



**Refrigerated
Meeting**

Navigating the Future: Electrification TRU for Trailers

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Carrier Transicold Overview



**Temperature
Control Units**



ISO Container



Trailer



Straight Truck



**Domestic Container, Rail,
and Intermodal Trailer**



**Class 8 Auxiliary
Power**



Small Truck or Van





Trailer



Rail



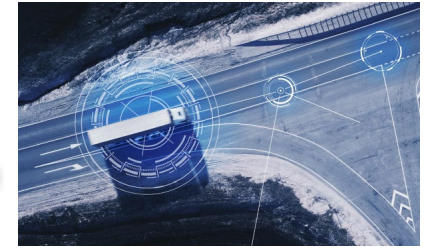
Truck



APU



Marine







Telematics





As the inventor of the transport refrigeration unit, we've been making it our mission for over 80 years to provide sustainable transport temperature-control solutions. Our products and people deliver peace of mind to our customers by ensuring passengers and temperature-sensitive goods make it to their destinations safely and efficiently.

Electrification Overview

Motivating interests in electric solutions

-  Regulatory requirements
-  Return on investment (TCO)
-  Sustainability initiatives
-  Special use (noise, enclosure)

Concerns about electric solutions

-  Range anxiety
-  Initial cost
-  Infrastructure (cost, availability, speed)
-  Weight

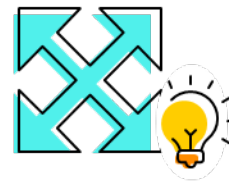
Focused and Committed to Easing Transition



Reliable Solutions



Flexible Solutions



Scalable Solutions

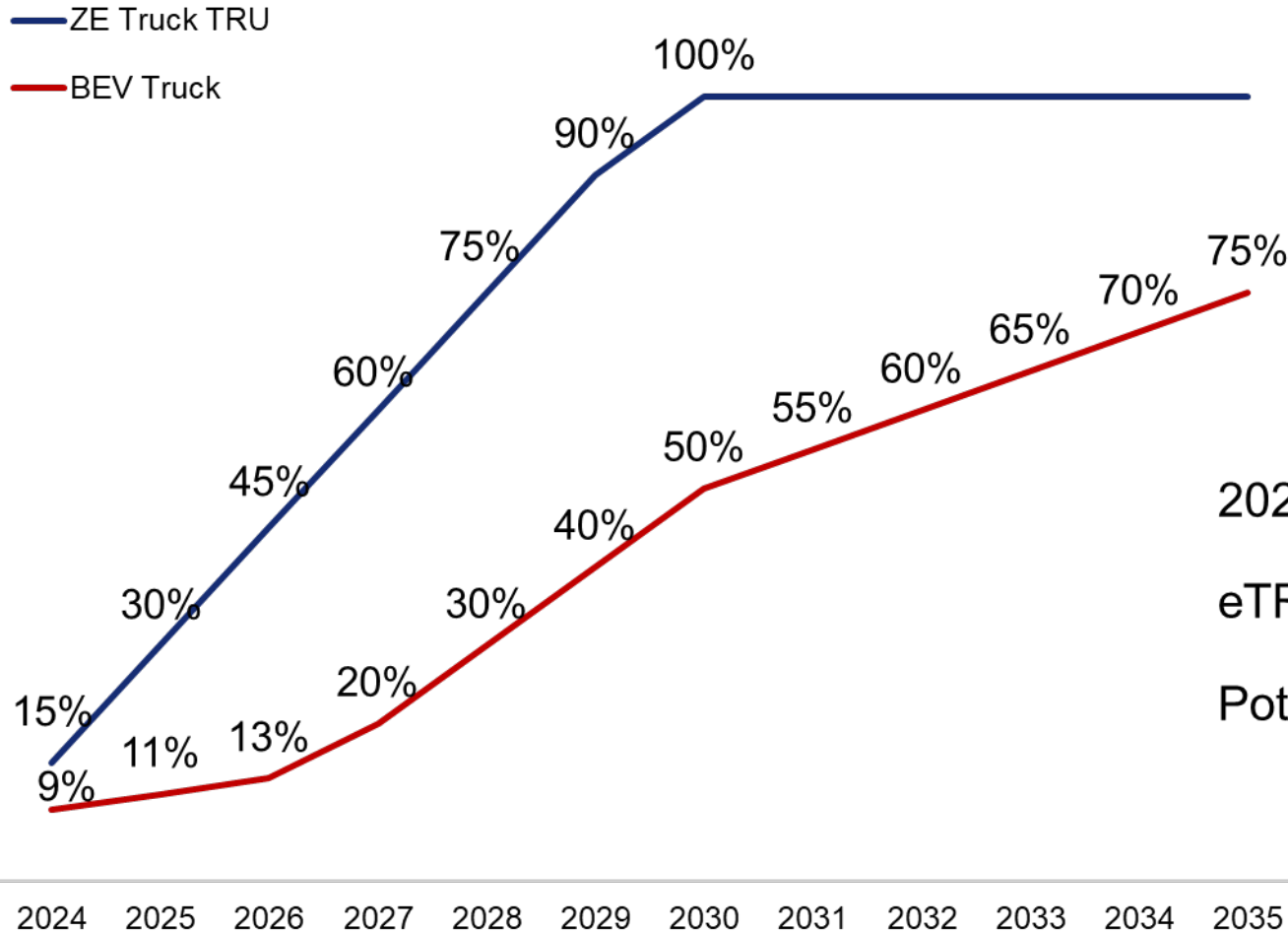


Compelling Total Cost of Ownership

Equal Performance
with Increased Reliability

Refrigerated Meeting

Truck Segment – CARB rules



California fleets required to operate % of ZE eTRUs



Truck OEMs required to sell % of class 4-8 BEVs

2024: OEMs may no longer sell diesel truck TRUs

eTRUs likely installed on ICE trucks

Potential infrastructure standardization issue



Regulation ... When is it coming?

CARB Part 2 regulation – Zero Emission

- Draft regulation Q4 2022
- Community engagement events / workgroups
- Industry stakeholder workshops
- Present to the board in 2025

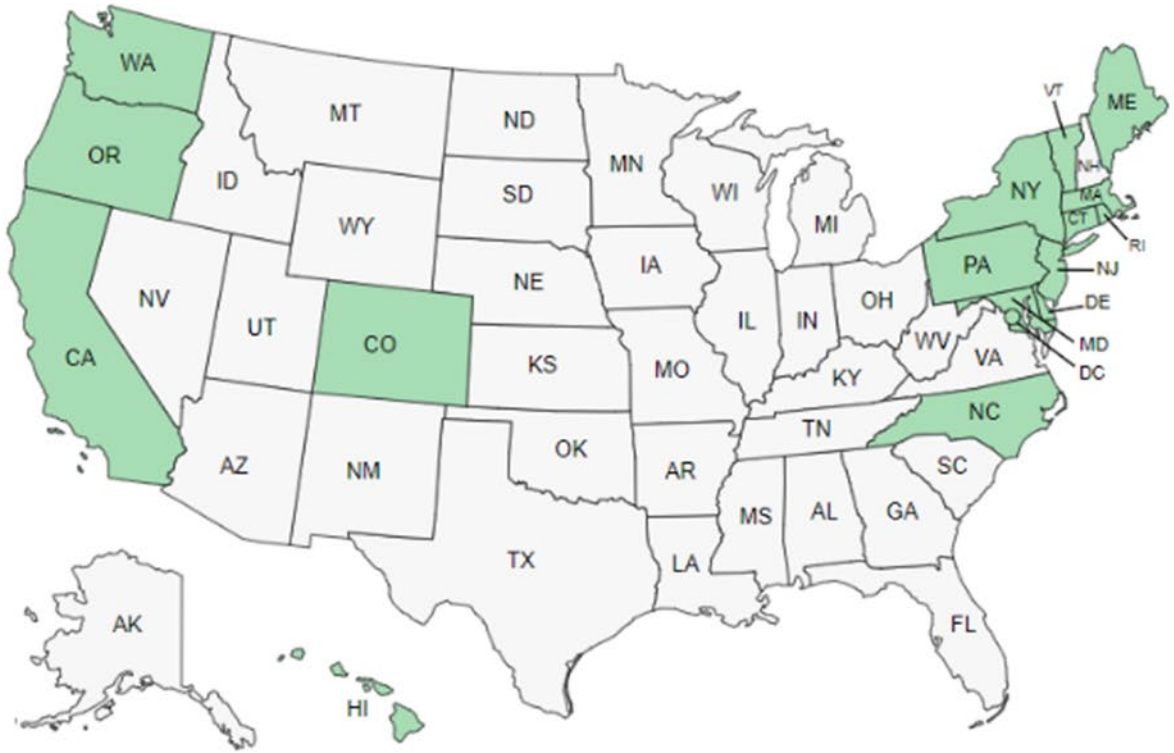
Source: [Transport Refrigeration Unit | California Air Resources Board](#)



THERMO KING



Multi-State ZE Agreement



15 states support rapid expansion of ZE trucks

2030 goal of 30% ZE truck sales

Represents 40% of US trucks sales



Fuel Cell or Battery?

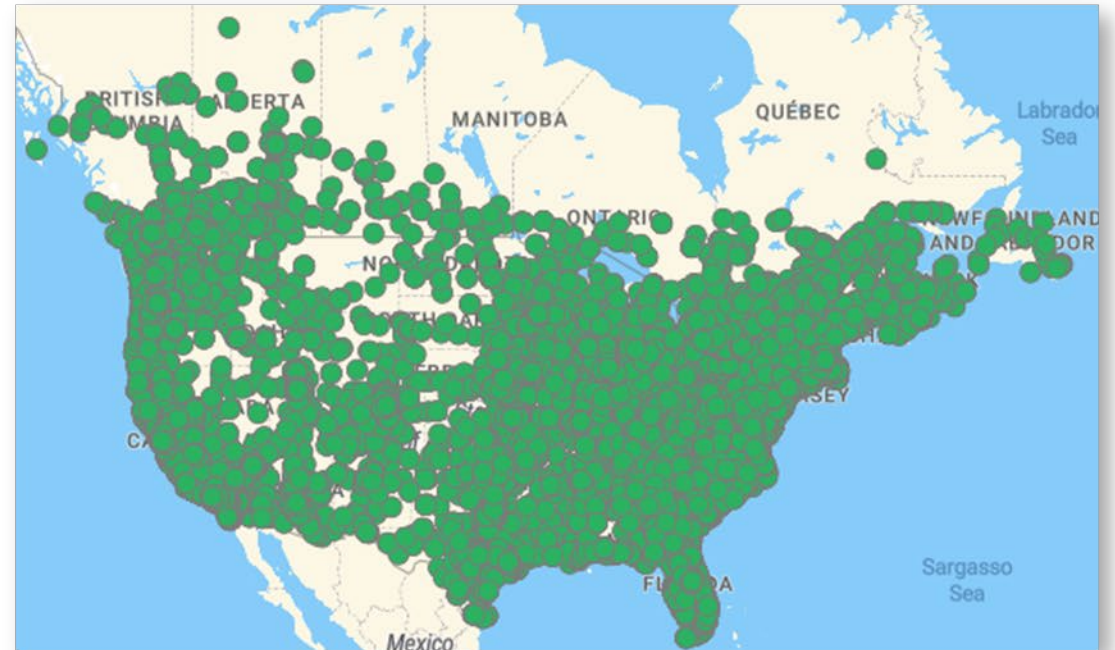
Public Hydrogen Fueling Stations



43 locations

+4 since 2018

Level 2 or Fast DC Charging Stations



53,296 locations

+36,096 since 2018



Infrastructure

- Today, shore power (e.g. 480V 30A) is available to eliminate the need for engine operation at the dock, many public utilities willing to subsidize infrastructure
- Tomorrow, CSS1 DC fast charging likely to be the standard for charging batteries, new facilities should consider utility transformer, metering, wire provisioning, and charging locations
- Utilities will need to participate in the scope and sizing of charging power requirements
- Being vocal around reefer charging considerations important with DCs / Public charging facilities

CHARGING EQUIPMENT & RATE – 100 KWH BATTERY EXAMPLE

	Level 2 EVSE	Level 2 EVSE	DC Charger	DC Fast Charger	MCS-Mega DC
Power Specs	240V 1Ø/32A	240V 1Ø/80A	240V or 480V 3Ø	480V, 3Ø	Medium Voltage
Equipment Cost	\$600	\$2,200	\$10,000	\$150k-250k ++	Millions \$\$\$\$ ++
Grid Interface	Plug in NEMA 14-50	Hard Wired	Hard Wired	Planned Infrastructure	Utility Grid capability
Total Power Availability	7.6kW	19.2kW	22.5kW – 24kW	175kW-350kW	4.5MW
Time to charge 100kWh battery pack	12 hours/OBC required*	5 hours/OBC required*	4 Hours—no OBC*	20-45min*	Minutes if battery compatible

*Approx charge time, assume charge from 0% to 90% SOC, OBC = On Board Charger

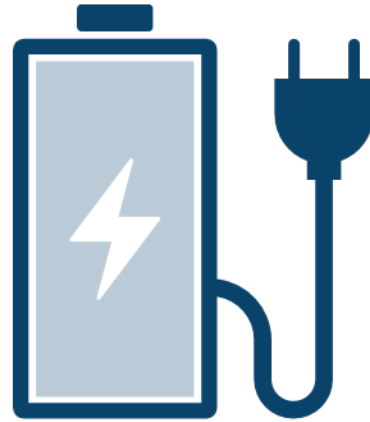
++May require significant installation cost, wiring, transformers etc.



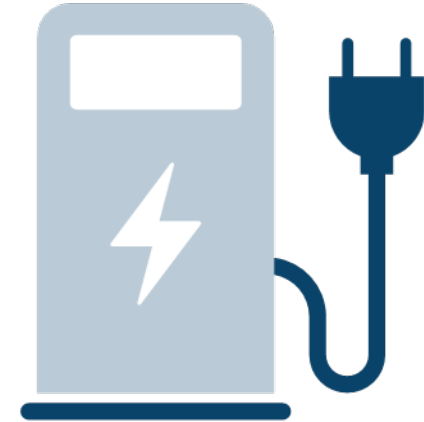
Power Wherever Fleets Go



REGENERATIVE
ENERGY



STORED
BATTERY
POWER



GRID
POWER



Customer Evaluations



FIGURES ARE AN AVERAGE PER ROUTE*



773g
NO_x reduced



7gal
diesel saved



27g
particulate
matter reduction



156lbs
CO₂ reduced



8hrs
electric run
operation

- 18 routes
- 83% utilization of electric operation
- 6-8hrs of run time



Efficiency is Key

Equipment Efficiency



Energy Efficiency



Application Efficiency



Questions & Feedback

