Market-Based Transportation Options for a Lower Carbon Future

Washington Climate Advisory Team
Market-based Mechanisms Ad Hoc Committee

Webinar #3, August 24, 2007
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Greenhouse Gas Sources

Transportation is 27% of U.S. emissions and 44% in Washington

<table>
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<th>Sector</th>
<th>MtC</th>
<th>%</th>
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<tbody>
<tr>
<td>Energy</td>
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<td>134.1</td>
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<td>Electric Utilities</td>
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<td>21.3</td>
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<tr>
<td>Residential</td>
<td>1.7</td>
<td>9.5</td>
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<tr>
<td>Commercial</td>
<td>1.1</td>
<td>5.9</td>
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<tr>
<td>Industrial</td>
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<td>30.5</td>
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<td>Transportation</td>
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<td>Fugitive Emissions</td>
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<tr>
<td>Industrial Processes</td>
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<td>7.3</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1.4</td>
<td>7.6</td>
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<tr>
<td>Land-Use Change &amp; Forestry</td>
<td>-9.3</td>
<td>-52.3</td>
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<tr>
<td>Waste</td>
<td>0.6</td>
<td>3.3</td>
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<tr>
<td>Total</td>
<td>17.8</td>
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* Represents shares of total emissions excluding LUCF.
Transportation and Climate Change: The Basic Facts

- Transportation: 44% of WA GHG emissions
- Miles are increasing by 2.0% per year
- Each gallon of gasoline burned emits 20 pounds of CO$_2$ which lasts in the atmosphere for 100 years.
- Technology changes are essential
- But technology changes alone will not solve the problem long-term (especially if we continue to sprawl)
Transportation and Climate Change: More Basic Facts

- Sprawl makes providing most essential public services more energy-intensive

- According to the Center for Clean Air Policy, planning can reduce future emissions trajectory by 5 - 20%

- The state, communities and regional governments are the ones making these decisions.
Four Basic Ways to Reduce CO\textsubscript{2} from the Transportation System

- Improve the fuel conversion efficiency of the vehicle. (i.e. hybrids)
- Reduce the carbon intensity of the fuel used (biofuels, CNG)
- Move to higher occupancy vehicles (transit and carpools)
- Reduce the need for travel in the first place (like energy efficiency for the transportation sector)
Rough Comparative CO₂ Emissions by Mode

Carbon Emissions on a 500 mile trip
(expressed in number of 5-pound bags of charcoal)

- Sport Utility Vehicle
- Average Car
- Efficient Car
- Airplane
- Commuter Rail Diesel
- Vanpool
- Bus
- Hybrid Car
- Electric Rail (NE avg. grid)
## What Influences Transportation Decisions?

<table>
<thead>
<tr>
<th>Entity</th>
<th>Factor</th>
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<tbody>
<tr>
<td></td>
<td>Travel Demand</td>
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<tr>
<td>Consumers</td>
<td>travel decisions</td>
</tr>
<tr>
<td>Vehicle Manufacturers</td>
<td>(indirect)</td>
</tr>
<tr>
<td>Fuel Producers</td>
<td>Fuel price</td>
</tr>
<tr>
<td>Land Use &amp; Infrastructure</td>
<td>travel options</td>
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</table>
General Considerations for the Transportation Sector

- Should it have a separate market or be part of broader market?
- All things equal, broader market more economically efficient
- GHG reductions through travel demand reduction may offer many co-benefits (e.g., energy security, congestion) but has to happen through many, many marketplace and consumer choices.
Vehicle Technology: What reductions can it offer?

- **Gasoline and diesel vehicles**
  - CAFE for light trucks: +2.1% mpg per year 2005-2011
    - If continued would be -31% g/mile by 2030
  - Proposals: -18% to -30% g/mile by 2016 (cars)
    - -30% g/mile by 2016 with few year payback
    - -40 to -50% g/mile over the longer term
Potential Market Instruments for Low GHG Vehicles

CAFE or Pavely - GHG Regulation
Feesbates
Gas Taxes

Incentives for consumers to purchase low GHG vehicles (e.g., tax credits for hybrids); preferential parking for clean vehicles, HOV lane access, reduced registration fees, etc.

Incentives to manufacturers/others to develop breakthrough technologies

Non-traditional financing for consumers
Regulating the Vehicles

- **Cover vehicle manufacturers directly**
  - This option would place car manufacturers into a market and then require that they hold allowances to match the average or direct emissions from the vehicles they sell:
    - Manufacturers are price-responsive
    - Similar to CAFE compliance but more direct
    - Manufacturers have no control over VMT
    - Emissions must be estimated;
    - No fuel price incentive to discourage driving or motivate interest in efficiency
    - Initially coverage low but can cover growing percentage over time

- **CAFE Standards increase**
- **Vehicle GHG standards (Pavley)**
Lower Carbon Fuel Sources: What reductions can they offer?

- Ethanol from biomass and waste
  Needs to be made from cellulose and not corn!
  Currently more expensive than gasoline
- Biodiesel from plant and animal oils
- Methanol from waste and plants
  Currently produced at $1.60/gal gas eq
- Battery electric vehicles fueled from efficient renewable energy (especially in the PNW)
GHG Characteristics of Fuels

Ethanol

- Corn: 15% GHG savings, Sugar care ≈ 40%, cellulosic ≈ 80%
  - Limits on imports (Brazil); costs need to come down for cellulosic
- 24% lower energy content → 30% more frequent refueling (E-85)
- Air quality concerns
- Penetration depends on land availability/conflicts & feed stocks
GHG Characteristics of Fuels

### Diesel
- 18% GHG savings (not accounting for black carbon)
- Biodiesel offers an additional 15% GHG savings (B-20)
- Ultralow Sulfur Diesel + controls will increase diesel use, but $$ to meet CA standards

### Hydrogen
- GHG savings require source of low-GHG hydrogen
- Stationary applications may be more attractive
Potential Transportation Programs
Low GHG Fuels

- Low GHG fuel standard
- Feebates for fuels
- Incentives for fuel suppliers to produce/sell low GHG fuels
- Incentives for consumers to purchase low GHG fuels
- Funding for low GHG fuel infrastructure
Transportation Market Barriers: Low GHG Fuels

- Fuel cost impact of "gas tax" equivalent of $10-30/ton CO2 is only $.10 - $.30 per gallon of gasoline.
  - Price not high enough to provide enough incentive for significant technology development in fuel industry.
  - Incremental fuel costs not high enough to command changes in customer gasoline purchase behavior.

- Infrastructure cost associated with certain alternative fuels very high

- Other issues: energy security concerns
What is the Low Carbon Fuel Standard?

- CA executive order requiring **passenger car** fuels to emit 10% fewer greenhouse gases in 2020
- CARB to establish regulations
- Full Life Cycle Accounting: **penalizes** carbon-intensive fuels and values low carbon fuels
- Could be met by use of ethanol at low blends, electricity, biodiesel, compressed natural gas, E85, hydrogen
- Credits can be generated from electricity sold for use in electric cars or plug-in hybrids (and in CA electricity will be a capped sector)
Key Options for Market-based Transportation Fuel Approach

Cover Oil Upstream
- Comprehensive
- Sends price signal with every gallon used
- Covered entities have limited compliance options
- Consumers relatively unresponsive to gasoline price changes

Low-Carbon Fuel Standard (LCFS)
- Comprehensive
- Takes into account life-cycle GHG emissions
- Life cycle analysis is challenging
- Doesn’t put a hard cap on emissions
- All things equal, not as economically efficient as cap and trade
Considering using the Market to Improve Travel Efficiency

- Land Use Planning and Development so we don’t need the car
- Transit Improvements: new technology and more dedicated funding streams
- Roadway Efficiency and Pricing
- Car Sharing
- Boosting knowledge of road conditions in real time
- New Telecommuting options
- Travel Blending - new mesh network applications for ridesharing
Potential Transportation Measures

**Encourage Low GHG travel modes**

- Support good planning with carbon in mind (resources: data, models, training)
- Require alternative analyses in regional transportation plans
- Target infrastructure funding
- Use Pricing approaches (congestion charge, parking, PAYD insurance)
- Provide incentives for transit, TOD, bike, walk, demand management
- Tires: after-market rolling-resistance labeling or standards, require service stations to have tire gauges for free, require frequent tire pressure checks for commercial vehicles/taxis
- Education & training for consumers on efficient driving behavior
Market Failure: VMT Reductions

Trading doesn’t adequately encourage changes in land use patterns & transportation infrastructure, due to:

- Short term focus of trading
- Multiple parties in land use & infrastructure planning
- Uncertain GHG benefits

Current infrastructure and land use decisions shape future travel patterns and emissions for 100 years.

Delaying smart growth policies puts more pressure on tech. & fuels and increases compliance costs:

- Low or negative $/ton when include fuel savings
Slowing VMT Growth through Well-directed State Investments

- Focus the current transportation and infrastructure funding to efficient locations and modes.
  - Billions will be spent anyway; they can be used reduce the GHG impacts

- Metropolitan regions and cities and towns need the tools and resources to assess the carbon impacts of alternative transportation and land use scenarios.
Zoning: changing the DNA of development

- Lift outdated prohibitions on mixed-use, multi-family, accessory apartments, housing over retail
- Concentrate development around existing infrastructure, saving money
- Respond to consumers who want to walk for simple errands, drive less, spend less money on gas
- Make the traditional towns and villages legal again..... and steer development away from woods and meadows and farmland
Closing Thoughts

- It is very difficult to get transportation sector GHGs below 1990 levels but big reductions are needed in this area.
- If the reductions don’t come from the transportation sector, more pressure will be placed on other sectors, which are also growing and produce more jobs.
- We need progress in all areas of transport: vehicle technology, fuels, reduction in miles traveled, freight movement and ports, & aviation
Closing Thoughts

We need to assess the opportunity costs of delayed action given that:

- Vehicles stay on the road for 15 years
- Emissions stay in the atmosphere for 100 years or so.
- Many small decisions sum to our land use patterns and many of these are happening at the municipal and regional level. (We need partnerships.)
- Land use and infrastructure decisions affect future carbon emissions for a century or more.
Acknowledgement: Thanks to Steve Winkelman at the Center for Clean Air Policy and to Judi Greenwald at the Pew Center on Climate Change for several of the slides in this deck.