EISP: Alt Fuels and Vehicles

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CLEAN CITIES COALITION NETWORK

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Clean Cities
U. S. Department of Energy

ABM
Building Value

Clean Communities
Of Central New York
www.ccofcny.com

Agenda

- Clean Cities / ABM
- Vehicles
- Infrastructure
- EV / EVSE Update
- Additional Resources

What is Clean Cities? For 30 Years ; a Collaborative Partnership with DOE

Clean Cities

advances the energy, economic, and environmental security of the United States by supporting local actions to cut petroleum use in transportation.

- Reduced petroleum consumption
- Reduced greenhouse gas (GHG) emissions
- Reduced dependence on imported petroleum

Clean Cities
U.S. Department of Energy

US Department of Energy Support Programs: Ask Clean Cities!

Laws and incentives in your region of the country

https://afdc.energy.gov/fuels/laws/ELEC

Who is ABM?

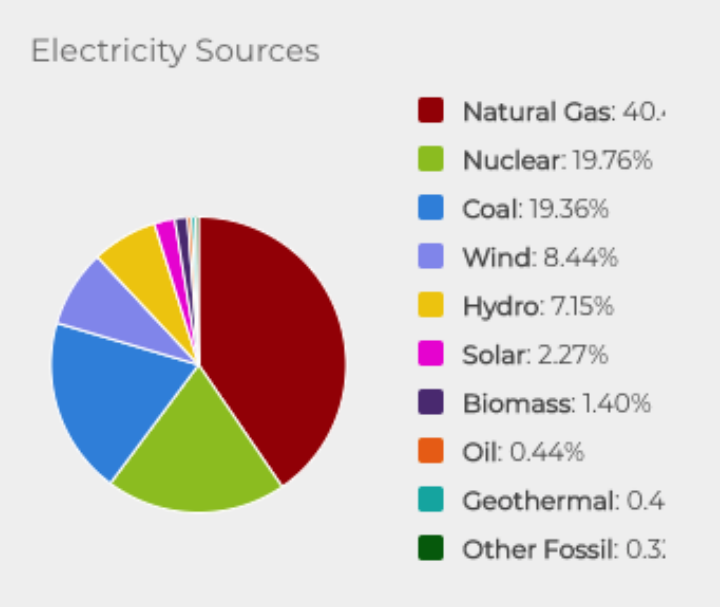
eMOBILITY & ELECTRICAL INFRASTRUCTURE

- Federal
- State
- Hospitals
- Parking
- Dealerships
- Airports
- Universities
- Fleet Charging
- Maintenance & Service


ULTIMATE OPPORTUNITY
FAST FOLLOWERS
CURRENT 2023
ABM
FAST MOVERS
FAST FOLLOWERS
ULTIMATE OPPORTUNITY
UTILITIES
FLEETS
RETAIL
AUTO
FUEL C-STORE

Basics: Electricity Production and Distribution

- Sources of electricity vary by region
- With planning, EVs are unlikely to strain existing electricity infrastructure



Helpful Resources

- The Alternative Fuels Data Center (AFDC) **Electricity Sources and Emissions tool**—find state-level electricity sources and how they affect EV well-to-wheels emissions.
- AFDC **EVI-Pro Lite tool**—estimate how increased EV charging may affect your area's electricity load profile.

Basics: Smart Grids and Renewables

- Smart grids allow two-way communication between utilities and customers
- Smart charging paves the way to smoother integration of EVs and renewable energy

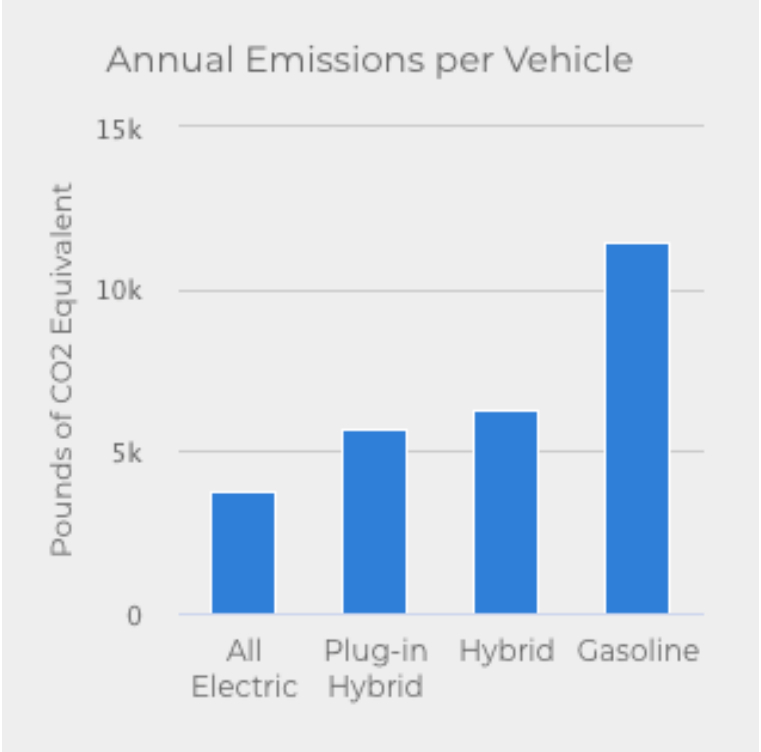
Basics: Benefits

Benefits:

- Increased energy security
- Improved fuel economy
- Lower fuel costs
- Reduced emissions

Considerations:

- Higher initial vehicle cost
- Infrastructure availability
- Battery life



Basics: Electric-Drive Vehicles

Electric Vehicles (EVs):

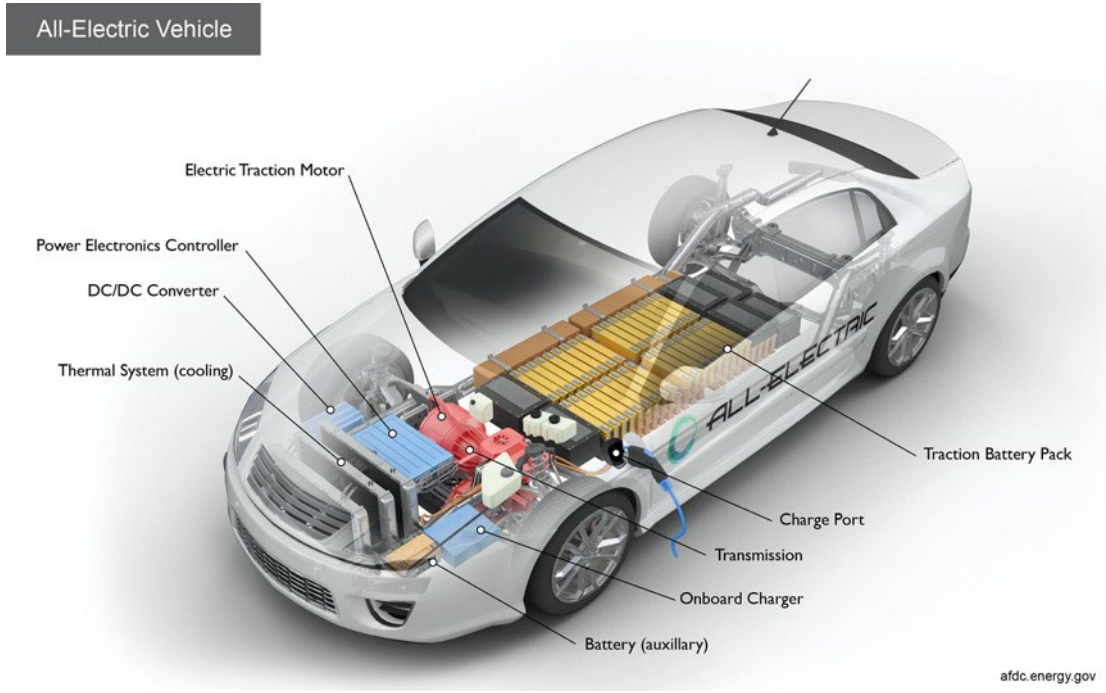
- All-Electric Vehicles
  - Powered by an electric motor
  - Uses charging infrastructure to charge the battery
- Plug-In Hybrid Electric Vehicle (PHEV)
  - Powered by an electric motor and engine
  - Uses charging infrastructure to charge the battery

Hybrid Electric Vehicle (HEV):

- Powered by an engine and electric motor
- Does not use charging infrastructure to charge the battery

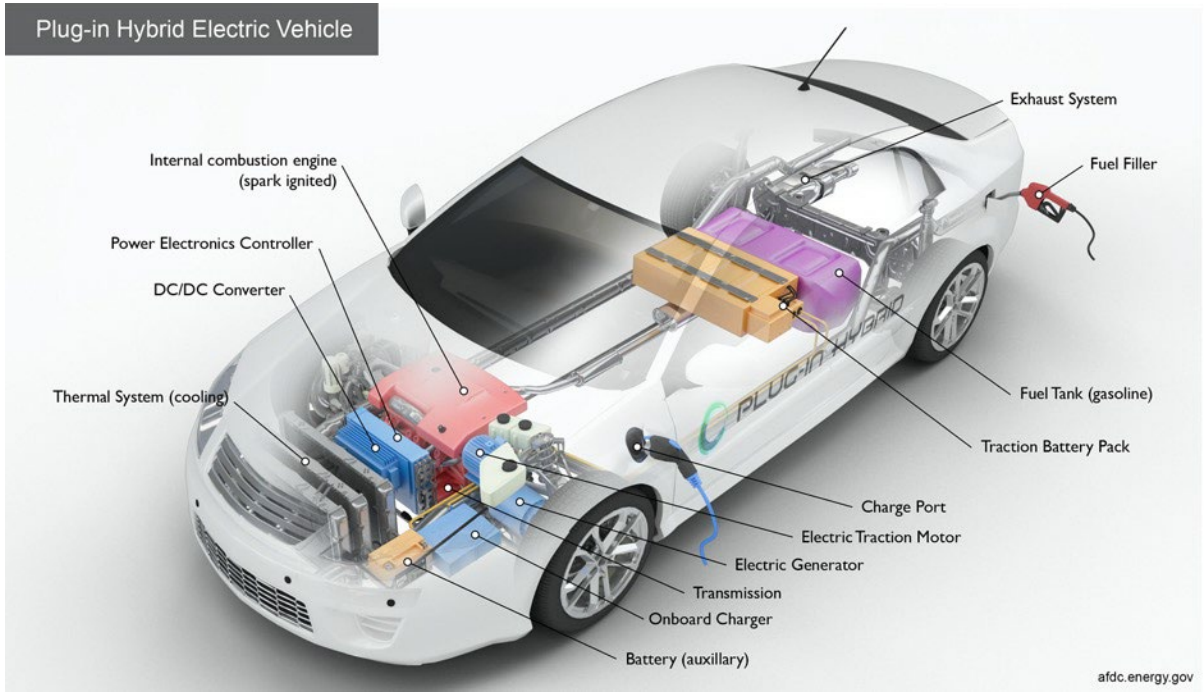
Vehicles: EVs

- Battery stores electrical energy that powers the motor
- Battery charged by plugging in to outside electric power source
- Zero tailpipe emissions, but air pollution may be produced through electricity generation
- Driving range of 100 to over 400+ miles



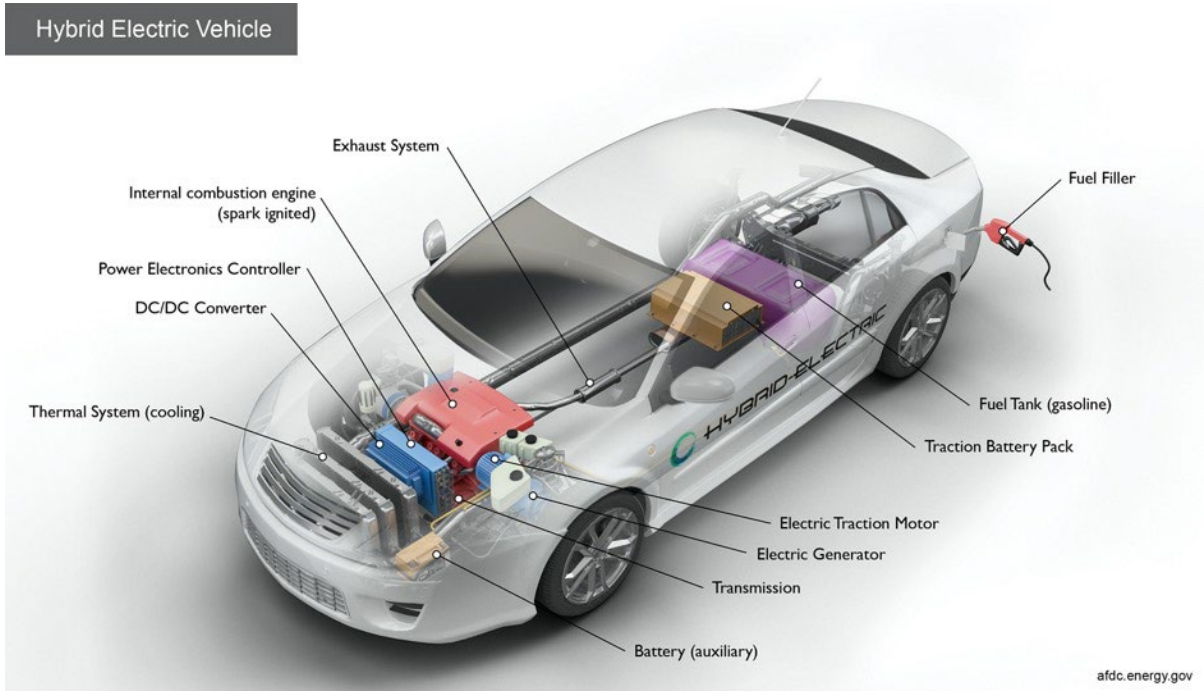
Vehicles: PHEVs

- Internal combustion engine uses alternative or conventional fuel
- Battery charged by outside electric power source, engine, and regenerative breaking
- During urban driving, most power comes from stored electricity



Vehicles: HEVs

- Battery is charged by the engine and regenerative braking
- Power from electric motor allows smaller engine and better fuel economy
- Fuel-efficient system design
  - **Mild hybrid:** Cannot power vehicle using electric motor alone
  - **Full hybrid:** More powerful electric motor, larger batteries can drive vehicle on just electric power for short distances and at low speeds



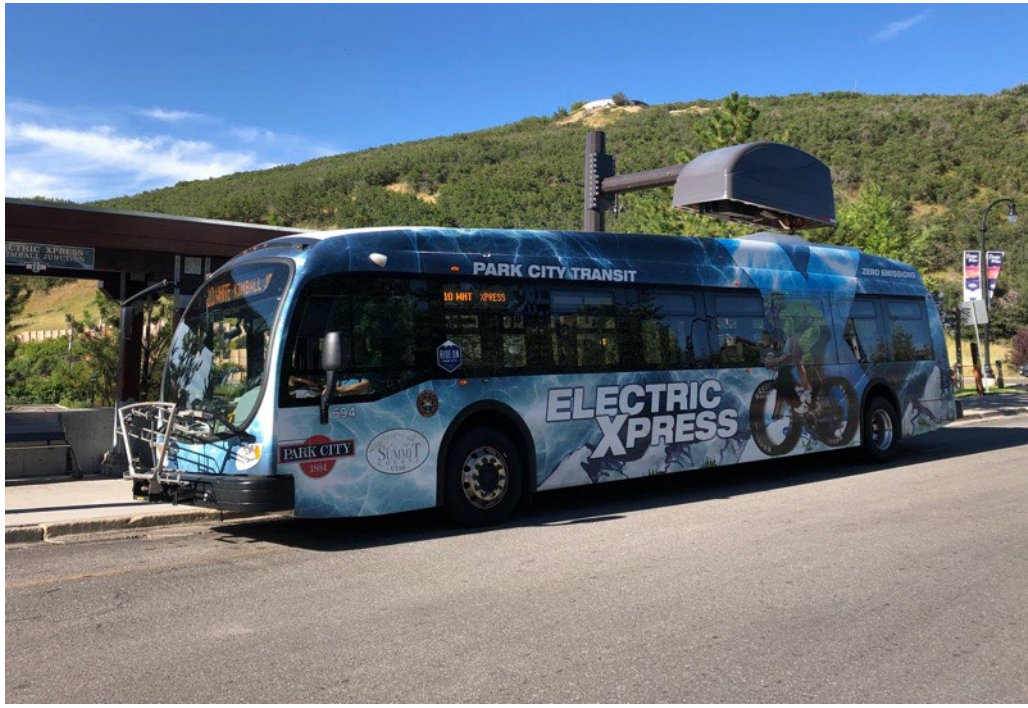
Vehicles:
Medium- and Heavy-Duty Vehicle Availability

Medium-Duty

- Variety of electric vehicles available
- New models becoming available, including vans and pickup trucks
- Certified conversions an option

Heavy-Duty

- Several EV and HEV makes and models available
- EV transit buses growing in popularity
- Regional haulers, refuse trucks, and yard tractors available



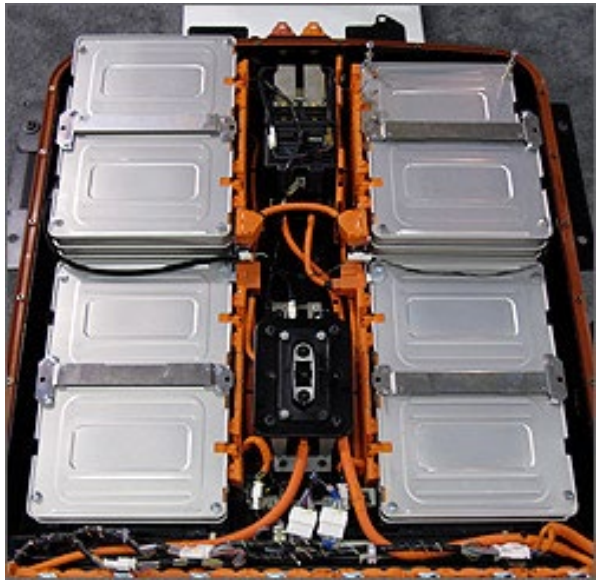
Source: https://caletc.com/wp-content/uploads/2019/12/ICF-Truck-Report_Final_December-2019.pdf

Vehicles: Conversions

- Provide options beyond what is standard from manufacturers
- Consider space and weight from added batteries and electric motors
- Conversions must meet vehicle standards

Vehicles: Batteries

- Energy storage systems, such as batteries, are essential for electric-drive vehicles
- All original equipment manufacturer EVs made today use **lithium-ion** batteries.
  - For more information about lithium extraction, contact the Technical Response Service at technicalresponse@icf.com
- Other energy storage options:
  - Nickel-metal hydride batteries (HEVs)
  - Lead-acid batteries
  - Ultracapacitors



Vehicles: Battery Recycling and Second Life

Recycling:

- Separating battery materials is a challenge
- Standardizing battery materials and design could help

Second life:

- Battery used in post-vehicle application
- Could help address battery cost barriers

The U.S. Department of Energy is supporting the Lithium-Ion Battery Recycling Prize to develop battery-recycling processes.

Other Considerations:

Maintenance and Safety

- PHEVs and HEVs have maintenance requirements like conventional vehicles
- EVs typically need less maintenance:
  - Battery, motor require little to no maintenance
  - Fewer fluids to change
  - Brake wear is reduced due to regenerative braking
  - Fewer moving parts
- Electric-drive vehicles must meet the same safety standards as conventional vehicles

What are Alternative Fuels and Alternative Fueled Vehicles? Part 1

- Biofuels
- CNG/RNG
- LPG/RLPG
- Electricity
- Hydrogen
- OEMs / Upfitters

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What are Alternative Fuels and Alternative Fueled Vehicles? Part #2

- Biofuels
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EVs: Automotive OEM EV Commitments

CADILLAC

- 100% Electric by 2025

GMC

- General Motors 100% by 2035

PORSCHE

- 80% Electric by 2030

STELLANTIS

- 100% Electric by 2030

BMW

- 50% Electric by 2030

AUDI

- 100% Electric by 2026

VOLVO

- 100% Electric by 2030

BENTLEY

- 100% Electric by 2030

MINI-COOPER

- 100% Electric by early 2030's

VOLKSWAGEN

- 100% Electric in Europe by 2035. US to follow.

FORD

- $22Bn investment in EV through 2025

FERRARI

- 40% Electric by 2030

Funding Opportunities : OPM

NEVI Formula Funding	BIL	**$5B for 52 jurisdictions dispersed over 5 years**
Discretionary Grant Program	BIL	**$2.5B complements NEVI Funds, competitive grants**
Utility “Make Ready” Programs	IRA	**Local Utilities pay 50% - 100% of Electrical Upgrades**
EPA Rebates	IRA	**$1B in rebates for clean heavy-duty trucks and School Buses**
Neighborhood Access & Equity Grants	IRA	**~$4B discretionary grants to improve connectivity**
Tax Credits (30D)	IRA	**Up to a $7,500 tax credit on EVs, 30% on Chargers; Plus state credits**

BIL = Bipartisan Infrastructure Law
IRA =Inflation Reduction Act

NEVI Plans

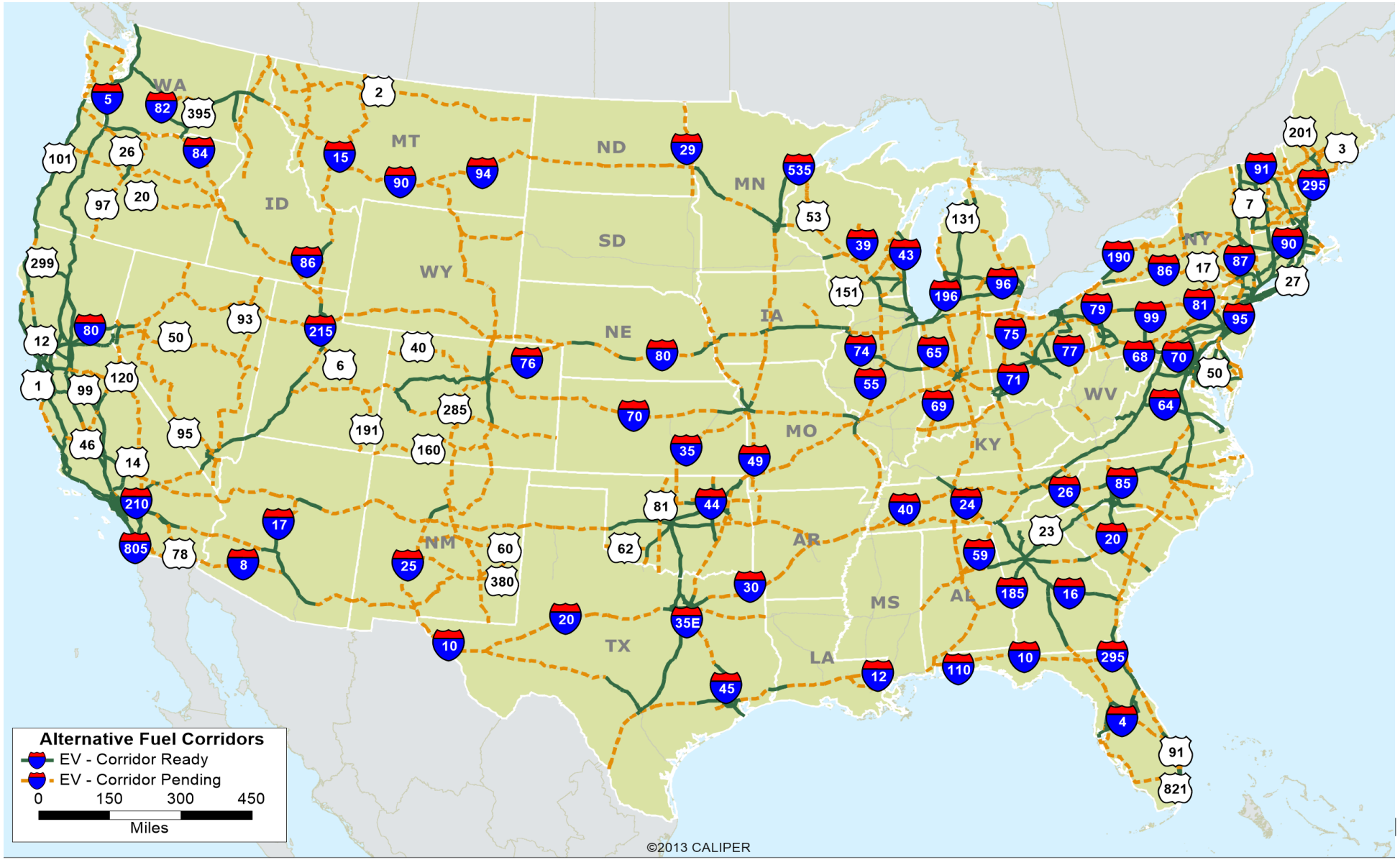
All 50 States, plus DC and Puerto Rico

National Electric Vehicle Infrastructure Act

- Electric Vehicle (EV-Round 1,2,3,4,5 and 6) - FHWA HEPGIS Maps (dot.gov)
- Each State. Plus DC and PR have Approved Plans for Deploying DC Fast Charge
- Alt Fuel Corridors Include Most Inter and Intrastate Highways
- Sites Will be Located Every 50 Miles; Within 1 Mile of Highway
- Each Site Will Need 600 KW Available to Charge 4 Vehicles
- Site Hosts/Real Estate Needed ! MOST IMPORTANT
- ABM eMobility Participating in Multiple States

Infrastructure: Alternative Fuel Corridors

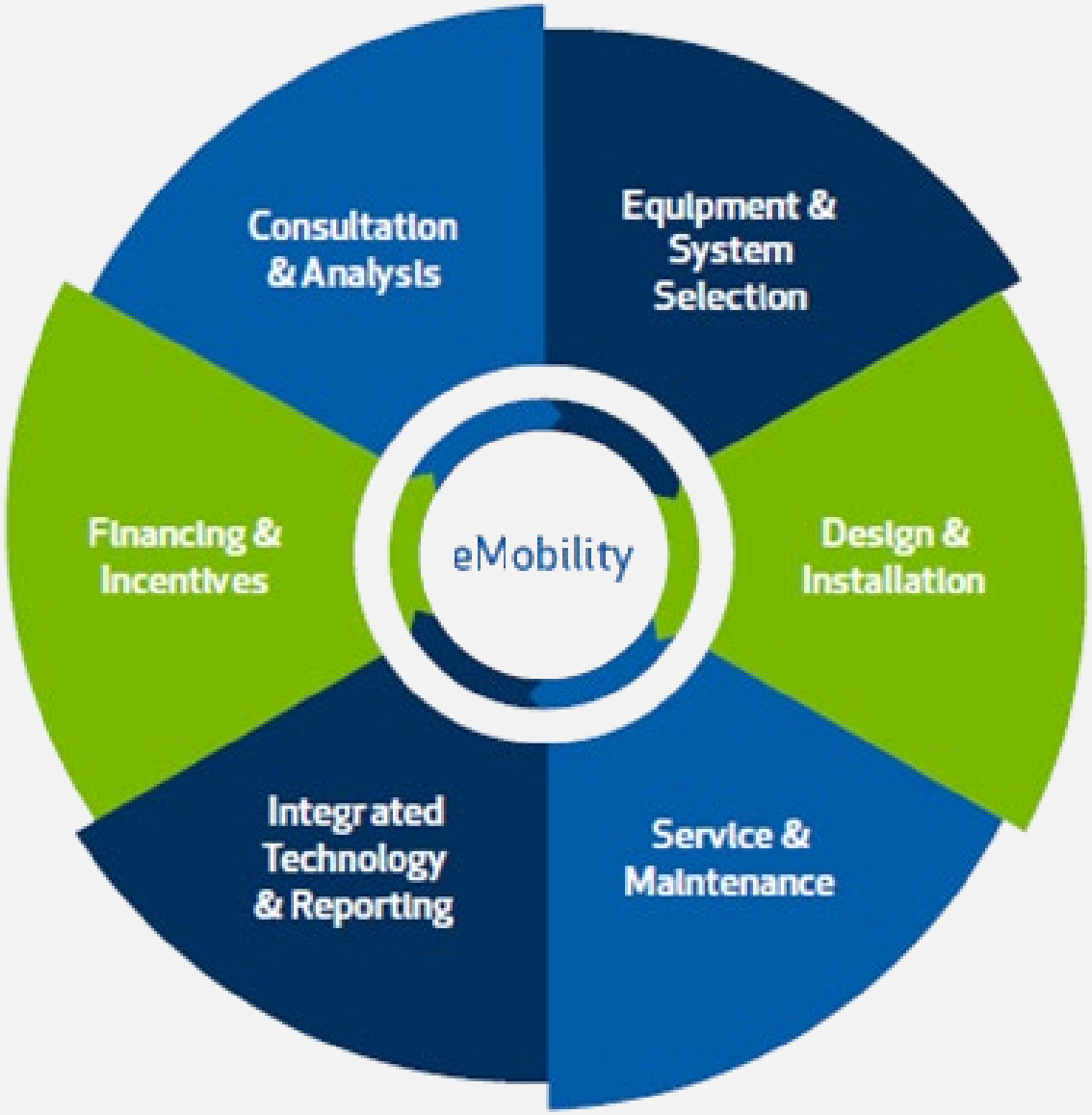
Designated EV Corridors for NEVI Funding:



eMobility Turnkey Solutions : Where do we Start?

Questions for Clients:

- *Have you started an EV implementation?*
- *Are you working with Clean Cities?*
- *Are you familiar with the current federal, state, and local requirements for offering and funding EV charging programs?*
- *Do you have near-term and long-term goals for your EV implementation?*



EVSE USA Equipment Options

(~3 miles/ kWh)

Level 1
AC
3-5 MPH

- 120V @ 12-16A
- 15-20A Dedicated Circuit/Outlet

Level 2
AC
18-60 MPH

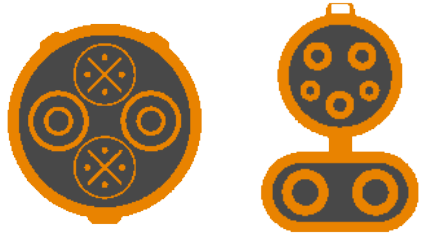
- 208 / 240V @ 32A
- 7.2 kw 40A Dedicated Circuit up to 19.2kW 80A Dedicated Circuit per Port

Level 3
DC FAST CHARGE
60-600 MPH

Low Power DC
- 240V, 208V, 480V
- 22.5-65kW 40A-125A Dedicated Circuit

Mid-Power DC
- 480V 3-Phase "WYE"
- 70-100kW
- 150-300A Feeder

High Power DC
- 480V-13.2kV 3-Phase "WYE"
- 150-500kW
- 200-800A Feeders & Cooling



Mega Watt
DC
MCS

- 3-Phase "WYE"
- 3,750 kW
- 1250VDC
- 3,000 ADC
- Standard vehicle location

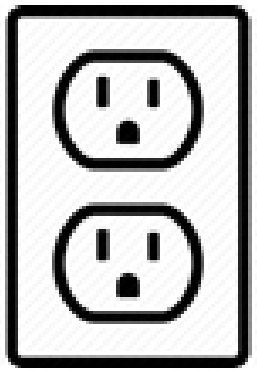
EV Charging

Level 1

Charger Types

Level 1: 1.5-1.9 kW typical

- Cord-set connects to a regular outlet
- Single-phase hookup produces about 1.5kW
- Charge time is 7 to 80 hours
- Meets overnight charging needs
- 3-6 miles per hour of charge



EV Charging

Level 2

Current: Charger Types

Level 2: 7.2 -19.2KW

- Wall or Pedestal mount
- 208 - 240VAC single phase
- 40-80A two pole circuit breaker
- Single-phase hookup produces about 6.6-19.2 kW
- Charge time is 4 to 24 hours depending on battery
- 21-57 miles per hour of charge
- Most common home and public charging station
- Charge rate is limited by onboard rectifier

EV Charging
Level 3

Current: Charger Types

Level 3: 22.5-180 KW

- Wall mount
- 208 - 240VAC single phase
- 100A two pole circuit breaker or 480V (WYE) three phase, 40A three pole circuit breaker
- Pad mounted all in one unit: 480V (WYE) three phase, 80 - 300A three pole circuit breaker
- Produces about 22.5-180 kW
- Charge time is 1.5 to 5 hours
- 67-500 miles per hour of charge.
- Charge rate is limited by Battery Control Module

EV Charging

Level 4

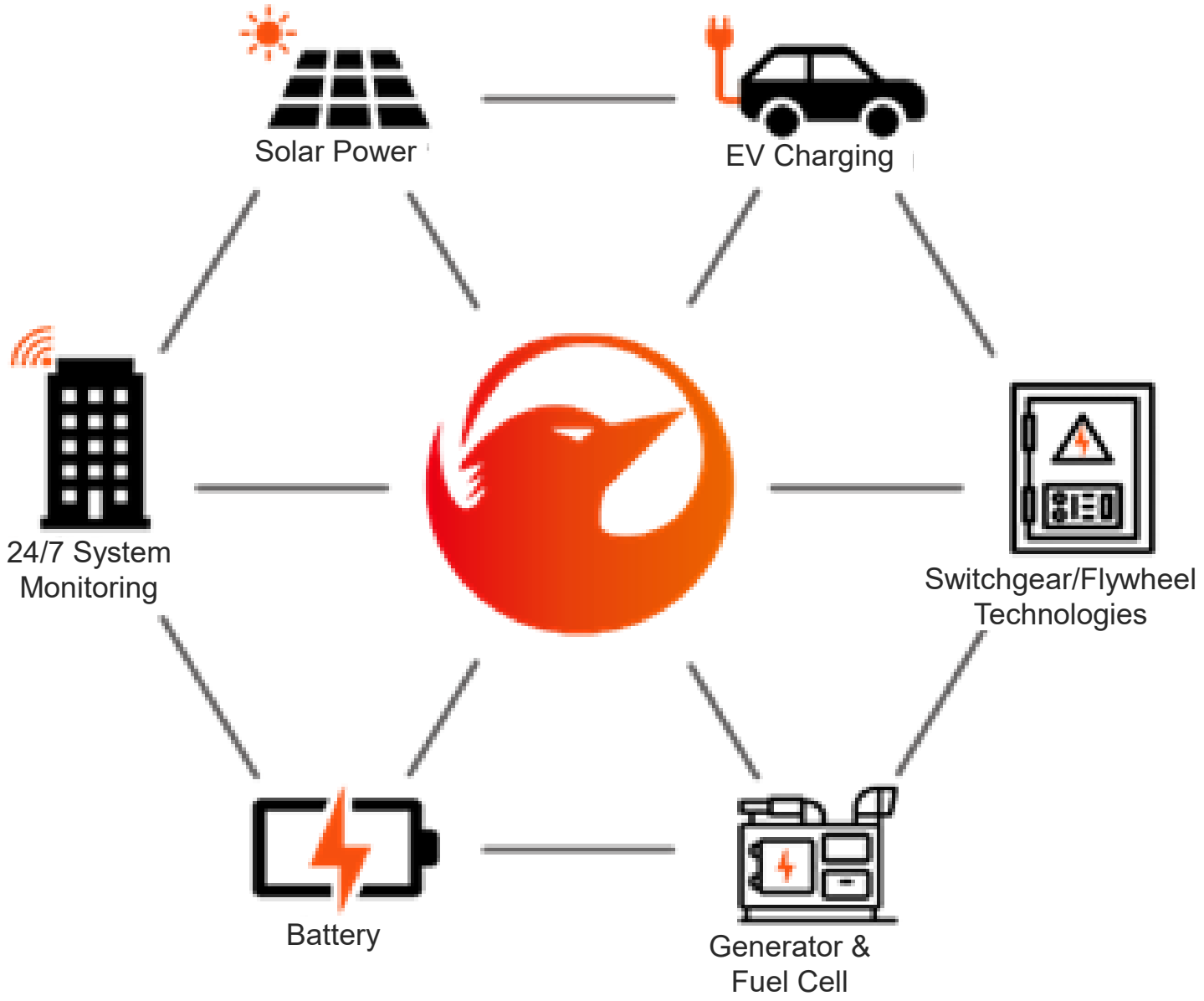
Future: Charger Types

Level 4: 150-500+ KW

- Pad mounted all in one unit, 480V (WYE) three phase, 200 – 300+A three pole circuit breaker
- Produces about 150-500+ kW
- Charge time is 1/2 to 2 hours
- 400-600 miles per hour of charge
- Charge rate is limited by the Battery Control Module

Resilience

- Ravenvolt
- Nationwide advanced turn-key microgrid systems
- Utilized by commercial and industrial customers, national retailers, utilities, and municipalities.



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Current: EVSE Suppliers

ABB
AddENERGIE Solutions de recharge | Smart Charging Solutions
AeroVironment
ATOM POWER
AUTEL
blink
BOSCH
BTCPower
chargepoint
ClipperCreek RELIABLE. POWERFUL. MADE IN AMERICA.
DELTA
EATON
efacec
eMotorWerks
enel x
EVBOX
nrg EVgo
EVOCHARGE
EVSE LLC
flo
FREEWIRE
Guidehouse
heliox
ies Beyond Charging
IoTecha
juicebar
LITEON
noodoe
NUVVE
POWER ELECTRONICS
powerflex EDF renewables
Rhombus Energy Solutions
SemaConnect
SIEMENS
TRITIUM
UVEYE
WattZilla

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EVSE Networks

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ABB
AMPLY FLEET CHARGING SIMPLIFIED
ampUp
ATOM POWER
blink
BTCPOWER
CHARGELAB
chargepoint
Chargie
eMotorWerks SMART [GRID] EV CHARGING
electrify america
enel x
EV+
nrg EVgo
EV PASS PORT
flo
Guidehouse
juice bar
loop ev charging network
THE MOBILITY HOUSE
noodoe
NUVVE
power dot
powerflex EDF renewables
SemaConnect
Shell Recharge
SIEMENS
TESLA

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EVSE User/Owner Operating System Platform

- Tiered Pricing Capabilities
- Time Based Pricing
- Prepaid Cards
- Consumer Loyalty Programs
- Promotions/Marketing
- Payment Gateway Integration
- Load Management
- Fleet Charging
- Client or ABM Managed

Membership Management Application

Questions?

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