MDOT Climate Change

Status Update & Trends Overview

Mitigation Working Group of the Maryland Commission on Climate Change

Sept. 26\textsuperscript{th}, 2016
MDOT EFFORTS SUPPORTING THE GGRA AND MCCC
Consistent with the 2015 GGRA Plan update, with more specific detail on funding, emissions, successes, and next steps
• Transportation Plans and Programs
• Transportation Technologies
  – Clean Car, Federal LDV fuel economy standards
  – Federal M/HD Truck Standards
  – Fuel Standards – Tier3 and Renewable Fuel Standard
• Electric Vehicle Initiatives
• Airport, Port and Freight Initiatives
• Public Transportation
• Pricing Initiatives
• Active Transportation Planning

## 2020 GHG Reductions and Costs

<table>
<thead>
<tr>
<th>GGRA Policy ID</th>
<th>Strategy</th>
<th>2020 GHG Reduction (mmtCO$_2$e)</th>
<th>Total Costs (2015-20 CTP) ($1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.1</td>
<td>Vehicle Technology and Fuel Standards</td>
<td>5.57</td>
<td>n/a</td>
</tr>
<tr>
<td>E.2.A</td>
<td>On-Road Technology</td>
<td>1.00</td>
<td>$1,333,456</td>
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<tr>
<td>E.2.B</td>
<td>Airport Initiatives</td>
<td>0.04</td>
<td>$12,077</td>
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<tr>
<td>E.2.C</td>
<td>Port Initiatives</td>
<td>0.03</td>
<td>$38,605</td>
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<tr>
<td>E.2.D</td>
<td>Freight and Rail Programs</td>
<td>Included in On-Road</td>
<td>$411,261</td>
</tr>
<tr>
<td>E.3</td>
<td>Electric and Low Emitting Vehicle Initiatives</td>
<td>0.25</td>
<td>$500</td>
</tr>
<tr>
<td>F.1</td>
<td>Public Transportation Initiatives</td>
<td>1.61</td>
<td>$3,612,336</td>
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<tr>
<td>F.2</td>
<td>Intercity Transportation Initiatives</td>
<td>0.16</td>
<td>$391,908</td>
</tr>
<tr>
<td>G</td>
<td>Pricing Initiatives</td>
<td>1.99</td>
<td>$287,047</td>
</tr>
<tr>
<td>H.2</td>
<td>Bike and Pedestrian Initiatives</td>
<td>0.07</td>
<td>$160,131</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td></td>
<td><strong>10.72</strong></td>
<td><strong>$6,247,321</strong></td>
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</tbody>
</table>
Transportation Policy & Funding

• Federally prescribed process
  – Maryland Consolidated Transportation Program (CTP)
    • Six-year fiscally-constrained capital program based on projected revenues
    • Includes all transportation business units
  – Metropolitan Planning Organizations
    • Transportation Improvement Programs (up to 4-6 year)
    • Long-Range Transportation Plans (25-year)
    • Fiscally constrained (based on estimates of available funding)
    • Also develop “needs-based” or “unconstrained” plans
    • Coordinated with jurisdictions and land use forecasts
2015-2020 CTP

- $14.4 billion total
- $10.4 billion (capital)
- 60% of funding to GHG beneficial projects
- 41% to projects ready by 2020

Note, the Draft 2017-2022 CTP is currently under review, with the CTP Fall Tour running Sept. 20th through Nov. 15th.

http://www.mdot.maryland.gov/newMDOT/Planning/CTP/2016_CTP_Tour/Index.html
TRANSPORTATION TRENDS
2006 – 2020 – 2030 AND BEYOND
2006 Baseline

Statewide Inventory

Transportation: 33%, 35.5 mmt CO₂e

Transportation Inventory

On-road: 84%, 29.7 mmt CO₂e

Other: 16%, 5.8 mmt CO₂e

2006 composite emission rate (VMT weighted) = 542 g/mi

1 mmt CO$_2$e = 1.84 billion VMT

2020 composite emission rate (VMT weighted) = 476 g/mi

1 mmt CO$_2$e = 2.10 billion VMT

2030 composite emission rate (VMT weighted) = 376 g/mi

1 mmt CO$_2$e = 2.66 billion VMT

1 mmt CO$_2$e reduction = 3.7% Reduction in VMT in 2030
2020 GHG and VMT Estimates

- **2020 GHG mmtCO2e**
  - Light-duty Vehicles: 73%
  - Heavy-Duty Vehicles: 26%
  - Motorcycles/Other: 1%

- **2020 VMT**
  - Light-duty Vehicles: 91%
  - Heavy-Duty Vehicles: 8%
  - Motorcycles/Other: 1%

**Notes:**
- VMT forecasts based on MPO analysis and FHWA trends.
- Emission estimates through EPA MOVES2014 model.
- Consistent with state of the practice for transportation per EPA
Trends to 2030

Emission Factor for Light-Duty Vehicles (By Model Years)

Grams CO$_2$e per mile

2000, 570

2000, 416

2016, 400

2018, 380

2016, 314

2018, 283

2022, 330

2027, 290

2030, 290

2022, 238

2027, 208

2030, 208


Passenger Car

Light Commercial Truck
Trends to 2030

Emission Rate v. Vehicle Miles Traveled (VMT)

Composite CO2e Emission Rate (g/mi)

<table>
<thead>
<tr>
<th>Year</th>
<th>Composite Emission Rate</th>
<th>Statewide Annual VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>56,616</td>
<td>542</td>
</tr>
<tr>
<td>2020</td>
<td>476</td>
<td>65,442</td>
</tr>
<tr>
<td>2030</td>
<td>376</td>
<td>72,014</td>
</tr>
</tbody>
</table>

- Composite Emission Rate
- Statewide Annual VMT
### Light Duty Fleet Turnover

#### Light Duty Vehicle Distribution by Model Year*  
(Compared to Light Duty Vehicles Total)

<table>
<thead>
<tr>
<th>Model Year Group</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>2026 and Later</td>
<td>0.0%</td>
<td>31.2%</td>
</tr>
<tr>
<td>2017-2025</td>
<td>22.8%</td>
<td>51.2%</td>
</tr>
<tr>
<td>2011-2016</td>
<td>43.5%</td>
<td>13.3%</td>
</tr>
<tr>
<td>2010 and Older</td>
<td>33.7%</td>
<td>4.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*Fleet turnover calculated for a sample MD county
LOOKING AHEAD TO 2030
Looking to 2030

More complex than 2020 analysis and many more unknowns....

1. Almost certain – Federal and State vehicle and fuel standards

2. Less certain – Transportation policy and funding

3. Some hints, with many variables to consider –
   - Technology advancement
   - Social trends
   - Market changes and economic shifts
   - Travel behavior
• Strategy Development
  – Identified potential strategies in addition to what’s included in the “Almost Certain” and “Less Certain” scenarios
    • Strategies represent “full” scope of possibilities by 2030, including strategies where MDOT has little control
    • Include traditional capacity and operational strategies, along with technology and behavioral strategies or trends
2030 Variables and Strategies

• Example: Technology advancement
  – Continued extension of Federal standards
    • Increased efficiency requirements through 2030
  – Increased EV market penetration
    • Passenger and commercial applications
    • Range and price concerns disappear
  – Autonomous and connected vehicles
    • V2V and V2I expansion, and more vehicles with higher levels of autonomy
  – Smart mobility, telework, other technologies that replace or remove trips
Technology Advancement

• Role of Maryland in facilitating strategies like electric vehicles, connected/autonomous vehicle technologies, and shared mobility
  – Examples already include:
    • EVIC
    • Bike Sharing
    • Integrated Corridor Management

Provision of Infrastructure/Systems

Regulation (Enabling and Barrier Abatement)

Research and Support for Readiness
2030 Preliminary Results

Almost Certain – Preliminary estimate of the impact of final Federal standards

Less Certain – Preliminary estimate of the impact of implementation of forecasted transportation plans and programs and land use patterns

Hints Only – Emerging technology and everything else
ROLE OF BLACK CARBON IN TRANSPORTATION
**What:** Black carbon is formed by the incomplete combustion of fossil fuels, biofuels and biomass, is the most strongly light-absorbing component of particulate matter (PM). It stays in the atmosphere only for days or weeks, therefore is considered a “short-lived climate pollutant” (SLCP).

**Climate Effects:** Highly variable depending on a number of factors (can have both warming and cooling effects).

**Role Compared to GHGs:** More local and regional impacts by location and season (climate impact is short-lived). Global warming potential of 2,000 – 3,000 (e.g., 2,000 tons of CO$_2$ equals the same radiative effect of 1 ton of black carbon)
Mobile sources account for 52% of U.S. black carbon emissions, with 93% of those emissions from diesel engines.

Substantial reductions expected due to Federal diesel engine controls:
- 32% reduction already from 1990 to 2005
- Further 86% reduction projected through 2030
- Reductions through standards, new particulate filters and fuel, and retrofit programs
Challenges

• Funding – Constraints & Opportunities
• Land use planning & controls at local jurisdiction level
• Increasing impact of M/HD trucks
• Cost effective strategies compared to technology advances
• Infrastructure / manufacturer support for electric and autonomous Vehicles
• MDOT / State role v. private role
• Removing barriers (e.g. role as a facilitator)
  – Groundbreaking technologies
  – Research / Regulations
  – Changing Social Norms
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MDOT Planning Documents: www.mdot.maryland.gov

MDOT 2015 Greenhouse Gas Reduction Plan