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Transportation and Land Use Technical Work Group

Summary List of Policy Options

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2028 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Level of Support
		2012	2028	Total 2008-2028			
TLU-1	Compact and Transit-Oriented Development Bundle	.26	.99	10.88	Net savings		Pending
TLU-2	Alternatives to Single Occupancy Vehicles (SOVs)	.28	.32	6.57	Net savings		Pending
TLU-3	Vehicle Emissions Reductions Incentives	.11	.63	7.73	-$42	-$10	Pending
TLU-4	Pay as You Drive Insurance	.20	.32	5.30	Net savings		Pending
TLU-5	Alternative Fuels and Infrastructure (LCFS)	.12	.42	5.75	NA		Approved
TLU-6	Regional Intermodal Transportation System – Freight and Passenger	.05	.20	2.22	NA		Pending
TLU-7	Commuter Choice/ Commute Benefits	.06	.19	1.86	-$1	-$1	Approved
TLU-8	Plug-in Hybrids [part of TLU-5]	-	-	-	-		Pending
TLU-9	Examine GHG/Transportation Funding Mechanisms as part of a funding package after reductions policies are chosen	-	-	-	-		Approved
	SECTOR TOTAL BEFORE ADJUSTING FOR OVERLAPS	1.09	3.07	40.31	NA	NA	Pending
	REDUCTIONS FROM RECENT POLICY ACTIONS						Pending
	SECTOR TOTAL PLUS RECENT POLICY ACTIONS	TBD	TBD	TBD	TBD	TBD	Pending

TLU-1. Compact and Transit-Oriented Development Bundle

Policy Description

Implement land use planning and development that supports protection of natural and cultural resources, strengthens communities, creates more compact development, and reduces growth in driving and emissions.

Policy Design

Goals:

- Support and promote public and private planning and development practices, including smart growth planning and infrastructure provision that reduce the number and length of trips and expand travel modes in Vermont.
- Vehicle miles traveled in Vermont are equal to the amount driven in aggregate in the year 2000 by the year 2012, and are equal to the 1990 level by 2025.

Timing: To achieve 2012 VMT goals, need to begin implementing policies immediately.

Parties Involved: Municipal elected officials; local and regional planning commissions and staffs; state agencies which have programs/projects that have land use impacts; private developers and contractors; planning, land use, and engineering professionals; public and private organizations with land use, transportation, and environmental interests.

Other: None noted.

Implementation Mechanisms

Supporting state, regional and municipal land use planning and development practices aimed at reducing the number and length of vehicle trips (VMT) and expanding travel mode opportunities is a multi-faceted undertaking. There is no one program or policy mechanism, but several, which together over the long term (how many years?), will make a difference.

The present Vermont planning and regulatory legal framework encourages commercial, residential and job growth in compact mixed use traditional cities, towns and villages and new growth centers, the conservation of the surrounding landscape of farm and forest land and the working of that land to support agricultural and forest-based economies. This legal framework and the programs and policies it supports are an excellent place upon which to build implementation mechanisms aimed at reducing VMT and significantly shifting travel modes to less polluting alternatives such as rail, transit, biking and walking.

For these alternatives to be viable in the future there must be a continuation of the existing compact mixed use development patterns of historic cities, towns and villages and that new places include similar and even greater land use densities as well as a mix of uses. Alternative

modes can not serve in a meaningful way the scattered commercial and residential development typical of current growth in many areas of the state. Instead growth needs to be redirected to Main Streets, downtowns and existing and new nearby neighborhoods. This pattern has shown to be, not only in Vermont but around the country, to be livable and highly desirable. Also, the growth of local economies and, thus jobs and housing, are an essential element of this vision for the future.

Implementation mechanisms for TLU 1 fall into the following categories:

1. **Providing technical and financial resources to municipalities to plan for the future.** This includes:
    - Implementation of the Growth Center Law (Act 183) by carrying out the recommendations of the Growth Center Natural Resource Lands "working group" and staffing and supporting the Growth Center Planning Coordination Group.
    - Assist municipalities in identifying and adopting planning principles and programs aimed at reducing green house gas emissions including but not limited to appropriate growth center densities and growth management techniques.
    - Explore additional incentives such as those currently in Act 183 to support municipalities that want to focus growth in their communities.
2. **Strengthening state level planning, decision-making and relevant programs in order to support municipalities with the necessary transportation, wastewater, and educational facilities, infrastructure and services to manage growth and reduce green house gas emissions.** This includes:
    - Directing waste water spending, school construction dollars and transportation enhancement dollars to downtown areas and growth centers as described in current funding regulations and policies.
    - Maintaining to the extent possible existing and locating new state buildings and schools in downtown and growth center locations.
    - Targeting downtown areas, growth centers and commuter routes as transit priority areas.
    - Consider carbon-neutral requirements for all development projects receiving state funding.
    - Continue funding for the Vermont Housing and Conservation Board at present statutory levels to develop housing in downtown and growth center locations and conserve farmland.
3. **Setting transportation policy aimed at rehabilitating and maintaining existing highway infrastructure and planning for alternative modes in the future to help alleviate present and future capacity needs.**

4. **Breaking down silos among agencies; creating state/municipal and public private partnerships; and working together on common goals related to areas such as transportation planning, resource protection, housing and community development.** This includes:

   - Implementing the Act 200 planning process including the required coordination among state agencies' and between the states', and regional and municipal plans and the development of accountable strategies in all plans to achieve the Act's planning goals.

   - Transportation planning focused along corridors served by transit and a planning process that includes all stakeholders, especially landowners, developers and local decision-makers, in order to promote growth center development. This may result in a program to encourage developers to help pay for transit or the examination of tax policy for land on versus off transit lines.

5. **Reform the existing regulatory systems to support the growth of alternative modes, improve the review of energy impacts of new development and consider the principles of carbon neutrality for development projects in the future.** This includes:

   - Strengthening Act 250 Criterion 5 (traffic) to support multi-modal options including site design standards that allow for transit and bike/pedestrian circulation.

   - Establish a task force to examine how the smart growth planning principles identified in Act 183 and carbon neutrality concepts might be incorporated in the Act 250 review process.

   - Encourage appropriate state agencies and other Act 250 statutory parties to establish project review guidelines and policies related to energy efficiency, smart growth and rural lands protection under criteria 9(b)(c) (of-site mitigation) H (the cost of scattered development), J (public utility services),and L (rural growth areas).

6. **For each of the above actions, identify a lead entity.**

Related Policies/Programs in Place

Fourteen policies, laws, rules and executive orders are already in place:

1. Act 250 – State land Use and Development Law
2. Act 200 and the Municipal and Regional Planning and Development Law (Chapter 117)
3. Act 183 – Growth Center Law - Through planning, regulatory and financial incentives, and state investment policy this 2006 law seeks to guide future development into designated growth centers so as to bring vitality to existing communities and enhance environmental quality in the countryside.
4. Downtown Law – Provides state assistance to communities to help with their downtown revitalization efforts. State agencies are required to give priority to downtowns in their subsidy programs.
5. ANR Sewer Rule – State funding of sewage treatment projects to be used for projects that serve designated growth centers.

6. Brownfields Law – Designed to facilitate clean-up of vacant, contaminated sites and implement productive re-use projects.
7. VTRANS Policies/Programs – Need input from Gina, Chuck, Polly et al – Corridor Management Planning
8. CCMPO Policies/Programs – Scott
9. Vermont Housing and Conservation Board – Funds acquisition of farm/forest land other open space lands and policy on agricultural lands mitigation
10. Vermont Economic Development Authority (VEDA) – Created to expand employment and raise per-capita income through the creation and expansion of industrial sites, businesses, farm assistance.
11. Vermont Economic Progress Council (VEPC) Programs – Administers several economic incentive programs (e.g. income tax credits, property-based tax incentives, and limited sales tax exemptions.
12. Development Cabinet Law (3 V.S.A. § 2293) – Established a mechanism to assure collaboration among state agencies to support economic development while conserving and promoting Vermont's traditional settlement patterns, working and rural landscape, strong communities and healthy environment.
13. Executive Order #15 (1985) – Requires state government to give priority for locating its activities in historic and other existing buildings.
14. Executive Order #7 (2001) – Requires that all state agencies, as appropriate, foster land conservation around interstate interchanges and work to ensure that any development around the interchanges be consistent with 24 VSA §4302.

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-1	Compact and Transit-Oriented Development Bundle	.26	.99	10.88	Net savings		Pending

Cost Effectiveness: Expected net savings.

Data Sources:

- **VMT impacts**: A wide variety of literature finds that integrated transportation and land use planning can substantially reduce VMT.[1] The appropriate percentage reduction depends on the scale at which policies are applied.[2] Given the methodology used here, a 35% reduction in VMT at the level of an individual development / neighborhood is an appropriate value. This is conservatively below the reductions of 50% and higher that have been empirically observed in neighborhoods planned to allow multi-modal access and compact, mixed-use development.[3]

  Note that VMT impacts for this policy option are driven in large part by how the suggested implementation mechanisms are implemented. The emissions impacts are driven by VMT impacts; for analysis purposes, the VMT impacts are driven by the 2012 and 2028 goals.

- **Costs:** A wide variety of literature finds that integrated transportation and land use planning produces *net savings* on total costs of buildings + land + infrastructure + transportation. Some portions of that total cost of may be higher. Preponderance of literature suggests net savings overall.[4] A National Academy of Sciences / Transportation Research Board review found substantial regional and state-level infrastructure cost savings from more compact development.[5] For example:

Burchell Findings of Savings of Compact Growth versus Current or Trend Development

Area of Impact	*Lexington, KY and Delaware Estuary*	*Michigan*	*South Carolina*	*New Jersey*
I. Public-Private Capital and Operating Costs				
1. Infrastructure Roads (local)	14.8-19.7%	12.4%	12%	26%
2. Utilities (water/sewer)	6.7-8.2%	13.7%	13%	8%
3. Housing Costs	2.5-8.4%	6.8%	7%	6%
4. Cost-Revenue Impacts	6.9%	3.5%	5%	2%
II. Land/Natural Habitat Preservation				
1. Developable Land	20.5-24.2%	15.5%	15%	6%
2. Agricultural Land	18-29%	17.4%	18%	39%
3. Frail Land	20-27%	20.9%	22%	17%

[1] US EPA, *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, 2001. http://www.epa.gov/dced/built.htm

[2] US EPA, *Guidance: Improving Air Quality Through Land Use Activities* (EPA 420-R-01-001; January 2001), and US EPA, *Comparing Methodologies to Assess Transportation and Air Quality Impacts of Brownfields and Infill Development* (EPA-231-R-01-001 August 2001).

[3] Cambridge Systematics, Inc., *Transportation Impacts of Smart Growth and Comprehensive Planning Initiatives: Final Report*, prepared for National Cooperative Highway Research Program, May 2004.

[4] Literature reviews include US EPA, *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, 2001; and Burchell *et al.* in footnote 8.

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

The cost reduction percentages for Vermont's total infrastructure costs will be determined by how Vermont, its jurisdictions, and developers implement the 10 suggested implementation mechanisms. Even at the low end of the above figures, the total savings would be significant.

Quantification Methods:

More compact development can reduce truck trip lengths, but the vast majority of the literature examines Light Duty Vehicles (LDV) VMT only. We do the same. The analysis is top-down rather than bottom up. That is, estimating and summing the impact of each of the 10 implementation mechanisms is beyond the scope of this effort. Reaching the 2012 and 2028 goals implies a 13% and 27% reduction in VMT from the baseline, respectively. Reaching these goals implies the following:

- 40% of total LDV VMT affected by these policies by 2012; 80% by 2028. So:
  - 2012 reduction = Statewide LDV * 40% of VMT affected * 35% reduction = **14%** reduction in total statewide LDV[6]
  - 2028 reduction = Statewide LDV * 80% of VMT affected * 35% reduction = **28%** of total statewide LDV
- Convert to CO_2

Key Assumptions:

The given VMT and emissions reductions assume that the planning described in "Implementation Methods" will produce the changes growth patterns necessary to produce the goal.

Key Uncertainties

Achieving the given VMT goal depends on a vigorous implementation of the policy initiatives at all levels of government.

Additional Benefits and Costs

Benefits include reduced infrastructure costs noted above, avoided health care costs from reduced air pollution and increased walking/biking, and other quality-of-life aspects. Agricultural and open lands protection should benefit the tourism economy.

Costs: There will be front-end costs of program development and implementation, and a successful program requires dedicated resources.

Feasibility Issues

None cited.

[6] We express the final result in terms of percentage reduction in LDV to provide for a common basis of comparison in terms of VMT. Since the ultimate output of interest is CO_2 /GHGs, it may be argued that this intermediate step is unnecessary, but many people find VMT percentage reductions a useful yardstick.

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-2. Alternatives to Single Occupancy Vehicles (SOVs)

Mitigation Option Description

Shift passenger transportation mode choice to lower emitting and clean alternatives including: transit, ridesharing, bicycling, and walking. Travel via single occupancy vehicle is the single largest contributor to GHG emissions in Vermont. Ensure that transportation/modes are integrated each other and with land use development plans. [See TLU-6 (inter-modal connections) and TLU-1 (Compact and TOD)]

Mitigation Option Design

Goals:

- Expand transit routes and ridership numbers aimed at reducing home to work VMT and providing convenient, reliable, and frequent service.
- Expand/create regional connections/links within the state to maximize inter-regional ridesharing and transit commuting opportunities
- Improve coordination of modes of transportation and transportation programs.
- Strategically increase the number and capacity of park and ride facilities. These should serve transit services, be integrated with bike/ped facilities and be available on the state highway system and at the regional, local and neighborhood levels
- Expand individual and place of employment participation in rideshare carpool and vanpool programs through increased marketing and incentive programs.
- Include bike and pedestrian facilities in all expanded and new roadway projects. Improve bike and pedestrian infrastructure both as inter-modal connections and as stand-alone modes, especially in growth centers and downtown areas.

Quantitative Goals: Increase statewide non-SOV mode split

[VDOT will provide absolute #s.]:

- 40% by 2012
- 100% by 2028

Timing:

- Vermont's present investments in Transit and Rideshare can be quickly enhanced/coordinated/expanded/re-directed to help reach emission reduction goals.

- Climate Change information and marketing of alternative modes to facilitate shift in choices/transportation behaviors can happen quickly.
- Infrastructure improvements and more complex policy initiatives will occur over a 2-5 year period.

Parties Involved: VTrans, regional planning commissions, MPO, municipalities, transit providers, human service transportation interests, inter-state transportation services, rider organizations, bicycle and pedestrian advocacy organizations environmental groups.

Other: Under Development.

Implementation Mechanisms

The following mechanisms aimed at increasing transportation mode choice in Vermont build on existing and include new programs. Most require additional resources. The success of TLU 2 is linked to the goals and policies described in TLU 1, Compact and Transit-Oriented Bundle, TLU 6 Inter-modal Connections, TLU 7 Commuter Choice and TLU 9 Funding Mechanisms.

Transit

- Work to create a transit system that is easy to use and affordable, and serves downtown, growth centers, major employers and major highway corridors with a goal of 15 minute headways throughout these areas and 30 minute headways elsewhere, as appropriate for each area.
- Maximize the capacity of existing public transit programs and by using performance evaluations of existing transit routes and cost of service data to guide/evaluate public transit services and invest or reinvest in services that have greatest potential to reduce VMT.
- Use existing Public Transit organizations to evaluate, coordinate, and plan services that get more people on to one ride whether that is a volunteer driver vehicle, a van or bus.
- Investigate the feasibility of an energy tax credit or other mechanism identified in TLU 9 to fund transit operations.

Rideshare

- Continue and expand the state park and ride program and encourage park and ride use and facilities at the regional, municipal, and neighborhood levels.
- Configure the state rideshare program to better promote/market both carpooling and vanpooling under a statewide coordinated inter-regional program.
- Coordinate between and among Public Transit Provider Regions to deliver improved inter-region VMT reducing commuter services such as rideshare and vanpools.

Biking and Walking

- Incorporate appropriate bicycle and pedestrian accommodations into VTrans projects, programs and actions.

- Sustain current state, regional and municipal programs to encourage walking and bicycling as a means of transportation.
- Promote the incorporation of pedestrian and bicycle considerations into municipal town plans and expand and/or implement regional bicycle and pedestrian plans.

Planning, Marketing, and Public Outreach

- Provide incentives and fund Transportation Management Association and guaranteed ride home programs
- Coordinate Rideshare, Transit, Park and Ride, Bike-Pedestrian and inter-state transportation planning and investment at the state, regional and municipal levels.
- Develop statewide GIS data base available to the traveling public that coordinates all transportation options, facilities, and programs. Include web based access to all modes, all inter-connection opportunities etc.
- Develop and fund marketing strategies promoting alternative modes where modes are ready to accept additional usage.
- Provide incentives to employers (such as UVM) and individuals who encourage or use rideshare, van pools transit, and other alternative modes. **(More options are included TLU-7)**

Related Policies/Programs in Place

- Vermont Rideshare Program is administered by VTrans and promotes car and van pooling statewide.
- VTrans Public Transit Section administers FTA 5311 and 5310 funding for provision of public transit services. VTrans also administers Congestion Mitigation and Air Quality (CMAQ) funding which is primarily use to fund new commuter routes.
- Local Transportation Facilities Program is responsible for the development of Enhancement Projects, Bicycle and Pedestrian Facilities, Safe Routes to School Projects, Park-n-Rides, Scenic Byways and “Local” Projects.
- Smart Growth laws passed in recent years (see TLU-1) are designed to promote/facilitate VMT reduction by development of projects/communities that are oriented toward use of public transit and other alternative modes.

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-2	Alternatives to Single Occupancy Vehicles (SOVs)	.28	.32	6.57	Net savings		Pending

Quantification Methods:

- Reductions from transit improvements: Transit economics literature.[7]
- Reductions from TDM and transit promotion: TDM literature.[8]

Costs: Both the above, and transit cost/benefit analysis guidance.[9]

VMT reductions:

Baseline: 1997 CCMPO-area mode split: SOV 92%. To increase non-SOV by 100%, then non-SOV = 16%, and SOV = 84%.

Apply reductions to urban LDV VMT only.

Convert to CO_2

Cost-effectiveness: 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.

[7] See McCollom, Brian E. and Richard Pratt. 2004. "Transit Pricing and Fares." TCRP Report 95. Washington, D.C.: Transportation Review Board; and Cervero, Robert. 1990. "Transit Pricing Research." Transportation 17, 2: 117-140; and Victoria Transport Policy Institute, "Public Transit Improvements" in *TDM Encyclopedia*, 2005.

[8] Including ICF Consulting, *Strategies for Increasing the Effectiveness of Commuter Benefits Programs: Transit Cooperative Research Program Report 87*, Transportation Research Board, Washington, D.C., 2003; ICF Consulting, *Analyzing the Effectiveness of Commuter Benefits Programs: Transit Cooperative Research Program Report 107*, Transportation Research Board, Washington, D.C., 2005; and ICF Consulting, "Commuter Connections Strategic Review", report to the Maryland Department of Transportation Office of Planning and Capital Programming, November 7, 2004.

[9] ECONorthwest, *Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners, Transit Cooperative Research Program Report 78*, Transportation Research Board / National Research Council / National Academy Press, Washington, D.C., 2002.

For the purposes of this analysis, and to give the Plenary Group 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 three 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.[10]

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.[11] Similar programs at other universities show similar results.[12] Universities are in some senses unique institutions, but the general types of challenges (esp. 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 business 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."[13]

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.[14]

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 household" as a household located within ¾ mile of public transportation, with two adults and one car.[15]

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[10] Cambridge Systematics, Inc., *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, 1999. (available at http://www.camsys.com/publi01.htm)

[11] 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.

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

[13] *Id*., p. 260.

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

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

On net, each person trip by auto in the CCMPO area costs ~$3.09. Each person trip by transit costs ~$2.25 (operating costs).[16] For urban and suburban areas, the more transit trips, the greater the savings. Capital costs add complexity to this calculation, but net state and local costs can be low relative to other options given substantial flexibility in the use of federal transportation funds, and the demonstrated capability of transit to reduce the need for households to own multiple vehicles.

Key Assumptions: None cited.

Key Uncertainties

None cited.

Additional Benefits and Costs

There is a broad literature on the role of transit as a part of a modern economy and as a key contributor to creating and maintaining certain aspects of quality of life. Overarching reviews of that literature are done only periodically; one the most comprehensive being Cambridge Systematics (CS), Inc., *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, 1999. It lists the following additional types of benefits from transit investments. We give this list, and cite CS's bottom line estimate of transportation benefits above, not to suggest that Vermont would necessarily see the same multipliers, but to support a finding that non-CO_2 benefits would, at a minimum, exceed costs:

- "Transit capital investment is a significant source of job creation. This analysis indicates that in the year following the investment 314 jobs are created for each $10 million invested in transit capital funding.
- "Transit operations spending provides a direct infusion to the local economy. Over 570 jobs are created for each $10 million invested in the short run.
- "Businesses would realize a gain in sales 3 times the public sector investment in transit capital; a $10 million investment results in a $30 million gain in sales.
- "Businesses benefit as well from transit operations spending, with a $32 million increase in business sales for each $10 million in transit operations spending. [….]
- "Business output and personal income are positively impacted by transit investment, growing rapidly over time. These transportation user impacts create savings to business operations, and increase the overall efficiency of the economy, positively affecting business sales and household incomes. A sustained program of transit capital investment will generate an increase of $2 million in business output and $0.8 million in personal income for each $10 million in the short run (during year one). In the long term (during year 20), these benefits increase to $31 million and $18 million for business output and personal income respectively.

[16] Chittenden County Metropolitan Planning Organization, "Regional Indicators: Measuring Our Progress Toward Chittenden County's 20-Year Transportation Goals / Year 2025 Metropolitan Transportation Plan Update Working Paper #1, September 12, 2000. http://www.ccmpo.org/MTP/mtp_indr_2000.pdf

- "Transit capital and operating investment generates personal income and business profits that produce positive fiscal impacts. On average, a typical state/local government could realize a 4 to 16 percent gain in revenues due to the increases in income and employment generated by investments in transit.
- "Additional economic benefits which would improve the assessment of transit's economic impact are difficult to quantify and require a different analytical methodology from that employed in this report. They include "quality of life" benefits, changes in land use, social welfare benefits and reductions in the cost of other public sector functions.
- "The findings of this report compliment studies of local economic impacts, which carry a positive message that builds upon the body of evidence that shows transit is a sound public investment. [L]ocal studies have shown benefit/cost ratios as high as 9 to 1."

Feasibility Issues

Like any class of investment, the fact that empirically and on average it produces net returns does not guarantee that a given investment will do so. Transit investment and operation, and transit promotion, need to be tailored to the communities that they serve, and be well-planned, well-implemented, and well-run to produce the maximum return on investment (ROI).

Feasibility Issues

None cited.

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-3. Vehicle Emissions Reductions Incentives

Policy Description

The recent rise in gasoline prices – coupled with the introduction of fuel-saving hybrid-electric vehicles – has caused many would-be car buyers to place more emphasis on fuel efficiency when making vehicle purchases. The New England states could further reinforce consumers' willingness to purchase more fuel-efficient vehicles by providing financial incentives.

One alternative is to finance incentives through fees charged to purchasers of less-efficient vehicles. This approach – known colloquially as a "feebate" plan – has been under discussion in Rhode Island, Maine and Connecticut. Under such an approach, the state would calculate the fee or rebate a vehicle purchaser would pay or receive based on the vehicle's fuel efficiency or its emissions of greenhouse gases. Purchasers of the most-efficient vehicles, such as hybrids, would receive the largest incentives; those purchasing the least-efficient vehicles, such as large SUVs and sports cars, would pay the greatest fees.

Policy Design

Goals:

1. To reduce overall GHG emissions from new automobiles purchased in the state:
    - By having price signals reflect emissions levels and thus have emissions level more directly enter buying decisions.
    - By sending a signal to manufacturers to produce increasingly low-emitting vehicles for the market.

Goal: Vermont new vehicle sales will have a CO2 efficiency 20% above the Pavley / California Clean car baseline.

5. To raise funds for State of Vermont to provide funds for transportation-related projects that reduce GHG, through a mechanism that is directly tied to a significant source of GHG emissions from cars and trucks. Create a dedicated revenue stream for promotion of low- or no-emitting GHG transportation alternatives e.g., hybrid tax credits, transit infrastructure.

Timing: Should be implemented as soon as possible.

Parties Involved:

- DMV.
- Agencies that distribute and spend the revenue.

Other: None

Implementation Mechanisms

Feebate programs would work on two levels. First, the feebates would directly affect consumer choices for vehicle purchases as a result of the financial incentives. Second, the feebates could indirectly affect the types of vehicles and technologies that manufacturers offer.

For consumers to be informed, information will need to be made more readily available. Manufacturers currently are required to label the level which the vehicles emissions are certified to, and the fuel economy rating. While the fuel economy information is readily available, vehicle emissions certification is not as available/visible. Vehicle emissions data can be complied and converted to a score that provides an "Index" of the vehicle's environmental and energy 'footprint'. This score would relate directly to a tax rate, which would also be advertised to consumers. This simple "Index" and correlating tax rate information would allow for informed choices by consumers.

There are numerous issues that must be resolved for a state to implement an incentive program; specifically, which vehicles will receive incentives and how great those incentives will be, whether the incentive will be given out directly or passed along as a reduction in the vehicle sales tax, and whether the incentive will be given at the time of purchase or the time of registration.

Depending on whether vehicle manufacturers opt to provide more fuel-efficient choices for consumers in response to the program, the impact on overall fuel economy and vehicle emissions could be significant. A recent analysis conducted for the Rhode Island greenhouse gas stakeholder process estimated that a feebate program could reduce gasoline consumption (and therefore global warming emissions) from light-duty vehicles by between 5 percent and 31 percent below business-as-usual levels by 2020.[17]

Because the response of manufacturers to the program is critical, a regional or multi-state vehicle incentive plan with consistent provisions and aggressive targets would likely be more effective than a piecemeal state-by-state approach. New England states should work together to devise an incentive program designed to significantly reduce gasoline use and carbon dioxide emissions from vehicles and to reward New Englanders who make vehicle choices that contribute to achieving the region's climate protection goals.

While recommending that the New England states should work together to devise an incentive program, this option assumes only implementation in Vermont.

Finally, the version of a fee bate program proposed here would raise revenue. That is, not all fees on higher-emitting vehicles would be rebated to buyers of lower-emitting vehicles.

Example fee/rebate schedules:

[17] Regional Economic Models, Inc., *Combined Economic Impact of Enacting a Feebates Program in Rhode Island, Connecticut, Massachusetts, Maine*, 31 December 2004.

Scenarios based on 2005 DMV information

Provided by VPIRG, 3-28-07

Alt #1

	Surcharge	Number of Vehicles	Estimated Revenue
40 MPG or better	-200	478	-95,600
32 to 39 MPG	-50	8	-400
25-31 MPG	0	5,507	0
20 to 24	100	13,598	1,359,800
19 MPG or less	500	18,798	9,399,000
Vehicles with GVWR of more than 8,500 lbs	500	4,374	2,187,000
TOTAL		42,763	**12,849,800**

Alt #2

	Surcharge	Number of Vehicles	Estimated Revenue
40 MPG or better	-100	478	-47800
32 to 39 MPG	-25	8	-200
25-31 MPG	0	5,507	0
20 to 24	100	13,598	1,359,800
19 MPG or less	250	18,798	4,699,500
Vehicles with GVWR of more than 8,500 lbs	500	4,374	2,187,000
TOTAL		42,763	**8,198,300**

Alt #3

	Surcharge	Number of Vehicles	Estimated Revenue
40 MPG or better	0	478	0
32 to 39 MPG	0	8	0
25-31 MPG	0	5,507	0
20 to 24	100	13,598	1,359,800
19 MPG or less	250	18,798	4,699,500
Vehicles with GVWR of more than 8,500 lbs	500	4,374	2,187,000
TOTAL		42,763	**8,246,300**

Alt #4

	Surcharge	Number of Vehicles	Estimated Revenue
40 MPG or better	0	478	0
32 to 39 MPG	0	8	0
25-31 MPG	0	5,507	0
20 to 24	0	13,598	0
19 MPG or less	100	18,798	1,879,800
Vehicles with GVWR of more than 8,500 lbs	200	4,374	874,800
TOTAL		42,763	**2,754,600**

Related Policies/Programs in Place

Feebates have been proposed in many forms over the last fifteen years but have not yet been implemented in the United States. While feebate proposals have been described in academic studies, there has been no implementation of a full feebate program to date in the United States. While there is a 'gas guzzler tax' and tax incentives for hybrid vehicle purchases, there is not yet any history of an on-the-ground example of an implemented feebate program.

Types(s) of GHG Reductions

Mainly CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-3	Vehicle Emissions Reductions Incentives	.11	.63	7.73	-$42	-$10	Pending

Data Sources: CCS Inventory and Forecast

Quantification Methods:

- **Impacts.** Current analysis shows that 90% of the benefits of feebate programs are likely to arise from the manufacturing response, as manufacturers change the technology mix in the fleet, rather than the consumer response, in which consumers change the mix of purchasing decisions within the current for-sale fleet. And manufacturers are unlikely to substantially change their technology mix in response to a single state feebate program, esp. one in a market as small as Vermont. (These studies have spurred an interest in multi-state feebate programs as a way to increase the increase the size of the affected market, and thus the incentive for manufacturers to shift technology mix.) *This policy option assumes only a VT-level policy.*

  Impacts were modeled by increasing the fuel efficiency of new cars in VT by 25% starting in 2010, and raising the penetration rate in the total fleet from 10% in 2010 to 100% in 2028.

  Although the above scenarios would raise substantial revenue for use in low-GHG travel options, those benefits are not quantified here.

- **Costs.** A wide variety of economics literature finds that vehicle buyers do not buy all the efficiency technology that is cost-effective, taking into account the net present value of both the fuel savings and the additional technology cost. Feebate analyses, the most recent of which is cited above, find that the fuel savings that result from a feebate program would pay for additional costs, producing net cost savings:

"The reduction in consumer surplus is more than compensated for by unvalued fuel savings that are realized. The benefits are positive for all rates up to $1000 but marginal costs begin to outweigh benefits between $500 and $1000. Adopting two or more classes reduces the benefits significantly while creating a relative subsidy for larger vehicles."

As a result: Net benefits range from $40 per ton for a low feebate, to $10 per ton for a high feebate. If Vermont has a stand-alone program, then it will have to have a high-feebate program to produce consumer response. We thus use the $10 net benefits / ton estimate.

"If it is assumed that consumers already fully value fuel savings, then there are no unvalued fuel savings and the costs are in the range of $10 per ton."

Key Assumptions

That the VT program is stand-alone.

Key Uncertainties:

Which feebate schedule is chosen.

Until the US has more experience with feebates, responses on both the consumer and producer side are uncertain. In a single-state program, most of the response would come from the consumer side, as the production mix is unlikely to change substantially in response to demand changes a single state market. Other analyses are pessimistic about the ability of consumer-side fee/rebates to produce consumer choice shifts of the magnitude estimated here.

Additional Benefits and Costs

Net revenue is used to fund other GHG programs. Those benefits are not analyzed here.

Feasibility Issues

None cited.

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-4. 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 mileage. PAYD makes insurance more actuarially accurate and allows motorists to save money when they reduce their mileage. The less you drive the more you save.

Policy Design

Goals:

- Change fixed costs of automobile ownership to incremental costs directly related to mileage driven.
- Reduce the cost differential between a SOV trip and a public transit trip.
- Direct financial reward for individuals who reduce VMT.

Timing: Direct the Commissioner of Banking, Insurance, Securities & Health Care immediately to develop regulations requiring companies offering auto insurance in Vermont to offer PAYD.

Parties Involved: VT Department of Banking, Insurance, Securities & Health Care Administration, Insurance Division; insurance companies.

Other: None cited.

Implementation Mechanisms

Develop strategies for implementing "pay as you drive insurance"

- Payment mechanism – how do policy purchasers pay for a product with a variable cost? Most current insurance policies involve a fixed payment at the beginning of the coverage period.
  - — Fixed-fee up front, with a re-imbursement (or additional payment) at the end of the policy period.
    - o Shorter policy periods (one month instead of 6 months to a year). Monthly insurance is billed similar to a utility.
    - o Purchase insurance that is valid up to a certain mileage, instead of a particular date.
    - o Review applicable technologies.
  - — Insurance type

- Discrete premium levels – premiums are set within specific ranges for mileage driven.
- Pay by the mile – using a linear rate that does not change as mileage increases
- Pay by the mile – using a non-linear rate that increase 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.

Related Policies/Programs in Place

GMAC and On-Star Offers Low-Mileage Discount Rates[18]

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 [19]

This Federal Highway Administration's Value Pricing Pilot Program is now providing funding for PAYD insurance simulation projects in GA and MA.

Distance Based Program

Progressive Insurance[20] offers distance-based insurance in Oregon, Michigan, and Minnesota. The program uses GPS to track vehicle location and use.

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

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

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

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

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." [21]

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-4	Pay-as-You-Drive Insurance	.20	.32	5.30	Net savings		Pending

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 %.[22] (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 %. The 8 % reductions estimates CCS used for estimated reductions in vehicle miles of travel and greenhouse gas emissions reductions fell within the lower range of the comparable estimates.

Quantification Methods: TBD

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

[22] 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.

- **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:

  Apply reductions to LDV VMT only:

  — 2010 reduction = Statewide LDV * 5% reduction

  — 2015-2028 reduction = Statewide LDV * 10**% reduction**

  — **Convert to CO2**

- **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, economic efficiency will increase.

Key Assumptions:

- State regulation of the Vermont automobile insurance industry requires insurance companies to offer PAYD insurance
- Eventual application of PAYD insurance to the whole Vermont light duty fleet.

Key Uncertainties

1. The specifics of the PAYD insurance programs are to be determined
2. Until there is broader implementation beyond the current pilot programs, the effects of PAYD insurance on driver behavior are subject to significant uncertainty.
3. Until there is broader implementation beyond the current pilot programs, economic impacts on insurance companies are unclear. A common question is, "If distance-based pricing is better, why do insurance companies not offer it without a mandate?"

   In general, as has been demonstrated repeatedly in other consumer sectors, individual firms may innovate and not be followed by other firms for a wide variety of reasons, but when the market is transformed through policy changes, the industry adapts and remains healthy. Specifically to vehicle insurance:

   > "Individual insurers face several barriers to implementing distance-based pricing. An individual company faces relatively high administration costs to establish an odometer auditing system. Insurance regulators are often unsupportive of pricing innovations. An individual insurance company only captures a small portion of the total benefits, since most financial savings are passed back to customers or accrue to competitors. Insurers do not profit from reductions in uncompensated crash costs, congestion, infrastructure costs, or pollution, or benefit directly from increased equity.
   >
   > "Insurance companies currently maximize profits by maximizing their gross revenue, because they are dependent on investment income. A pricing strategy that reduces total crashes could reduce profits if regulators or market competition required a comparable

reduction in premiums. Although there are potential financial and marketing benefits, these longer-term saving which would have to offset an individual insurer's short-term revenue losses and risks. It is therefore not surprising that few insurers have implemented distance-based pricing." [23]

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."[24]

Other equity issues may be addressed through policy design.

Feasibility Issues

None cited.

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

Concern about impact on insurance companies.

[23] Todd Litman, "Pay-As-You-Drive Vehicle Insurance: Converting Vehicle Insurance Premiums Into Use-Based Charges", *TDM Encyclopedia*, Victoria Transport Policy Institute, March 2007. http://www.vtpi.org/tdm/tdm79.htm

[24] Litman, *Ibid.* This article discusses a wide variety of questions about PAYD in some detail, and additional references.

TLU-5. Alternative Fuels and Infrastructure

Policy Description

This policy option seeks to increase market penetration of low-carbon fuels in Vermont via a Low Carbon Fuel Standard (LCFS).

Rather than defining a policy that sets goals for a given fuel type, the LCFS would establish a full life cycle GHG rating system, apply it to available fuels, and set overall goals for the life cycle GHG emissions of the total statewide fuel mix. The benefits of this approach include allowing the market to choose the lowest-cost way to pursue that overall GHG / carbon-intensity goal, and allowing the market to vary the mix as technology changes.

Policy Design

Decrease the net lifecycle carbon in Vermont's total transportation fuels by 10% by 2028.

Goal Levels and Timing:

California has adopted the basic outlines of a LCFS, and is developing the full system now. One option would be to develop an approach similar to California's, adapting as necessary to Vermont:

> Under the LCFS, fuel providers will have at least three different options with which to comply:
>
> - Blend or sell an increasing amount of low-carbon fuels (for examples, see Table 1)
> - Use previously banked credits
> - Purchase credits from fuel providers who have earned credits by exceeding the
>
> One of the critical benefits of this performance-based approach is that it does not dictate the mix of fuels that fuel providers are obligated to deliver. Fuel providers will have flexibility to choose what types of fuels in what volumes they sell as long as their sales-weighted average meets the standard. In this way, the market will determine the least-cost and most consumer-responsive outcome for the fuel mix while ensuring decreasing GHG emissions.[25]

[25] David Crane and Brian Prusnek The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting Our Economy, Office of the Governor, California, January 8, 2007. http://gov.ca.gov/index.php?/fact-sheet/5155/

Table 1. Possible Low Carbon Fuel Strategies Low Carbon Fuel Strategy Description

Low Carbon Fuel Strategy	Description
E10 (10% ethanol, 90% gasoline by volume)	- Increase blending of ethanol from today's 5.7 percent by volume to 10 percent.
E85 (85% ethanol, 85% gasoline by volume)	- Sell high blend ethanol (85 percent ethanol, 15 percent gasoline) for use in Flex Fuel Vehicles (FFVs).
Switch to Low-Carbon Ethanol	- Switch to ethanol made from cellulosic materials (e.g., agricultural waste, switchgrass)l that has 4-5 times lower GHG emissions than today's corn.
Electricity	- Either in pure battery electric vehicle or in plug-in hybrid vehicle that can be recharged from the electricity grid.
Hydrogen	- Used in zero-emitting fuel cell vehicles or internal combustion engine cars modified.
CNG, LPG	- Compressed Natural Gas and Liquefied Petroleum Gas burned in modified internal combustion engine cars.
Other biomass based fuels	- For example, BP and Dupont are developing biobutanol as a possible additive and Chevron is exploring petroleum-like products synthesized from biomass (so-called "biocrude")
Other?	- Future strategies to be developed by fuel providers and outside innovators.

Parties involved:

- State of Vermont.
- Fuel retailers.
- Fuel wholesalers.
- Business owners.
- Municipal and institutional fleet managers.
- Car dealers.
- Biofuels producers.
- Vermont Biofuels Association.
- Private vehicle owners.

Implementation Mechanisms

To be successful and accepted, an LCFS would benefit from the following:

Information and Education

Use information and education outreach to focus on voluntary methods of LC fuels expansion. Provide the public with information on the use of and effects of using ethanol and other alt fuels in their existing vehicles. Target information and outreach about biodiesel use and effects to trucking and shipping companies, as well as smaller owner/operators in the State. Information

should also be provided on where these vehicles can be purchased and their environmental and fuel-saving benefits.

Technical Assistance

- Provide technical assistance through vehicle dealers, consumer technical support groups, fuels trade and advocacy groups and public demonstrations.
- Funding mechanisms, market-based mechanisms, and incentives:
- Pursue DOE and State funding for more renewable fuel pumps throughout the State and for introducing appropriate infrastructure throughout the State. Some federal tax incentives currently exist for the purchase of alternative fuel vehicles. When the federal incentives expire, examine the feasibility/need to continue such incentives for alternative fuel vehicles.
- *Reduce or eliminate the motor fuels tax on biodiesel and ethanol (E85).* Develop a system to provide for monthly credit for biodiesel and E85 blended fuel that would be equivalent to the state motor fuels tax owed on the biofuels portion of the fuel blend.

  Monthly tax credit would be claimed on same form (Biodiesel and Fuel Alcohol Providers Form) as marketers currently file with VT DMV Motor Fuel Tax Division to pay fuel tax. This would reduce pump price of Biofuels as marketers would pass bulk of credit on to consumer in order to be competitive. Credit could be paid for out of General Fund. Credit would be revenue neutral as it would be equal to the tax that would have been paid by marketers for biofuel portion of blend.

Codes and Standards

The LCFS should include a cost trigger, so that if the cost of alternative fuels exceeds conventional fuels by more than a specified amount, the RFS would be temporarily removed. The cost trigger should be based on costs over a period of time, and not spot prices.

Voluntary and/or Negotiated Agreements

- Provide financial incentives for renewable fuels distributors.
- Provide state funds and/or loan guarantees for construction of renewable fuels distribution facilities.

Pilots and Demos

- Show example of existing multi-fuel pumps in Vermont which provides a model for dispensing three alternative fuels: B20 biodiesel, E85 ethanol and E10. The State's experience with these vehicles should be publicized.
- State invests in "VT-Green" Tourism through expanded use of Vermont-produced biofuels, linking producer farms with motorcoach tours using biofuels.

Research and Development

- Link in-state biofuels production from a variety of sources with expanded use of biofuels through public demonstrations.

- The State advocates for significant federal funds for research and development to commercialize cellulosic ethanol technology and processes. This will be required for the ethanol targets for 2020 and beyond to be met.
- Analyze and quantify range of cost benefits that accrue to renewable fuels vehicle owners.
- Research on production of renewable electricity and hydrogen will be required in order to implement a cost effective process.

Related Policies/Programs in Place

The Energy Policy Act of 2005 includes provisions requiring an increasing volume of renewable fuel to be included in the gasoline sold in the United States. The Act instructs the Environmental Protection Agency (EPA) to establish a Renewable Fuel Standard (RFS) program to oversee the increase. In April 2007, the EPA issued a rulemaking that requires refiners, blenders, and importers of motor vehicle fuels to increase the proportion of renewable fuel in their products.

Because of Vermont's peripheral position in relation to national fuel systems, as well as differences in policy design between the state and federal programs, the EPA's program is unlikely to have a great impact on Vermont's fuel production and distribution infrastructure.

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-5	Alternative Fuels and Infrastructure	.12	.42	5.75	NA		Pending

Quantification Methods:

- **Impacts:** Modeled by decreasing the GHG intensity of the total fuel consumption by 2% in 2010, 5% in 2015, and 10% 2000-2028.
- **Costs:** There are very few analyses of likely LCFS costs. There is substantial uncertainty both about the path of technology (for example, the cost of cellulosic ethanol), and about how both alternative fuels providers and buys may behave. The field is changing too quickly for CCS to be able to provide a credible estimate at this time.

Key Assumptions: None

Key Uncertainties

See above.

Additional Benefits and Costs

To the extent that the LCFS is met with biofuels grown in Vermont, there will be economic benefits in Vermont. Depending on the origin of those feedstocks in Vermont (e.g., corn or wood) there may be concern about environmental effects and effects on livestock feed prices.

Feasibility Issues

California finds its 10% goal achievable.[26]

Status of Group Approval

Approved

Level of Group Support

TBD

Barriers to Consensus

TBD

[26] *Ibid.*

TLU-6. Regional Intermodal Transportation System – Freight and Passenger

Policy Description

The option addresses: inter-city rail and bus service, Vermont and regional rail and air freight, commuter rail, and all inter-modal connections for passengers and freight.

The option will decrease GHG emissions and the state and the region's VMT by increasing the access (location), frequency, travel time, and quality of service for passenger rail and inter-city bus service. The options will also decrease GHG emissions by providing adequate inter-modal connections – including bike, pedestrian, transit, shuttle service and parking facilities at all nodes – and increasing the use of rail for both in-state and regional freight movement. The environmental benefits will help drive an adequate subsidy for all modes.

Policy Design

Goals:

- Increase rail freight in Vermont by 100 percent by 2028.

  [Discussion: From 1992 to 2002, freight rail traffic that originated and terminated in Vermont declined by 21 percent. Freight that originated in Vermont, however, increased from 430,000 tons in 1992 to 764,360 tons in 2002, which is primarily attributable to the increase in shipments from Omya, Inc. in Florence. It is projected that freight rail tonnage will increase between 44 and 55 percent between now and 2020 or approximately 2.4% annually during the next five years.

  State rail plan calls for 2% annual increase. So, baseline calls for 29% increase by 2020.]

- Increase passenger rail use by 200 percent by 2028.
- Increase other inter-city passenger services substantially:

Achieve these goals by maintaining and improving inter-city bus and rail, freight and commuter rail services, and the necessary inter-modal connections and the efficiency and emissions cleanliness of equipment through the following policies, programs, and mechanisms:

- Replace Amtrak engines with more efficient Diesel Multiple Units.
- Improve the frequency of service and travel time of Vermont's current Amtrak routes.
- Increase the marketing of the state's current Amtrak routes.
- Expand passenger rail service to VT's western corridor.
- Improve inter-city bus service throughout the northeast region.

- Improve inter-city bus service in the Rt. 7 corridor thorough public/private partnerships.
- Improve passenger rail connections to Montreal and Boston.
- Determine the demand necessary to justify commuter rail in certain corridors and work to provide the service, including, but not limited to, piggybacking commuter and inter-city rail services.
- Provide adequate inter-modal (transit, bike, pedestrian, shuttle bus, etc.) connections at all railroad stations, airports, and bus stops.
  - Jitneys
  - Ski shuttles
- Target improved railroad station and airport inter-modal connections for large institutions, companies, and the VT travel industry.
- Provide parking facilities at railroad and bus stations and airports.
- Improve rail infrastructure to serve all freight needs (for example, double-stack on the Western Corridor?).
- Identify and provide necessary freight modal transfer stations within Vermont and the region.
- Work with municipalities to plan and regulate land use to accommodate rail and bus infrastructure and service.

Timing: Begin immediately.

Parties Involved: VTrans. Amtrak, FTA, US Congress, VT transit providers, private bus companies, railroad owners, airport commission and directors, municipalities, private industry including tourism.

Implementation Mechanisms

- Re-examine state rail plans
- Examine possible funding sources for rail investment, including per-freight-car charges.
- Link to TLU-1 growth policies. Both freight and passenger traffic benefit from growth centers that can be served by intermodal.

Types(s) of GHG Reductions

Mostly CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-6	Regional Intermodal Transportation System – Freight and Passenger	.05	.20	2.22	NA		Pending

Data Sources: VAOT Forecast

Impacts

Quantification Methods: reductions taken from heavy-duty and light-duty rural VMT only

Key Assumptions:

Moving a freight or passenger shipment/trip to intermodal each produce 50% of baseline GHG emissions compared to baseline;

Extent of Implementation	2012	2015	2020	2028
VMT reached:	10%	20%	50%	50%

Costs

The types of infrastructure investments and operating costs necessary to produce these results are unclear. Several states have successfully completed public-private freight rail investment partnerships that they have found cost-effective (for example, the Pennsylvania double-stack project with Norfolk Southern and CP Rail). Given truck damages to highways, shifts to rail can produce substantial savings in road maintenance costs. Without knowing what kind or amount of such partnerships may be available, there is no way to estimate net costs.

Key Uncertainties

Given the transformation of the economy to rely on smaller, just-in-time shipments, whether substantial amounts of freight, in particular, can be shifted for within Vermont trips.

Additional Benefits and Costs

Reduced truck traffic would bring various quality of life and safety benefits.

Feasibility Issues

None cited.

Status of Group Approval

Pending

Barriers to Consensus

TBD

TLU-7. Commuter Choice/Commuter Benefits

Policy Description

- Reduce emissions by focusing on the workplace and reducing Single Occupant Vehicle commutes via:
  - Reducing free parking
  - Providing paid or pre-tax transit passes
  - Providing Guaranteed Ride Home
  - Allowing (periodic) telecommuting
  - Joining Universal Access program (institutional ID card = transit pass)
- Commute benefits need not imply transit use: employers can reward / incentive any non-SOV commute.

Policy Design

Goals:

- All VT employers over 50 employees offer Commuter Benefits (CB) programs,
- All colleges and universities offer CB
- All government units offer CB, especially the state.
- State adopts employee parking management and incentive programs
- Parking priority for low-GHG vehicles (car/vanpools, and low-GHG SOVs)

Timing: Implement by 2010.

Parties Involved: VTrans, regional planning commissions, CCMPO, municipalities, large employers, state legislature.

Implementation Mechanisms

- Provide employer education, and technical assistance, especially for large employers, including the State of Vermont.
- Improve broadband telecommunication facilities.
- Work to have towns revise parking policies/requirements. (See TLU-1)
- Expand transit service and marketing. (See TLU-2)

Related Policies/Programs in Place

Similar programs are implemented by TMAs: CATMA, on behalf of the Hill Institutions in Burlington, and UVTMA, centered around the White River Junction VT and Lebanon NH area.

CCTA providing Universal Access for Champlain College.

Types(s) of GHG Reductions

CO2

Estimated GHG Savings and Costs per $MtCO_2e$

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-7	Commuter Choice/Parking Cash Out	.06	.19	1.86	-$1	-$1	Pending

Data Sources:

- 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, *Strategies for Increasing the Effectiveness of Commuter Benefits Programs*, Transit Cooperative Research Program Report 87, 2003.[27]

Quantification Methods:

Per Participant Reduction in VMT with Full Implementation				
	12%			
	2012	2015	2020	2028
Extent of Implementation	25%	50%	50%	50%

Key Assumptions:

That reduced SOV commuting has collateral VMT reduction benefits as CB-recipients use transit more outside the commute.[28]

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

[28] ICF, Analyzing the Effects of Commuter Benefit Programs on Transit Systems, Transit Cooperative Research Program Report 107, 2005. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_107.pdf

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Approved

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-8. Plug-In Hybrids

[TWG recommends that this be included as part of the LCFS in TLU-5]

TLU-9. GHG-related transportation funding Mechanisms

Policy Description

Vermont (like the rest of the country) needs to find an alternative to a gas-tax-based transportation funding system. The revised / replacement system should include a mechanism with which to also fund the low-GHG policy options in TLU 1-7.

Policy Design

- The goal is not to use pricing to reduce emissions directly, but to fund a low-GHG transportation system as part of a broader funding system.
- Option examples
  - Per gallon
  - Feebates
  - Per mile
  - Per carbon unit
  - Per freight car
- Could be offset by reductions in property taxes

Timing: Existing per-gallon approach will be almost certainly gone or unsustainable by 2015.

Parties Involved: State, All fuel providers.

Other: None cited.

Implementation Mechanisms

Fund the options detailed in TLU 1-7.

Related Policies/Programs in Place

Current tax system

Types(s) of GHG Reductions

Primarily CO_2

Estimated GHG Savings and Costs per $MtCO_2e$

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
TLU-9	GHG-related transportation funding mechanism	-	-	-	-		Approved

Quantification Methods: None. This just funds other policies that produce reductions

Cost effectiveness: Cost effectiveness depends on the use of revenues.

- Current discussion focuses on using the revenue to fund transit and other non-SOV travel choices. Cost-effectiveness in that case is the same as TLU-2: net savings.
- Depending on the chosen level of tax/fee, more revenue may be raised than will be used to fund travel choices. At that point, revenue can be used to reduce other, more economically distortionary taxes. Two typical examples are personal income taxes, and employer payroll taxes.[29] In one example of revenue-neutral "revenue recycling":

  "This paper considers the distributional effects of imposing additional excise duties [taxes] on energy products according to carbon content. The assumed duties escalate from 1999 to 2010 and achieve levels reducing CO2 emissions by 10 per cent below baseline by 2010 for 11 EU member states. *By 2010, real personal disposable incomes are 1.6 per cent above baseline and employment is 1.2 per cent above, assuming that the change is tax-revenue-neutral."*[30] [emphasis added]

Data Sources: Economics literature, cited above.

Key Assumptions: None

Key Uncertainties

None cited

Additional Benefits and Costs

None cited

Feasibility Issues

TBD

[29] For example, Richard D. Morgenstern, "Towards a Comprehensive Approach to Global Climate Change Mitigation", *The American Economic Review*, Vol. 81, No. 2, (May, 1991), pp. 140-145.

[30] Terry Barker, Jonathan Köhler (1998) "Equity and Ecotax Reform in the EU: Achieving a 10 per cent Reduction in CO2 Emissions Using Excise Duties", *Fiscal Studies* 19 (4), 375–402.

Status of Group Approval

Approved

Level of Group Support

TBD

Barriers to Consensus

TBD