

# Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation

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Scientific analyses and models indicate a need to stabilize atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases (GHGs) by the middle of this century to reduce the risks of climate change. Controlling GHG buildup will require major reductions in CO<sub>2</sub> emissions from the economic sectors that are the predominant users of carbon-rich fossil fuels.

A response by the transportation sector to this energy and emissions challenge will be important because the sector produces between one-quarter and one-third of all the CO<sub>2</sub> emitted from the country's energy consumption. In addition, because transportation accounts for more than two-thirds of the petroleum consumed in the United States, saving energy in transportation also can have important implications for the cost of access to the world's oil supplies.

## Setting Targets

A study committee appointed by the National Research Council of the National Academies under the auspices of the Transportation Research Board (see box, page 26) examined the potential for policies targeting cars and light trucks, medium and heavy trucks, and commercial airliners to yield major changes in transportation energy use and emissions trends. These three modes account for the vast majority of passenger trips and freight movements and are by far the largest users of energy in U.S. transportation.

In Special Report 307, *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, the committee examines fuel taxes, vehicle efficiency standards, fuel standards, infrastructure investments, and coordinated transportation and land use planning as ways to bring about

Transportation accounts for more than two-thirds of the petroleum consumed in the United States and between one-quarter and one-third of the nation's energy-based carbon dioxide emissions.



PHOTO: JEREMY NOBLE

Sharklet wing tips on an Airbus A320 development aircraft are among the energy-saving features under testing by aircraft manufacturers in response to airline demands for energy efficiency. Passenger aircraft account for approximately 6 percent of transportation energy use.



PHOTO: P. PIERRE, AIRBUS S. A. S. © 2011

large energy and emissions savings from the three modes over time. Each option, however, presents particular challenges with respect to the scope and timing of its impacts. A combination of policy options to improve the timeliness and expand the scope of the response may be warranted.

### Policy Challenge

U.S. transportation is powered almost entirely by petroleum. Transportation is the country's largest user of oil and a major source of GHG emissions and is central to commerce and to daily routines. Transportation allows people to access more places of work, obtain a wider range of goods and services, and connect socially over broader areas. Transportation allows businesses to situate in the most economically efficient locations and reach a larger number of suppliers and customers.

Today's transportation modes and systems cannot be easily or quickly altered, having evolved over many decades and reflecting countless decisions about where and how Americans live and businesses operate. The diversity and ubiquity of the nation's transportation system present both opportunities and challenges for policy making.

The amount of petroleum consumed in transportation and the associated emissions of GHGs are a function of the fuel economy of transportation

vehicles, their operating environment, the frequency and intensity of vehicle use, and the GHG characteristics of the fuels. Policies to curb transportation energy consumption and emissions will need to focus on the sector's dominant modes—cars and light trucks for personal travel and medium and heavy trucks for moving freight.

Cars and light trucks account for approximately two-thirds of the sector's petroleum consumption and a comparable share of GHG emissions. Because of anticipated increases in federal fuel economy and GHG performance standards, light-duty vehicles are projected to account for a decreasing share of the transportation sector's total energy use and emissions over time; yet even by 2030 they still will account for the majority share, or 55 to 60 percent.

Medium- and heavy-duty vehicles, including large trucks that carry freight, contribute 20 to 25 percent of the sector's energy use and emissions. These vehicles also are projected to account for a similar percentage in 2030. All motor vehicles together will continue to account for more than 75 percent of transportation's total energy use and emissions.

The next-largest contributor is the passenger airline industry, with a share of emissions projected to increase from roughly 6 percent to 8 percent over the 20-year period. The three types of vehicles—cars,

Cars and light trucks account for approximately two-thirds of the sector's petroleum consumption and a comparable share of GHG emissions; discretionary shopping trips are a rapidly increasing reason for car use.



PHOTO: GREG HICKMAN

trucks, and commercial airliners—will be the main sources of the sector's energy use and emissions for many years to come.

## Exploiting Opportunities

Any policies aimed at making major changes in transportation energy use and emissions trends will almost certainly need to find and exploit opportunities to reduce the energy and emissions intensity and the activity of these vehicles.

For cars and light trucks, the opportunities are likely to include the following:

- ◆ Increasing the energy efficiency of vehicles introduced after 2020 to exceed the goal of 35 miles per gallon, required by current legislation;
- ◆ Moderating the rate of growth in private-vehicle use by households, particularly for the fastest-growing reasons for personal trip making, such as discretionary trips for shopping and services; and
- ◆ Diversifying the fuel supply to reduce dependence on gasoline and to favor energy sources that yield lower emissions of GHGs in fuel production and consumption.

For freight-carrying trucks, the opportunities are likely to include the following:

- ◆ Accelerating the development and introduction of fuel-saving truck designs and technologies,
- ◆ Encouraging the widespread adoption by fleet operators of more energy-efficient operations and maintenance practices, and
- ◆ Diversifying the fuel supply to reduce diesel consumption and to favor energy sources that yield lower emissions of GHGs in fuel production and consumption.

For passenger airliners, the opportunities include the following:

- ◆ Accelerating fleet turnover to hasten the early entry of next-generation aircraft that are more energy efficient and that produce fewer emissions and
- ◆ Enabling more efficient airline routing and operations through improved air traffic management procedures and systems.

## Keys to Success

The successful exploitation of opportunities for saving energy and reducing emissions in these dominant modes will require policies that influence the decisions and actions of those who (a) supply the vehicles, fuels, and infrastructure; (b) own and operate the vehicles and provide commercial freight and pas-



PHOTO: TOYOTA MOTOR CORPORATION

senger services; and (c) demand these transportation services.

A policy approach that does not influence the incentives and actions of all of these target groups is likely to fall short of the desired outcome. The debate is over the types and combinations of policies that are best suited to making early progress in controlling emissions and that can increase the scope and amount of emissions reductions by the middle of this century.

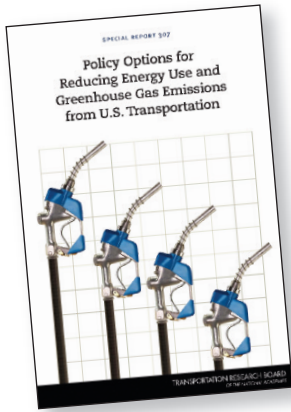
## Policy Options Explored

The committee reviewed several policy options:

- ◆ Transportation fuel taxes;
- ◆ Vehicle efficiency standards and feebates—that is, using fees charged to purchasers of low-efficiency vehicles to fund rebates to purchasers of high-efficiency vehicles—as well as other financial incentives to motivate interest in vehicle efficiency;
- ◆ Low-carbon standards for transportation fuels;
- ◆ Land use controls and travel demand management measures aimed at curbing private household vehicle use; and
- ◆ Public investments in transportation infrastructure to increase vehicle operating efficiencies.

The report examines how each policy option influences transportation energy use and GHG emissions, whether by affecting the amount of energy- and emissions-intensive transportation activity, the energy efficiency of vehicles and their operations, or the GHG characteristics of the transportation energy supply. Policies that affect all three areas and that can be applied across modes are likely to have the most influence on transportation energy use and

The study committee examined financial incentives such as feebates and fuel taxes to encourage the purchase of more energy-efficient vehicles. Above, a hybrid vehicle on the assembly line.



Special Report 307, *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, is available from the TRB online bookstore, [www.trb.org/bookstore/](http://www.trb.org/bookstore/); to view the book online, go to <http://onlinepubs.trb.org/onlinepubs/sr307.pdf>.

emissions. How quickly each policy can be put into effect is an important consideration, because early actions that slow the rate of growth in emissions will allow more time for developing and implementing responses to reverse the upward trend.

### No Silver Bullet

Achieving timely, sustained, and increasing cuts in GHG emissions may require a variety of policy measures acting in combination and synergistically. According to the report, fuel taxes have the greatest applicability across modes, although raising fuel prices is unpopular with the public. In addition to having sectorwide applicability, fuel taxes can prompt a varied energy- and emissions-saving response by consumers and by the suppliers of fuels, vehicles, and transportation services.

Efficiency standards have a more focused impact, increasing the energy and emissions performance of vehicles and fuels but without prompting vehicle operators to engage in more energy-efficient operations or to scale back their energy- and emissions-intensive activities. The key advantage is that efficiency standards have a history of implementation.

Few of the policies examined in this report are likely to be adopted quickly or to remain in place for long unless they do more than reduce GHG emissions. Interest in reducing dependence on petroleum,

much of it supplied from politically unstable regions of the world, has been an important reason for adopting vehicle fuel economy standards, and this will continue to motivate the introduction of other policies aimed at curbing transportation's energy use.

Other public interests also must align with these goals. For example, if investments in transportation infrastructure and operating practices to make the system more energy efficient also can reduce congestion and delays, they will be desirable to consumers. The coordination of land use planning and transportation investments likewise can yield more effective and efficient energy-saving responses by consumers. The introduction of fuel taxes and other measures to raise energy prices would require infrastructure-related policies to support the ensuing demand for system efficiencies to save fuel.

### Role of Research

Although the study committee was not tasked with developing a research agenda, the challenges discussed in the report point to the long-term importance of making near- and medium-term policy choices on a well-informed, strategic basis. A policy-making approach that is strategic requires research that goes beyond the traditional role of supporting technology advances.

Strategic policy making requires information and analytical techniques drawn from multiple disciplines—for example, economics research on the connections between transportation and productivity, political research on how policies can be coordinated across jurisdictions, and behavioral research that yields a better understanding of how consumers value future streams of energy savings. With this information, policy makers will be able to assess alternative policies and their likely interactions, the lead times that specific measures will require for maximum effectiveness, and the actions that can put favored policies into effect.

### Strategic Alignment

Whichever strategic combination of policies is pursued, success in introducing and sustaining the initiatives will depend on the public's resolve to conserve energy and reduce GHG emissions from transportation and from other sectors. For decades, the reasons for the public to care about saving energy in transportation have been ample—from the need to improve air quality to concern about the world's oil supplies. Climate change has added to—and elevated—this public interest. The calls for a strategic alignment of public policies to address these challenges may not be new but are becoming more urgent.

## Committee for a Study of Potential Energy Savings and Greenhouse Gas Reductions from Transportation

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