It's Electric – Vehicles, Tools, & Infrastructure

Presented By:

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Session Overview

Planning

- What is EV?
- Requirements
- Grants

Financial

- Why invest in Electric Equipment?
- Cost & Incentives
- Financial Planning

Parks & Tech

- Equipment: Pros & Cons
- Let's Get More Technical

Lessons Learned & Final Thoughts

Questions

What is EV?

Electric Vehicles (EV) do not have an Internal Combustion Engine (ICE)

- **Electric Vehicles:** cars, trucks, buses, vans, etc.
- **Electric Mobile Equipment:** mowers, forklifts, scissor lifts, etc.
- **Electric Hand Tools:** trimmers, saws, blowers, edgers.
- **Chargers:** need to power equipment.

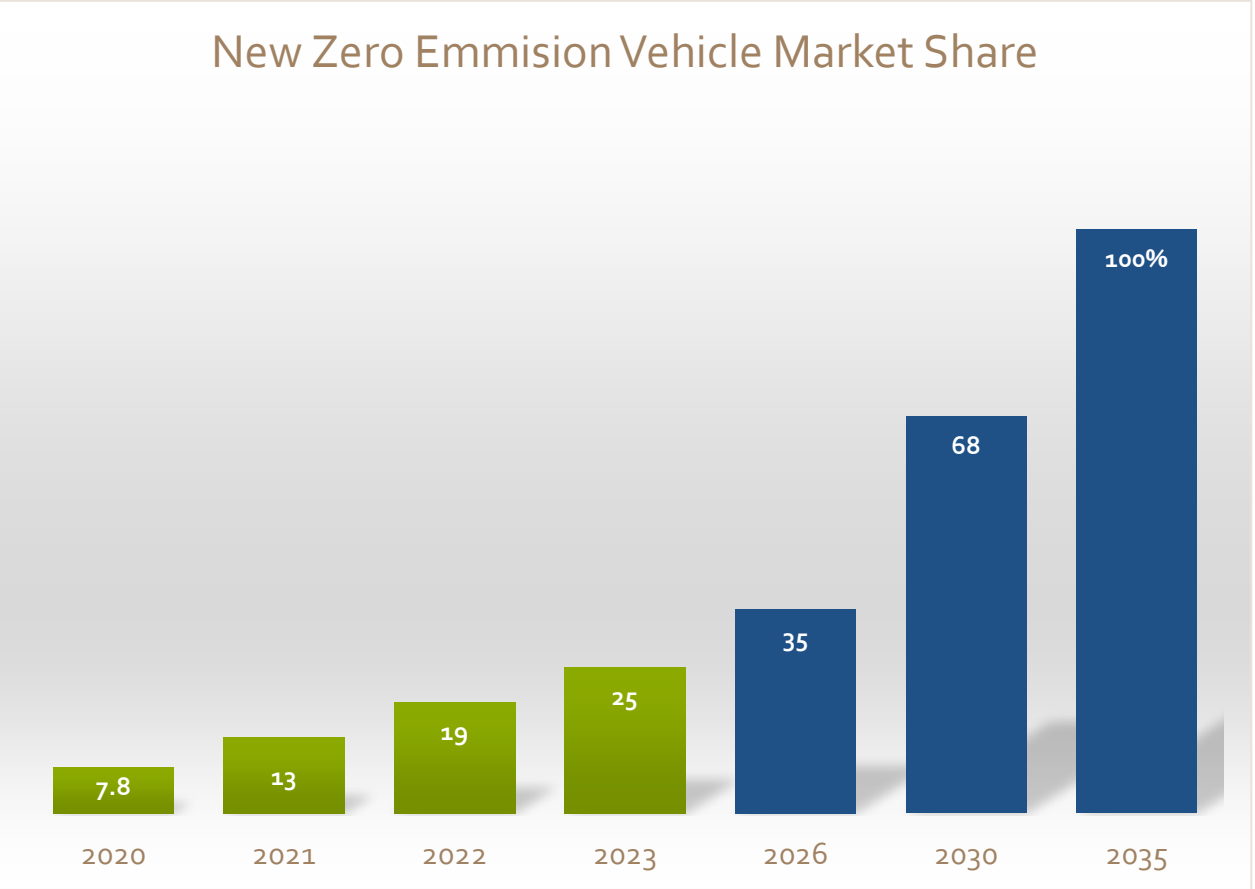
Much of the equipment agencies currently use are electric powered.

- Scissor Lifts
- Utility Carts
- Turf Carts
- Golf Carts

Planning

Electric Vehicle Market Share

- Increasing
- CA goal of 100% sales of new vehicles by 2035
- Types of Chargers:
  - Level 1 (120V; 2-5 mile/hr)
  - Level 2 (240V; 10-60 mile/hr)
  - Level 3 (480+V; 80% ½-hr)



Sources:

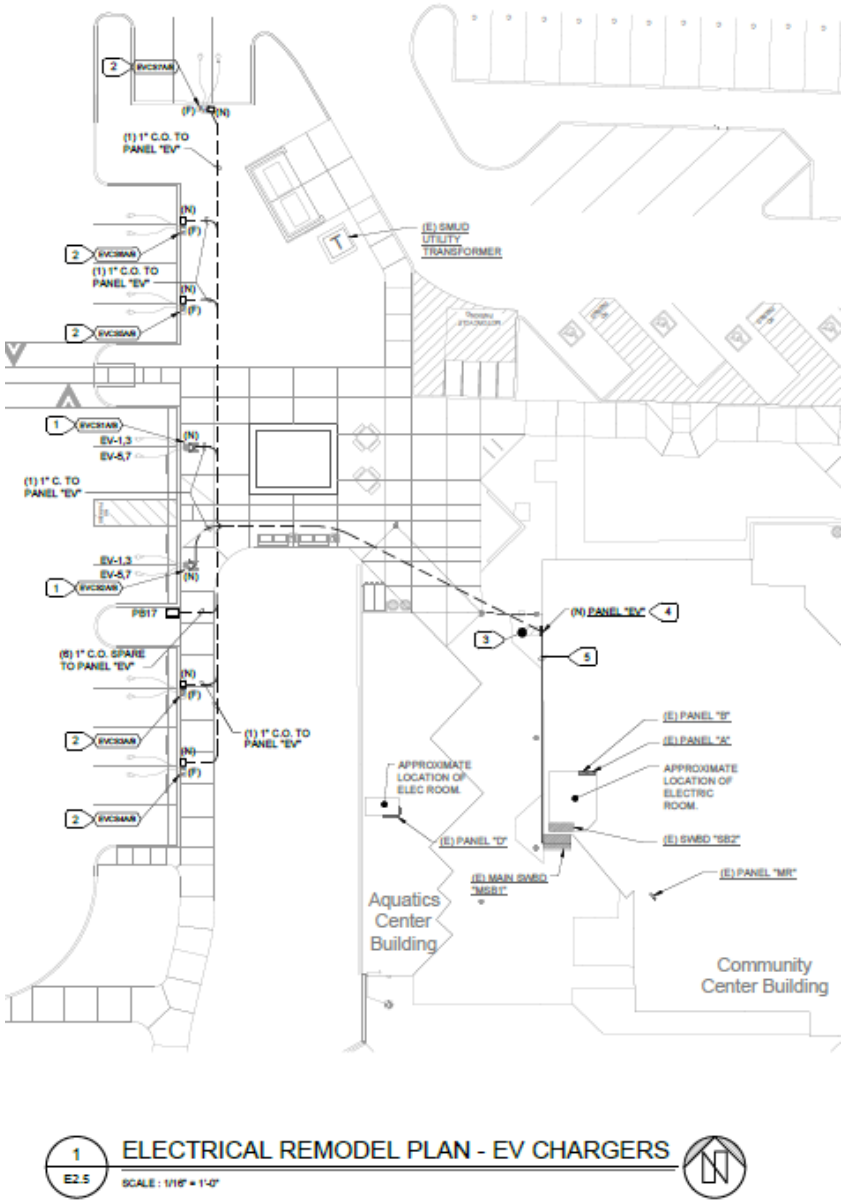
Past: California Energy Commission (https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/new-zev)

Future: California Air Resources Control Board (https://ww2.arb.ca.gov/news/california-moves-accelerate-100-new-zero-emission-vehicle-sales-2035)

Planning – Requirements

Building Code – EV Chargers

- California Electrical Code (CEC) - Title 24 & CALGreen code Sec. 5.106.5.3 – 5.106.5.6.5 (with July 2024 supplement)
- EV Readiness: requires "EV-ready" infrastructure
- Number determined by parking capacity
- Existing electrical capacity? Adding supply?
- Dedicated circuits
- Accessibility: EV chargers comply with ADA
- Hire professionals familiar with requirements



Planning – Requirements

Resources:
https://www.dgs.ca.gov/bsc/calgreen

Link to Table 5.106.5.3.1

Building Code – EV Chargers

EV Capable Space is not abbreviated. This is how many spaces must be prepped for future installation total based on the chart below.

Electric Vehicle Charging Station (EVCS) is now the spaces that need an actual working plug. So, if you have 175 parking spaces you need 35 capable spaces, 18 of which need plugs (50% rounded up), in a park setting. It's different for other uses.

TABLE 5.106.5.3.1—EV CAPABLE SPACES AND EVCS

TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	OTHER THAN OFFICE AND RETAIL NUMBER OF REQUIRED EVCS[2, 3]	OFFICE AND RETAIL NUMBER OF REQUIRED EVCS[2, 3]
1–9	0	0	0
10–25	4	2	3
26–50	8	4	6
51–75	13	6	8
76–100	17	8	13
101–150	25	12	19
151–200	35	18	26
201 and over	20 percent of actual parking spaces[1]	50 percent of EV capable spaces[1]	75 percent of EV capable spaces[1]

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. Each EVCS shall reduce the number of required EV capable spaces by the same number.
3. At least one Level 2 EVSE shall be provided.

Additions or Alterations:

Must comply if:

- ✓Increase power supply;
- ✓Adding new photovoltaic covering existing parking; or
- ✓Modifying a building and part of scope includes increases in power.
- ✓See section 5.106.5.4
- ✓May vary by jurisdiction

Resources:
Link to Table 5.106.5.3.2.3

Planning – Requirements

EV Level 3 Direct Current Fast Chargers (DCFC)

5.106.5.3.2.3

The installation of each DCFC EVSE shall be permitted to reduce the minimum number of required EVSE or EVCS with Level 2 EVSE by five, and reduce proportionally the required electrical load capacity to the service panel or subpanel.

Planning – Grants

Infrastructure & Equipment

- **Sources will phase out**
  - Federal (Inflation Reduction Act)
  - State grants (park & energy infrastructure)
    - ALL: *https://www.grants.ca.gov/*
    - Hybrid Vehicle Incentive Program (HVIP): *https://californiahvip.org/*
  - Air Districts (SMAQMD): *https://www.airquality.org/Businesses/Incentive-Programs*
  - Utilities (SMUD, PG&E, etc.), Grants/Rebates and time of use charges
  - Equipment Vendors and Suppliers
  - Private
  - Often increased benefit in disadvantaged communities
- **Very Complex**
  - Find a good staff person from the grant agency to walk you through it
  - Funding in cycles
  - Wild West – new industry & everyone is trying to figure it out
- **Get Creative: How can my goals fit theirs? Solar?**
- **Patience: Jumping through hoops**

Photovoltaic Infrastructure

Solar Photovoltaic Panel and Electric Powered Equipment

• **Nicholas Park** Photovoltaic Solar Panels (39 kWDC) and EV Level 2 Chargers (4)	**Completed**
• **Pat O'Brien Community Center** Photovoltaic Solar Panels (100 kWDC) – 50% match grant	**Completed**
• **Fruitridge Park Photovoltaic** Solar Panels (17 kWDC) and EV Level 2 Chargers (14)	**Under Construction**
• **Corporation Yard** EV Level 2 Chargers (4) & Electrical Infrastructure (32 outlets)	**Bidding**
• **Pat O'Brien Community Center and Scott Hokama Support Facility** EV Level 2 Chargers (6) & Electrical Infrastructure (32 outlets)	**Bidding**

Why Invest in Electric Equipment?

A. Health Benefits

1. Community – less noise, better air quality in parks, community centers and other facilities
2. Employees – (a) less pollution from equipment use, (b) less noise, (c) equipment can be lighter, (d) less personal protective equipment
3. Eliminate reliance on fossil fuels
4. Save on gasoline and diesel fuel costs

B. Regulations

1. California Air Resources Board (CARB) effective January 1, 2024
   a) Advanced Clean Fleets Regulation
   b) Small Off-Road Engine (SORE) Regulations

Cost and Incentive Examples

2022 GMC 4500 Electric Truck with 14' Hydraulic Dump Bed

Retail Cost – $ 189,298

Less:

1. CA HVIP Base Voucher (paid to vendor*) - $60,000
2. SMAQMD Sacramento Emergency Clean Air and Transportation (SECAT) Program Grant- $100,000

Net Cost – $29,298

Application in process for Inflation Reduction Act funds up to $34,500

2026 Toro 60" Ex Mark Lazer Z V Series 23 kW Battery

Retail Cost – $32, 399

Less:

1. Charlene McGhee Memorial Lawn and Garden Program Voucher (paid to vendor) - $15,000

Net Cost – $17,399

Cost and Incentive Examples
Larry Gury Community Park (ADA Handle Required)

3 Level 2 Handles

Installation	$51,165
Less: grant funds	15,000
Net cost	$36,165

EV Chargers Service Revenue

Gross revenue from charging fees

Less: service charge – 10%

Less: electricity expense

- Fund parks with vehicle charging stations?

Financial Planning

A. Prepare an Equipment Purchase Plan (5+ years)
   – Include Electric Equipment

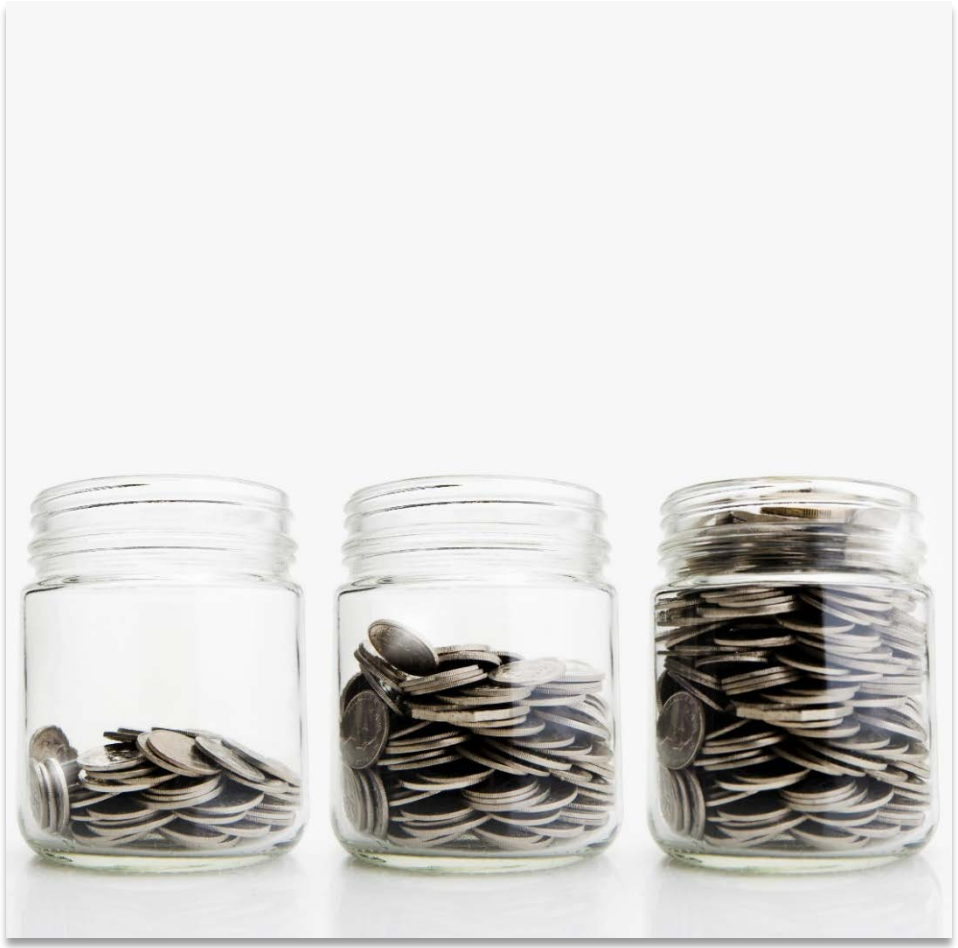
B. Funding Sources for Incentives

   A. Grants

   B. Vendor & Utility Rebates

   C. Inflation Reduction Act of 2022 (IRA) Clean Energy Tax Incentives: Elective Pay Eligible Tax Credits

Elective Pay is a special process for government agencies, who do not normally file tax returns, to pre-register projects and file a tax return to receive funds.



Parks – Current Inventory

Electric Equipment:

A. **2022:** Mean Green Rival Mowers–60"rotary deck mowers (2)
B. **2024:** Greenworks Optimus– 60" rotary deck mowers (2)
C. **2025:** Toro Ex Mark 60" Rotary (2)
D. **2026:** Lazer Z V-Series 60V 23kW Battery with 60" Electric Series 4 Deck and Mulch Kit
E. Husqvarna battery powered hand-held equipment: string trimmers (5), chain saws (5), pole saw telescopic (5), blower (3) hedge trimmers (5), extension hedge trimmers (2), batteries and battery chargers
F. Power pack generator replacements (3 units)

60” Zero Turn Electric Mowers

PROS:

- Very low maintenance
- Battery life is more than sufficient for a full day's work
- Overnight charging time is sufficient
- Mulch kits may available
- Cleaner to operate

CONS:

- Power of mowers can vary by brand & generation , newer generation mowers may have more power
- Price varies, some mowers may have more power for less cost
- Mulch kits may not be available on some brands
- Solar canopies are not sturdy, easily broken/smashed on low branches, and expensive.
- When compared to the gas equivalent, some battery-operated mowers have similar performance (except when mulching is needed).

Husqvarna Electric Hand Tools

(Trimmers, saws, blowers, edgers)

PROS:

- Lighter than gas equivalent
- No pull-to-start. Easy to use
- Fuel cost savings, no mixed gas
- Very low maintenance
- Comparable power to gas equivalent (backpack blowers excluded)
- Less fatiguing due to less noise, less vibration and push-button starts
- No emissions from gas
- Battery packs can be switched out to complete a full day of work

Husqvarna Electric Hand Tools

(Trimmers, saws, blowers, edgers)

CONS:

- Backpack blowers do not have the power needed for efficient park maintenance
- Pole trimmers have balance challenges due to the battery
- Parts are expensive and not as readily available, sometimes taking weeks to receive
- Initial costs are currently significantly more expensive than gas equivalents (if not grant funded)
- Single battery packs do not have enough power for a full day of work
- Need to carry additional battery packs in the field

EGO Nexus Power Station

(Substitute for small generators)

Pros:

- Silent
- No point-of-use emissions
- Great for Recreation needs and special events

Cons:

- Not enough power for most of Parks Department needs
- Significantly more expensive than gas alternative
- Significantly less power than gas alternative
- Heavy

Lightning eMotors GMC 4500 Hydraulic Dump-bed Trucks

Electric Powered Vehicles:

GMC 4500 Hydraulic Dump-bed Trucks (2)

Vehicle Weight = 9,660 lbs., 4540 lbs. payload capacity, GVWR=14,200

PROS:

- No tail pipe emissions
- Less scheduled maintenance required than gas vehicles
- Brakes not used as much
- No smog inspection required
- Fuel cost savings
- Charge can last 1-3 days depending on miles driven
- Fully charged overnight

Lightning eMotors GMC 4500 Hydraulic Dump-bed Trucks

CONS:

- Lightning eMotors went bankrupt soon after our purchase
- List price is high (more than 2x cost of an equivalent vehicle) without incentives
- Parts are specialized, limited in availability, and very expensive
- Service centers are few and very expensive
- Technical/service information is closely guarded (proprietary)
- Warranty is voided if any non-approved service center performs repairs
- Highly specialized skill sets necessary for repairs and maintenance
- Batteries have a warranty of 7 years, cost $55k (currently) to replace (not including labor and disposal fees).
- Battery life unknown
- Potential for lithium-ion battery fire
- Low ground clearance
- Towing of trailers not allowed under warranty

Let's Get More Technical

- Robotic/Electric/Autonomous Mowers
- Drone Imaging

Robotic/Electric/Autonomous Mowers

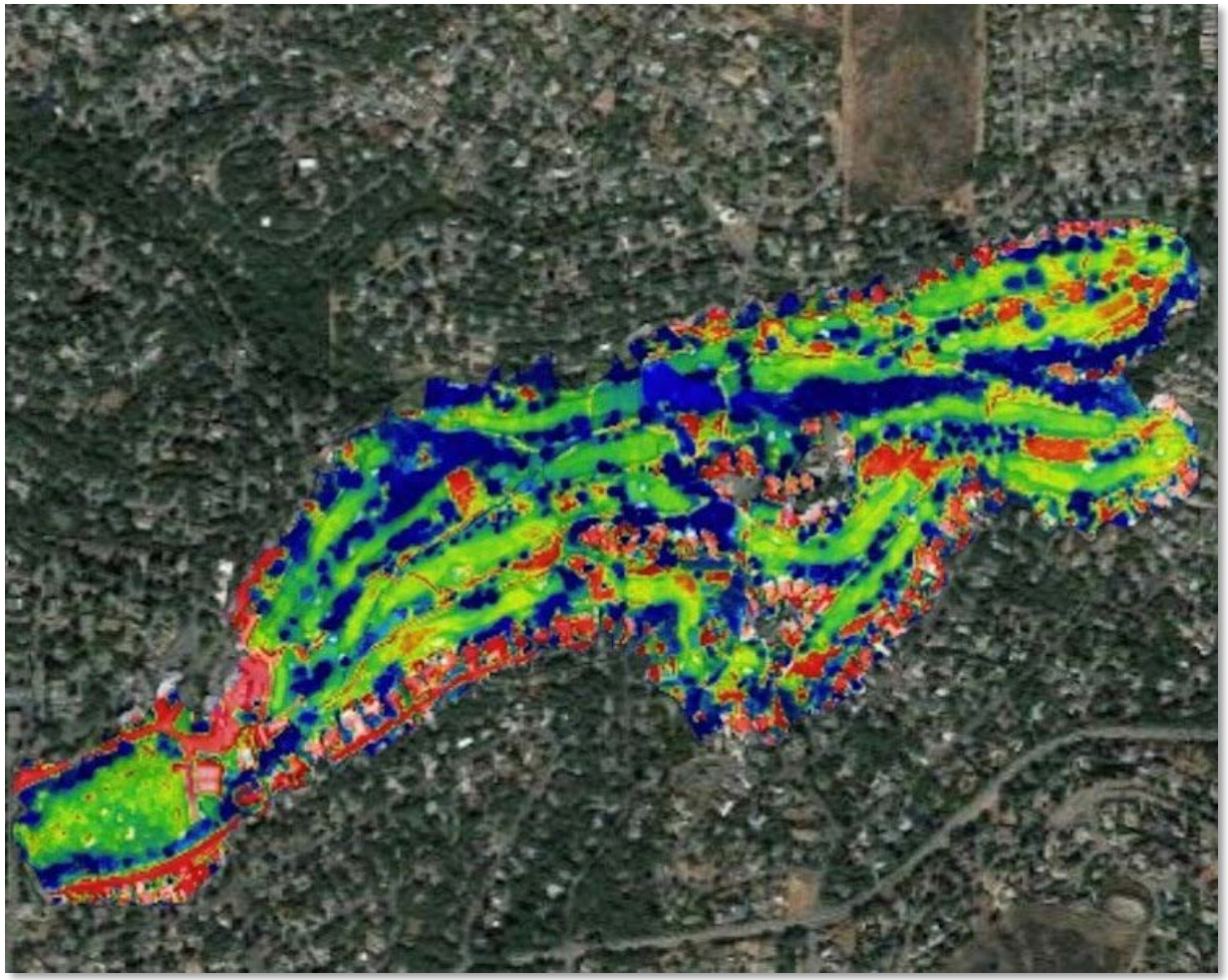
Pros:

- Elimination of emissions
- Reduced noise
- Usually lower maintenance costs
- Frees up/eliminates operator labor hours/costs
- Similar purchase costs to combustible engine equipment
- Ability to mow more frequently due to lower operating costs, yielding more consistent turf quality, less clippings
- Some able to still mow in soft, wet conditions due to lighter footprint of machines
- Some have ability to mow during non-work-hours to minimize disruption to public and neighbors

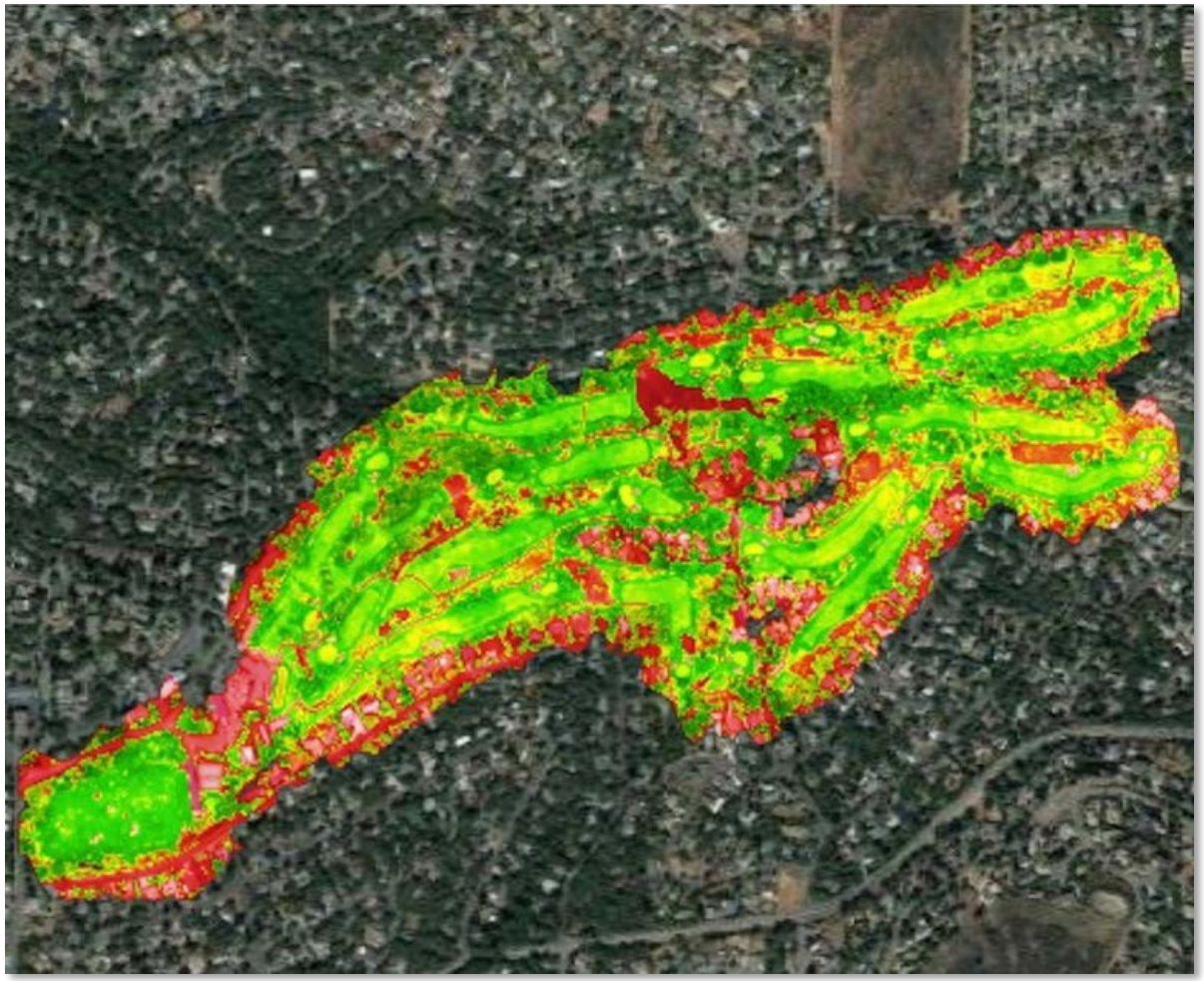
Robotic/Electric/Autonomous Mowers

Cons:

- May still require supervision
- May require more advanced experience with electronics & computer systems to troubleshoot & repair
- Generally slower operation, so may need more time to complete the same task
- Smaller machines may not be ideal for unsupervised public areas due to possibility of theft or vandalism
- Still emerging technology, so may experience some "growing pains" working through hiccups in start-up operation & programming, as well as delays in parts, repairs and service



Moisture – blue/cool
Thermal Imagery captures temperature data by detecting the infrared radiation emitted by objects.



Plant Health and Vigor – green/good
Normalized Difference Vegetation Index (NDVI) compares how much rear infrared (NIR) light plants reflect versus how much red light they absorb.

Drone Imaging

PROS:

- Quick snapshot of larger properties
- "See" things not easily seen (or seen at all) with the naked eye (i.e. moisture, plant stress)
- Useful imagery for presentations
- Simple operation (no experience necessary)

CONS:

- Requires Remote Pilot license through FAA
- Flights difficult in harsh weather (i.e. regular high winds)
- Requires human analysis and diagnosis to be used effectively
- Cost may be a barrier
- May cause concern with public (i.e. fears of surveillance/invasion of privacy)

Lessons Learned & Final Thoughts

- Make sure contract documents and purchase orders are written to protect your agency. If possible, deduct rebates in the contract or purchase order so the agency is responsible only for the net cost.
- Complete all tasks quickly to avoid delays. Get all paperwork needed for grant reimbursement from the vendor.
- Document your efforts to comply via email with vendors and grant agencies.

Lessons Learned & Final Thoughts

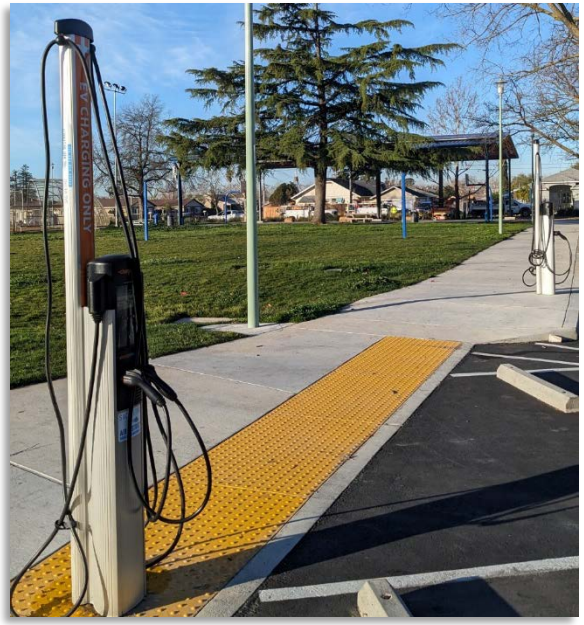
- Develop and maintain relationships with grant funding sources, agencies, consultants, vendors, repair shops for current information and advice.
- Train staff on repair and maintenance of new equipment.
- Test equipment, schedule demos with your team, get feedback from your team and provide to vendors.
- Technology changes quickly – Keep checking out new equipment.
- **Do not dispose of old equipment with working engines, they can be traded in for new equipment.**

Lessons Learned & Final Thoughts

- Have vendor complete DMV registration and apply for government exempt plates for vehicle purchases.
  - If you need to complete DMV registration:
    - Use a DMV office that specializes in commercial vehicles.
    - Be prepared for additional requests such as additional payment (no credit cards/CAL Card), weight certificate for the vehicle, etc.
    - It may take several trips and payments

Real World Example
2024 Nicholas Park Renovation

- 4 Level 2 EV handles
- Large, Full-Court Basketball Shade Structure
- Photovoltaic Solar panels (39 kWDC)

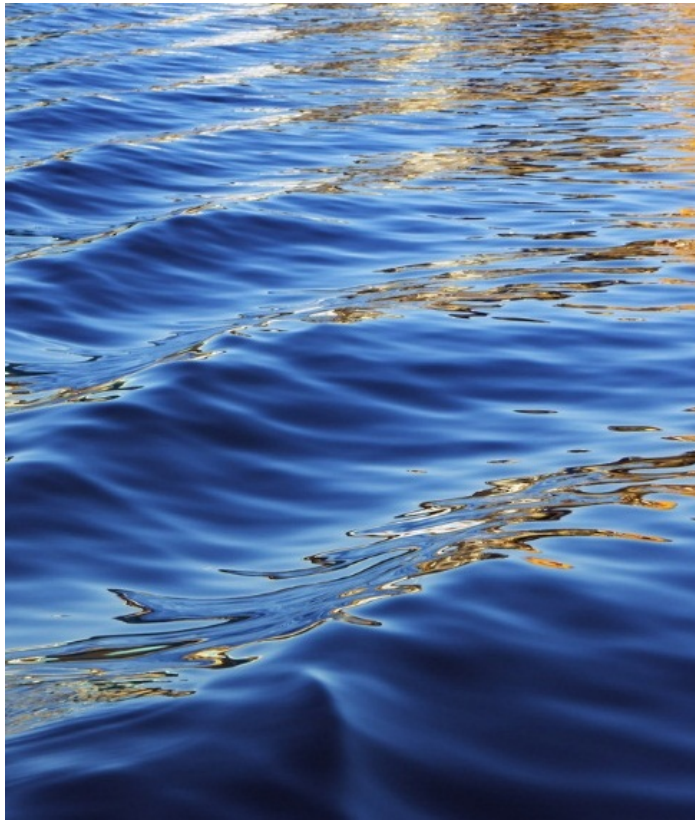


Real World Example
2024 Nicholas Park Renovation

Grant funded infrastructure: $688,400
OGALS Round 3 SPP: $3.63 million
Total Project Cost: $4.2 million

Item	Cost	Air District (Infrastructure)	Air District (EV chargers)	Private (Solar)	SMUD (EV chargers)	SMUD (Grant)	State Park (Grant)
Electrical Service Upgrades	$127,000	$31,750	$5,550	-	$14,600	-	$75,100
Electrical Conduit & Trenching	$234,000	$70,902	-	-	-	-	$163,098
Solar Panels & Infrastructure	$99,800	$74,800	-	$25,000	-	-	-
EV Charging Stations	$37,600	-	$28,200	-	$9,400	-	-
Sport Court Shade Structure (48'x82')	$190,000	$95,000	-	-	-	$13,971	$81,029
TOTAL:	**$688,400**	**$272,452**	**$33,750**	**$25,000**	**$24,000**	**$13,971**	**$319,227**

Questions?



Thank You!

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