



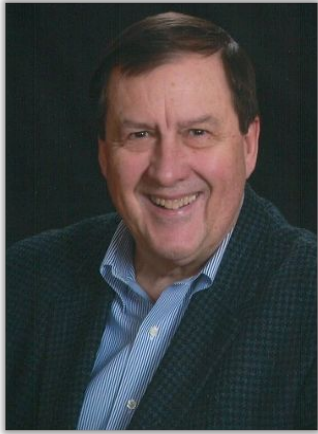
## Powering Fleets with Medium-Duty EV Trucks

Get AMPED Forum  
July 21st - 12:00-12:45 pm

# Agenda

- Introductions & Webinar Goals
- AMPED Campaign Overview
- Medium-Duty EV Trucks
  - The EV Truck Market & Real-world Product Availability
  - Financial Incentives
  - Developing EV charging infrastructure
  - Total cost of ownership
- Q&A
- Resources & Next Steps

# Presenters



**David Keefe**  
Greater Rochester Clean Cities



**Jonathan Norris**  
Lead Transportation and  
Energy Consultant, ICF



**Rudy Velez**  
Eastern Region Sales  
Manager, eMobility, Navistar

# Webinar Goals

- Learn about available products, technology, and availability
- Get familiar with EV charging infrastructure needs for a medium-duty EV truck fleet
- Understand the factors to consider when evaluating cost
- Learn about next steps and how to get started



Mitigating the impacts of climate change by reducing carbon pollution caused by fossil fuels through the promotion of beneficial electrification in the Genesee/Finger Lakes region.

# Funders



**Climate Solutions Accelerator**

of the Genesee-Finger Lakes Region



## Steering Committee Members

Causewave Community Partners  
Center for Community Health & Prevention  
Common Ground Health  
Dutton Properties  
EMCOR Betlem  
Empire State Development  
Genesee/Finger Lakes Regional Planning Council  
Genesee Transportation Council  
Greater Rochester Chamber of Commerce

Monroe County  
PathStone Corporation  
Piekunka Systems Inc.  
Rochester Gas and Electric Corporation  
Rochester Institute of Technology  
Rochester Housing Authority  
Rochester Regional Health  
Regional Transit Service  
SWBR  
Turner Engineering  
University of Rochester



# NEXT EMOBILITY UPDATE

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PRESENTED BY: RUDY VELEZ  
FOR AMPED

JULY 21, 2022



# NEXT







# WHAT IS NEXT?

NEXT is an eMobility solutions group designed to help commercial truck and bus customers implement electric vehicles via its unique consultative approach that goes beyond the vehicle



# NAVISTAR PRODUCT ROADMAP

	VEHICLE		ENGINEERING UNITS	CUSTOMER UNITS
1	CE Electric School Bus		Complete, Continuous Improvement ongoing	Delivered
2	eMV Medium Duty pickup and delivery		Complete, Continuous Improvement ongoing	Delivered
3	Battery electric regional haul tractor		2022	2024
4	Fuel Cell electric regional haul tractor		2023	2025



# NAVISTAR PRODUCT ROADMAP



# NAVISTAR PRODUCT ROADMAP









# eMV Series

Dry van & Service body applications

## Vehicle Performance

Peak power: 335hp (250kW)

Continuous power: 215hp (160kW)

Feature	Availability
Axle Configuration	4x2
Vehicle Configuration	Dry Van, Service Body
Wheelbases / A.F. (Dry Van)	272" / 112" (26' box)
	254" / 106" (24' box)
	236" / 100" (22' box)
	217" / 100" (20' box)
Wheelbase (Service Body)	217"
12V Liftgate	Available
GVWR	25,999 and 33,000 lbs.
Interior	Diamond Trim, Flat Panel



## Battery Capacity

210kWh

135 miles\*

1-2 Hr. Charge

\*Range is tested with 28,000 GVW, includes use of heat and air conditioning





# Battery Electric Regional Haul Tractor

Production purpose-built Class 8 tractor under development

Feature	Availability
Cab	Day cab
Vehicle Type	Class 8 Tractor
GCWR	82,000 lbs.
Range	Standard, Extended
Axle Configurations	6x4, 4x2
Drivetrain	e-axle (s)
Charging	DC
Brakes	Air Disc Brakes
Collision Mitigation System	Standard



Demonstration Proof of Concept Unit





# Financial Incentives

David Keefe

# New York Truck Voucher Incentive Program: Voucher Funding to Accelerate Fleet Electrification in NY

- NYTVIP Background
- Program Updates
- Program Funding
- Locational and Scrappage Requirements
- Voucher Amounts
- Fleet Eligibility
- Voucher Process – Voucher Help Center
- Questions & Discussion

# New York Truck Voucher Incentive Program

- Vouchers reduce the upfront purchase cost and accelerate or eliminate the payback period associated with zero-emission vehicles
- Brings together vehicle manufacturers, dealers, and fleets to get cleaner trucks and buses on the road
- Scrappage option accelerates removal of the oldest, dirtiest diesel engines from New York State roads

**\$58.3M**  
**incentive pool**

For medium and heavy-duty trucks, transit buses, school buses, and repowers

# Program Updates

- **NYTVIP is now a 100% zero-emission truck and bus program**
  - As of April 1, 2022, all remaining funding for hybrid electric, CNG, and propane trucks or buses has been reallocated to battery electric vehicles (BEVs) and hydrogen fuel cell vehicles (FCEVs)
- **Fleets in select counties that purchase BEVs may choose not to scrap a vehicle**
  - Eligible to receive lower incentive amounts
- **Voucher redemption timelines extended from 12 to 18 months**
  - Extensions may be granted for up to a total of 24 months

# Program Funding

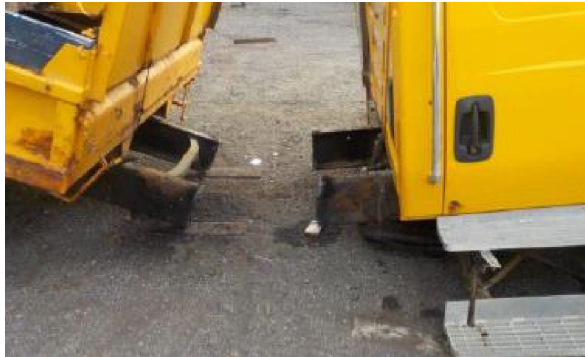
- **Funding available for Class 3-8 zero emission vehicles (FCEV and BEV) across categories**
  - On-Road Trucks
  - Transit Buses
  - School Buses
  - Non-Road Port Cargo Handling Equipment
  - ‘Other’ on-road medium- and heavy-duty vehicles
    - E.g., shuttle buses
  - BEV conversions (repowers) are eligible
    - Must be certified with an operational lifespan of 10 years

# Program Funding

Funding Source	Vehicle Types	Amount
CMAQ	Class 3-8 Battery Electric Vehicles	\$10M
Volkswagen Settlement	Class 4-7 Trucks	\$4.8M
	Class 8 Trucks	\$3.6M
	Class 4-8 Electric Transit Buses	\$33M
	Class 4-8 Electric School Buses	\$6M
	Non-road Cargo Handling Equipment (CHE)	\$0.9M
TOTAL		\$58.3M

# Vehicle Scrappage Requirements

- Goal: Reduce diesel exhaust emissions by replacing older, dirtier diesel vehicles with new electric vehicles
- Eligibility: Vehicles with 1992-2009 model year diesel engines
  - GVWR must be similar to new vehicle
  - Must meet annual usage requirements



*Note: scrappage must occur after Voucher Application is approved*



# What if we don't have any EMY 2009 or older diesels?

- Ownership flexibility for school buses and trucks
  - Registered in NY for 24 of the most recent 27 months
  - Registration and mileage requirements **may be met by previous owner**
- Class size flexibility for BEV truck purchases
  - Within Class size 4-7, the scrappage vehicle may be up to two class sizes different than the new vehicle

# Voucher Amounts

		Voucher Amounts and Caps						
Vehicle Type	Fuel Type	Incremental Cost %	Vehicle Weight Class (GVWR)					
			3	4	5	6	7	8
On-Road Trucks	BEV / FCEV	95%	\$ -	\$ 100,000	\$ 110,000	\$ 125,000	\$ 150,000	\$ 185,000
Transit Buses	BEV / FCEV	100%	\$ -	\$ 100,000	\$ 125,000	\$ 150,000	\$ 250,000	\$ 385,000
School Buses	BEV	100%	\$ -	\$ 100,000	\$ 120,000	\$ 150,000	\$ 200,000	\$ 220,000
Non-Road Port Cargo Handling Equipment	New BEV	90%	\$ 170,000 across all classes					
	Repower BEV		\$ 140,000 across all classes					
Other	New BEV	80%	\$ 60,000	\$ 90,000	\$ 100,000	\$ 110,000	\$ 120,000	\$ 150,000
	Repower BEV							

*Note: Voucher amounts listed in the table above are weight-specific limits, and voucher amounts listed and on the Eligible Vehicles List are estimates. The final voucher amount will be confirmed upon an individual project's approval.*

# Fleet Eligibility

- NYTVIP is available to any public, private, or non-profit fleets (except for Federal government fleets)
- No single fleet may claim more than 25% of funding from any category
  - Transit buses and non-road port cargo handling equipment (CHE) are exempt from this requirement
- Vehicles purchased through the Program must be operated for a minimum of five years and meet minimum annual usage requirements
- Fleet Usage Reports are required for 3 years following voucher payment
- Lease term must be at least 5 years
  - Leasing company is purchaser of record, responsible for ensuring compliance with all requirements (e.g., reporting)

# Fleet Eligibility

Vehicle Type	Annual In-Service and Term Requirements for New Vehicle	Annual In-Service and Term Requirements for Scrapped Vehicle
Truck	≥5,000 miles annually on average during the five-year in-service period	≥5,000 miles (or ≥1,000 hours in-service for off-road vehicles) annually over the two most recent years
Transit Bus	≥15,000 miles annually on average during the five-year in-service period	Must be part of active fleet for at least the previous 24 months. A transit bus that is part of a contingency fleet, or considered a spare bus, is not eligible.
School Bus	≥8,000 miles annually on average during the five year-in-service period	≥2,500 miles annually over at least one of the last two years
Non-Road Port Cargo Handling Equipment	≥700 hours annually on average during the five-year in-service period (located and operated exclusively at the approved port)	≥700 hours a year for at least one of the last two years at an eligible NYS port

# Involved Parties

## Manufacturers

Original Equipment Manufacturers (OEM), Upfit/Retrofit Manufacturers (URM), or engine/powertrain producers with vehicle(s) to be sold through the Program

- Submit *Vehicle Eligibility Application*

## Contractors

Dealers / vendors that market and sell approved vehicles through the Program and receive voucher payment from NYSERDA

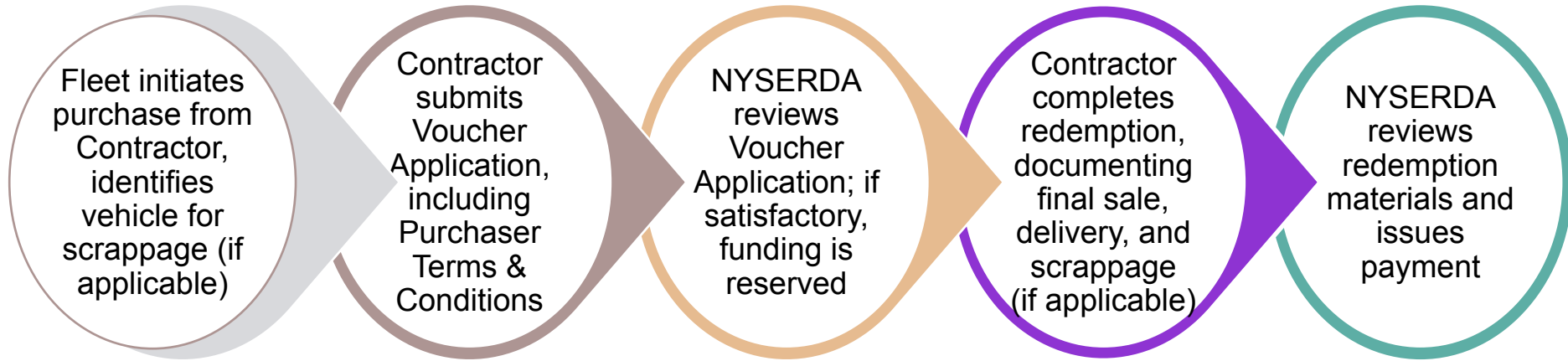
- Submit online *Contractor Application*
- Submit online *Voucher Application*
- Responsible for providing documentation to VHC to redeem voucher

## Vehicle Fleets

Commercial, non-profit, or non-federal government fleets that use point-of-sale discounts to purchase or lease new BEV or AFV

- Must scrap an eligible diesel vehicle
- Works with Contractor to supply all information for Voucher Application / redemption
- Responsible for compliance with Semi-Annual Fleet Usage reporting requirement

# Voucher Process at a Glance



# Voucher Help Center (VHC)

- Operated by the Center for Sustainable Energy (CSE)
  - Manages intake of Vehicle, Contractor, and Voucher Applications
  - Works with NYSERDA to approve/deny and process applications
  - Point of entry for general inquiries
- Contact the Voucher Help Center  
[NYTVIP@energycenter.org](mailto:NYTVIP@energycenter.org)  
866-595-7917

# Charging Infrastructure Support

- Electric utilities in NY are implementing a Medium- and Heavy-Duty Make Ready Pilot (MRP)
  - Provides \$15 million for make-ready infrastructure for MHDV fleets receiving vehicle incentives through NYTVIP
- NYTVIP team working with NYS utilities to coordinate processes and create a seamless experience for accessing vehicle + infrastructure incentives for MHD EVs
- Program overview and contacts:  
<https://jointutilitiesofny.org/ev/make-ready/mhd-pilot-program>



# EPA School Bus Funding Opportunities

- **EPA Clean School Bus Program**
  - Anticipated to open April 2022
  - \$5 billion over 5 years (FY22-26) for the replacement of existing school buses with low and zero-emission school buses
    - Available as competitive grants and rebates
    - Up to 100% of the cost of the replacement bus and charging / fueling infrastructure
  - Eligible recipients include: state or local governmental entities, eligible contractors, nonprofit school transportation associations, or tribal organizations
  - Learn more at <https://www.epa.gov/cleanschoolbus/prepare-clean-school-bus-funding>



# Powering Fleets with Medium-Duty EV Trucks

AMPED Webinar

Jonathan Norris  
Lead Transportation & Energy Consultant



July 2022

## Considerations and Best Practices for Developing EV Charging Infrastructure to Support Medium-Duty Electric Trucks

- Estimating Energy and Power Demand
- Right-sizing Charging Infrastructure
- Understanding Components of Power Delivery
- Futureproofing

## Total Cost of Ownership for Medium-Duty Electric Trucks versus Internal Combustion Engine Trucks

- Vehicle
  - Capital Costs
  - Operating Costs
- Infrastructure
  - Capital Costs
  - Operating Costs
- Funding and Financing

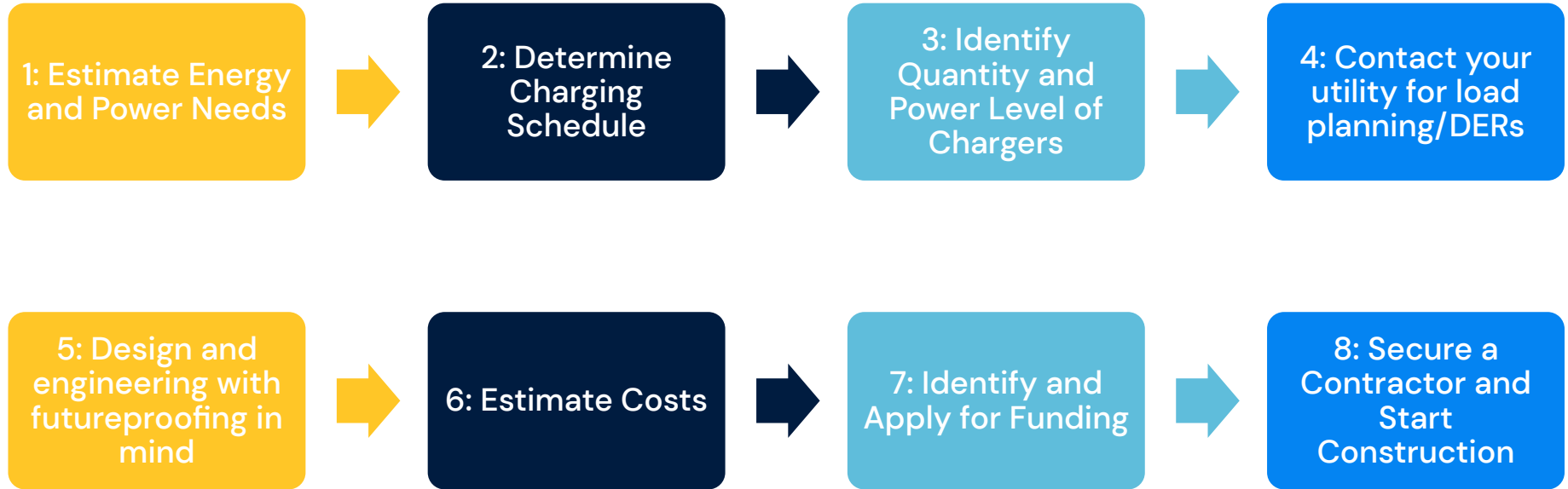
### → **Agenda**

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# → Charging Infrastructure

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## → Steps to Charging Infrastructure Development

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## Key Questions to Address

- Which vehicles will be electrified?
- How many vehicles of each type will be electrified?
- What is the average daily mileage of each vehicle to be electrified?
- What is the expected energy efficiency (fuel economy) of the electric vehicles?
- How much energy will the vehicles consume daily (in kilowatt-hours)?
- How long can the electric vehicles stay connected to a charger?

### Typical Specifications for MD E-Trucks

- 1 kWh/mile on average
- ~70-to 200-mile range; average 150 miles
- Includes: box trucks, bucket trucks, MD pickups, MD vocational trucks, & refuse trucks

## → Step 1: Estimate Energy and Power Needs

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## Key Questions to Address

- At **what times** will the vehicles be operating?
- Can the vehicles **charge overnight** when electricity is typically the least expensive?
- Do vehicles need to charge every day, or **can vehicle charging be staggered**?
- **Where** will vehicles be charged?

## Rochester Gas & Electric Time of Use Rate Schedule



→ **Step 2: Determine Charging Schedule(s)**

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## Key Questions to Address

- How many vehicles will be electrified now and in the future?
- What vehicle-to-charger ratio is achievable and appropriate (e.g., 1:1, 2:1, 3:1, etc.)?
- How powerful must the chargers be to recharge the vehicles to desired levels in the time allotted? (kWh / h = kW)

Plug-In



Wireless



Overhead



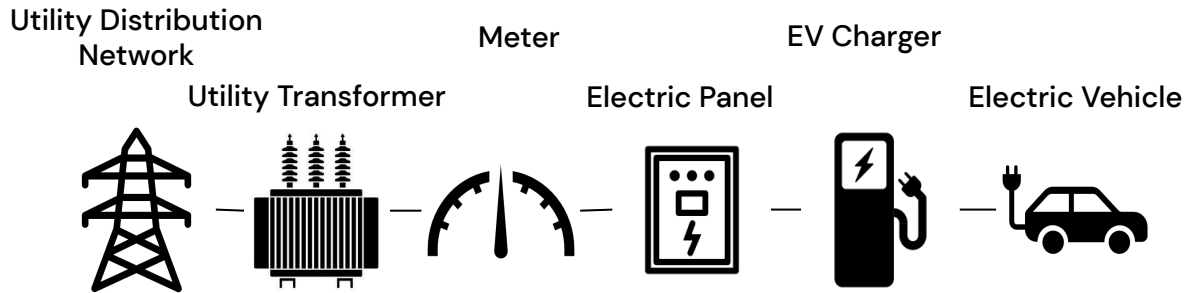
	AC	AC + DC	DC
LEVEL	Level 1 (120 V) Level 2 (240 V)	Level 2 Level 3	Level 3
SAE J1772	 <b>SAE J1772 AC</b> Charging rate: up to 20 kW Supply voltage: 120/240 V/208 V Supply amperage: up to 80 A	 <b>Combined Charging System [CCS Type 1]</b> Charging rate: up to 20 kW (AC) or 350 kW (DC) Supply voltage: 480V Supply amperage: up to 500A	 <b>Combined Charging System [CCS Type 1]</b> Charging rate: up to 350 kW (DC) Supply voltage: 480 V Supply amperage: up to 500 A
SAE J3068	 <b>SAE J3068 AC</b> Charging rate: up to 133 kW Supply voltage: 208-480V 3P Supply amperage: up to 160 A	 <b>SAE J3068 AC/DC<sub>s</sub></b> Charging rate: up to 133 kW (AC) or 200 kW (DC) Supply voltage: 208-480 V 3P Supply amperage: up to 160 A (AC) or 200 A (DC)	 <b>SAE J3068 DC<sub>s</sub></b> Charging rate: up to 200 kW (DC) Supply voltage: 480 V 3P Supply amperage: up to 200 A (DC)
CHAdeMO	N/A	N/A	 <b>CHAdeMO</b> Charging rate: up to 400 kW (DC) Supply voltage: 208-480 V 3P Supply amperage: up to 500 A
GB/T 20234	 <b>GB/T 20234 AC</b> Charging rate: up to 40 kW Supply voltage: 240 V/480 V Supply amperage: up to 63 A	N/A	 <b>GB/T 20234 DC</b> Charging rate: up to 238 kW Supply voltage: 480 V 3P Supply amperage: up to 300 A

→ Step 3: Identify Quantity and Power Level of Chargers



## Key Tasks

- Provide your utility with your **near- and long-term electrification plans**
- Provide your utility with **initial energy, power, and charging time estimates**
- Discuss any **plans to use** solar, storage, or other **distributed energy resources (DERs)**
- Determine if your utility offers any **incentives**, if your fleet qualifies, and how to participate
- Request your utility to determine their **distribution capacity** and **identify any needed upgrades** to distribution grid equipment or site-level electrical equipment
- Discuss your utility's **line extension policy** and obtain a quote for any equipment upgrades
- **Request a timeline** for your utility to provide service and for any equipment upgrades



## → Step 4: Contact Your Utility

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# Step 5: Design and Engineering with Futureproofing in Mind

## Futureproofing

- Plan for future/extra power capacity
- Plan for future EV parking spaces and EVSE
- Consider building EV-Ready parking spaces prior to future EVSE deployments
- Energy and fleet management systems
- Cybersecurity
- Charger and network interoperability

## Design Considerations

- Site layout
- Single line diagram
- Conduct load study to determine existing site-level electrical capacity and determine needed electrical upgrades (e.g., electric panel upgrades)
- Determine needed civil and other infrastructure upgrades (e.g., trenching and pouring new concrete)
- Incorporate any distributed energy resources and energy management systems
- Coordinate with the electric utility throughout the design and engineering process



## Capital Costs

- Charger hardware
- Charger software
- Direct charger installation
- Site-level make-ready infrastructure
- Distribution grid infrastructure upgrades
- Design and engineering
- Permitting and inspection

## Operating Costs

- Charger maintenance
- Data subscription
- Network subscription

## Potential Revenues

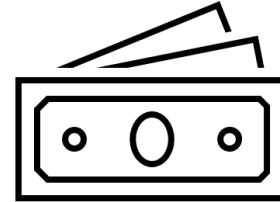
- Capital incentives
- **Proposed:** NY Clean Fuel Standard (In Committee)
- Any charging fees levied

# → Step 6: Estimate Costs



## Types of Funding Programs for Charging Infrastructure

- Charger grants and rebates
  - Federal
  - State
  - Local
- Utility make-ready infrastructure programs
  - Joint Utilities of New York EV Make Ready Program
- Proposed: NY Clean Fuel Standard (In Committee)



## Financing Options

- Cash
- Loan financing
- Bond financing
- Infrastructure-as-a-Service

→ **Step 7: Identify and Apply for Funding**

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## Considerations

- Develop and release an RFP
- Obtain proposals, including:
  - Cost Quotes
  - Timelines
- Meet all applicable building and zoning codes
- Start construction



## → Step 8: Secure a Contractor and Start Construction

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# → Total Cost of Ownership

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Type of Cost	Cost Component	Typical Range of Costs
Capital	Vehicle Purchase Price	\$77,000 to \$290,000; Avg: \$168,000
	Sales Tax	Varies by location
Operating	Electricity/Charging	\$0.1632/kWh (Commercial), \$0.1374 (Transportation) per EIA April 2022
	Maintenance	Varies by location; generally lower than ICE vehicles
Incentives	Vehicle Incentives	NYTVIP funding

## → Typical Vehicle Costs

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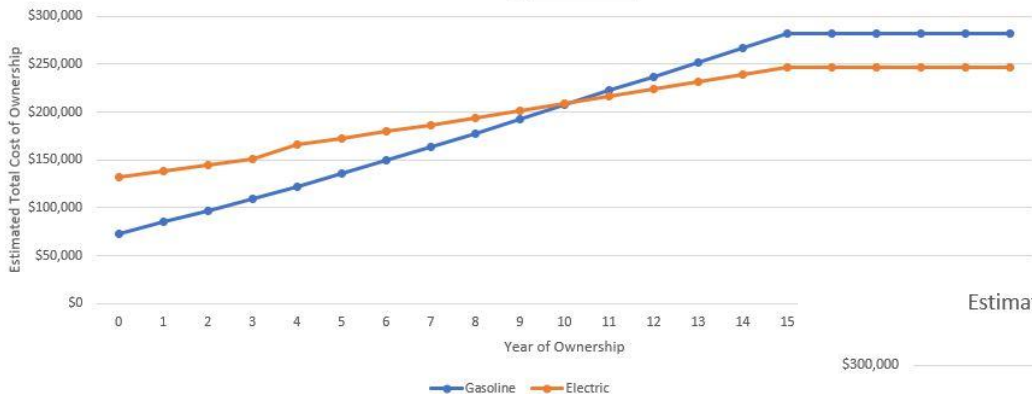
Type of Cost	Cost Component	Typical Range of Costs
Capital	Charger Hardware – Level 1	\$375 to \$500; Avg: \$400
	Charger Hardware – Level 2	\$550 to \$8,500; Avg: \$4,000
	Charger Hardware - DCFC	\$12,000 to \$130,000+; Avg: \$50,000
	Charger Installation – Level 1	Avg: \$1,500
	Charger Installation – Level 2	Avg: \$3,000
	Charger Installation - DCFC	Avg: \$20,000
	Make-Ready Infrastructure – Electrical Work	Highly site-specific. Est. 5% installation cost increase
	Make-Ready Infrastructure – Special Work	Highly site-specific. Est. 33% installation cost increase
	Make-Ready Infrastructure – Structural Factors	Highly site-specific. Est. 125% installation cost increase
	Distribution Gird Upgrades	Highly site/utility-specific. \$1,500 to \$6,000 per vehicle
Operating	Charger Maintenance	Level 1: \$20; Level 2: \$750; DCFC: \$4,000
	Data and Network Subscription	Level 2: \$300/port/year; DCFC: \$600/port/year
Incentives	Infrastructure Incentives	NY MHDV Make-Ready Infrastructure Funding

## → Typical Infrastructure Costs

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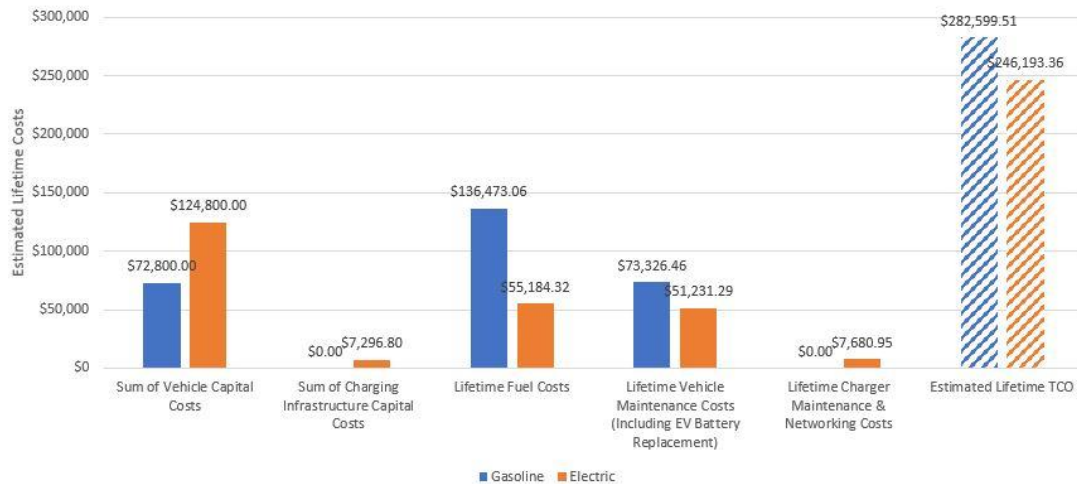


Estimated Average Per-Vehicle Payback Period: Annual Cumulative Cash Flow (Gasoline Vehicle Vs EV) (Discounted)



Actual results will vary case by case

Estimated Average Per-Vehicle Lifetime Costs by Category: Gasoline Vehicle Vs EV (Discounted)



### Assumptions (Class 4 Box Truck)

- Medium Level 2 charger costs
- Minimal make-ready infrastructure costs
- No distribution grid upgrades
- Capital costs incurred in Year 0
- Gas price: \$4.70/gal; Electricity price: \$0.16/kWh
- Gas vehicle cost: \$70K; BEV cost: \$120K
- No demand charges
- 100 miles a day; 300 days a year; 15 year lifespan
- Sales tax rate: 4%
- Discount rate: 5%
- Gas fuel economy: 13 mpg; BEV: 33.705 mpgge

➔ **Example BEV to ICE Comparison**



## Jonathan Norris

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[icf.com](https://www.icf.com)

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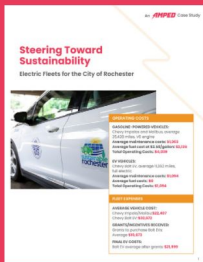
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### About ICF

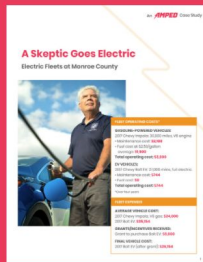
ICF (NASDAQ:ICFI) is a global consulting and digital services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future.

# AMPED Resources



### Steering Toward Sustainability

Electric Fleets for the City of Rochester



### A Skeptic Goes Electric

Electric Fleets at Monroe County

Meet Rob Tyndal, Safety and Training Analyst for



### A Healthy Investment

Charging Stations at Rochester Regional Health

# AMPED Website information and resources

## Charging Infrastructure

Learn about the different types of charging stations, considerations for location and operating costs, and financing options.

[View Resources](#)

## The Bottom Line

Calculators, incentives, rebates, and more information about the broad range of financial factors in moving to electric vehicles.

[View Resources](#)

## FAQs

We've put together a list of common questions about electric vehicles. Find answers here.

[Learn More](#)

## Still not convinced?

There are even more reasons to believe the conversion to electric vehicles is possible and important in our community.

[Tell me more.](#)

# Let's get started!

The EV needs of businesses and individuals vary greatly and constantly change as vehicles are replaced and new options are brought to market. In this rapidly-changing landscape, the best place to start is getting a **FREE CONSULTATION** from one of our non-profit partners, Greater Rochester Clean Cities. You'll be connected with an expert who can help you understand your options and get you started with whatever steps you decide to take.

If you'd rather move forward independently, use the button below to take advantage of New York State programs for electric vehicles.

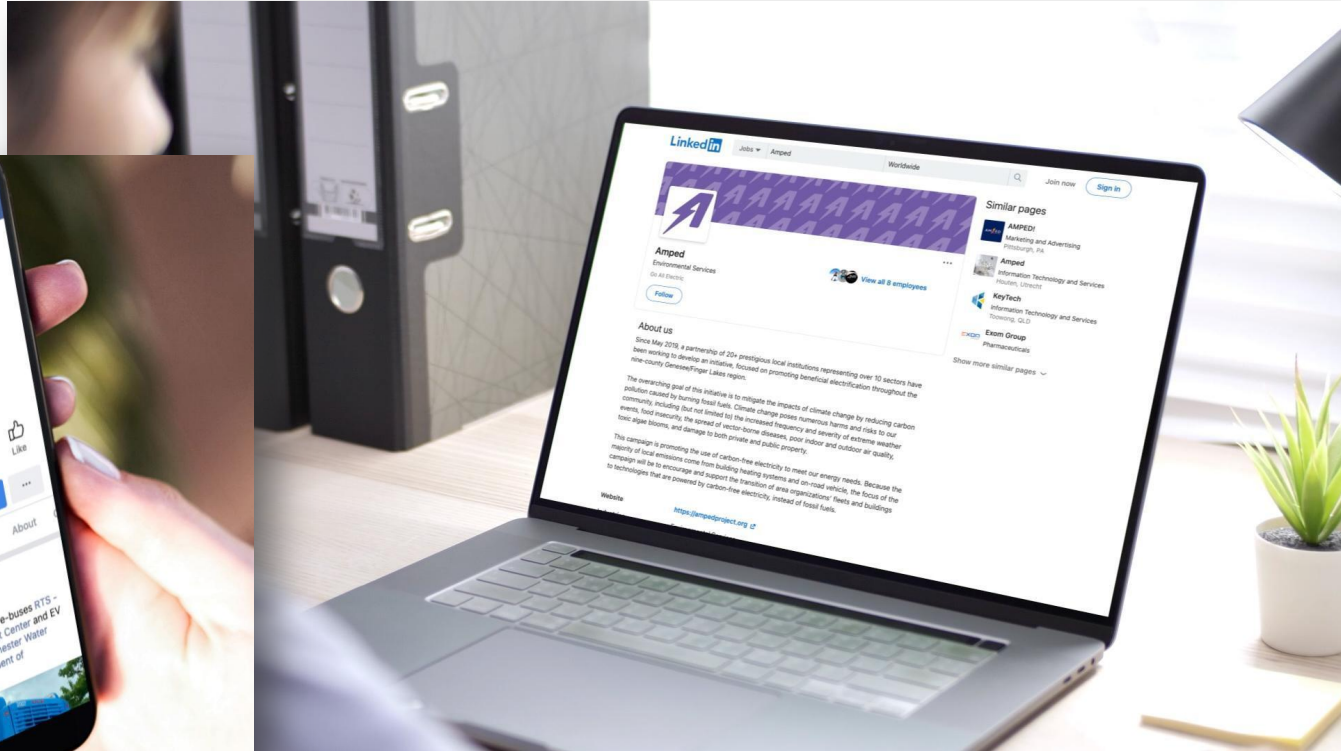
[Connect to an expert at Greater Rochester Clean Cities](#)

OR

[Explore NYS Programs for Clean Energy Transportation](#)

As part of the national U.S. Department of Energy's (DOE) Clean Cities Program, **Greater Rochester Clean Cities** works with vehicle fleets, fuel providers, community leaders, and other stakeholders to save energy and promote the use of domestic fuels and advanced vehicle technologies in transportation.

# Social Media



# Next Steps

1. Contact [DLKeefe@rochester.rr.com](mailto:DLKeefe@rochester.rr.com) at Greater Rochester Clean Cities to have a conversation about electrifying your fleet
2. Visit the [NYTVIP website](#) or contact the Voucher Help Center to get started with the Trucker Toucher Program: [NYTVIP@energycenter.org](mailto:NYTVIP@energycenter.org) / 866-595-7917
3. For more information on Navistar eMobility, schedule an appointment via email to [Rudy.velez@Navistar.com](mailto:Rudy.velez@Navistar.com)
4. For questions about EV model availability, check out the Alternative Fuels Data Center's [Alternative Fuel Vehicle Search tool](#)
5. Learn more about school bus funding at the [EPA website](#)
6. If you are a fleet that is planning to electrify, contact your electric utility and share your plans with them



Next Get AMPED Forum: District Heat Pumps

September 15th, 2022