



Planning for the  
ZEV Transition



20 years experience in green fleet analysis and 40+ years experience with utility programs.



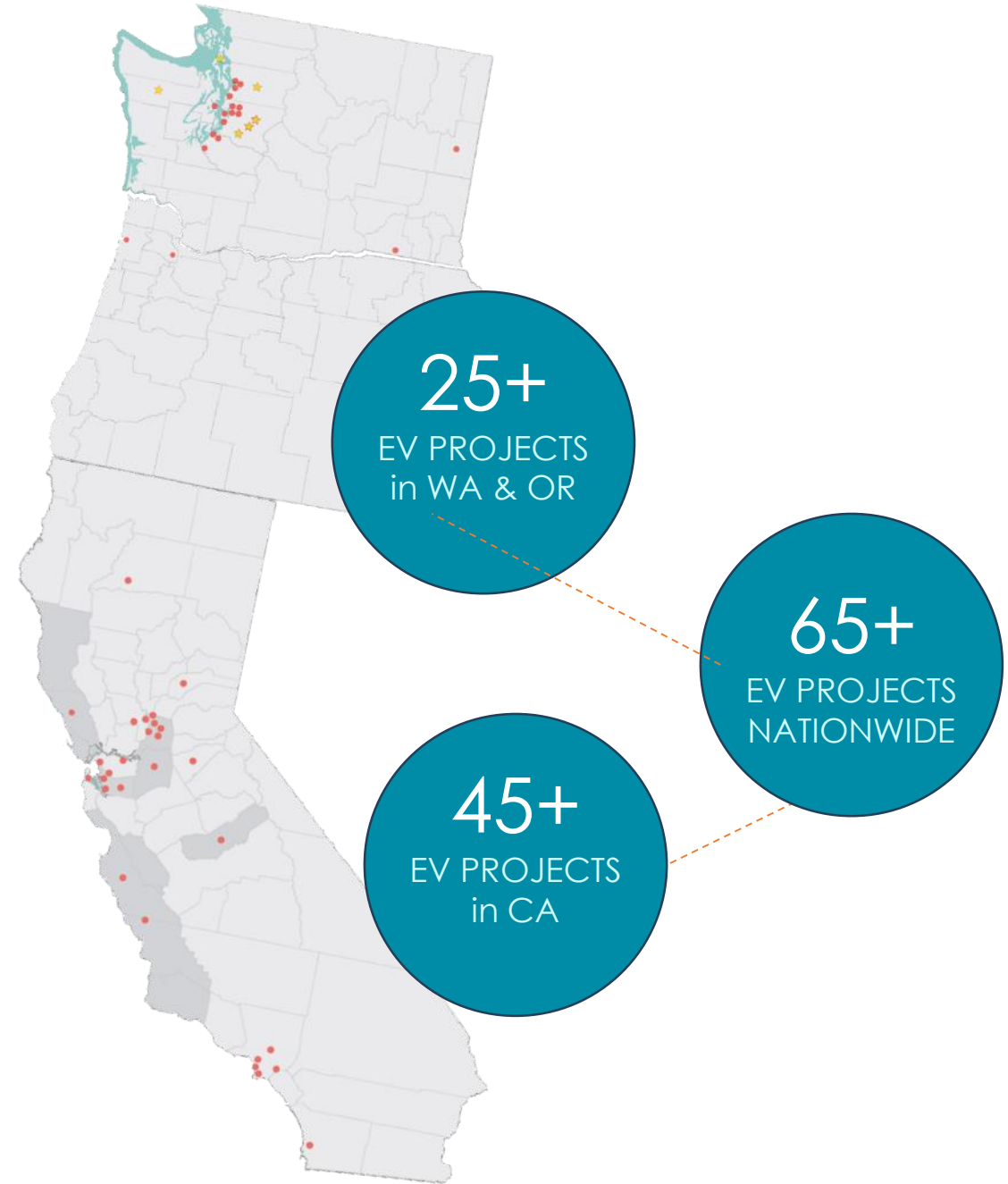
Experience helping 1500+ clients and institutional partners deploy \$10B+ in globally significant innovations.



40 years experience designing transportation systems to serve community members and fleets.



Responsive engineering for real energy savings and true impact.



# Scope

- Figure out the vehicle replacement schedule for all County vehicles
- Calculate the energy needed for charging
- Recommend charging/fueling strategies
- Evaluate the sites for charging stations and/or hydrogen
- Estimate costs
- Identify funding
- Revise policies and processes
- Identify tools, equipment, training, and technology for management and maintenance

# ZEVs are coming

## **Advanced Clean Fleets**

Applies to municipal fleets

Started on 1/1/24, 100% of medium- and heavy-duty purchased must be ZEVs in 2027.

Exceptions and exemptions will change annually

## **Advanced Clean Cars II**

Applies to dealerships

Starting with the 2026 model year, dealers must sell an increasing percentage of ZEVs.

By 2035, all new light-duty vehicles will be ZEVs  
By 2035, 75% of medium-duty trucks will be ZEVs

## **Advanced Clean Trucks**

Applies to dealerships & manufacturers

Starting with the 2024 model year, dealers must sell an increasing percentage of ZEVs.

By 2035, 75% of medium-duty trucks will be ZEVs

## **EPA Tailpipe Standards**

Applies manufacturers

Starting in MY 2027, cars, SUVs, vans, and pickups must reduce CO2 by 50%.

OEMs will comply with EVs, PHEVs, and particulate filters.

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## **Innovative Clean Transit**

Applies to transit agencies

Started on 10/1/19, 100% of transit buses must be ZEVs by 2040

# Nevada County strategies



## Right Size

Retire low-mileage vehicles  
Match vehicles to use



## Shuffle

Delay implementation  
Pull forward & push back  
Request exemptions



## Partner

Coordinate with other agencies on infrastructure



## Incentives

Actively seek state and federal grants



# Nevada County is ready to run!



## 2024 ON YOUR MARK

- Implement ZEBs & Charging
- Shuffle Vehicle Purchases
- Survey Employees
- Increase Electrical Capacity



## 2024-2029 GET READY

- Procure ZEVs
- Install Charging Stations
- Plan for the Budget Bubble
- Explore a Grid Resiliency Program



## 2030-2034 GET SET




- Plan for Capacity
- Procure ZEVs
- Assess Hydrogen Potential
- Analyze Data and Adapt



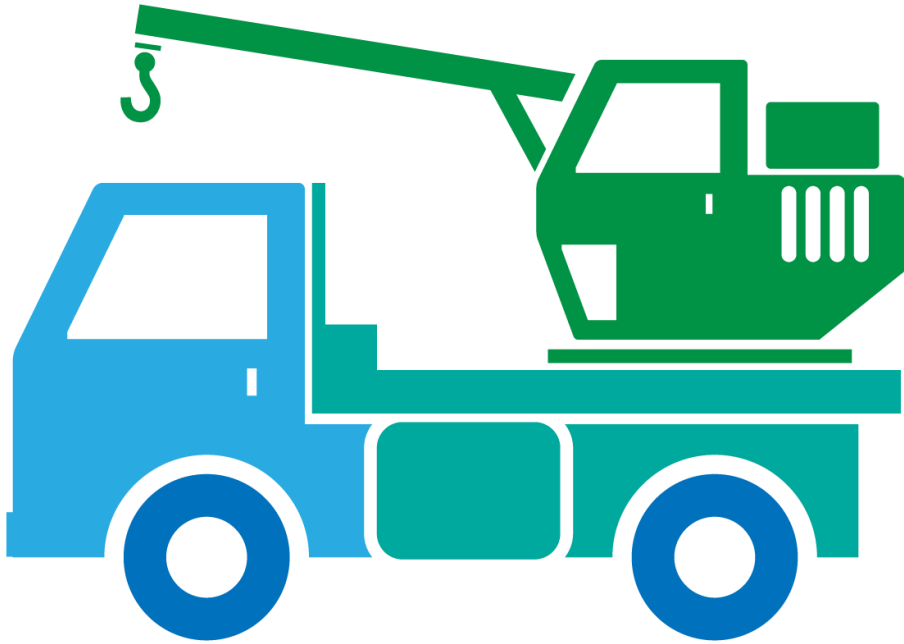
## 2035+ GO!

- Complete the Transition
- Adjust Policies
- Plan for the Next Change
- Celebrate!

# Summary of each phase

Phase	Total Added ZEVs		Total Added Charging Stations		
	<i>Light</i>	<i>MHD</i>	<i>Level 2</i>	<i>Slow DC</i>	<i>DCFC</i>
 <b>2024-2029</b> GET READY	82	11	50	3	2
 <b>2030-2034</b> GET SET	73	55	62	9	5
 <b>2035+</b> GO!	23	26	16	12	0
<b>Total</b>	<b>270 EVs</b>		<b>128</b>	<b>24</b>	<b>7</b>

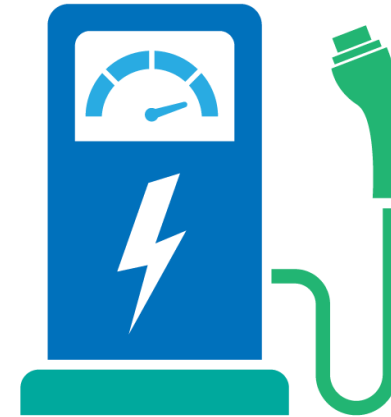
# Calculating energy needs



Daily Miles + Idle Hours + Payload + Accessory Operation



kWh used



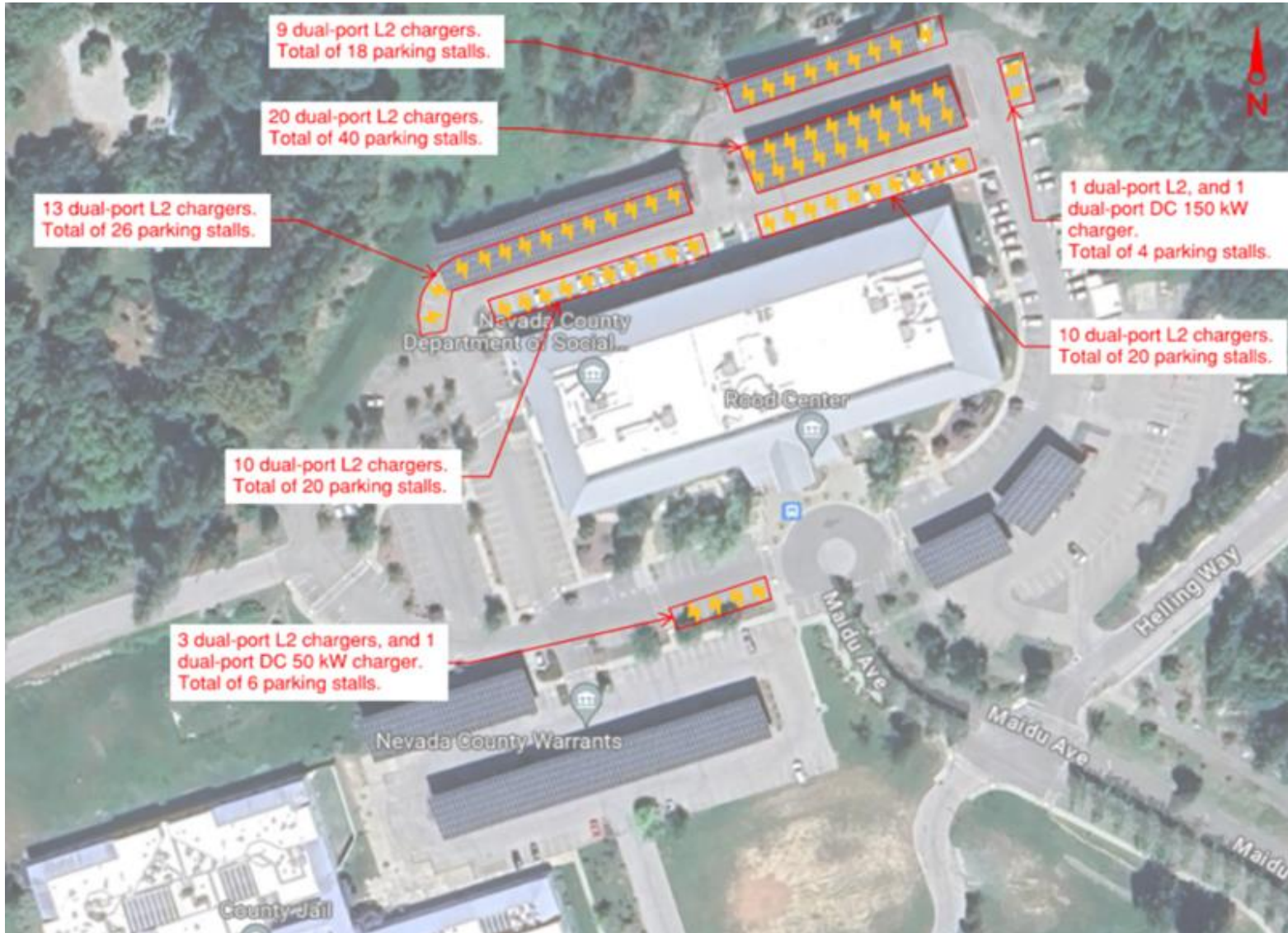
Dwell Time + Battery + Domicile



kWh replaced



# Facility assessments

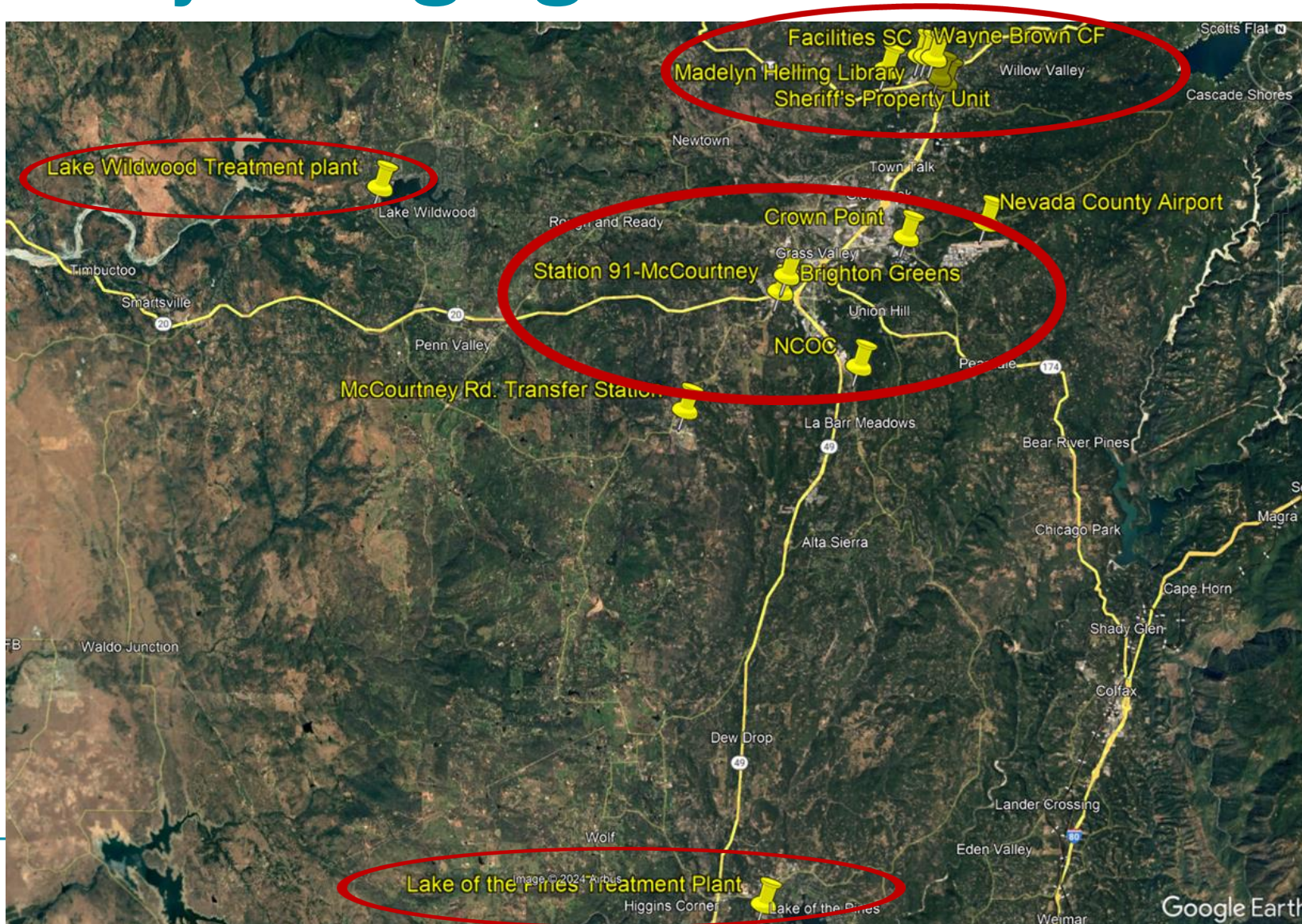


## Rood Center

- Future EVs: 132 (131 LD, 1 MD)
- EV charging load: 2,678 kWh/day
- Electrical upgrades: Yes
- Public/workplace charging: Yes



# Opportunity charging





# Nevada County Fleet Electrification Assessment

EVSE Recommendations	Transition Planner	EV Procurements	ACF Compliance	Fuel Cost Comparison	GHG Emission Reductions	Risks/Challenges
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## Infrastructure/EVSE Recommendations

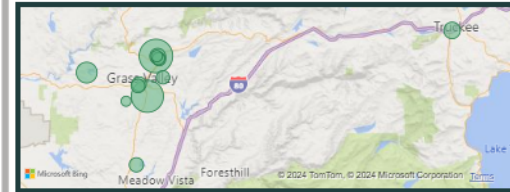
### Recommended

Facility	EVs	L2s	Slow DC	DCFC	CapEx	OpEx
Brighton Greens	11	6			\$472,600	\$344,770
Crown Point	13	7			\$224,800	\$352,760
District Attorney	7	4			\$164,500	\$227,390
Facilities SC	8	4			\$262,700	\$234,300
Joseph Center	10	5			\$187,900	\$298,500
Lake of the Pines Treatment Plant	5	1	4	2	\$494,300	\$849,270
Lake Wildwood Treatment plant	15	7	2	2	\$682,500	\$1,032,830
LEGEND	0					
Madelyn Helling Library	1	1			\$70,200	\$132,000
McCourtney Rd. Transfer Station	3	1	1		\$53,700	\$137,790
<b>Total</b>	<b>270</b>	<b>128</b>	<b>24</b>	<b>7</b>	<b>\$7,224,000</b>	<b>\$9,139,730</b>



### Phase

Phase 1    Phase 2    Phase 3



Phase 1: 2024-2029  
Phase 2: 2030-2034  
Phase 3: 2035-2053

EV = Electric Vehicle  
EVSE = Electric Vehicle Supply Equipment  
CapEx = Capital Expenditures  
OpEx = Operating Expenditures



### Facility

- Select all
- Brighton Greens
- Crown Point
- District Attorney
- Facilities SC
- Joseph Center
- Lake of the Pines Treatment ...
- Lake Wildwood Treatment pl...
- Madelyn Helling Library
- McCourtney Rd. Transfer Sta...
- NCOC
- Nevada City Veterans Hall
- Nevada County Airport
- Rood Center (ERAC)
- Sheriff's Property Unit
- Station 91-McCourtney
- Take Home
- Wayne Brown CF

EV = Electric Vehicle  
EVSE = Electric Vehicle Supply Equipment  
CapEx = Capital Expenditures

## Transition Planner

ID #	Model Year	Make	Model	Veh Pathway	Facility	Replacement Year	EV CapEx
26497	1999	Iso2u	NPR	BEV	NCOC	2025	\$161,071
27161	1999	Rampstar	RC3C0	BEV	Nevada County Airport	2035	\$87,710
26434	2000	GMC	C6500	BEV	NCOC	2043	\$120,038
27458	2004	International	4200 SBA	BEV	Nevada County Airport	2044	\$124,839
26543	2006	Ford	F250	BEV	Nevada County Airport	2044	\$105,925
26544	2006	Ford	F350	BEV	McCourtney Rd. Transfer Station	2030	\$106,424
26541	2006	Ford	Ranger	BEV	NCOC	2027	\$57,669
26756	2007	GMC	C7500	BEV	McCourtney Rd. Transfer Station	2048	\$146,044
26760	2008	Ford	Escape	BEV	NCOC	2024	\$49,445
26648	2008	Ford	Escape	BEV	Rood Center (ERAC)	2034	\$56,331
26677	2008	Ford	F250	BEV	Lake Wildwood Treatment plant	2033	\$68,807
26659	2008	Ford	F550	BEV	NCOC	2040	\$106,713
26786	2008	GMC	C7500	BEV	NCOC	2025	\$356,998
26785	2008	GMC	C7500	BEV	NCOC	2043	\$120,038
26655	2008	Kenworth	T800	BEV	NCOC	2029	\$236,989
26757	2008	Kenworth	T800	BEV	NCOC	2031	\$176,984
26653	2008	Peterbilt	367	BEV	NCOC	2028	\$266,991
26763	2008	Peterbilt	367	BEV	NCOC	2033	\$116,980
26897	2009	Ford	E450	BEV	Sheriff's Property Unit	2049	\$138,030
26850	2009	Ford	Escape	BEV	Rood Center (ERAC)	2026	\$47,374
26840	2009	Ford	F350	BEV	NCOC	2033	\$73,695
26853	2009	Ford	Ranger	BEV	Lake Wildwood Treatment plant	2038	\$68,449
26852	2009	Ford	Ranger	BEV	Facilities SC	2039	\$71,187
26905	2010	Dodge	Grand C...	BEV	NCOC	2025	\$57,600
26974	2011	Ford	Expediti...	BEV	Crown Point	2030	\$48,152
26895	2011	Ford	F450	BEV	Station 91-McCourtney	2030	\$106,424
26983	2012	Ford	Escape	BEV	NCOC	2025	\$48,409
26999	2012	Ford	F250	BEV	NCOC	2028	\$57,256
26982	2012	Ford	F450	BEV	NCOC	2042	\$104,891
26984	2012	Toyota	Rav4	BEV	Rood Center (ERAC)	2028	\$45,303
27002	2012	Toyota	Rav4	BEV	Rood Center (ERAC)	2030	\$48,152
27017	2014	Chevrolet	Traverse	BEV	Rood Center (ERAC)	2034	\$56,331
<b>Total</b>							<b>\$18,505,583</b>

### Replacement Year

- Select all
- 2024
- 2025
- 2026
- 2027
- 2028
- 2029
- 2030

### Department

- Select all
- Agricultural Commi...
- Animal Control
- Behavioral Health
- Building Department
- Code Enforcement
- Department of Soci...
- District Attorney
- Environmental Heal...
- Facilities
- HHSA Admin
- Information & Gen...
- Library

### Vehicles

270

# EV and EVSE costs through 2050

- EVSE OpEx
- EVSE CapEX
- Registration
- Fuel
- Maintenance
- Vehicle CapEx



*Does not include gas vehicle purchases*

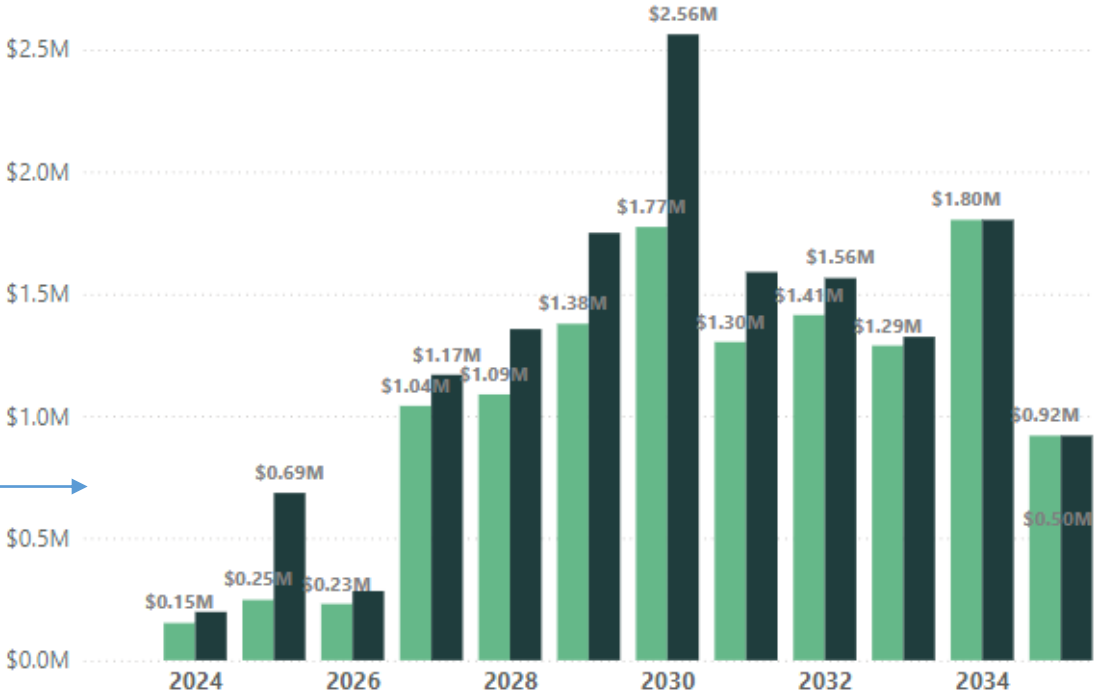
CapEx Needed Over Baseline	\$9.8M
OpEx Savings Compared to Baseline	\$7.0M
Max Charging Rate	150 kW
DCFC Ports (While U Wait)	14
DC Slow	24
New L2	256

# The “Bubble”

## Vehicle CapEx



● Baseline ICE CapEx ● Transition EV CapEx



Does not include gas vehicle purchases

Facility	Baseline	Transition
Brighton Greens	\$471,880	\$517,765
Crown Point	\$638,354	\$656,819
District Attorney	\$371,784	\$381,530
Facilities SC	\$541,730	\$551,995
Joseph Center	\$469,861	\$514,302
Lake of the Pines Treatment Plant	\$450,687	\$789,484
Lake Wildwood Treatment plant	\$790,330	\$1,001,654
Madelyn Helling Library	\$44,519	\$45,303
McCourtney Rd. Transfer Station	\$285,981	\$326,890
NCOC	\$2,959,063	\$4,426,973
<b>Total</b>	<b>\$15,940,500</b>	<b>\$18,505,583</b>

Replacement Year

Year

2024    2025

Increase in Cost

**\$2.6M**

Transition minus Baseline



## 2024 ON YOUR MARK

### Implement ZEBs & Charging

Complete the electrical upgrades for the planned charging stations.

Install, operate, and collect data to inform operations.

### Shuffle Vehicle Purchases

Identify specific vehicles that will need to comply with ACF in 2027-2029 and reallocate budget to replace by December 2026.

### Survey Employees

Understand current and future desire for workplace charging, and willingness to pay for electrons.

### Increase Electrical Capacity

Complete load analysis with PG&E and evaluate battery energy storage.



## 2024-2029 GET READY

### Procure ZEVs

Purchase ZEVs for Class 8 and Class 2b pickups.

Apply for ACF exemptions

Add LD ZEVS that reach cost parity

### Install Charging Stations

Issue bids for charging station vendors and construction.

Dig once; install conduit and wires for future charging stations to reduce construction costs and minimize disruption.

### Plan for the Budget Bubble

All new light-duty vehicles, including police, will be ZEVs.

Vehicles replaced early in Phase 1 will need to be replaced again.

Refuse trucks will start to be replaced.

### Explore a Grid Resiliency Program

Identify options to ensure that vehicles can charge during a power outage, which may include a microgrid, long-duration energy storage, and hydrogen production.



## 2030-2034 GET SET

### Plan for Capacity

Explore and evaluate advanced technologies and software that can reduce grid load of charging.

Consider behavior and technology changes on electric use.

Install remaining charging stations.

### Procure ZEVs

Increase purchases of medium- and heavy-duty ZEVs for Class 8 and Class 2b pickups.

All LD vehicles are ZEVs

### Assess Hydrogen Potential

Assess the progress of locally available hydrogen.

Coordinate with other fleets about interest in hydrogen and fuel cells.

Reassess the initial recommendations for BEVs and FCEVs for transit and heavy-duty.

### Analyze Data and Adapt

Collect and analyze data from vehicles and stations to show trends in use, cost, maintenance, reliability, accessibility, and gaps. Use predictive modeling to identify future impacts to budgets and staffing.



## 2035+ GO!

### Complete the Transition

Except for fire apparatus, all fleet vehicles are ZEVs.

All infrastructure is installed and operating.

### Adjust Policies

Based on experience, adjust policies and practices for procurement, maintenance, take-home vehicles, and charge-back fees.

### Plan for the Next Change

Follow developing regulations, land use policies, and workforce development to prepare for other decarbonization efforts

### Celebrate!

Getting here was a long and unpredictable road. Celebrate your success!

# Hydrogen option

- Longer term solution for refuse and other heavy-use vehicles
- Potential to make H<sub>2</sub> at WWT plants or landfill
- Partner with a station developer or collaborate with others!



## COST EFFECTIVE HYDROGEN SUPPLY

HyGear offers hydrogen supply ranging from 10 Nm<sup>3</sup>/h up to 1000 Nm<sup>3</sup>/h by means of small-scale on-site generation systems. Four standardized models are available: HyGEN 50, HyGEN 100, HyGEN 150, and HyGEN 300 which are containerised and can be placed in parallel. This makes them highly suitable to be installed at industrial sites and hydrogen filling stations.

The HyGEN systems produce hydrogen by converting (renewable) natural gas with Steam Methane Reforming (SMR). Decentralised hydrogen production offers a safer, more reliable and cost-effective





# Thank you!

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