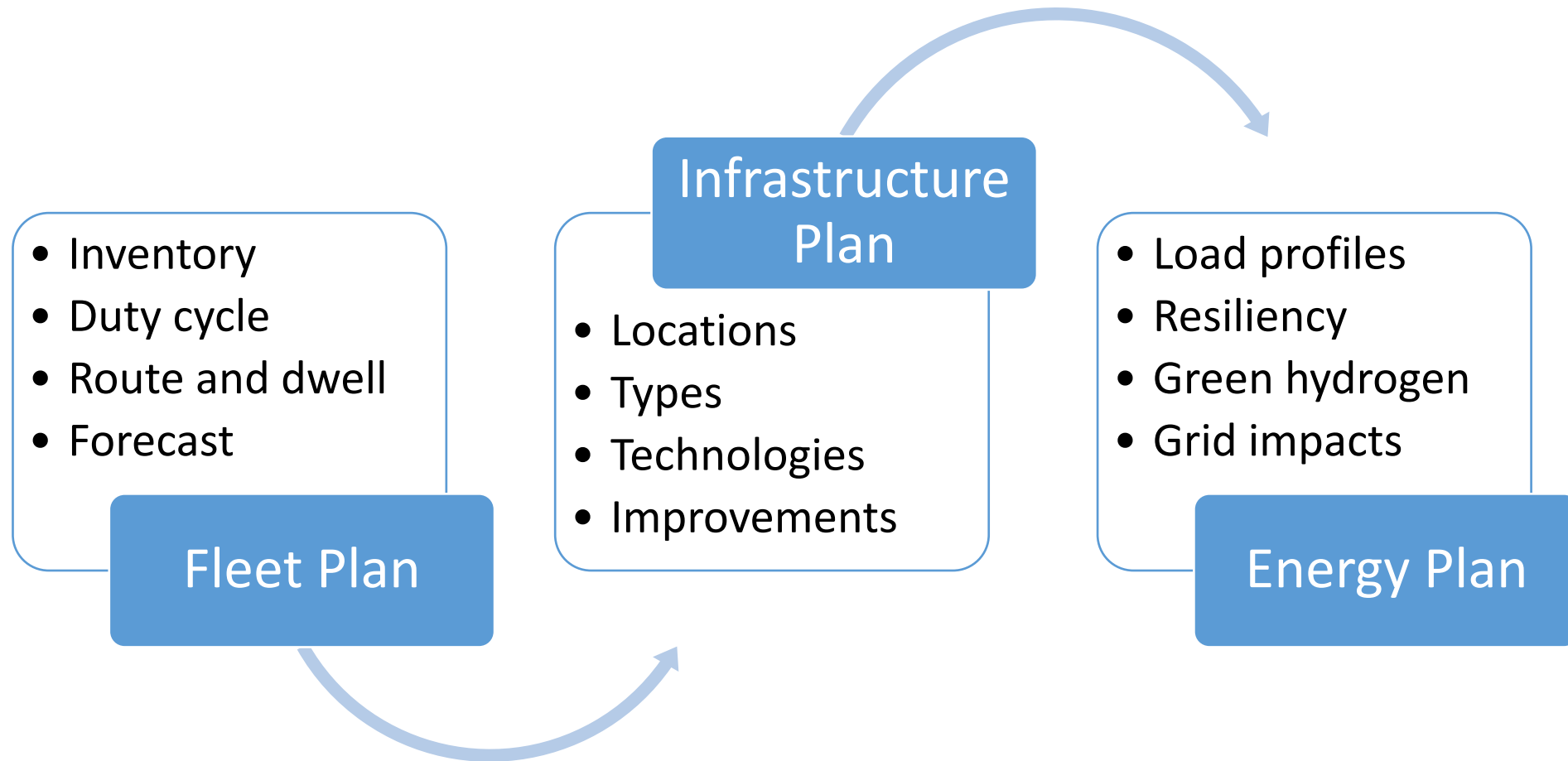




Planning for the Transition
Clean Cities Fleet Academy

Transition Planning



“Platform” and truck



Motiv Power shuttle bus



Ford E-450 platform

Lighting Systems truck



Lighting Systems van



“Platform” with power



Advanced Clean Trucks

Manufacturers must sell ZEV trucks

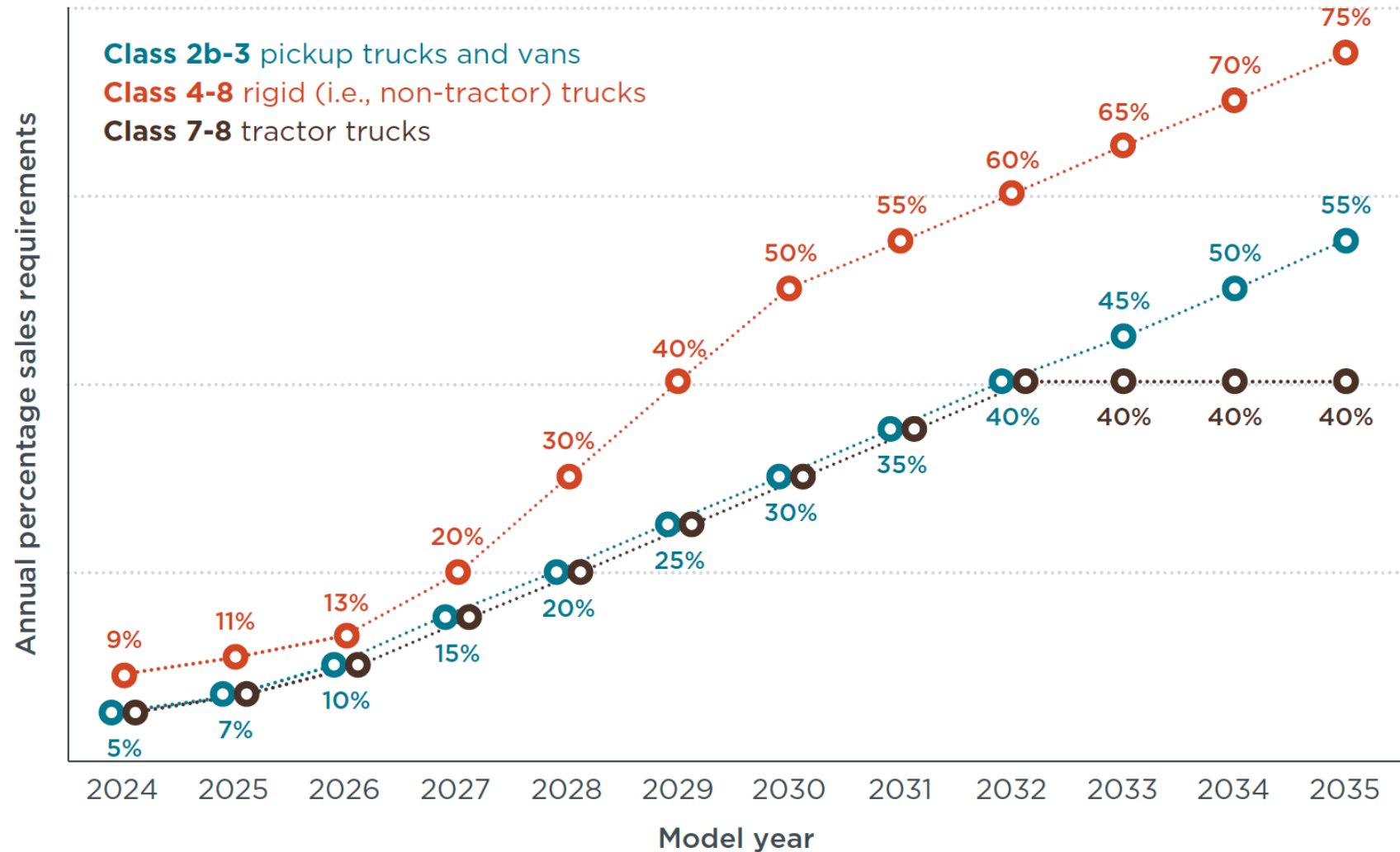


Chart from The ICCT

Advanced Clean Fleet

Requires fleets to buy ZEVs for on-road vehicles over 8,500 lbs (Class 2)

- Private fleets with 50+ vehicles or \$50 million in revenue
- Public fleets
- Drayage vehicle that operate at ports and railyards

Proposed Requirement	Deadline
50% of new purchases must be ZEV	2024 through 2026
100% of new purchases must be ZEV	2027 and onward

This rule is not approved yet. It will be sent to CARB Board in 2022.

Mapping replacements

If Advanced Clean Fleet is passed as written

Introduce ZEVs and near-ZEVs
Plan infrastructure for Phase 1

50% of purchases must be ZEV or hybrid
Build out infrastructure for Phase 2

100% of purchases must be ZEV

2022

2023

2024

2025

2026

2027

5% of Class 2 pickups & vans
5% of Class 7-8 trucks
9% of Class 4-8 rigid trucks

55% of Class 2 pickups & vans
75% of Class 7-8 trucks
40% of Class 4-8 rigid trucks

Why these?

- Fewer daily miles
- Routine schedule
- Return to base
- Long dwell time
- Light load weight
- Potential for on-route charging

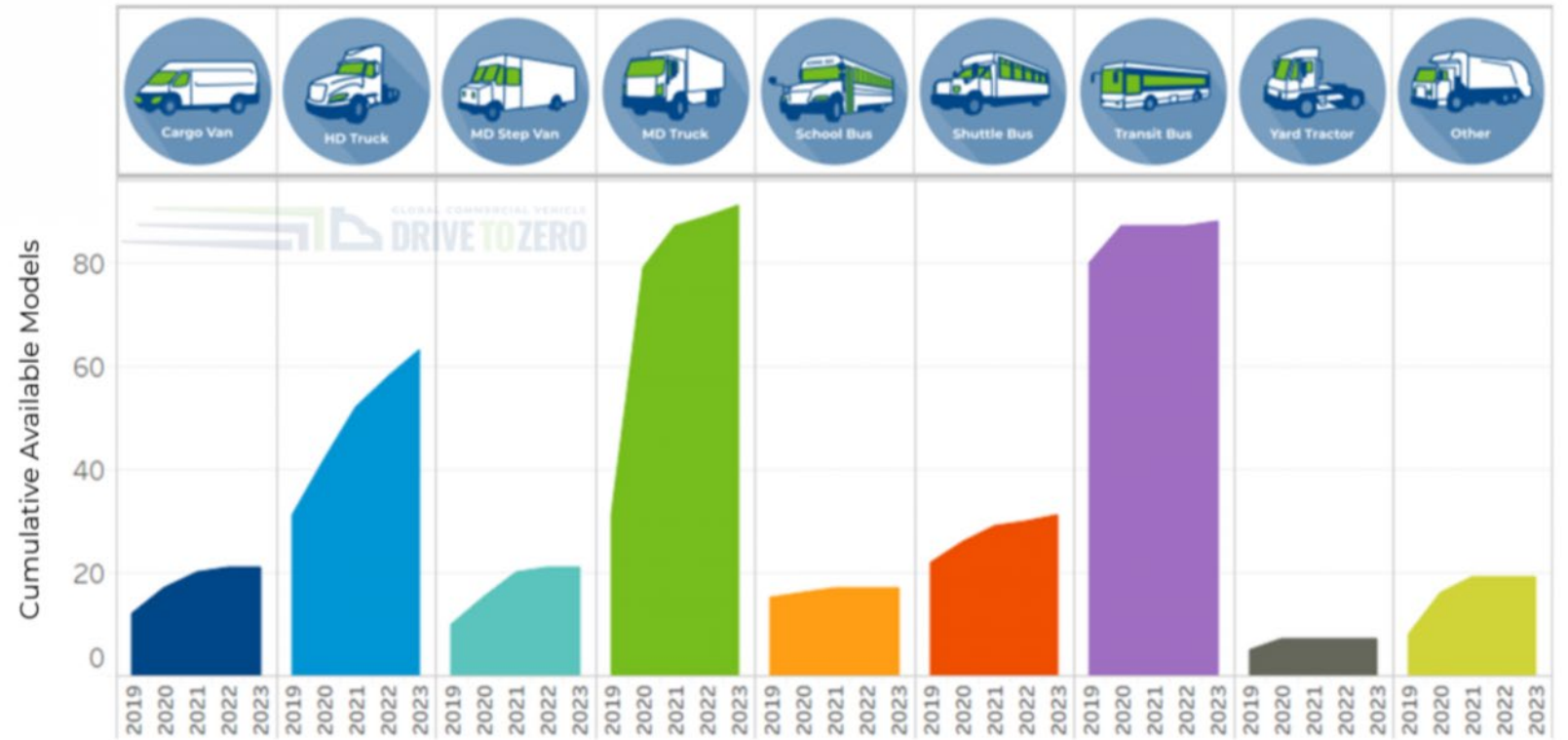


Chart from Drive to Zero

Class Two: 6,001 to 10,000 lbs.

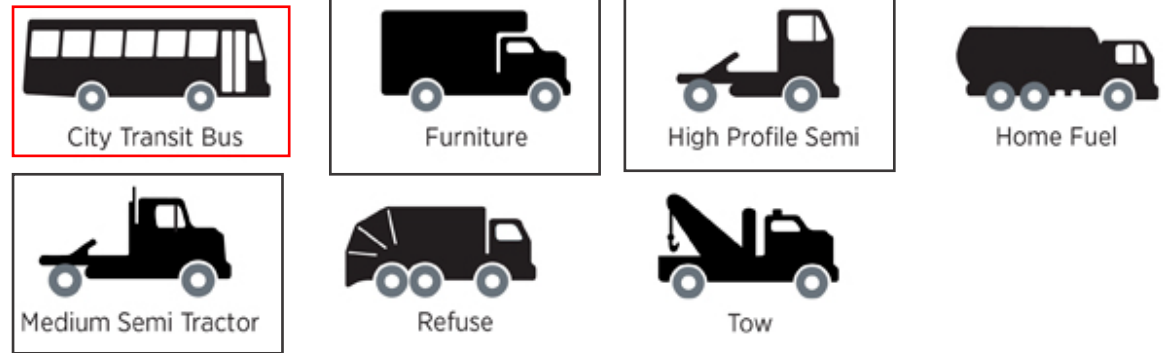


Predictable route and return to base
 Predictable schedule, usually return to base

Class Three: 10,001 to 14,000 lbs.



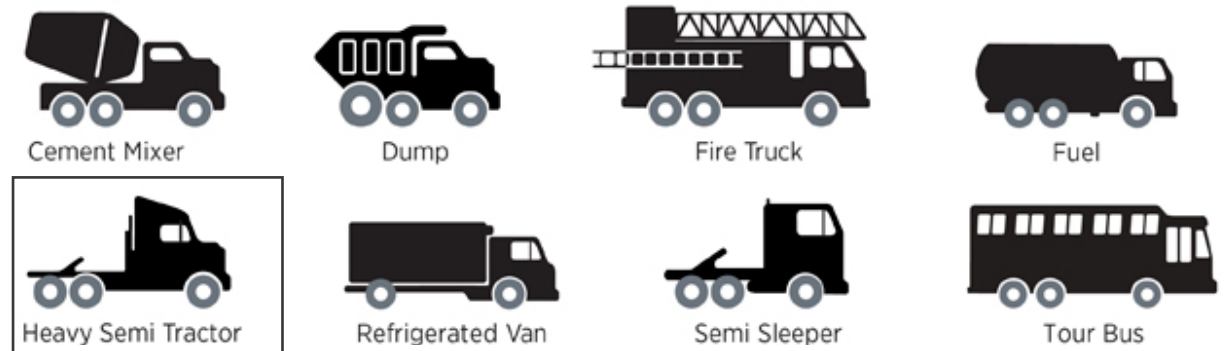
Class Seven: 26,001 to 33,000 lbs.



Class Four: 14,001 to 16,000 lbs.



Class Eight: 33,001 lbs. & over



Class Five: 16,001 to 19,500 lbs.



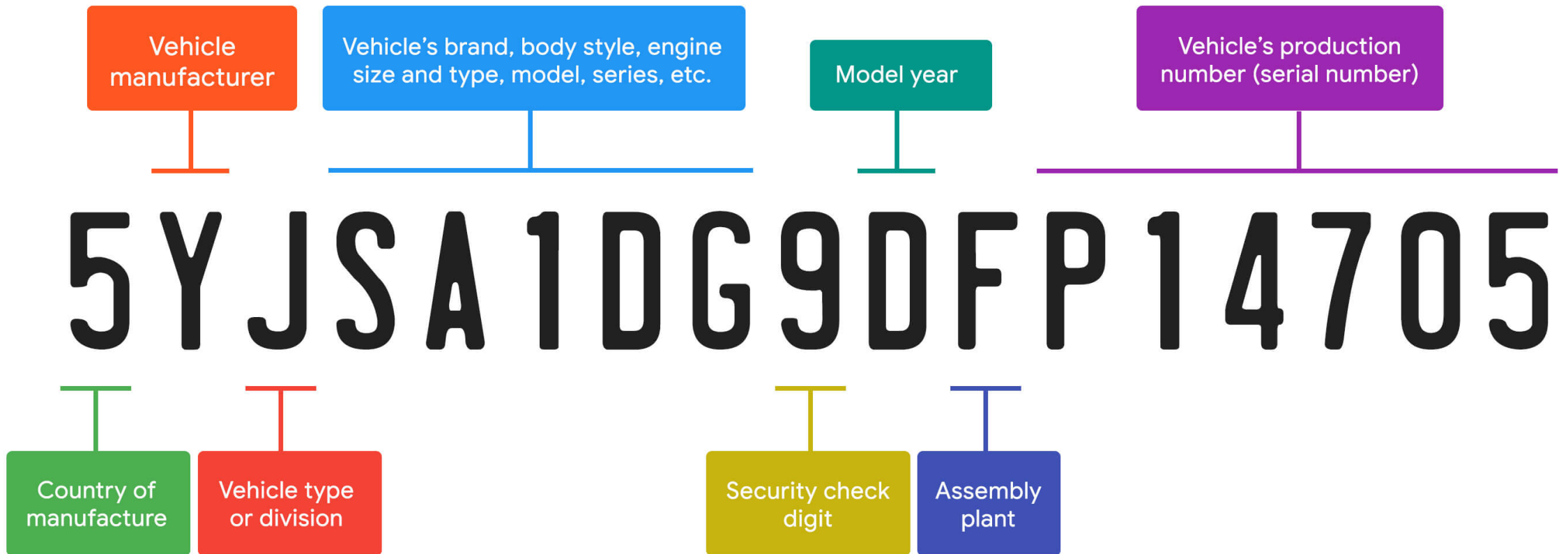
Class Six: 19,501 to 26,000 lbs.



The inventory

Desired Information	Typical Day	Emergency Day
Vehicle VIN		
PTO, mounted equipment, assigned equipment (e.g., tows a bulldozer)		
Amount of time engine powers equipment		
Avg idle time at job site (not in traffic)		
Address of domicile		
Hours parked at assigned domicile		
Regular parking spot with engine off during a shift, length of time		
Number of days a week in service and hours per day		
Special equipment or configuration (e.g., hazmat, pump, sleeper cab)		

Decoding the VIN



Duty Cycle

- Miles per day: typical and max
- “On-duty” power use
 - PTOs and AC/DC power
 - Fully-loaded weight
 - Towing
 - Idling for shelter
- Off-road use
- People needs



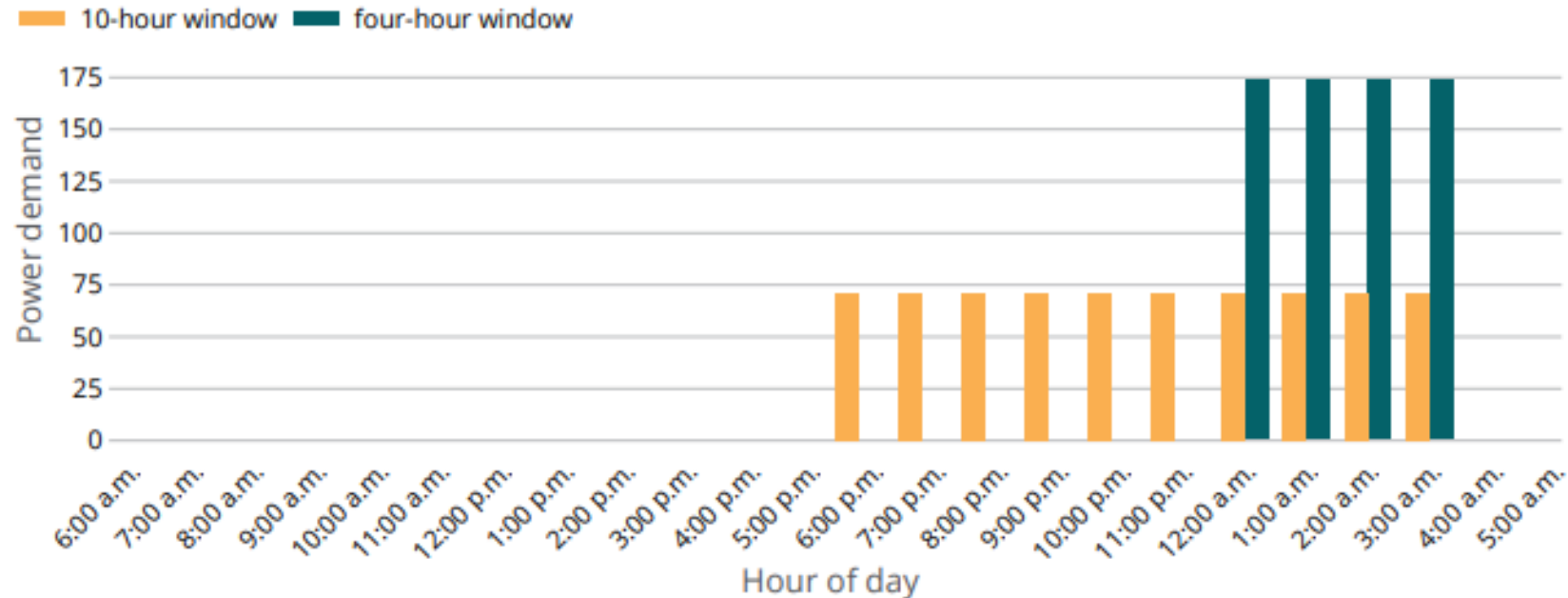
The fueling

Desired Information	Typical Day	Emergency Day
Address of domicile		
Hours parked at assigned domicile		
Regular parking spot with engine off during a shift, length of time		
Back-up or emergency power		
Fueling systems		
Fueling depots and contracts		

Dwell time dictates charger type

Number of charging stations and energy costs

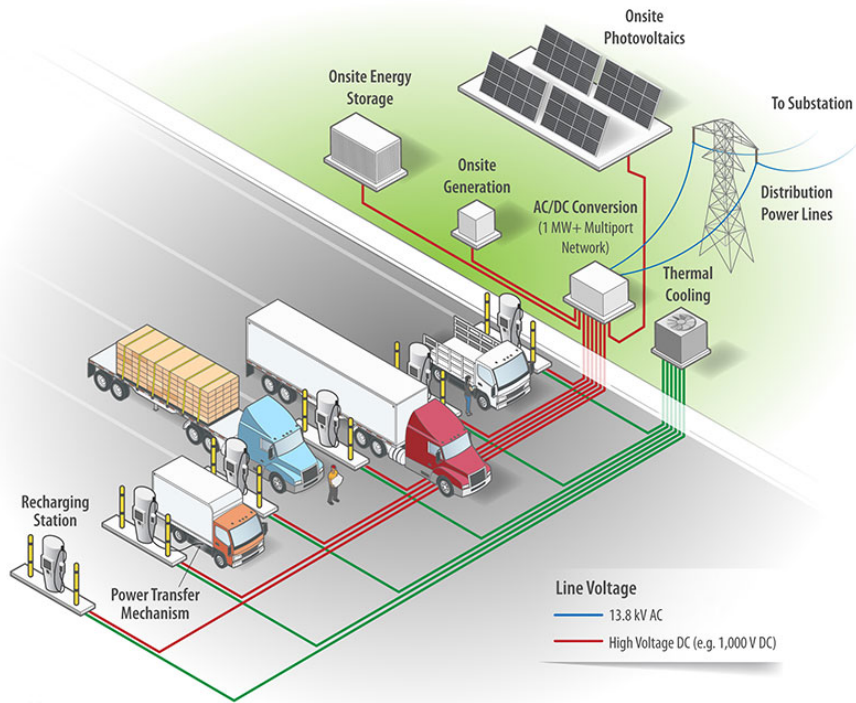
FIGURE 3:
Power demand over four- and 10-hour charging windows.



L2=8-10 hours
DCFC=4-6 hours

Source: Charge Ready Transport (SCE)

Charging stations



(not to scale)

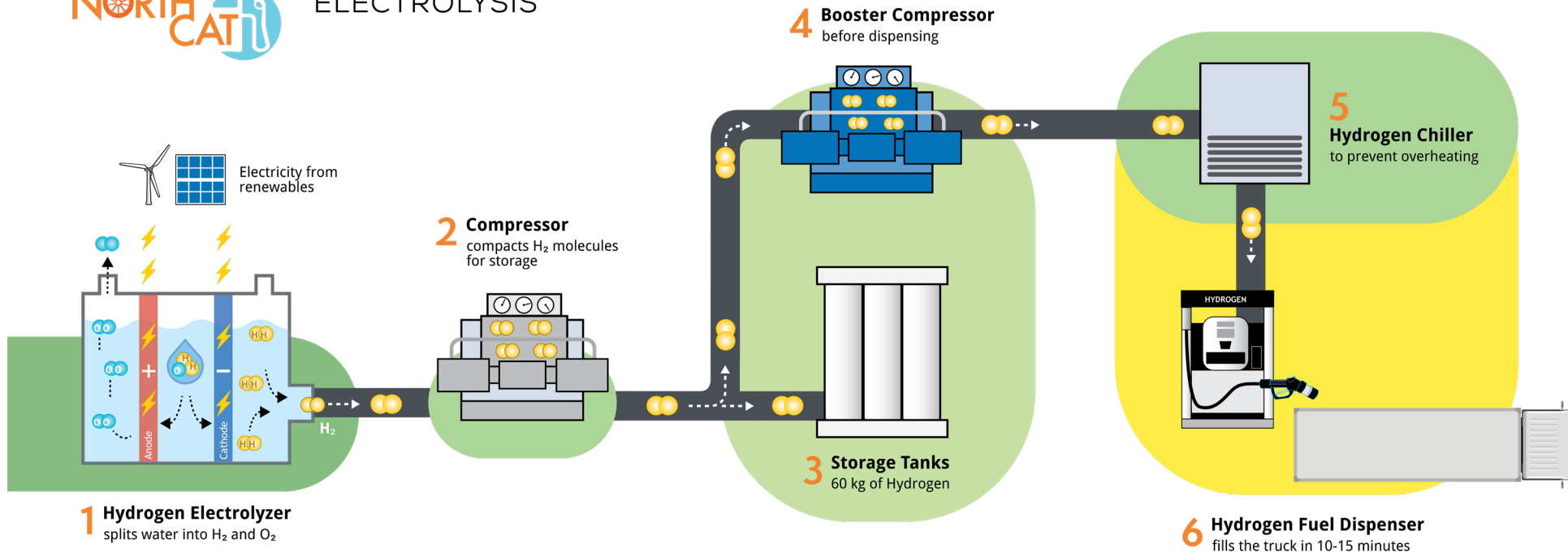
DC Fast Charging – 4-6 hours
One station per truck
PV and storage for BU power and avoid peak



Hydrogen stations



HYDROGEN STATION: ELECTROLYSIS



H₂ fill – about 10 minutes
 One station for many trucks
 H₂ can provide storage and BU power



Class Two: 6,001 to 10,000 lbs.



Class Three: 10,001 to 14,000 lbs.



Class Four: 14,001 to 16,000 lbs.



Class Five: 16,001 to 19,500 lbs.



Class Six: 19,501 to 26,000 lbs.

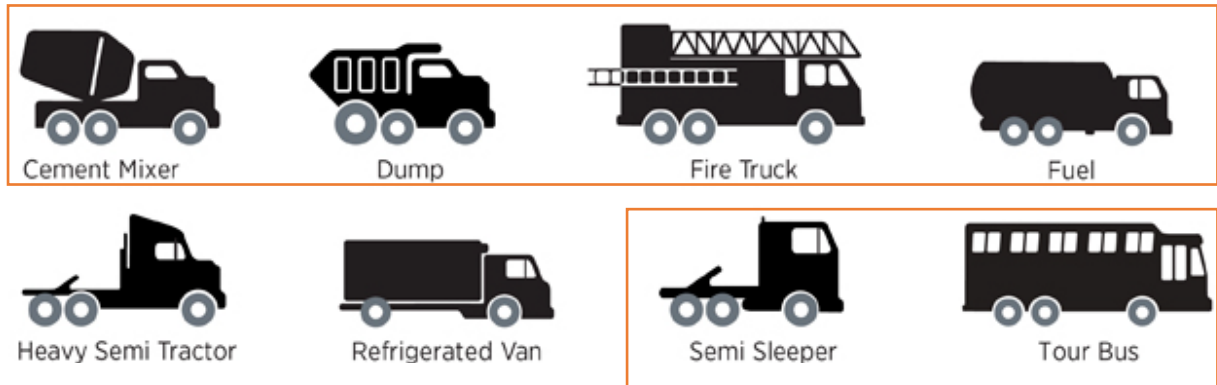


Longer timeline for competitive ZEVs

Class Seven: 26,001 to 33,000 lbs.



Class Eight: 33,001 lbs. & over

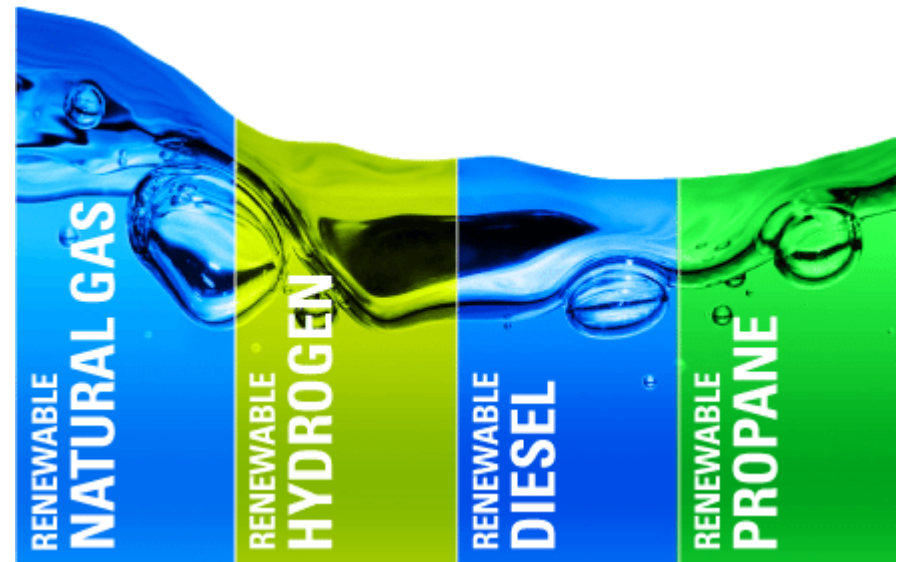


A few other parameters

- Willingness to try emerging technology
- Loyalty to brand or badge
- Resources to go after funding
- Workforce and training needs
- Change management

Important points

- This isn't happening tomorrow
- We need to plan for 2024/25 today!
- Renewable fuels will be part of the plan
- Do you have opportunities for group buys?





Thank you!

[Chris White](#)

Sr. Manager

Frontier Energy