Memorandum

Date: February 27, 2015

To: MWCOG Greenhouse Gas Multi-Sector Working Group - Transportation Subgroup

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Subject: Examples of Greenhouse Gas Reduction Strategies for the Transportation Sector

This handout contains examples of greenhouse gas reduction strategies from various reports and publications.

Appendix A (Page 2)

Select Outcome-based Transportation Sector Recommendations from "Table 10: Recommendations for Reducing Regional Greenhouse Gas Emissions from Transportation and Land Use," *National Capital Region Climate Change Report,* Metropolitan Washington Council of Governments, November 2008, pp. 64-65.

Appendix B (Page 3-7)

"Appendix A: List of WWIT Groupings and Individual Strategies" from *What Would it Take? Final Report,* National Capital Region Transportation Planning Board, May 2010, pp.49-51.

Appendix C (Page 8-10)

"Identifying the Most Appropriate GHG Reduction Strategies" from *A Performance-Based Approach to Addressing Greenhouse Gas Emissions through Transportation Planning ,* Federal Highway Administration, December 2013, pp.39-41.

Appendix D (Page 11)

"Table 3.1. State and Local Government Strategies that can Influence Transportation-related GHG Emissions and Energy Use" from *Incorporating Greenhouse Gas Emissions into the Collaborative Decision-Making,* Strategic Highway Research Program, 2013, p.20.

Select Outcome-based Transportation Sector Recommendations from "Table 10: Recommendations for Reducing Regional Greenhouse Gas Emissions from Transportation and Land Use," *National Capital Region Climate Change Report.* Metropolitan Washington Council of Governments, November 2008, pp. 64-65.

A. Increase Fuel Efficiency and Use of Clean-Fuel Vehicles
   - Promote clean-fuel vehicles (cars, trucks, buses)
   - Assess the benefits from a "Cash-for-Clunkers" Program
B. Reduce Vehicle Miles Traveled (VMT)
   - Expand transit use (incentives, exclusive transit lanes)
   - Expand commuter options (car sharing, bicycle/pedestrian, financial incentives)
   - Examine parking policies to reduce VMT
C. Increase Travel Efficiency
   - Adopt best practices for traffic engineering improvements and road management to reduce VMT and congestion
   - Implement the Metropolitan Area Transportation Operations Coordination Program to improve coordination among transportation agencies for data sharing and incident management
   - Enforce existing idling regulations

~~Appendix A~~

List of WWIT Groupings and Individual Strategies

1. Federal Actions:

a. No Further Federal or Local Action

Strategies:	Description
Fuel Efficiency: CAFE 35.5 mpg by 2016	CAFE standards adopted in 2007 and later strengthened in 2009 moving from 25 mpg corporate average fuel economy to 35.5 mpg by 2016
Alternative Fuels: DOE Annual Energy Outlook, based on current energy legislation	Uses national forecasts of energy usage in the transportation sector completed annually by the U.S. Department of Energy. Forecasts are conducted according to current legislation and market assumptions.
Travel Efficiency: Committed TERMs	Committed TERMs include strategies already adopted by state and local jurisdictions in the region to address criteria air pollutants.

b. High Federal Role

Strategies:	Description
Fuel Efficiency: CAFE 55 mpg by 2030	Assumes that after CAFE 35.5 mpg is achieved in 2016, CAFE standards are further strengthened to 55 mpg by 2030.
Fuel Efficiency: Doubling heavy duty vehicle CAFE by 2020	Assumes institution of heavy duty CAFE standards, which would double current heavy duty vehicle fuel economy by 2020
Alternative Fuels and Travel Efficiency: High energy prices ($7/gallon	Uses DOE forecasts for a national high energy price scenario, which assumes $7/gallon gasoline. This causes higher alternative fuel usage and a 6%

gas)	reduction in VMT.

2. State/Regional/Local Actions

a. Shorter term Strategies

Strategies:	Description
(1) Increase transit use	
Metrorail feeder bus service	At 2 underutilized park and ride lots and $.50 am fare buy-down program
Implement neighborhood circulator buses	Expanded circulator bus service to/from Metrorail in 10 neighborhoods
Real-time bus schedule information	Internet and bus shelter display units, with satellite technology tracking 596 buses.
Purchase 185 WMATA buses	CNG buses on 36 crowded routes in DC
WMATA bus information displays with maps (2000 cases)	Increased and improved bus service information at 2000 stops.
Enhanced commuter services	Bus service from Metrorail to Potomac Mills and Arundel Mills shopping centers; bus service from Reston/Herndon, Centreville, and Springfield to Pentagon and downtown DC.; and bus service on HOV facilities such as US 50, I-270, and US 29.
Free bus-rail transfers	Free bus to rail transfers similar to the reduced fare rail to bus transfers.
Free off-peak bus service	Free bus service mid-day and on weekends.
K Street Transitway	Implementation of the K Street Transitway project on K Street in NW DC between 10th St and 23rd St.
TIGER smart hubs	Implementation of the technology component of the TPB TIGER grant submission: regional website of comprehensive transportation information and digital displays at 20 intermodal hubs.
TIGER bus priority	Implementation of the bus priority component of

	the TPB TIGER grant submission: transit signal priority, queue jump lanes, etc on 10 bus corridors.
10 transit stores in MD	Arlington stores used as the example
6 kiosks in MD	Transportation information kiosks similar to ones in VA and DC
(2) Increase non-motorized mode share	
Bike stations at rail stations	Assumes construction of 9 bike stations similar to the Union Station BikeStation.
TIGER bike-sharing	Implementation of the bike-sharing component of the TPB TIGER grant submission: regional expansion of DC's bike-sharing program from 500 bikes to 3000.
Improve pedestrian facilities near rail stations	Improved sidewalks, curb ramps, crosswalks, and lighting at 11 MARC stations and 12 Metrorail stations in Montgomery County.
(3) Pricing	
Volunteer employer parking cash-out subsidy	Equal compensation for free parking to those not driving to work
Parking impact fees	Administered by local governments to recoup costs associated with maintaining roadways and mitigating negative impacts of auto use. Fees are charged per parking space to land owners.
Pay-as-you-drive insurance	Assumes 30% of light duty drivers will switch to PAYD insurance within 6 years (insurance premiums are on a per-mile driven basis).
(4) Improve operational efficiency	
Eco-driving incentives and promotion	Based on study done in Denver, assuming 50% of drivers adopt eco-driving practices.
Idling reduction	Enforcement of existing idling regulations. Many states have state-wide anti-idling laws and several counties and cities have their own anti-idling rules.

MATOC	Regional coordination of incident management. Assumes current MATOC commitments.
Traffic signal optimization	Optimization of almost 2000 signals throughout the region.
(5) Reduce travel	
Expanded Telecommuting (conversion of all potential telecommuters)	Based on State of the Commute Report, all commuters stating that they are able and willing to begin telecommuting do so within 5 years.
Carpool incentive program	Based on Commuter Connections Carpool Incentive Demonstration Project Study where participants received $1 per carpool trip taken.
Vanpool incentive program ($25/van/day)	Incentive program designed to increase number of vanpools in the region.
Expand car-sharing program	Funds incentives for 1000 new car-sharing customers.
Employer outreach, public and private (Metrochecks and carpooling)	Marketing and implementing employer-based TDM programs

b. Longer term Strategies

Strategies:	Description
(1) Increase transit use	
Construction of 1000 parking spaces at Metrorail stations	WMATA adding 1000 parking spaces at different Metrorail stations.
Incremental increase in transit (heavy rail)	Example used is the Dulles rail project to indicate the order of magnitude of CO_2 reduction for a major Metrorail expansion.
(2) Increase non-motorized mode share	
Completion of 2030 Bike/Ped plan by 2020	Accelerated completion of the TPB Bicycle and Pedestrian Plan by 2020 instead of 2030.

(3) Pricing	
TPB Value Pricing Study, with transit	2008 TPB Value Pricing Study, including new priced lanes on major freeways, pricing of existing arterials in DC and pricing of national parkways. Also includes enhances bus transit operating on priced lanes.
(4) Reduce travel	
CLRP Aspirations Scenario	TPB land use and transportation scenario examining concentrated land use around a network of BRT and pricing. Also includes a scenario of just concentrated, transit-oriented land use.

the types of strategies that would be required to meet regional climate change mitigation targets, including GHG emission reductions.[46] The analysis required a GHG inventory and forecast, which was created using a travel demand model to forecast vehicle miles traveled (VMT) for the years 2005, 2010, 2020, and 2030, and applied MOBILE6.2-generated CO_2 emissions factors to generate CO_2 emissions totals.[47] The analysis addressed a wide range of strategies, including transit investments, eco-driving, and operations strategies.

The Atlanta Regional Commission (ARC), Atlanta's MPO, performed a scenario analysis to compare the long range plan forecasts with various transportation investments and vehicle technological improvements in an effort to understand what actions would be required to reduce on-road GHG emissions to 1990, 2000, or 2010 levels.[48] ARC's analysis used a 4-step travel demand model and MOBILE6, the previous EPA emissions model, to model land use scenarios that described different potential growth patterns.[49] Other examples are provided by California MPOs, which have conducted extensive analysis to show which strategies can be implemented and investments made to reduce light-duty GHGs above and beyond what will be achieved through vehicle technologies and fuels.[50]

An important element of this approach, however, is that it should not be just a stand-alone analysis. The GHG analysis and strategy assessment should directly inform and support investment decisions in the LRTP.

Identifying the Most Appropriate GHG Reduction Strategies

A wide suite of strategies are available to reduce GHG emissions from transportation. It is important that States and MPOs identify the key drivers of GHG emissions in their areas and then analyze potential GHG reduction strategies to assess potential effectiveness in their specific State or regional circumstances. Some of the types of transportation-related GHG reduction strategies that may be advanced by States and MPOs are briefly described below.

VMT Reductions - Light-duty Vehicle Strategies

GHGs from light-duty vehicles can be further reduced beyond what will be achieved through technological developments and regulatory programs, primarily through reductions in VMT influenced by strategies and programs that support travel alternatives. These strategies include:

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[46] MWCOG, "What Would It Take?" Available at: http://www.mwcog.org/clrp/elements/scenarios.asp.

[47] FHWA, "Handbook for Estimating Transportation Greenhouse Gases for Integration into the Planning Process."

[48] Atlanta Regional Commission's PLAN 2040 and associated documents. Available at: http://www.atlantaregional.com/plan2040/documents--tools.

[49] In the time since ARC conducted the scenario analysis using MOBILE6, the EPA has developed an updated model, MOVES. FHWA, "Handbook for Estimating Transportation Greenhouse Gases for Integration into the Planning Process."

[50] Metropolitan Transportation Commission's Climate Change website. Available at: http://www.mtc.ca.gov/planning/climate/.

- **Carpooling and vanpooling programs** that provide an option for motorists to split the costs and externalities of driving alone
- **Bicycling and pedestrian improvements** that encourage greater multi-modal road use
- **Transit improvements**, which provide greater options for motorists to leave their cars at home
- **Teleworking programs**, which give employees the choice to work from home or choose an alternate travel schedule
- **Pricing strategies,** including road pricing, parking pricing, and including Pay as You Drive insurance, influence motorists to drive less and use alternative modes more
- **Land use planning and urban design**, which can reduce trip length, and increase use of transit and non-motorized modes
- **Outreach and education** to increase awareness about the use of alternative modes, the option of teleworking, and other choices that reduce personal costs and GHG emissions from light-duty vehicle travel
- **Incentive programs** to influence more motorists to drive alone less often

By creating more transportation options and influencing travel behavior, these strategies also support other objectives in most regions including improving mobility and travel choices, reducing emissions, developing livable communities, improving access for bicyclists, and improving pedestrian safety. Therefore, such strategies complement and support other regional and/or State objectives.

Vehicle/Systems Operations Strategies

There are a number of actions that State DOTs and MPOs and local communities can take to reduce GHG from transportation system operations. These include the following strategies:

- Managing speed (35-55 MPH is optimal)
- Speed limits/enforcement
- Eliminating bottlenecks
- Smoothing traffic flow
- Improving signal timing
- Roundabouts
- Reducing car and truck idling
- Work zone management to smooth flow
- Congestion pricing
- Encouraging eco-driving

Several of these strategies are routinely included in MPOs' and State DOTs' long range plans because they support other regional and/or State goals and priorities. While these strategies reduce GHG emissions, it is important to recognize that some of them, such as eliminating bottlenecks and improving traffic flow, may facilitate additional vehicular travel that may offset GHG reductions in the long term.

Freight Strategies

Heavy-duty truck GHG emissions are growing faster than other sources of transportation GHGs, and constitute a significant portion of total on-road emissions. An evaluation of GHG emissions from heavy-duty vehicles in seven States found that while the heavy-duty VMT accounted for a relatively small share of total in-state VMT, heavy-duty CO_2 emissions accounted for 20 to 37 percent of total on-road emissions in these States.[51]

MAP-21 established a national freight policy that requires the U.S. DOT to establish a primary freight network of up to 300,000 miles, and requires the development of a National Freight Strategic Plan. With this new focus on freight planning, there may be additional opportunities to address freight-related GHG emissions. Freight strategies that have been identified in various State climate action plans (and some of which are routinely included in State and/or MPO Long Range Plans) are listed below.[52]

- Anti-idling programs
- Truck-stop electrification
- Speed limit enforcement
- Freight villages/consolidation centers
- Feeder barge container service
- Bottleneck reduction
- Traffic flow improvements
- Pre-clearance at scale houses
- Truck driver training
- EPA SmartWay upgrade kits, loans and diesel retrofits
- Improvements to highway grade crossings
- Efficient intermodal facilities
- Incentives to retire older trucks
- Freight logistics improvements
- Shifting freight from truck to rail
- Technologies (Hybrid power trucks; low-viscosity lubricants; single side-base tires; automatic tire inflation systems)

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[51] An evaluation of VMT and on-road CO_2 was conducted for seven states (Michigan, California, Nevada, Maryland, South Carolina, Pennsylvania, and Idaho) and eight metropolitan regions (Atlanta, Denver, Salt Lake City, Chattanooga, Washington, DC, San Francisco, Youngstown, OH, and Burlington, VT). The evaluation found that in the seven states, heavy-duty vehicles accounted for 7%, 8%, 9%, 10%, 10%, 11%, and 18% of total VMT in Michigan, California, Nevada, Maryland, South Carolina, Pennsylvania, and Idaho, respectively. The evaluation also found that heavy-duty vehicle travel accounted for 20%, 21%, 28%, 22%, 26%, 28%, and 37% of total on-road CO_2 emissions in Michigan, California, Nevada, Maryland, South Carolina, Pennsylvania, and Idaho, respectively. This analysis was conducted by ICF International using data from FHWA and these states.

[52] Detailed information on strategies is available in NCHRP 20-24(59) Appendix C, available at:
http://climatechange.transportation.org/pdf/nchrp_2024_59_final_report_031309.pdf.

Appendix D

Table 3.1. State and Local Government Strategies That Can Influence Transportation-Related GHG Emissions and Energy Use

Strategy	Government Action	Primary Responsibility
Transportation system planning and design	• Transportation network design • Modal choices and investment priorities • Roadway design standards (affecting traffic speed and flow and pedestrian and bicycle accommodation)	Transportation agency (state, metro, local)
Construction and maintenance practices	• Pavement and materials (reduced energy consumption materials, durability and longevity, smoothness) • Construction and maintenance equipment and operations (idle reduction, more efficient and alternative fuel vehicles) • Right-of-way management (vegetation management to maximize vegetation as carbon sinks, minimize mowing, solar and wind alternative energy capture)	Transportation agency (state, local)
Transportation system management and operations	• Traffic management and control (signal optimization and coordination, integrated corridor management) • Speed management (speed limits, enforcement) • Idle reduction policies and enforcement • Real-time travel information • Incident management • Preferential treatment for vehicle types (high-occupancy vehicle lanes, bus priority) • Pricing (high-occupancy toll lanes, congestion pricing)	Transportation agency (state, metro, local)
Vehicle and fuel policies	• Vehicle emissions standards (possibly) • Feebates or carbon-based registration fees • Provision of low-carbon fuel infrastructure • Subsidies for low-carbon fuels • Transit vehicle fleet purchases or retrofits • State and local government fleet purchases • Older and inefficient vehicle scrappage	State government, transportation agency (fleet purchases)
Transportation planning and funding	• GHG consideration and analysis in planning • GHG emissions reduction targets • Funding incentives tied to GHG reduction • Multiagency working groups	Transportation agency (state, metro, local)
Land use codes, regulations, and other policies	• Integrated regional transportation and land use planning and visioning • Funding incentives and/or technical assistance for local policies for compact development, walkable communities, mixed-use development, reduced parking requirements • Infrastructure investments to support in-fill and transit-oriented development	Local government (mostly), state government, state and metro transportation agency (incentives, technical assistance)
Taxation and pricing	• State or local tax policies that discourage low-density development • Congestion pricing • Pay-as-you-drive insurance • Parking pricing • Mileage-based transportation user fees • Vehicle registration fees based on fuel efficiency, carbon emissions, or miles driven	State government (mostly), local government (development fee policies, parking pricing), transportation agency (congestion pricing)
Other travel demand management and public education	• Commute and worksite trip reduction programs • Telecommuting and alternative work schedules • Ridesharing and vanpooling incentives and services • Individualized marketing campaigns	Transportation agency (state, metro, local)
Other public education	• Eco-driving information, training, and in-vehicle feedback • Information on fuel economy, cost, and GHG impacts of vehicle purchase and travel decisions	State and local government, transportation agency