EV Boot Camp

April 6, 2023
Carl Lisek, Executive Director
Drive Clean Indiana







Learning Outcomes



- Establish sustainable, reciprocal relationships with communitybased organizations and diverse community members, and support community-based decision-making for transportation initiatives and projects
- Leverage existing skillsets to support EJ efforts, and recognize the role that Drive Clean Indiana can support these communityfocused initiatives
- Gather feedback on mobility inequities in underserved communities and cascade to high-level partners (i.e., DOE's VTO) to identify gaps in Clean Cities initiatives and to better serve all communities



Agenda

- Who is DCI?
- Clean Cities Coalition
- Projects
- Basics
- Vehicles
- Infrastructure
- Other Considerations
- Additional Resources



Clean Cities Coalition Network

Building partnerships to advance affordable, domestic transportation fuels and technologies



Clean Cities Coalitions:

- Serve as forums for local stakeholders to connect and collaborate on saving energy and using affordable alternative fuels
- Provide grassroots support and resources on new transportation technologies and infrastructure development
- Support networks to help their stakeholders identify cost-effective solutions that work locally

Clean Cities Portfolio



Light-, Medium-, and Heavy-Duty Vehicles



Alternative and Renewable Fuels and Infrastructure



Idle Reduction Measures and Fuel Economy Improvements



New Mobility
Choices and
Emerging
Transportation
Technologies

National Network of Clean Cities Coalitions

More than 75 active coalitions covering nearly every state with thousands of stakeholders

cleancities.energy.gov







Past Electric Projects:

- NIPSCO IN-CHARGE -\$2M in EV
- Michigan to Montana (M2M) I-94 Clean Fuel Corridor
- EV Charging for MUD
- Drive Electric USA



NIPSCO IN-CHARGE

"At Home" Program (Started April 2012) Budget = \$1M

- •\$1,650 credit towards the installation of a Level 2 home charging station for first 250 customers
- •Free off peak electricity for EV Charging from 10 PM to 6 AM through 1/31/17
- Convenient one stop shop for installation
- •NIPSCO will purchase 3 years of REC's for all EV consumption in the program.

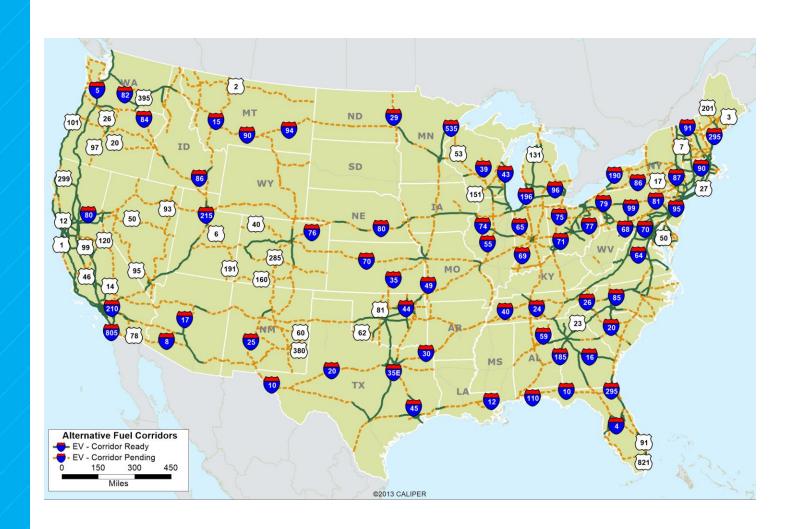
"Around Town Program (Started Feb. 2014) - Budget = \$1M

- Provide up to 2 Free dual port ChargePoint Level 2 Charging Stations
 - Includes shipping and activation
 - Provide 50% credit towards the installation cost for up to \$3,000 per customer
 - If customer self installs, then the customer forfeits any installation payment
 - Provide a 2 year subscription to ChargePoint Network
 - •Convenient one stop shop for installation



• Provide a rebate for 50% of the total installation cost for any Level 3 Charging Station (including charger) for up to \$37,500.

M2M: I-94 Corridor





Vehicle Charging Innovations for Multi-Unit Dwellings

VCI-MUD Goal: Identify and address barriers to multi-unit dwelling (MUD) and curbside residential plug-in electric vehicle (PEV) charging.

VCI-MUD Approach:

- Engage stakeholders to document barriers to MUD and residential curbside PEV charging
- Gather baseline data from existing MUD and residential curbside charging stations
- Demonstrate innovative technologies that address identified barriers
- Compile project findings in an easy-to-use toolkit
- **Disseminate the toolkit** across national, regional, state, and local channels



Current Projects:

- Drive Clean Rural USA
- Drive Electric USA
- I-80 Mid-America Alternative fuel Corridor
- GOEVIN
- Indiana Green Fleet Program
- Note Worthy Projects
- Empower Workplace Charging

Drive Clean Rural USA

 Drive Clean Rural USA is engaging with Indiana government leaders, business owners, fleet managers and farmers to remove barriers and accelerate access to clean fuel solutions that deliver financial savings, clean air and economic opportunity to rural communities.

 This eight-state DOE-funded project focuses on alternative fuel options through technical assistance, clean fuel transition planning & demo vehicles with an emphasis on business & job growth.



Drive Electric USA

Drive Electric USA is engaging with 18 states Indiana government leaders, business owners, fleet managers and farmers to remove barriers and accelerate access to clean fuel solutions that deliver financial savings, clean air and economic opportunity to rural communities.

This twenty DOE-funded project focuses c alternative fuel options through technical assistance, clean fuel transition planning & demo vehicles with an emphasis on business & job growth.

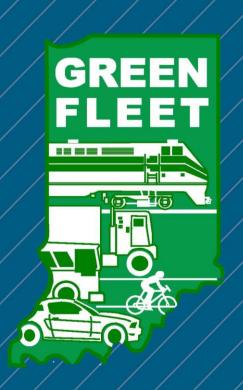


I-80 Mid-America Alt. Fuel Corridor

Drive Clean Indiana is working across I-80 with the U.S. Department of Energy, Argonne National Laboratory, the Federal Highway Administration, IDEM, INDOT, other state DOTs and designated Clean Cities coalitions from New Jersey to Nebraska to develop a deployment plan for alternative fuel infrastructure, including DC fast charging, along the I-80 corridor.



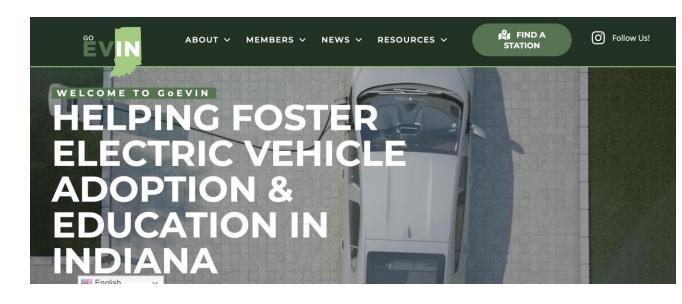
Indiana Green Fleet Program



- DCI manages the Indiana Green Fleet Program for the State of Indiana. Manage NIRPC Green Fleet Programs
- Goal of the program: To improve the environmental performance of public, private and nonprofit vehicle fleets in Northwest Indiana.
- DCI currently guides over 100 private, municipal, county, school & university member fleets to help mitigate barriers associated with sustainable transportation adoption while creating policies supporting vehicle emission & petroleum use reductions.
- Over \$51 Million awarded in 2021 & 2022!

GoEVIN

- -5 Year Contract to provide education, outreach and marketing for Indiana's EV Corridor
- -Funded by IDEM's VW Settlement program
- -61 DCFC to be in operation by end of 2023





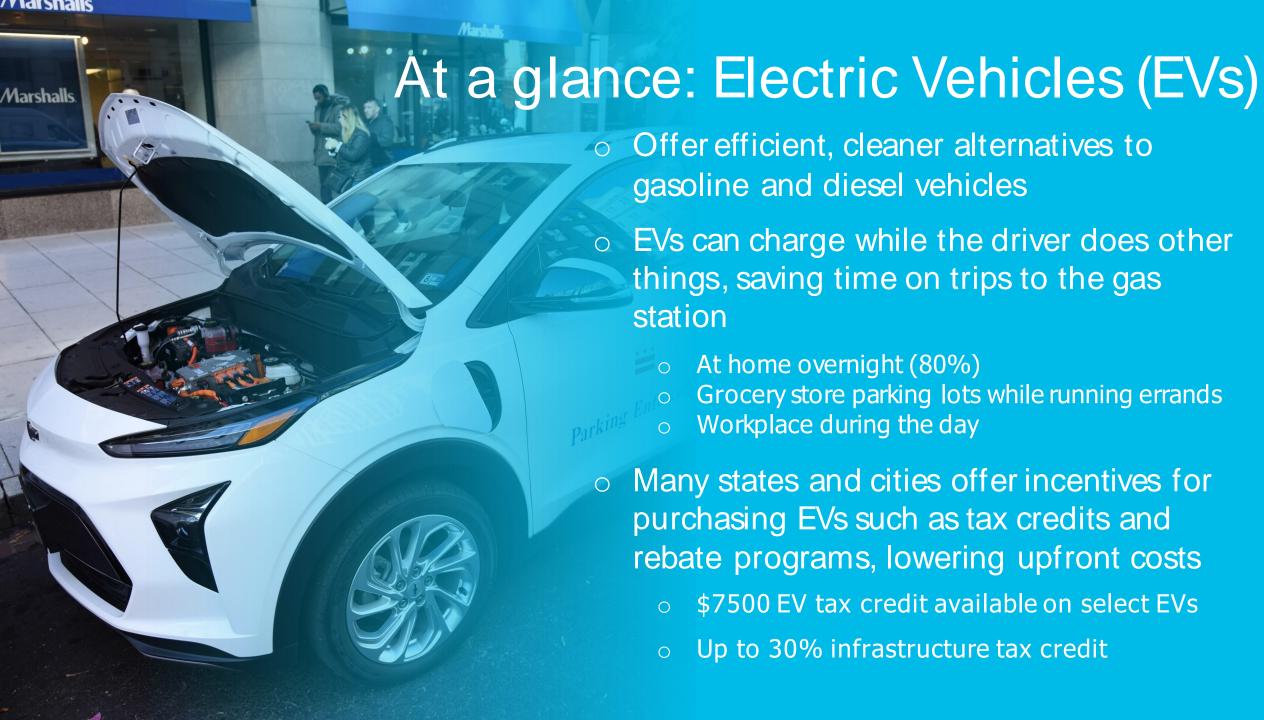
Note Worthy Projects

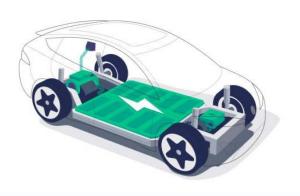
- 1. 56 (Level 2) Charging Stations Deployed
- 2. Three Electric Trucks
- 3. Two Electric Refuse Trucks
- 4. Electric Material Handlers
- 5. Electric Railcar Mover
- 6. 12 Electric School Buses (26 total in Indiana)















Battery Electric Vehicles (BEVs)

- Fully electric and rechargeable batterypowered system
- 100-400 miles on a single charge
- No tailpipe emissions
- Regenerative braking

Plug-In Hybrid Electric Vehicles (PHEVs)

- Equipped with both gas and electric capabilities
- Increased fuel efficiency results in lower tailpipe emissions
- o 50 miles from electricity
- Regenerative braking

Hybrid Electric Vehicles (HEVs)

- Equipped with both gas and electric capabilities
- Increased fuel efficiency
- Has internal battery but does not recharge by plug-in charging
- Regenerative braking

EVs from manufacturers other than Tesla

BEVs PHEVs



Nissan LEAF MSRP \$27,800 MSRP (after federal & state rebates) \$17,800 Electric range 212 miles



Toyota Prius Prime (PHEV) 1	
MSRP	\$28,670
MSRP (after federal & state rebates)	\$27,170
Electric range	25 miles



Chevrolet Bolt EV

MSRP \$31,500

MSRP (after federal & state rebates) \$21,500

Electric range 259 miles



Kia Niro Plug-In Hybrid (PHEV) 1	
MSRP	\$29,590
MSRP (after federal & state rebates)	\$28,090
Electric range	26 miles



Ford F-150 Lightning	
MSRP	\$39,947
MSRP (after federal & state rebates)	\$29,947
Electric range	320 miles



Ford Escape (PHEV) •	
MSRP	\$35,455
MSRP (after federal & state rebates)	\$25,455
Electric range	37 miles

Types of Chargers

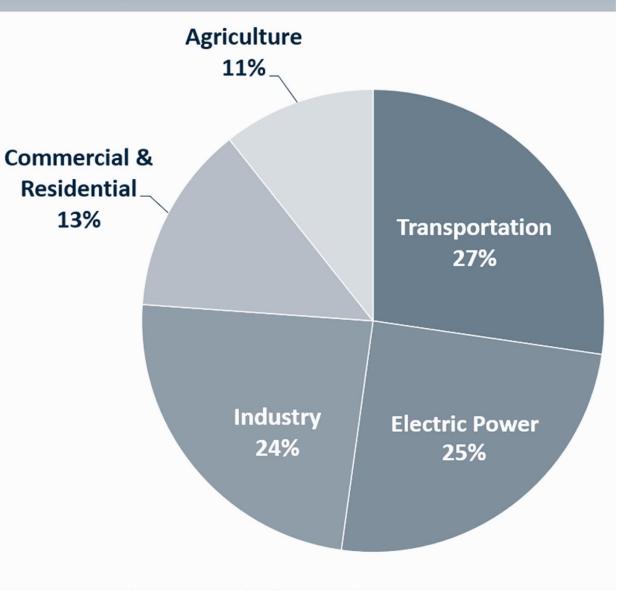
At-home and Private Charging

- Level I (110 Volts): Basic charger equipped for standard outlet
 - Adds 2-5 miles of range per hour of charging
 - BEV charge time can be upwards of 40 hours, more efficient for PHEVs
- <u>Level II (240 Volts)</u>: Most common charger requiring little to no electrical upgrade
 - Adds 10-30 miles of range per hour of charging
 - 4-10 hours for full charge

On the Go and "Corridor" Charging

- Level III/DC Fast Charging (480 Volts):
 The fastest and most efficient charger
 - Adds 100-200+ miles of range in as little as 30 minutes
- Level II Chargers are commonly used for public infrastructure around the community

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2020



Environmental Benefits

- EVs and PHEVs help tackle the largest contributor of U.S. greenhouse gas emissions
- Improved air quality via fewer greenhouse gas emissions and reduced air pollutants
- BEVs produce zero greenhouse emissions and PHEVs emit much lower emissions compared to gas and diesel vehicles
- Emissions from electricity
 production for transportation are
 less than 1% of total emissions

Health Risk Mitigation

- Not only does clean energy pose environmental benefits, but can also improve community health and racial environmental disparities
- Underserved communities experience disproportionate health risks such as asthma, cancer, and other respiratory illnesses
- The wide-scale electrification of vehicles can have beneficial effects on community health
 - GPTC adoption of electric transit buses in Gary, IN



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





Basics: Electricity as a Fuel Source

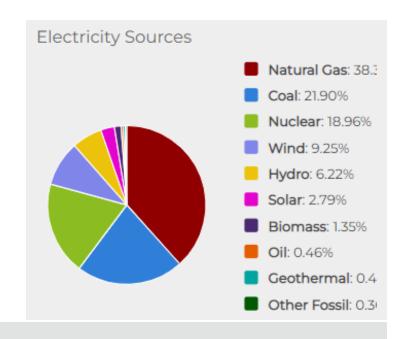
- Electricity is considered an alternative fuel under the Energy Policy Act of 1992
- EVs draw from electrical power sources to charge their batteries





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



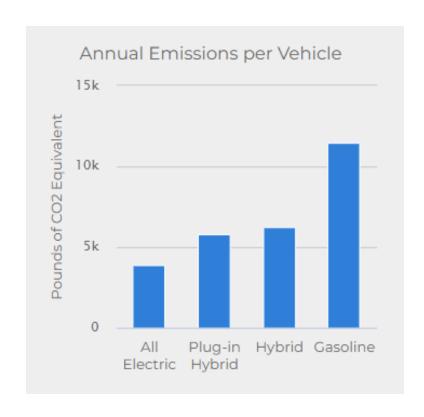
Basics: Benefits

Benefits:

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

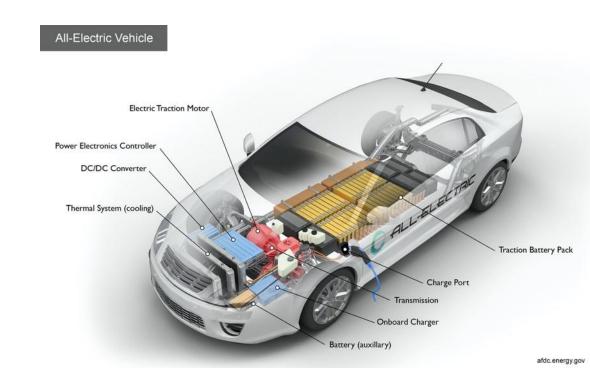
Considerations:

- Higher initial vehicle cost
- Infrastructure availability
- Battery life



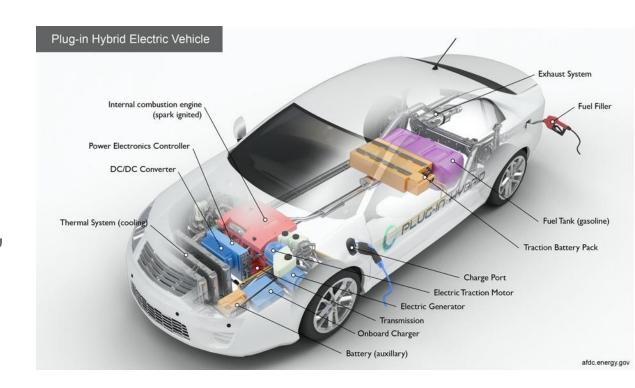
Vehicles: EVs

- 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



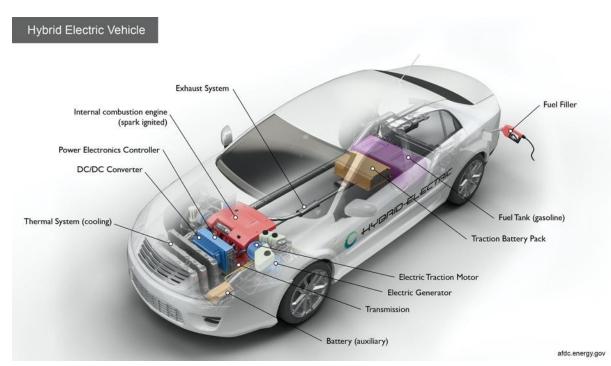
Vehicles: PHEVs

- 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: 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 Drive Clean Indiana at info@drivecleanindiana.org
- 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

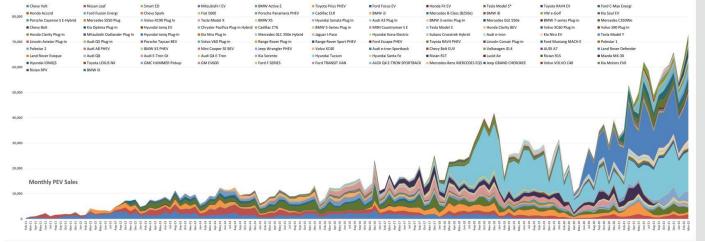


The U.S. Department of Energy is supporting the Lithium-Ion Battery Recycling Prize to develop battery-recycling processes.

Vehicles: Light-Duty Vehicle Availability

- EVs, PHEVs, and HEVs widely available
- New models rolling out nationwide





Helpful Resources

- AFDC Alternative Fuel and Advanced
 Vehicle Search—find available electricdrive vehicle models
- Electric Drive Transportation Association's
 Electric Drive Sales page—see current
 information on electric-drive vehicle sales

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

Infrastructure: Electric Vehicle Charging Infrastructure

Type of Charger	Current Type	Input Voltage (V)	Power Output	Typical Charging Time	Primary Use
Level 1	Alternating Current (AC)	120 V	1 kW	~5 miles of range per hour of charging	Residential (comes with EV)
Level 2	AC	208 V or 240 V	7 – 19 kW	~25 miles of range per hour of charging	Residential Commercial
DC Fast	Direct Current (DC)	480 V	50 – 350 kW	100–200+ miles of range per 30 minutes of charging	Commercial
Wireless	AC	Varies	Varies	10–20 miles of range per hour of charging	Commercial



Infrastructure: Extreme Fast Charging

- Power outputs of up to 350 kW and higher
- New EV models will be able to charge at higher rates
- May provide up to 200 miles of charge in less than 10 minutes



Infrastructure: Connectors and Plugs

Type of Charger	Charging Standard		
Level 1	SAE J1772		
Level 2	SAE J1772		
DC Fast	CHAdeMO CCS (SAE J1772 Combo) Tesla Supercharger		
Wireless Charging	SAE J2954		



Infrastructure: Charging at Home and in Public

Charging at Home

- Most charge overnight at home using a Level 1 outlet or installed Level 2 charging infrastructure
- Installation requires permitting and licensed contractors

Charging in Public

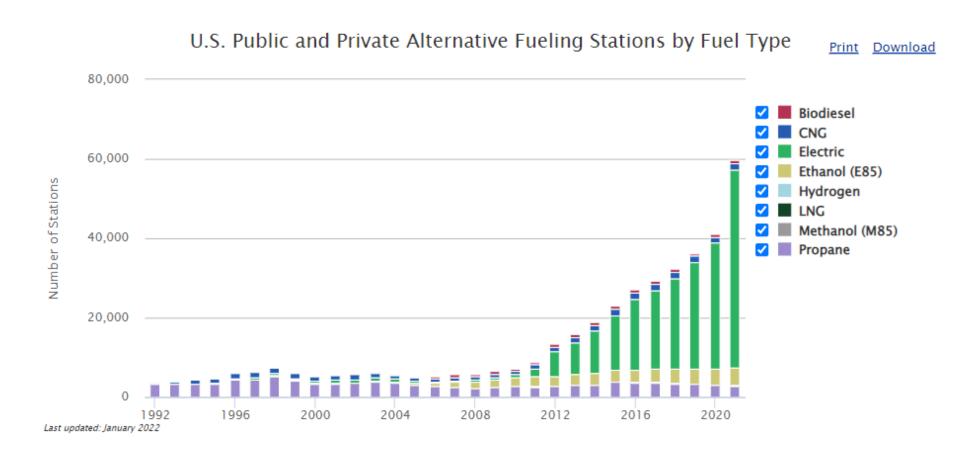
- Increases vehicle range, especially for consumers in dense urban areas
- Ideal public charging locations include:
 - Workplaces or office buildings
 - Shopping centers
 - City parking lots
 - Airports
 - Hotels





Infrastructure: Charging Infrastructure Availability

Station Growth Over Time:



NIRPC Territory Current and Planned

Red = Tesla Superchargers

Blue = Current Level 2

Green = Current DCFC

Yellow = Planned DCFC



Other Considerations:

Maintenance and Safety

- 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
- PHEVs and HEVs have maintenance requirements like conventional vehicles
- Electric-drive vehicles must meet the same safety standards as conventional vehicles



Other Considerations:

Tools

afdc.energy.gov/tools

Tools

The Alternative Fuels Data Center offers a large collection of helpful tools. These calculators, interactive maps, and data searches can assist fleets, fuel providers, and other transportation decision makers in their efforts to advance alternative fuels and energy-efficient vehicle technologies.



Calculators



Interactive Maps



Data Searches



EVI-Pro Lite

Estimate a city or state's need for vehicle charging and the effect on electric load.



Alternative Fueling Station Locator

Locate alternative fueling stations and get maps and driving directions.

mobile



Vehicle Search

Compare all classes of alternative fuel vehicles, electric vehicles, and hybrids.



AFLEET Tool

Calculate a fleet's petroleum use, cost of ownership, and emissions.



Alternative Fuel Corridors

Find maps and station data to help with nominating alternative fuel corridors.



Laws and Incentives Search

Search for laws and incentives related to alternative fuels and advanced vehicles.



Vehicle Cost Calculator

Compare cost of ownership and emissions for most vehicle models.

mobile



TransAtlas

Analyze vehicle densities and locations of fueling stations and production facilities.



Battery Policies and Incentives

Find policies and incentives for batteries developed for EVs and energy storage.



VICE Model

Evaluate the financial case for natural gas vehicles and battery electric buses.



Biofuels Atlas

Compare feedstocks and analyze biofuel production by location.



Fuel Properties Comparison

Compare alternative fuel properties and characteristics.

Other Considerations: **Tools**

afdc.energy.gov/tools



JOBS Model

Estimate economic impacts of deploying alternative fuel and charging infrastructure.



Coalition Locations

Find Clean Cities coalitions and contact information for coordinators.



Find a Car

Compare fuel efficiency, costs, carbon footprints, and emissions.



Heavy-Duty Vehicle Emissions

Calculate the emissions of alternative fuel medium- and heavy-duty vehicles.



Energy Zones Mapping Tool

Identify potential energy resource areas and energy corridors in the United States.



State Information

Find state information about alternative fuels and advanced vehicles.



EVolution: E-Drive Vehicle Education

Understand the costs and benefits of electric vehicles based on location.

Getting Started:

Questions to Ask

- What support can Drive Clean Indiana provide?
- What federal, state, and local incentives are available?
- What additional fees are associated?
- What are my driving range needs?
- What type of EV is best for me?
- How and where will my EV be charged each day?
- What level of charging will I need?
- Are there charging stations in my area? Are they public or private? Can I visit?
- Helpful Resource:
 - The AFDC Laws and Incentives Search provides information about available state and federal incentives for EVs and charging infrastructure.



More Information

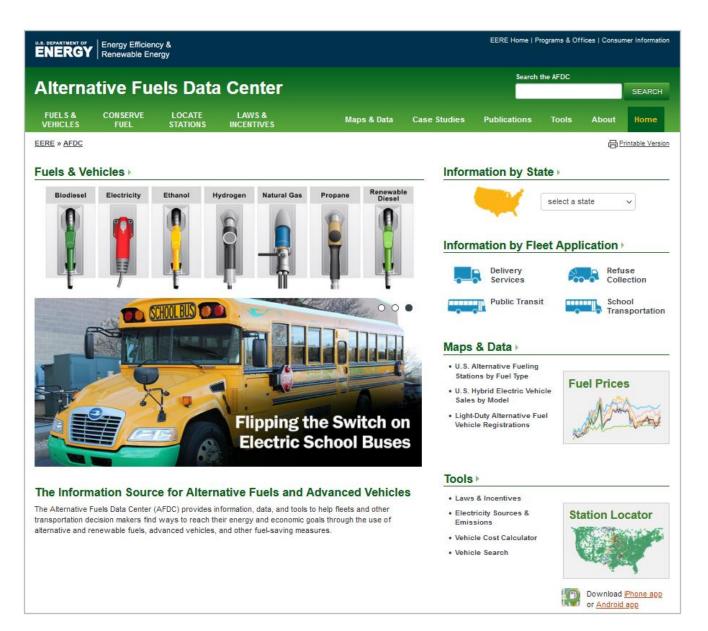
Drive Clean Indiana

DriveCleanIndiana.org

Alternative Fuels Data Center (AFDC) afdc.energy.gov

Plug In America pluginamerica.org

fueleconomy.gov



Potential Partnerships

- 1. Indiana Clean School Bus Consortium
- 2. EJ & DAC Education/Outreach
- 3. 20 Level 2 Charging Stations for EJ Communities
- 4. 80 Electric Pick up trucks coming to EJ Communities
- 5. Port Electrification Initiatives
- 6. Grant Opportunities

1. Charging and Fueling Infrastructure Program

Discretionary Grant Program for Charging and Fueling Infrastructure

- \$700 Million in FY2022 and FY2023
 - \$350 Million for Community Charging and Fueling Program
 - \$350 Million for Alternative Fueling Corridor Program
- 80% Funding
- Applicant must be public entity and stations must be publicly accessible
- Educational and community engagement activities to develop and implement education programs through partnerships with schools, community organizations, and vehicle dealerships to support the use (may not exceed 5% of the grant amount awarded)

2. Indiana NEVI Plan

- INDOT is investing more than \$100 million to build an EV charging network at strategic locations across Indiana.
 - Through the NEVI Formula Program, INDOT will contract with partners to build direct current fast charging (DCFC) stations along Indiana's federally-designated alternative fuel corridors.
 - Funding is available for up to 80% of eligible project costs, including:
 - The acquisition, installation, and network connection of EV charging stations to facilitate data collection, access, and reliability;
 - Proper operation and maintenance of EV charging stations; and,
 - Long-term EV charging station data sharing.
- Late 2023/Early 2024 RFP

3: Other Funding Opportunities

- 1. Low- and No-Emission Transit Bus Program (\$5.6 billion) U.S. DOT
- 2. Electric or Low Emitting Ferry Program (\$250 million)- U.S. DOT
- 3. Energy Efficiency and Conservation Block Grant Program (\$430M)
- 4. 2023 National DERA Program (TBD)

QUESTIONS?

Drive Clean Indiana



- DriveCleanIndiana.org
- **Q** 219-644-3690
- Info@DriveCleanIndiana.org
- O 10115 Ravenwood Drive, Suite B St John, IN 46375

References and Resources

- AFDC Alternative Fuel and Advanced Vehicle Search: https://afdc.energy.gov/vehicles/search
- AFDC EV Emissions page: https://afdc.energy.gov/vehicles/electric emissions.html
- AFDC EVI-Pro Lite tool: https://afdc.energy.gov/evi-pro-lite
- AFDC Station Locator Database: https://afdc.energy.gov/stations/#/find/nearest
- AFDC Vehicle Cost Calculator: https://afdc.energy.gov/calc
- Argonne National Laboratory AFLEET tool: https://greet.es.anl.gov/afleet
- Argonne National Laboratory Evolution tool: https://evolution.es.anl.gov
- Electric Drive Transportation Association Electric Drive Sales page: https://electricdrive.org
- Federal Fleet Training: Electric Vehicle Technology Overview: https://www.youtube.com/watch?v=UgUAfU3rCHU&list=PLmIn8Hncs7bEa NOG5Y8EZyONoxJtT0EF&index=1
- Federal Fleet Training Video 2: Electric Vehicle Financial Considerations:
 https://www.youtube.com/watch?v=Xdi7T rz75Q&list=PLmIn8Hncs7bEa NOG5Y8EZyONoxJtT0EF&index=3
- FuelEconomy.gov Alternative Fuel Vehicles: https://www.fueleconomy.gov/feg/alternatives.shtml
- Impacts Assessment of Plug-in Hybrid Vehicles on Electric Utilities and Regional US Power Grids: Part 1: Technical Analysis: https://www.researchgate.net/publication/237324999 Impacts Assessment of Plugin Hybrid Vehicles on Electric Utilities and Regional US Power Grids Part 1 Technical Analysis

References and Resources (Continued)

- Light Duty Electric Drive Vehicles Monthly Sales Updates: https://www.anl.gov/es/light-duty-electric-drive-vehicles-monthly-sales-updates
- Lithium-Ion Battery Recycling Prize: https://americanmadechallenges.org/batteryrecycling
- National Alternative Fuels Training Consortium First Responder Safety Training: https://naftc.wvu.edu/afv-safety-training-home/
- National Fire Protection Association EV Safety Training: https://www.nfpa.org/EV
- PlugStar by Plug In America: https://plugstar.com
- U.S. Department of Transportation Federal Highway Administration Alternative Fuel Corridor Program: https://www.fhwa.dot.gov/environment/alternative fuel corridors/



UPCOMING EVENTS

Drive Clean IN's Clean School Bus Consortium Webinar

April 11, 2023 at 10 a.m. CST

NIRPC Partner for Clean Air Awards & Luncheon

May 5, 2023 in Hammond, IN

Student Transportation News Conference

June 2nd – 6th, 2023 in Indianapolis, IN

Student Transportation Association of Indiana

June 26th – 29th in Westfield, IN

Drive Clean Indiana's Annual Conference & Expo

August 23, 2023 @ Blue Chip Casino, Michigan City, IN

Drive Clean Indiana's 11th Annual Clean Air Golf Outing

September 19, 2023 @ White Hawk Country Club, Crown Point, IN



Register at www.DriveCleanIndiana.org