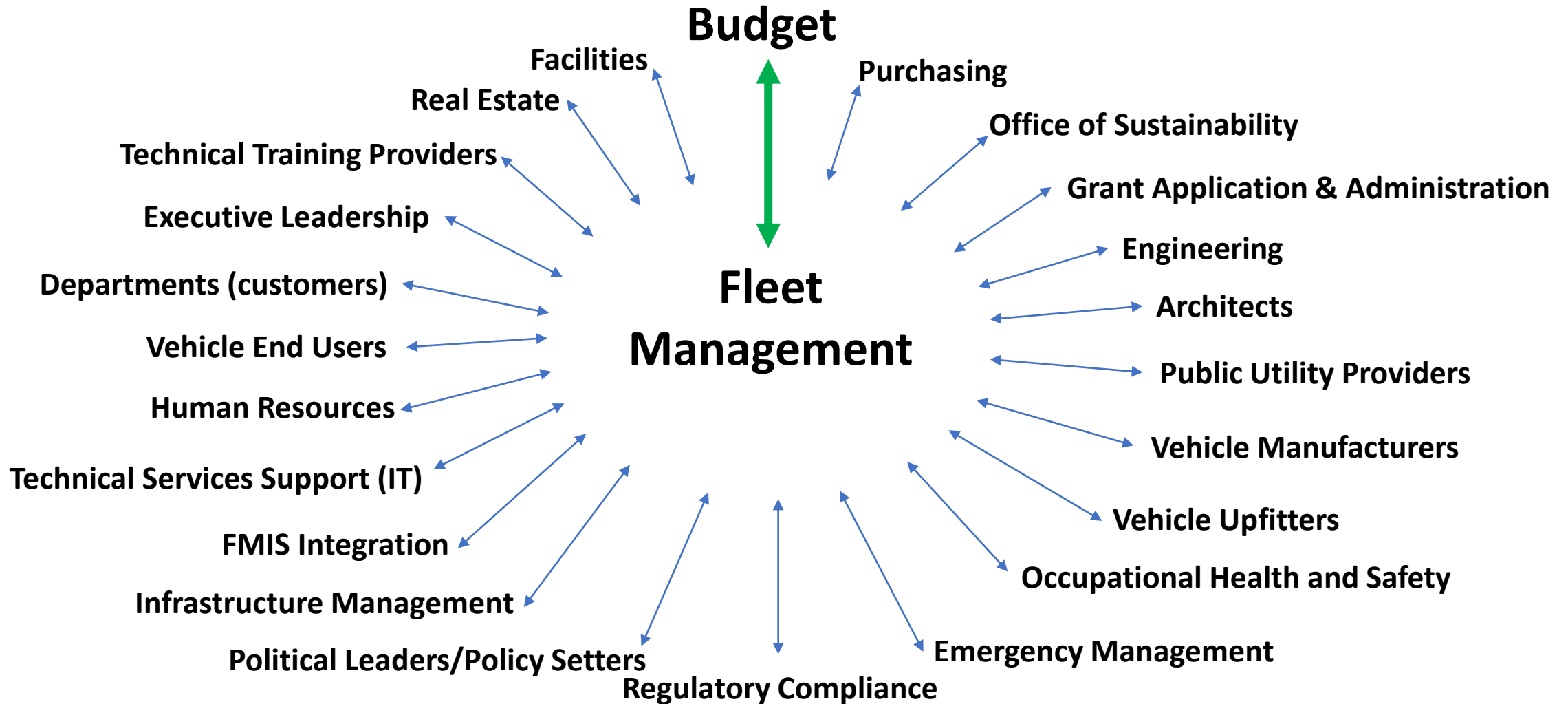




Fleet Conversion to Electric Vehicles

February 27, 2024

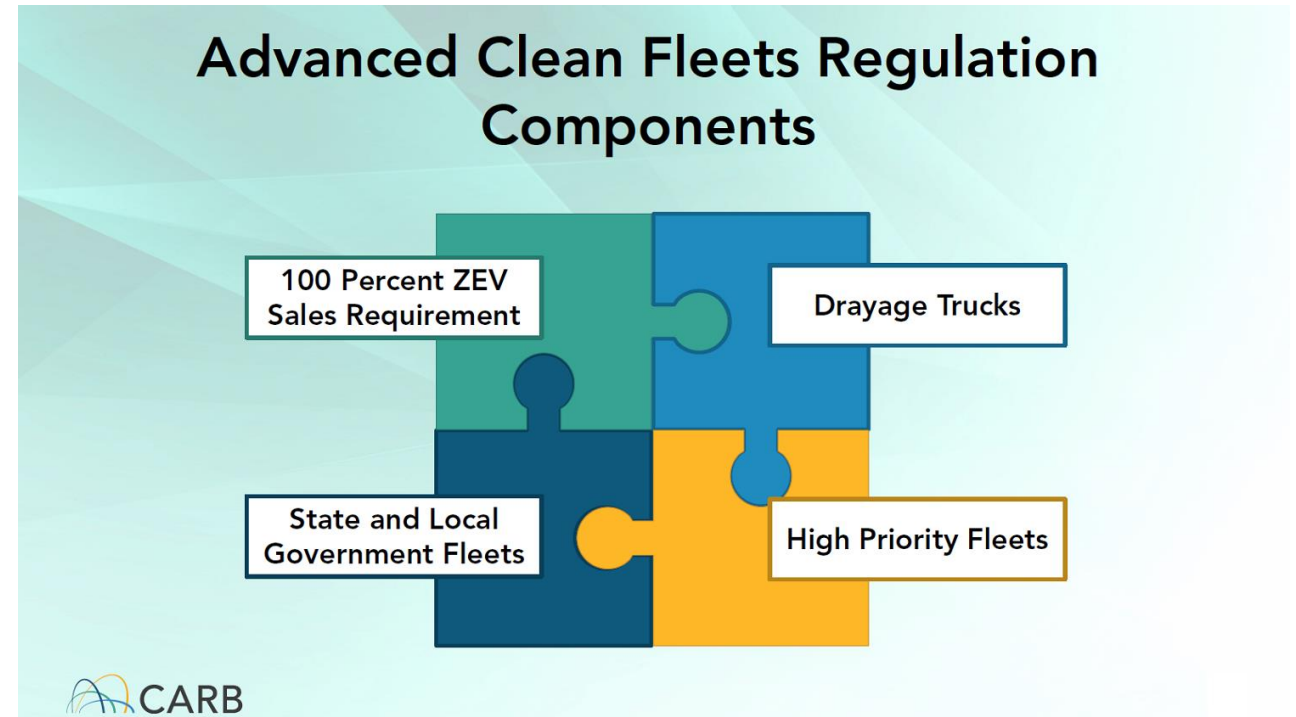
Internal and External Group Collaboration Required



Advanced Clean Fleets (ACF) Regulation

The Office of Administrative Law approved ACF in September 2023.

- ACF requires all medium and heavy-duty vehicle sales in California to be zero emission beginning with model year 2036.
- The regulations are split into three sections depending on the type of fleet:
 - Drayage Fleets
 - High Priority and Federal Fleets
 - State and Local Governments Fleets



Advanced Clean Trucks (ACT) Regulation – Companion to ACF



Enacted Prior to ACF Regulation

- Requires manufacturers to sell an increasing percentage of their total sales volume as Zero Emissions Vehicles (ZEVs).
- Required private and government fleets to submit a fleet report to CARB staff by 3/31/2022
- ACF's 100% in 2036 rule supersedes ACT.

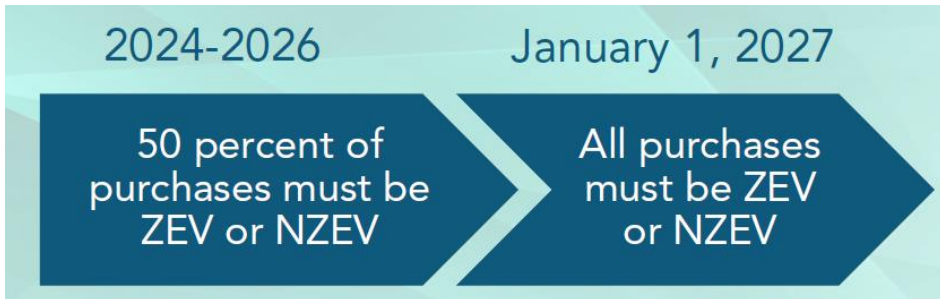
Model Year (MY)	Class 2b-3	Class 4-8	Class 7-8 Tractors
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035+	55%	75%	40%

Local Government Requirements



State and Local Government Requirements

- Apply to local government agencies that own, lease, or operate one or more vehicles that have a **Gross Vehicle Weight Rating (GVWR) greater than 8,500 pounds, typically a 3/4 ton vehicles and larger.**



ZEV Milestone Option

Optional ZEV Milestone Phase-in

- Open to High Priority and State and Local Government fleets
- Must meet ZEV milestones as a percent of total fleet
- Flexibility to add new ICE vehicles that are California certified or used ICE vehicles with 2010 or newer model year

Zero-Emission Fleet Percentage	10%	25%	50%	75%	100%
Group 1: Box trucks, vans, 2-axle buses, yard trucks, light-duty package delivery vehicles	2025	2028	2031	2033	2035
Group 2: Work trucks, day cab tractors, 3-axle buses	2027	2030	2033	2036	2039
Group 3: Sleeper cab tractors and specialty vehicles	2030	2033	2036	2039	2042



Work truck means any single-unit truck that is not a box truck, van, bus, or specialty vehicle

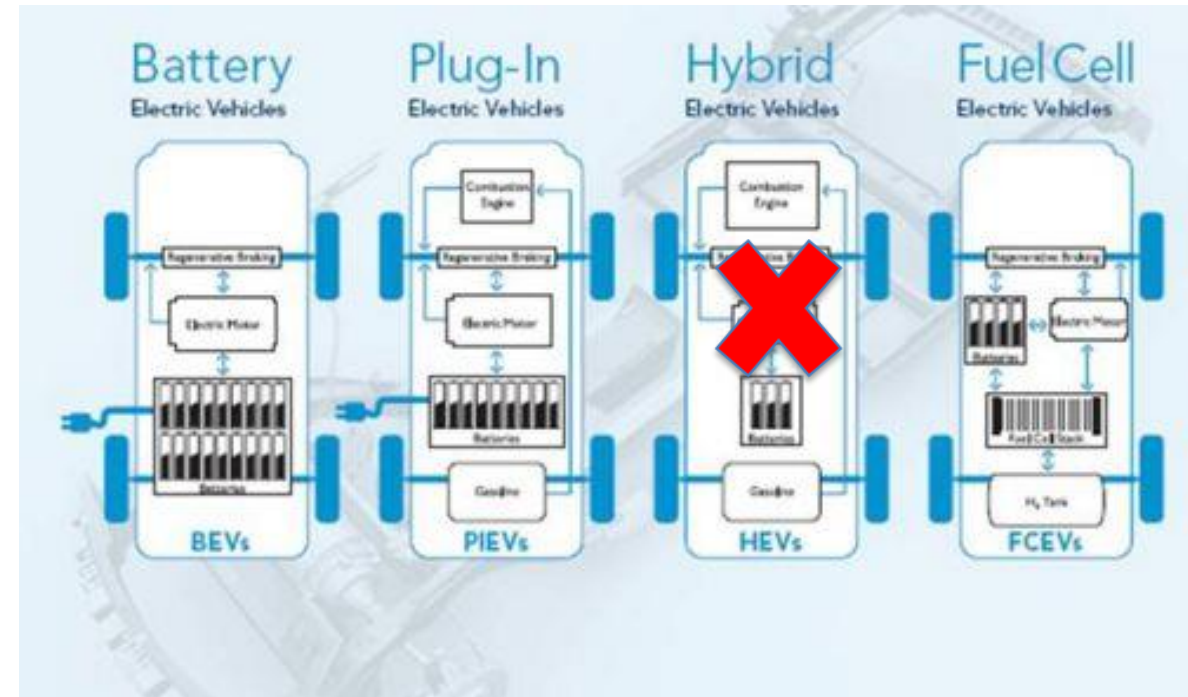
Zero Emission Vehicle ACF Definition

Zero Emission Vehicle (ZEV) Types

- Battery Electric Vehicles (BEV)
- Hydrogen Fuel Cell Electric Vehicles (FCEV)
- Hybrid Electric Vehicles (HEV) Are Not ZEVs
- Plug-In Hybrid Electric Vehicles (PHEV).
- Considered as Near Zero Emissions Vehicle (NZEV) in the regulation. **Limited by All-Electric Range Requirement**

Vehicle Manufacturers are currently focused on producing “Low Hanging Fruit” classes such as:

- Delivery Vans, Mini-Buses, Cargo Trucks, Transit Buses, and Trucks for Intrastate Commerce
- Vocational (work) Truck Designs are Forecast to be Available Beginning in 2026



Local Government – Vehicle Exemptions

Exemptions Requiring Approval

- Non-Repairable Vehicles - used with same configuration and same or newer model year engine
- Backup Vehicle Exemption – 1,000 miles or less per year
- Daily Usage Exemption – Based on usage, there is not adequate time to recharge.
- ZEV Purchase Exemption – Comparable functionality does not exist.

Excluded From Fleet Requirements

- School buses
- Transit buses
- Military tactical vehicles
- Vehicles awaiting sale
- Emergency vehicles*
- Dedicated snow removal vehicles
- Historical vehicles
- Heavy cranes
- Two-engine trucks and workover rigs
- Vehicles subject to Mobile Cargo Handling Equipment regulation



Local Government – Infrastructure Extensions

Construction Delays

- Requires executed agreement and construction permit.
- Delay must have occurred after permit was issued.
- Does not delay ZEV purchase obligations.

Electrification Delays

- Requires certification from the public utility confirming the delay.
- Allows Fleet owners to align ZEV delivery dates with the time need by the electric utility to supply the required power.
- The Fleet is required to deploy the maximum number of ZEVs that the site can support.

Extensions are site specific.



Requirement to Hire Compliant Fleets

Hired Fleet Requirements

- Beginning on 1/1/2024 government agencies are required to hire “Compliant Fleets”.
- Hired Fleets subject to ACF must be compliant throughout the term of the agreement.

Examples:

- Rental Car or Truck Companies.
- Trucking Companies- Hired to pickup or deliver large goods.
- Contracted companies delivering services or goods.
- General Contractors.
- Facility Repair Businesses
- Equipment Rental Businesses
- Bottled Water Delivery Businesses
- Uniform Cleaning Service and Delivery Businesses
- Food Delivery Businesses



Requirement to Hire Compliant Fleets – Recordkeeping Requirements



Recordkeeping Requirements for Hired Fleets

- Annually obtain compliance certification from CARB website for every hired fleet.
- If exempt, annually obtain certification from Fleet owner of exempt status.
- Include the following compliance disclosure notice in all contracts.

“Vehicles with a GVWR greater than 8,500 lbs. and light-duty package delivery vehicles operated in California may be subject to the California Air Resources Board Advanced Clean Fleets regulations. Such vehicles may therefore be subject to requirements to reduce emissions of air pollutants. For more information, please visit the CARB Advanced Clean Fleets webpage at <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets>.”
- Maintain records for five years.
- Provide records to CARB staff electronically or on paper within 72 hours of request.



Reporting Requirements



Annual Reporting Requirements

- Detailed vehicle information for every vehicle in the Fleet.
- Funding contract term for vehicles purchased with California State-funding that require the vehicle is excluded during the funding contract.
- ZEV purchase reporting for every replaced pursuant to the ZEV Purchase Exemption.
- Joint Compliance Reporting - **each individual department must report separately** and include the CARB-issued ID number of the primary controlling agency.
- Odometer reading reporting for backup vehicles.
- Emergency Mileage travelled for backup vehicles used in emergency operations that would exceed the backup vehicle mileage limit.
- Reports must be maintained for five years and available to CARB staff electronically or in paper format within 72 hours of request.

Additional Reporting Requirements

Reporting Requirements within 30 Calendar Days of Occurrence

- Any vehicle added to or removed from the fleet.
 - If purchased with an exemption, the report must also include additional information and photos.
- Purchase agreements for a ZEV canceled by the manufacturer and replacement purchase agreement.
- Backup vehicle exceeding the allowable mileage limit.
- New fuel type of any vehicles converted to a ZEV.
- Odometer failures and replacements.



ZEV Transition Planning



- What ZEVs are available for purchase in the near term?
- What ZEVs are available to order versus be manufactured and delivered within 12 months?
- What charging infrastructure is in place? Public or Private stations?
 - Can the infrastructure be in place by the time the ZEVs are delivered?
 - Will the regional electric grid capacity be exceeded due to multiple fleets installing charging infrastructure?
- Where is the nearest ZEV dealership located? 10 miles or 500 miles away?
- Can you perform ZEV warranty work in house?
- Will your maintenance facility need to be remodeled or replaced to meet OSHA and safety requirements to work on high voltage amperage batteries and control systems?
- What volume of work can the nearest ZEV dealership perform?
- Will they need to modify their dealership to work on ZEVs?
- Are local collision repair facilities certified to work on the ZEV manufacturer and models you plan on purchasing?
- Do you have or can you acquire the necessary funding for vehicle acquisitions and refueling infrastructure?

Vehicle Challenges

Vehicle Manufacturers are Currently Focused on Producing “Low Hanging Fruit” Classes

- Delivery Vans
- Minibuses
- Cargo Trucks
- Transit Buses
- Trucks for Intrastate Commerce



Vocational (work) Truck Designs are Forecast to be Available Beginning in 2026



Vehicle Design Challenges - Upfitting

- Upfitting limitations depending on vehicle trim level package?
- Can additional pieces of equipment be grounded to the frame?
- Are there amperage restrictions on what additional electrical load can be added to truck?
- Are there restrictions on where electrical equipment can be connected to the truck's 12-volt system?
- Can auxiliary 12-volt batteries be added to the truck?
 - Where and how can they be added?
- Where can equipment be mounted?
 - What panels can be drilled through?
- What happens when the 12-volt battery is discharged?
 - Does the powertrain system lock up like a smart phone in a “brick” mode?
 - Does the truck need to be towed on dollies only?



Vehicle Battery Module Replacement



- Will future replacement battery modules be backwards compatible?
- Will vehicles need to be replaced because battery modules and control systems are not backwards compatible or cannot be retrofitted?
- Battery cost per kWh reduction advancements may not decrease older battery module replacement costs

QUANTITY SHIPPED	PART NUMBER	DESCRIPTION	PRODUCT CODE	UNIT PRICE	AMOUNT
	15GGE301691091768	SYSTEM SHUT DOWN ISSUES , POSSIBLE HYBRID PROBLEMS SYSTEM SHUT DOWN ISSUES , POSSIBLE HYBRID PROBLEMS STORAGE ASSEMBLY - ENERGY UNIT BUS HAS ACTIVE DTC 76-21 & 77-71 ALSO ESS DTC 3161-15 AND 3171-15 . DTC FOR HIGH SUBPACK RESISTANCE INDICATES ESS NEEDS REPLACING . REMOVED OLD ESS AND INSTALLED A NEWW ESS . RECALIBRATED THE BUS AND TEST DROVE . CUSTOMER BILLABLE ALLISON POLICY 9.69-00 GENRAL OPERATIONS 2 9.69-01 T/S & DIAG .5 9.65-01 RECAL ECU 1 9.64 -00 TEST DRIVE .5 04000040 R&R ESS 4			
1	29550278	STORAGE ASSEMBLY - ENERGY	ALLISON	44,547.77	44,547.77 *

8/2012 – Battery Module Replacement Cost

Line #	Description	Parts	Lab
	Complaint: Remove ESS and install new ESS assembly. Cause: ESS expired battery life. Correction: Receive bus from customer. Connect DOC and record snapshot. Remove ESS from bus. Install new ESS assembly. Perform SID calibration and test drive.		
	Parts:		
1	New ESS assembly	\$82,365.37	
2	AC Access cover gasket	422.73	

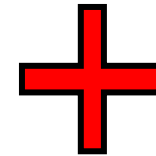
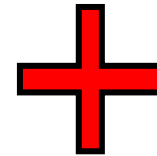
11/2022 – Battery Module Replacement Cost

Accident Damage Safety Training – First Responders



First Responders

- Police
- Fire
- Tow Truck Drivers
- Fleet Staff



- Unless there are injuries, gasoline or fluids from the vehicles, or they are blocking a major throughfare, Police dispatchers will direct the vehicle operators/owners to exchange contact, insurance, and driver license information and then call a tow company to remove the vehicles from the accident scene
- Vehicle undercarriage damage is not seen, and this is where many vehicle battery modules are located
- Damage to an EV battery module **may not develop into a fire for days or weeks**



EV Battery Fires



Fire Destroys Electric Bus Two Days After Initial Thermal Event – Connecticut, July 2022



Electric Scooter Caught Fire Onboard the Bus. Bus Hybrid Electric Battery was Intact After the Fire



Electric Bus Fire Injures Two Mechanics
San Jose, Sept 2023



Electric Bus Caught Fire and It Spread to Adjacent Buses

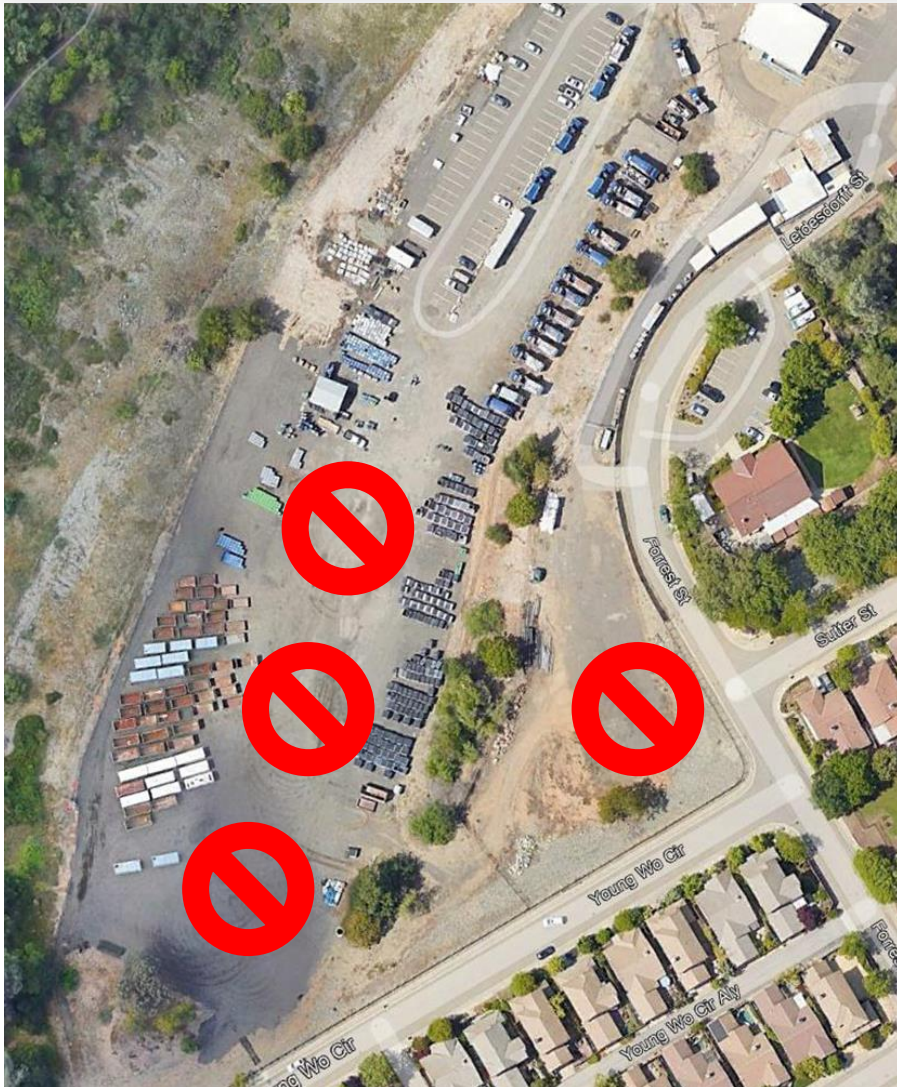


Dry Chemical Extinguisher and Foam Used to Put Out Fire - Maryland, Sept 2016



EV Bus Fire Damages Depot
Germany, 2021

Accident Damage – EV Quarantine



- Light Duty EV Trucks require a 50' radius between the vehicle and the next closest object.
- **Medium/Heavy Duty Truck radius requirements may be greater.**
- An EV Truck will need to quarantine for 48 hours to 2 weeks depending on the manufacturer's recommended safety protocols
- A majority of towing vendors do not have space to meet safety protocols for just one EV sedan
- Other technologies include submersion units and fire suppression units that fully enclose the vehicle.
- Water generated from submersion or suppression units must be managed as hazardous waste.



Operational Challenges

Take-Home Trucks

- Commute mileage uses up battery range.
- Will employees be expected to charge at home?
- Will the city assume the risk of an EV fire damaging an employee's home?

Charging Session Electricity Interruptions – Restart?

- Is someone notified of power interruptions?
- Are staff on hand to restart charging stations?
- Does the charging station or vehicle restart charge sessions automatically when electrical power is restored?

Do you have a back-up plan for 3 days of power outages?

- Do you have alternative locations with unaffected localized electrical grids to charge vehicles?



Operational Challenges - Facilities



Employee Safety - 10' Clearance
Between EV and Closest Metal
Object Possible?

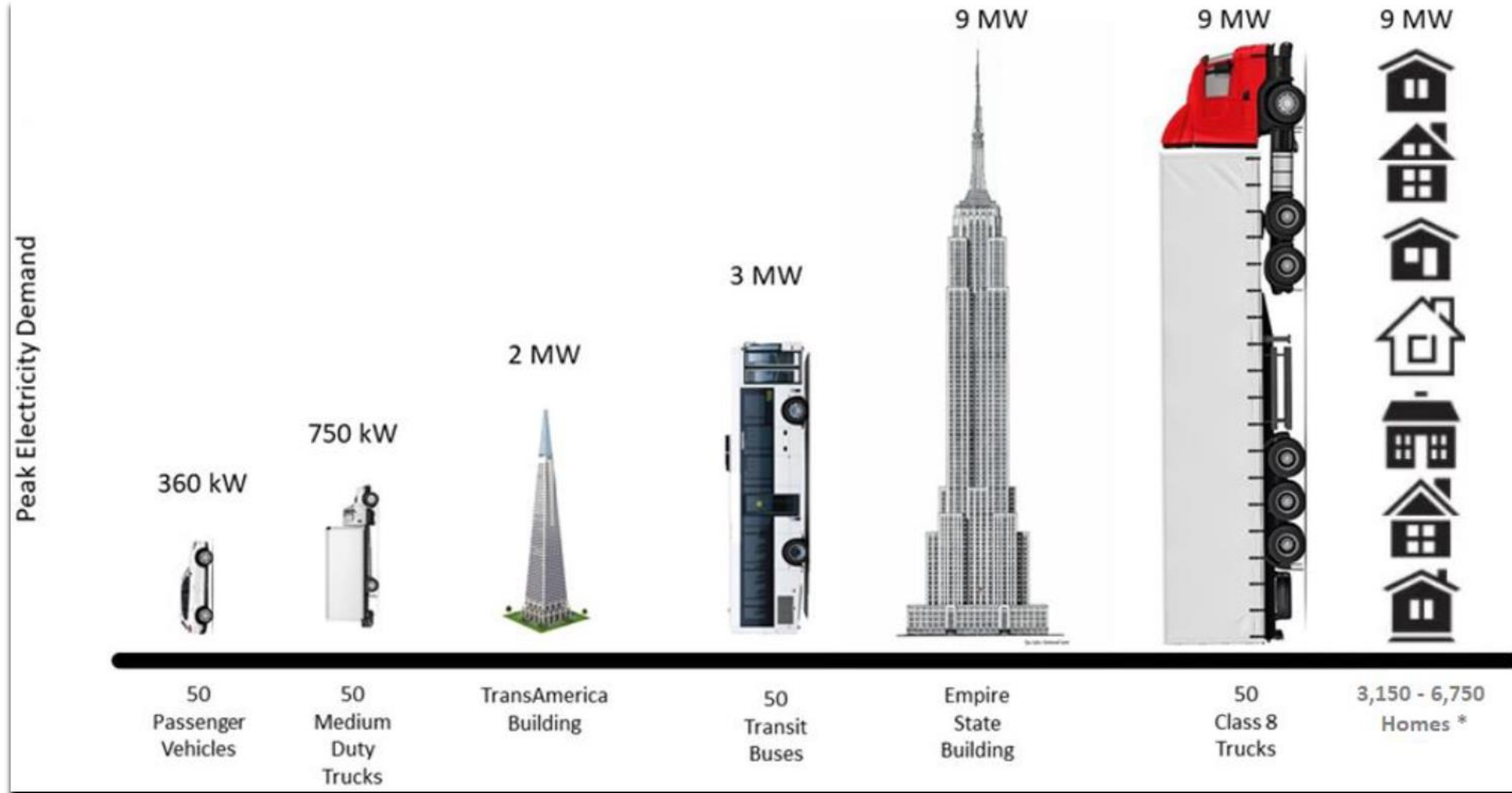


Maintenance Facility - Vehicle to Roof
Clearance Sufficient?



Employee Safety – Additional 10' of
Clearance Between Insulated Fall Protection
Work Platforms and Closest Metal Object

Electricity Requirements Perspective



Operational Challenges - Training

Training:

- Providers
- Hi-voltage systems
- Vehicle operations
- First response
- Fall protection
- First aid
- Electric Vehicle Supply Equipment (EVSE) training.

Training Program Development:

- Develop SOP's
- Training implementation plan
- Tracking
- Recurrence
- Train the trainer!

Job Classifications:

- HV Level I Technician
- HV Level II Technician

Capital and Budgetary Costs



ZEV Trucks Cost **1.5X – 5X** more than conventional powered trucks.

- Costs highly dependent upon class of vehicle and duty cycles.
- \$90K to \$1M each.
- Limited cost data is available.

Example from June 2023:

- Three Axle Day Cab Diesel Engine. Frame modified for a Low Boy trailer: \$175,000
 - Equivalent ZEV Battery Electric is \$569,000. 3.25X more than diesel powered alternative
 - Dealership is not positive if the frame can be modified for a Low Boy Trailer
-
- Charging Infrastructure - \$35K to \$200K per charger depending on voltage and amperage needs.
 - Additional charging infrastructure needed to recharge electric auxiliary equipment on truck bodies.
 - Cranes, generators, compressors, aerial units, welders, hydraulic pumps, etc.

Capital and Budgetary Costs – Human Resources



New Facilities Position to manage charging station infrastructure maintenance, repairs, warranties and regulatory compliance.

New Grants Management Position to research, apply for, and manage the administration of grants, rebates, and vouchers funding source requirements.

New Fleet Job Classifications to repair and maintain ZEVs, high voltage safety disconnect and ARC flash training and certifications, contact release safety training and certification, repair work related to vehicle high voltage battery system and components

Updated Fleet Job Classifications to repair and maintain ZEVs, normal maintenance and repair work not related to high voltage battery system and components, contact release safety training and certification.

New Fleet Compliance Position to research available ZEV technology, vehicle designs, specialty body designs, develop specifications, and manage ACF regulatory compliance, including regulatory extensions and exemptions.

New Procurement Position to collect, track, and manage vendor certificates and contracts that require the use of an ACF applicable vehicle. To manage the purchase and recordkeeping of all vehicles in consultation with Fleet.

Funding Resources



- CARB Website Incentives & Funding
- Advanced Vehicle Technology and Infrastructure Funding Finder Tool
- Hybrid & Zero-Emission Truck & Bus Voucher Incentive Program (HVIP)
- Low Carbon Fuel Standard
- EnerGIZE Commercial Vehicles
- Truck Loan Assistance Program
- Truck Loan Assistance Program | California Air Resources Board
- Carl Moyer Program
- Low Carbon Transportation Investments Program
- Volkswagen Environmental Mitigation Trust
- Voucher Incentive Program (VIP)
- Community Air Protection Incentives for On-Road Heavy-Duty Vehicles

Beginning on 1/1/2024, vehicles acquired with California State incentive program funding for ZEVs will not count as a compliant vehicle during the contract period if the general program requirements state that funding cannot be used for compliance requirements.

Strategies for Moving Forward



- Advanced Clean Fleets is California State Law, and the city must comply to avoid enforcement.
- The cost of ACF is unknown, but it will be millions, even with grant funding.
- Additional Human resources will be required to achieve compliance, safety, and cost minimization.
- Use standard implementation, rather than the Milestone Phase-In Option to manage cost and program flexibility.
- Add vehicle telematics to all city vehicles to evaluate usage patterns.
- Analyze the fleet to eliminate underutilized vehicles and achieve any available cost savings.
- Maintain as many existing specialty vehicles as possible to allow strategic phase-in of electric replacements. This will spread out the cost and allow time for infrastructure construction and technology development.
- Utilize pool vehicles and other vehicle sharing strategies to maximize efficiency.
- Implement a modern Fleet Management System that allows accurate tracking of detailed maintenance information, cost accounting, scheduling, and other asset management functions.
- Centralize purchasing so all purchases are evaluated for compliance, records are tracked, and reports are generated from a single specialized division. Implement and manage hired fleet requirements citywide.

Thank You
Questions?

