Transportation’s Contribution to U.S. GHGs

Analytic Team: Cambridge Systematics

Multiple Partners on Steering Committee:

- U.S. Environmental Protection Agency
- U.S. Federal Highway Administration
- U.S. Federal Transit Administration
- American Public Transportation Association
- Environmental Defense
- ITS America
- Shell Oil
- Natural Resources Defense Council
- Kresge Foundation
- Surdna Foundation
- Rockefeller Brothers Fund
- Rockefeller Foundation
- Urban Land Institute
Objectives

- Fill a gap left by McKinsey and others who analyzed future technologies and fuels but not travel behavior

- Goal of consistent analysis across strategy types

- Multiple parameters
  - Effectiveness in reducing GHGs
  - Cost
  - Externalities/co-benefits
  - Equity
Assumptions for Baseline

- **Travel continues to grow**
  - VMT growth of 1.4% per year
  - Transit ridership growth 2.4% / year

- **Fuel prices increase**
  - 1.2% per year, beginning at $3.70 / gallon in 2009*

- **Fuel economy improves steadily**
  - Light duty vehicles at 1.91% annually
  - Heavy duty at 0.61%

* AEO high fuel price scenario
Note: This figure displays National On-Road GHG emissions as estimated in the Moving Cooler baseline, compared with GHG emission estimates based on President Obama’s May 19, 2009, national fuel efficiency standard proposal of 35.5 mpg in 2016. Both emission forecasts assume an annual VMT growth rate of 1.4 percent. The American Clean Energy and Security Act (H.R. 2454) identifies GHG reduction targets in 2012, 2020, 2030, and 2050. The 2020 and 2050 targets applied to the on-road mobile transportation sector are shown here.
Wide Range of Strategies Examined

- Pricing, tolls, PAYD insurance, VMT fees, carbon/fuel taxes
- Land use and smart growth
- Nonmotorized transportation
- Public transportation improvements
- \textbullet{} Regional ride-sharing, commute measures
- Regulatory measures
- Operational/ITS strategies
- Capacity/bottleneck relief
- Freight sector strategies
Analytic Approach

- Estimate the GHG reduction of each individual strategy (change in fuel consumption)
  - Cumulative reduction through 2030 and through 2050
  - Annual reductions in critical target years
  - 3 levels of intensity of implementation

- “Bundle” the strategies and examine the combined impacts
  - Effectiveness
  - Interactions, synergies, antagonistic effects
  - Cost
  - Other societal impacts / co-benefits / externalities
  - Equity effects
Strategy Bundles
Illustrative Analysis

- Near-Term/Early Results
- Low Cost
- Facility Pricing
- System and Driver Efficiency
- Long-Term/Maximum Results
- Land Use/Nonmotorized/Public Transportation

Moving Cooler

CAMBRIDGE SYSTEMATICS
Findings: Individual Strategies

Individual strategies achieve varying levels of GHG reductions, ranging from <0.5% to over 4.0% cumulatively to 2050

Examples:

- Speed limit reductions, eco-driving
- PAYD insurance, VMT fees
- Operational and ITS improvements
Combinations of transportation strategies can achieve GHG reductions from transportation

- Less than 4% to 16% annual GHG reductions from baseline* in 2050 (aggressive deployment) (without economy-wide pricing)
- Up to 24% annual GHG reductions from baseline* in 2050 (maximum deployment)

These strategies complement the important reductions anticipated from fuel and technology advancements

* Projections for on-road surface transportation GHG emissions
Range of Annual GHG Reductions of Six Strategy Bundles (Aggressive and Maximum Deployment)

Total Surface Transportation Sector GHG Emissions (mmt)

1990 & 2005 GHG Emissions – Combination of DOE AEO data and EPA GHG Inventory data
Study – Annual 1.4% VMT growth combined with 1.9% growth in fuel economy
Aggressive Deployment Levels – Range of GHG emissions from bundles deployed at aggressive level
Maximum Deployment Levels – Range of GHG emissions from bundles deployed at maximum level

Note: This figure displays the GHG emission range across the six bundles for the aggressive and maximum deployment scenarios. The percent reductions are on an annual basis from the Study Baseline. The 1990 and 2005 baseline are included for reference.
Economy-Wide Pricing

- Mechanisms: Carbon pricing, VMT fee, and/or Pay As You Drive (PAYD) insurance

- Strong economy-wide pricing measures added to “bundles” achieve additional GHG reductions
  - Aggressive deployment: additional fee (in current dollars) starting at the equivalent of $0.60 per gallon in 2015 and increasing to $1.25 per gallon in 2050 could result in an additional 17% reduction in GHG emissions in 2050

- Two factors would drive this increased reduction
  1. Reduction in vehicle-miles traveled (VMT)
  2. More rapid technology advances
Economy-Wide Pricing

Total Surface Transportation Sector GHG Emissions (mmt)

1990 & 2005 GHG Emissions – Combination of DOE AEO data and EPA GHG Inventory data
Study Baseline – Annual 1.4% VMT growth combined with 1.9% growth in fuel economy
Aggressive – GHG emissions from bundle deployed at aggressive level without economy wide pricing measures

- Study Baseline
- Aggressive
- Economy-Wide Pricing
Direct Vehicle Costs and Costs of Implementing Strategy “Bundles”

Note: This figure displays estimated annual implementation costs (capital, maintenance, operations, and administrative) and annual vehicle cost savings [reduction in the costs of owning and operating a vehicle from reduced vehicle-miles traveled (VMT) and delay. Vehicle cost savings DO NOT include other costs and benefits that could be experienced as a consequence of implementing each bundle, such as changes in travel time, safety, user fees, environmental quality, and public health.
Near-Term and Long-Range Strategies

- Some strategies are effective in achieving near-term reductions, reducing the cumulative GHG challenge in later years.

- Investments in land use and improved travel options involved longer timeframes but would have enduring benefits.
Other Societal Goals

- Many strategies contribute to other social, economic and environmental goals while reducing GHGs

- Some strategies have significant equity implications that should be examined and addressed

- Both national level and state/regional/local strategies are important
For More Information…

- http://movingcooler.info
- http://www.uli.org/Books
- jrpotter@camsys.com