NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Fleet Tools

NREL Tools Help Fleets Reduce Fuel Consumption, Emissions, and Costs

From beverage distributors to shipping companies and federal agencies, industry leaders turn to the National Renewable Energy Laboratory (NREL) to help green their fleet operations. Cost, efficiency, and reliability are top priorities for fleets, and NREL partners know the lab's portfolio of tools can pinpoint fuel efficiency and emissions-reduction strategies that also support operational goals and the bottom line.

NREL is one of the nation's foremost leaders in medium- and heavy-duty vehicle research and development (R&D) and the go-to source for credible, validated transportation data. NREL developers have drawn on this expertise to create tools grounded in the real-world experiences of commercial and government fleets. Operators can use this comprehensive set of technology- and fuel-neutral tools to explore and analyze equipment and practices, energy-saving strategies, and other operational variables to ensure meaningful performance, financial, and environmental benefits.

NREL understands that each fleet has its own priorities, and the lab's tools are designed to help operators select the right solution to meet their needs from a wide range of technology and operational options. Tools can be used to examine:

- Replacement of existing fleets with hybrid, electric, natural gas, biodiesel, or flex-fuel vehicles
- Conversion of conventional fleet vehicles to alternative fuel vehicles
- Technology retrofits of existing fleet vehicles to improve fuel economy and reduce emissions
- Enhancements to route efficiency, driving speed, engine performance, fuel economy, and maintenance practices, as well as reductions in idling time
- Availability of incentives and compliance with regulations.

The comprehensive suite of resources described on the following pages can be used to boost the fuel economy and emissions performance of transit buses, delivery vans, long-haul trucks, maintenance vehicles, police cruisers, taxi cabs, and other types of fleet vehicles.

NREL's tools help fleets find the best ways to increase fuel efficiency and reduce emissions. One approach is to increase the use of alternative fuels, as with this delivery truck (top) fueled with compressed natural gas and this street sweeper (bottom) running on a 20% biodiesel blend. *Photos from Paper Transport, Inc., NREL 22257 (top) and Pat Corkery, NREL 18129 (bottom)*

**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.**

Fleet Tools and Data Resources

NREL offers a broad selection of sophisticated tools, putting vital information and analysis capabilities at fleet managers' fingertips.

		NREL Tool										
		AFDC	PREP	FASTSim	FleetDASH	BLAST	ADOPT	TSDC	Fleet DNA	NFCTEC	DRIVE	CoolSim
Helps Improve	Fuel Efficiency	√	√	√		√	√	√	√	√	√	√
	Cost	√	√	√	√	√	√	√	√	√	√	
	Regulatory Compliance	√	√		√							

The **Alternative Fuels Data Center** (AFDC) (*afdc.energy.gov/tools*) acts as a one-stop clearinghouse of information related to advanced transportation technologies, supplying decision-makers with a collection of data, tools, and analytics for increasing fuel economy and reducing emissions. Users can find resources to help improve the efficiency of existing fleets, replace older vehicles with new technology, enhance operational practices, and retrofit equipment.

In addition, the following tools address specific needs of fleet managers. While most resources are available to all users 24/7 via the Internet, some tools provide greater data access and functionality to registered users, and other off-line tools require the assistance of NREL staff.

Assessing Energy-Efficiency Enhancements

Petroleum Reduction Planning Tool (PREP). Compares and evaluates the impacts of a wide range of options for fleets to reduce their petroleum consumption and greenhouse gas emissions. (*afdc.energy.gov/prep*)

Future Automotive Systems Technology Simulator (FASTSim). Uses real-world duty-cycle data to evaluate the impact of technology changes on fuel economy, performance, cost, and battery life. (*nrel.gov/transportation/fastsim.html*)

Fleet Sustainability Dashboard (FleetDASH). Tracks participating federal agencies' fuel consumption, greenhouse gas emissions, and vehicle inventories. (*federalfleets.energy.gov/FleetDASH*)

Exploring Alternative Fuel Options

Vehicle Search. Allows companies to find and compare alternative-fuel vehicles, engines, and hybrid propulsion systems. (*afdc.energy.gov/vehicles/search*)

Battery Lifetime Analysis and Simulation Tool (BLAST). Calculates total ownership expenses for specific hybrid, plug-in, and battery electric vehicle-driver combinations based on lifetime battery costs. (*nrel.gov/transportation/energystorage/blast.html*)

Automotive Deployment Options Projection Tool (ADOPT). Projects consumer demand for different vehicle types. Analyzes potential fuel savings and financial impacts of new technology when introduced into the national vehicle fleet. (*nrel.gov/transportation/systems_analysis_tools.html*)

This all-electric vehicle operates at peak effectiveness in urban applications that demand heavy "stop-and-go" driving. *Photo from Smith Electric Vehicles, NREL 22851*

Analyzing Operational Practices

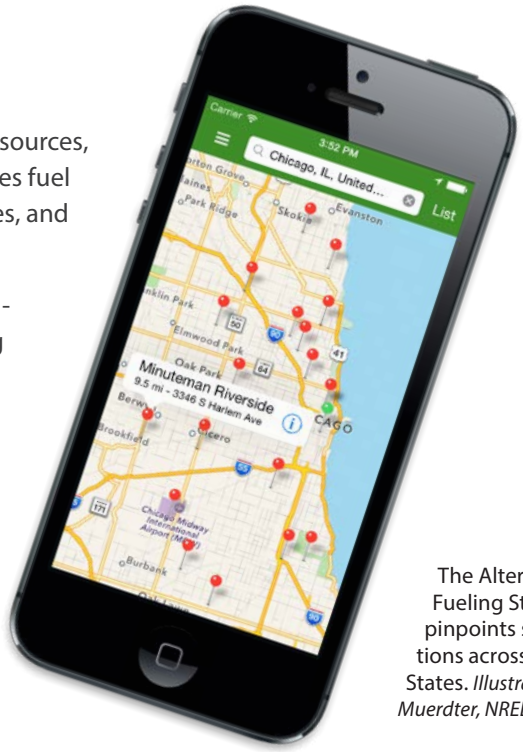
TransAtlas. Helps fleets view existing infrastructure, make efficient use of resources, and plan for the future through a dynamic, interactive mapping tool that uses fuel station data, fuel production locations, transportation routes, traffic densities, and other geographically specific data. (*maps.nrel.gov/transatlas*)

Alternative Fueling Station Locator. Allows users to find alternative fuel stations by providing online and mobile access to addresses, maps, and driving directions for more than 12,000 alternative fuel stations and electric charging sites, including the Truck Stop Electrification Locator. (*afdc.energy.gov/locator/stations*)

Transportation Secure Data Center (TSDC). Provides free access to detailed transportation data from a variety of travel surveys and studies, including second-by-second GPS readings for millions of miles of travel, along with vehicle characteristics and demographics. (*nrel.gov/tsdc*)

Fleet DNA. Serves as a clearinghouse of medium- and heavy-duty commercial fleet vehicle operating data for optimizing vehicle designs and choosing advanced technologies for fleets. (*nrel.gov/fleetdna*)

National Fuel Cell Technology Evaluation Center (NFCTEC). Provides independent third-party analysis of hydrogen fuel cell technologies in real-world operation based on the secure management, storage, and processing of proprietary data from industry. (*nrel.gov/hydrogen/facilities_nfctec.html*)



The Alternative Fueling Station Locator pinpoints station locations across the United States. *Illustration by Nick Muerdter, NREL*

Retrofitting and Designing Equipment

Drive-Cycle Rapid Investigation, Visualization, and Evaluation (DRIVE). Produces testable drive cycles from real-world vehicle data, cutting testing and analysis time. (*nrel.gov/transportation/drive.html*)

CoolSim. Models heating, ventilating, and air conditioning systems for vehicles, including all the major components—compressors, condensers, expansion devices, and evaporators. (*nrel.gov/transportation/vtm_models_tools.html*)

In addition to these tools, the National Clean Fleets Partnership, supported by the U.S. Department of Energy's (DOE's) Clean Cities program, provides large private fleets with resources, expertise, and support to incorporate alternative fuels and fuel-saving measures into their operations. (*eere.energy.gov/cleancities/national_partnership.html*)

Fleet Tools Point to Savings for Indianapolis

NREL recently demonstrated the power of its fleet tools by helping the City of Indianapolis examine the fuel consumption of its refuse haulers and snowplows. NREL instrumented 14 refuse haulers and collected data over three weeks of operation. NREL then fed the data into its Fleet DNA database and used the DRIVE and FastSim analysis tools to identify energy-saving opportunities. According to Mayor Greg Ballard, the data collected and the early analysis provided by NREL launched the city's ongoing, in-depth analysis, which will result in a fleet replacement plan geared toward achieving the mayor's commitment to a petroleum-free fleet by 2025.

An NREL engineer installs a data logger in a truck to monitor its performance. *Photo by Dennis Schroeder, NREL 22750*

Data Security and Quality Control

NREL has established strict quality-control processes to ensure accuracy and timeliness of the data used in its fleet tools. GPS driving data can be prone to errors, so NREL developed techniques for identifying and correcting GPS measurement errors. NREL also knows how important business-sensitive data are in today's competitive markets, and has developed systems and practices to guarantee secure collection, analysis, storage, and protection of proprietary data.

A Colorado school district has successfully reduced its petroleum consumption by adding 12 propane-fueled buses to its fleet. The buses have demonstrated low maintenance costs and high reliability and are a favorite among the district's bus drivers. *Photo by Dennis Schroeder, NREL 31321*

Some of NREL's data sets include highly detailed GPS records of travel, including precise time and location data, which could raise privacy concerns. To avoid such concerns, NREL's data centers—such as the TSDC and Fleet DNA—have secure enclaves for raw data, with no external access; secure portals for controlled access to detailed data; and public download areas with aggregated, cleansed data (with latitude and longitude specifics removed).

360-Degree Fleet Expertise

NREL provides more than just tools—it offers integrated, 360-degree fleet expertise. Hands-on support is available from technical experts experienced in field data collection, analysis, modeling, and R&D.

NREL works hand-in-hand with DOE, automakers, and vehicle equipment manufacturers to develop high-performance, fuel-efficient technologies that meet marketplace needs. Researchers use a three-pronged approach to evaluate vehicles for fleet partners via on-road data collection, in-lab testing, and simulation and modeling, examining how new approaches stack up against conventional vehicles.

The lab's technical and programmatic assistance to DOE's Clean Cities program helps private and public sector partners identify and deploy the right electric-drive vehicles, fuel economy improvements, renewable and alternative fuels, and idle-reduction equipment and strategies. Clean Cities' National Clean Fleets partners (*eere.energy.gov/cleancities/national_partnership.html*) operate well over 1 million commercial vehicles on American roadways.

Working with NREL

For more information about NREL's fleet evaluation and analysis tools, contact:

Deployment

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R&D

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www.nrel.gov/transportation/fleettest.html
www.nrel.gov/transportation/systems_analysis.html

NREL's Sustainable Transportation RD&D

As the only national laboratory solely dedicated to renewable energy and energy efficiency, NREL spearheads the research, development, and deployment (RD&D) needed to put sustainable transportation solutions on the road. The laboratory's innovative and integrated approach helps government, industry, and other partners develop and deploy the components and systems needed for market-ready, high-performance, low-emission, fuel-efficient passenger and freight vehicles, as well as alternative fuels and related infrastructure.

For more information on NREL's transportation RD&D capabilities and successes, go to *www.nrel.gov/transportation*.

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