

Educating Consumers: *New Content on Diesel Vehicles, Diesel Exhaust Fluid, and Selective Catalytic Reduction Technologies on the AFDC*

Debbie Brodt-Giles

National Renewable Energy Laboratory

DEER Conference

August 5, 2008

NREL/PR-540-43803

Presented at the 14th Diesel Engine-Efficiency and Emissions Research (DEER) 2008 Conference held August 4-7, 2008 in Dearborn, Michigan.



What is the AFDC?

Alternative Fuels and Advanced Vehicles Data Center (AFDC)

- Technology-focused Web site
- Comprehensive alternative fuels and advanced vehicle information
- Tools for the general public, fleets, educators, and consumers
 - Alternative Fueling Station Locator
 - Vehicle Search (alternative fuel and advanced)
 - Cost/Emissions Calculators
 - Laws and Incentives
 - Publications Database
 - Truck Stop Electrification Site Locator

AFDC: www.eere.energy.gov/afdc



U.S. Department of Energy
Energy Efficiency and Renewable Energy

*Bringing you a prosperous future where energy is
 clean, abundant, reliable, and affordable*



[EERE Home](#)

Alternative Fuels & Advanced Vehicles Data Center

[About the AFDC](#) [Fuels](#) [Vehicles](#) [Fleets](#) [Incentives & Laws](#) [Data, Analysis & Trends](#) [Information Resources](#)



[Search Help](#) [More Search Options](#)

[Site Map](#)
[EERE Information Center](#)

NEWS

[Proposed Rulemaking on CAFE Standards](#)
 April 23, 2008

[More News](#)

Learn About Our **RSS** Feed

[Subscribe to EERE News Updates](#)

EVENTS

[Green Street Fair](#)
 05/03/2008 - 05/04/2008

[More Events](#)

FEATURES

[Handbook for Handling, Storing, and Dispensing E85](#) (PDF 5.4 MB)
[Download Adobe Reader](#)

The Alternative Fuels and Advanced Vehicles Data Center (AFDC, formerly known as the Alternative Fuels Data Center) provides a wide range of information and resources to enable the use of alternative fuels (as defined by the [Energy Policy Act of 1992](#)), in addition to other petroleum reduction options such as advanced vehicles, fuel blends, idle reduction, and fuel economy.

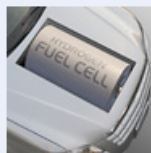
This site is sponsored by the U.S. Department of Energy's [Clean Cities](#) initiative.



Alternative Fuel Portals

- [Biodiesel](#)
- [Electricity](#)
- [Ethanol](#)
- [Hydrogen](#)
- [Natural Gas](#)
- [Propane](#)

[More Fuels Information](#)



Select Vehicle Information

- [Conversions](#)
- [Emissions](#)
- [Fuel Economy](#)
- [HEVs](#)
- [Plug-in Hybrids](#)
- [Idle Reduction](#)

[More Vehicle Information](#)



Quick Links to AFDC Tools

- [Vehicle Make & Model Search](#)
- [Alternative Fueling Station Locator](#)
- [Incentives & Laws](#)
- [Publications Search](#)



Data, Analysis, and Trends

Our [Data, Analysis, and Trends](#) section provides industry trends and facts based on data analysis.


Why Diesel Information?

- Light-duty diesels are ready to enter the marketplace
- Fuel-efficiency improvements to light-duty diesels lead to reduced dependence on foreign oil
- Some light- and heavy-duty vehicles will require diesel exhaust fluid (DEF), and consumers need to be trained on how to use it
- Adding DEF information to the AFDC is a cooperative effort between:
 - U.S. Department of Energy
 - National Renewable Energy Laboratory
 - Alliance of Automobile Manufacturers

Diesel Information on the AFDC


- Content is located in the Diesel Vehicles section and includes links to relevant information
- All vehicle classes are covered (light-, medium-, and heavy-duty)
- Topics covered on the site include:
 - Light-duty vehicle availability
 - Emissions
 - Selective catalytic reduction
 - DEF
 - NO_x traps

Diesel Vehicles Section



U.S. Department of Energy
Energy Efficiency and Renewable Energy

*Bringing you a prosperous future where energy is
clean, abundant, reliable, and affordable*




AFDC

[EERE Home](#)


Alternative Fuels & Advanced Vehicles Data Center

[About the AFDC](#) | [Fuels](#) | [Vehicles](#) | [Fleets](#) | [Incentives & Laws](#) | [Data, Analysis & Trends](#) | [Information Resources](#) | [Home](#)

Alternative & Advanced Vehicles



- [Vehicle Make & Model Search](#)
- [Flexible Fuel Vehicles](#)
- [Natural Gas Vehicles](#)
- [Propane Vehicles](#)
- [Hybrid Electric Vehicles](#)
- [Plug-in Hybrid Vehicles](#)
- [Electric Vehicles](#)
- [Fuel Cell Vehicles](#)
- [Diesel Vehicles](#)
- [Vehicle Classes](#)
- [Light-Duty Availability](#)
- [Emissions](#)
- [Selective Catalytic Reduction](#)
- [NO_x Adsorbents](#)
- [Conversions](#)
- [Resale](#)
- [Technician Training](#)
- [Idle Reduction](#)
- [Fuel Economy](#)

 [Printable Version](#)

Diesel Vehicles

Advanced diesel vehicles using EPA-mandated [ultra-low sulfur diesel](#) (ULSD) fuel are among the most fuel-efficient vehicles available today. Collaborative R&D between DOE, industry and the national laboratories has resulted in improved engine efficiency and very low emissions. Collaboration with the U.S. Environmental Protection Agency, industry, and national laboratories under the DOE Diesel Emission Control Sulfur Effects (DECSE) program provided the supporting data needed to mandate 15 ppm sulfur in diesel fuel as the appropriate level to maintain effectiveness of diesel engine emission control technologies. Most diesel vehicles also can run on [biodiesel](#) blends without engine modification.

Progress in DOE- and industry-funded diesel engine R&D is highlighted annually in the [Advanced Combustion Engines Progress Report](#) and in the [DOE Diesel Engine-Efficiency and Emissions Research \(DEER\) Conference](#), now in its 14th year.

This page serves as a table of contents for the Diesel Vehicles section. To learn more, choose from the links below.

Diesel Vehicle Classes ▶

Learn about light-, medium-, and heavy-duty diesel vehicles.


Light-Duty Diesel Vehicle Availability ▶

Find out which light-duty diesel vehicles are available in the United States.


[Search Help](#) ▶ [More Search Options](#) ▶

[Site Map](#)
[EERE Information Center](#)

- [NEWS](#) ▶
- [EVENTS](#) ▶
- [FEATURES](#)



Truck Stop
Electrification
Site Locator



Alternative
Fueling Station
Locator

Light-Duty Diesel Vehicle Availability



U.S. Department of Energy
Energy Efficiency and Renewable Energy

*Bringing you a prosperous future where energy is
 clean, abundant, reliable, and affordable*



[EERE Home](#)

Alternative Fuels & Advanced Vehicles Data Center

[About the AFDC](#) [Fuels](#) [Vehicles](#) [Fleets](#) [Incentives & Laws](#) [Data, Analysis & Trends](#) [Information Resources](#) [Home](#)

Alternative & Advanced Vehicles



[Search](#)

[Search Help](#) [More Search Options](#)

[Printable Version](#)

[Site Map](#)
[EERE Information Center](#)

Vehicle Make & Model Search

Flexible Fuel Vehicles

Natural Gas Vehicles

Propane Vehicles

Hybrid Electric Vehicles

Plug-in Hybrid Vehicles

Electric Vehicles

Fuel Cell Vehicles

Diesel Vehicles

Vehicle Classes

Light-Duty Availability

Emissions

Selective Catalytic Reduction

NO_x Adsorbers

Conversions

Resale

Technician Training

Idle Reduction

Fuel Economy


Light-Duty Diesel Vehicle Availability

According to [J.D. Power Automotive Forecasting](#), demand for light-duty diesel vehicles might approximately double in the next 10 years. More auto manufacturers will be producing light-duty diesels, and these vehicles will be more fuel efficient and environmentally friendly than ever.

To learn about currently available light-duty diesel vehicles, use the [FuelEconomy.gov's diesel vehicle search engine](#) or visit the Diesel Technology Forum's [Diesels for Sale in the U.S.](#) (this page lists some larger diesel vehicles as well.)




Diesel Selective Catalytic Reduction



U.S. Department of Energy
Energy Efficiency and Renewable Energy

*Bringing you a prosperous future where energy is
clean, abundant, reliable, and affordable*



AFDC

[EERE Home](#)

Alternative Fuels & Advanced Vehicles Data Center

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

Alternative & Advanced Vehicles

Search

Vehicle Make & Model Search

Flexible Fuel Vehicles

Natural Gas Vehicles

Propane Vehicles

Hybrid Electric Vehicles

Plug-in Hybrid Vehicles

Electric Vehicles

Fuel Cell Vehicles

Diesel Vehicles

- Vehicle Classes
- Light-Duty Availability
- Emissions
- Selective Catalytic Reduction
- Diesel Exhaust Fluid
- NO_x Adsorbers

Conversions

Resale

Technician Training

Idle Reduction

Fuel Economy

[Printable Version](#)

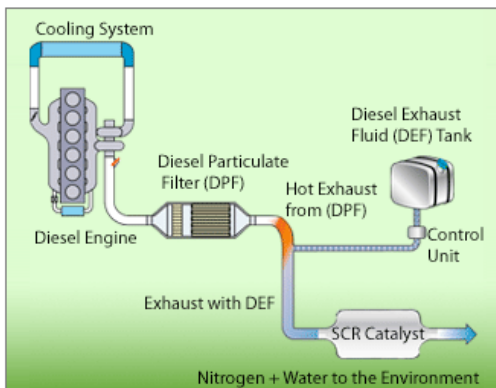
[Site Map](#)

[EERE Information Center](#)

Diesel Selective Catalytic Reduction

Selective catalytic reduction (SCR) is an advanced emission-control technology that can help light-, medium-, and heavy-duty diesel vehicles meet stringent [regulations](#) on nitrogen oxides (NO_x) emissions. In an SCR system, a liquid reducing agent composed of urea and water—known as [Diesel Exhaust Fluid](#) (DEF)—is combined with engine exhaust in the presence of a catalyst to convert smog-forming NO_x into harmless nitrogen and water vapor. See the diagram below.

Schematic of a Selective Catalytic Reduction (SCR) System



Diesel Exhaust Fluid



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable



[EERE Home](#)

Alternative Fuels & Advanced Vehicles Data Center

[About the AFDC](#) [Fuels](#) [Vehicles](#) [Fleets](#) [Incentives & Laws](#) [Data, Analysis & Trends](#) [Information Resources](#) [Home](#)

Alternative & Advanced Vehicles



[Search Help](#) [More Search Options](#)

Vehicle Make & Model Search

Flexible Fuel Vehicles

Natural Gas Vehicles

Propane Vehicles

Hybrid Electric Vehicles

Plug-in Hybrid Vehicles

Electric Vehicles

Fuel Cell Vehicles

Diesel Vehicles

Vehicle Classes

Light-Duty Availability

Emissions

Selective Catalytic Reduction

- Diesel Exhaust Fluid

NO_x Adsorbers

Conversions

Resale

Technician Training

[Printable Version](#)

[Site Map](#)
[EERE Information Center](#)

Diesel Exhaust Fluid

Diesel Exhaust Fluid (DEF)—sometimes known simply by the name of its active component, urea—is a key component of [selective catalytic reduction \(SCR\)](#) systems, which help diesel vehicles meet stringent [emission regulations](#). DEF is a liquid reducing agent that reacts with engine exhaust in the presence of a catalyst to convert smog-forming nitrogen oxides (NO_x) into harmless nitrogen and water vapor.

Composition


Current DEF formulations are a nontoxic, colorless, and odorless mixture of the chemical urea and purified water. The use of alternative reducing agents—such as diesel fuel—is also being explored.

Urea is a nitrogen-containing compound that transforms into ammonia when heated. It occurs naturally or is synthesized from natural gas and is used in various industries, including as a fertilizer in agriculture. A urea-based DEF is used widely in Europe under the brand name [AdBlue](#).

Use in Diesel Vehicles


Diesel Exhaust Fluid is carried onboard a vehicle in a tank separate from the fuel tank. The vehicle's DEF tank must be refilled periodically. Experience in Europe indicates that average DEF consumption is about 5% of diesel fuel consumption. Refilling the DEF tank occurs at approximately the interval of recommended oil changes for light-duty vehicles. The interval varies based on application for medium- and heavy-duty vehicles.

Diesel Exhaust Fluid Locator (Still in development)



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable



EERE Home

Alternative Fuels & Advanced Vehicles Data Center

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

Alternative & Advanced Vehicles

Search


Alternative & Advanced Vehicles

[Printable Version](#)

Search Help ▶ More Search Options ▶

Site Map
EERE Information Center

- Vehicle Make & Model Search
- Flexible Fuel Vehicles
- Natural Gas Vehicles
- Propane Vehicles
- Hybrid Electric Vehicles
- Plug-in Hybrid Vehicles
- Electric Vehicles
- Fuel Cell Vehicles
- Diesel Vehicles**
 - Vehicle Classes
 - Light-Duty Availability
 - Emissions
 - Selective Catalytic Reduction
 - Diesel Exhaust Fluid Locator
 - NO_x Adsorbents
- Conversions
- Resale
- Technician Training
- Idle Reduction



Diesel Exhaust Fluid Locator

The [Diesel Exhaust Fluid Locator](#) helps users locate facilities that sell Diesel Exhaust Fluid (DEF, sometimes called urea). DEF is a liquid reducing agent used in [selective catalytic reduction](#) (SCR) systems to reduce [emissions](#) of nitrogen oxides (NO_x) from diesel vehicles.

To learn more about DEF, visit the [Diesel Exhaust Fluid](#) page. Visit the [Light-Duty Diesel Availability](#) page to see which light-duty vehicles require DEF.

The DEF Locator includes details for each DEF provider, including address, phone number, public/private status, type of location, hours of operation, dispensing capability, vehicle access, DEF recycling capability, and more. The data are provided by the [Alliance of Automobile Manufacturers](#) and are updated monthly. Detailed information is available on the DEF Locator Instructions page.

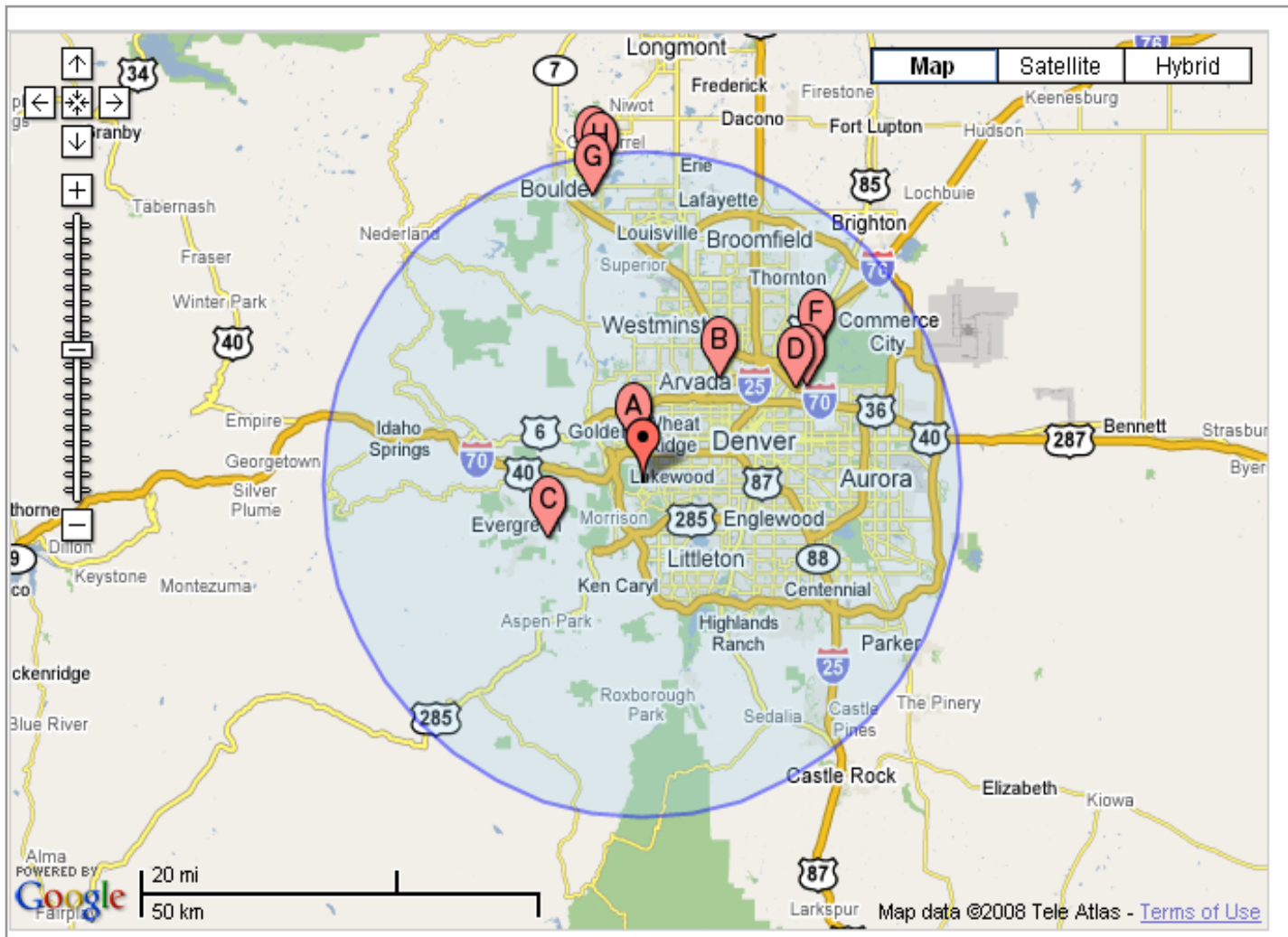
If DEF providers have addresses that cannot be located by the mapping application, the providers might be mapped in incorrect locations. You should call a provider before visiting to verify its location, hours of operation, and type of access.

The DEF Locator is dynamically generated. If you are using a specialized screen reader and having difficulty understanding the content, contact the [AFDC Webmaster](#), who can assist you with a verbal or written description.

Plans for the DEF Locator

- Application will run using Google Maps
- Basic search will provide a quick search for most users' needs
- Advanced search will meet additional needs
 - Will search by location type, access type, DEF dispenser type, vehicles serviced, and payment methods
- Route-mapping capability will also be available

Example Map Output



Scheduled Release of DEF Locator

- Some original equipment manufacturers (OEM) anticipate the public release of light-duty diesel vehicles utilizing DEF in fall 2008
- General-educational portions of the Diesel Vehicles section went live in late July 2008
- Diesel Exhaust Fluid Locator is due to go live early fall 2008 in conjunction with the release of OEM light-duty diesel vehicles