

Petroleum Reduction Technologies

Instructor's Manual



National Alternative
Fuels Training Consortium

A Program of

 West Virginia University

Notes

Shifting the focus to the U.S., transportation activities account for the second largest portion of the nation's CO₂ emissions (see **Figure 6**). This emphasizes the opportunity to significantly reduce GHGs through the use of alternative fuels and reduced petroleum consumption.

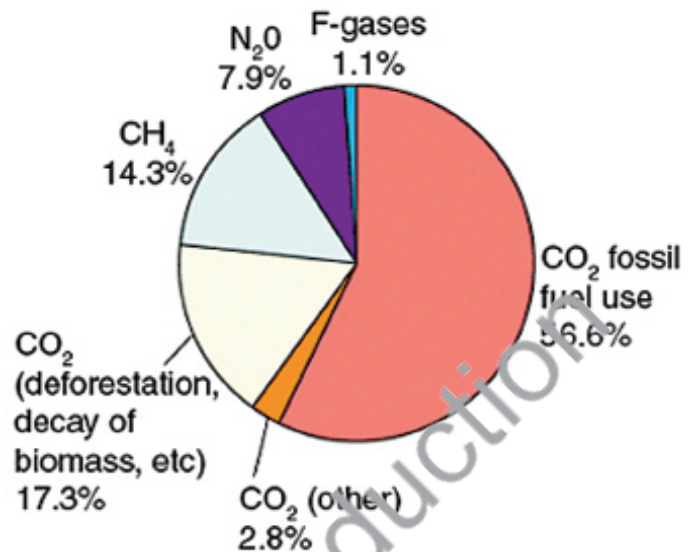


Figure 5: Global anthropogenic greenhouse gas emissions, 2004. Source: Intergovernmental Panel on Climate Change 4th Assessment. Report: Climate Change 2007: Synthesis Report.

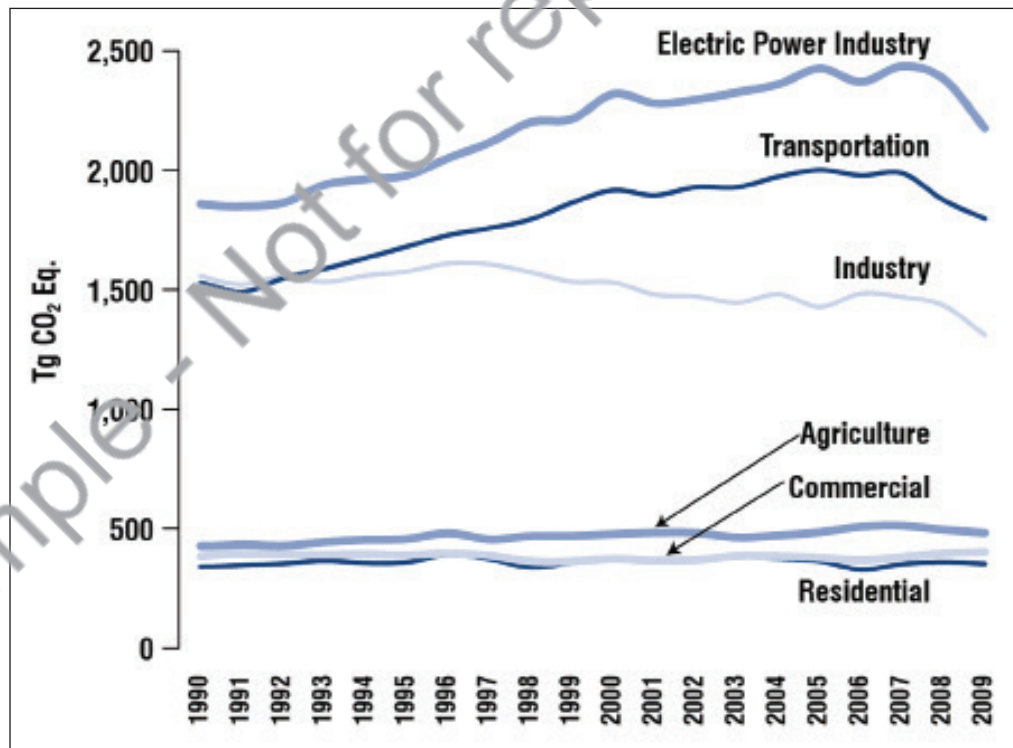


Figure 6: Emissions allocated to economic sectors. Source: U.S. EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2009.

The U.S. EPA regulates the production of emissions other than CO₂ for conventional and alternative fuel vehicles. The main regulated emissions are oxides of nitrogen (NO_x), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM). These emissions have negative environmental and health effects (see **Figure 7**). They also can lead to secondary emissions problems such as the formation of smog in heavily congested area. Smog or ground level ozone is monitored by the EPA and also has negative impacts on health and the environment.

Regulated Emission	Abbreviation	Negative Impacts
Oxides of nitrogen	NO _x	Contributes to smog/ozone formation and acid rain
Carbon monoxide	CO	Poisonous, can displace oxygen causing suffocation
Hydrocarbons	HC	May be carcinogenic and contributes to smog
Particulate matter	PM, soot	May be carcinogenic, respiratory irritant, can contribute to smog and acid rain

Figure 7: Major regulated tailpipe emissions. Source: NAFTC.

Reduced petroleum consumption and decreased emissions are not the only benefits of utilizing alternative fuel and advanced technology vehicles. According to the Pew Charitable Trust, jobs in the environmentally friendly production industry, which includes biofuel and hybrid electric vehicle production, increased by 67% from 1998 to 2007. There is great potential for alternative fuel and advanced technology vehicles to continue contributing to economic growth. The increase in jobs in these industries is the result of research and development efforts, feedstock generation, renewable fuel production and distribution, vehicle conversions and maintenance, and fueling infrastructure development.

The Need for Alternative Fuels and Advanced Technology Vehicles

Alternative fuel and advanced technology vehicles have evolved significantly over the years. The production and use of these vehicles have been driven by multiple forces, including federal and state regulation, consumer acceptance, and consumer demand.

Federal Requirements

First enacted by Congress in 1975, the purpose of Corporate Average Fuel Economy (CAFE) standards is to reduce energy consumption by increasing the fuel economy of cars and light-duty trucks. The Act was passed in response to the 1973 Oil Embargo. The near-term goal was to double new car fuel economy by model year 1985. The current goal of 27.5 has been in place for years, but the current administration has nearly doubled the standard through 2025.

Figure 8 shows the CAFE standards for light-duty passenger cars from its inception to the 2025 goal of more than 50 MPG.

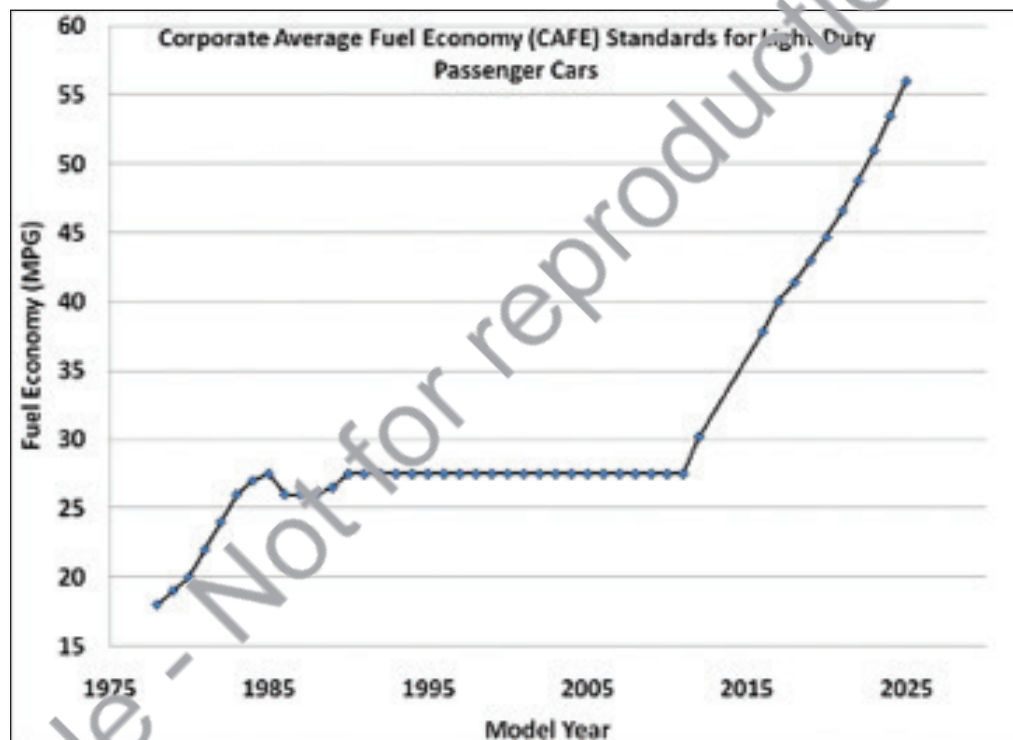


Figure 8. CAFE fuel economy standards for passenger cars. Source: National Highway Traffic Safety Administration (NHTSA).

The Energy Policy Act of 1992 (EPAct 1992) was enacted with the purpose of reducing U.S. dependence on imported petroleum and improving air quality by addressing all aspects of energy supply and demand. EPAct 1992 encourages the use of alternative fuel and advanced technology vehicles through voluntary and regulatory activities and approaches carried out by the DOE. Voluntary activities to promote alternative fuel and advanced technology vehicles, mainly focused on local efforts, are implemented primarily through the Clean Cities Program. EPAct 1992 regulations require that certain federal, state, and alternative fuel provider fleets build an inventory of AFVs.

DEFINITION: ALTERNATIVE FUELS

As defined by EPCA 1992, alternative fuels are methanol, ethanol, and other alcohols; blends of 85% or more of alcohol with gasoline (E85); natural gas and liquid fuels domestically produced from natural gas; liquefied petroleum gas (propane); hydrogen; electricity; biodiesel (B100); coal-derived liquid fuels; other than alcohol, derived from biological materials; and P-Series fuels (added to the definition in 1999).

EPCA 1992 also defines alternative fuels and gives the authority to DOE to add to the list of authorized alternative fuels if certain criteria are met.

EPCA 1992 was amended by the Energy Conservation Reauthorization Act of 1998, the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and the National Defense Authorization Act of 2008. Additionally, Executive Orders 13149, 13423, and 13514 were signed in 2000, 2007, and 2009, respectively. Together, these actions have added alternative fuel use requirements for federal fleets; given state and alternative fuel provider fleets alternative compliance options; and defined hybrid electric, fuel cell, and advanced lean-burn vehicles as AFVs.

Federal regulations also encourage the production of alternative fuel and advanced technology vehicles. In 2010, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation's National Highway Traffic Safety Administration jointly issued a final rule that requires vehicle manufacturers of passenger cars, light-duty trucks, and medium-duty passenger vehicles to improve fleet-wide fuel economy and reduce fleet-wide GHG emissions annually. These regulations are more stringent as compared to past fuel economy standards and will likely push automobile manufacturers to produce more AFVs and advanced technology vehicles.