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Transportation and Land Use Technical Work Group

Summary List of Draft Priority Policy Options for Analysis

The greenhouse gas reductions (GHG) estimated for the proposed priority policy options are listed in the table below. The policies are not listed in the order that they are discussed in the text that follow the table but rather are grouped to reflect how the policy options will affect emissions. Specifically, the factors that determine GHG emissions from the transportation sector, and that are addressed in the policy options, can be categorized as follows:

- Transportation carbon emissions = Miles driven × carbon per mile.
- Carbon per mile = vehicle emissions per unit × carbon per unit of fuel.

Thus, reducing GHG emissions requires reducing:

1. The number of miles driven,
2. The carbon per unit of fuel (Cleaner Fuels), and
3. The carbon per mile and/or per hour emitted by vehicles (Improved Vehicle Efficiency).

The policy options are grouped such that those that affect the number of miles driven comprise TLU Area 1, those that relate to cleaner fuels comprise TLU Area 2 and those that relate to improved vehicle efficiencies comprise TLU Area 3.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU Area 1: Reduce VMT's contributions to emissions 20% from 2020 baseline		2.9	7.6	53.1			

The overall TLU Area 1 goal could be reach through a variety of policy options. Those options and their quantification are listed below. Together, the individual options affecting VMT produce significantly more reductions that the overall TLU Area 1 goal. The TLU TWG is currently considering whether the VMT reductions implied from the quantification of individual policy options are practical, and seeks guidance from the MWG on how aggressive to be in goal-setting.

Option No.	Policy Option	GHG Reductions (MMtCO2e)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/tCO2e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-1	Carbon Fuel Tax Fund ($0.15 > $2.00/gal)	*0.8*	*2.5*	*16.4*	NA (transfer)		Pending
TLU-2	Land Use and Location Efficiency	*1.1*	*4.6*	*27.6*	Large net savings		Pending
TLU-3	Transit	*1.1*	*2.8*	*20.3*	Net savings		Pending
TLU-5	Intercity Travel: Aviation, High Speed Train, Bus	*TBD*	*TBD*	*TBD*	TBD	TBD	Pending
TLU-6	Pay-as-you-Drive Insurance	*1.0*	*4.3*	*27.2*	Net savings		Pending
TLU-7	VMT Budgets	NA (implemented via TLU-2, et al.)					Pending
TLU-8	Bike and Pedestrian Infrastructure	Included in TLU-3					Pending
TLU-9	Commuter Choice and other Pricing Measures	*1.9*	*2.2*	*21.0*	Net savings	-$1 to -$643	Pending
TLU-11	Evaluate the GHG Emissions Impacts of Major Projects	NA					Pending
	Total of Individual Options	***5.9***	***16.74***	***112.5***			

TLU Area 2: Reduce carbon per unit of fuel							
TLU-4	Low Greenhouse Gas Fuel Standard	0.7	1.9	12.8	TBD	30-90	Pending
TLU Area 3: Reduce carbon per mile and/or per hour							
TLU-10	Transportation Technologies	1.21	3.2	22.44	NA	(200)-1500	Pending
	Sector Total before Adjusting for Overlaps, using ONLY the Area totals	**4.81**	**12.7**	**88.34**	NA	NA	
	Reductions From Recent Actions	TBD	TBD	TBD	NA	NA	
	Sector Total Plus Recent Actions	TBD	TBD	TBD	NA	NA	

As the TLU TWG has worked to set appropriate goals for each of the TLU Area 1 policy options, the TWG has also sought guidance from the level of needed reductions.

Maryland has set statewide goals for reducing GHG emissions and while there is no mandate that the emission reductions for each sector be commensurate with the current and/or projected contribution of the sector to emissions, it is a benchmark against which to compare the reductions estimated for the policy option goals.

The statewide goals for GHG emissions reductions in Maryland are:

- 10% below 2006 GHG emissions levels by 2012
- 15% below 2006 GHG emissions levels by 2015
- 25-50% below 2006 GHG emissions levels by 2020

If each sector is expected to contribute to the reduction efforts in proportion to their contribution, **then** in 2020 a 25-50% reduction below 2005 GHG emissions levels would also be expected from the transportation sector.

The following table shows historical, current (2005) and projected contributions of the transportation sector to Maryland GHG emissions, and emissions required to contribute proportionately to the 2015 and 2020 goals:

Source	1990	1995	2000	2005	2010	2015	2020
Onroad Gasoline	17.91	19.67	21.61	23.94	25.29	26.97	28.78
Onroad Diesel	2.91	3.42	5.09	5.89	6.83	7.91	9.18
Jet Fuel/Av. Gas	1.49	1.41	1.68	1.31	1.32	1.37	1.42
Boats and Ships - Ports/Inshore	1.16	0.90	0.90	0.87	0.81	0.87	0.93
Boats and Ships - Offshore	0.21	0.35	0.39	0.31	0.33	0.35	0.37
Rail	0.39	0.27	0.05	0.06	0.06	0.06	0.06
Other	0.14	0.14	0.16	0.14	0.16	0.18	0.19
Total	**24.20**	**26.16**	**29.90**	**32.52**	**34.81**	**37.71**	**40.93**
Goal (if proportionate) = 2006 *							
-15%						**27.64**	
-25%							**24.39**
-50%							**16.26**

For proportional contributions, the table below shows both the level of emissions that would meet the 2020 goals and the reduction required from the current baseline. The table also presents the reductions that are forecast from the current goals in the TLU policy options.

Maryland State Goals for Emissions by 2020, assuming proportional contribution from all sectors**:**	**25% reduction from 2006 baseline (MMTCO2e)**	**50% reduction from 2006 baseline (MMTCO2e)**
Total TLU emissions in 2020	32.52 – 25% = 24.39	32.52 – 50% = 16.26
TLU Reduction required from current 2020 baseline (38.0 MMTCO2e) to meet goal	40.93 – 24.39 = **16.54**	40.93 – 16.26 = **24.67**
	Total reductions in 2020 (MMTCO2e)	
	If TLU Area 1 goal set at 20% reduction in per capita VMT in 2020	**TLU Area 1 reductions set by individual Policy Options under Area 1**
Reductions estimated from quantification of Draft Policy Options	TLU Area 1: 12.7 TLU Area 2: 1.9 TLU Area 3: 3.2	TLU Area 1: 21.8 TLU Area 2: 1.9 TLU Area 3: 3.2
	17.8	**26.9**
Percentage of each goal	107%	109%

In sum:

- To help reach a statewide goal of a **25% emissions reduction** from the 2006 baseline, TLU can essentially adopt its Area 1 (VMT) goal of a 20% reduction in per-capita VMT from the 2020 baseline, and can substantially relax many of the individual VMT-related policy options.
- To help reach a statewide goal of a **50% emissions reduction** from the 2006 baseline, TLU will have to adopt all of the Area 1 (VMT) policy options at most of their current strength. That would imply roughly a 34% a reduction in per-capita VMT from the 2020 baseline.

VMT goals:

Transportation and Land Use
Policy Descriptions

TLU Area 1: Reduce VMT

Overall goal is to reduce VMT by an amount necessary to reduce emissions by 20% from 2020 baseline, all else being equal. The TLU TWG expects that the overall goal in emissions reduction will be achieved through implementation of TLU-1, 2, 3, 5, 6, 7, 8, 9, and 11. The estimates of reductions available from that individual policy options exceeds the overall emissions reductions goal of 20% for VMT related emissions. The TLU TWG is currently considering whether and how the goals set under the individual policy options can be achieved.

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)		
		2012	2020	Total 2008–2020
TLU Area 1: Reduce emissions 20% from 2020 baseline		2.9	7.6	53.1
Quantification Results from Individual Policy Options that affect VMT				
TLU-1	Carbon Fuel Tax Fund ($0.15 > $2.00/gal)	*0.8*	*2.5*	*16.4*
TLU-2	Land Use and Location Efficiency	*1.1*	*4.6*	*27.6*
TLU-3	Transit	*1.1*	*2.8*	*20.3*
TLU-5	Intercity Travel: Aviation, High Speed Train, Bus	*TBD*	*TBD*	*TBD*
TLU-6	Pay-as-you-Drive Insurance	*1.0*	*4.3*	*27.2*
TLU-7	VMT Budgets	NA (implemented via TLU-2, et al.)		
TLU-8	Bike and Pedestrian Infrastructure	Included in TLU-3		
TLU-9	Commuter Choice and other pricing measures	*1.9*	*2.2*	*21.0*
	Total of individual options	*5.9*	*16.4*	*112.5*

TLU-1 Carbon Fuel Tax Fund

Policy Description

Establish an incremental fuel tax whose revenue would fund transportation investments and operations that reduce GHG emissions. Funds would be available to be spent on any carbon-reducing transportation measure. The GHG performance of the proposed transportation investments would be closely evaluated prior to funding and closely tracked afterwards with performance-based contracts ensuring timely GHG reductions. GHG emission reductions will be greater if regional implementation can be coordinated.

Amount levied to be determined

- Small amounts (~15 cents) can have some demand impact, but can be more appropriately seen as a way to fund transportation related policies than to reduce consumption and emissions directly.
- Larger amounts can have a more meaningful direct impact on consumption and emissions. Revenue can still be used to fund transportation-related policies, but can also be used to reduce other taxes and fees.

Policy Design

Goals:

- Gas tax phased towards carbon tax that increases over time. Start with $0.15 per gallon tax that will increase to $2.00 per gallon by 2025.
- Increase the state tax on conventional fuels to raise revenues for funding transit and other transportation alternatives, options other than single occupant driving.
- Reflect some of the health and environmental (especially GHG) costs of carbon combustion in the fuel being sold, and by reflecting the costs of combustion, thereby reduce the growth in combustion

Timing: 2009 Legislative Session.

Parties Involved: automobile users, state departments of commerce, transportation, revenue, finance.

Other:

Implementation Mechanisms

1. To implement the multimodal transit elements of this policy,

- State, regional, and local transit plans are to be developed, as well as the transit promotion programs and other related programs such as improved bike/pedestrian access to stations and bus rapid transit.

- Funding gaps that exist to implement these plans should be assessed
- Proportion of gap that would be covered by the gas tax levied should be determined
- Governor should create interagency group to identify ways to reduce GHGs and develop resource allocation strategy to:
    - Recognize different regional needs (especially rural versus metropolitan)
    - Establish cost-effectiveness / emission-reduction criteria for determining how tax revenue will be spent.
    - Establish mechanism to ensure that revenue can only be spent for low-carbon transportation options; cannot be used for other state purposes.

2. To implement the non-transit transit elements of this policy

- State, regional, and local needs and opportunities to reduce GHG emissions from transportation through non-transit investments are to be developed. The state should lead, working together with regional and local jurisdictions.

Related Policies/Programs in Place

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Types(s) of GHG Reductions

CO2, methane, and carbon black

Estimated GHG Reductions and Net Costs or Cost Savings

The forecast effect of this policy turns on two calculations:

1. the elasticity of demand for fuel with respect to price, and
2. the responsiveness of VMT to investments in reducing VMT.

Data Sources:

Jonathan Hughes, Christopher R. Knittel, and Dan Sperling, "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand" (February 14, 2007). Center for the Study of Energy Markets. Paper CSEMWP-159. http://repositories.cdlib.org/ucei/csem/CSEMWP-159

ICF Consulting, "Commuter Connections Strategic Review, Final Report," for Maryland Department of Transportation, Office of Planning and Capital Programming, November 7, 2004.

Quantification Methods:

In response to recent data showing a low gasoline elasticity of demand, we use an elasticity of 0.1. the GHG reductions reported in the table are due to the demand response only.

The revenue from the tax is invested in projects, services, and incentives that reduce VMT. Those reductions are quantified in the category in which the revenue is spent. Thus:

A carbon fuel tax that increased smoothly from $0.15/gallon (for conventional gasoline) in 2008 to $2.00/gallon in 2020 would reduce demand directly by about 0.8 MMtCO_2e in 2012. It would also raise (@$0.77/gal) about $2.8 billion/year in 2012.

Benefits

The most cost-effective VMT-reducing Commuter Choice programs in the country are in the DC region, reducing VMT at ~1-2 cents/VMT.[1] Such a program can effectively invest much more than its current budget, but almost certainly not $2.8 billion. The rest would go into funding transit and pedestrian, bicycle, intermodal freight, traffic management, and demand management measures, whose impacts are quantified largely in TLU-3.

The TWG needs to advise on an investment split between commuter benefits programs and other programs and measures.

For this round of analysis, we assume the following use of the $2.8 billion in 2012:

1. Commuter Choice programs:
    a. Increased funding for existing DC-area Commuter Connections: $12 million
    b. Increased funding for existing and new Commuter Connections-type programs (including parking cash out) in Baltimore, Frederick, and throughout the state: $20 million

    Impact: Commuter Connections currently reduces 1,774,670 VMT/day (461,414,200 VMT/yr), for $5 million/yr.

    MD VMT in 2005 was 51,430 million, so Commuter Connections reduced state-wide VMT by ~1%. Moving from $5 million/year to $32 million/year on Commuter Connections-type programs should reduce VMT by ($32/$5 = 6.4 * 0.0089) = 5.7%
2. Transit and non-SOV travel investments: $2.8 billion - $32 million = $2,768,000,000.

The MWG direction on how to analyze spending this revenue: “Focus on the options most likely to reduce GHG emissions.” For this round of analysis, we proceed as follows:

2007 MDOT capital expenditures:

MTA:	$1.5 billion
WMATA:	$1.1 billion

2007 MDOT operating expenditures:

MTA:	$0.5 billion
WMATA:	$0.2 billion
	$3.3 billion / yr

An additional $ /yr would be an 84% increase in total transit expenditures.

[1] ICF Consulting, “Commuter Connections Strategic Review, Final Report,” for Maryland Department of Transportation, Office of Planning and Capital Programming, November 7, 2004.

Total transit ridership in Maryland in 2006 was 252,773,000 trips. An 84% increase in trips would produce an additional 212,329,000 trips. This is very close to a doubling in transit ridership.

Thus:

We report in TLU-1 only those reductions from the direct impact of the proposed carbon tax via fuel.

We report

- in TLU-3 the reductions from investments in transit, since the revenue raised in TLU-1 would be almost exactly the amount needed to double transit expenditures, and thus the double ridership goal in TLU-3;
- in TLU-9 the reductions from investments in commuter connections programs.

Costs

Generally, tax revenue is considered a transfer payment, and is not analyzed as a "cost." Whether a carbon fuel tax is the most efficient (least distortionary) way to raise the revenue with which to make the above investments is beyond the scope of this analysis. We observe that the $2.8 billion is 1.09% of Maryland's Gross State Product.[2]

Another way to use the revenue would be to rebate it or "recycle" it, such as through a reduction in the income tax or a reduction in employer payroll taxes. Such a use would shift taxations from "goods" (income, jobs) to "bads" (GHG emissions). There is an extensive literature on revenue recycling of carbon taxes, which is to extensive to summarize here. There is extensive agreement that revenue recycling reduces the costs of any carbon tax; the extent to which it does so has less agreement, and is subject to the specifics of the case.

Results:

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($\$/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-1	Carbon Tax via fuel ($0.15 > $2.00/gal)	0.8	2.5	16.4	NA	NA	Pending

Key Assumptions:

For this round of analysis, we assume that

- the revenue raised in this Policy Option is spent as outlined above.
- Notwithstanding the emphasis on the ability to invest in non-transit GHG-reducing actions,

[2] Federal Reserve Bank of Richmond, http://www.richmondfed.org/research/regional_conditions/regional_profiles/maryland/output/gross_state_product.cfm

- the most effective use of funds is to help people use transit and non-SOV options that are in place. That is the role of Commuter Connections and related programs targeting non-commute trips.
- The next most effective use of funds is to expand the transit and related options and incentives that those programs need. Clearly the two are also linked; the one is most effective with the other.

Key Uncertainties

1. Response to carbon tax.
2. How the state will choose to invest the revenue.

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-2 Land Use and Location Efficiency

Policy Description

Implement land use planning and development strategies that reduce the number of vehicle miles traveled and corresponding greenhouse gas emissions. Strategies include adopting statewide growth management plans and planning process that encourage more compact development, transit-oriented development and other tools that encourage people to drive fewer miles.

Policy Design

Goals:

To return statewide VMT to 2000 per capita levels by 2020 by implementing policies that maximize growth management and incentivize GHG emissions reductions in the following areas:

1. Land use planning and regulation policies,
2. Development and housing policies that shape public and private investment, and
3. Transportation policies.

Timing:

Parties Involved:

Other:

The 2000 benchmark in Maryland is 9,496 miles traveled per capita based on a 2000 population of 5.3 million and 2000 VMT of 50,296 million miles.

The comparable statistics for 2005 are 10,200 miles per capita based on a 2005 population of 5.56 million and 2005 VMT of 56,725 million miles.

2020 projections estimate VMT per capita in Maryland in that year of 11,519.

Therefore, the needed VMT *per capita* reduction in Maryland from 2020 business-as-usual estimates to reach 2000 levels is 16 percent. This would result in a total VMT of 60,643 million given a 2020 forecast population of 6,386,225. That would be an increase of 6.9% from total 2005 VMT.

Additionally, the TLU supports an aspiration goal of 30% reduction in per capita VMT by 2030. This goal should be evaluated and reset by the state every 5-10 years.

Implementation Mechanisms

Strategies and mechanisms are detailed for the 3 policies outlined under policy design.

1. *Land use planning and regulation policies*
    a. Require climate-friendly compact growth and integrated transportation/land use planning
        i. Adopt statewide development plan that includes a GHG emissions cap for regional transportation & land use plans/programs.
        ii. Develop GHG budgets and VMT per capita targets for local, county, regional and state land use and infrastructure plans.
        iii. Develop a mechanism for coordinating with and comparing local and county land use and infrastructure plans with the statewide growth management plan to ensure consistency and compatibility.
        iv. Provide underlying data/resources to local jurisdictions to implement i – iii.
    b. Require local comprehensive plans and environmental impact statements to run local transportation plans against land use plans and then include global warming emissions analysis and reduction policies.
    c. Direct state spending (including sewer and water) to communities that adopt land use planning and regulation best practices that meet the GHG budget and VMT performance standards set.
    d. Require and support zoning for smart growth
    e. Protect open space to absorb CO_2 and concentrate development in existing areas
2. Development and housing policies that shape public and private investment so as to maximize growth management and incentivize GHG emission reductions
    a. Create smart location requirements and incentives for developers, business and homeowners to maximize growth management and concurrent reductions in GHG emissions.
    b. Strengthen cities, towns and villages by creating and expanding tax incentives for redevelopment and infill development
    c. Fund the reform of state and local tax and zoning/building codes and policies to support and incentivize maximum growth management and GHG emission reductions.
3. Transportation policies that
    a. Sets targets for VMT in line with the overall goal of returning statewide VMT to 2000 per capita levels by 2020 and develop more effective VMT measurement.
    b. Prioritize funds for new transit and significantly expand and improve existing transit systems to provide alternatives to single occupancy vehicular travel.

   c. Prioritize funds for preservation and management ahead of capital/capacity expansion for roadway projects.
   d. Introduce new pricing incentives for roads, parking, transit, and motor vehicle ownership and use to support these goals. [via TLU-9]

4. Develop appropriate enforcement policies to ensure that the plans are followed through with and goals are met.

Related Policies/Programs in Place

- Smart Growth Priority Funding Areas
- Task Force on the Future for Growth and Development

[CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Types(s) of GHG Reductions

Primarily CO2

Estimated GHG Reductions and Net Costs or Cost Savings

GHG impacts:

Current reductions assume a return to 2000 per capita VMT in 2020: a 16% reduction from BAU 2020 VMT. All else is held constant.

Costs / cost savings:

All else being equal, buildings cost somewhat more to construct in urban areas than in suburban or exurban areas. The preponderance of the evidence, and of the academic review of that evidence, finds that increased private construction costs are more than paid for (1) through initial higher sales prices, and higher resale value over time, and (2) through substantial savings in reduced infrastructure costs.

Under a compact, transit-oriented development scenario, such as would be produced under this option, the state would save substantial infrastructure costs. A portion of those benefits would come from the transit use that improved land-use patterns would make possible. More compact land use alone would produce net cost savings, as the more compact development pattern by itself would save substantial amounts. A wide variety of literature shows that integrated transportation and land-use planning produces net savings on total costs of buildings + land + infrastructure + transportation. Some portions of that total cost may be higher. The preponderance of literature suggests net savings overall.[3] A National Academy of Sciences/Transportation Research Board review found substantial regional and state-level infrastructure cost savings from more compact development, as shown in Table H-1.

[3] Literature reviews include US EPA (2001), "Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality"; and Burchell et al. in footnote 4.

Table H-1. Burchell findings of savings of compact growth versus trend development[4]

Area of Impact	Lexington, KY, and Delaware Estuary	Michigan	South Carolina	New Jersey
Public–private capital and operating costs				
Infrastructure roads (local)	14.8%–19.7%	12.4%	12%	26%
Utilities (water/sewer)	6.7%–8.2%	13.7%	13%	8%
Housing costs	2.5%–8.4%	6.8%	7%	6%
Cost-revenue impacts	6.9%	3.5%	5%	2%
Land/natural habitat preservation				
Developable land	20.5%–24.2%	15.5%	15%	6%
Agricultural land	18%–29%	17.4%	18%	39%
Frail land	20%–27%	20.9%	22%	17%

Data Sources: CCS inventory and forecast

Quantification Methods: Top-down

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

There is currently substantial discussion in the TWG about whether land use and location efficiency can produce these kinds of gains.

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

[4] Robert Burchell, et al., *The Costs of Sprawl—Revisited (TCRP Report 39)*, Transportation Research Board/National Research Council/National Academy Press, Washington, DC, 1998.

TLU-3 Transit

Policy Description

Shift passenger transportation mode choice to increase transit ridership and carpooling. This strategy will reduce GHG emissions by reducing vehicle miles traveled (fewer vehicle trips). Ensure that transportation is integrated with and appropriately serves land use development plans (developed under TLU-02).

Policy Design

Goals: To double transit service statewide by 2020.

1. Improve transit service and expand transit infrastructure (rail, bus)
2. Focus new development and growth on transit-served corridors
3. Expand transit marketing and promotion
4. Expand low GHG options

MWG Charge TO TWG: Make this goal *more* aggressive?

Timing:

Parties Involved:

Other:

Implementation Mechanisms

The following strategies should be implemented

1. Improve transit service and expand transit infrastructure (rail, bus)
    a. Planning:
        i. Coordinate Rideshare, Transit, Park and Ride, Bike-Pedestrian and inter-state transportation planning and investment at the state, regional and municipal levels
        ii. Prioritize regional routes for expansion, emphasizing cost-effective BRT to maximize service expansion.
    b. Capital/ Infrastructure:
        i. Improve multi-modal transit access with a focus on cost-effectiveness.
        ii. Improve Park and Ride Lots by expanding construction of well-lighted and police patrolled parking

iii. Develop more effective multi-modal hubs (terminals/shelters), especially at TOD centers
iv. Technology improvements (real-time customer information)
v. Expand Operations and Maintenance facilities (transit bases)
vi. Emphasize pedestrian, bicycle, and bus stop accessibility and safety projects and programs.

c. Operating
   i. Improve access within and between centers
   ii. Provide new service for developing areas
   iii. Provide assistance to rural areas
   iv. Increase resources available to elderly and disabled populations (paratransit), and
   v. Coordinate schedules of transit services
   vi. Improve transit times using transportation management systems (signal prioritization) and/or HOV lanes

2. Focus new development and growth on transit-served corridors
3. Expand transit marketing and promotion
   d. Develop and fund marketing strategies promoting alternative modes
   e. Provide incentives and/or fund guaranteed ride home programs
   f. Provide incentives and/or fund association/network for transit/transportation coordination/management
   g. Provide incentives to employers and individuals who encourage or use rideshare, van pools transit, and other alternative modes
   h. Provide employer education and technical assistance, especially for large employers

Related Policies/Programs in Place

The Maryland Department of Transportation, in cooperation with the Metropolitan Planning organizations, MDE and local government bodies has the following in place with regards to promoting transit use in the state:

- **Park and Ride spaces:** This strategy has been on going in Maryland since 1976. State Highway Administration (SHA), Maryland Transportation Authority (MdTA) and Maryland Transit Administration (MTA) will continue to implement additional Park and Ride spaces along the major roadways of the state.

  State Highway Administration:
  - 2005-2008: 1408 new spaces

- 2009-2012: 2012 new spaces
- 58% occupancy
- SHA estimates 102,010,000 VMT reduced per year based on 11,745 spaces which exist today

Maryland Transit Administration:

- 2005-2008: 2,890 new spaces
- 2008-2012; 2,475 new spaces

- **Expansion of MARC and other transit services**: There is an understanding that there is a need to increase the supply of available transit service in Maryland.

    - Maryland Transit Administration expects that there will be 10,000 additional MARC seats from added train sets and railcars by 2012.
    - Occupancy estimated at 80% conservatively

Types(s) of GHG Reductions

C02, methane, and black carbon

Estimated GHG Reductions and Net Costs or Cost Savings

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods:

GHG impacts:

As described in TLU-1, TLU-3 would be funded with $2,768,000,000/yr from the TLU-1 carbon fuel tax. That amount would be an 84% increase in total transit expenditures statewide.

Total transit ridership in Maryland in 2006 was 252,773,000 trips. An 84% increase in trips would produce an additional 212,329,000 trips. Put another way, we can simply assume an 84% increase in non-SOV mode share. We take the latter approach, and calculate the impacts of an 84% increase in non-SOV mode share.

Transit mode share in 2005: 8.5%

*84%

7.14%

Thus we analyze the impacts of an additional 7.14% transit mode share = a decrease in VMT of 7.14% by 2020. We ramp up from 2007 smoothly to the 2020 goal of an additional 7.14%.

Costs/cost savings:

The cost-effectiveness of investments in transit and transit promotion will vary depending on how those investments are made, and the Option language gives the state and its constituents wide flexibility in making those investments. A given investment in transit and/or transit promotion may or not produce net benefits, so while this process needs to make general policy recommendations, it will remain the responsibility of the state and its constituents to maximize the cost-effectiveness of investments made.

For the purposes of this analysis, and to give the MWG guidance, we ask whether those types of investments are *likely* to produce net costs or net savings. A wide variety of empirical experience suggests that the policies and investments listed in the Option Design and Implementation Mechanisms sections are likely to produce substantial ***net savings***, as in the following four examples.

1. *Transit investments generally:* Nationally, transit produces net economic returns on investment: "For every $10 million invested, over $15 million is saved in transportation costs to both highway and transit users. These costs include operating costs, fuel costs, and congestion costs." These are in addition to the ancillary benefits summarized below.[5]
2. *Transit fare initiatives:* Unlimited Access transit at the University of California–Los Angeles costs $810,000 a year and has total benefits of $3,250,000 a year.[6] Similar programs at other universities show similar results.[7] Universities are in some senses unique institutions, but the general types of challenges (especially demand for and cost of providing parking), and the types of benefits enjoyed in response to commute benefits programs, are equally available to businesses, even businesses located in what would normally be thought of as locations unsupportive of transit use:

   > "Eco Passes also offer significant advantages for employers who offer free parking to all commuters, because those who shift from driving to transit will reduce the demand for employer-paid parking spaces. A survey of Silicon Valley commuters whose employers offer Eco Passes found that the solo-driver share fell from 76 percent before the passes were offered to 60 percent afterward. The transit mode share for commuting increased from 11 percent to 27 percent. These mode shifts reduced commuter parking demand by approximately 19 percent.
   >
   > "Given the high cost of constructing parking spaces in the Silicon Valley, each $1 per year spent to buy Eco Passes can save between $23 and $333 on the capital cost of required parking spaces."[8]

3. *Transit and non-SOV options information and promotion:* Per public dollar, a Transportation Management Organization (TMO) can accommodate seven times as many commuters as new highway investment.[9]
4. *Transit use:* Nationally,

   > "Households who use public transportation save a significant amount of money. A two adult "public transportation household" saves an average $6,251 every year, compared to an equivalent household with two cars and no access to public transportation service. We define "public transportation

[5] Cambridge Systematics, Inc., *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, 1999 (available at www.apta.com/research/info/online/documents/vary.pdf).

[6] Jeffrey Brown, Daniel Hess, and Donald Shoup, "Fare-Free Public Transit at Universities: An Evaluation," *Journal of Planning Education and Research* 23:69–82, 2003.

[7] Jeffrey Brown, Daniel Hess, and Donald Shoup, "Unlimited Access," *Transportation* 28:233–267, Kluwer, 2001.

[8] Ibid., 260.

[9] Minnesota Department of Transportation, Modal Options Identify Project, "Measurement and Evaluation", 2006.

household" as a household located within ¾ mile of public transportation, with two adults and one car."[10]

As a bounding measure of benefits, one may use the most recent analysis of the full cost of a mile of auto travel in a US urban area, which concluded that the total cost of a mile of auto travel was between $0.84 and $1.62, with a mid-range estimate of $1.14, in 2020.[11] That figure would give net savings of:

65,582,642,647 VMT
- 7.14%
= 4,682,600,685 VMT
× $1.14/mile
= $ 5,338,164,781
- 2,768,000,000 transit investment
= $2,570,164,781 net savings in 2020

The $1.14/mile is composed of the following costs:

Internal to driver/owner:

- Fixed vehicle
- Variable vehicle
- Travel time
- Other time
- Crashes
- Parking and Driveways

External to driver/owner:

- Congestion
- Crashes
- Air pollution (health)
- Air pollution (other)
- Noise
- Fires and robberies
- Petroleum consumption

At a lower bound, one might do the same calculation using the current federal mileage reimbursement rate of 60 cents/mile:

65,582,642,647 VMT
- 7.14%
= 4,682,600,685 VMT
× $0.60/mile

[10] Linda Bailey, "Public Transportation and Petroleum Savings in the U.S.: Reducing Dependence on Oil," ICF International, January 2007 (available at: http://www.icfi.com/Markets/Transportation/doc_files/public-transportation.pdf).

[11] David Anderson and Gerard McCullough, *The Full Costs of Transportation in the Twin Cities Region*, University of Minnesota, 2000. http://www.cts.umn.edu/trg/research/reports/TRG_05.html

= $ 2,809,560,411
- 2,768,000,000 transit investment
= $ 41,560,411 net savings in 2020

Due to recent rapid increases in fuel prices, there are no good low bounds to use in this analysis. For example, the most recent AAA cost per mile figure of 52.2 cents/mile is from 2007: "Fuel prices in the study are based on the fourth quarter 2006 U.S. price for regular grade fuel, which averaged $2.256 per gallon.…"[12] The current national average price is $3.287/gallon, or 45% higher.[13] The IRS mileage reimbursement rate does not include all relevant expenses. Sixty cents per mile almost certainly underestimates even private costs and certainly underestimates total social costs. Thus, regardless of what the true cost per avoided mile is, transit investments of this magnitude will almost certainly show net benefits.

How to characterize those benefits *per ton* is another challenge. *Savings per ton* behave very differently than do costs per ton. To give a simple example:

- If Maryland will *spend* a given amount and reduce emissions, the more emissions Maryland can reduce for that expense, the lower the cost per ton.
  - If Maryland were to spend $2.7 billion and reduce emissions by 2.8 million metric tons, the cost per ton would be $964/ton.
  - If Maryland were to spend $2.7 billion and produce twice the benefit, reducing emissions by 5.6 million metric tons, the cost per ton would fall by half, to $482/ton.
- But if Maryland will s*ave* a given amount and reduce emissions, the more emissions Maryland can reduce for that expense, the *lower* the savings per ton.
  - If Maryland were to save $2,570,164,781 (the estimated savings above) and reduce emissions by 2.8 million metric tons, the cost per ton would be -$918/ton.
  - If Maryland were to save $2,570,164,781 (the estimated savings above) and double the GHG reductions, reducing emissions by 5.6 million metric tons, the savings per ton would fall by half, to -$459/ton.

In sum, for a given amount of savings, the higher the estimated emissions reduction, the less money per ton is saved. To exaggerate for the sake of argument:

- Say that Maryland invested the entire $2.7 billion in transit for purely economic and quality of life reason, and happened to reduce a ton of emissions in the process. The savings per ton would be $2.7 billion/ton.
- On the other hand, if Maryland made the same investment and made a wildly inflated estimate of 2.7 billion tons of emissions reductions, then it could estimate the savings per ton at an apparently very reasonable $1/ton.

[12] http://www.aaanewsroom.net/main/Default.asp?CategoryID=4&ArticleID=529

[13] http://www.aaafuelgaugereport.com/

The bottom line is that characterizing the benefits of transit / multi-modal investments in $/ton is fraught with difficulty. Transit – and transportation generally – serves so many social goals that estimating its benefits has always been a difficult challenge.[14] Going another step and assigning those monetary benefits to a single output measure, such as tons of emission reduction, risks further distorting the policy picture. "$/ton" is a measure very well suited to evaluating and comparing investments like (say) scrubbers that have explicit costs directly attributable to emissions reduction. Transit and transportation investments, unless made for the sole purpose of emissions reduction (like various vehicle technologies) are not well evaluated using that kind of metric.

What then should policymakers do in a process like this one that uses $/ton as an evaluation criterion? This analysis suggests that under a reasonable band of assumptions, a substantial Maryland investment in transit and multi-modal transportation is almost certain — especially in an era of high and increasing fuel prices — to produce meaningful net savings for Maryland. Various people have characterized policies in this category as "no regrets policies" from a GHG perspective. One hesitates to use a phrase with such a political background, but the TWG—and then the MWG—might thing about finding a phrase to describe policies that produce large non-GHG benefits, such that assigning all their benefits to GHG reduction produces numbers that are not useful in the policymaking process.

Counter-argument:

Not presenting and defending very high cost-effectiveness figures for transit and related investments incorrectly hides the large benefits available to society from those investments. In two examples given in the above discussion:

- Unlimited Access transit at the University of California–Los Angeles costs $810,000 a year and has total benefits of $3,250,000 a year.
- Given the high cost of constructing parking spaces in the Silicon Valley, each $1 per year spent to buy Eco Passes can save between $23 and $333 on the capital cost of required parking spaces.

The way for society to achieve that rate of return of "1 to 23" or "1 to 333" is to have the transit in place so that garages to not need to be built. Available benefits are empirically large, and should not be hidden behind a catch-all phrase "net benefits."

[Note to TWG: So, you have to decide: use $/ton #s for TLU-3 or not? We need discuss both that, and how to treat TLU-9, which currently shows a range of -$1 to -$643/ton.]

Cost-effectiveness:

$2,570,164,781 savings / 2.8 million metric tonnes = $917/tonne savings.

[14] David J. Forkenbrock and Glen E. Weisbrod, Guidebook for Assessing the Social and Economic Effects of Transportation Projects, NCHRP Report 456, Transportation Research Board (www.trb.org), 2001.

Result:

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/t$CO_2$e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-3	Transit	1.1	2.8	20.3	Net savings		Pending

Key Assumptions: that doubled transit provision will produced doubled ridership.

Key Uncertainties

Ability to expand transit service and ridership at the modeled pace.

Additional Benefits and Costs

Reducing VMT and increasing reliance on public transit will result in a reduced parking demand, lower household costs for transportation, decreased traffic congestion, improved air quality, reduced need and cost for roadway expansion, and improved health for new transit riders who walk or bicycle to transit.

Feasibility Issues

See “Key Uncertainties” about feasibility. On the other hand, the American Association of State Highway and Transportation Officials (AASHTO) has a goal of doubling national transit ridership by 2030.[15]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

[15] John Horsley, Executive Director, Reauthorization and Climate Change, www.transportation.org/sites/aashto/docs/Horsley-2008-01-14.pdf

TLU-4 Low Greenhouse Gas Fuel Standard

Policy Description

A low greenhouse gas fuel standard (LGFS) would create a market-based program to reduce the GHG emissions from transport fuels and diversify transport fuel options for consumers.

The LGFS is not designed to be biased toward any particular fuel: it would include fossil and renewable fuels. Instead, the LGFS is designed to require fuel providers to reduce the greenhouse gas (GHG) intensity of the fuels they sell in Maryland. "Fuel providers" are identified as producers, importers, refiners, and blenders.

The LGFS is not a tailpipe standard for GHGs. The LGFS considers GHG emissions on a full fuel cycle basis, which includes not only tailpipe emissions, but also emissions associated with the production and distribution of fuels (Well to Wheels). This will result in varying carbon impact values for fuels that would otherwise look the same to customers.[16] The extent of GHG emission reduction will be greater if regional implementation can be coordinated.

Policy Design

Goals: Implement policy that reduces the average carbon intensity of on-road transportation fuel 5 % by 2020. This was revised down from 10% based on the uncertainty surrounding the GHG emissions reductions that can be expected from the biofuels that are currently available on the market. Additionally, proposed implementation mechanisms should emphasize use of fallow or waste stock land to produce the biofuels.

Timing: TBD

Parties Involved: All layers of government, fuel providers

Implementation Mechanisms

1. Partnership with the Department of Transportation to create the framework for the LGFS.
2. Market-based mechanisms for fuel providers to choose how they wish to meet LGFS.
3. Full life cycle basis of measuring GHG impact of transportation fuels. Implemented by a cap and trade system for fuel providers.
4. Financial incentives for refueling station creation and retrofitting based on LGFS.
5. Certification process
6. To the extent practicable, harmonize with CA Low Carbon Fuel Standard (LCFS)

[16] For example, how ethanol is made affects its life-cycle GHG profile substantially.

Related Policies/Programs in Place

Currently, about 85 percent of MD's gasoline supply contains 10 percent ethanol (E10), which has been added to federal reformulated gasoline to replace MTBE. Other sources of biofuels are three stations in the State dispensing E85 (a blend of 85 percent ethanol and 15 percent gasoline) to the public and eight retail outlets and 10 distribution facilities offering biodiesel. Maryland requires that at least 50 percent of State vehicles must use a minimum biodiesel blend of B5 beginning in fiscal year 2008.

The Energy Policy Act of 1992 required federal and state governments to purchase alternative fuel vehicles, and in 2001, a MD Executive Order was signed stating that state vehicles should use flexible fuel at least 50 percent of the time. The State of MD owns approximately 800 FFVs, few of which use E85. Under current mandates, however, at least 50 percent of diesel-fueled vehicle in the State's fleet are required to use a blend of fuel that is at least 5 percent biodiesel.

The Renewable Fuels Promotion Act of 2005 authorizes the payment of credits to producers of MD-originating ethanol and biodiesel that meet certain requirements. The amount of credit paid to producers would depend on the number of qualifying plants and whether the feedstocks would qualify for a 5 cents or 20 cents per gallon credit. The law also established a Renewable Fuels Incentive Board to review claims and pay credits to producers over a ten year period. Beginning in FY08, once a facility is certified, the Governor must include funds to implement the credit program. To date, no facility in Maryland has been certified.

Chapter 425 of 2006 SB 54)—this requires that at least 50 percent of diesel-fueled vehicles in the state vehicle fleet (with the exception of vehicles whose manufacturers warranties would be voided if the use of biodiesel caused mechanical failure) use a blend of fuel that is at least 5 percent biodiesel fuel (5%), beginning in fiscal year 2008. The effects of this legislation are just beginning to be felt, but it appears that the State is successfully meeting the requirements of the bill.

Chapter 623 of 2007 (HB 745)—this requires that, beginning in fiscal year 2009, at least 50 percent of the State's heavy equipment, off-road equipment, and heating equipment that uses diesel fuel must use a blend of fuel that is at least 5 percent biodiesel, subject to its availability. According to the bill's fiscal and policy note, this resulted in increased state expenditures (all funds) of $177,600 in FY 2009, reflecting a five cent per gallon price premium for 5 percent biodiesel blends for heating and heavy equipment. According to the MD DBM, the state purchases 9.5 million gallons of diesel annually. The two largest State consumers of diesel fuel are the MTA which uses 8 million gallons of diesel fuel annually in 800 buses, and the SHA, which uses 750,000 gallons. These two agencies consume 92 percent of diesel fuel purchased by MD State agencies. Under the terms of this bill, MTA would use 4 million gallons of B5 fuel annually to run half of its fleet, and SHA would use 375,000 gallons. In total, the state would purchase 4.75 million gallons of B5, nearly all of it with Transportation Trust Fund dollars. This equates to a market for approximately 240,000 gallons of biodiesel. The State anticipates having no difficulty meeting the mandates of this legislation.

Types(s) of GHG Reductions

All GHG types in the fuel life cycle.

Estimated GHG Reductions and Net Costs or Cost Savings

	MMt CO_2e		
	2005	2015	2020
No action-trend (Light-duty + heavy-duty)	23.94 + 5.89 = 29.83	26.97 + 7.91 = 34.88	28.78 + 9.18 = 37.96
CA LGFS – 5% by 2020		33.73	36.06
Reduction		1.1	1.9

Under the LGFS, fuel providers would be required to track the global warming intensity (GWI) of their products, measured on a per-unit-energy basis, and reduce this value over time. Global warming intensity is a measure of all of the mechanisms that affect global climate including not only GHGs, but also processes (like land use changes that may result from biofuel production). The term life cycle refers to all of the activities included in the production, transport, and storage and use of fuel. The unit of measure for GWI used in this study is CO_2e per mega joule of fuel delivered to the vehicle (g CO_2e/MJ) and adjusted for inherent differences in the in-use efficiency of different fuels (e.g., diesel, electricity, and hydrogen).

The table below is from the University of California analysis of the LGFS. It shows the global warming impacts by fuel estimated by two different life cycle analysis (LCA) models. GREET is a model that was developed by Argonne National Laboratory for the Department of Energy. The GREET model is the primary tool relied upon in the University of California study. While LEM has been under development for several years, it remains unfinished today, so some of the qualified impacts are best characterized as illustrative of rough magnitudes under certain sets of assumptions. However, LEM is more comprehensive than many other LCA models.

Note that very recent research published in Science (Fargione et al, 2007) provides different evidence than the University of California study from which the information that follows on GWIs was developed. The Fargione paper says that while biofuels can offer carbon savings, this is dependent on how they are produced. Converting grasslands, peatlands, or savannas to produce food-based biofuels in Brazil, Southeast Asia, and the United States creates a biofuel carbon debt be releasing 17 to 420 times more CO_2 than the annual GHG reductions these biofuels provide by replacing fossil fuels. In contrast, biofuels made from waste biomass, or from biomass grown on abandoned agricultural lands planted with perennials incur little or no carbon debt and offer immediate and sustained GHG advantages.

A second Science article (Searchinger et al, 2007) notes that most prior studies of biofuels have failed to count the carbon emissions that occur as farmers worldwide respond to higher prices and convert forest and grassland to new cropland to replace the grain (or cropland) diverted to biofuels. Using a worldwide agricultural model to estimate emissions from land use change, they found that corn-based ethanol, instead of producing a 20 percent savings, nearly doubles GHG emissions over 30 years and increases GHGs for 167 years. Biofuels from switchgrass, if grown on U.S. corn lands, increase emissions by 50 percent. This result raises concerns about large biofuel mandates and highlights the value of using waste products.

The table below illustrates two important points:

(1) the wide range of GWI values for motor vehicle fuel alternatives, and

(2) the level of uncertainty in estimated GWI values for any specific fuel (as seen by the difference between the GREET and LEM model GWI estimates for individual fuels).

Global Warming Impacts Estimated by Two Life Cycle Analysis Models (gCO_2e/MJ)

Fuel	Fuel production pathway	GREET	LEM (CEF)
CA RFG	Marginal gallon produced in CA	92	85
Diesel	Ultra-low-sulfur diesel produced in CA	71	73
Propane	From petroleum	77	67
CNG	From North American natural gas (in spark ignition engines)	79	81
BTL	Fischer-Tropsch diesel from California biomass (poplar trees)	- 3	–
CTL	Fischer-Tropsch diesel from coal	167	–
Biodiesel	FAME biodiesel from Midwest soybeans	30	224
Ethanol	Midwest corn ethanol from a coal-fired dry-mill	114	–
Ethanol	Midwest corn ethanol from a natural gas-fired dry-mill	70	97
Ethanol	Midwest corn ethanol using stover as fuel in a dry-mill	47	–
Ethanol	California corn from a gas-fired dry-mill, wetcake coproduct	52	–
Ethanol	Cellulosic ethanol from California poplar trees	- 12	–
Ethanol	Cellulosic ethanol from Midwest prairie grass	7	–
Ethanol	Cellulosic ethanol from municipal solid waste	5	–
Electricity	CA average electricity	27	–
Electricity	Natural gas combined cycle and renewable generation	21	34
Hydrogen	Hydrogen from biomass, delivered by pipeline	22	–
Hydrogen	Hydrogen from steam-reformation of onsite natural gas	48	26

The table below summarizes the light-duty vehicle scenarios that were evaluated in the CA low carbon fuel standard study. This table compares the baseline scenario of continuing use of existing fuel and vehicle technologies with various fuel and vehicle innovations. While the LGFS could be met, in part, by vehicle technology innovations, it is suggested that the scenarios of most interest to MD should be the two labeled: (1) existing vehicles with advanced biofuels, and (2) biofuel intensive. For these two scenarios, D10 and G10 represent the 10 percent reduction goal. (Perhaps confusingly, these designations are simply identifiers, not abbreviations like B10 for 10% biodiesel.)

The D10 scenario includes two types of advanced biofuels for light-duty vehicles, low GHG biofuel blends with gasoline and low GHG Fischer-Tropsch (FT) diesel blends. This scenario minimizes changes to the fuel delivery infrastructure, including the equipment to ship biofuels into and within the State and at retail stations. This scenario avoids the use of E85. Attaining a 10 percent AFCI reduction by 2020 requires some biofuels with performance better than the identified low GHG fuels (cellulosic ethanol from switch grass or Midwest prairie grass). Unfortunately, these are controversial, and it is not clear that such fuels are technically feasible. An alternative is to increase the fraction of biofuel blended with gasoline.

The G10 scenario is designed to explore potential outcomes that require as little fuel and vehicle innovation as possible, and instead rely mostly on large volumes of mid-GHG biofuels in both low blends (10 percent by volume in gasoline and 10 percent bio/renewable diesel) and high blends (85 percent volume in gasoline).

Light-duty Vehicle Scenario Names, Descriptions, and AFCI Goals

Scenario Name	Fuel Innovations	Vehicle Innovations			
			-5%	-10%	-15%
Baseline	Current technologies	Gasoline ICE dominates Increased diesel, HEVs		A*	
Electric Drive	Electric charging & H2 refueling	Significant innovation in PHEV, EV, and FCV technologies	C5	**	**
Existing Vehicles with Advanced Biofuels	Significant biofuel innovation Low-GHG biofuels (5.7% vol.) Low-GHG FT diesel blends	None required	D5	D10	**
Evolving Biofuels and Advanced Batteries	No fuel innovation Mid-GHG biofuels (10% vol.) Mid-GHG biodiesel blends	Advances in PHEV, EV, and FCV technologies.	F5	F10	**
Biofuel Intensive	No fuel innovation Mid-GHG biofuels (10%, 85%) Mid-GHG biodiesel blends Low-GHG fuels for G15	None required	G5	G10	G15
Multiple Fuels & Vehicles	Low-GHG biofuels (10%, /85%) Low-GHG FT diesel blends Electric charging & H2 refueling	Advances in PHEV, EV, and FCV technologies	H5	H10	H15
Heavy Duty Compliance	(to be determined)	(to be determined)			

NOTES: *No AFCI goal applies; **Not considered.
No "B" or "E" scenarios are used to avoid confusion with biodiesel and ethanol blends.
In the "No fuel innovation" scenarios, investment is needed to increase the use of current technologies, but no new technologies are assumed. Biofuel scenarios that assume energy crop production for mid-GHG ethanol (F and G scenarios) have large uncertainties due to feedstock production. See Section 2.4.

The incremental cost of biodiesel is 20 cents per gallon above the cost of petroleum diesel. MD 2020 on-road diesel usage is expected to be 837 million gallons. If 20 percent of the petroleum diesel gallons are replaced with biodiesel, then the added consumer cost in MD during 2020 is $33.5 million. Diesel CO_2 emission reductions in a 10 percent reduction scenario are 0.998 million metric tons. The cost effectiveness of these diesel emission reductions therefore would be $33.5 dollars per metric ton CO_2e.

For Fischer-Tropsch (F-T) diesel, recent analyses have estimated the F-T diesel costs 15 cents more than conventional diesel. This is based on California Energy Commission (CEC) reports stating that the analysis of a mature market assumes that the incremental cost of F-T fuel is 15 cents per gallon higher than EPA diesel at the refinery gate.

Based on 2007 U.S. prices, the cost per gallon for gasoline is $3.03 per gallon while the cost for ethanol as E85 is $3.71 (to get the energy equivalent of a gallon of gasoline). The gasoline cost analysis reviewed the 2020 gallons of gasoline equivalent projections of light-duty vehicle fuel use by fuel type for the D10 and G10 scenarios in California. The G10 scenario was ultimately used for this cost analysis because it included the largest penetration of E85. The CA analysis showed a 14 percent statewide reduction in gasoline usage, with most of these gallons replaced with either E85 or an ethanol blend. A 14 percent reduction in 2020 gasoline gallons in MD is 376 million gallons. The cost of achieving this gasoline displacement is $255 million at a 68 cent price differential per gallon. A 10 percent reduction in gasoline-associated carbon is estimated to yield a 2.878 million metric ton reduction in CO_2e. The associated cost effectiveness is $88.6 per metric ton.

Data Sources: "Maryland Task Force on Renewable Alternative Fuels, Final Report," December 31, 2007.

Farrell and Sperling, 2007: "A Low Carbon Fuel Standard for California, Part 1: Technical Analysis," University of California at Berkeley and University of California at Davis, May 29, 2007.

Quantification Methods: [e.g., Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

There is considerable uncertainty in the future price of gasoline and petroleum diesel as well as the lower carbon alternatives to these transportation fuels. There is uncertainty in AFCI values for the alternatives to petroleum fuels. There is also uncertainty in the ability of the market to deliver lower carbon fuels.

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-5 Intercity Travel: Aviation, High Speed Rail, Bus + freight

Policy Description

Provide transportation infrastructure between cities to create connectivity of non-auto transportation modes. Rail transport is one of the most energy efficient means to move people and freight over commonly traveled routes on land. High-speed rail can offer an energy efficient alternative to short-range air travel. Movement of passengers and freight by an efficient rail system decreases overall greenhouse gas emissions by 2-4 times as compared to movement by highway. As such, intercity rail express train passenger services covering longer distances than commuter trains can reduce automobile use and possibly aircraft activity. Increased rail capacity could also allow shifting more freight from trucks to rail.

Technology-based improvements, such as anti-idle devices and more efficient engines, will reduce direct emissions from the locomotives operating on the rail network. A robust and efficient rail network using modern, efficient technology is a cornerstone for sustaining Maryland's thriving economy under future carbon emission constraints while providing many social, economic, and environmental benefits.

Policy Design

Goals:

Reduce transportation sector GHG emissions from intercity travel by making passenger and freight rail more accessible, efficient and available. This would be a contributor toward meeting the VMT per capita reduction goal by 2020 via:

1. Building capacity of express rail and bus by expanding and/or improve current passenger and freight rail as needed,
2. Marketing of new and/or improved/expanded services, and
3. Shift short and mid-distance air travel to high speed rail.

- **Timing:**
- **Parties Involved:** public & private
- **Other:** capacity constraints through the Baltimore area that restrict use of double stack rail cars that are capacity-limiting.

Implementation Mechanisms

Implementation details include:

1. Building capacity of express rail and bus by expanding and/or improve current passenger and freight rail as needed

a. Planning:
    i. Work with municipalities to plan and regulate land use to accommodate well-connected rail and bus infrastructure and service.
b. Capital/Infrastructure:
    i. Improve rail infrastructure to serve all freight needs (double-stack, etc)
    ii. Provide adequate inter-modal (transit, bike, pedestrian, shuttle bus, etc) connections at all railroad stations, airports, and bus stops.
    iii. Indentify and provide necessary freight modal transfer stations throughout Maryland.
c. Operating:
    i. Improve the frequency of service and travel time of current express train and bus routes
    ii. Extend service to underserved cities and regions of Maryland, if and as warranted by demand analysis

2. Standardize the use of anti-idle equipment and best practices for locomotives
    a. Increase the number of modern, more fuel efficient locomotives in service (e.g. Diesel Multiple Units)
    b. Develop electrified rail support systems and hybrid or fully electric locomotives.
    c. Adopt regulations to ensure timely adoption of high-efficiency, low-polluting freight and passenger and port equipment statewide.
3. Marketing of new and/or improved/expanded services
    a. Target improved railroad station and airport inter-modal connections to large institutions and companies and the Maryland travel industry.
    b. Develop auto-free tourism offices in MDOT? to advise on program investments and public-private partnerships and incentives.

Related Policies/Programs in Place

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Types(s) of GHG Reductions

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g., Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD **–** [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD **–** [as needed and approved by the TWGs]

Feasibility Issues

TBD **–** [as needed and approved by the TWGs]

Status of Group Approval

Pending **–** [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD **–** [blank until MWG meeting #5]

Barriers to Consensus

TBD **–** [blank until final vote by the MWG]

TLU-6 Pay-as-you-Drive Insurance

Policy Description

Pay-As-You-Drive (PAYD) pricing converts a portion of insurance to a variable cost with respect to vehicle travel, so premiums are directly related to hours or mileage driven, possibly adjusted for other factors. PAYD makes insurance more actuarially accurate and allows motorists to save money when they reduce their vehicle use and drive more calmly. The less you drive the more you save.

Policy Design

Goals:

PAYD coverage to 10% of MD drivers by 2012 and 100% by 2020 by implementing the following:

1. Conducting a review of opportunities and barriers, and
2. Initiating state-sponsored pilot programs
3. Phasing in a requirement that carriers offer PAYD as part of their MD product choices.

Timing:

Parties Involved: Insurance Commissioner, insurance companies

Other: ensure that policy pays attention to equity

Implementation Mechanisms

Implementation details include:

1. Conducting a review of possibilities
    a. Payment mechanism possibilities:
        i. Insurance type:
            1. Discrete premium levels: premiums are set within specific ranges for mileage driven.
            2. Pay by the mile: using a linear or non-linear rate that increases as mileage increases. This payment scheme must be carefully developed to insure that when a person is faced with the choice of using 2 vehicles to make a trip that the logical and cost effective choice is the most fuel efficient vehicle.
            3. Pay based on hours or miles driven, time, and location.

ii. Fixed up front with a re-imbursement (or additional payment) at the end of the policy period.
    1. Shorter policy periods (1 month instead of 6-12 month period). Billed in a manner similar to utility.
    2. Purchase insurance is valid up to a certain mileage, instead of a particular date.
    3. Review applicable technologies.

2. Initiating state sponsored pilot programs
3. Equity issues could be dealt with much like the state already handles electricity and heating for low income families, via means-tested discounting or employer-side subsidies

Related Policies/Programs in Place

GMAC and On-Star Offers Low-Mileage Discount Rates[17]

Since mid-2004 the General Motors Acceptance Corporation (GMAC) Insurance has offered mileage-based discounts to OnStar subscribers located in certain states. The system automatically reports vehicle odometer reading at the beginning and end of the policy term to verify vehicle mileage. Motorist who drive less than specified annual mileage receive insurance premium discounts of up to 40%:

1-2,500 miles:	40% discount
2,501-5,000 miles:	33% discount
5,001- 7,500:	28% discount
7,501-10,000:	20% discount
10,001-12,500:	11% discount
12,501-15,000:	5% discount
15,001-99,999:	0% discount

Value Pricing Program PAYD Pilot projects [18]

This Federal Highway Administration's Value Pricing Pilot Program is now providing over $4 million in funding for PAYD pilot projects in Georgia and Washington State. The Dallas-Ft. Worth Metropolitan Planning Organization has spent $2 million a PAYD pilot program.

Distance Based Program

Progressive Insurance[19] offers distance-based insurance in Oregon, Michigan, and Minnesota. The program uses GPS to track vehicle location and use.

[17] See http://www.onstar.com/us_english/jsp/low_mileage_discount.jsp.

[18] See http://www.fhwa.dot.gov/policy/13-hmpg.htm.

[19] See http://www.progressive.com.

TripSense(SM)

"Safer drivers and people who drive less than average should pay less for auto insurance. That's why we created the revolutionary TripSense(SM) discount program, which measures your actual driving habits and allows you to earn discounts on your insurance by showing us how much, how fast and what times of day you drive. TripSense gives you more control over what you pay for insurance, as your driving habits determine your discount." [20]

Types(s) of GHG Reductions

Predominantly CO2.

Estimated GHG Reductions and Net Costs or Cost Savings

Data Sources:

The Arizona Public Research Interest Group (PIRG) Education Fund analyzed the potential GHG savings from a Pay-As-You-Drive (PAYD) automobile insurance policy. The strategy for a PAYD policy analyzed assumes that insurers are required to offer mileage-based insurance for certain elements of vehicle insurance, including collision and liability. The PIRG Education Fund assumes the PAYD policy is required, phased in over time, and that all drivers in Arizona are eventually covered.

To calculate GHG savings, the Arizona Public Research Interest Group Education Fund converted Arizona state automobile collision and liability insurance expenditures to an insurance cost per mile (6.4 cents per mile). If insurance consumers pay 80 % of their collision and liability insurance on a per-mile basis, then drivers would be assessed about a 5.1-cent charge per mile. This per-mile insurance charge would reduce vehicle-miles traveled by about 8 %.[21] (To put this charge in context, at 20 mpg, 5.1 cents/mile = ~$1/gallon of gasoline.)

CCS compared the PIRG Education Fund results for estimated reductions in vehicle miles of travel with other studies of PAYD policies, including those produced by the Economic Policy Institute and Resources for the Future (RFF). CCS found that the AZ PIRG estimates were comparable with other estimates, which ranged from 8 % to 20 %.

Quantification Methods:

Impacts:

Pilot studies and empirical experience with other marginal costs of use find that PAYD can reduce VMT by between 8% and 20%. If phase in / ramp up, then:

[20] See http://tripsense.progressive.com/about.aspx.

[21] Elizabeth Ridlington and Diane E. Brown, *A Blueprint for Action: Policy Options to Reduce Arizona's Contribution to Global Warming*, Arizona Public Research Interest Group Education Fund, April 2006, pp. 25-26. http://www.arizonapirg.org/AZ.asp?id2=23683. See also: http://www.serconline.org/payd/links.html, which links to a wide variety of PAYD studies and materials.

Apply reductions to LDV VMT only:

— 2012 reduction = Statewide LDV * 4% reduction

— 2012-2020 reduction = Statewide LDV * 15% reduction

— Convert to CO2

Results:

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/t$CO_2$e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-6	Pay-as-you-Drive Insurance	1.0	4.3	27.2	Net savings		Pending

Net present value / cost effectiveness:

The success of the Progressive Insurance pilot in Texas suggests that there is an unmet demand for more choice in auto insurance. If PAYD a) improves and increases consumer choice, and b) allows insurance providers to more efficiently align risks and premiums, then economic efficiency will increase.

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

Equity Impacts

> "Current vehicle insurance pricing significantly overcharges motorists who drive their vehicles less than average each year, and undercharges those who drive more than average within each price class. Since lower-income motorists drive their vehicles significantly less on average than higher-income motorists, this is regressive. Distance-based insurance is fairer than current pricing because prices more accurately reflect insurance costs.
>
> "Distance-based pricing benefits lower-income drivers who otherwise might be unable to afford vehicle insurance, and who place a high value on the opportunity to save money by reducing vehicle mileage. It benefits lower income communities that currently have unaffordably high insurance rates…. Distance-based insurance would provide significant savings to workers during periods of unemployment, when they no longer need to commute."[22]

Other equity issues may be addressed through policy design.

Maryland legislation by Sen. Gladden of Baltimore aims to offer PAYD policies to benefit lower-income motorists especially in Baltimore.

[22] Ibid. This article discusses a wide variety of questions about PAYD in some detail and provides additional references.

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-7 VMT budgets

Policy Description

The other TLU options affecting VMT will produce only part of the necessary reductions. VMT budgets set state VMT goals by year, and apportion those to the regional and local levels.

State, regional, and local authorities would work together to maintain and increase personal mobility—not inhibit it—through expanded regional and local multimodal design, tools, and investments. The success of those investments would be measured against a VMT budget.

Policy Design

Goals:

State to establish a schedule of targets for reducing statewide per capita VMT and work with local governments and regional planning organizations to distribute and then achieve those targets.

Timing:

Parties Involved:

Other:

Implementation Mechanisms

Following are the details for the policy design above:

1. Set a CO2 cap for the transportation sector (following the model, for example, of Clean Air Act "conformity").
2. Set a VMT cap that is a subset of the CO2 cap. The VMT cap would take into account the effects of other impacts on CO2 from the transportation sector, including improvements in fuel economy and other impacts from measures developed through this process, and set a VMT goal necessary to meet the CO2 goal given all other factors.
3. Develop a statewide plan with targets to reduce annual per capita VMT consistent with the VMT goal.
    a. The state should adopt a schedule of statewide per capita VMT reduction targets.
    b. Schedule would include goal to reduce annual per capita VMT from a business as usual projection for 2020 to 1990 levels.
    c. As the per capita VMT reduction plan would be a partnership connecting the state, regional, and local levels, the state should design a plan that consists of both state actions and investments to achieve the targets.

2. Apportion responsibilities of that plan to planning organizations, inclusive of local jurisdictions.
    a. Significant state oversight is anticipated and much of the attainment in per capita VMT reductions is expected to result from complimentary actions considered by the TWG.
    b. State to develop and provide guidance to the local transportation groups with a wide range of tools and best practices in order to reach the identified benchmarks.
    c. Local governments must adopt VMT plans consistent with statewide plans.
3. Develop appropriate enforcement policies to ensure that the plans are followed through with and goals are met. The most obvious approach would be to follow the Conformity model, in which a transportation funding stream is subject to attainment. In this case a funding stream may be subject to mandatory funding shifts to transit in case of non-attainmment.

The TWG envisions a state and MPO consultative process to establish rules and requirements, but with establishment and management at the state-level.

Related Policies/Programs in Place

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Types(s) of GHG Reductions

CO2, etc.

Estimated GHG Reductions and Net Costs or Cost Savings

TLU-2 would implement land use policies to "return statewide VMT to 1990 per capita levels by 2020"; the placeholder goal for this option. No further GHG emissions reductions are estimated.

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g., Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-8 Bike and Pedestrian Infrastructure

Policy Description

Improve, add, and promote sidewalks and bikeways to increase pedestrian and bicycle travel and reduce automobile use. Expansion of bike and pedestrian infrastructure would aid in decreasing the MD per capita VMT. A growing body of research demonstrates that communities with traditional neighborhood design, connected pedestrian and bicycle networks, available transit and a rich mix of uses are strongly correlated with decreased automobile use.[23]

Policy Design

Goals:

Remove obstacles to providing and benefiting from improved bike and ped infrastructure:

1. Planning for local streets has often focused on the movement and storage of cars while making walking and biking unsafe and unattractive through street design and management, neighborhood design, and parking policies.
2. Local governments have lacked sufficient funding and incentives to maintain basic street infrastructure and invest in biking and walking.

So, increase the bicycle and walking mode share of all trips in Maryland urbanized areas to 15% by 2020 by putting the following policies in place:

1. Build on and implement infrastructure planning and designing tools that support and promote bicycle and pedestrian activity
2. Adopt financial requirements or provide incentives that promote bicycle and pedestrian activities
3. Investing much more in this area.

Timing:

Parties Involved:

Other:

[23] See LUTAQH Study. Also Frank L, Pivo G. Impacts of Mixed Use and Density on Utilization of Three Modes of Travel: Single Occupant vehicle, Transit, and Walking. TRB 1995; 1466: 44-52. – Key study supports Healthscape or LUTAQH

Implementation Mechanisms

Following details are recommended for the policies mentioned above:

1. Introduce infrastructure planning and designing tools/concepts such as:
    a. A state-wide "Complete Streets" policy.
        i. Complete street policies require that new streets, or streets undergoing major maintenance, be designed to accommodate all users.
        ii. Local governments could be required to adopt Complete Street policies for their spending, or provides substantial incentives to localities to do so, e.g. making state transportation grants to localities contingent on project consistency with Complete Street policies.
    b. A rewrite of Highway Design Manual to require all new engineering and construction to accommodate safe, convenient movement of bicycles and pedestrians along all non-limited corridors as well as across corridors where these corridors act as barriers unless exceptional circumstances exist.
    c. Local land use policies could be mandated to include requirements for shower and bike storage facilities in new buildings and design requirements to promote a pedestrian friendly environment.
    d. Add bike storage at transit stations and employers.
2. Financial requirements or incentives that promote bicycle and pedestrian activities include:
    a. Increased funding available for bicycle and pedestrian projects.
        i. Provide grants to localities to develop plans and policies to encourage biking and walking, including public education, safety, engineering, and revisions to local land use policies.
        ii. Provide grants to local governments to identify and study the gaps in their bicycle and pedestrian infrastructure and determine how these gaps can be best filled by street-related improvements as well as those associated with other public right-of-ways (e.g., parks, inter-street links, and specialized structures).
    b. Fund and implement low cost safety solutions that improve conditions for bicycling and walking in maintenance projects like paving projects.
    c. Provide local governments with new taxing authority and more flexibility with gas tax revenues to finance local improvements.
        iii. If these fees and transportation prices were based on vehicle usage (e.g., miles traveled or fuel used) or vehicle type (weight, EPA mpg), it could

provide further incentives for users to choose more efficient vehicles, or shift their trips to less polluting modes.

iv. The goal would be provide sufficient funding for localities to build out their pedestrian and bicycle networks, invest in inviting streetscapes to accompany new development, and retrofit existing streets to prioritize transit, biking and walking.

v. Similarly, local transit agencies should be granted additional voter-approved revenue sources

Related Policies/Programs in Place

The proposed policy would build on the model of Clean Air Act Conformity, adapting that model to growth in VMT and CO2. That model takes one piece of a state-level challenge—future growth—and gives it to local jurisdictions, who are closest to the source of the growth. The model uses the locals' structure to respond, while building on incentives and technology adopted by the state.[24]

Types(s) of GHG Reductions

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Estimated GHG Reductions and Net Costs or Cost Savings

Key Assumptions: This is financed through TLU-1 and implemented via TLU-3. GHG reductions are not quantified independently.

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

[24] See, for example, Environmental Defense, "Incorporating Environmental Performance into Transportation Projects", memo to TLU TWG, 1/30/08.

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-9 Pricing Measures

Policy Description

Pricing measures reduce GHG emissions by changing the economics of transportation.

Roadway tolling can be help manage single-occupant automobile use and provide revenue for alternative modes. Congestion pricing, tolls (or other charges) that vary with congestion levels can also be particularly effective at reducing congestion. Various forms of VMT-based user fees also help manage VMT. Roadway pricing revenues can help fund needed highway improvements. In addition, pricing revenues can be used to fund transit and other transportation alternatives within a corridor or region.

Commuter Choice Programs and Parking management have also been bundled into this policy option.

Commuter Choice Programs encourage and support employers to provide options such as telecommuting, transit subsidies, pre-tax transit fare program, parking cash-out, and guaranteed ride-home service in order to reduce automobile commutes. The telecommuting option includes the development and utilization of neighborhood telecommuting centers that offer office-type services in locations close to commuters' residences. As an incentive to develop and provide such services, a tax credit can be offered to companies. Government spending to encourage commuter choice can stimulate a large private-sector match (17 dollars of private incentives per dollar of public incentive, according to one source).

Automobile use is strongly influenced by the location, supply, and pricing of parking. Local Governments can encourage reduction in automobile use by eliminating minimum parking supply requirements, establishing parking supply caps, encouraging higher parking prices, and other mechanisms. Parking ratios for the maximum number of spaces allowed can be set based on the level of transit service an area has. Smart parking ID systems can help inform drivers of parking availability and reduce excessive circling and searching.

Policy Design

Goals:

Establish the following pricing measures throughout the State by 2020:

1. Cordon Pricing in appropriate areas,
2. VMT Pricing statewide,
3. Parking Pricing

Additionally, commuter choice programs will focus on

1. Requiring and/or incentivizing employers to provide commuter benefits,
2. Expanding commuter choice by supporting telecommuting centers and working with employers to implement best practices in Transportation Demand Management, and

Implementation Mechanisms

Pricing Policy Options for Implementation

This section describes “Commuter benefits and Choice” implementation mechanisms for immediate action, and a set of pricing measures for longer-term policy development and implementation.

Commuter Choice Policy Options for Implementation:

Commuter Benefits and Choice

1. Require and/or incentivize Commuter Benefits
   a. Target program to
      i. all non-rural employers over 200 employees offer Commuter Benefits (CB) programs
      ii. All colleges and universities offer Commuter Benefits
      iii. All government units offer Commuter Benefits, especially the state of Maryland, and
   b. Incentive could be by way of State Tax Credits for Employer-provided Commuter Benefits
2. Expand/ Promote Commuter Choice
   a. State establishes a public/private partnership to develop and run telecommuting centers that offer office-type services in locations close to commuters’ residences.
   b. State establishes best practices in Transportation Demand Management, and assist the following to develop and implement Transportation Demand Management plans:
      i. Employers of over 200 employees,
      ii. Colleges and Universities, and
      iii. State agencies.

Policies for further development:

VMT Pricing

1. Programmatic Details: Maryland should develop a VMT fee. The state should implement the fee if necessary, and adjust the fee, to meet the VMT reduction target.

2. Use of Funds: All proceeds should be used to support the Low-GHG Transportation Investment Fund described in TLU-1.

Cordon Pricing

1. Programmatic Details:
    a. Establish a cordon pricing system similar to that used in Stockholm and Oslo where all vehicles other than public transit should be charged a fee when entering the urbanized core of major cities in MD on a principal arterial.
    b. The fee should be collected electronically and vary by time of day, but in peak periods be at least twice the peak period transit fare then in effect.
    c. The phase-in should be by principal arterial based on highest traffic count.
2. Use of Funds: All proceeds should be used to support development of public transit (see TLU-3).

High Occupancy Toll (HOT) Network

1. Programmatic Details:
    a. Establish a network of lanes that allow public transit vehicles, carpools, and SOVs willing to pay a fee, congestion-free travel.
    b. The electronically charged toll for use of these HOT lanes would vary by time of day and traffic conditions to ensure free-flowing conditions at posted highway speeds. The network should consist of the existing HOT lanes, any currently proposed HOT lanes, and other highway corridors that exhibit the highest level of traffic congestion and the ability to cost-effectively turn bus-only shoulder lanes into a HOT lane.
    c. The HOT network should be phased in over time and completely operational by 2015. The lanes/networks should be phased in based on demand and highest traffic counts.
2. Use of Funds:
    a. Pay back the funding source for monies spent to establish each lane,
    b. Pay all the costs of implementing and administering the toll collection system for that lane, and
    c. The remainder, if any, for the expansion and improvement of transit services within the HOT lane corridor.

Parking Pricing

1. Programmatic Details:
    a. Implement a parking surcharge
    b. Establish mechanisms to encourage the price to be passed on to parkers

c. Explore creating a lower tax structure for parking spaces dedicated to short-term use

d. Explore the use and valuation of commercial park license fee (required to operate a parking garage) to reflect the environmental cost of parking to the cities and result in parking operators charging high rates for off-street parking

e. Ensure that 50% of employers who provide leased parking spaces to employees will offer parking cash-out

f. Develop or improve tools that can be used to evaluate pricing options

2. Use of Funds: All proceeds should be used to support development of public transit.

Related Policies/Programs in Place

- The Maryland Department of Transportation, in cooperation with the Metropolitan Planning Organizations, MDE, and local government bodies, has the following in place with regards to expanding commuter choice and offering of commuter benefits in the state: **Guaranteed Ride Home (GRH) for transit users**. GRH is in place in the Washington region and portions of the Baltimore region.
- **Ridesharing**: MDOT works with the counties and WCOG to help facilitate ride matching

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

We quantify only the impacts of Commuter Choice programs.

Results:

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/t$CO_2$e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-9	Commuter Choice and other Pricing Measures	1.9	2.2	21.0	-$1	-$1	Pending

Data Sources:

ICF Consulting, “Commuter Connections Strategic Review, Final Report,” for Maryland Department of Transportation, Office of Planning and Capital Programming, November 7, 2004.

ICF Consulting, Analyzing the Effectiveness of Commuter Benefits Programs, Transit Cooperative Research Program Report 107, 2005[25]

ICF Consulting, Strategies for Increasing the Effectiveness of Commuter Benefits Programs, Transit Cooperative Research Program Report 87, 2003.[26]

Donald C. Shoup, "Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies," October 9, 1997, Transport Policy.

Donald C. Shoup, Cashing Out Employer-Paid Parking, Report No. FTA-CA-11-0035-92-1. U.S. Department of Transportation. Washington, DC.

ICF Consulting, Strategies for Increasing the Effectiveness of Commuter Benefits Programs, Transit Cooperative Research Program Report 87, 2003.

Quantification Methods:

Commuter Choice programs:

a. Increased funding for existing DC-area Commuter Connections: $12 million
b. Increased funding for existing and new Commuter Connections-type programs in Baltimore, Frederick, and throughout the state: $20 million

Impact: Commuter Connections currently reduces 1,774,670 VMT/day (461,414,200 VMT/yr), for $5 million/yr.

MD VMT in 2005 was 51,430 million, so Commuter Connections reduced state-wide VMT by 0.89%. Moving from $5 million/year to $32 million/year on Commuter Connections-type programs should reduce VMT by ($32/$5 = 6.4 * 0.0089) = 5.7% (2,953,050,880 VMT)

Key Assumptions:

GHG impacts

The assumptions are given above. We believe these kinds of increases are possible given the following results:

> More than half of the surveys reported an increase in transit riders between 10 and 40 percent, and nearly one-quarter reported increases of more than 60 percent. Two surveys—one in San Jose in 1997 and one in Atlanta in 2003—suggest that transit ridership more than doubled after a transit benefits program was implemented.[27]

[25] http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_107.pdf

[26] http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_87.pdf.

[27] ICF Consulting, Analyzing the Effectiveness of Commuter Benefits Programs, p. 43.

Costs

The costs of providing commuter benefits at the work place vary widely. Contributing to employee commute benefit financially produces the largest mode shifts. Simply allowing an employee to participate in a pre-tax transit pass deduction actually saves the employer money, and generally produces almost as much mode shift. Employers then save money on parking, on turnover, and on employee stress.

In a national survey of employers about why they did or did not offer commuter benefits, the main concern was not cost, but the hassle factor of adding an additional benefit. This, we show as the main cost the state's investment in promoting Commuter Connections.

At the IRS mileage rate of 50.5 cents per mile, cost savings to commuters would total:

2,953,050,880 VMT
* $0.505
$ 1,491,290,694
- $32,000,000 Investment in Commuter Connections
$ 1,459,290,694

For there to be negative benefits, costs per employee state-wide would have to exceed

$ 1,459,290,694 savings / 2,530,000 employees = $576/yr.

With an MTA pass at $64/month / $768/yr, it seems highly unlikely that all savings from reduced driving costs would be used up by additional transit fare costs. A substantial portion of the target population would be in the Washington DC suburbs, where transit costs are higher, but these would be balanced by those in the many parts of Maryland with far lower costs.

For a broader discussion of the difficulty of quantifying these benefits in terms of $/ton, please see TLU-3.

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-10 Transportation Technologies

Policy Description

Reduce GHG emissions from both on-road vehicles and off-road engine vehicles (including marine, rail and other off-road engine and vehicles such as construction equipment)through deploying technology designed to simultaneously reduce congestion, curb traffic growth and expand travel choices.

Emissions reductions on on-road vehicles are expected from

a) The implementation of the committed-to MD Clean Car Program and policies to spur use of Plug-in Hybrids

b) A combination of intelligent vehicle infrastructure, driver education (for fuel efficient traffic operation), and smart traffic operations and management designed to simultaneously reduce congestion, curb traffic growth, and expand travel choices.

Transportation Management Systems improve vehicle flow on the roadway system, which can reduce fuel use and GHG emissions. Coordinated operation of the regional transportation network can improve system efficiency, reliability, and safety. Tools to reduce traffic congestion include HOV lanes, roundabouts at intersections, synchronized signals, incident management, variable message signs, and other firms of intelligent transportation systems (ITS).

Policy Design

Goals:

To reduce emissions from on-road and off-road engines/vehicles by 7.5% by 2020.

Policies to be implemented that relate to off-road engines/vehicles include:

1. Provide incentives to increase purchases of fuel-efficient or low GHG vehicles.
2. Increase the use of alternate fuels or low sulfur diesel to reduce GHG emissions.
3. Reduce idling time in locomotive and construction equipment.
4. Initiate marketing and education campaigns to operators of off-road vehicles.
5. Adopt “Green Port Strategy” for Baltimore area port facilities

Transportation system management policies to be implemented in brief include:

1. Active traffic management,
2. Traffic management center(s)
3. Traffic signal synchronization and,
4. Managed lanes

5. Smart parking systems
6. Bus signal priority

All the TSM policies noted above are described in further detail under implementation mechanisms.

Timing:

Parties Involved:

Other:

Implementation Mechanisms

Details for implementing policies include:

1. Provide incentives to increase purchases of fuel-efficient or low GHG vehicles.
    a. Examples of vehicles targeted by program include pure electric, hybrid, plug-in hybrid, and other alternative fuel vehicles
    b. Examples of incentives include
        i. Fees on relatively high emissions/lower fuel economy vehicles.
            1. That is, higher vehicle registration fees can be charged for vehicles that have lower fuel economy, and/or vehicles that use alternative fuels could be charged a lower vehicle registration fee.
            2. Vehicle licensing fees could be based upon vehicle weight, with use of a dollar per vehicle-ton multiplier instead of the present broad categories of vehicle weight.
        ii. Rebates or tax credits on low emissions/higher fuel economy vehicles.
        iii. Implement a sliding scale tax that would allow purchasers of low greenhouse gas emitting vehicles to earn a rebate on their vehicle registration or sales tax of up to X%, and purchasers of high greenhouse gas emitting vehicles to be assessed a vehicle registration or additional sales tax of up to X%. The sliding scale could be designed to be revenue-neutral, i.e., such that rebates are offset by fees assessed.
2. Increase the use of alternate fuels or low sulfur diesel to reduce GHG emissions. By increasing the availability and usage of alternative fuels (low carbon fuel) and low sulfur diesel for off-road vehicles, as well as recreational marine usage, there could be a significant reduction in GHG emissions.
3. Reduce idling time in locomotive and construction equipment.
    c. Consider increasing measures to reduce locomotive idling including “auxiliary engines” to help maintain power, as well as “plug in” power receptacles in the proposed train storage yards.

   d. For equipment in construction contracts, there would be clauses that would restrict idling time in construction equipment.

4. Initiate marketing and education campaigns to operators of off-road vehicles.

   e. Providing the operators of off-road vehicles with better operations information and education can lead to a gain in fuel efficiency.

   f. Operators also need to be aware of maintenance issues that cause an increase in pollution and vehicle operating cost. By ensuring vehicles are well maintained, fuel efficiency and emissions benefits can be achieved.

5. Adopt "Green Port Strategy" for Baltimore area port facilities

   g. Introduce less polluting, more energy efficient technologies for vessel dwelling and for land-side cargo handling equipment as part of strategy

   h. Include providing "shore power" at the port sites where applicable and feasible for shipping vessels.

   i. Replace diesel cranes at the Port; consider electrifying, or other methods to reduce GHG emissions, if feasible.

TSM Policy Options for Implementation:

1. Active Traffic Management. The real-time variable control of speed, lane movement, and traveler information within a corridor and can improve traffic flow in the corridors where it is applied, including:

   a. *Speed Harmonization/Queue Warning/Lane Control* - the ability to smooth traffic flows and speeds as vehicles approach congested areas and reduce the speed of vehicles as they approach queues. In Europe, this strategy has been shown to reduce both primary and secondary accidents, reducing non-recurrent congestion. It has also been found to reduce congestion, queuing, and improve throughput. Speed control allows the highway to continue operating nearer to its highest throughput capacity as volumes increase. Specific performance measure is "increase operating speed for congested areas". Anticipated investment level to achieve it is medium.

   b. *Traveler Information and Dynamic Re-Routing* **-** providing Traveler Information opportunities including travel times and the availability of alternative routes around incidents and congested areas. Dynamic re-routing uses modified destination guide-signs and other traveler information methods to assist drivers through alternative routes. Specific performance measure is "reduction of delay" (time) from one destination to another. Other measures may include how much time it takes to change signals across various jurisdictions/alter signal timing dynamically for city streets. Anticipated investment level to achieve it is medium.

Overall, benefits of Active Traffic Management are reduced overall delay, reduced idling, and fewer secondary accidents which will also reduce delay and idling. Again, anticipated investment level to achieve it is medium.

2. Traffic Management Center(s). Provides centralized data collection, analysis, and real-time management of the transportation system. System management decisions are based on in-road detectors, video monitoring, trend analysis, and incident detection.
    a. Specific performance measures are how quickly problems are identified and responded to and restored to normal, "reduced idling time", and "reduction of secondary accidents".
3. Traffic Signal Synchronization. The timing and operations of the traffic signal operations are synchronized to provide an efficient flow or prioritization of traffic, increasing the efficient operations of the corridor and reducing unwarranted idling at intersections. The system can also provide priority for transit and emergency vehicles.
    a. Specific performance is "reliability". Anticipated investment level to achieve is fairly low, though development of concurrent local jurisdiction support and coordination may raise the cost to medium.
4. Managed Lanes are lane(s) which have special operational characteristics and restrictions that are intended to manage the operations of the lane(s). Management of the facility is typically a combination of physical design, which limits access and regulation, and may include pricing. Examples are:
    a. High Occupancy Vehicle (HOV) lanes – are lane(s) exclusively used by transit, vanpools, and vehicles with a minimum number of occupants (typically a minimum of two or three).
        i. Full funding for the completion of the system is needed.
        ii. In addition, periodic re-examination of the system will allow for improved use by deciding which areas should be maintained at 2+ vehicle capacity vs. other locations that would be better served with 3+ vehicle capacity requirements where demand is high and where further extensions of HOV facilities would best serve the traveling public.
    b. Reversible Express Lanes – Lane(s) that change directions during peak periods to manage peak demand periods.
    c. Direct Access Ramps – Highway ramps which provide direct access to a managed lane. An example is a direct access ramp that links a HOV lane to a park & ride facility.
    d. Ramp Bypass Lane – A lane that provides priority bypass of ramp meters for vehicles.
    e. Truck Only Lanes – a lane(s) exclusively used for trucks.
    f. Transit Only Lane or Bus Ways – a lane(s) exclusively used for transit.

g. Green Lanes – a lane(s) exclusively for vehicles which meet specified environmental impact levels (this management strategy will require careful study, since our HOV lanes are already at capacity)

h. Limited Access Highways – are highways with limited access points.

i. High Occupancy Toll (HOT) or Tolled Express Lane –

   i. Discussed in detail under Pricing Policy Options above.

Specific performance measures: It is important to continuously review the definitions of the segments of the system to achieve the greatest travel time reliability without creating undue inefficiencies in the overall network.

Reliability may be more useful measure than "delay", some other measures include "average operating speeds", "person throughput" and "VMT reduction" depending on facility type and improvement. Anticipated investment level to achieve is medium for conversion of existing lanes and high for construction of new lanes.

5. Increase Incident Response opportunities – detection, assistance, and clearing of incidents on the highway so as to assist travelers, increase safety, and reduce non-reoccurring delay caused by incidences.

   a. This strategy is best served on limited access roadways where it is hard for drivers to find an alternative route to their destinations.

   b. However, perhaps expand incidence response activities to high volume and accident prone local streets and major arterials if appropriate.

   Specific performance measures are "response time to the scene", "time needed to clear an incident", "delay", and reduced "idle time". Anticipated investment level to achieve is medium to high.

6. Improve Traveler Information - providing real time and projection of travel conditions and transit information to the public to aid in their decision about how, when, and where to travel.

   Reliability may be a more useful measure than "delay." Other measures include "speed/travel time". Anticipated investment level to achieve is medium to high.

Related Policies/Programs in Place

CMAQ funding can be used for retrofits that reduce idling and associated energy use.

The Maryland Department of Transportation, in cooperation with the Metropolitan Planning organizations, MDE and local government bodies has the following in place with regards to promoting the purchase of fuel-efficient and low GHG vehicles:

- **Hybrid Vehicles:** MDOT and the State of Maryland have been purchasing Hybrid vehicles to reduce fuel usage and improve air quality

- **Hybrid Buses:** New buses powered by hybrid engines use much less fuel and emit fewer emissions. MTA has begun to put into service.
    - MTA will put 10 Hybrid buses into service as replacements for older buses between 2005 and 2008
    - By 2012 MTA will have 340 hybrid buses total in service.
    - MTA will replace all buses with hybrids as the fleet ages and is replaced
    - While hybrid buses cost $200,000 more than a conventional diesel full size bus, the average bus travels 250 miles a day 300 days a year and as such fuel savings on operating the buses should compensate for the higher purchase cost.

- **Locomotive Refurbishing:**

    - MTA has purchased 26 remanufactured diesel/electric locomotives that meet TIER 2 standards.
    - Although not yet confirmed, emissions reductions of about 1/3 are expected for operating these remanufactured locomotives in the place of conventional buses.

With respect to reducing idling time, Maryland Department of Transportation (MDT), in cooperation with the Metropolitan Planning organizations, MDE and local government bodies has the following in place:

- **Truck Stop Electrification:** Maryland already has 3 TSE locations with almost 300 spaces in service. Truckers do not need to idle their engines to heat, cool the cab or obtain power while "out of service".

    1. Between 8/22/05 - 3/13/08 the 3 TSE locations ((Baltimore (63 spaces), Jessup (129 spaces and Elkton (57 spaces)) operated 671,869 hours.
    2. They saved 671,869 gallons of fuel
    3. 7,121 metric tons reduced based on EPA emissions factor of 10,397 g/hr. (Source: IdleAire)

- **Idling Reduction requirements:** being pilot tested at major construction sites including the ICC project**.**

With respect to Transportation Management Systems, Maryland Department of Transportation (MDT), in cooperation with the Metropolitan Planning organizations, MDE and local government bodies has the following in place:

- **Intelligent Transportation Systems (ITS)** is in place on the MD interstate system. Benefits allow for a reduction in delay due to accidents, or breakdowns. According to the CHAERT report for 2006 the system in place reduced idle time for trucks and passenger vehicles as follows:
    1. Annual truck idle time reduced:– 2,445,865 hours
    2. Daily truck idle time reduced: - 9,407 hours
    3. Annual car idle time reduced: - 35,090,766 hours
    4. Daily car idle time reduced: - 134,964

5. Benefits have been growing conservatively at 2% a year. By 2012 benefits should increase 10-12%

- **Traffic Signal synchronization/Light Emitting Diode (LED) signals**

Types(s) of GHG Reductions

CO2, carbon black

Estimated GHG Reductions and Net Costs or Cost Savings

Off-road

The table below summarizes transportation sector off road engine/vehicles baseline CO_2e emissions compared with a 15% by 2020 reduction program.

Transportation Sector
Off Road Engines/Vehicles

	MMt CO2e		
	2005	**2015**	**2020**
No action-trend (marine, air, rail, other)	2.69	2.81	2.95
GHG reduction strategy			2.51
Reduction			0.44

This option includes a mix of policies designed to reduce GHG emissions from off-road engines/vehicles. The costs and benefits of each of the individual policies are different.

For example, options like locomotive auxiliary engines and providing shore power at port facilities typically have an upfront capital investment to purchase a more efficient engine, and the cost savings results from reduced fuel usage compared with the original equipment. The length of payback periods for this capital investment is often the most important question when considering the feasibility of an option such as this. Two example cost effectiveness analyses for providing shore-power at a port and applying idle control technologies on switcher locomotives are provided below.

Shore-power is becoming a major part of the green port strategies being implemented at ports on the west coast of the U.S. For example, the Port of Long Beach has adopted a green port policy that is intended to guide the Port's operations in a green manner. The Port has committed to providing shore-power to all new and reconstructed container terminal berths and other berths, as appropriate. Through lease language, the Port will require selected vessels to use shore power and all other vessels to use low sulfur diesel in their auxiliary generators. The primary method for providing shore power at California ports is referred to as cold-ironing. Cold ironing refers to shutting down auxiliary engines on ships while in port and connecting to electrical power supplied at the dock. Without cold ironing, auxiliary engines run continuously while a ship is docked, or hotelled at a berth to power lighting, ventilation, pumps, communication, and other onboard equipment. Ships can hotel for several hours or several days.

In an example of cold ironing, an analysis was done on the cost effectiveness of three ships that each visited port 17 times during the year. On every trip they were electrified for their 60 hours in port, saving a total of 1,478 metric tons of fuel. These fuel savings resulted in a GHG reduction of 4,741 metric tons of CO2 equivalent. Given the estimated annual costs of $1,583,000, this means that there are costs of $334 per metric ton of CO2e avoided through fuel consumption. However, the production of electricity for use in the ship will reduce the GHG savings with this approach. Using Maryland emissions factors, the GHG benefits of this program would be reduced to only 1,051 metric tons of CO2e annually. This would mean a cost of $1,506/metric ton of CO2e reductions from the cold ironing method.

There are several other important factors to consider on the issue of cold ironing. This process has significant up-front costs. While the analysis above considers the annual costs of the program over a ten year period, the initial costs can be prohibitive. In this example, the port requires an initial investment of $4.5 million dollars to provide electrification, and each of the three ships must undergo a $1.5 million dollar modification to accept electricity from the ports. If very few ships make this modification, then the costs per metric ton of CO2e would increase dramatically. Labor and electricity are also part of the costs estimate, though these are less of a problem in terms of upfront capital. Finally, the example is of ships that use the port 17 times a year. If a ship does not frequent a particular port more than a few times a year, it is unlikely that they would want to undertake the costly modification. And even if the ship were equipped to engage in cold ironing, the benefits of such a case would be far reduced.

Switcher locomotives are used to move materials within a rail yard. Switcher locomotives are idling approximately 12 hours a day, to avoid problems with shutdown and possible freezing in cold weather. Installing auxiliary engines in these locomotives can decrease fuel consumption, which helps reduce GHG emissions, as well as reducing local air pollutants and noise. This reduction is achieved through reduction of fuel consumption while idling. Installing an auxiliary engine is highly cost effective, with a payback period of 2-2.5 years without taking any environmental benefits into account.

Idling with the locomotive's main engine takes about 3 gallons/hour in warm weather and 11 gallons/hour in cold weather (a higher setting is required to keep the engine from freezing). Assuming 4 months of cold weather a year, and an average of 335 active days annually for a locomotive, this would result in a savings of 19,564 gallons of diesel fuel. For a railyard in a warmer climate where no warm weather idling is ever used, then 8,844 gallons of fuel would be saved annually.

This modification has an upfront capital cost of $35,500. Using a 5% discount rate and a ten year life for the engine, this would mean annualized costs of $4,597.25. In a cold climate, the auxiliary engine would have an annualized savings of 19,564 gallons. This would be a GHG emissions reduction of 200.54 metric tons of CO_2e. Even in the scenario of a warmer climate, with no cold-weather idling, there would still be an emissions reduction of 90.65 metric tons of CO_2e over the year.

When avoided fuel costs are taken into account, the low costs of this program become obvious. Given that 19,564 gallons of fuel are saved annually in the cold weather scenario, using AEO energy prices, this would be a net annual savings of over $42,000. This would mean a net savings of $209.45 for every metric ton of CO_2e avoided. In the less optimistic warm weather scenario, this would still result in an annual savings of nearly $16,500, or $181.66 per metric ton of CO_2e avoided.

Costs of alternative fuels strategies for off-road equipment would be expected to be similar to those shown under the cost analysis for TLU-4.

On-road

We assume that the new technologies reduce emissions by 7.5% in 2020, with a smooth ramp up to 2020.

Data Sources:

California Air Resources Board, Evaluation of California Ocean-Going Vessels at California Ports, Stationary Source Division, Project Assessment Branch, March 2006.

USEPA. “Locomotive Switcher Idling and Idle Control Technology”. June 2005. http://www.epa.gov/NE/eco/diesel/assets/pdfs/locomotive-factsheet.pdf

USEPA. "Case Study: Locomotive Idle Reduction Project" March 2004. http://www.epa.gov/smartway/documents/420r04003.pdf

Quantification Methods: [e.g., Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

Cold ironing applied in the Port of Baltimore would provide significant co-benefits via reducing criteria air pollutant emissions, including NOX, PM, VOC and SO2.

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MWG moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until MWG meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MWG]

TLU-11 Evaluate the GHG Emissions Impacts of Major Projects

Policy Description

The State will require greenhouse gas emissions evaluation of all transportation and land use relevant state and local, major capital projects.

Policy Design

Goals:

1. Understand the impacts of new capital projects on the Governor's GHG commitment by perform a GHG impacts build / no-analysis on all major capital projects.
2. Where appropriate, the build-no-build will be accompanied by analysis of potential alternatives, such as, for example, transit oriented land use and investment; adding toll lanes and express bus; high occupancy toll (HOT) lanes; and a hybrid transit oriented HOT lane, and / or a rail and express bus scenario.

Timing: [TBD, as needed on TWG approval]

Parties Involved: [TBD, as needed on TWG approval]

Other: [As needed]

Implementation Mechanisms

Develop guidance for the state and other large capital project sponsors to use.

Related Policies/Programs in Place

A key part of the MD GHG inventory and forecast is a 2006-2020 VMT forecast that was developed by the Maryland Department of the Environment (MDE). The MDE VMT forecast used Highway Performance Monitoring System (HPMS) historical traffic volume forecasts by county and facility type for the 1990 to 2005 period to establish a trend line. An extrapolation of this trend line was used to estimate VMT for 2006 to 2020. This trend-based extrapolation method provides higher estimates of 2020 Maryland VMT by county than is included in the Metropolitan Planning Organization (MPO) forecasts for their long range transportation planning process in Metro Washington and Baltimore. Because the latest MPO forecasts include the VMT estimates associated with major projects such as the ICC, BRAC, and I-95 expansion, the higher VMT forecasts in the statewide VMT forecast used in this process are also expected to include the effects of these projects. Nevertheless, it is recognized that an extrapolated trend line VMT forecasting method is too aggregated to allow the group to discern the effects that might be attributable to any single project.

No consensus was reached about whether it makes sense to develop estimates of the VMT impacts of the three recent major projects in MD on GHG emissions.

However, the TWG members recommend that best practice planning tools be used in the future to fully evaluate the effects of new major projects to determine the expected effects on GHG emissions before these projects proceed.

Types(s) of GHG Reductions

TBD – [CCS to list GHG reductions with input / approval from TWG]

Estimated GHG Reductions and Net Costs or Cost Savings

NA; policy does not provide emissions reductions on its own.

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until MCCC/GHG MWG moves to final agreement at Meeting #5 or #6]

Level of Group Support

TBD – [blank until MCCC/GHG MWG Meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the MCCC/GHG MWG]