Alternative Fuels and Advanced Vehicles: Resources for Fleet Managers

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National Renewable Energy Laboratory

Golden, CO

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Agenda

Resources for implementing alternative fuels & advanced vehicles

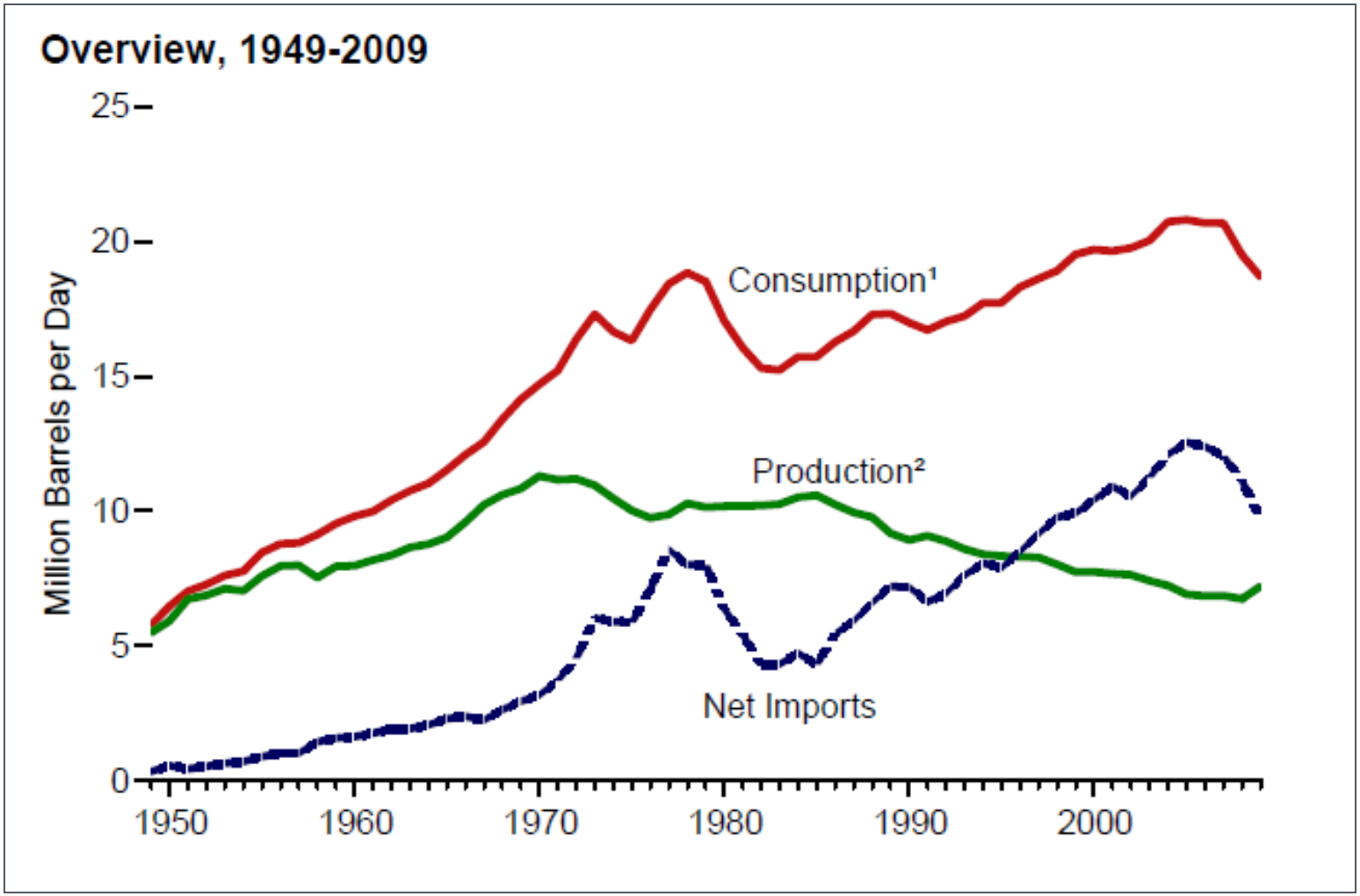
- Context and motivations
- Step 1: Learn about the options
- Step 2: See what others have done
- Step 3: Are there regulations or incentives that affect you?
- Step 4: Set baseline and goal
- Step 5: Explore options for your fleet
- Step 6: Get help
- Feedback & Discussion

Clean Cities Mission

To advance the energy, economic, and environmental security of the U.S. by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector.

- Sponsored by the DOE's Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Program
- Provides a framework for businesses and governments to work together as a coalition to enhance local markets
- Provides a way to coordinate activities, identify mutual interests, develop regional economic opportunities, and improve air quality

U.S. Petroleum Trends



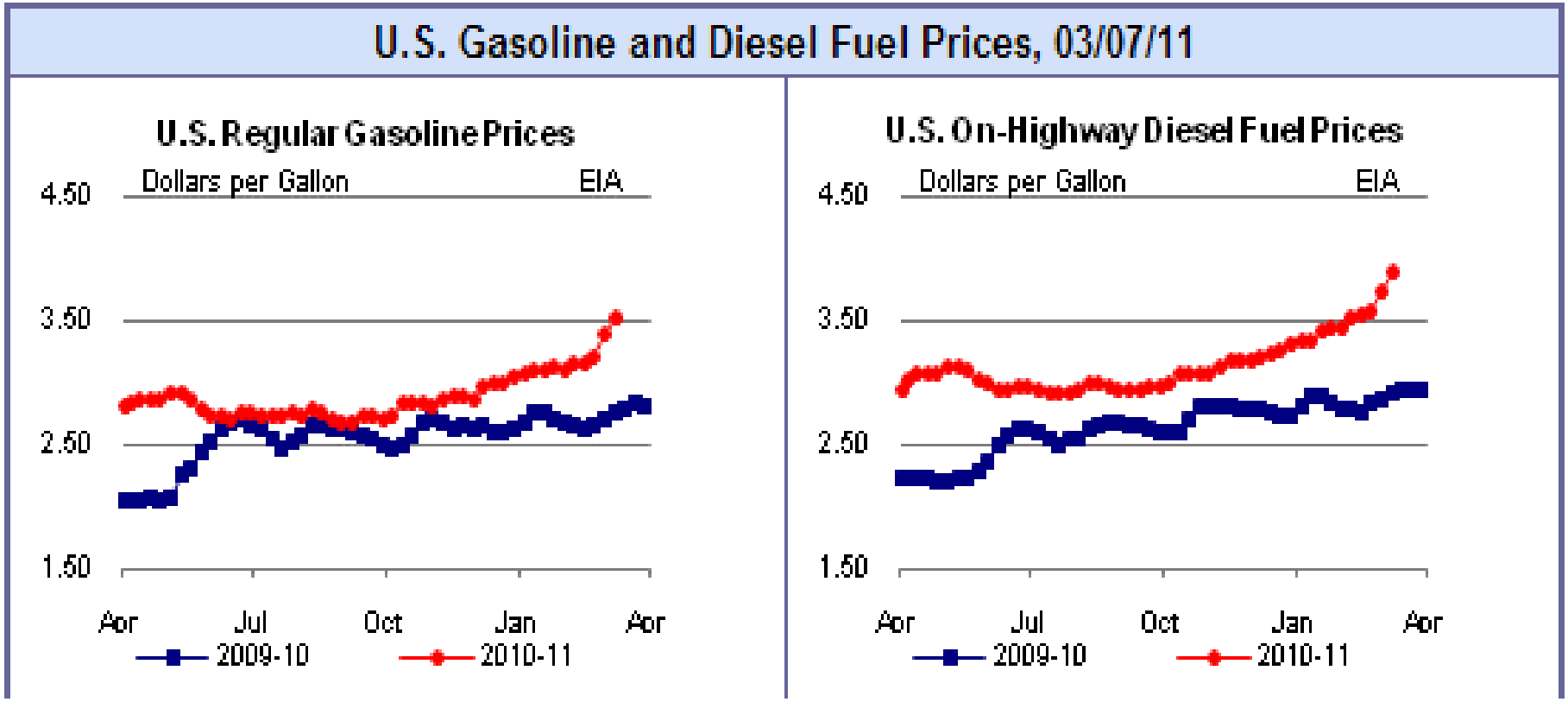
Source: Annual Energy Review 2009. Energy Information Administration.

Clean Cities Today

- 87 active coalitions in 45 states
- Coalitions cover 75% of U.S. population
- 8,400+ public, private stakeholders
- Coalitions generate 18:1 leveraging of Federal investment[1]

[1]http://www1.eere.energy.gov/cleancities/pdfs/49389.pdf

Gasoline and Diesel Prices



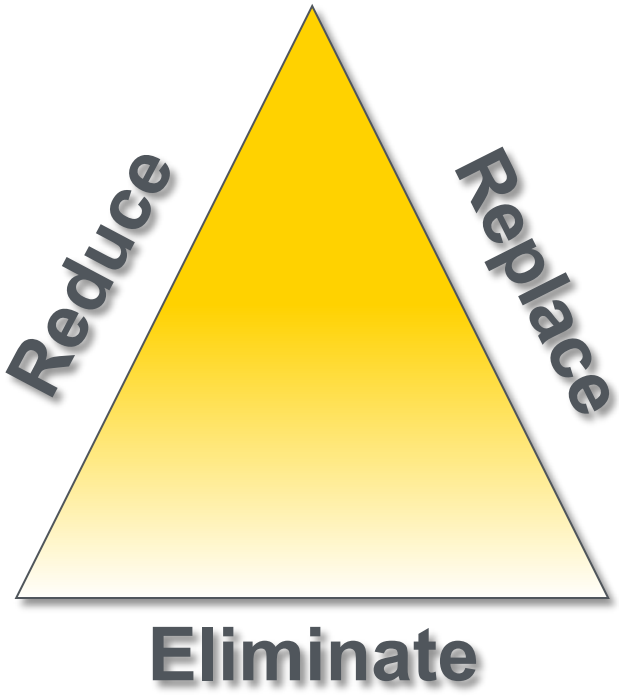
Source: http://www.eia.doe.gov/oog/info/gdu/gasdiesel.asp

Motivation and Goals

- Besides cost, motivators include:
  - Reducing emissions of air pollutants or greenhouse gases
  - Meeting Federal or state mandates
  - Responding to corporate goals
  - Supporting regional economy
  - Promoting green image

Petroleum Displacement Strategies

- **Reduce** by promoting energy efficiency in vehicles through advanced technologies and more fuel efficient vehicles.
- **Replace** petroleum with alternative fuels and low-level blends.
- **Eliminate** by promoting idle reduction, combining or eliminating trips, and other mileage reduction measures.



Clean Cities Portfolio of Technologies

Alternative Fuels and Vehicles

- Biodiesel (B100)
- Electricity
- Ethanol (E85)
- Hydrogen
- Natural gas
- Propane

Fuel Blends

- Biodiesel/diesel blends (B2, B5, B20)
- Ethanol/gasoline blends (E10)
- Hydrogen/natural gas blends (HCNG)

Fuel Economy

- Fuel efficiency
- Behavior changes
- Vehicle maintenance initiatives
- Reducing vehicle miles traveled (VMT)

Hybrids

- Light- and heavy-duty HEVs
- PHEVs

Idle Reduction

- Medium and heavy-duty trucks
- School buses
- Truck stop electrification

Step 1: Learn About the Options

cleancities.energy.gov

afdc.energy.gov

fueleconomy.gov

Learn About Fuel Options

Fuels Pages

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Alternative Fuels & Advanced Vehicles Data Center

About the FDC | Fuels | Vehicles | Fleets | Incentives & Laws | Data, Analysis & Trends | Information Resources | Home

Search | Search Help | More Search Options

Alternative & Advanced Fuels

- Biodiesel
- Electricity
- Ethanol
- Hydrogen
- Methanol
- Natural Gas
- Propane
- Ultra-low Sulfur Diesel
- Emerging Fuels
- Stations
- Fuel Properties
- Fuel Blends
- Fuel Prices

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More than a dozen alternative and advanced fuels are in production or use today. Although government-regulated and voluntary private fleets are the primary users of these fuels, consumers are increasingly more interest in them. Using these fuels is critical to reduce U.S. dependence on foreign oil and improve air quality.

Alternative Fuels

Alternative fuels defined by the Energy Policy Act of 1992 that are or have been commercially available for vehicles include:

- Biodiesel
- Electricity
- Ethanol
- Hydrogen
- Methanol
- Natural Gas
- Propane

Other Fuels

Several emerging fuels are currently under development. Many of these fuels are also considered alternative fuels and may have other benefits such as reduced emissions or increased energy security.

- Biobutanol
- Biogas
- Biomass to Liquids (BTL)
- Coal to Liquids (CTL)
- Fischer-Tropsch Diesel
- Gas to Liquids (GTL)
- Hydrogenation-Derived Renewable Diesel (HDRD)
- P-Series
- Ultra-Low Sulfur Diesel

Fuel Topics

Learn about these additional alternative and advanced fuel topics:

Site Map
EERE Information Center

- EVENTS
- FEATURES

Plug-in Ready? Read case studies featuring metro areas preparing for electric vehicles.

BioFuels Atlas Compare biofuels and feedstocks by location

Clean Cities MotorWeek Videos

TransAtlas Explore alternative fuel and vehicle data

Mobile Fueling Station Locator

Petroleum Reduction Planning Tool

Alternative Fueling Station Locator

Learn About Vehicle Options

Electric Drive Vehicle Section

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Alternative Fuels & Advanced Vehicles Data Center

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Alternative & Advanced Vehicles

- Light-Duty Vehicle Search
- Heavy-Duty Vehicle Search
- Flexible Fuel Vehicles
- Natural Gas Vehicles
- Propane Vehicles
- Hybrid, Plug-in Hybrid, & All-Electric Vehicles
  - Basics
  - Benefits
  - Availability
  - Emissions
  - Charging
  - Batteries
  - Maintenance & Safety
  - Deployment
  - Research & Development
  - Related Links
- Fuel Cell Vehicles
- Diesel Vehicles
- Conversions
- Resale
- Technician Training
- Idle Reduction
- Fuel Economy
- Emissions

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Site Map
EERE Information Center

Hybrid, Plug-in Hybrid, and All-Electric Vehicles

Hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and all-electric vehicles (EVs)—also called electric drive vehicles collectively—use electricity either as their primary fuel or to improve the efficiency of conventional vehicle designs.

Basics
Learn how electric drive vehicles work.

Benefits
Explore the benefits of electric drive vehicles.

Availability
Discover which electric drive vehicles are available commercially.

Emissions
Learn how emissions and fuel costs are calculated for electric drive vehicles.

Charging
Explore ways to charge electric drive vehicles at home and in public.

Batteries
Learn about energy-storage devices and recycling.

Maintenance and Safety
Learn about maintaining electric drive vehicles and their batteries.

Deployment
Learn about deployment and demonstration projects to commercialize electric drive vehicles.

Research and Development
Read about electric drive vehicle studies and trends.

Related Links

Plug-in Hybrid Electric Vehicle Basics

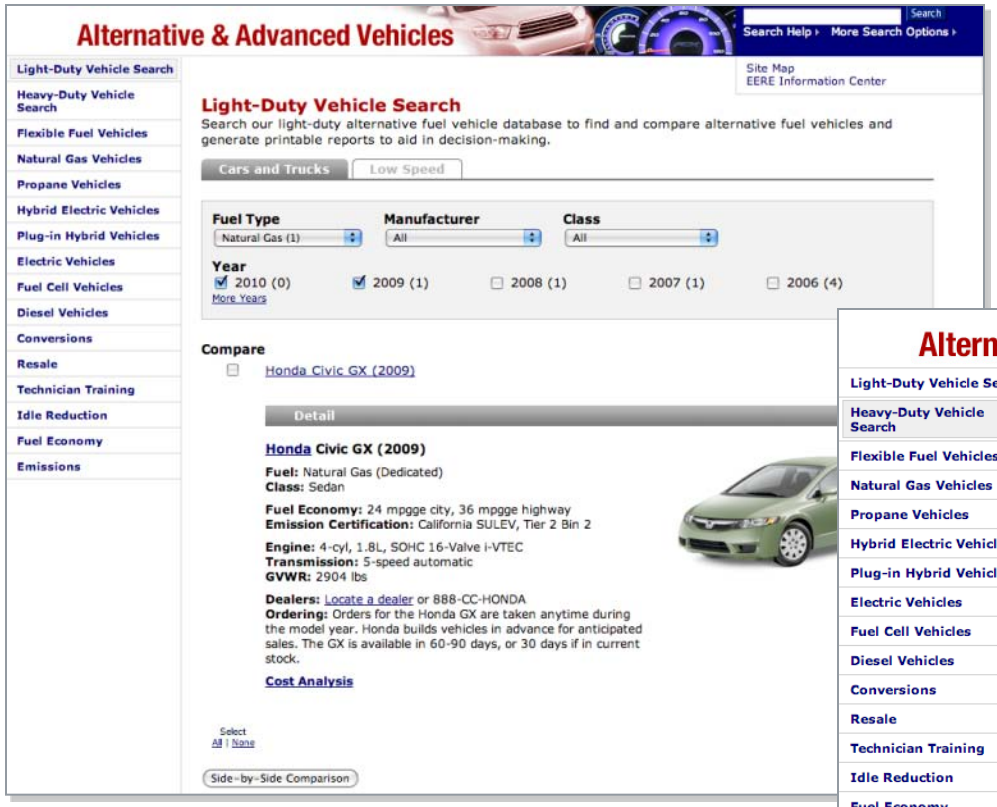
Tax Credits and Incentives
Plug-in hybrids and all-electric vehicles qualify for a $2,500 to $7,500 federal tax credit.

Some hybrid electric vehicles qualify for a light-duty HEV federal tax credit.

Find tax credits and incentives in your state.

Internet | 100%

AFDC Light- and Heavy-Duty Vehicle Search



Find Alt Fuel Stations Near You

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Alternative Fuels & Advanced Vehicles Data Center

About the AFDC | Fuels | Vehicles | Fleets | Incentives & Laws | Data, Analysis & Trends | Information Resources | Home

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Alternative & Advanced Fuels

- Biodiesel
- Electricity
- Ethanol
- Hydrogen
- Methanol
- Natural Gas
- Propane
- Ultra-low Sulfur Diesel
- Emerging Fuels
- Stations
  - U.S. Maps
  - Total Counts
  - Custom Query
  - Add/Delete a Station
- Fuel Properties
- Fuel Blends

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Site Map
EERE Information Center

Alternative Fueling Stations

Alternative fueling stations are located throughout the United States and their availability continues to grow. This page allows you to find alternative fuels stations near you or on a route, obtain counts of alternative fuels stations by state, view U.S. maps, and more.

The following alternative fuels are included in the mapping application: compressed natural gas (CNG), E85 (85% ethanol, 15% gasoline), propane/liquefied petroleum gas (LPG), biodiesel, electricity, hydrogen, and liquefied natural gas (LNG).

Alternative Fueling Station Mapping Resources

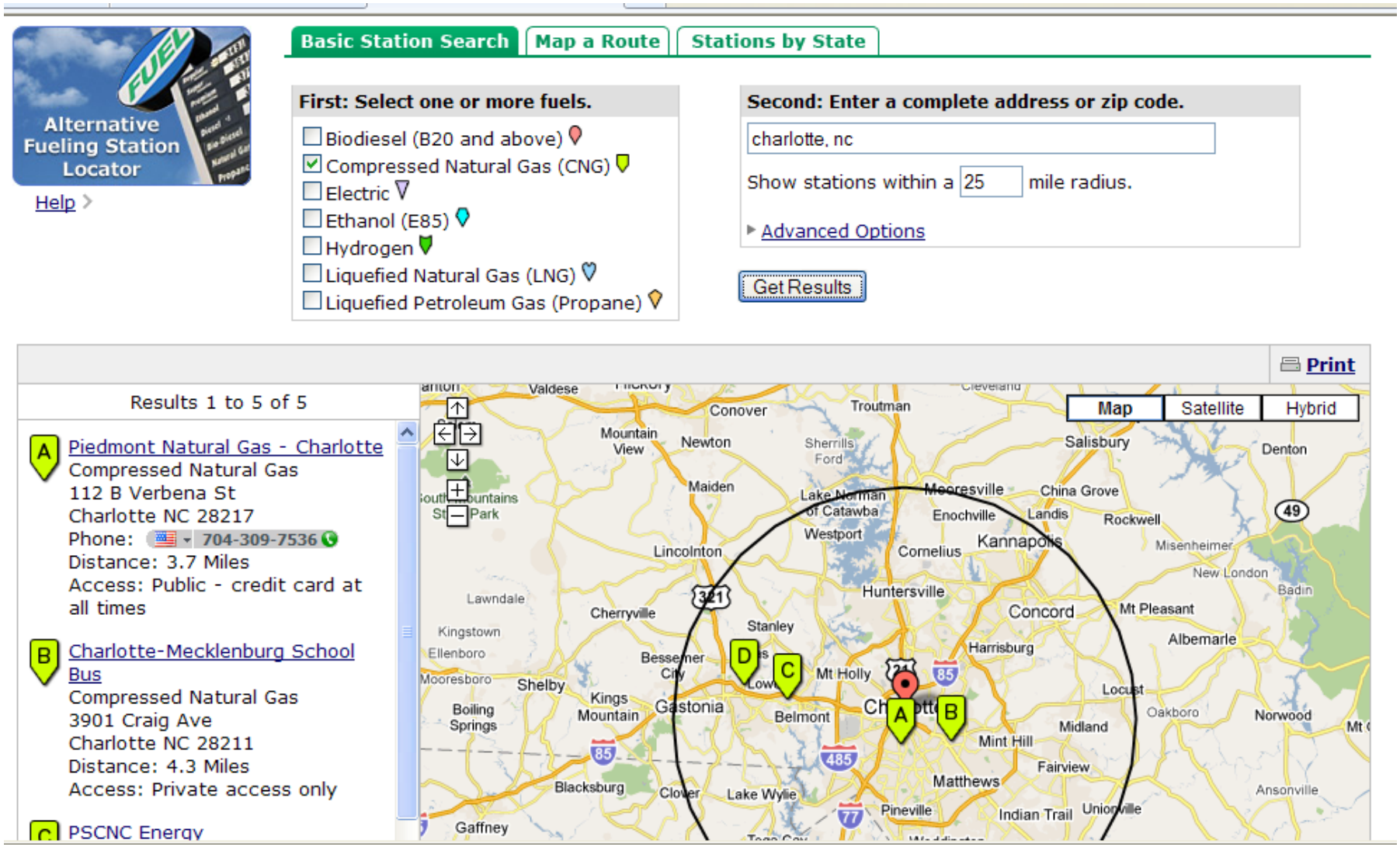
Alternative Fueling Station Locator
Find alternative fuel stations near a specific location or along a route.

U.S. Maps
Explore maps displaying alternative vehicle and fuel data.

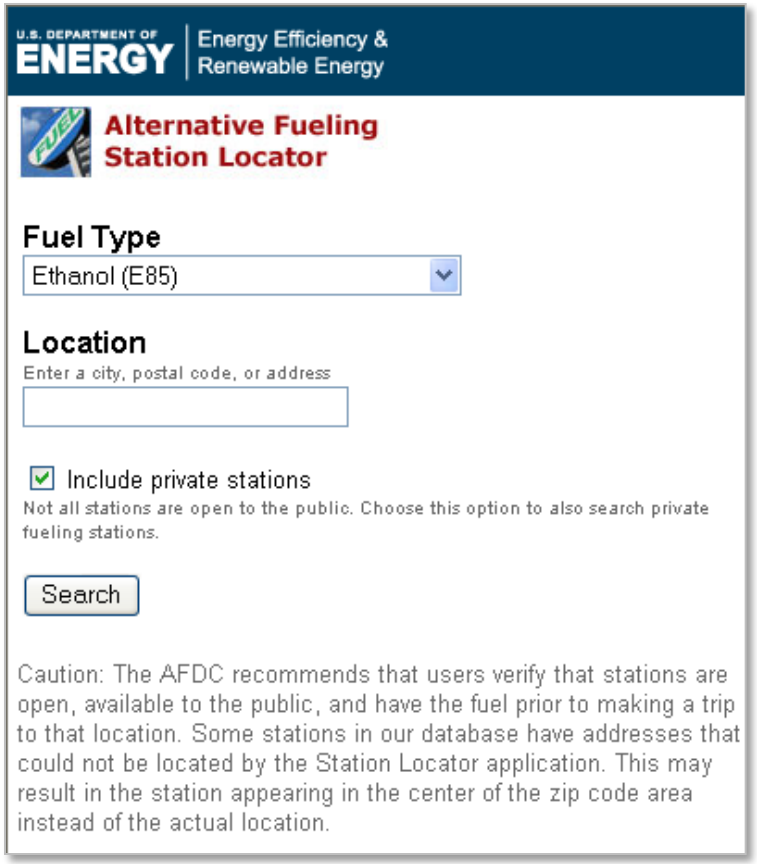
Total Station Counts
Obtain total station counts by state and fuel type.

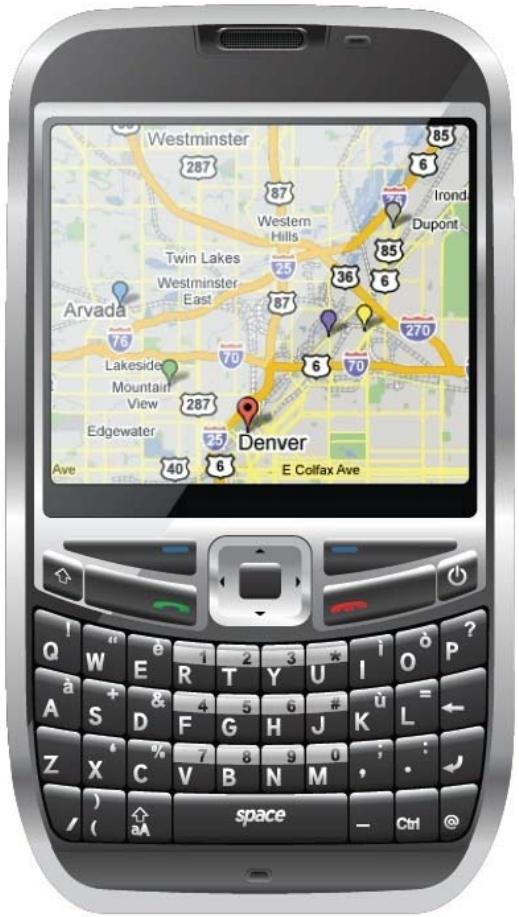
Custom Database Query
Search the stations database for specific fuel types in specific states or throughout the U.S.

Find Alt Fuel Stations Near You (example)



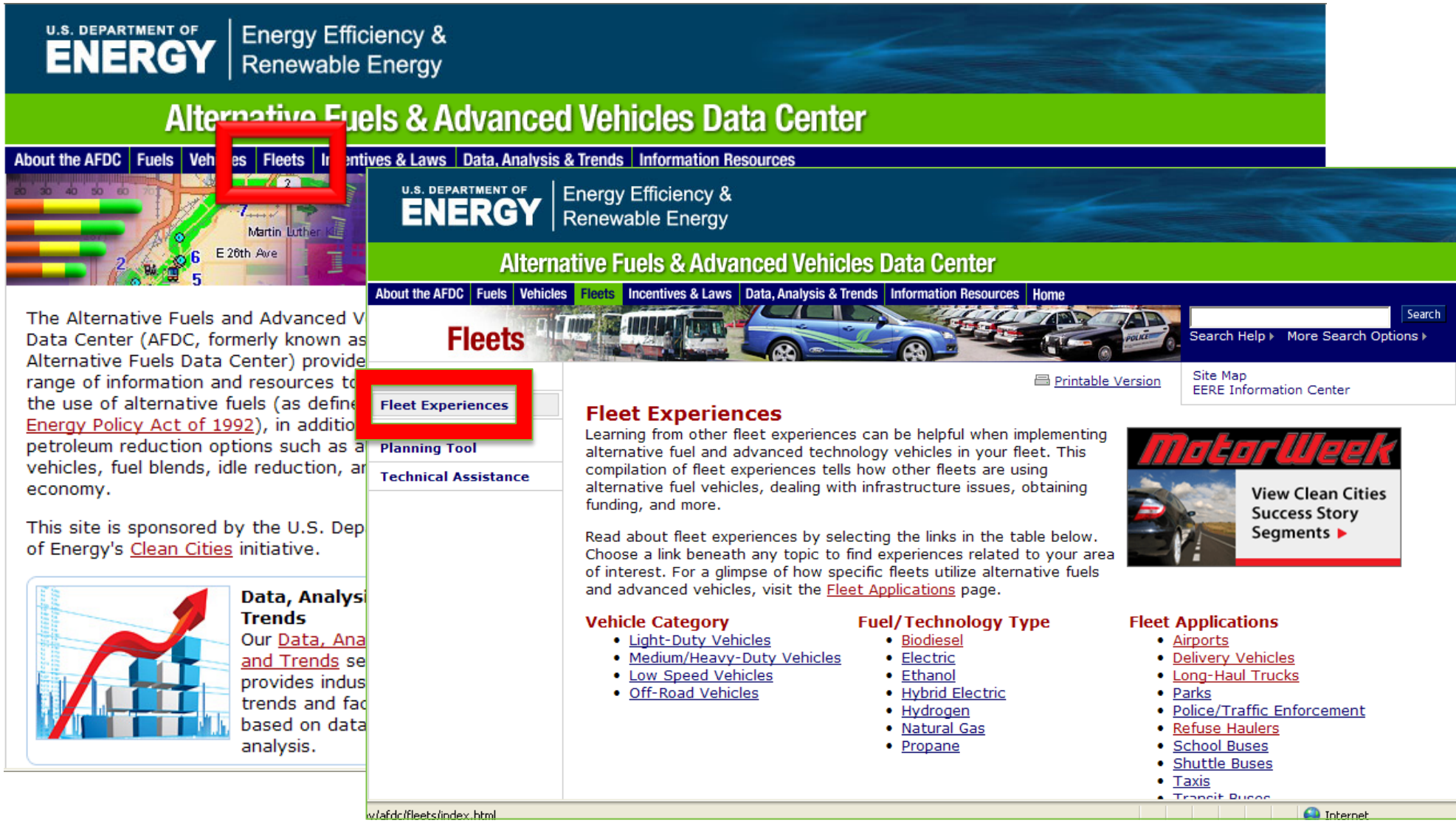
Find Fuel On-the-Go



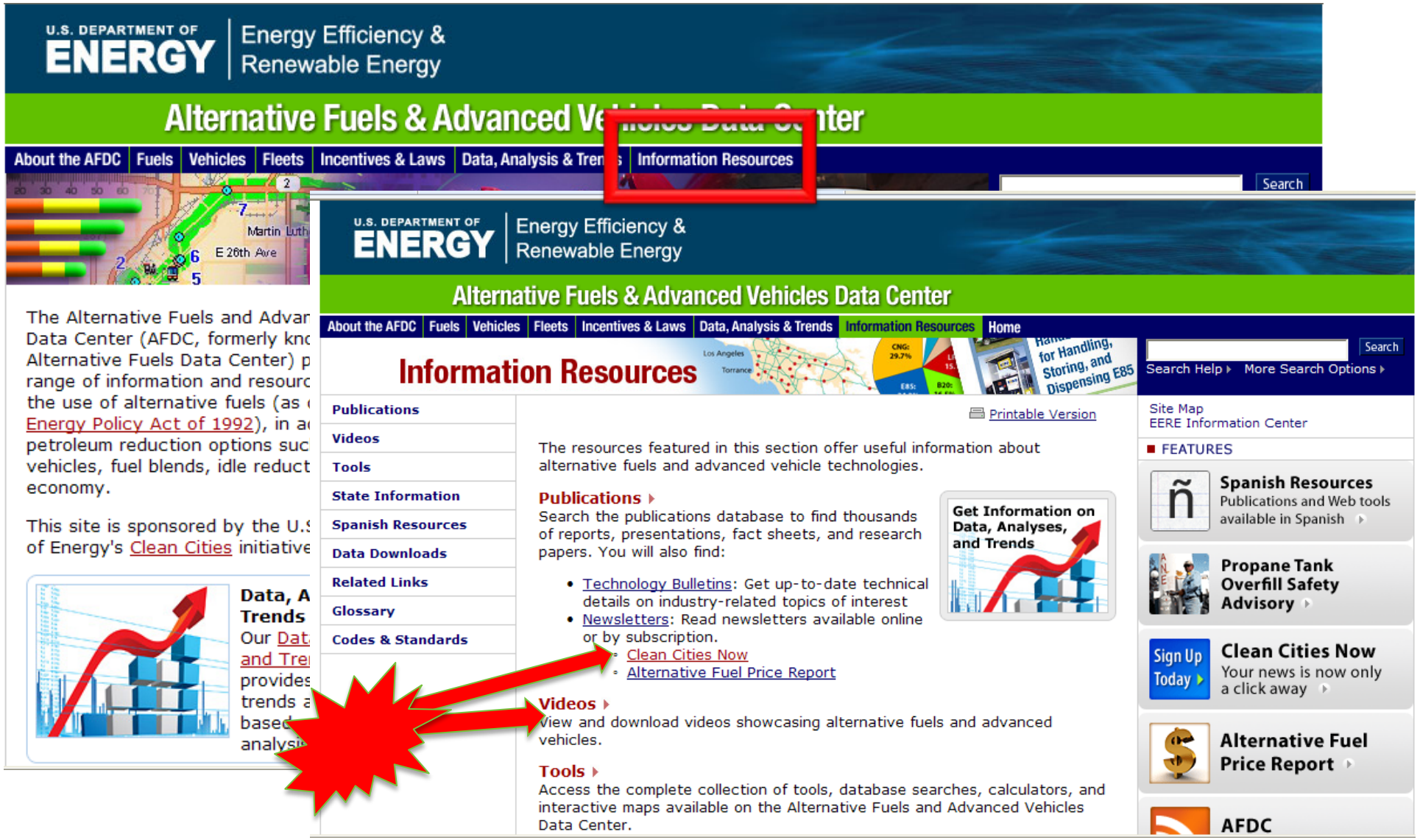


http://www.afdc.energy.gov/cleancities/m/

Step 2: See What Others Have Done (part 1)



Step 2: See What Others Have Done (part 2)



Step 3: Are There Regulations or Incentives That Affect You?

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Alternative Fuels & Advanced Vehicles Data Center

About the AFDC | Fuels | Vehicles | Fleets | Incentives & Laws | Data, Analysis & Trends | Information Resources | Home

Search | Search Help | More Search Options

Federal & State Incentives & Laws

- Federal
- State
- Advanced Search
- All Incentives & Laws Sorted by Type

Printable Version | Site Map | EERE Information Center

This section allows you to browse and search a database of federal and state laws and incentives related to alternative fuels and vehicles, air quality, fuel efficiency, and other transportation-related topics.

Federal Incentives and Laws | State Incentives and Laws

Search All Inc
Use an advance

View Tables o
View tables of ir

Read Key Legi
Read selected fe
transportation t

Federal Incentives and Laws

Listed below are federal incentives, laws and regulations, funding opportur
related to alternative fuels and vehicles, advanced technologies, or air qua
be available through Clean Cities Financial Opportunities. For more informa
section or refer to:

- Key Federal Legislation Summaries
- Recent Federal Actions

Incentives, Laws, and Programs

The information in this list is updated after legislation is enacted.

Sort by: Category Agency

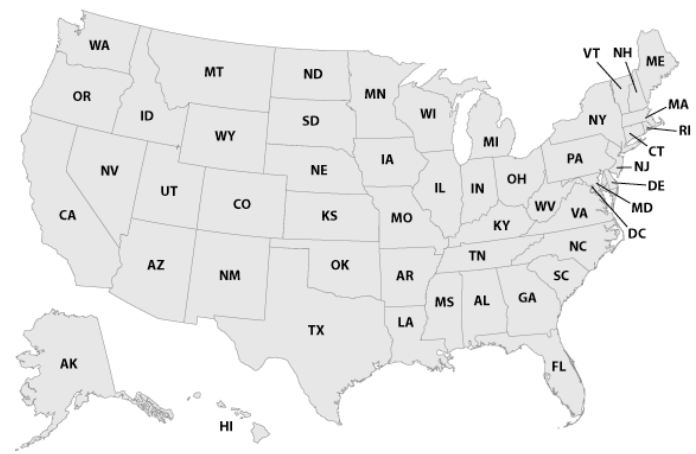
Incentives

- Advanced Energy Research Project Grants
- Advanced Technology Vehicle (ATV) Manufacturing Incentives
- Alternative Fuel Infrastructure Tax Credit
- Alternative Fuel Tax Exemption
- Biobased Transportation Research Funding
- Biomass Research and Development Initiative
- Cellulosic Biofuel Producer Tax Credit
- Fuel Cell Motor Vehicle Tax Credit
- Hydrogen Fuel Excise Tax Credit
- Hydrogen Fuel Mixture Excise Tax Credit
- Idle Reduction Equipment Excise Tax Exemption
- Improved Energy Technology Loans

State Incentives and Laws

To view a state's incentives and laws related to alternative fuels and advanced vehicles, select a state from the map or menu below.

Select a State | Go | Advanced Search



Are There Regulations or Incentives That Affect You?

Federal Fleets

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EERE Home | Programs & Offices | Consumer Information

Federal Energy Management Program

Federal Energy Management Program SEARCH

Search Help

HOME | ABOUT THE PROGRAM | PROGRAM AREAS | LAWS & REGULATIONS | INFORMATION RESOURCES | FINANCING MECHANISMS | TECHNOLOGIES | SERVICES | NEWS & EVENTS

EERE » Federal Energy Management Program » Program Areas

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- Sustainable Buildings & Campuses
- Operations & Maintenance
- Greenhouse Gases
- Water Efficiency
- Data Center Energy Efficiency
- Industrial Facilities
- Federal Fleet Management
  - Federal Requirements
  - Reporting
  - Technologies
  - Infrastructure Development
  - Working Group

Federal Fleet Management

FEMP provides guidance and assistance to help implement Federal legislative and regulatory requirements mandating reduced petroleum consumption and increased alternative fuel use. FEMP's efforts include assisting agencies with implementing and managing energy-efficient and alternative fuel vehicles and facilitating a coordinated effort to reduce petroleum consumption and increase alternative fuel use annually.

FEMP provides the following information and resources:

- **Federal requirements**: List of current Federal legislation and regulatory requirements for Federal fleets, including related FEMP guidance documents, executive order implementation instructions, and resources.
- **Technology resources**: Information on the latest alternative fuel and advanced vehicle technologies to help Federal agencies meet Federal fleet management requirements.
- **Infrastructure development**: Resources and event information to help Federal agencies locate and use alternative fueling stations, develop onsite fueling capabilities, and/or partner with other entities to leverage the development of retail fueling infrastructure.
- **Data, analysis, and trends**: Alternative Fuels and Advanced Vehicle Data Center (AFDC) Web site page featuring Federal fleet management resources, data, and reports.

Federal Fleet Guidance and Handbook

New fleet management guidance for Executive Order 13514 is now available. FEMP also released an accompanying Federal Fleet Management Handbook to help Federal agencies plan and implement strategies to meet Federal fleet requirements.

http://www1.eere.energy.gov/femp/program/fedfleet_management.html

Are There Regulations or Incentives That Affect You?

State and Fuel Provider (Utility) Fleets

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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EPAct Transportation Regulatory Activities

EPAct Transportation Regulatory Activities
SEARCH
Search Help

EERE » Vehicle Technologies Program » EPAct Transportation Regulatory Activities

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- Home
- About EPAct Transportation Regulatory Activities
- Fleet Coverage & Compliance
- Alternative Fuel Petitions
- Resources

The U.S. Department of Energy's (DOE) Vehicle Technologies Program manages several transportation regulatory activities established by the Energy Policy Act of 1992 (EPAct), as amended by the Energy Conservation Reauthorization Act of 1998, EPAct 2005, and the Energy Independence and Security Act of 2007 (EISA).

ACTIVITY HIGHLIGHTS

The EPAct transportation regulatory activities seek to reduce U.S. dependence on imported oil primarily through the use of alternative fuels, alternative fuel vehicles (AFVs), and other petroleum-displacement methods.

Following EPAct 1992, DOE established the Alternative Fuel Transportation program and associated regulatory requirements. The program encompasses the State and Alternative Fuel Provider (SFP) program, which requires certain state government and alternative fuel provider fleets to acquire a specific percentage of AFVs annually through Standard Compliance.

EPAct 1992 also established two related activities not covered by this site: the Federal Fleet and Clean Cities programs.

KEY FEDERAL STATUTES

The documents linked below are excerpts from federal statutes that established key EPAct transportation regulatory activities. Other federal statutes and amendments have also shaped these activities.

Energy Policy Act of 1992
Defined alternative fuels and directed DOE to develop a regulatory program for certain fleets in Metropolitan Statistical Areas to serve as launching pads for alternative fuels and advanced vehicle technologies

Energy Conservation Reauthorization Act of 1998

FEATURES

QUICK LINKS

Trusted sites

http://www1.eere.energy.gov/vehiclesandfuels/epact/

Step 4: Set Baseline and Goal

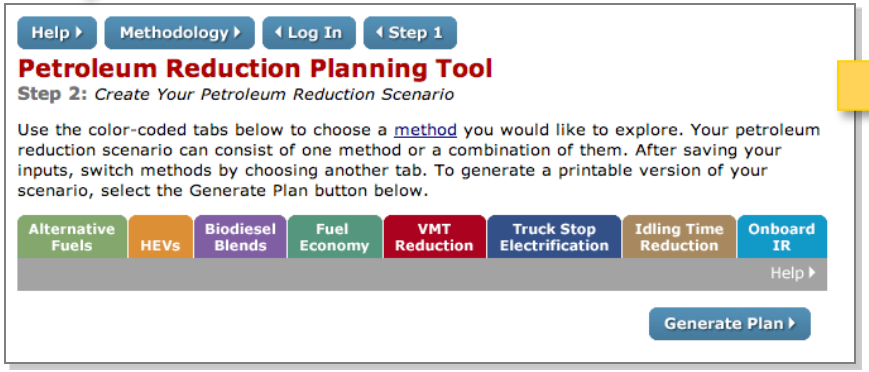
- Inventory fleet: Types/classes of vehicles
  - Number of each type/class
  - Annual miles traveled
  - Annual fuel consumption
  - Annual CO_2 produced
    - 19.4 pounds per gallon gasoline*
    - 22.2 pounds per gallon diesel*

- Set goal for fuel reduction
  - No new vehicle purchases?
  - Next year's acquisitions?
  - 10 year reduction?

*** http://www.epa.gov/oms/climate/420f05001.pdf**

Step 5: Explore Options for Your Fleet

AFDC Petroleum Reduction Planning Tool



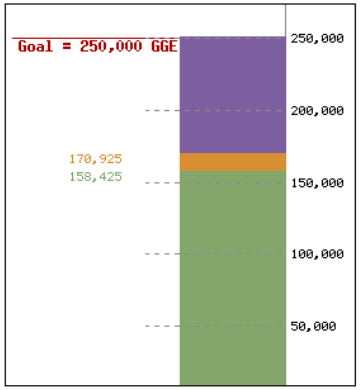
https://www.afdc.energy.gov/afdc/prep/index.php

Petroleum Reduction Plan

Scenario Name:Test2
Annual Petroleum Reduction
Goal:250000 GGE

Based on your inputs, this is your petroleum reduction goal and associated plan. You may print the information on this page and use it to help you reach your goal. If you are a registered user, this scenario is saved in the system and you may make changes at a future time.

To alter your plan, return to Step 2.



Alternative Fuels

AFV Type	AFV Fuel	Number of AFVs	Average VMT	Fuel Economy (mpg)	Fraction of Fuel Use	GGE Reduced
Large Pickup/Utility	LPG	50	10000	20	1	25000
Midsize Car	E85	100	15000	25	1	47400
HD Truck > 26k lb	CNG	25	15000	5	1	86025
					TOTAL GGE	158425

Hybrid Electric Vehicles (HEVs)

Fuel Type	Number of Vehicles	Average VMT	Fuel Economy of new HEVs	Fuel Economy of Old Vehicles	GGE Reduced
Gasoline	75	15000	45	30	12500
				TOTAL GGE	12500

Biodiesel Blends

Vehicle Type	Blend Type	Number of Vehicles	Average VMT	Fraction of Fuel Use	Fuel Economy	GGE Reduced
HD Truck > 26k lb	B50	50	15000	1	5	80777
					TOTAL GGE	80777

FuelEconomy.gov Web Site

Fuel economy information

- ✓ Side-by-side comparisons
- ✓ Fuel economy ratings
- ✓ Carbon footprint
- ✓ Average annual fuel cost
- ✓ Smart driving tips

Compare GHG Impacts

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Alternative Fuels & Advanced Vehicles Data Center

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Information Resources

- Publications
- Videos
- Tools
- State Information
- Spanish Resources
- Data Downloads
- Related Links
- Glossary
- Codes & Standards

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Site Map
EERE Information Center

FEATURES

Project Assistance
Contact your local c

Tools

On this page you can access the complete collection of tools, database searches, calculators, and interactive maps available on the Alternative Fuels and Advanced Vehicles Data Center. For mobile tools, go to www.eere.energy.gov/m/cc on your mobile device.

Fuels and Stations

Alternative Fueling Station Locator
Find alternative fueling station locations.

TransAtlas
Explore an interactive map displaying alternative fuel and vehicle data.

Stations Custom Query
Search the U.S. alternative fueling station database.

BioFuels Atlas
Compare feedstocks and analyze biofuel production by location in this interactive map.

Total Stations Count
Find the number of fueling stations in the U.S. by fuel type.

Fuel Properties Search
Create custom charts comparing fuel properties.

Fleets

Fleet Experiences Search
Browse fleet experience stories by category.

GREET Fleet Footprint Calculator
Evaluate life-cycle petroleum use and GHG emissions.

Petroleum Reduction Planning Tool
Forecast fleet petroleum reduction.

GREET Fleet Footprint Calculator
Evaluate life-cycle petroleum use and GHG emissions.

GREET_fleet_footprint_calculator_1_1a[2].xls [Compatibility Mode] - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View

Cut | Copy | Format Painter | Paste | Clipboard | Font | Alignment | Number | Styles | Wrap Text | Merge & Center | Conditional Formatting | Format as Table

B3 | 1

	Gasoline (gallons)	Diesel (gallons)	Diesel HEV (gallons)	B20 (gallons)	B100 (gallons)	E85 (gallons)	CNG (cubic feet)	LNG (gallons)	LPG (gallons)	Electricity (kilowatt-hours)	G.H2 (cubic feet)	L.H2 (gallons)
School Bus	0	0	0	0	0	0	0	0	0	0	0	0
Transit Bus	0	0	0	0	0	0	0	0	0	0	0	0
Shuttle/Paratransit Bus	0	0	0	0	0	0	0	0	0	0	0	0
Waste Hauler	0	0	0	0	0	0	0	0	0	0	0	0
Street Sweeper	0	0	0	0	0	0	0	0	0	0	0	0
Delivery Step Van	0	0	0	0	0	0	0	0	0	0	0	0
Transport/Drayage/Freight Truck	0	0	0	0	0	0	0	0	0	0	0	0
Medium/Heavy Duty Pickup Truck	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance Utility Vehicle	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Gasoline Gallon Equivalent Total	0	0	0	0	0	0	0	0	0	0	0	0

6. Fuel Production Assumptions

Ethanol Feedstock Source	1	1 - Corn 2 - Switchgrass
CNG Feedstock Source	1	1 - North American NG 2 - Non-North American NG 3 - Landfill Gas
LNG Feedstock Source	1	1 - North American NG 2 - Non-North American NG 3 - Landfill Gas
LPG Feedstock Source	NG 60%	Petroleum 40%
Source of Electricity for On-Road Electric Vehicles and H2 Electrolysis	14	1 to 13 - EIA Regions 1 through 13 Mix (see map) 14 - Average U.S. Mix 15 - User Defined (go to 'Specs' sheet)
G.H2 Production Process	1	1 - Refueling Station SMR (On-site) 2 - Central Plant SMR (Off-site) 3 - Refueling Station Electrolysis (On-site)
L.H2 Production Process	1	1 - Refueling Station SMR (On-site) 2 - Central Plant SMR (Off-site) 3 - Refueling Station Electrolysis (On-site)

EIA – Electricity Market Model Supply Regions
1. ECAR
2. ERCOT
3. MAAC
4. MAIN
5. MAPP
6. NPCC-NY
7. NPCC-NE
8. FRCC
9. SERC
10. SPP
11. WECC-NW
12. WECC-RMP/AZNM
13. WECC-CA

7. Results of On-Road Fleet's Petroleum Usage (barrels)

	Gasoline	Diesel	Diesel HEV	B20	B100	E85	CNG	LNG	LPG	Electricity	G.H2	L.H2	Vehicle Total
School Bus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

On-road fleet | Off-road fleet | Specs

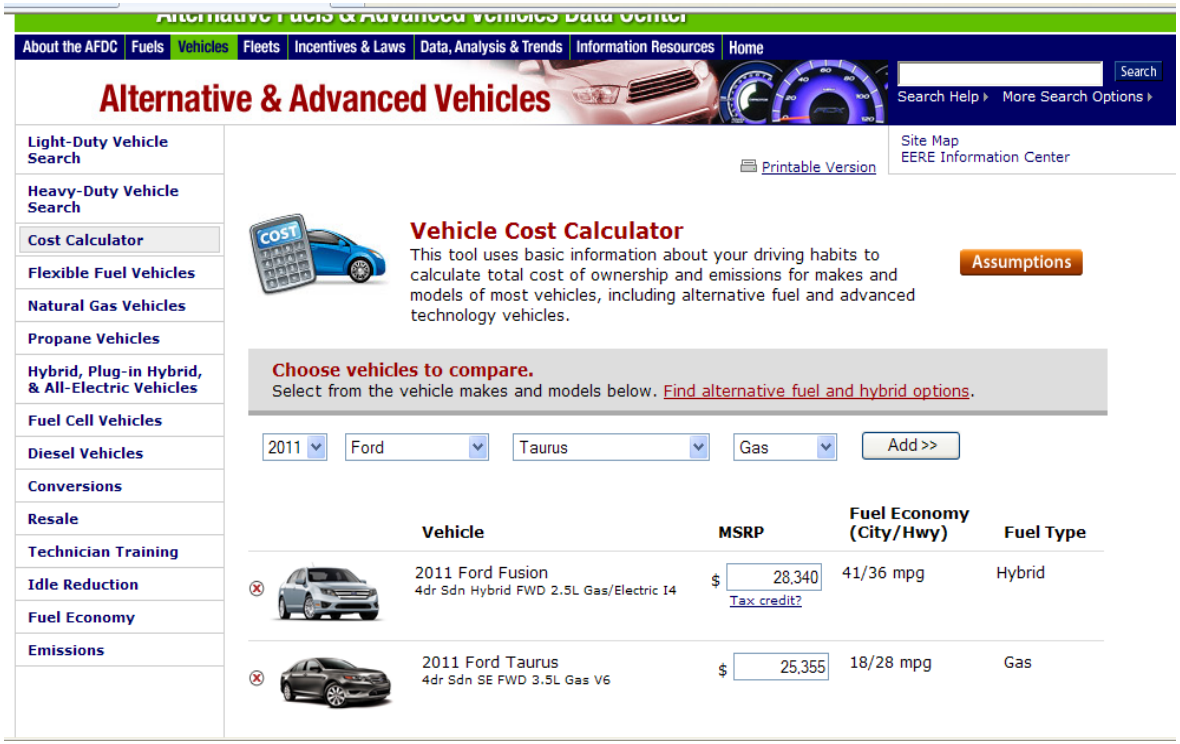
Ready

(Soon) Compare Costs

AFDC Cost Calculator

- ✓ Side-by-side cost comparisons
- ✓ Operating costs
- ✓ Fuel consumption & cost
- ✓ CO_2 emissions

In development—live April 2011

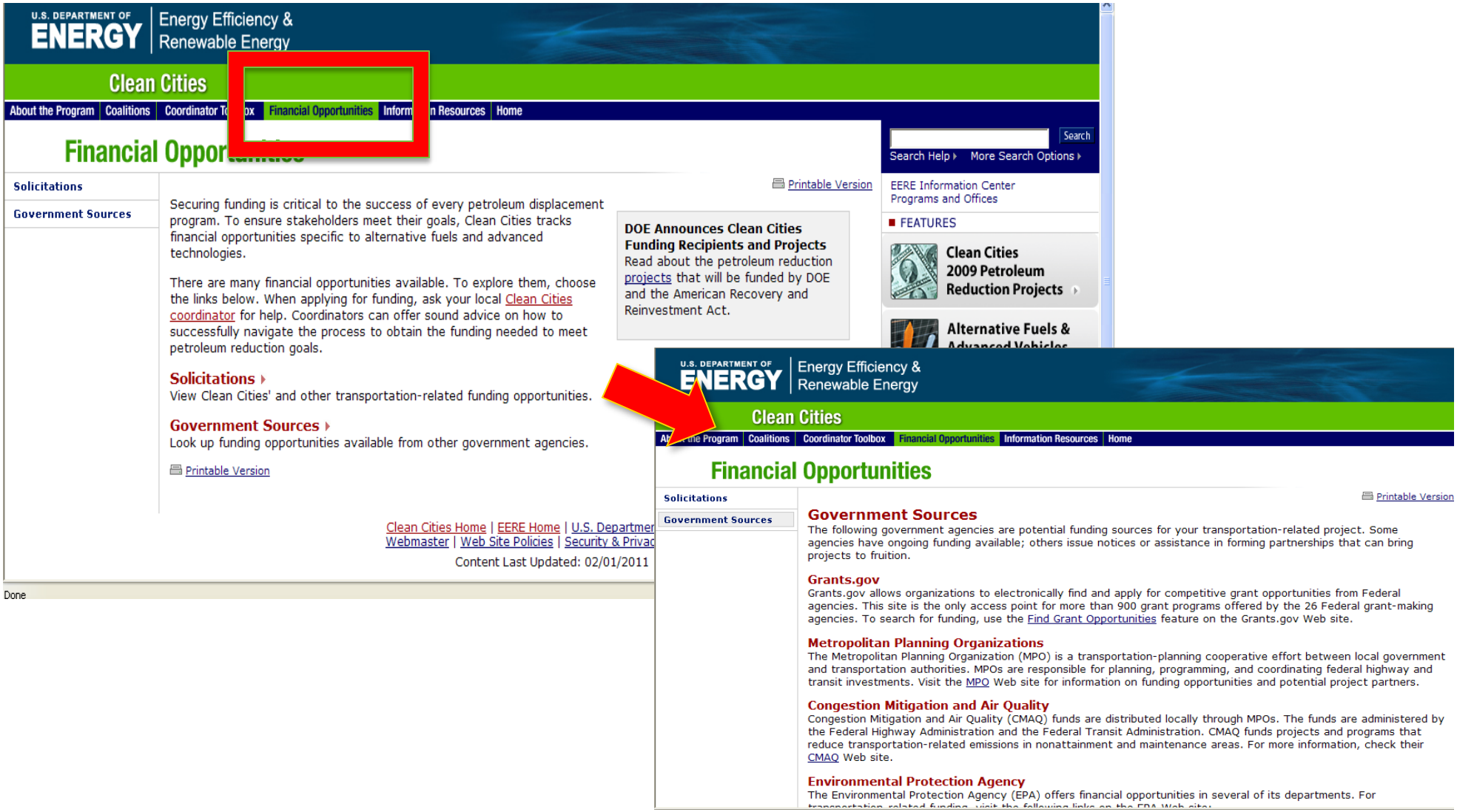


Clean Cities Web Site

- Financial opportunities
- Information resources
  - ✓ Newsletters
  - ✓ Technology bulletins
  - ✓ Technical assistance
- Local experts and resources

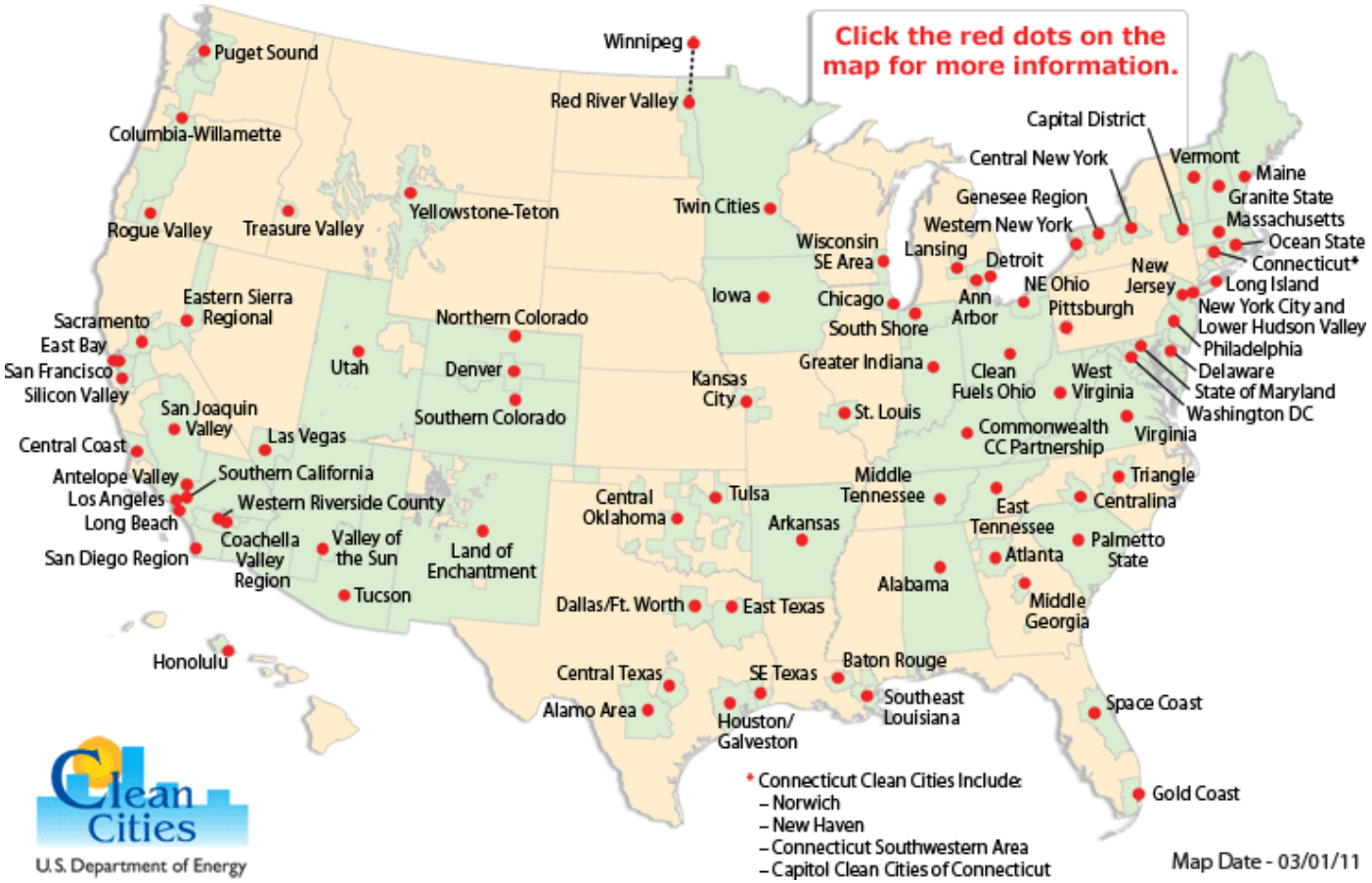
http://www1.eere.energy.gov/cleancities/

Clean Cities Financial Opportunities



Clean Cities Coordinators

Start working with the Clean Cities coalition in your area.



http://www.afdc.energy.gov/cleancities/progs/coalition_locations.php

National Clean Fleet Partnership

Charter Members:

- AT&T
- FedEx
- PepsiCo
- UPS
- Verizon

http://www1.eere.energy.gov/cleancities/national_partnership.html

Web Sites and Resources

Clean Cities Web site
www.cleancities.energy.gov

Alternative Fuels & Advanced Vehicles Data Center Web site
www.afdc.energy.gov

FuelEconomy.gov
www.fueleconomy.gov

Clean Cities Coordinator Contact Information and Coalition Web sites
http://www.afdc.energy.gov/cleancities/progs/coalition_locations.php

DOE EERE Information Center and Technical Response Service
Web Site: http://www.eere.energy.gov/afdc/informationcenter.html
Phone: 1-800-EERE-INF (1-877-337-3463)
E-mail: technicalresponse@icfi.com
Hours: 9:00 a.m. – 6:00 p.m. EST

Web Sites and Resources

Clean Cities Information Resources
http://www1.eere.energy.gov/cleancities/info_resources.html

Data, Analysis & Trends
http://www.afdc.energy.gov/afdc/data/index.html

Clean Cities Financial Opportunities
http://www1.eere.energy.gov/cleancities/financial_opps.html

AFDC PREP tool
https://www.afdc.energy.gov/afdc/prep/index.php

Fleets
http://www.afdc.energy.gov/afdc/ fleets/index.html

Vehicle Search
http://www.afdc.energy.gov/afdc/progs/vehicles_search.php

Publications Database
http://www.afdc.energy.gov/afdc/publications.html

Alternative Fuel Station Locator
http://www.afdc.energy.gov/afdc/locator/stations/

State and Federal Incentives & Laws
http://www.afdc.energy.gov/afdc/incentives_laws.html

TransAtlas
http://www.afdc.energy.gov/afdc/data/geographic.html

Truck Stop Electrification Locator
http://www.afdc.energy.gov/afdc/vehicles/idle_reduction_stations.html

Conversions
http://www.afdc.energy.gov/afdc/vehicles/conversions.html

Other Federal Agency Web Sites

Energy Information Administration (EIA)

http://www.eia.doe.gov

U.S. Environmental Protection Agency (EPA)

http://www.epa.gov

Internal Revenue Service (IRS)

http://www.irs.gov