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

Scientific analyses and models indicate a need to stabilize atmospheric concentrations of carbon dioxide (CO₂) 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 CO₂ emissions from economic sectors that are heavy 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 CO₂ emitted from the country’s energy consumption. Saving energy in transportation can also have important implications for the cost of access to the world’s oil supplies, since transportation accounts for more than two-thirds of the petroleum consumed in the United States.

The committee that produced this report 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 thus are by far the largest users of energy in U.S. transportation. Major policy options examined in the report—fuel taxes, vehicle efficiency standards, fuel standards, infrastructure investments, and coordinated transportation and land use planning—could bring about large energy and emissions savings from these modes over time; however, each option 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 it is central to commerce and to daily lives. It allows people to access more places of work, obtain a wider range of goods and services, and connect socially over broader areas. It 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 thus present both opportunities and challenges for policy making.

The amount of petroleum consumed in transportation and the associated emissions of GHGs are largely a function of the fuel economy of transportation vehicles, their operating environment, how often and intensely they are used, and the GHG characteristics of the fuels. Policies to curb transportation energy consumption and emissions in the decades ahead will almost certainly need to focus on the sector’s most heavily used modes: the cars and light trucks used for personal travel and the medium and heavy trucks used for moving freight. Cars and light trucks account for about two-thirds of the sector’s petroleum consumption and thus a comparable share of GHG emissions. Largely 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. However, they will continue to account for the majority (55 to 60 percent) in 2030.

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 are projected to account for a similar percentage in 2030, which means that 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, whose share of emissions is projected to increase from about 6 to 8 percent over the 20-year period. Thus, three types of vehicles—cars, trucks, and commercial airliners—will be the main sources of the sector’s energy use and emissions for many years to come.

**OPPORTUNITIES TO EXPLOIT**

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

- Further increasing the energy efficiency of vehicles introduced after 2020 in an attempt to exceed the goal of 35 miles per gallon required in current legislation;
- Modifying 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 whose production and consumption both result in lower emissions of GHGs.

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

- 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 whose production and consumption both result in lower emissions of GHGs.

For passenger airlines, the opportunities include

- Accelerating fleet turnover to hasten early entry of next-generation aircraft that are more efficient in using energy and produce fewer emissions and
- Enabling more efficient airline routing and operations through the use of 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 passenger services; and (c) demand these transportation services.

A policy approach that does not influence the incentives and actions of all three groups will likely fall short of achieving the desired outcome. The crux of the debate is over the types and combinations of policies that are best suited both to making early progress in controlling emissions and to enlarging the scope of impact as necessary to bring about deep emissions reductions by the middle of this century.

POLICY OPTIONS EXPLORED

The policy options reviewed in the report include

- Transportation fuel taxes,
- Vehicle efficiency standards and feebates (and 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 factors and that can be applied across modes are likely to have the most influence on transportation energy use and 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

The importance of achieving timely, sustained, and increasing cuts in GHG emissions means that various policies, acting in combination and synergistically, may be needed. 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 both consumers and suppliers of fuels, vehicles, and transportation services. Efficiency standards have a more focused impact; they seek to increase the energy and emissions performance of vehicles and fuels but do not prompt vehicle operators to engage in more energy-efficient operations or to scale back their energy- and emissions-intensive activity. Their key advantage lies in having a history of implementation.

Few of the policies examined in this report are likely to be adopted quickly or kept in place for long unless they promise to do more than reduce GHG emissions. Interest in reducing dependence on petroleum, much of it supplied by politically unstable regions of the world, has been an important reason for the adoption of vehicle fuel economy standards, and this interest will continue to be a driving force behind the introduction of other policies aimed at curbing transportation’s energy use.

Other public interests must also be aligned with these goals. For example, investments in transportation infrastructure and operating practices that make the system more energy efficient will also be desirable to consumers if they reduce congestion and delays. The coordination of land use planning and transportation
investments can likewise yield more effective and efficient energy-saving responses by consumers. Indeed, 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 this study 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 will require research that goes beyond the traditional role of supporting technology advancement. It will require information and analytical techniques that are 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 such information, policy makers will be in a better position to assess how alternative policies are likely to interact with one another, the lead times that specific measures will require for maximum effectiveness, and the actions that will be needed to put favored policies into effect.

CONCLUSION

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