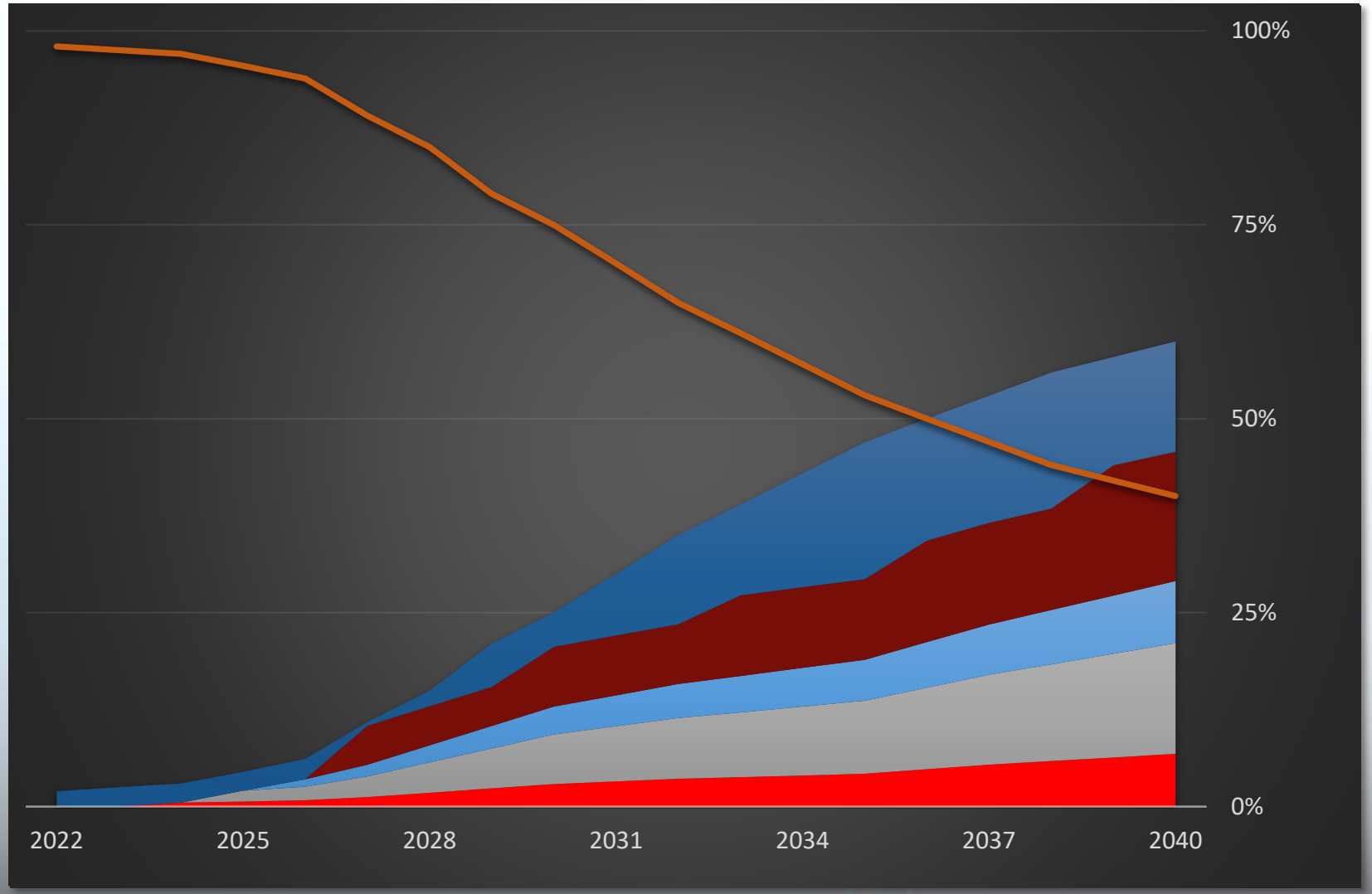
DRIVING TO ZERO EMISSIONS

Sean Henebry, Powertrain Marketing Manager

KENWORTH

The World's Best®

ZERO EMISSIONS VEHICLE MARKET



- Staying Ahead of Regulations
- Green Image & Sustainability
- Total Cost of Ownership Benefits
- State and Federal Incentives

- Internal Combustion
- Growing Demand
- Greenhouse Gas
- MOU States - 2026
- MOU States - 2025
- ACT Rule - CA

REGULATORY LANDSCAPE

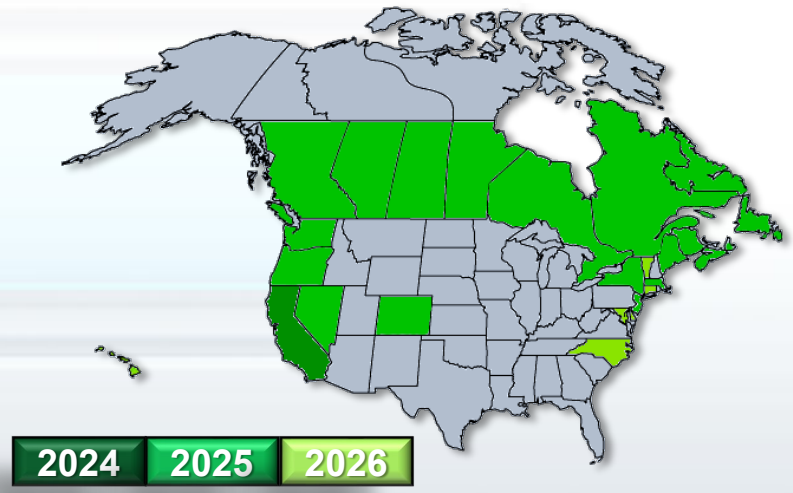
Advanced Clean Truck (ACT)

Model Year	Class 4-8 Vocational	Class 7-8 Tractors
2024	9%	5%
2025	11%	7%
2026	13%	10%
2027	20%	15%
2028	30%	20%
2029	40%	25%
2030	50%	30%
2035	75%	40%
2040	100%	100%

Sales Targets

New Trucks ZEV by 2027

CARB MOU



17 States & Canada

30% ZEV by 2030

Federal

Climate Policy

Net-Zero Emissions by 2050

ADVANCED CLEAN FLEETS

CALIFORNIA AIR RESOURCES BOARD

Private Fleet Vehicles	% of Private Fleets that Must be Zero Emissions				
	10%	25%	50%	75%	100%
Box Trucks, Yard Tractors	2025	2028	2031	2033	2035
Work Trucks, Day Cab Tractor	2027	2030	2033	2036	2039
Sleeper Tractor, Specialty Vehicles	2030	2033	2036	2039	2042

Public Fleets

- 2024 - 50% of Purchases
- 2027 - 100% of Purchases

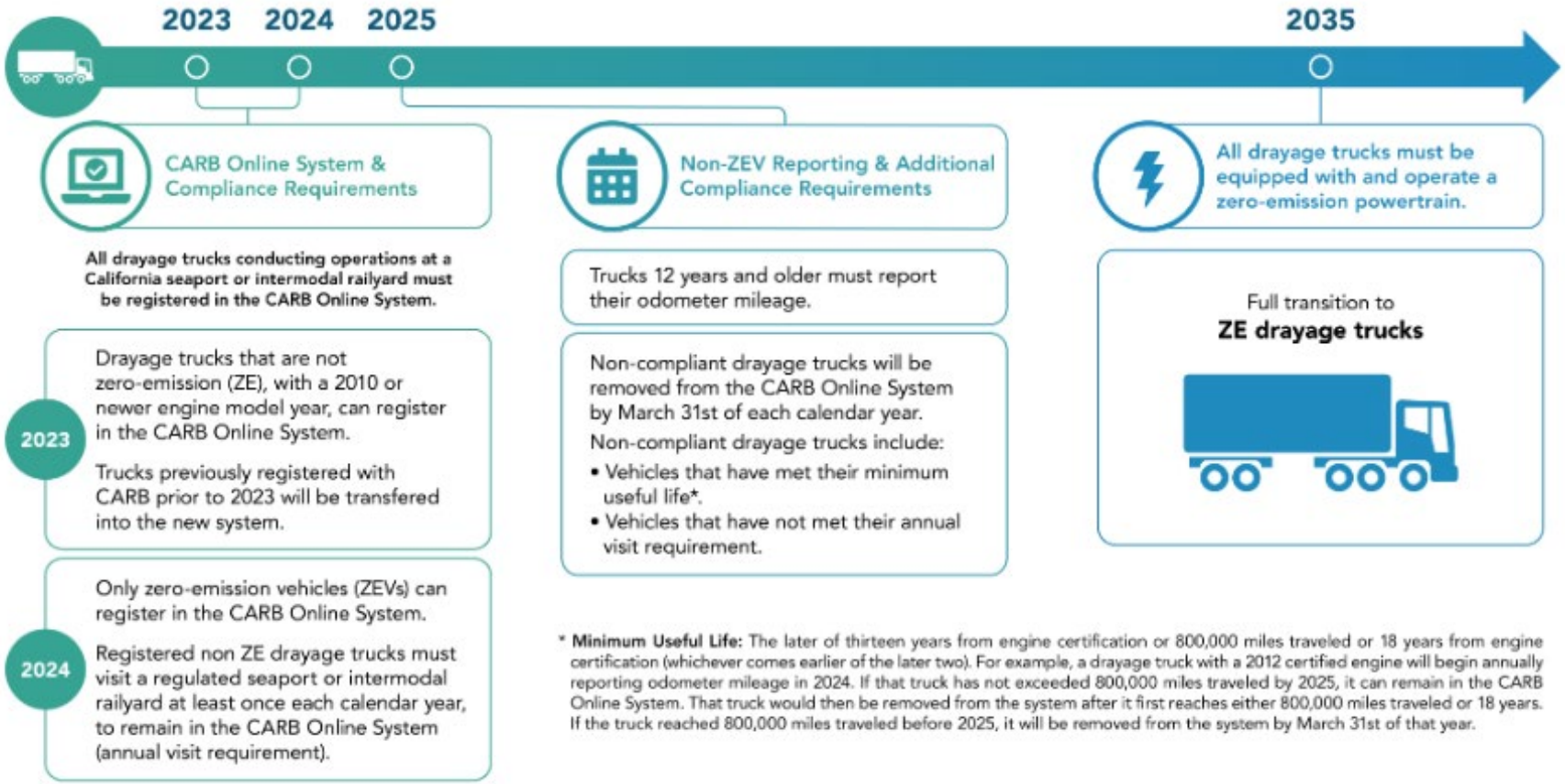
Drayage

- Nov. 2023 – New Port Registrations Must be ZEV
- 2035 – All Drayage Trucks Must Be ZEV
- Varying Mileage and Age Requirements

Drayage Requirements

Requirements and Compliance Deadlines

The proposed Advanced Clean Fleet Regulation contains the following requirements and compliance deadlines for drayage trucks.



* **Minimum Useful Life:** The later of thirteen years from engine certification or 800,000 miles traveled or 18 years from engine certification (whichever comes earlier of the later two). For example, a drayage truck with a 2012 certified engine will begin annually reporting odometer mileage in 2024. If that truck has not exceeded 800,000 miles traveled by 2025, it can remain in the CARB Online System. That truck would then be removed from the system after it first reaches either 800,000 miles traveled or 18 years. If the truck reached 800,000 miles traveled before 2025, it will be removed from the system by March 31st of that year.

GREEN IMAGE AND SUSTAINABILITY

Marketing Value

- Corporate Sustainability Goals
- Leader in the Transportation Industry
- Commitment to Public Health

Customer Expectations

- Customer Sustainability Goals
- Increased Freight Rates
- Driver & Operational Benefits

CUSTOMER TCO BENEFITS

Fuel Savings

Diesel Prices Increasing

Low, EV-Specific Electricity Rates

Maintenance

40% Fewer Moving Parts

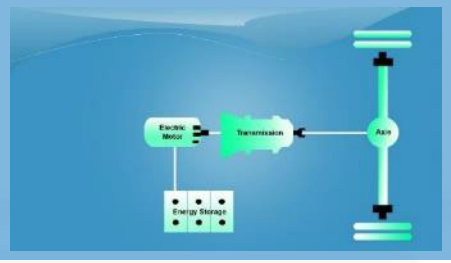
No Engine and Aftertreatment

Incentives

Infrastructure and Vehicle Grants and Incentives

ZEV POWERTRAIN OUTLOOK

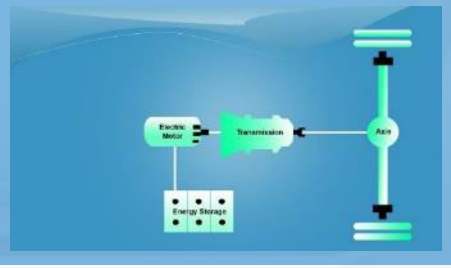
Local



Battery Electric

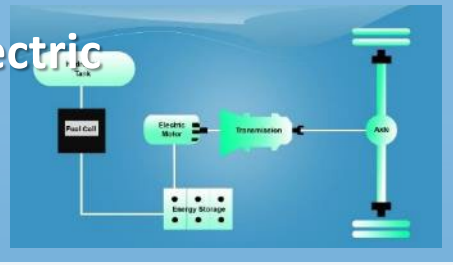
<200mi

Regional



Battery Electric

<200mi



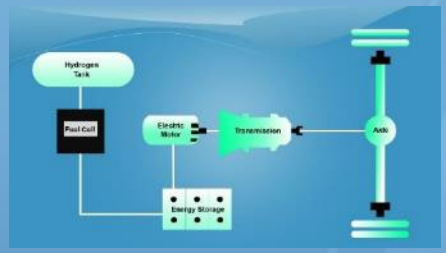
Hydrogen

200 – 400mi

Longhaul

Hydrogen

≥400mi



Today → **2030+**

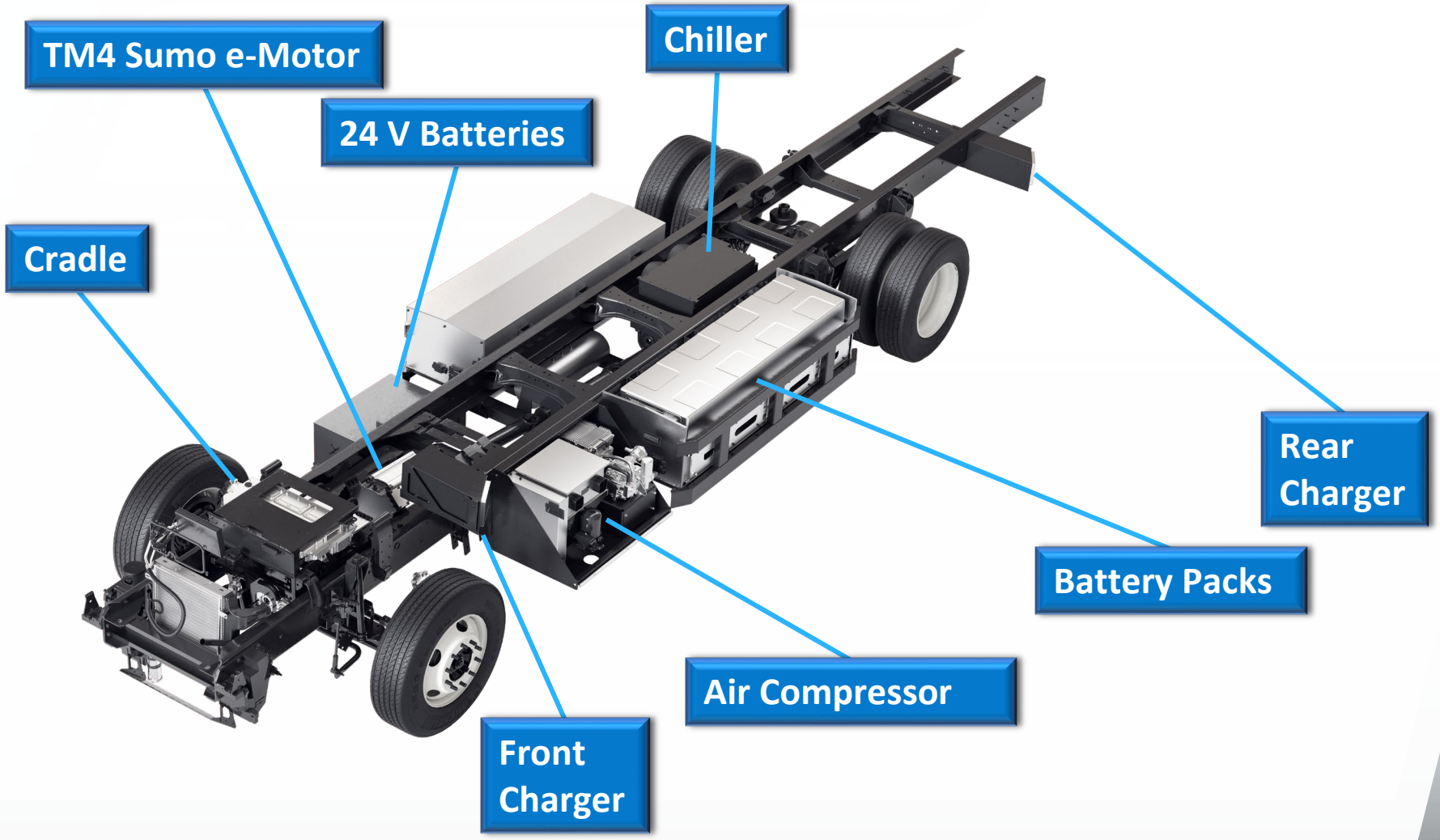
K270E / K370E

- Class 6 & 7
- 100-200 Mile Range
- P&D & Last Mile

K270E/K370E BATTERY ELECTRIC VEHICLE

- **K270E**
  - 26K GVWR – Class 6 – Non CDL
    (10K FA / 16K RA)
- **K370E**
  - 33K GVWR – Class 7 – CDL / Under FET
    (12K FA / 21K RA)
  - 35k GVWR – Class 8 – CDL
    (12k FA / 23k RA)
- Vehicle Weight : 12,700 – 14,700lb
- Wheelbase Options : 206in, 218in, 274in
  - Box Size Options: 24’, 26’, 30’
  - Customizable for Multiple Vocations
- Lift Gates Compatible
- Collision Mitigation System Available

E-POWERTRAIN LAYOUT



E-POWERTRAIN PERFORMANCE

Power

Traction Motor Power

Up to 496 HP

Maintain 40 MPH
on a 6% Grade

Direct Drive Motor and Inverter

Torque

Enough to Start
on a 20% Grade*

EV Range

100 to 200 Miles

Regenerative Braking

Top Speed - 70 MPH

T680 E

- Class 8 Daycab
- 150 Mile Range
- P&D, Drayage, Regional

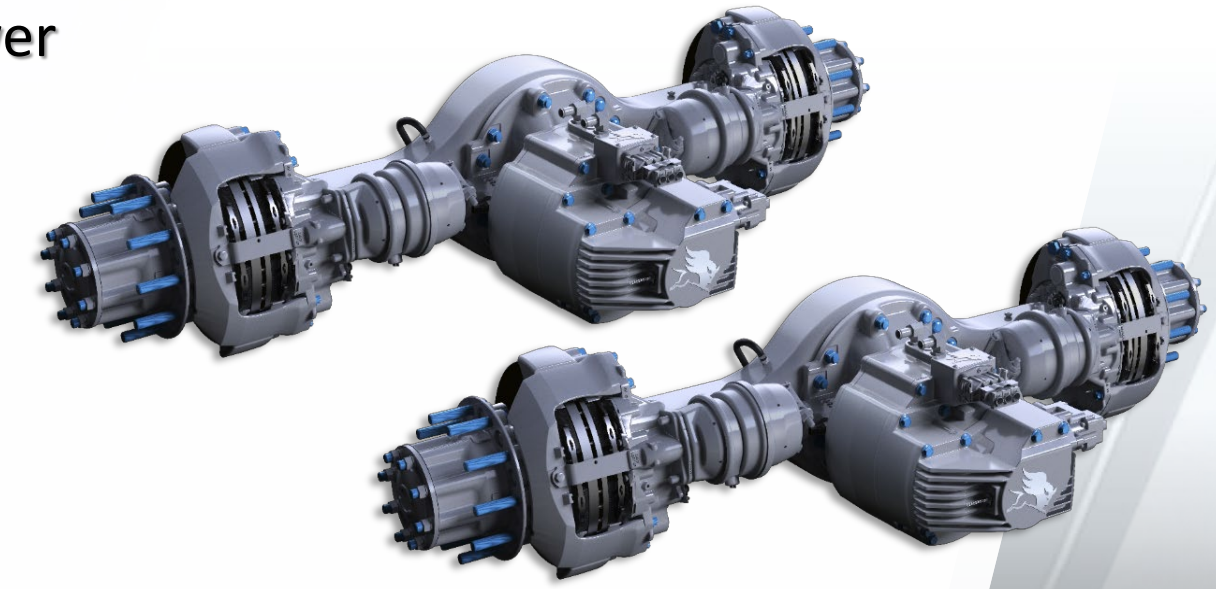
T680E BATTERY ELECTRIC VEHICLE

- Class 8 Day Cab
  - 82,000lb GCWR
- Available in 6x4 Tractor & Straight Truck
- Wheelbase: 190” & 216”
- Bendix Fusion Collision Mitigation
- ePTO Available
- Weight: 22.5k lbs

MERITOR eAXLE

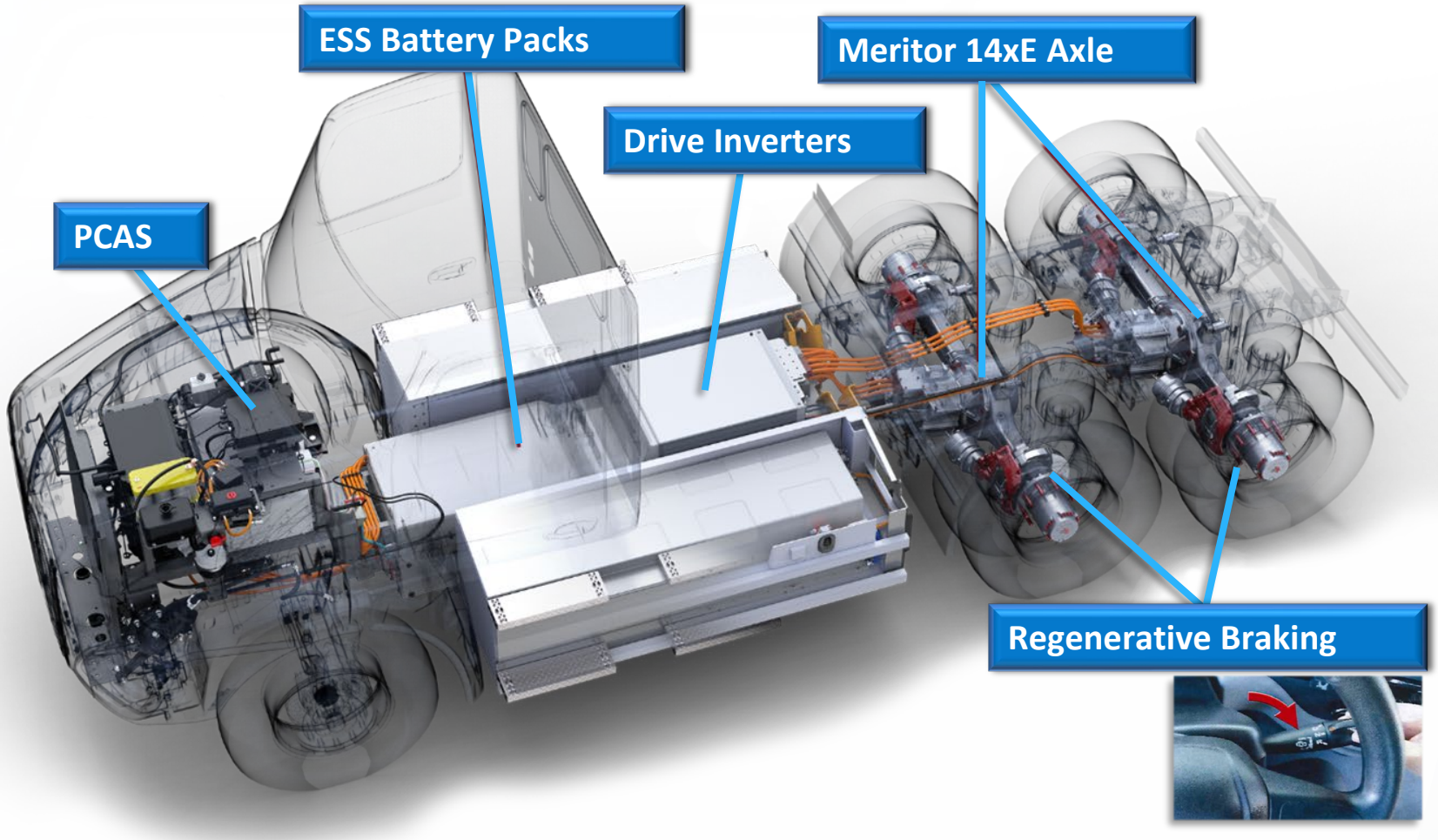
Meritor 14Xe Tandem eAxle

- 2-Speed Integrated transmission
- Up to 670 HP peak power
- 536 HP Continuous Power
- Up to 1,623 ft-lb



E-POWERTRAIN PERFORMANCE

E-POWERTRAIN LAYOUT



T680

FUEL CELL ELECTRIC

- Class 8 Daycab
- 300 Mile Range
- P&D, Drayage, Regional

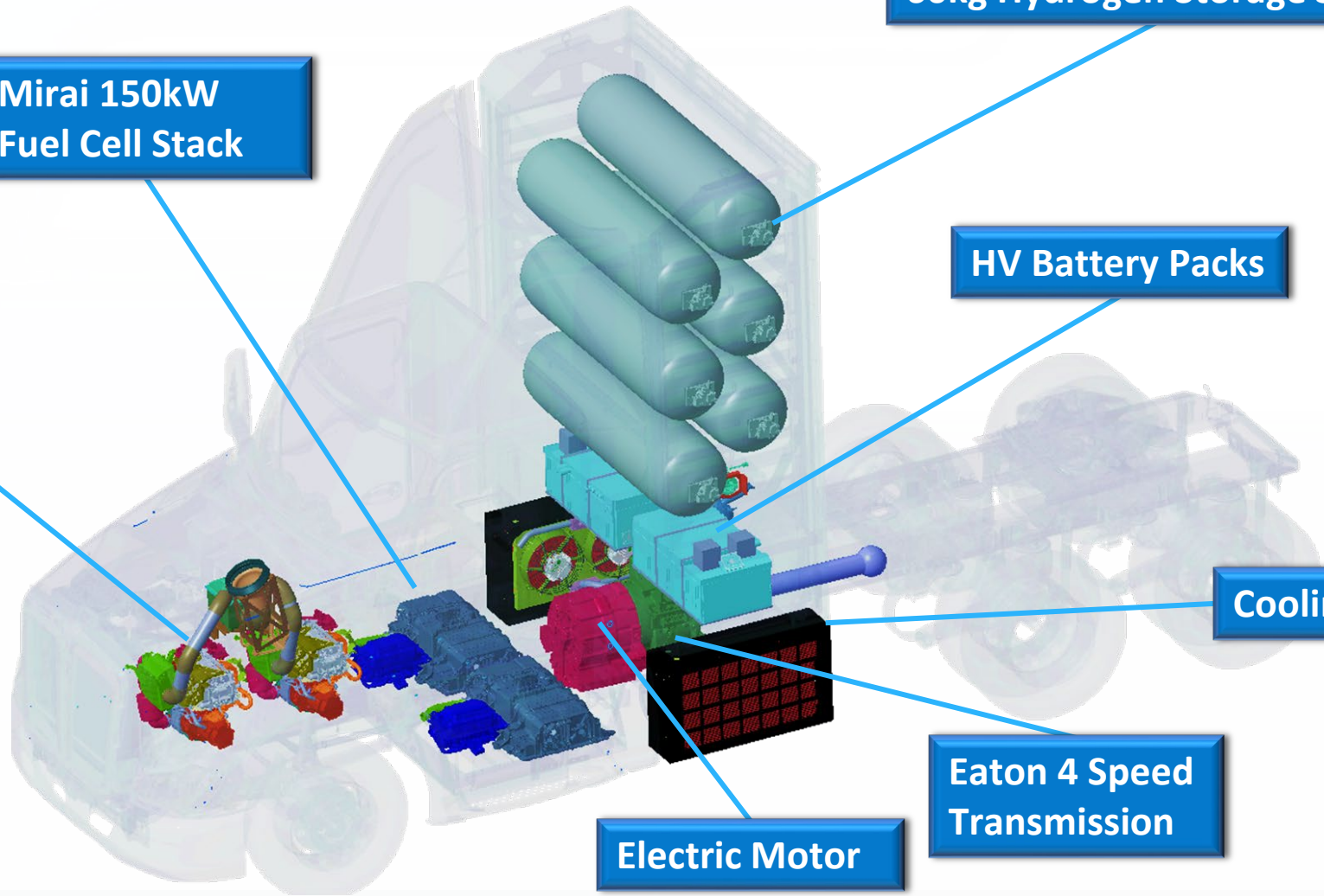
ZEV SUCCESS STORIES – SHORE TO STORE

- **Shore to Store**
- 4 Year CARB-Funded ($41M) Demonstration
- 10 T680FCEV Tractors Performing Drayage From Port of LA and Regional Haul in Inland Empire
- Partnership with Toyota, Shell, Air Quality Management Districts, CA Climate Investments
- Proves Hydrogen Fuel Can Supplant Diesel
  - Reduction of 5.08 tons of NO_x, 1830 tons of CO_2
- Substantial Investments in Infrastructure and Manufacturing Required

T680 FUEL CELL ELECTRIC VEHICLE

- Class 8 Daycab
  - 82,00lb GCWR
- Collaboration with Toyota
  - 150kW Toyota Mirai Fuel Cell Stack
  - 60kg Hydrogen Tank Array BOC
  - 420kW Electric Motor

T680FCEV LAYOUT



FCEV POWERTRAIN PERFORMANCE

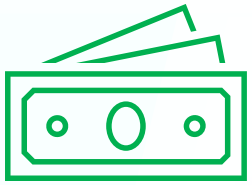
TOP SPEED
70 MPH

POWER
MAINTAIN 28 MPH
ON A 6% GRADE*

TORQUE
ENOUGH TO START
ON A 25% GRADE

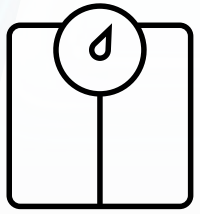
FCEV RANGE
300 MILES

Adoption Challenges



Upfront Costs → **State/Federal Incentives**

Infrastructure Readiness → **Dedicated Heavy Duty Charging**



Weight/Range → **Weight Exemption/ Tech Advancement**

EPA NATIONAL DERA

Next Application Round Q4 2022

Available Funding

- Zero Emissions Vehicles: 45% of Total Project Cost (Vehicle and 1 charger per vehicle)
- 50% for Drayage
- Requires Scrappage of a Diesel Vehicle
- No Model Year Restriction on Scrappage Vehicles

Eligibility

- Open to Public Entities and Private-Public Partnerships
- Clean Cities Coalitions, Other Non-Profits Could be Considered Partners

https://www.epa.gov/dera/national#rfa

CALIFORNIA HVIP

Available Funding

- T680E - $120,000 / $150,000 (Drayage)
- T680FCEV - $240,000 / $270,000 (Drayage)
- K270E/K370E - $85,000
- Additional 15% Bonus Funding for Small Fleets if Domiciled in a SB535 Disadvantaged Community
- Additional Funding Available for ePTO Applications

Eligibility

- Fleet Must Operate 100% of Time in California
- Vehicle Must be in Operation for a Minimum of 3 Years
- Lease Deals May Also Apply for Funding
- Grant Stacking is Allowed

https://www.californiahvip.org/

Clean Fuel Standard

Low Carbon Fuel Standard (LCFS) Credits

- Programs in WA, OR, CA, and Canada
- State Sets a “Pollution Baseline” for Businesses
- Businesses that Create Less Pollution than the Baseline Generate Credits
- Businesses that Create More Pollution than the Baseline Must Purchase Credits/Pay Fines
- Credit Values Vary by State
- Credit Brokers Manage Sales

California Example (Values from SRECTrade Calculator)

- 45k mi/yr @ 2.25kWh/mi = 101,250 kWh/yr
- 101,250 kWh/yr = 137.1 LCFS Credits
- 137.1 Credits @ $120/Credit = **$16,452/ yr**

COMPREHENSIVE EV EXPERIENCE

EV Trucks

KENWORTH

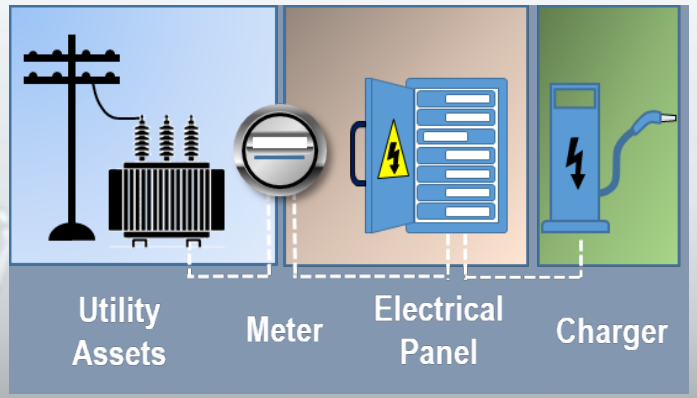
Charging

PACCAR PARTS

Infrastructure

EnTech SOLUTIONS

Schneider Electric



Funding

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