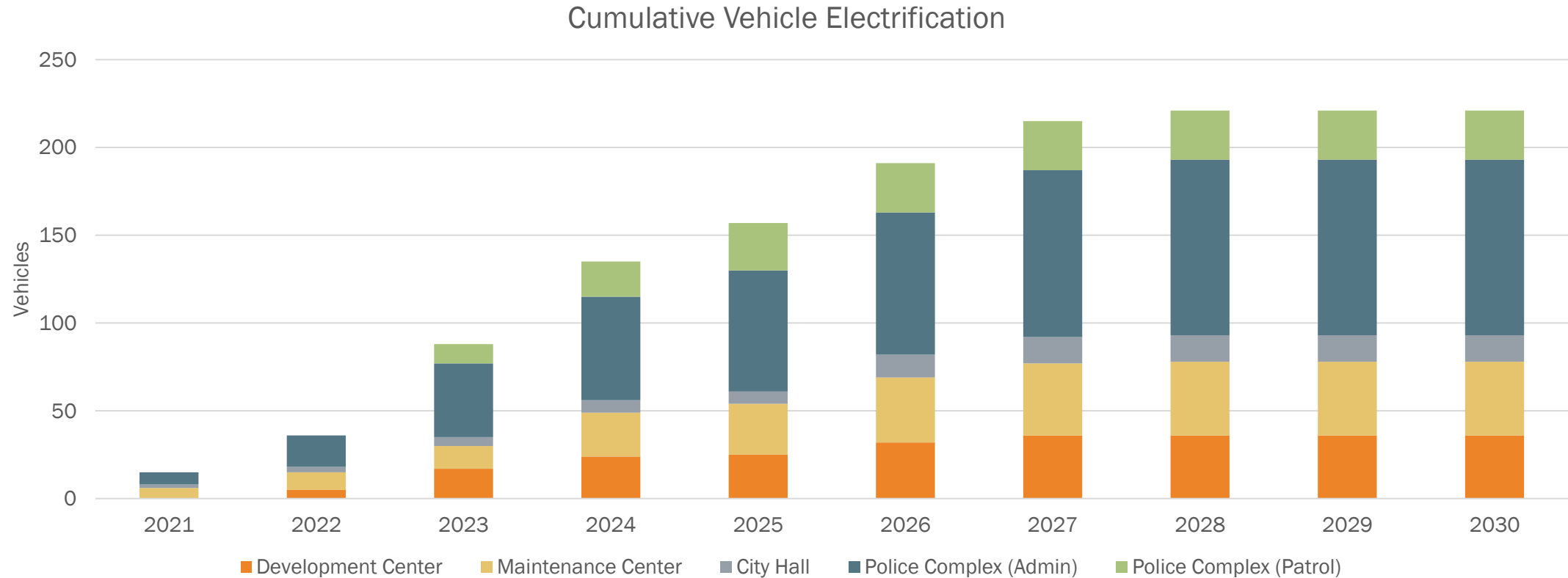
# Q&A



# VEHICLE-GRID INTEGRATION FOR MUNICIPAL FLEETS



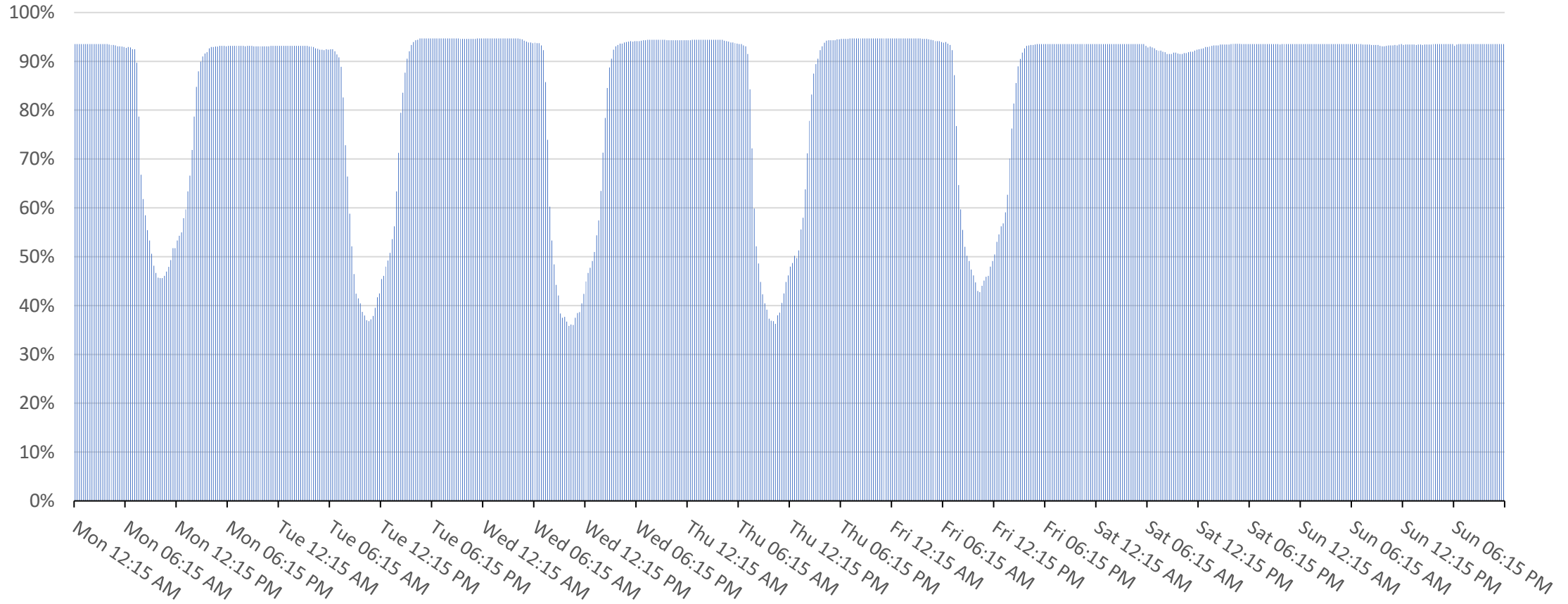
# VGI IN MUNICIPAL FLEETS: TOTAL BATTERY CAPACITY



By 2030, the City of Fremont will have an estimated ~15 MWh of storage located in vehicles

# VGI IN MUNICIPAL FLEETS: VEHICLE DWELL TIMES

Percent of Vehicles Parked (Maintenance Center)





# PANELISTS

- Ed Burgess, Acting Executive Director, Vehicle Grid Integration Council
- David Schlosberg, Head of Energy Services, North America e-Mobility at Enel X
- John Wheeler, Co-founder & Chief Financial Officer, Fermata Energy



VEHICLE-GRID INTEGRATION COUNCIL



# Vehicle-Grid Integration in CA Today: Potential Benefits for Fleets

Presented to the Fleet Electrification Working Group  
January 26, 2021

# About The VGIC

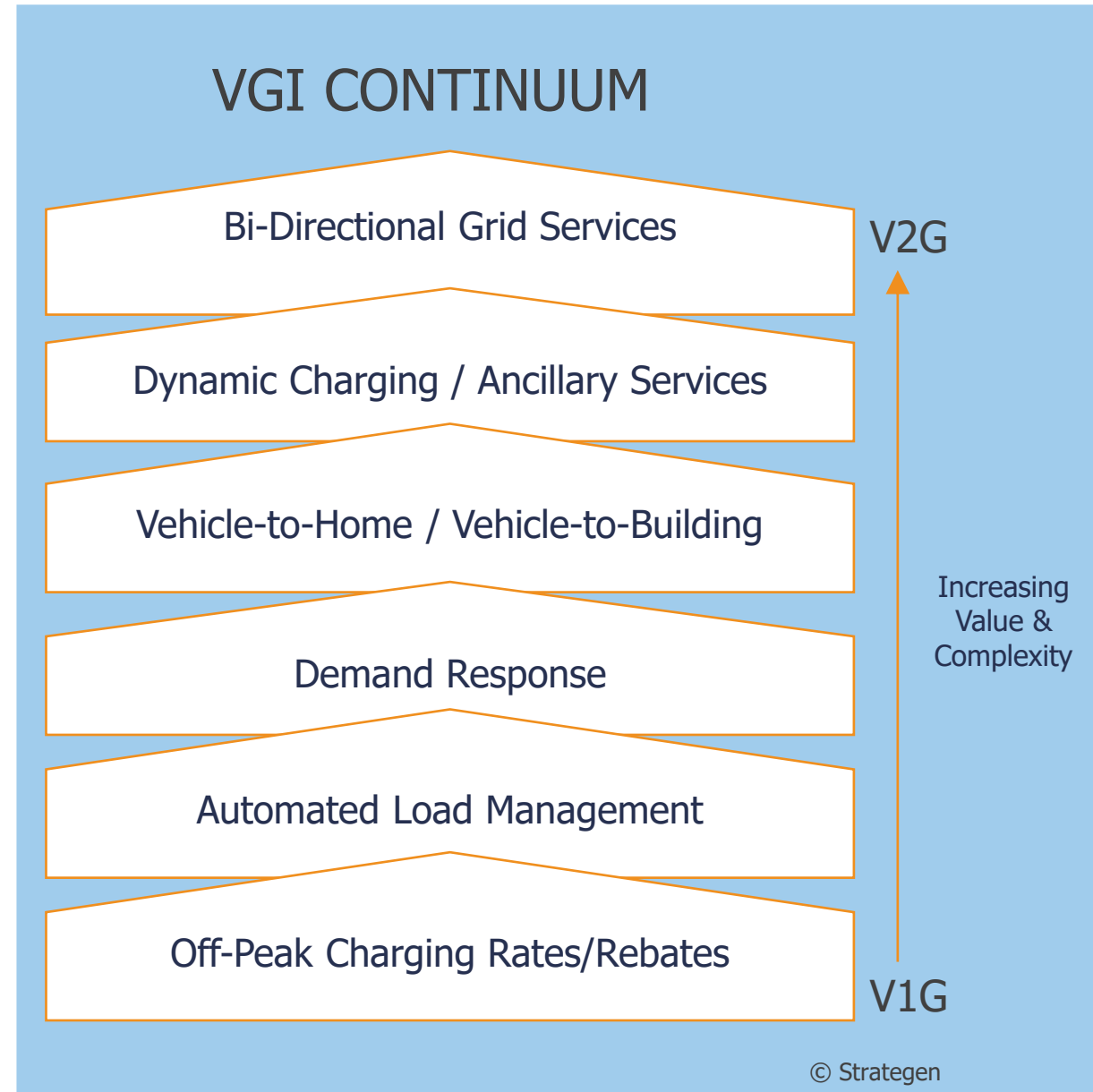
Vehicle-Grid Integration Council (VGIC) is a national 501(c)(6) membership-based advocacy group committed to advancing the role of electric vehicles and vehicle-grid integration through policy development, education, outreach, and research.

The mission of VGIC is to support the transition to a decarbonized transportation and electric sector by ensuring the value from EV deployments and flexible EV charging and discharging is recognized and compensated in support of achieving a more reliable, affordable, and efficient electric grid.

The Honda logo, consisting of the word "HONDA" in a bold, red, sans-serif font.The FCA logo, featuring the letters "FCA" in a blue, sans-serif font, with "FIAT CHRYSLER AUTOMOBILES" in a smaller, blue, sans-serif font below it.The Enel X logo, featuring the word "enel" in a purple, lowercase, sans-serif font, followed by a purple "X" symbol.The Nissan Group of North America logo, featuring the word "NISSAN" in a bold, black, sans-serif font, with "GROUP OF NORTH AMERICA" in a smaller, black, sans-serif font below it.The Toyota logo, consisting of the word "TOYOTA" in a bold, red, sans-serif font.The Mobility House logo, featuring three black chevrons pointing right, with "THE MOBILITY HOUSE" in a black, sans-serif font below it.The Nuvve logo, featuring the word "NUVVE" in a green, sans-serif font, with a stylized green "V" shape.The Fermata Energy logo, featuring a red square with white horizontal lines, followed by the words "FERMAT" and "ENERGY" in a grey, sans-serif font.The Ossiaco logo, featuring a blue wavy line above the word "OSSIACO" in a blue, sans-serif font.The Connect California logo, featuring a white outline of the state of California, with "CONNECT CALIFORNIA" and "CLEAN BACKUP POWER SYSTEMS" in a small, black, sans-serif font below it.

# What is VGI?

- Vehicle-Grid Integration (VGI) is a broad term that includes a variety of possible technologies and use cases for EVs to employ managed charging and provide grid services
  - V1G: one-direction, managed charging
  - V2B/V2H: vehicle used to power a building or home
  - V2L: vehicle used to power other loads
  - V2G: bidirectional charging/discharging for grid services



# Recent Developments in the California VGI Policy Landscape

- ✓ June 2020: Final Report of the California Joint Agencies Vehicle-Grid Integration Working Group
- ✓ September 2020: Rule 21 Interconnection process updated to enable V2G-dc and V2G-ac (on a pilot basis) functionality (CPUC Decision 20-09-035)
- ✓ October 2020: PG&E proposes new dynamic charging rate option for commercial fleet customers (A. 20-10-011). Currently pending at CPUC.
- ✓ December 2020: CPUC approves Decision on VGI strategy implementation (D. 20-12-027)
  - Adopts framework for utilities to implement VGI strategies over next 10 years
  - Unlocks up to \$35 million in funding for VGI Pilots, and \$5 million/year for Emerging Tech program
  - Extensive follow up actions for Automated Load Management and Demand Response to reduce charging and grid infrastructure costs
- ✓ December 2020: CPUC designates portions of utility-collected Low Carbon Fuel Standard “holdback” revenues to be used for resiliency and equity purposes (D. 20-12-027)





## Benefits of VGI for Fleets

VGI Activity	Potential CA Example	Potential Benefits for Fleets
Development of more dynamic charging rates	Successful implementation of PG&E's October proposal	More affordable and flexible charging schedules
Automated Load Management	Development of new ALM incentive program under way at CPUC	Reduced EVSE and interconnection costs
Demand Response	Emergency reliability "extreme weather" procurements	New revenue streams from vehicles when parked
Backup Power	LCFS resilience programs	Dual purpose community benefit for constituents





# Thank You!

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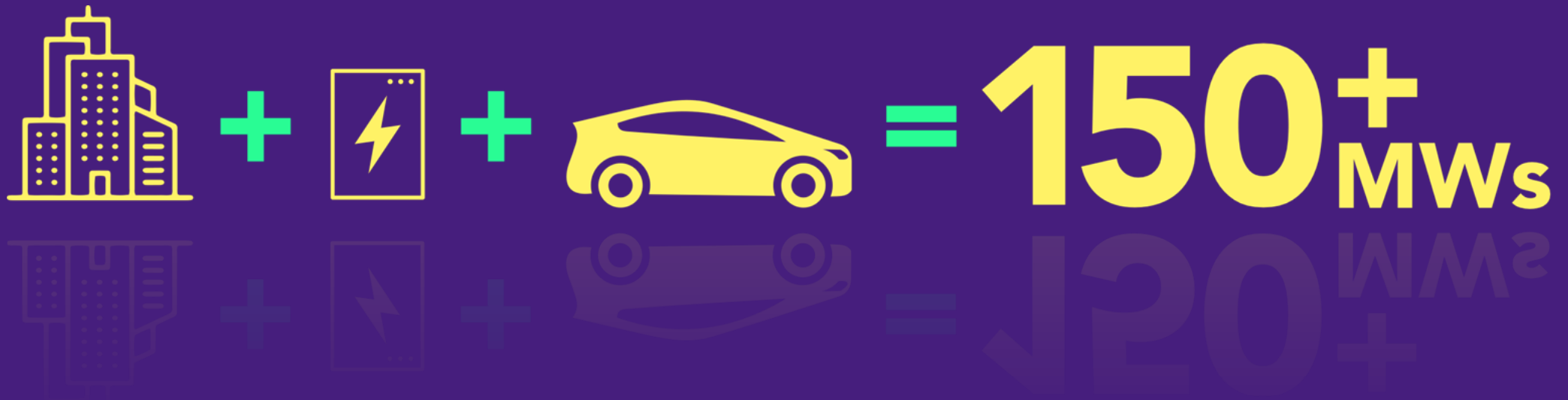
For more information on membership, please email

[info@vgicouncil.org](mailto:info@vgicouncil.org)

# California Heat Wave - August 2020

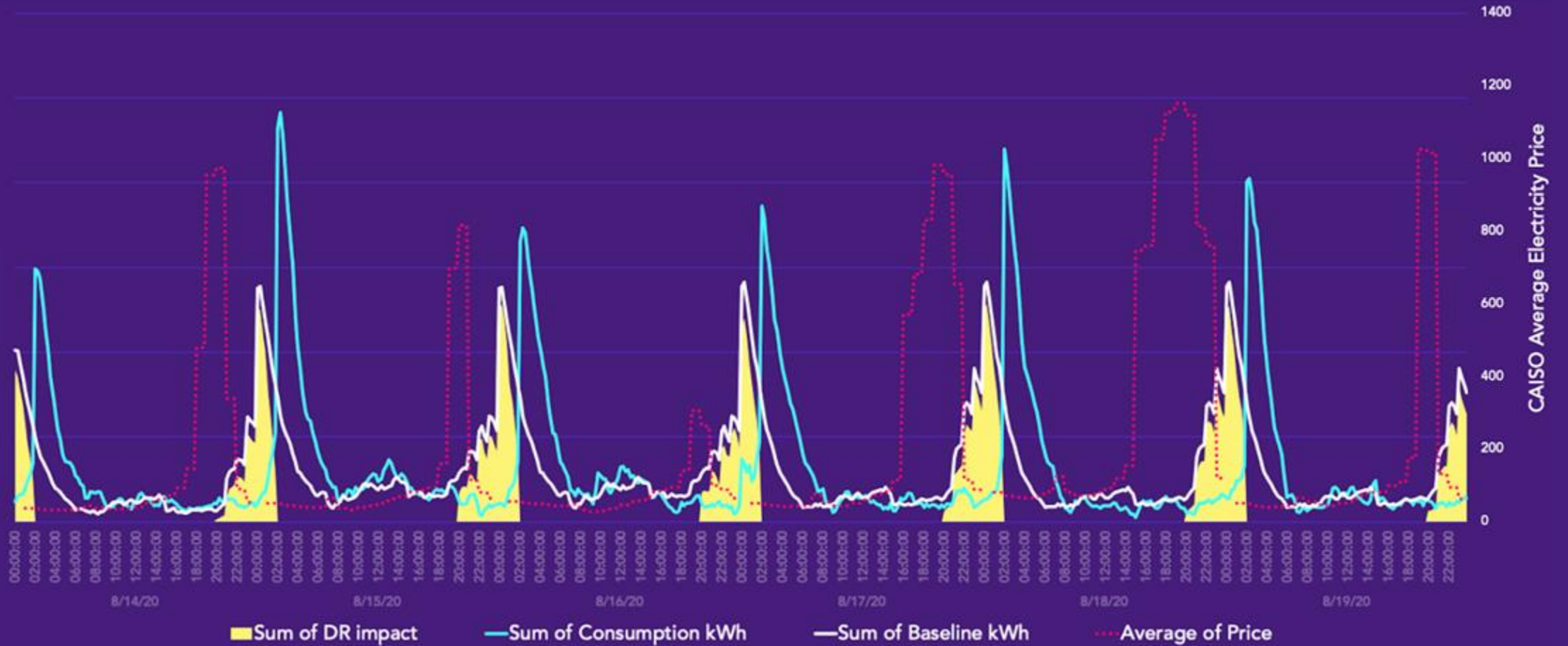


Enel X Provides DER Based Grid Reliability Services



# Enel X e-Mobility

## Vehicle Grid Integration in Action



# CASE STUDY

## Sacramento Municipal Utility District (SMUD)



# 70 JuiceBox smart chargers installed

*Load balancing used to save half of the installation costs.*

### GOAL

Support SMUD's goal to create a path to net-zero carbon emissions by 2040.

### CHALLENGE

Introduce cost-effective smart charging solution to support SMUD's growing electric vehicle fleet.

### SOLUTION

70 commercial JuiceBox Pro smart chargers installed at SMUD HQ. JuiceNet Enterprise used to manage charging and optimize energy usage. Load balancing used to save half of the installation costs.

### USE CASE

Utility fleet charging

# An electrified future

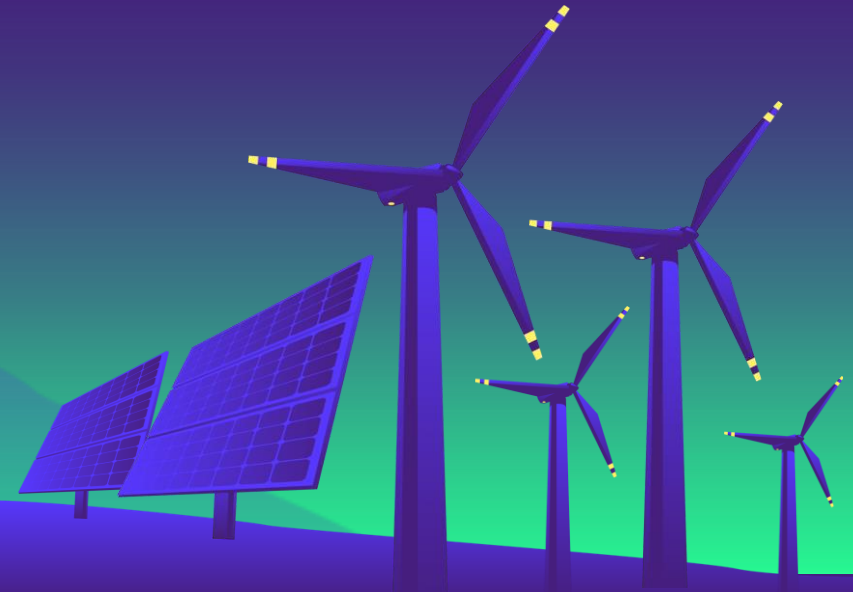
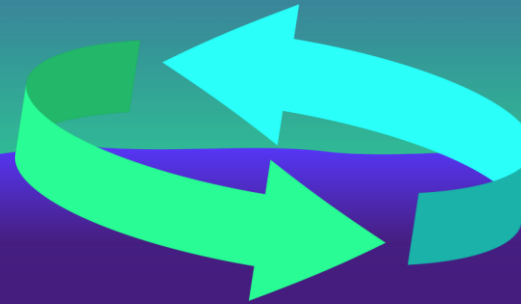


Creating flexibility & value while decarbonizing energy & transport



**100%  
ELECTRIC TRANSPORT**

*Enel Goal: 100% Electric Fleet by 2030*



**100%  
RENEWABLE ENERGY**

*Enel Goal: 100% Renewable by 2050*





## David Schlosberg

VP, Energy Market Operations & Policy  
Enel X

Contact Us:  
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Photo credit: Timothy Hurst/Staff Photographer, Daily Camera



Photo Credit: Green Mountain Power





Meter/Building Detail ▾





## V2X REVENUE POTENTIAL

