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Technology Training – Electric Vehicles

NYSERDA CLEAN ENERGY HUB

AUGUST 2023

Agenda Overview

- Technical Overview – EVs and EV Chargers
- Relevant Policies
- Customer Economics – Total Cost of Ownership (TCO) framework
- Emissions Reduction Potential
- Contractor and Supply Chain Engagement
- Marketing and Promotion
- Customer FAQs
- Q&A Session

Technical Overview

EVs and EV Charging Infrastructure

Key Considerations for Installation

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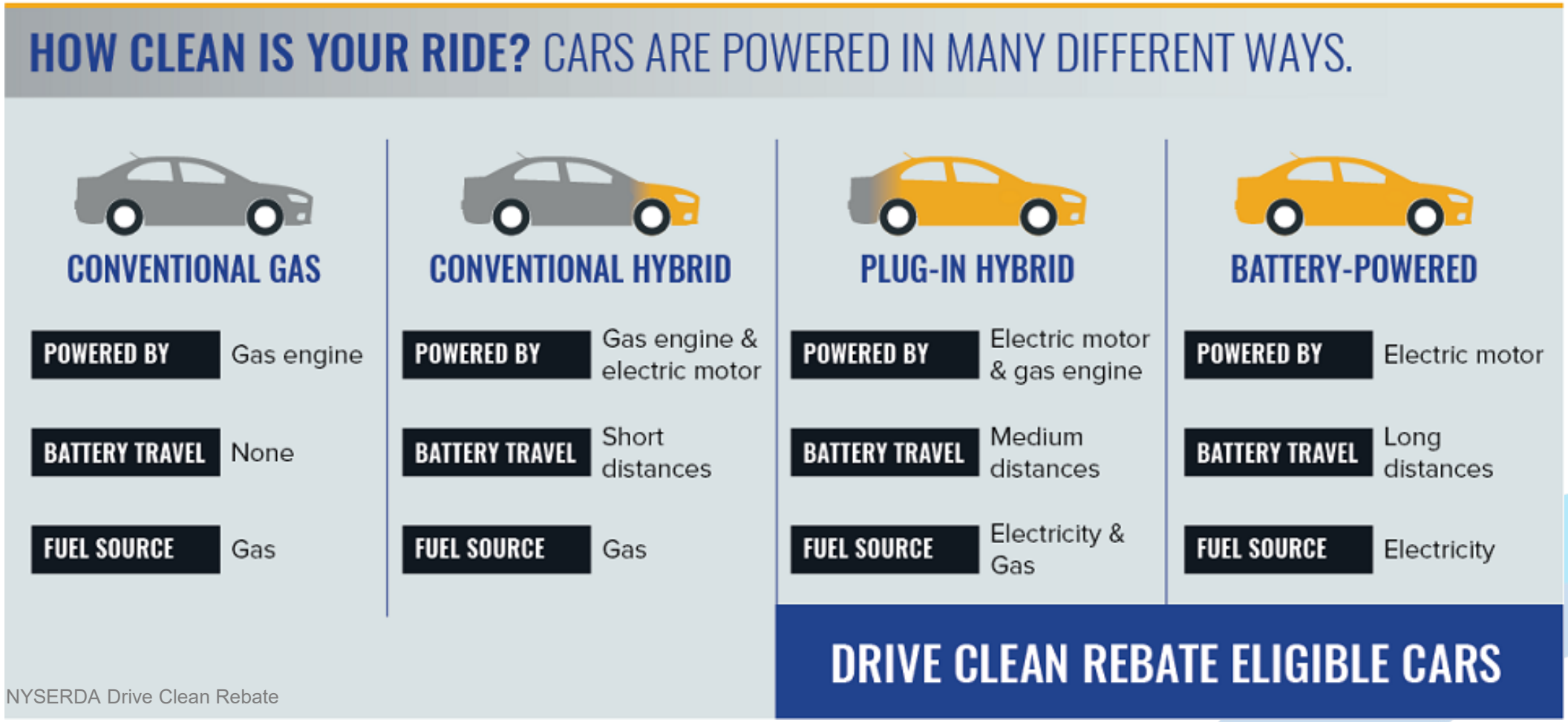
Electric Vehicle 101

Main Types of Vehicles



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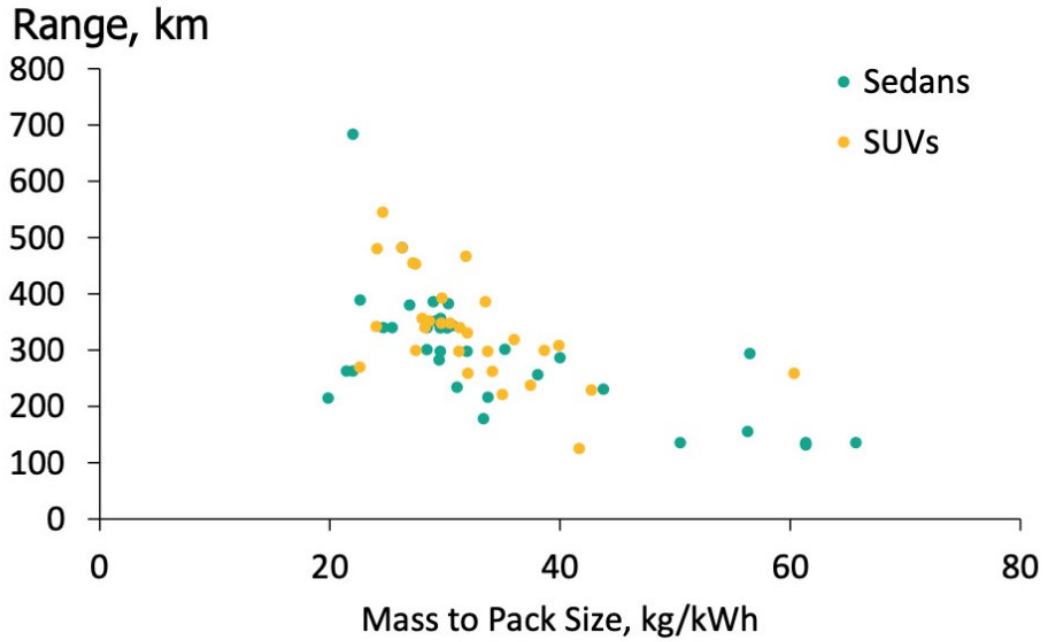
Electric Vehicle 101

Electric Vehicle Considerations

Nissan Leaf (2023)	Ford F-150 Lightning (2023)
	
40 kWh Battery	98 kWh Battery
149 Mile Range	240 Mile Range
3,509 lbs	6,015 lbs
7.5 Hour Charge Time (240V)	14 Hour Charge Time (220V)



Vehicle range decreases as weight to battery capacity ratio increases

- **Battery Size**: Increases range, vehicle weight, and charging time
- **Vehicle Weight**: 20-25% battery, Decreases range

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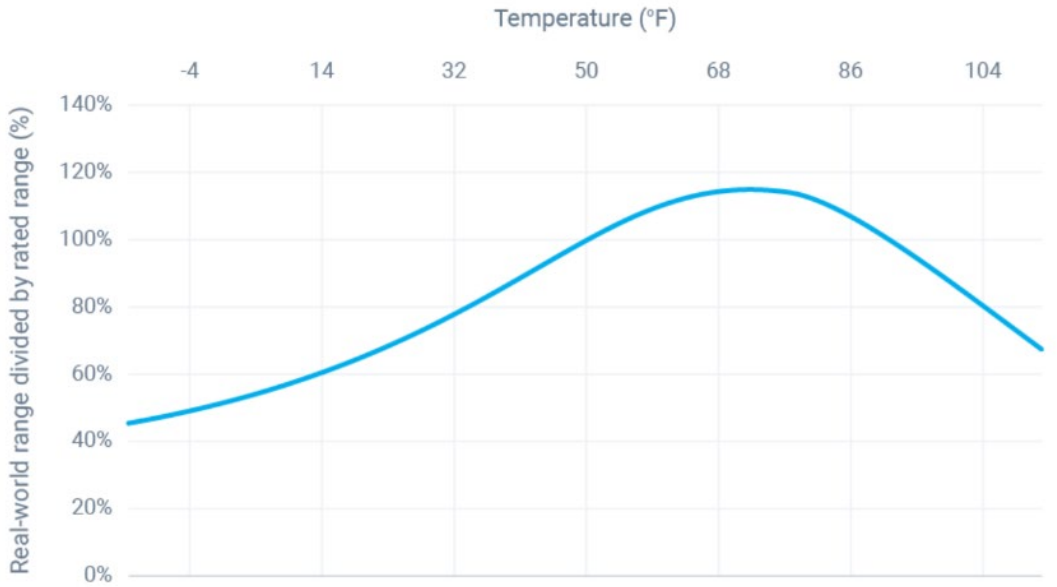
Electric Vehicle 101

Factors Impacting EV Performance



Electric vehicles potentially perform *better* than ICE vehicles at **Extreme Elevation and Altitude**

- Altitude inhibits air/fuel combustion
- Vapor lock resulting from low air pressure
- Cold temperature can reduce EV range

Extreme Temperatures can *negatively affect* electric vehicles':

(1) Battery Capacity
(2) Range
(3) Charging Time

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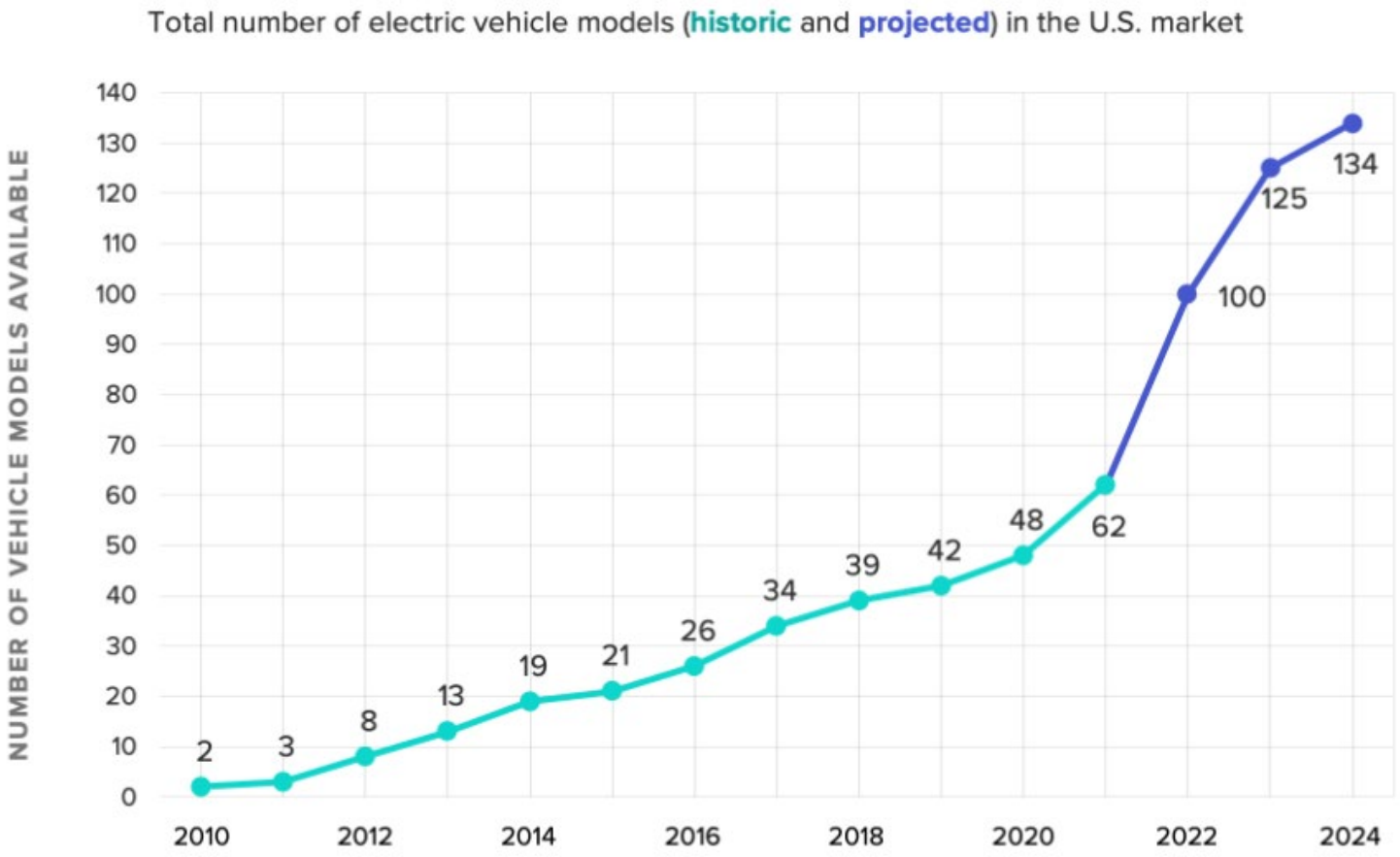
Electric Vehicle 101

Models & Availability



- As of 2023, roughly 111 electric vehicle models
- Trends in Availability
  - Higher demand for EVs
  - Declining prices as manufacturing increases
  - Some residual supply chain issues due to Covid-19 pandemic (semiconductor shortage)
  - Long wait times have declined

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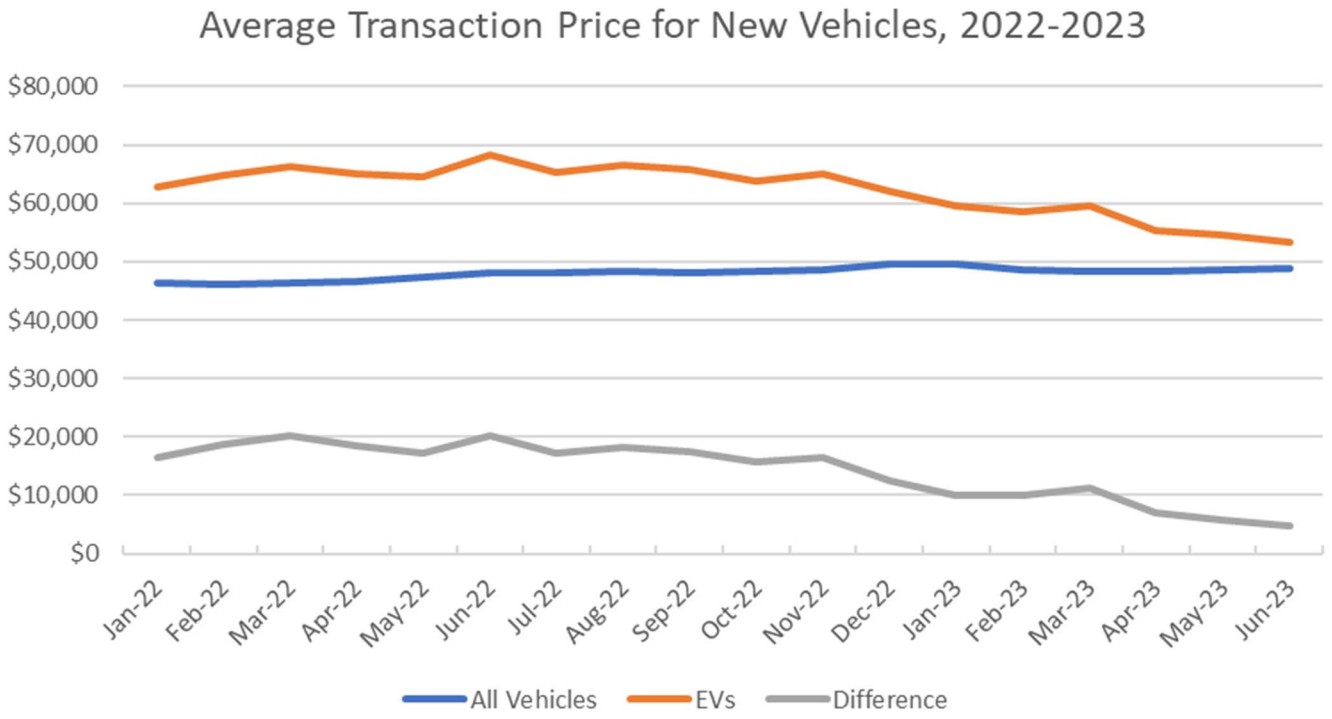
Electric Vehicle 101

Incremental EV Cost



- June 2023; EVs were ~$4,600 *more* than average vehicle
- Tesla represents >50% of EV sales
  - Price adjustments have a disproportionate impact on these trends
- Non-Tesla EVs have very similar transaction price on average to Tesla EVs

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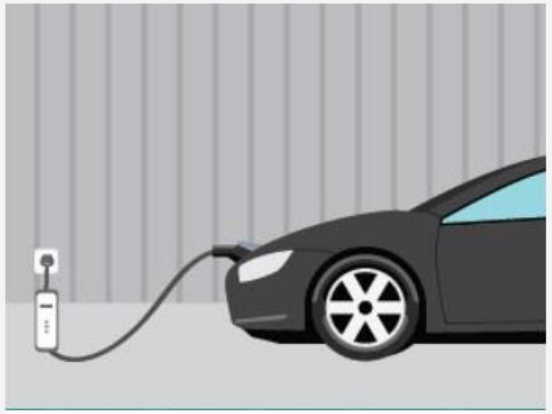
Electric Vehicle Charging

Level 1



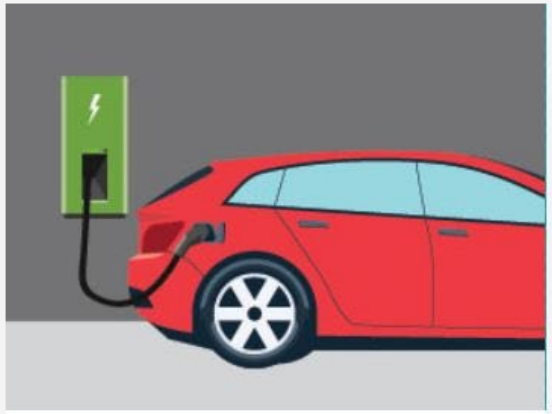
VOLTAGE:
120V 1-Phase AC

AMPS:
12-16 Amps

CHARGING LOAD:
1.4-1.9 kW

CHARGING TIME:
3-5 Miles per Hour

Level 2



VOLTAGE:
208V or 240 V 1-Phase AC

AMPS:
12-80 Amps (Typ. 32 Amps)

CHARGING LOAD:
2.5-19.2 kW (Typ. 6.6 kW)

CHARGING TIME:
12-60 Miles per Hour

DC Fast Charge

VOLTAGE:
208V or 480V 3-Phase AC

AMPS:
>100 Amps

CHARGING LOAD:
50-350 kW

CHARGING TIME:
60-80 Miles in 20 Minutes

Range added per hour of charging depends on both charger and vehicle

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Electric Vehicle Charging

Main Connector Types

LEVEL 1 Charging

Standard
Wall Plug

Typical 110V household wall outlet

LEVEL 2 Charging

J1772

Tesla

Utilizes 208-240V outlet on dedicated circuit

DC Fast Charging

CHAdeMO

CCS
Combo

Tesla
Supercharger

Requires minimum 400V connection

Only major compatible US BEV is Nissan LEAF

Recently became the North American Charging Standard (NACS)

- **All EVs** can use **Level 1 and Level 2 J1772**
- Only Tesla vehicles have historically used Tesla connectors
  Changing in 2024/2025 (via adapters and the vehicle redesign)

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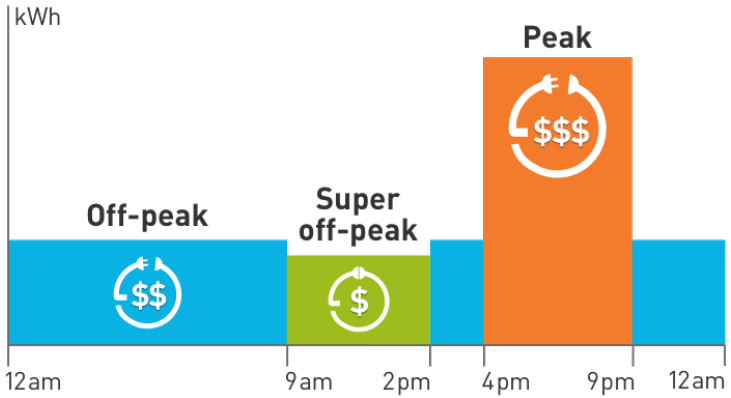
Electric Vehicle Charging

Costs of Charging and Rates

Common EV Rates

- Fixed Rate
- Time-of-Use (TOU)



Demand Charges

- Commercial & Public Chargers
- Based on peak consumption (kW)
- Recovers grid capacity costs
- Highest for DCFC stations (74% of average electricity bill)

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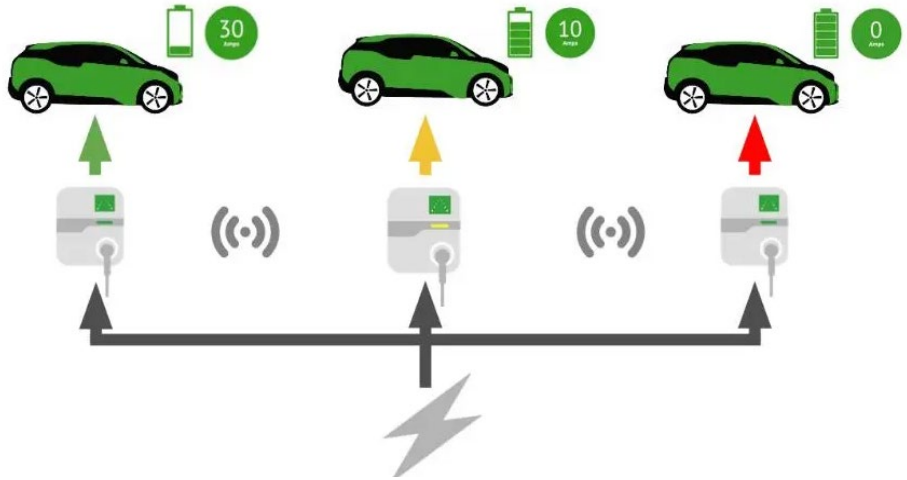
Electric Vehicle Charging

Smart Chargers and Managed Charging

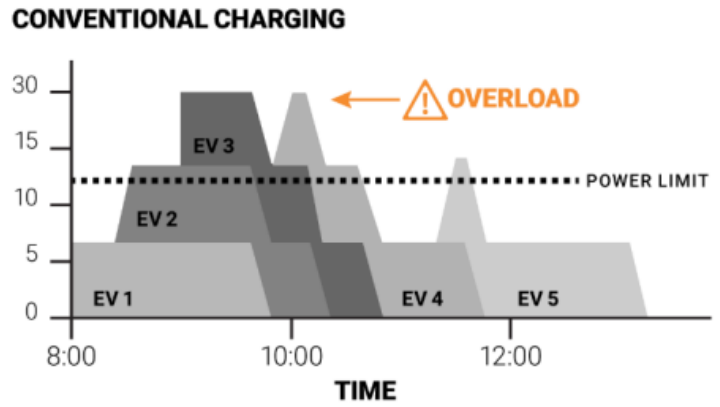
Adaptation of the charging cycle to conditions of both the (1) grid and (2) vehicle needs

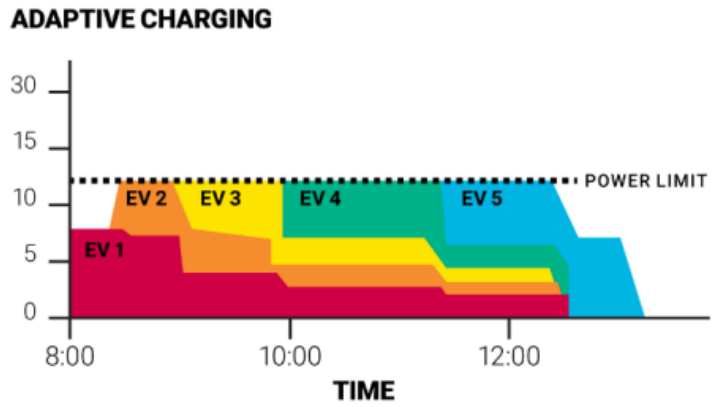
- Load Management
- Vehicle Communication



Costs and Benefits

- Often requires Smart Chargers ($$)
  - Vehicle telematic-based scheduled charging
- Cost Savings for EV owners & Utilities





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Electric Vehicle Charging

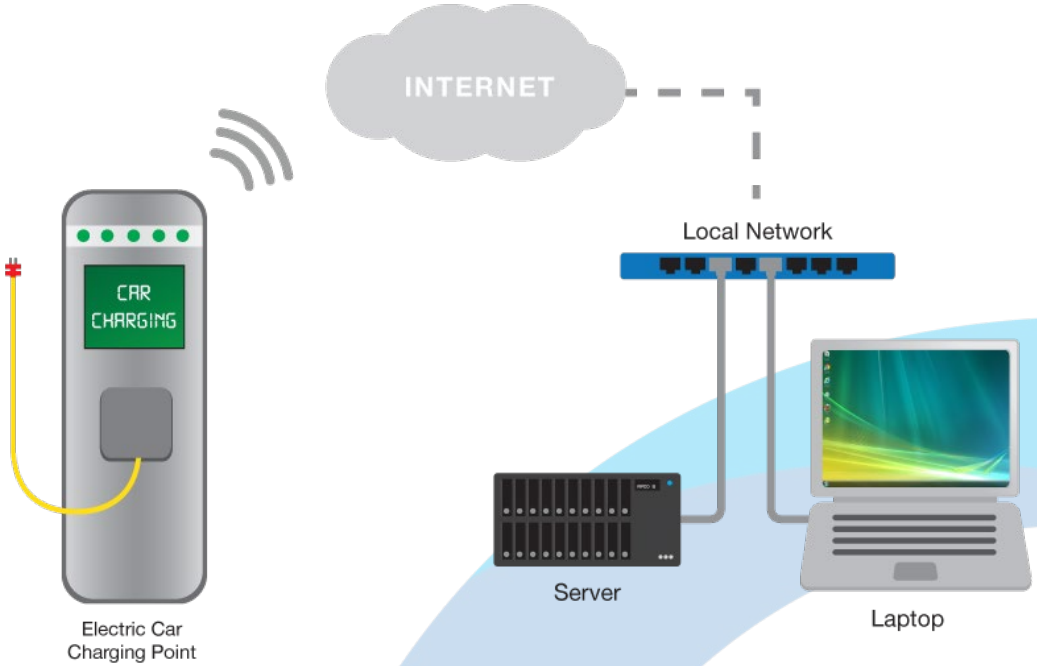
Networked Chargers

1) Connect to a broad network of EV chargers
2) Access to online management platform
3) Option for hardwired or wireless

Open vs. Closed Networks

Costs and Benefits of Networked Chargers

- Monthly networking fee ($$)
- Ability to impose a charging fee
- Collect usage data
- Load and cost management
- Remote access to manage all charger operations
- Remote maintenance and troubleshooting



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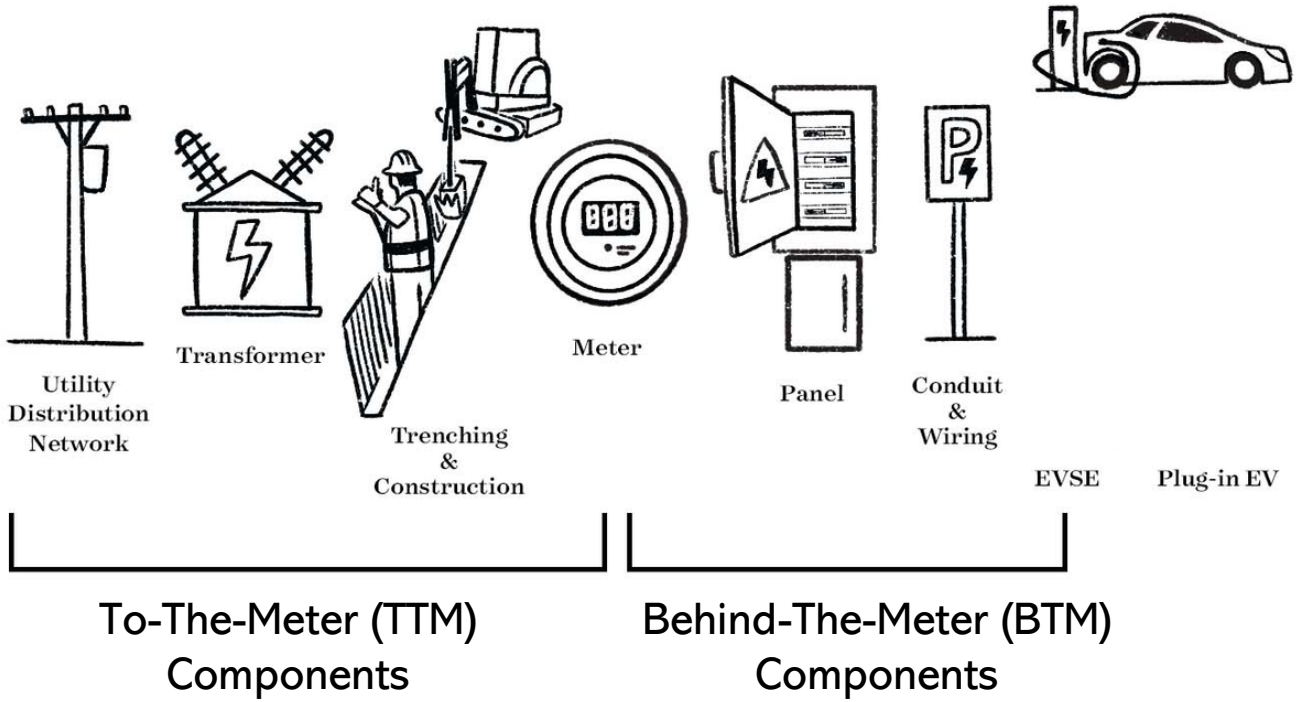
Electric Vehicle Charging

Considerations for MFH and Public Charging

	Multi-Family Housing	Public Charging
		
Access	1. Designated parking and chargers 2. Communal chargers, helpful if paired with networked platform with sharing features	Competes with general parking, requires thoughtful placement (limit misuse) Signage and Marketing via apps to support utilization
Charger Level	Level 2	Level 2 or DCFC (location-dependent)
Ownership (& Maintenance)	Property Owner Tenant/Resident	Specific business entity Third-party organization (e.g., network provider)
Payment	Free amenity Monthly charging fee Charge according to usage (networked)	Free amenity Charge according to usage (networked)

Utility Infrastructure for EV Charging

Overview



TTM Infrastructure Upgrades

- Utility Jurisdiction

BTM Infrastructure Upgrades

- Site Owner Responsibility

Charging Station Ownership

- Specific business entity or residence
- Third-party organization (e.g., charger network provider)

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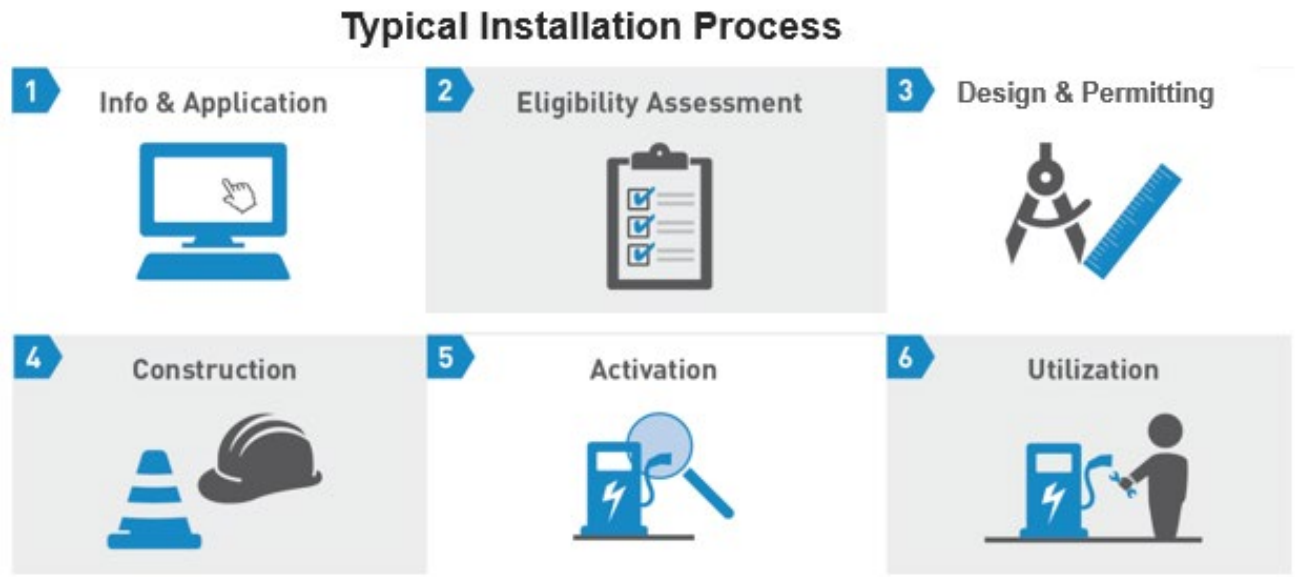
Utility Infrastructure for EV Charging

Key Considerations for Installations

- Typical installation timeline 10-16 months
- Good Candidates
  - Have site plan
  - Understand cost & on-site load availability*
  - Receptive to right-sizing
  - Consider future expansion
- Limiting Factors
  - Available funding, incentives, rebates
  - Grid capacity at site*
  - Program team availability



	Site Host	Utility
Responsibilities	1) Application (site plan) 4) BTM Construction & EVSE (e.g., chargers, networking)	2) Eligibility Screening 3) Design & Permitting 4) TTM Construction 5) Site Activation

**New York State Utilities host publicly accessible load capacity maps*

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Relevant Policies

Rebates and Incentives for EVs, EVSE and Utility Infrastructure

Additional Funding for DACs

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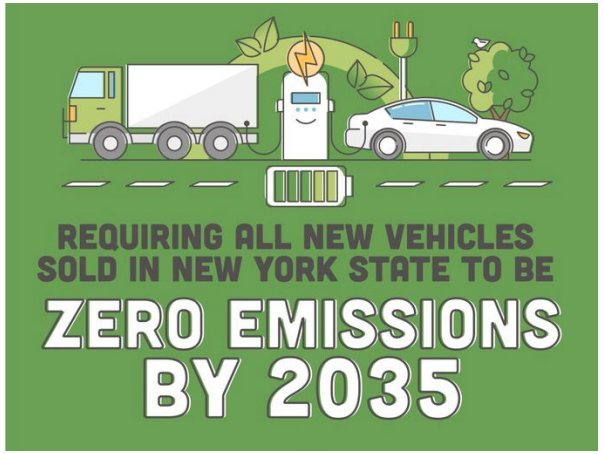
Federal, State and Local Policies & Programs

Residential, Multi-family, and Small Commercial Sectors

	Electric Vehicle Incentives	EVSE Incentives
Federal	Inflation Reduction Act (2022)	Infrastructure Investment and Jobs Act (2021) creating National Electric Vehicle Infrastructure (NEVI) Formula Program ($5B) & Discretionary Grant Program ($2.5B)
State	NYSERDA Drive Clean Rebate	Alternative Fueling Infrastructure Tax Credit Charge Ready NY 2.0
Utility*		Electric Vehicle Managed Charging Programs Electric Vehicle Make-Ready Programs

*NYS Utilities include Central Hudson, National Grid, Con Edison, NYSEG, O&R, and RG&E



Statewide requirement that ***all sales & leases of new light-duty vehicles must be zero-emission vehicles by 2035***

NY State Policies:

- Emissions Inspection Exemption
- HOV Lane Exemption
- Multi-family Housing EVSE Installation Protection

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Utility Policies & Programs

Funding for DACs

Justice40

DACs receive 40% of total benefits from certain federal investments (including clean transportation)

Additional Utility Support

Non-Residential EV Infrastructure Programs

- DAC incentive covers 100% cost

Electric Vehicle Make-Ready Program

- DACs receive minimum 30% total funding

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Customer Economics

Total Cost of Ownership

Overview of Incentive Programs

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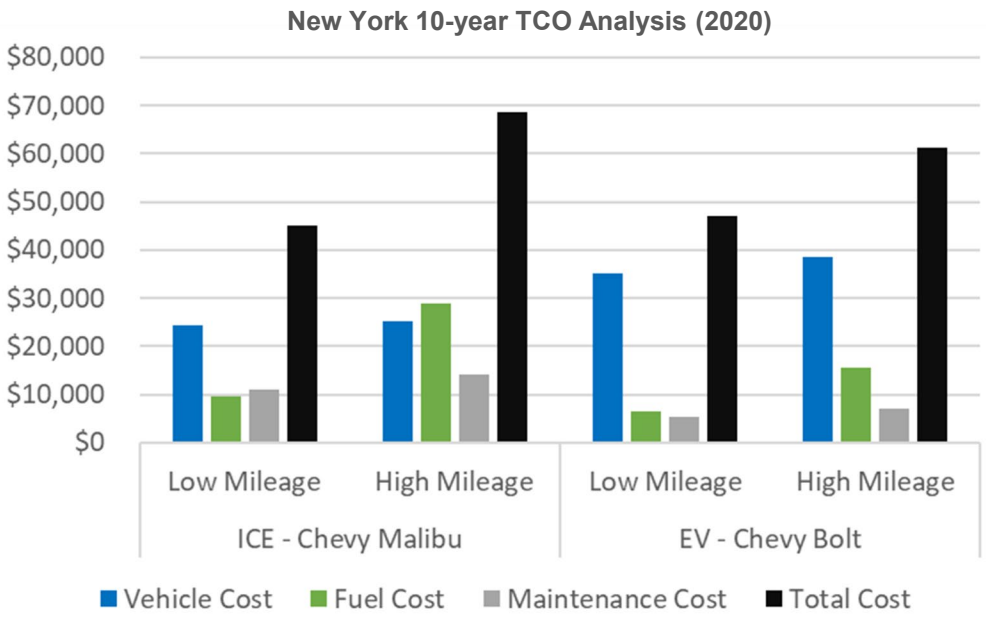
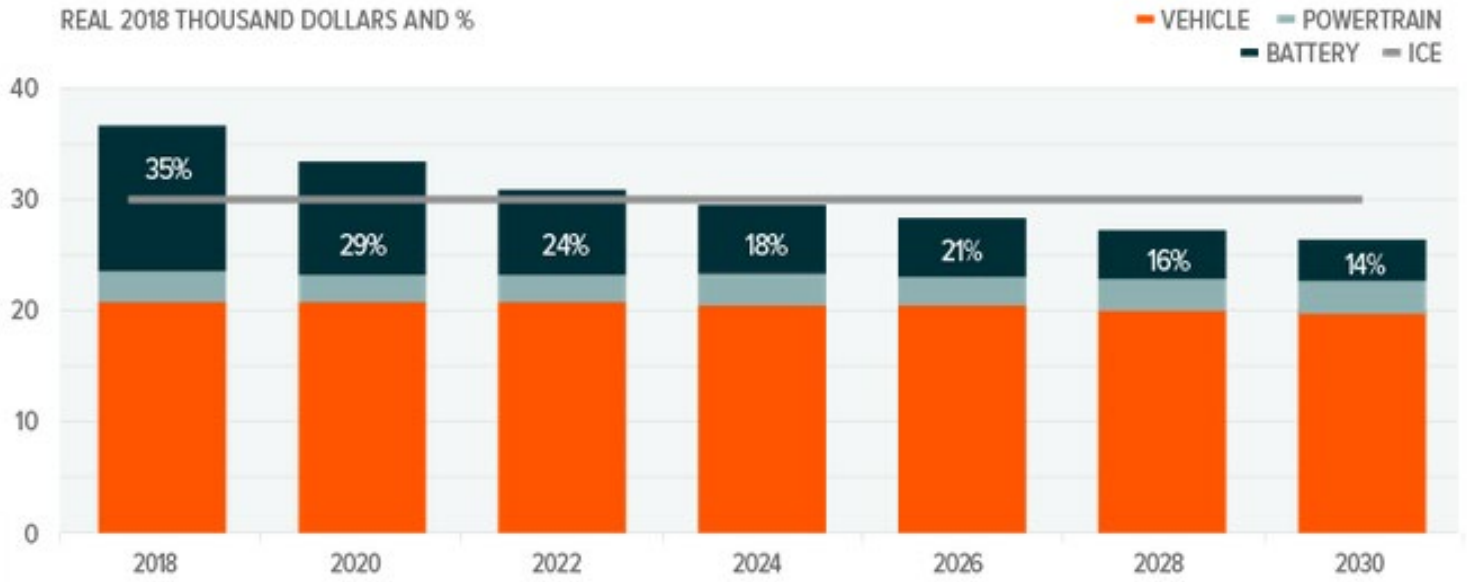
Total Cost of Ownership

Light-Duty Vehicles

- EVs are at ***price parity*** with ICE vehicles in some classes but not in all
  - Pickup truck price premium is high





- Short-run TCO Considerations
  - Upfront capital costs more for EVs than ICE
- Long-run TCO Considerations
  - Fuel costs 2-3x more for ICEVs than EVs
  - Maintenance costs 2x more for ICEVs than EVs

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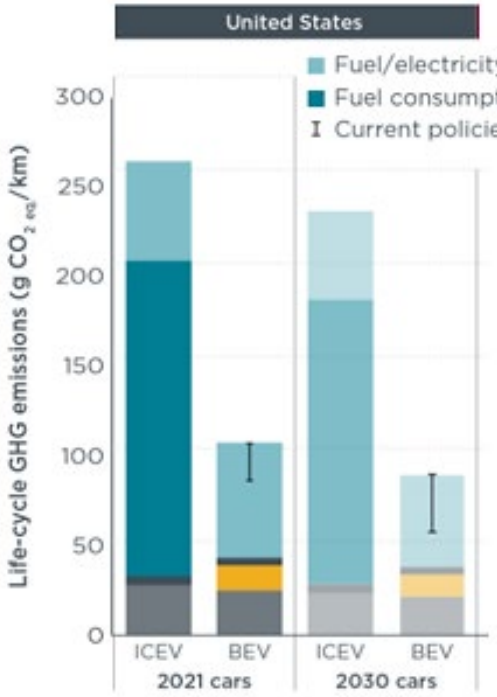
Energy and GHG Savings Potential

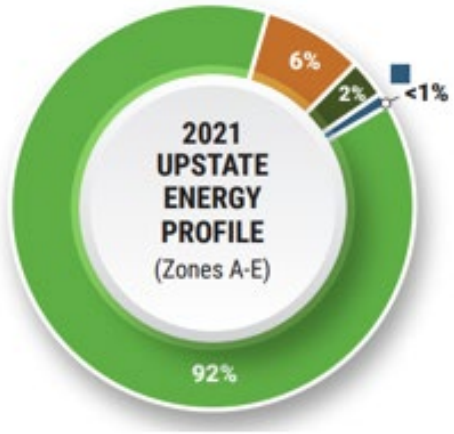
EV vs ICE

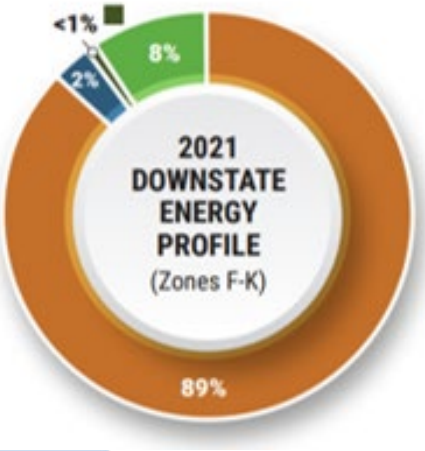
- **Net GHG reduction for EVs**
  - EVs lack tailpipe emissions
  - Manufacturing emissions higher for EVs (Battery)
  - GHG emissions from EVs depends on **fuels in electricity production**

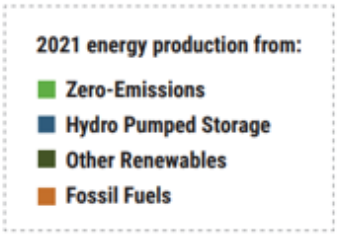
- Upstate vs. Downstate NY Electricity Production Profiles

- Key Fuel Distinctions
  - Gasoline prices higher for Upstate
  - Electricity prices higher for Downstate
  - Greenhouse Gas Potential









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Dealer and Installer Supply Chain Engagement

Overview of NY Supply Chain
Key Points for Engagement

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EV Dealers in New York

Regional Supply Chain

- Manufacturing:
  General Motors Lockport factory conversion
- Distribution channels:
  Direct sale* vs. Independent dealerships

Service Providers

- Independent mechanics
- Dedicated service center

**Only available for Tesla*

EV Charger Installers in New York State

Regional Supply Chain

- **Manufacturing**: Tesla EVSE manufacturing center at NY Gigafactory
- **Distribution channels**: Manufacturers or Network Provider
- **Installers**: Specialty firms or regular contractors

Ownership

- Business or Residence
- Third-party entity or Network provider

Future-proofing installations

- Ensure site can support larger loads (more or faster EVSE) in the future

Key Points for Engagement

Key In-State Assets

- GM's Electric Vehicle Factory
- Tesla's EVSE Gigafactory
- Local Charger Manufacturers

Industry Events

- Conferences, Webinar, Auto show engagement opportunities

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Marketing and Promotion

Best Practices for Promoting EVs
Opportunities for DACs

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Promoting EVs

Promoting technology to residential and small commercial customer

- Key motivating factor: **Environmental Protection**
- Most important incentives: **Home, Multifamily, & Workplace Level 2 Charging; Public DCFC**
- Primary information sources: **EV-specific websites, forums, video reviewers, ride and drive events**

Key considerations and opportunities for DAC Engagement

- Lowering upfront costs through point-of-sale rebates
- Income-qualified programs for used EVs, used EV tax credit, etc.
- Financing for income-qualified EV owners who may use car for gig work (Lyft, Uber, etc.)
- Relevant rates for income-qualified EV owners

Customer FAQs

Common questions asked by customers about [technology]

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Customer FAQs

- The Lifespan of the Electric Car and Battery
- Sufficient charging infrastructure available to support electric vehicles
- Owning an EV without access to charging at home or work
- Range afforded by electric vehicles vs. Necessary range
- Advantages of purchasing an EV now vs. in future

Questions?

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Citations

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