

What's Afoot in DOE's Clean Cities? AFLEET!

For fleet managers, the free AFLEET tool simplifies the difficult task of estimating the environmental and economic impacts of conventional and alternative fuel vehicles.

The Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) tool, developed by researchers at Argonne National Laboratory for the U.S. Department of Energy (DOE) Clean Cities coalition network, estimates the environmental and economic costs and benefits of alternative fuel and advanced vehicles. Using simple inputs, AFLEET lets fleet managers estimate and compare petroleum use, greenhouse gas emissions (GHGs), air pollutant emissions, and cost of ownership for conventional and alternative fuel vehicles (AFVs).

Key Features of AFLEET

AFLEET has three modules, depending on the user's needs:

 The AFLEET spreadsheet-based tool, which provides detailed data on AFVs' environmental and economic impacts

 AFLEET Online, a simplified web-based version of AFLEET that calculates AFVs' environmental and economic impacts

 HDVEC (Heavy-Duty Vehicle Emissions Calculator), a web-based calculator comparing the cost-effectiveness and environmental benefits of environmental mitigation projects for medium- and heavy-duty vehicles



Fleet managers are key stakeholders in the U.S. Department of Energy's Clean Cities coalition network.

The AFLEET spreadsheet and AFLEET Online, which use data from highly regarded sources,¹ analyze 18 fuel/vehicle technology combinations.

- **Conventional:** gasoline and diesel
- **Hybrid:** gasoline hybrid electric vehicle (HEV), diesel HEV, and diesel hydraulic hybrid vehicle (HHV)
- **Plug-in electric:** plug-in HEV (PHEV), extended-range EV (EREV), and EV
- **Alternative fuel:** biodiesel (B20), B100, renewable diesel (RD20), RD100, ethanol (E85), hydrogen (H2), liquefied petroleum gas (LPG), compressed natural gas (CNG), liquefied natural gas (LNG), and LNG/diesel pilot ignition

Vehicles can be examined for petroleum use, GHG emissions (Figure 1, next page), air pollutant emissions, and simple payback (i.e., comparison of the purchase and annual operating costs of a new AFV to its conventional counterpart). Additionally, the AFLEET spreadsheet tool allows users to calculate the environmental footprint of their existing fleet, the total cost of ownership of potential vehicle and refueling infrastructure acquisitions, and idle-reduction fuel savings and emissions reductions.

HDVEC was developed to compare the emission impacts (nitrogen oxides, particulate matter, and GHGs) and cost-effectiveness of various options for environmental mitigation projects involving medium- and heavy-duty vehicles. HDVEC includes four fuel types: diesel, electricity, propane, and natural gas.

Results Tailored to Your Fleet

Evaluate Both Existing Fleet Vehicles and Potential New Vehicles

AFLEET simplifies the difficult task of estimating the environmental and economic impacts of numerous conventional vehicles and AFVs. Fleet managers can use it to understand their current environmental footprint. They can also compare potential new vehicle options to see what AFVs best suit their fleet's operational and organizational needs.

Footprint Your Existing Fleet

To examine an existing fleet's environmental footprint, users enter vehicle location and fuel production assumptions (e.g., the regional electricity-generation mix for electric vehicles) on the **Inputs** sheet. The user then enters the vehicle type, model year, miles traveled, and fuel use for each vehicle in the fleet on the **Footprint** sheet. The fleet's total petroleum use, GHG emissions, and air pollutant emissions can be viewed in the tables and graphs on the **Footprint Outputs** sheet (Figure 1).

¹ Argonne's GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) fuel-cycle model, the U.S. Environmental Protection Agency's MOVES (Motor Vehicle Emission Simulator), and the Clean Cities Alternative Fuel Price Report.

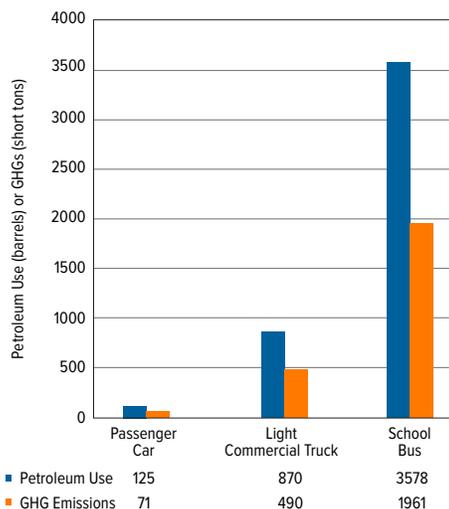


FIGURE 1. Sample output from AFLEET's footprint calculator for a fleet of 3 cars, 5 light trucks, and 10 school buses over 1 year of use.

Compare Costs of Potential Vehicle Purchases

For users who want to perform a simple payback analysis, AFLEET Online will walk the user through the process. Alternatively, users seeking a comparison of *annual* costs, energy use, and emissions can use AFLEET's spreadsheet version, inputting information for vehicle location, vehicle type, number of vehicles, miles traveled, fuel economy, purchase price, and fuel price data.

To examine total cost of ownership (TCO), users enter additional details such as years of planned ownership, loan terms, and discount factor, which generates a comparison of *lifetime* costs, energy use, and emissions. Fuel-production assumptions are adjusted on the **Inputs** sheet, and other assumptions (e.g., maintenance, repair, and infrastructure costs) are specified on the **Payback** sheet. AFLEET presents the results on the **Simple Payback Outputs** and TCO Outputs sheets (Figure 2), respectively.

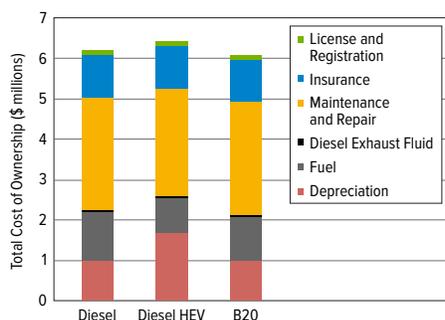


FIGURE 2. Sample output from AFLEET's total cost of ownership calculator for a fleet including trucks powered by diesel, diesel HEV, and B20.

AFLEET has been downloaded more than 8,000 times since its launch, while AFLEET Online has more than 1,500 users

Transportation and Energy Use

The U.S. transportation sector uses more than 70% of the petroleum consumed in the United States.² In 2017, transportation accounted for 37% of the carbon dioxide (CO₂) emissions from U.S. fossil fuel combustion.³ For that reason, reducing vehicle petroleum consumption—and increasing the use of alternative fuels—can substantially contribute to the U.S.'s trend toward energy independence, energy resilience, and environmental sustainability.⁴

Having the right information to understand the costs and benefits of reducing petroleum use and emissions for different AFVs can help fleet managers make informed vehicle acquisition decisions, enabling them to meet a variety of organizational goals and legal requirements.

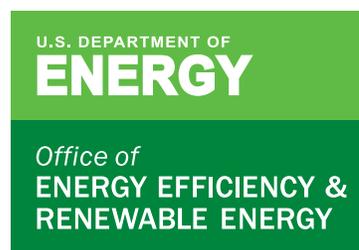
Accessing AFLEET

The free, publically available AFLEET suite of tools is available at <https://afleet-web.es.anl.gov/home/>.

DOE's Clean Cities Coalition Network

The Clean Cities coalition network is a resource of DOE's Vehicle Technologies Office (VTO) Technology Integration Program. Clean Cities coalitions work to advance the nation's energy and economic security by building partnerships to improve transportation energy efficiency through the use of affordable, domestic transportation fuels and technologies. To find your nearest Clean Cities coordinator, input your zip code at the Clean Cities home page: <https://cleancities.energy.gov>.

The AFLEET tool, and more than 20 others from the U.S. Department of Energy's Clean Cities coalition network, are available at <https://www.afdc.energy.gov/tools>. ■



For more information, visit: cleancities.energy.gov

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² https://www.eia.gov/energyexplained/index.php?page=oil_use

³ <https://tedb.ornl.gov> (TEDB, Edition 37.2, Chapter 11)

⁴ http://www.eia.gov/energyexplained/index.cfm?page=oil_imports