Heavy-Duty Zero Emission Vehicles Webinar Part 3

Clean Fuels and Energy Team |3.27.2025

Dallas-Fort Worth CLEAN CITIES

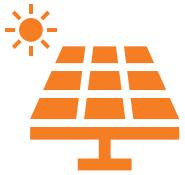
Image Source: https://www.gettyimages.com/

Clean Fuels and Energy Team

Hosted within the North Central Texas Council of Governments (NCTCOG) Transportation Department

Clean Vehicle Initiatives

Alternative Fuel Infrastructure Initiatives



Energy Integration & Community Readiness

Funding Support

Technical Assistance

Planning the Future

Raising Awareness

Agenda

15 Minutes

NCTCOG

- Battery Electric Vehicle (BEV) and Hydrogen Vehicle 101
- Investments in Zero-Emission Vehicles (ZEV)
- Funding Opportunities
- Key Resources

15 Minutes

Speakers

Global Environmental Products

- M4 Plug-in Hybrid
- M4 HFC
- Air/Mechanical EV Sweeper

15 Minutes

Oshkosh Corp

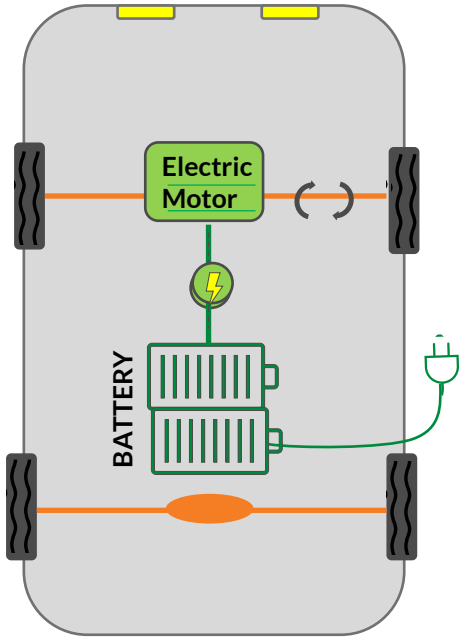
- Volterra ZSL Electric
- Pierce Volterra Hybrid Electric
- Fire Truck; Striker Volterra

15 Minutes

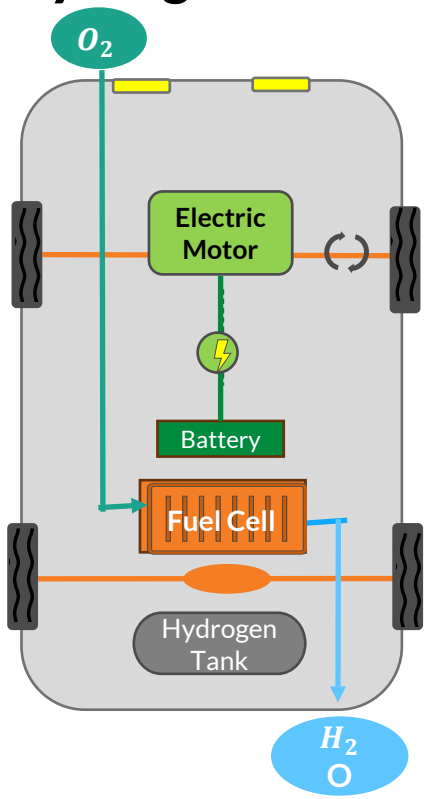
Open Discussion

Battery-Electric vs Hydrogen Vehicles

Battery- Electric Vehicle

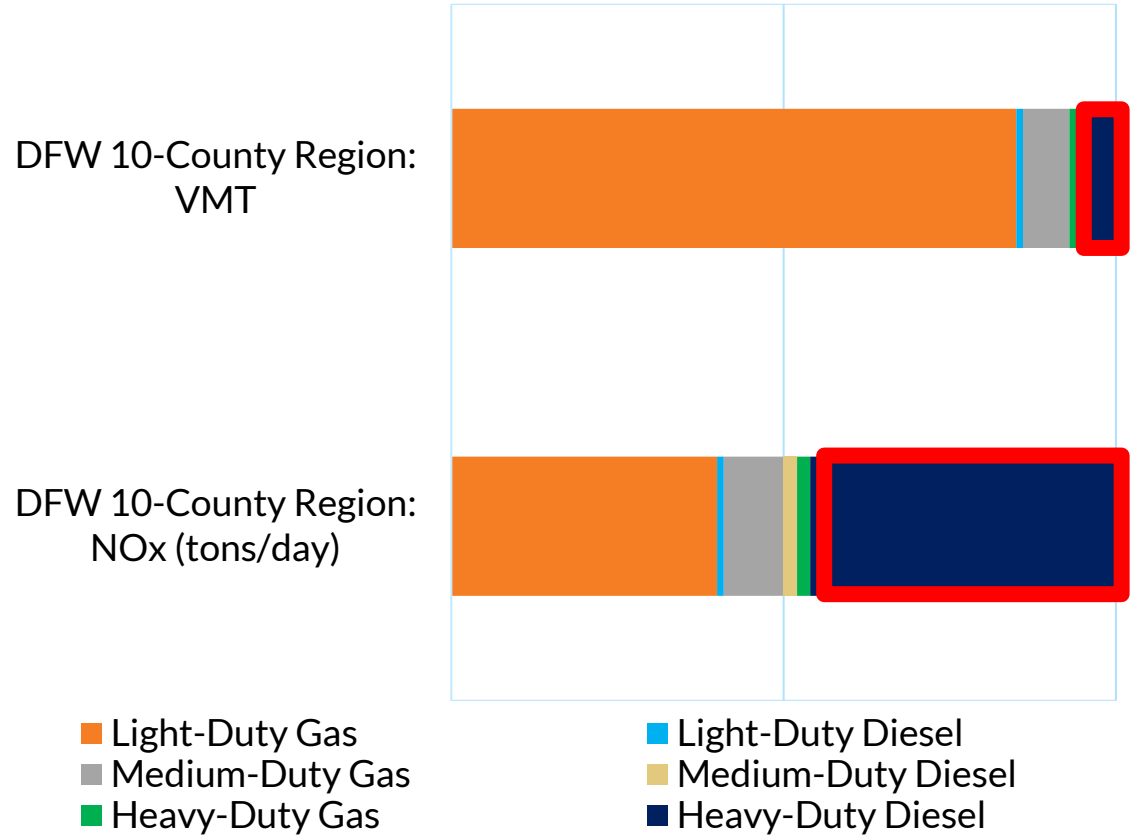


Hydrogen Vehicle



Current Ozone design value of 78 ppb continues to exceed the EPA standard

Vehicle Miles Traveled Versus Nitrogen Oxides Contribution by On-Road Vehicle Type in Dallas-Fort Worth



Ideal Duty Cycles for Heavy-Duty (HD)Vehicles*

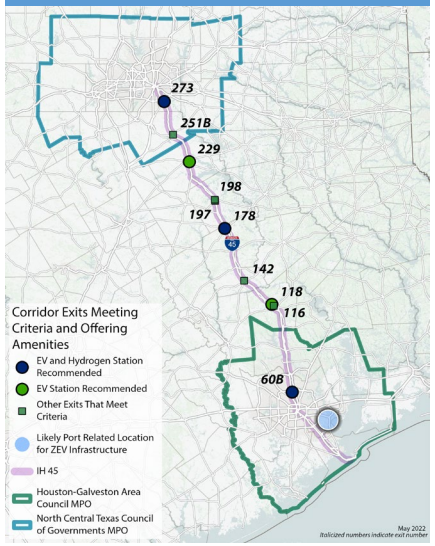
	Hydrogen Fuel Cell	Battery Electric
Ideal Range (miles)	≤ 650	≤ 250
Ideal Freight Payload (lbs)	≤ 48,000	≤ 43,000

*Source: North American Council for Freight Efficiency
NACFE | Hydrogen Trucks: Long-Haul's Future?

Developing ZEV Infrastructure

H2LA Plan
(Hydrogen)

IH-45 ZEV Plan
(BEV and Hydrogen)



Texas Department of Transportation's Rider 48 Report
(BEV Only)

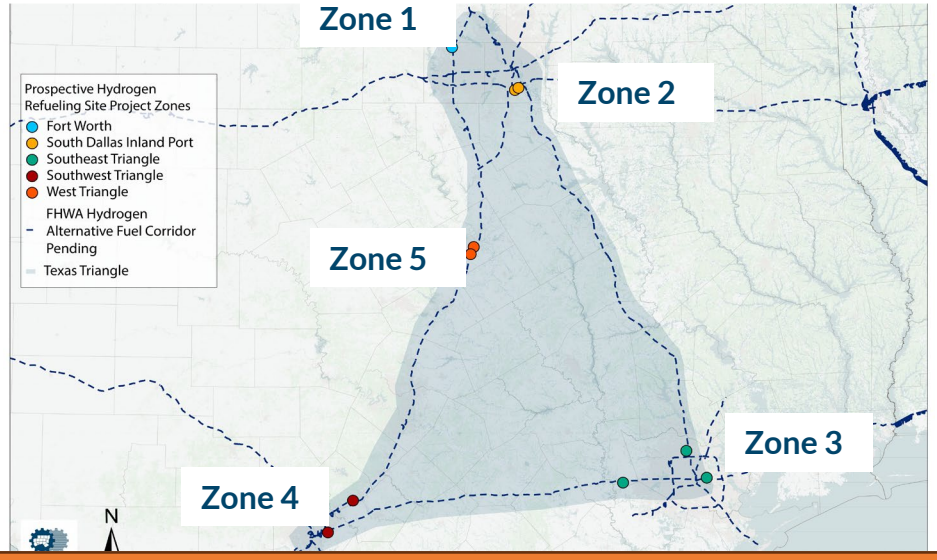
[Evaluation of Medium- Duty and Heavy-Duty Vehicle Charging Infrastructure and Capacity]

Texas Policy Development Opportunities

[Texas Hydrogen Alliance]

Texas Hydrogen Production Policy Council (TxH2 Council)

Texas Hydrogen and Electric Freight Infrastructure Project(Tx-HEFTI):$70M for 5 hydrogen stations



Other Investments:

FHWA Reducing Truck Emissions at Port Facilities Program: $150M to Port of Houston; Includes hydrogen fuel cell vehicles/mobile infrastructure

Gulf Coast Hydrogen Hub: $1.2B to GTI Energy for Clean Hydrogen Hub

Gage Zero and Hillwood Builds EV Fleet Charging Hub at [AllianceTexas]

Texas Electric Vehicle Charging Plan: Up to $60 million for DFW Region; Can include Medium and HD Depot EV Charging

EPA Clean Ports: $105M Project to Port of Corpus Christi; Includes EV Charging

Heavy-Duty All-Electric Vehicles

Available HD Hydrogen Vehicles

Street Sweeper –

Global Environmental Products: M4HSD

Tractor –

ZM Trucks: ZM8 FC
Nikola: Tre FCEV
Peterbilt: 579HFC
Accelera by Cummins

Transit-

ENC: AXESS EVO-FC
New Flyer: Xcelsior Charge FC

Step Van-

Unique Electric Solutions

Available Battery-Electric HD Vehicles

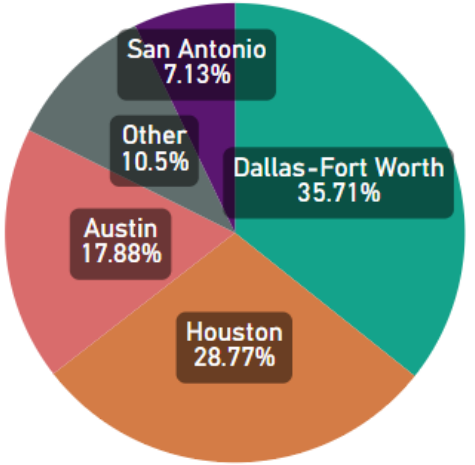
15 Original Equipment Manufacturers (OEM) Offering HD BEVs:

BYD	Freightliner
HINO Trucks	International Southwest Trucks
Kenworth	Lion
Mack Trucks	Motiv
Peterbilt	Unique Electric Solutions
Workhorse	XL Fleet & Curbtender, Inc.
XOS	Zeus Electric Chassis
ZM Trucks	

All-Electric Medium and HD Electric Vehicles in Texas

Class 2B–6 EV: 18,187
Class 7-8 EV: 148

18,335 EVs
EV's in Texas as of March 18, 2025



Electric School Buses:
Bluff Dale ISD, Carrollton-Farmers Branch ISD, Cedar Hill ISD, Dallas ISD, Fort Worth ISD, Plano ISD, Princeton ISD

Electric Fire Truck: City of Denton, DFWIA

Electric Semi: Truck Kings LLC

Electric Refuse Trucks: City of Plano, City of Dallas

No hydrogen vehicles are operating in Texas, but the first hydrogen vehicles have been funded through state funding

Data Source: EVs in Texas | DFWCC

For information on available EVs and resources to help deployment visit: **www.afdc.energy.gov**

Other Ways to Improve Air Quality

Request ZEV in Contract Specifications for Fleets

Examples:
NCTCOG Clean Construction

NCTCOG Waste to Fuel Study

City of Fort Worth Request for Proposals for Natural Gas Refuse Haulers

ZEV in Contract Specifications included in NCTCOG Clean Fleet Policy

Use Renewable or Lower-Emitting Electricity or Clean Hydrogen

Renewable or Lower-Emitting Electricity
In 2024, 40% of the net electricity generation was from a zero-emission source*

100% renewable or zero-emission electricity can be purchased

Clean Hydrogen Standard
- Defined by Hydrogen and Fuel Cell Technologies Office
- Determines eligibility for Clean Hydrogen Production Tax Credit, which provides up to $3/kg to producers of clean hydrogen
- *Note: Producers cannot receive credit if hydrogen produces more than 4kg of CO_{2e}/kg of hydrogen*

Hydrogen Shot
- Goal to reduce cost of clean hydrogen by 80% *($1 per 1kg in 1 decade)*

*Source: EIA: Electricity data browser - Net generation for all sectors

Use On-Site Power Generation and Other Resilience Strategies

Smart Charging Management

Energy Storage Systems (batteries or hydrogen fuel cell)

Generators

Mobile Charging

Bidirectional Charging (i.e. Vehicle to Grid)

Microgrids

Read More:
Planning for Resilient EV Charging Infrastructure
Developed by NCTCOG through funding from the Texas State Energy Conservation Office (SECO)

North Texas Zero-Emission Vehicle Project (NTx-ZEV)

	Vehicle & Infrastructure ~$58 million	ZEV Workforce Development ~$1.2M
Eligible Projects	Any battery-electric or hydrogen fuel cell Class 6 or 7 vocational vehicle and infrastructure replacing a non-zero emission (gasoline, diesel, propane, natural gas) Class 6 or 7 vehicle Public and private entities eligible*	Fund workforce development projects, such as: - First responder training - Mechanic training for vehicles/infrastructure - Driver training
Project Selection	Call for Projects – Expected to open Spring 2025 Priority given to operations in 10 county nonattainment area**; but all 16 counties are eligible	Strategic Selection or Other Selection Process
Funding Level	Maximum federal share allowed by EPA 33% to 65% per battery-electric vehicle 60% to 80% per hydrogen fuel cell vehicle	Workforce costs not subject to maximum federal share

NTX-ZEV provides new opportunities for the region, including:

- Increased funding levels for hydrogen fuel cell vehicles and electric vehicles
- Replacement of non-diesel (gasoline, compressed natural gas, propane) vehicles
- Flexible scrappage alternatives
- Funding for infrastructure, renewable power generation systems, and workforce activities

*Must adopt Clean Fleet Policy
**Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise

Go to www.nctcog.org/NTxZEV for more information

Funding for Heavy-Duty ZEV

Looking for?	Programs
Heavy-Duty Diesel On-Road Vehicle Replacement with Lower-Emitting Versions	North Texas Diesel Emissions Reduction Project – Open through June 13, 2025 Rebate Grants - Expected to open Summer 2026
Replace Off-Road Diesel Equipment/Drayage with Lower-Emitting Versions	Seaport and Rail Yard Areas Emissions Reduction Program - Expected to open Spring 2027 Emissions Reduction Incentive Grants (ERIG) – Expected Spring 2027 North Texas Diesel Emissions Reduction Project – Open through June 13, 2025
Light-Duty Gasoline or Diesel Vehicle Replacement with Alternative Fuel, Electric, or Hybrid Vehicles	Governmental Alternative Fuel Fleet Grant Program – Expected to open Spring 2027 Texas Clean Fleet Program (TCFP) - Expected to open Spring 2027
Replacement of Heavy-Duty EV or Hydrogen Only	Texas Hydrogen Infrastructure, Vehicles, and Equipment (THIVE) – Expected to open Fall 2025 Texas Volkswagen Environmental Mitigation Program – All-Electric Grant Round– Open through August 31, 2025
Alternative Fuel Infrastructure or EV Charging	Alternative Fueling Facilities Program (AFFP) – Expected to Open in 2026 Sometimes included in other grant programs for vehicles
Replacement of Diesel School Buses with Lower-Emitting Versions	Texas Clean School Bus Program (TCSB) - Expected to open Spring 2026
Light-Duty or Heavy-Duty Alternative Fuel or Electric Vehicle Expansion (i.e. no scrappage requirements)	Governmental Alternative Fuel Fleet Grant Program – Expected to open Spring 2027 Commercial Clean Vehicle Tax Credit – Open Now Rebate Grants - Expected to open Summer 2026

Find more funding at: www.nctcog.org/aqfunding

Upcoming Involvement Opportunities

Contact us at cleancities@nctcog.org for any questions on fleet electrification, funding opportunities, or other inquiries

Upcoming webinars and events posted regularly at dfwcleancities.org/events

- March 25-27 : Heavy-Duty Zero-Emission Vehicle Webinar Series

Complete the **DFWCC Annual Survey** NOW, to report your fleets efforts to improve air quality help measure regional efforts to reduce emissions at www.dfwcleancities.org/annualreport

Sign up for DFWCC weekly email list and follow DFWCC LinkedIn at:dfwcleancities.org/getinvolved

GLOBAL ENVIRONMENTAL PRODUCTS
ISO9001:2008
5405 Industrial Parkway
San Bernardino, CA 92407 USA
Phone: 909-713-1600
info@globalsweeper.com

GREEN SWEEPING – DALLAS /FORT WORTH CLEAN CITIES COALITION

Clean Fuel,
Clean Streets
Clean Air

We build Purpose Built, Heavy Duty, and simply Tough Street Sweepers.

- *Reliable, Affordable and Innovative Products*
- *Protect our Environment and Reduce our Carbon Footprint*

OUR SPECIALTY…

PURPOSE BUILT CHASSIS PROVIDES FLEXIBILITY TO LEAD INDUSTRY:

ALTERNATIVE FUEL/GREEN TECHNOLOGIES

- GLOBAL M3 AND M4 CNG MECHANICAL SWEEPERS
- GLOBAL M4 HYDROGEN FUEL CELL
- GLOBAL M4 PLUG-IN HYBRID
- GLOBAL MECHANICAL AND REGENERATIVE AIR EV SWEEPERS

EXTENDED RANGE PLUG-IN HYBRID SWEEPER

EXTENDED RANGE PLUG-IN HYBRID SWEEPER

- FULLY ELECTRIC OPERATION WITH 100 KW/HR BATTERY
- 300 KW AXIAL FLUX DIESEL GENERATOR RECHARGES BATTERY WHEN DEPLETED
- NACS AND CCS PLUG-IN CHARGING
- QUIETER OPERATION
- REDUCED EMISSIONS

Advanced Technology Powertrain System

Extended Range Plug-in Electric Vehicle.

- 400V architecture, 240kW traction motor with Silicon Carbide inverter
- 300kW on-board Axial Flux generator
- 60kW hydraulic pump Axial Flux motor for sweeper functions, fully electric functions optional
- 100 kWh Lithium Battery Pack
- 400A 12V DC-DC converter
- Up to 22 kW L2 charging with North American Charging Standard (NACS) and J1772 adapter
- Up to 250 kW DC Fast charging with NACS and CCS1 adapter, CCS2 optional
- Advanced thermal management for cabin and battery pack
- Dedicated active cooling system for power electronics, generator and traction motor
- Touch screen and driver information system
- Electronic Parking Brake system
- Remote diagnostics, over the air software updates

1st Heavy-Duty Hydrogen Fuel-Cell Powered Street Sweeper in USA!

Protecting our Future with Zero Emissions!

- 33,000 GVWR = 65 MPH TRAVEL SPEED
- Rear Dump and Side Dump Hopper Available.
- Extremely quiet operation.
- Always ZERO EMISSIONS!
- Electric Motor Drives the Sweeper.
- Heavy-Duty Sweeping System Sweeps up to 3-Tons of sand per minute.

GLOBAL ENVIRONMENTAL PRODUCTS

- Hydrogen powered engine provides energy to the batteries. – Toyota (Mirai)/ Hyundai

  Can deliver 80-120 Kw/hrs of energy to the batteries for minimal engine operation. Battery capacity – 100 Kw/hrs

  Carrying 15-20 Kilos Hydrogen

- The by-product of electro-chemical reaction is energy and H2O.

At a glance

California Department of Transportation utilizes 170-plus street sweepers daily. Each M4 ZE produces 43 gallons of water per shift so that equals 7,310 gallons of water produced by operating street sweepers.

REGISTERED WITH FEDERAL EPA AND AIR RESEARCH BOARD (ARB)

The Global M4ZE Street Sweeper is North America's first Hydrogen Fuel Cell Street Sweeper whose only by-product is pure H2O!

The water produced through this chemical reaction is diverted to the sweeper's water tank system, providing an additional 43 gallons of water per shift to use for dust suppression.

GLOBAL CLASS 7
EV SWEEPERS

GLOBAL
ENVIRONMENTAL PRODUCTS


M4EV
100% PLUG-IN
M4
ELECTRIC
ALL ELECTRIC DRIVE


100% PLUG-IN
M4
ELECTRIC
ALL ELECTRIC DRIVE


M4
ELECTRIC

4EV - Advanced Electric Powertrain System

100% Electric Plug-In Zero Emission Electric Street Sweeper.

- 400V architecture, 240kW traction motor with integrated inverter
- 60kW hydraulic pump motor for sweeper functions, fully electric functions optional
- 240kWh Lithium Battery Pack
- 400A 12V DC-DC converter
- L2 charging with North American Charging Standard (NACS) and J1772 adapter
- L3 DC Fast Charging with NACS, CCS1 or CCS2
- Advanced thermal management for cabin and battery pack
- Dedicated active cooling system for power electronics, hydraulic and traction motor
- Touch screen and driver information system
- Electronic Parking Brake system
- Remote diagnostics, over the air software updates

New Advanced Powertrain Advantages

Efficient Sweeping operation:

- Sweeper powertrain and functions are optimized for maximum efficiency

One-Pedal Driving

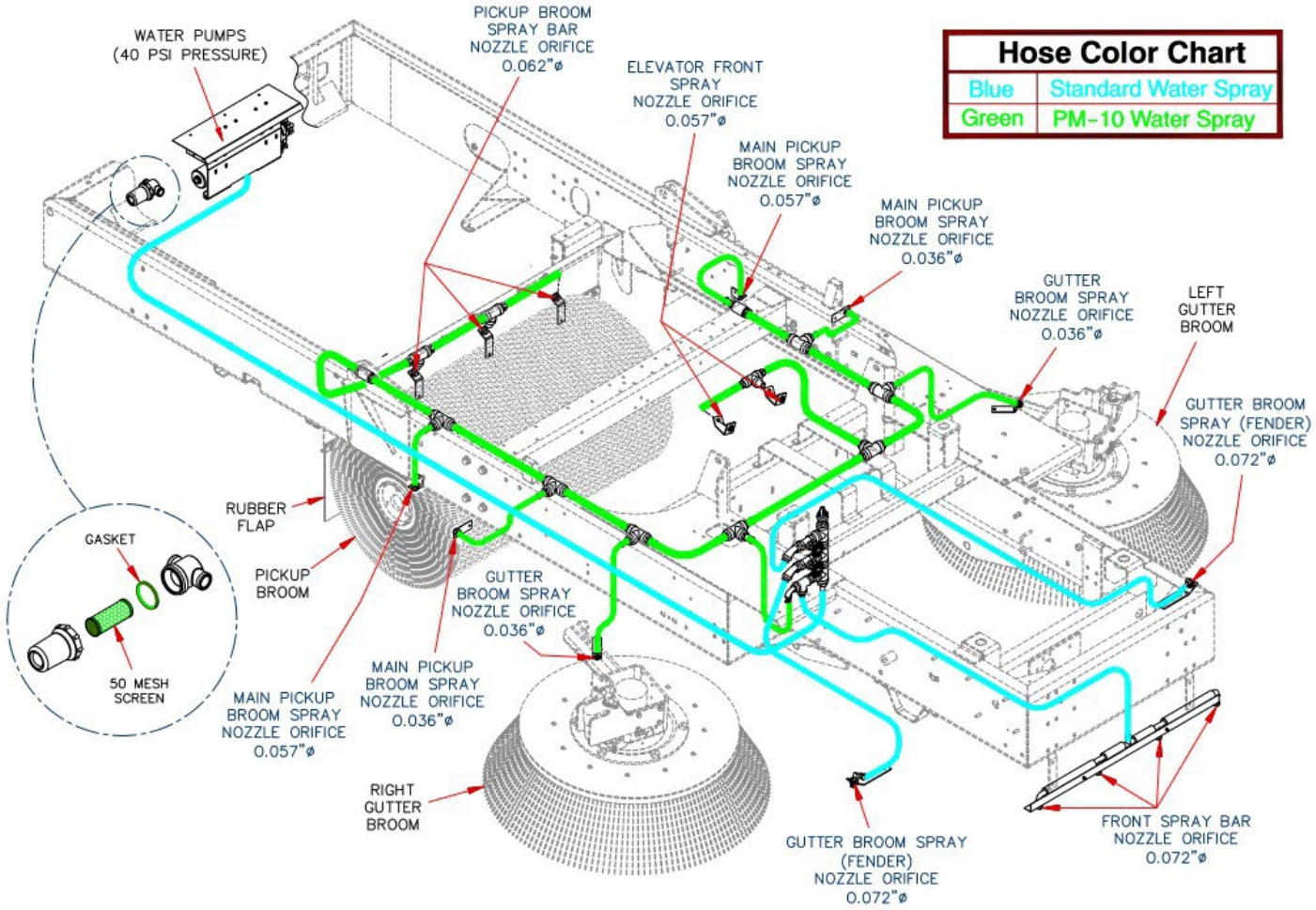
- Advanced algorithm - full regen driving allowing to recuperate energy and reuse it
- Easier and comfortable operation with less brake pads and discs wear
- Lower maintenance cost
- Energy savings

Up to 22kW AC and up to 250kW DC charging

- Any charging inlet available (NACS, CCS1, CCS2, J1772) on request
- Matching AC wall mounted chargers and DC chargers available for any input voltages.

DUST CONTROL SYSTEM:

POLY WATER TANK CAPACITY: 250 GALLONS



GLOBAL ENVIRONMENTAL PRODUCTS

ISO9001:2008

THANK YOU!

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GLOBAL SWEEPER 55

OSHKOSH™

Oshkosh Corporation EV Products

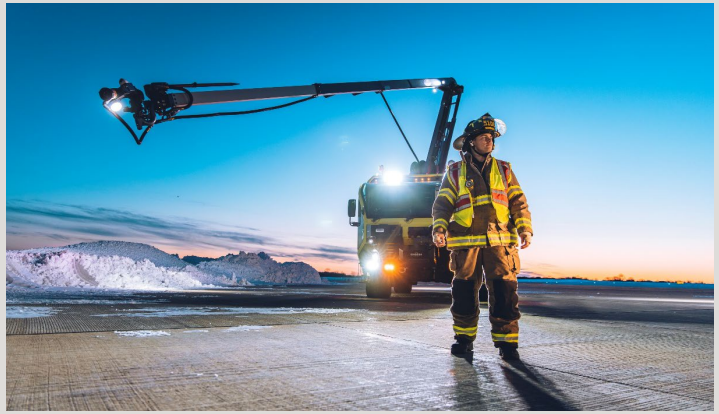
MOVING THE WORLD FORWARD

An industrial technology company

- We design and develop purpose-built vehicles, equipment and services.
- We create and enable technology for people doing tough work in challenging environments.
- Our innovations deliver safe, intuitive and productive solutions.

OUR PURPOSE

Making a difference in people's lives








THREE BUSINESS SEGMENTS

ACCESS | DEFENSE | VOCATIONAL

Serving a diversified range of end markets

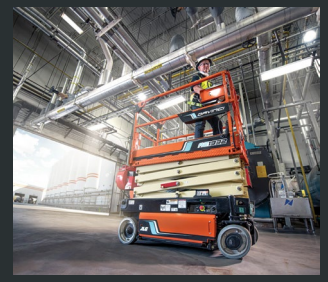
COMMUNICATIONS

CONSTRUCTION

FIELD SERVICE

AIRPORT GROUND SUPPORT

TOWING AND RECOVERY



FACILITIES MAINTENANCE

AIRCRAFT RESCUE AND FIREFIGHTING

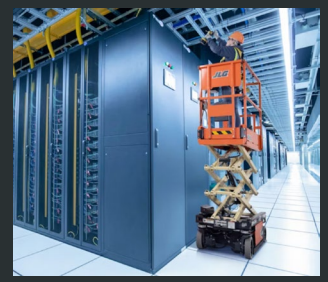
REFUSE AND RECYCLING

FIRE AND EMERGENCY

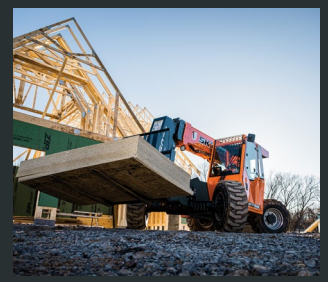
DEFENSE

CONCRETE

AGRICULTURE



DATA CENTERS



MATERIAL HANDLING

OSHKOSH

Innovate. Serve. Advance.

We innovate customer solutions by combining leading technology and operational strength to empower and protect the everyday hero.

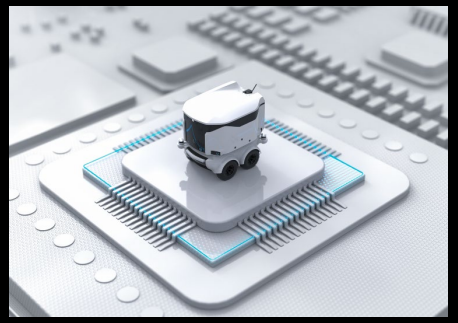
- Electrification.
- Autonomy and Active Safety.
- Intelligent, Connected Products.
- Advanced Analytics.
- Digital Manufacturing.

Innovation focus areas

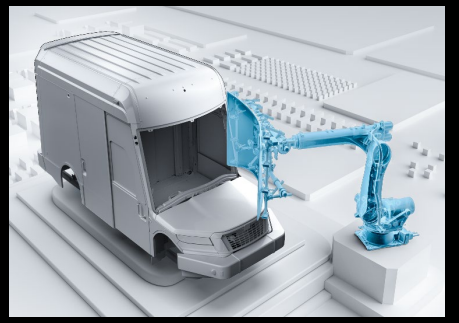
We innovate customer solutions by combining leading technology and operational strength to empower and protect the everyday hero.

ELECTRIFICATION

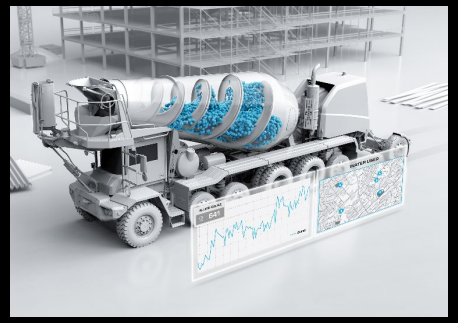
AUTONOMY AND ACTIVE SAFETY



INTELLIGENT, CONNECTED PRODUCTS



DIGITAL MANUFACTURING



ADVANCED ANALYTICS

Electrified products are a critical element of our vision for a more sustainable future. We have over two decades of experience designing electric vehicles that reduce emissions, lower total cost of ownership and increase performance.

PIERCE® AND OSHKOSH® AIRPORT PRODUCTS
Volterra™ electric vehicles

OSHKOSH® DEFENSE
NGDV - Next Generation Delivery Vehicle

MCNEILUS®
Electric refuse collection vehicle

JLG®
DaVinci® all-electric scissor lift

OSHKOSH® S-SERIES™
Electric front discharge concrete mixer

OSHKOSH™

Technology In Focus: Volterra Fire Truck

Vocational segment

Market leading manufacturer of purpose-built vocational vehicles and equipment including fire and emergency, refuse and recycling collection, field service and support, concrete placement and airport ground support equipment.

FRONTLINE COMMUNICATIONS

IMT

MAXIMETAL

McNeilus

OSHKOSH AEROTECH

OSHKOSH AIRPORT PRODUCTS

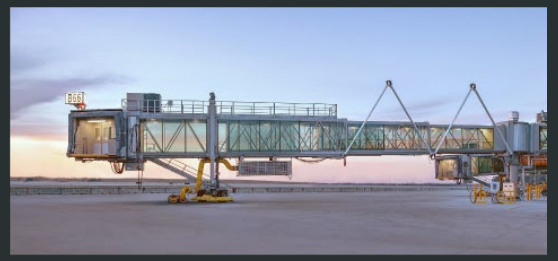
OSHKOSH S-Series

Pierce

Broadcast and communications
Field service
Airport ground support

Airport fire and rescue
Refuse and recycling

Fire and emergency
Concrete



OSHKOSH

Pierce Volterra

- Charging

- How does a Fire Department Set Up?

OSHKOSH

Pierce Volterra

- Service & Maintenance

Thank you.

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