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Transportation and Land Use Technical Work Group
Summary List of Mitigation Options

	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-1	Compact and Transit-Oriented Development Bundle	.15	.37	2.36	Net savings		Pending
TLU-2	Alternatives to Single Occupancy Vehicles (SOVs)	.14	.37	2.72	Net savings		Pending
TLU-3	Vehicle Emissions Reductions Incentives	.04	.15	.86	Net savings		Pending
TLU-4	Pay as You Drive Insurance	.14	.37	2.72	Net savings		Pending
TLU-5	Alternative Fuels and Infrastructure	In progress			In progress		Pending
TLU-6	Regional Intermodal Transportation System – Freight and Passenger	.05	.11	.82	In progress		Pending
TLU-7	Commuter Choice/Parking Cash-out	.03	.09	.64	Net savings		Pending
TLU-8	Plug-in Hybrids	.1	.29	1.77	In progress		Pending
TLU-9	Fuel Tax Funding Mechanism	.07	.08	.84	Net savings		Pending
	SECTOR TOTAL BEFORE ADJUSTING FOR OVERLAPS	.72	1.83	12.73			Pending

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008-2020			
	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

Mitigation Option 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.

Mitigation Option 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.
- Reduce projected increase in VMT by **15%** statewide by 2020. [Note: AOT projects gasoline + diesel consumption to increase 38% through 2020.]

[Discussion (to be deleted or moved after establishing goal):

- North Carolina state Climate Action planning process is about to adopt a goal of 10% reduction in VMT growth from option "TLU 1a Land Development Planning".
- New Mexico adopted a goal of reducing growth in VMT by 11% through "Infill, Brownfield Re-development; Transit-Oriented Development; Smart Growth Planning, Modeling, Tools; Multimodal Transportation Bundle; and Promote LEED for Neighborhood Development.
- Arizona adopted a goal of reducing growth in VMT by 11% through a similar set of bundles.
- Oregon has for several years been implementing a goal of no increase in per-capita metropolitan-area, non-commercial VMT.]

Timing: Have policies in place to achieve that VMT goal by 2010.

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: Under Development.

Implementation Mechanisms

Mechanism 1: Implement Growth Center Law (Act 183)

a. Fund and carry out recommendations of the growth center natural resource lands "working group"

b. Staff and fund the growth center Planning Coordination Group
c. Expand and fund the growth center "incentives"
d. Ensure state infrastructure provision supports growth centers

Mechanism 2: Act 250 Climate Change Revisions

a. Incorporate Act 183 smart growth planning principles in Act 250
b. Strengthen criterion 5 – traffic, by including multi-modal options
c. Incorporate site design standards that promote transit and other alternative transportation modes
d. Strengthen criterion 9H – costs of scattered development
e. Strengthen criterion 9J – public utility services
f. Clarify criterion 9L - rural growth areas

Mechanism 3: Enact ANR Sewer Rule

Require that grants or loans for sewer expansions be awarded to projects that support smart growth.

Mechanism 4: Implement Act 200 Planning Process

a. Enforce state agency planning to require all state agencies that have programs that have an impact on land use to coordinate those plans with community and regional plans.
b. Incorporate climate change/smart growth principles in local and regional plans and bylaws

Mechanism 5: Transportation Policy

a. Adopt a statewide "fix it first" policy targeting funding to fix and maintain existing roads and bridges.
b. Target spending to areas that support smart growth
c. Focus corridor management planning along transportation corridors that are or can be served by transit; include all stakeholders, especially landowners, developers and local decision-makers, in order to promote smart growth development;
d. Expand transit service and infrastructure
e. Incorporate bike and pedestrian improvements into all transportation projects
f. Increase public transportation commuter routes prioritizing such services from compact development and village centers to employment centers.
g. Program entire annual apportionment of Congestion Mitigation/Air Quality (CMAQ) federal funds towards CMAQ activities.

Mechanism 6: Capital Construction/State Buildings/School Construction

a. Require that all leases and new building investments avoid sprawl locations
b. Move offices in existing sprawl locations to downtown areas
c. Keep new schools out of sprawl locations. Consider the location of a school as part of any state school construction funding decision.

Mechanism 7: Interchange Development

a. Require state agencies to take action to avoid sprawl development at highway interchanges

Mechanism 8: Vermont Housing and Conservation Board

a. Make smart growth locations a requirement for housing project eligibility
b. Continue funding at the statutory levels to protect farmland and provide for affordable housing

Related Policies/Programs 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 $MtCO_2e$

	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-1	Compact and Transit-Oriented Development Bundle	0.15	.37	2.36	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 30% 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

[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).

have been empirically observed in neighborhoods planned to allow multi-modal access and compact, mixed-use development.[3]

- *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%

We have not attempted to apply these kinds of cost reduction percentages to Vermont's total infrastructure costs, but even at the low end of the above figures, the total savings would be significant.

Quantification Methods:

Apply reductions to LDV VMT only:

- 15% of total LDV VMT affected by these policies by 2012; 40% by 2020. So:
  - 2012 reduction = Statewide LDV * 15% * 30% = **4%** of total statewide LDV[6]
  - 2020 reduction = Statewide LDV * 40% * 30% = **15%** of total statewide LDV
- Convert to CO_2

[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.

[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 CO2 / GHGs, it may be argued that this intermediate step is unnecessary, but many people find VMT percentage reductions a useful yardstick.

- **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

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

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 choices. Travel via single occupancy vehicle is the single largest contributor to GHG emissions in Vermont. Ensure that transportation/modes are linked/integrated with land use development plans. (see TLU-1)

Mitigation Option Design

Goals:

- Expand VMT savings oriented, convenient, reliable, frequent, Commuter/home to work routes and ridership.
- Expand/create regional connections/links to maximize inter-regional commutates by means other than SOV.
- Improve coordination of modes of transportation and transportation programs.
- Strategically fund and link Transit/Rideshare/Bike-Ped and Park and Ride facilities.
- Expand individual and workplace participation in Rideshare carpool and vanpool programs.
- Improve bike and pedestrian infrastructure both as feeders and as stand-alone modes.
- **Quantitative goals: Increase statewide non-SOV mode split by 50% by 2020.**

  2000 statewide journey-to-work mode split:

  SOV 75.5%; Non-SOV (Carpool 12%, Walk 5.7%, Work at home 5.7%, Transit 0.7%, Other 0.4%) 24.5%.

  In increase non-SOV by 50%, then non-SOV = 36.75%, and SOV = 63.25%.

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, environmental groups.

Other: Under Development.

Implementation Mechanisms

- Maximize capacity of existing public transit programs and operations that work to reduce VMT and emissions. Use 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/plan services that get more people on to one ride whether that is a volunteer driver vehicle, a van or bus.
- Coordinate between among Public Transit Provider Regions to deliver improved inter-region VMT reducing commuter service.
- Configure Rideshare program to better promote/market both carpooling and vanpooling under a statewide coordinated inter-regional program.
- Coordinate Rideshare, Transit, Park and Ride, Bike-Ped and inter-state transportation planning and investment.
- Develop statewide GIS grounded data base to coordinate all transportation options/facilities/programs. Web based access to all modes, all inter-connection opportunities etc.
- Develop and fund marketing strategy promoting alternative modes where modes are ready to accept additional usage.
- Plan to provide range of incentives to car pool/van pool/transit users/alternative mode users.
- Coordinate changes in land use planning to maximize use of alternative modes.
- Adopt land use practices/policies to prevent/discourage construction of major VMT generating outside of public transit service areas. Use incentives to encourage “smart growth”.
- Target State Infrastructure funding to projects/communities/growth center projects that meet smart growth goals for transportation and VMT reduction.
- Fund the transportation-related programs in this mitigation option with monies generated by other mitigation options that may be in place or adopted for the purpose of addressing global warming.
- Adopt strategies/programs/funding mechanisms to make alternative mode use easy.
- Adopt strategies to make use of public transit easy and affordable. Expand UVM program of swiping student passes for free access to public transit to all business/employment centers/state government, etc.
- Investigate/evaluate then implement a mix of policies and funding strategies (including tax credit strategies) that target successful VMT and emission reduction projects/programs for additional funding.

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)	.14	.37	2.72	Net savings		Pending

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]

[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.

Quantification Methods:

- **VMT reductions**
- Apply reductions to urban LDV VMT only.
- **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.

For the purposes of this analysis, 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 providing, parking), and the types of benefits enjoyed in response to commute benefits programs, are equally available to businesses:

> "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]

[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.

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]

Key Assumptions: TBD

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 North Carolina 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.
- "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.

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

- "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

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-3 Vehicle Emissions Reductions Incentives

Mitigation Option 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.

Mitigation Option Design

Goals:

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.
- By creating a dedicated revenue stream for promotion of low emitting or no emitting GHG transportation alternatives e.g., hybrid tax credits, transit infrastructure.

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.

Timing: Should be implemented as soon as possible.

Parties Involved:

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

Other: Under Development.

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. One 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.[15]

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.

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

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	.04	.15	.86	Net savings		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.

- **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 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.

Gas Guzzler Charge 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**

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.

Additional Benefits and Costs

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

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-4 Pay as You Drive Insurance

Mitigation Option 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.

Mitigation Option Design

Goals:

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

Timing: Direct the Commissioner of Banking, Insurance, Securities & Health Care to develop ASAP regulations allowing and 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: Under Development.

Implementation Mechanisms

1. Develop strategies for implementing "pay as you drive insurance"
    a. 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.
        i. Fixed-fee up front, with a re-imbursement (or additional payment) at the end of the policy period.
        ii. Shorter policy periods (one month instead of 6 months to a year). Monthly insurance is billed similar to a utility.
        iii. Purchase insurance that is valid up to a certain mileage, instead of a particular date.
        iv. Review applicable technologies.
    b. Insurance type
        i. Discrete premium levels – premiums are set within specific ranges for mileage driven.
        ii. Pay by the mile – using a linear rate that does not change as mileage increases

iii. 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[16]

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 [17]

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 [18]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 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." [19]

[16] See http://www.onstar.com/us_english/jsp/low_mileage_discount.jsp.
[17] See http://www.fhwa.dot.gov/policy/13-hmpg.htm.
[18] See http://www.progressive.com.
[19] See http://tripsense.progressive.com/about.aspx.

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	.14	.37	2.72	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 %.[20] (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

- **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] 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**
- **2020 reduction = Statewide LDV * 8% 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 North Carolina automobile insurance industry requires insurance companies to offer PAYD insurance
- Eventual application of PAYD insurance to the whole NC light duty fleet.

Key Uncertainties

The specifics of the PAYD insurance programs are to be determined, and the actual effects of PAYD insurance on driver behavior are subject to some significant uncertainty.

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" (Edlin, 1999; Litman, 2001). 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…."[21]

Other equity issues may be addressed through policy design.

Feasibility Issues

TBD

Status of Group Approval

Pending

[21] Todd Litman, "Pay-As-You-Drive Vehicle Insurance: Converting Vehicle Insurance Premiums Into Use-Based Charges", *TDM Encyclopedia*, Victoria Transport Policy Institute, December 2005. http://www.vtpi.org/tdm/tdm79.htm

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-5 Alternative Fuels and Infrastructure

Policy Description

This policy option seeks to increase market penetration of biofuels in Vermont by a mixture of policies (voluntary and/or mandatory) to achieve feasible goals. Offset fossil fuel use (gasoline) with use of starch-based and cellulosic ethanol and offset petrodiesel use with biodiesel.

Replacing gasoline and petrodiesel with ethanol and biodiesel respectively, can reduce GHGs to the extent that the ethanol and biodiesel are produced with lower GHG content.

This option is linked with policy options AFW-12: In-State Liquid Biofuels Production. This option seeks to develop the demand for biofuels, whether produced locally or out-of-state, while Options AFW-12 pursue the GHG benefits that would be achieved beyond the TLU-5 option by promoting in-state production of ethanol and biodiesel using feedstocks and production methods with greater GHG benefits than the likely business as usual national market production methods (e.g., conventional starch-based ethanol).

Policy Design

The goals for this policy should be phased in to utilize biofuels to replace the specified percentages of gasoline and diesel consumed for transportation throughout Vermont by the specified years, as shown under Goal Levels, below. The goals of this policy can be achieved through a combination of a renewable fuels standards, financial incentives, outreach, and market-based mechanisms.

Goal Levels and Timing:

- The goal levels and timing for biofuels implementation are shown in the table below.
- The Governor and the Legislature would have the authority to change these targets (up or down) based on technical and/or economic feasibility.
- The Governor and Legislature could also set intermediate targets.

Phase	Year	Represents percentage of total diesel used in state (in 2006)	Gallons of biodiesel used in Vermont	Represents percentage of total gasoline used in state (in 2006)	Gallons of ethanol used in Vermont
1	2010	5%	12,000,000	10%	33,000,000
2	2015	10%	24,000,000	15%	49,000,000
3	2020	20%	47,000,000	20%	65,000,000
4	2028	25%	60,000,000	25%	82,000,000

Parties involved:

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

Implementation Mechanisms

Information and education

Use information and education outreach to focus on voluntary methods of biofuels expansion. Provide the public with information on the use of and effects of using ethanol 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, biofuels 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.

- *Develop a $0.25/gallon credit for biodiesel and ethanol use in Vermont registered vehicles.*

  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 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 not be revenue neutral as the state would be providing incentive for fuel sold to non-taxable entities (local and state government) as well as sales to taxable entities. However, only the biofuel portion of blended fuel would be eligible for .25 cent credit. For example a B20 blend would get a .05 cent credit.

Codes and standards

This measure should include a mandated Renewable Fuel Standard (RFS), corresponding to the penetration rates listed above. The RFS 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 starting in 2006 with 4 billion gallons, increasing to 7.5 billion gallons by 2012. In this Act, renewable fuel includes motor vehicle fuel produced from grain, starch, vegetable, animal, or other biomass material, cellulosic biomass ethanol, waste derived ethanol, and biodiesel.

The program also requires refiners, blenders and importers to use a minimum volume of renewable fuels each year between 2007 and 2012. This year, 4.7 billion gallons — or 4 percent of all fuel sold or dispensed to U.S. motorists — will need to be blended with ethanol, biofuels or other renewable fuel sources.

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-5	Alternative Fuels and Infrastructure	*	*	*	In progress		Pending

- **Data Sources:** In progress; biofuels well-to-wheels values taken from the literature. Corn ethanol is assumed for LDVs as a conservative floor to emissions benefits. Corn ethanol shows very small benefits; have to work with TWG to define likely feedstocks for alt fuels to be consumed in VT.

  Even split between B5 and B20 is assumed for HDV fuel penetration

- **Quantification Methods:**

Current research indicates that starch-based ethanol production provides up to 18-29% reduction in CO_2 from starch-based ethanol production compared to gasoline.

Hill *et al* (2006) report that the energy available from biodiesel produced from soybeans is 93% greater than the fossil energy consumed in producing it. This biodiesel reduces lifecycle GHG emissions by as much as 41% compared with petroleum diesel.

- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-6 Regional Intermodal Transportation System – Freight and Passenger

Mitigation Option 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.

Mitigation Option Design

Goals: [PG urges goals to be set high]

- Decrease growth in intercity VMT within Vermont (including VT portion of multi-state travel) by **20%** percent by 2020.
- Increase rail freight in Vermont by ?? percent.

  [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. A target higher than that would have to come from the TWG.
- Increase passenger rail service by ?? percent by 2020.

  Discussion: State rail plan calls for 3% annual increase. [http://www.vermontrailroads.com/Documents/VT_SR&PP.pdf] So, baseline calls for 46% increase by 2020. **A target higher than that would have to come from the TWG.**
- Increase inter-city bus service by ?? percent.

  Discussion: A quick review of VTrans' "Public Transportation Policy Plan" did not find a current goal for intercity bus use.

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.
- 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.
- 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: Achieve by 2010.

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

Implementation Mechanisms

In progress

Types(s) of GHG Reductions

Mostly 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-6	Regional Intermodal Transportation System – Freight and Passenger	.05	.11	.82	In progress		Pending

Data Sources: VAOT Forecast

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

Key Assumptions:

- Rail and passenger intermodal produces 50% of baseline GHG emissions;

	2012	2015	2020
Extent of Implementation	10%	20%	30%

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-7 Commuter Choice/Parking Cash-out

Policy Description

- Provide employer education, especially for large employers, including the State of Vermont.
- Develop state legislation to encourage activities.
- Improve broadband telecommunication facilities.
- Work to have towns revise parking policies/requirements.
- Expand transit service and marketing.

Policy Design

Goals:

- Shift commuters from SOVs to alternative modes of transportation.
- Ensure employer support and participation.
- Have state commit XX dollars to the program by 2010.
- **Goals:**
  - **Largest 25% of VT employers offer CB, and all colleges and universities / all government units offer CB.**

  [Discussion: 15% of employers nationally offer a commuter benefits program.[22]]

Timing: Implement by 2010.

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

Implementation Mechanisms

TBD

Related Policies/Programs in Place

Potential that 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.

Types(s) of GHG Reductions

CO2

[22] Society for Human Resource Management, Benefits Survey Report, June 2006.

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	.03	.09	.64	Net savings		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.

Quantification Methods:

Per Participant Reduction in VMT with Full Implementation			
	12%		
	2012	2015	2020
Extent of Implementation	10%	15%	25%

Key Assumptions: TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-8 Plug-In Hybrids

Mitigation Option Description

Plug-in hybrid vehicles are hybrid electric vehicles that are equipped with a larger battery pack than standard hybrids and with the capability to provide a range of all-electric (zero-emission) transportation through the ability to plug into grid-supplied electricity from a standard outlet. Generally, early plug-in hybrids are expected to provide 20-60 miles of battery-supplied fuel before the internal combustion engine is needed. Most consumer roundtrips are fewer than 60 miles, so plug-in hybrids could create significant reductions in petroleum use and related greenhouse gas emissions. However, the technology is in its early stages, and its effects on Vermont's electrical supply and distribution system need be quantified and analyzed.

Mitigation Option Design

Goals:

- Establish a market for plug-in hybrid vehicles, and ensure that sales are **[10%]** above levels encouraged by the "Zero Emission Vehicle" requirements of the California Low Emission Vehicle Standards that Vermont has adopted.
- Ensure the use of plug-in hybrid vehicles has no adverse affect on the electrical supply and distribution system.
- Maximize the potential for efficient use of the electrical distribution system, mitigating adverse effects to electric ratepayers or the system.

Timing: Various policies should be implemented at different times depending of the progress of the technology.

Parties Involved:

- State Agencies: The Department of Public Service, VTrans, Buildings and General Services.
- The Vermont Public Service Board.
- Electric Distribution Companies.
- VELCO.
- EVermont.
- UVM UTC.
- Legislators.

Other: Under Development.

Implementation Mechanisms

Research and Development, Demand and Impact Assessments:

- The State should create a public/private partnership to assess consumer demand for plug-in vehicles and the potential impact of plug-in electric vehicles on electric load serving entities and transmission providers, considering efficiencies gained through a higher load factor, the increase in total demand and the resulting emissions, and increased pressure on the transmission and distribution system.
- The State should collaborate with electric utilities to create a rate design that will facilitate the use of plug-in hybrids (overnight off-peak pricing)

State Lead by Example:

- Vermont should joint the national "Plug-in Partners" campaign started by the City of Austin, Texas in 2005 in order to communicate to auto manufacturers that there is already a market for plug-in hybrid vehicles.
- The State should use its fleet to demonstrate plug-in vehicles as they become available

Incentives/Rebates:

- Establish a favorable environment for plug-in hybrid associated businesses in Vermont through production or investment tax credits
- As plug-in hybrid vehicles become commercially available, the State should provide incentives and/or rebates to auto dealers, utilities, and/or consumers to encourage purchase of these vehicles by mitigating initial incremental costs.

Related Policies/Programs in Place

The California Low Emissions Vehicle (LEV) Standards have been adopted by Vermont. The LEV program includes a technology forcing "Zero Emission Vehicle" ZEV sales mandate beginning in Vermont in model year 2007 and phasing in through 2018. The ZEV sales requirement increases from 10 percent to 16 percent during this time period. The ZEV program allows manufacturers two paths to meet the ZEV requirements. The conventional path requires the delivery of ZEV vehicles. A second "alternative compliance" path allows the manufacturers to meet the requirements with a combination of ZEVs, advanced-technology partial zero-emission vehicles (AT-PZEVs), and partial zero-emission vehicles (PZEVs). Plug-in Hybrid vehicles qualify as PZEVs, and are therefore encouraged under this program.

The US Department of Energy has, as part of its "Advanced Energy Initiative," created a research and development plan for plug-in hybrid electric vehicles (PHEVs). The near term focus is on adapted technology, an electric range of 10-20 miles (with reduced performance) or a full performance "charge depleting" range of 20 miles. The mid-term focus (3-5 years) is on an electric range of 20+ miles or a charge depleting range of 40 miles, both a full performance. The long-term development focus (5-10 years) targets meeting the goal of 40+ miles of electric range at full performance. The DOE doesn't choose between electric ranges or charge depleting ranges as neither technology is developed enough to determine its full potential. Some in the industry believe that battery technology can be achieved sooner than the DOE targets.

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-8	Plug-in Hybrids	.1	.29	1.77	In progress		Pending

- **Data Sources:** GREET model hybrid electric emissions (to be conservative)
- **Key Assumptions:**

% of LDV fleet	2010	2015	2020
Gasoline	98%	95%	90%
Gas-Elec Hybrid	2%	5%	10%

Key Uncertainties

Rate of market creation and penetration

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-9 Fuel Tax Funding Mechanism

Mitigation Option Description

A per-gallon fee or tax charged per gallon of liquid fuel sold at the pump.

- Goal is to fund transportation-related policies that reduce GHG emissions rather than to reduce consumption and emissions directly.
- **Amount: 2¢/gallon.** Would not vary by carbon content or by fuel. (Two reasons: the goal is revenue-raising, not pricing carbon; and simplicity of both analysis and implementation.)

Although the main goal is not to price carbon, this mitigation option would raise revenue (with which to reduce GHG emissions) from transportation fuels in part to reflect some of the health and GHG costs of carbon in transportation fuels.

Mitigation Option Design

- Fund options other than single-occupant vehicle driving.
- Most likely the options detailed in TLU-2.
- Could be offset by reductions in property taxes

Timing: Immediate. (No phase-in.)

Parties involved: All fuels.

[**Note**: The PG simultaneously agreed that this option was not aimed at reducing emissions directly, but then also held open the possibility of using this option as an implementation strategy in a Cap and Trade program. Using it as such an implementation option would require a different option design, starting with higher amounts. However, given skepticism about the feasibility of any fuel tax, have not invested in analysis of higher amounts.]

Other: None Cited.

Implementation Mechanisms

Fund the options detailed in TLU-2.

Related Policies/Programs in Place

See TLU-2.

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-9	Fuel tax funding mechanism	.07	.08	.84	Net savings		Pending

Quantification Methods

- **Reductions**

  Assumes long-run fuel demand elasticity of 1: all else being equal, demand falls at the same rate that price increases.

- **Cost effectiveness**

  Fuel tax cost effectiveness depends on the use of revenues.

  1. 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.
  2. 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.[23] 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.*"[24] [emphasis added]

- **Data Sources:** Economics literature, cited above.
- **Key Assumptions**: TBD

Key Uncertainties

TBD

[23] 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.

[24] 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.

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD