



WWW.NCCLIMATECHANGE.US

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

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2012	2020	Total 2008-2020			
TLU-1a	Land Development Planning	2.6	8.0	TBD	<i>Expected net savings</i>		TBD
TLU-1b	Multi-modal Transportation & Promotion	2.8	3.0	TBD	TBD	TBD	TBD
TLU-3a	Feebates to raise revenue	Currently included in 1b	Currently included in 1b	TBD	TBD	TBD	TBD
TLU-3a	Feebates to change fleet mix		< 0.5	TBD	TBD	TBD	TBD
TLU-4	Truck-stop Electrification	Currently included in TLU-8		TBD	TBD	TBD	TBD
TLU-5	Tailpipe GHG Standards	0	8.09	TBD	TBD	TBD	TBD
TLU-6	Biofuels Bundle	1.14	3.25	TBD	TBD	TBD	TBD
TLU-7	Procure Efficient Fleets	Included with TLU-6		TBD	TBD	TBD	TBD
TLU-8	Anti-idling	0.1	0.2	TBD	TBD	TBD	TBD
TLU-9	Diesel Retrofits	TBD	TBD	TBD	TBD	TBD	TBD
TLU-10	Fuel tax (50 cents/gallon)	6.4	13.9	TBD	TBD	TBD	TBD
TLU-11	Pay As You Drive Insurance	2.3	5.3	TBD	<i>Expected net savings</i>		TBD
TLU-12	Incentives for Advanced Tech Vehicles	NA	NA	TBD	TBD	TBD	TBD
TLU-13	Buses – Clean Fuels	Included with TLU-6		TBD	TBD	TBD	TBD

	Mitigation Option	GHG Reductions (MMtCO₂e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO₂e)	Level of Support
		2012	2020	Total 2008-2020			
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS	TBD	TBD	TBD	TBD	TBD	TBD
	REDUCTIONS FROM RECENT POLICY ACTIONS	TBD	TBD	TBD	TBD	TBD	TBD
	SECTOR TOTAL PLUS RECENT POLICY ACTIONS	TBD	TBD	TBD	TBD	TBD	TBD

TLU 1a Land Development Planning

Mitigation Option Description

Promote land planning and development that supports conservation of high quality natural and cultural resources and supports more compact development, and as a result reduces growth in driving and emissions.

Mitigation Option Design

- **Goals:** Support and promote private and public planning and development practices, including infrastructure provision, that reduce the number, length, or travel mode of trips made in North Carolina.
Reduce projected increase in VMT by 10% statewide by 2020.
- **Timing:** Have policies in place to achieve that VMT goal by 2010.
- **Parties involved:** Include private developers/contractors, local government planning/elected boards, and planning staffs for towns and counties.

Implementation Mechanisms

Meeting the goal will require diverse implementation tools. Providing many options, statutory changes, and program assistance for smaller communities will be essential.

Mechanism 1: Land use and development legislation to require adoption of a growth plan:

a. Each municipality and county shall develop a land use and development plan. The plan should designate planned growth areas and natural resource areas within that jurisdiction and any extraterritorial jurisdiction for a planning horizon of at least 25 years. The land use and development plan should include standards and criteria for conservation area and/or urban service area designations to accommodate a minimum 20-year growth forecast agreed upon by the each county and municipality, establish development and conservation goals, recognize important natural and human resources, and express appropriate policies, practices and strategies to implement these goals.

Local planning programs should include appropriate public involvement processes to achieve consensus on the development and conservation vision for the community.

b. Require and support integration of transportation with land use plans.

Maryland, Minnesota, and Denver, CO, as well as the non-profit Triangle Land Conservancy have developed “greenprints” of areas that have old-growth forests, productive agricultural lands, water supply watersheds, historic sites or other critical and

irreplaceable resources. Adding this as a required element of all transportation plans would be a simple and meaningful step that would greatly enhance the effect and benefits of NCGS 136-66.2 without requiring new zoning or regulatory powers. The November, 2004 passage of tax increment financing legislation demonstrates that North Carolina can and does make room for new ideas that help achieve economic development goals in concert with infill development objectives. The N.C. Small Town Economic Development (NCSTEP) initiative created grant funds that are being applied to 33 communities to better develop their areas.

c. Regulatory incentives such as withholding transportation funds for non-compliance have worked in Tennessee and should be considered in North Carolina as well.

Mechanism 2: Remove barriers to Smart Growth

Many states have successfully implemented a variety of tools that are unavailable to North Carolina municipalities and counties due to prohibitions imposed by North Carolina statutes or constitution. Modify statutes to permit adequate public facilities ordinances, transfer of development rights programs, and development impact fees to improve the ability of local governments to control their own destinies.

Related Policies/Programs in Place

1. § 136-66.2. Development of a coordinated transportation system and provisions for streets and highways in and around municipalities.

(b1) The Department of Transportation may participate in the development and adoption of a transportation plan or updated transportation plan when all local governments within the area covered by the transportation plan have adopted land development plans within the previous five years. The Department of Transportation may participate in the development of a transportation plan if all the municipalities and counties within the area covered by the transportation plan are in the process of developing a land development plan. The Department of Transportation may not adopt or update a transportation plan until a local land development plan has been adopted. A qualifying land development plan may be a comprehensive plan, land use plan, master plan, strategic plan, or any type of plan or policy document that expresses a jurisdiction's goals and objectives for the development of land within that jurisdiction. At the request of the local jurisdiction, the Department may review and provide comments on the plan but shall not provide approval of the land development plan.

2. § 113A-100. Coastal Area Management Act, § 113A-101. Cooperative State-local program.

This Article establishes a cooperative program of coastal area management between local and State governments. Local government shall have the initiative for planning. State government shall establish areas of environmental concern. With regard to planning, State government shall act primarily in a supportive standard-setting and review capacity, except where local governments do not elect to exercise their initiative. Enforcement shall be a concurrent State-local responsibility.

A wide variety of other state, regional, and local level planning and design programs, requirements, and efforts.

Types(s) of GHG Reductions

Mainly CO₂, small amounts of others

Estimated GHG Reductions and Costs (or Cost Savings)

First-round estimate:

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)
		2012	2020	Total 2008–2020		
	Transportation and Land Use					
TLU-1a	Land Use Strategies	2.6	8.0	In progress	<i>Expected net savings</i>	

• **Data Sources:**

1. *VMT impacts*: literature. Wide variety of literature finds that integrated transportation and land use planning can substantially reduce VMT.¹ Use 30% as a first pass.
2. *Costs*: literature. Wide variety of literature finds that integrated transportation and land use planning produces savings on infrastructure and transportation costs. Building (including land) costs may be higher. Preponderance of literature suggests net savings overall.²

• **Quantification Methods:**

Apply reductions to LDV VMT only:

- 15% of total VMT affected by these policies by 2012; 40% by 2020.

- 2012 reduction = Statewide LDV * 15% * 30% = **4%** of total statewide HDV + LDV

- 2020 reduction = Statewide LDV * 40% * 30% = **10%** of total statewide HDV + LDV

- Convert to CO₂

• **Key Assumptions:**

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, *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>

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 – 1b Multimodal Transportation and Promotion

Mitigation Option Description

- **Goals:**
 1. Shift passenger transportation mode choice to lower emitting choices
 2. Ensure that transportation is integrated with and appropriately serves land-use development plans [developed under TLU-1a].
 3. State invests 5% of all state transportation dollars in transit by 2010, and 12% by 2030.

Mitigation Option Design

- **Goals**

Implement policies that increase use of public transportation, producing a shift to lower emitting mode choices, by the following policies:

- Improve Transit Service (frequency, convenience, quality)
- Expand Transit Infrastructure (rail, bus, BRT)
- Focus new development on transit-served corridors (Transit-Oriented Development)
- Expand Transit Marketing and Promotion (including tax-free and employer-paid Commuter Benefits, and Parking Cash Out)
- Expand Transportation System Management and Design, which speeds both transit and other traffic
- Improve bike and pedestrian infrastructure both as feeders and as stand-alone modes.

- **Timing:**

- Many programs are in place and are therefore immediately expandable/implementable – enhancement and continuation can begin short-term.
- Infrastructure improvements will take 1-5 years at a minimum.

- **Parties involved:** NC DOT, Regional Transportation Districts, Metropolitan Planning Organizations, Regional Planning Organizations, municipalities, counties.

- **Other:** TBD

Implementation Mechanisms

1. Aggressively support and aid the creation of Regional Transportation Districts (RTDs). RTDs can sell bonds for capital projects, and member governments can levy taxes for operation and maintenance subject to voter approval.
2. Make planning and funding rules more flexible to allow transit operators to provide service to places outside of their municipal jurisdictions.
3. Abolish or reduce minimum parking requirements in zoning codes, and allow localities to establish parking maximums.
4. Create a best practice guide and recognize developers who adhere to best practice when designing and locating new private (and public) development.
5. Require planning to extend beyond 5 years (20 years recommended) for all systems.
6. Incentivize or require the purchase of biodiesel fuel (minimum: B20) as a part of all public bus replacement programs. Conover has already done so with great results.
7. Location of State Facilities – Locate state facilities near transit facilities. Where/when appropriate all state government offices should be located downtown when possible (per Executive Order from NC Governor James Holshouser).
8. State Targeting of Infrastructure Investments – Legislatively appropriated capital outlay funds, state public revolving loan fund, and other state-funded infrastructure initiatives should be used for projects that encourage walkable and traditional communities, and are supportive of transit.
9. Make maintenance of infrastructure a priority – Fix it First. Revise any state infrastructure programs (transportation, water, sewer) that fund new systems but not maintenance or upgrades for existing systems.
10. Replace “average cost pricing” for utilities services with rate structures that charge full marginal costs for both new infrastructure and for water, sewer, electricity, and telephone service delivery.
11. Fund the transportation-related programs in this mitigation option with monies generated by other mitigation options such as feebates and/or gas tax.

Related Policies/Programs in Place

1. Statewide Transportation Demand Management Program (TDM) – NCDOT-PTD supports the formation and ongoing activities of local TDM programs across the state by funding up to 50% of the cost of administering and marketing the services of the local TDM programs. We also provide training for the TDM Coordinators operating the TDM programs. Currently there are programs in the Charlotte, Asheville, Triad, Triangle and Wilmington areas of the state. In support of the TDM programs, the state funded, with local areas support, a ridematching program that is available statewide which individuals can access

through the internet to find or form carpools or vanpools for their daily commuter trips. We are looking into adding a module to the program that allows individuals to enter trip needs that vary by day of the week, instead of the usual Monday through Friday work trip. The new module would allow part time workers, workers with variable work schedules and college students to find rides even though their trips are not regular throughout the week.

2. Intermodal Transportation Centers – NCDOT-PTD works with municipalities in the states larger cities to develop intermodal transportation centers that allow for seamless movement between intercity passenger rail, intercity bus and city bus services. Currently Greensboro has an intermodal center in operation which spurred double digit increases in ridership on the city’s bus system and the intercity bus operator after it opened. Rocky Mount has a successful intermodal center in operation. Additional projects are being developed in the following areas: Charlotte, Durham, Fayetteville, Greenville, Raleigh, Wilmington and Winston-Salem.

The state assists the municipalities in getting Federal Transit Administration funding, provides a 10% match to the 80% FTA funding and participates in the planning, land acquisition and design processes leading to construction of the centers.

3. Technology on Transit Vehicles and Facilities – NCDOT-PTD supports the installation of new technologies on transit buses and in transit facilities that make transit services more safe and efficient and that provide a higher level of information on the services for riders and potential riders. The state funds 90% of the cost of the technologies. Examples of such technologies include installation of cameras on buses (safety), real time transit service information signage at transit facilities (more information), compatible electronic fareboxes for systems in one region (ease of transit systems use) and installation of AVL/GPS systems on buses (more efficient operation and more information to passengers).

Types(s) of GHG Reductions

Mainly CO₂, small amounts of others

Estimated GHG Savings and Costs per MTCO₂e

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2012	2020	Total 2008-2020			
	Transportation and Land Use						
TLU-1b	Multi-modal Transportation & Promotion	2.8	3.0	In progress	In progress	In progress	TBD

- **Data Sources:**

Transit economics literature.

- **Quantification Methods:**

Apply reductions to urban LDV VMT only.

1. Reductions from transit improvements:

50%	Percent of travel (by VMT) that is potentially transit servable
2%	Current pax miles traveled share for transit trips
50%	Percentage decrease in transit fares
25%	Percentage increase in service
0.4	Elasticity of transit demand wrt price
0.8	Elasticity of transit demand wrt service
2.40%	Expected percent reduction in VMT (based on fare decrease)
2.40%	Expected percent reduction in VMT (based on service increase)

- 2012 reduction = **2.4%** of total statewide HDV + LDV

- 2020 reduction = **2.4%** of total statewide HDV + LDV

2. Reductions from TDM and transit promotion

30%	Multiply urban LDV VMT by the percent of travel that is associated with commuting
12%	Effectiveness of TDM measures for reducing daily commute VMT (through 2012)
20%	Effectiveness of TDM measures for reducing daily commute VMT (through 2020)
4%	Calculate expected percent reduction in commute VMT through 2012
6%	Calculate expected percent reduction in commute VMT through 2020

- Convert to CO2

- **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 – 3a Feebates to raise revenue

Mitigation Option Description

Motor vehicle registration fees that vary with vehicle emissions and fuel economy as rated by U.S EPA. Could be designed to be a ‘feebate’ by providing a small refund instead of surcharge for vehicles that achieve low scores.

Mitigation Option Design

Goals:

1. To raise funds for State of North Carolina to provide funds for transportation related projects that reduce GHG.
2. To raise funds through a mechanism that is directly tied to a significant source of GHG emissions (our cars and trucks).

Timing: Should be implemented as soon as possible.

Parties involved: DMV, and agencies that distribute and spend the revenue.

Other: TBD

Implementation Mechanisms

This could be ordered through legislation.

For light duty vehicles, the appropriate emissions/efficiency factor is identified from the table below (this will be done by a DMV computer). This factor is based on the vehicle’s Green Vehicle Guide rating, as published by EPA (www.epa.gov/greenvehicles)

. By incorporating the vehicle’s Green Vehicle Guide rating, both fuel economy and emissions are accounted for.

Combined Score from EPA Green Vehicle Guide	Emissions/Efficiency Factor
19-20	10,000
17-18	9,000
15-16	8,000
13-14	7,000
11-12	6,000
9-10	5,000
7-8	4,000
5-6	3,000
3-4	2,000
<3	1,000

Then to calculate the surcharge, vehicle miles traveled (VMT) is divided by the emissions/efficiency factor, as shown in the example below.

Vehicle	Vehicle Miles Traveled	Combined Score from EPA Green Vehicle Guide	Factor from Table Above	Fee (VMT/Factor)
Toyota Prius	15,000	20	10,000	\$ 1.50
Volkswagen Jetta Diesel, Manual	21,000	13	7,000	\$ 3.00
Chevy Cavalier	49,000	14	7,000	\$ 7.00
Toyota Land Cruiser	15,000	2	1,000	\$15.00

Generally the feebate design needs to: be simple, minimize the number of pivot points, be well-documented, be designed to maximize not minimize consumer attention.

During the past 2 legislative sessions, variations of a motor vehicle surcharge have been introduced; these could be drawn on for more detailed policy language.

Mobile Source Emission Reduction Program

*Establishes variable motor vehicle registration fees based on vehicle’s pollution and fuel economy score to generate funds for public and private sector use of alternative fuel and advanced transportation technologies. Funds would be distributed through the State Energy Office for transportation projects that support clean air renewable energy objectives.

**Proposed committee substitute will set vehicle surcharge from \$2-\$14 annually*

Related Policies/Programs in Place

None.

Types(s) of GHG Reductions

TBD

Estimated GHG Reductions and Costs (or Cost Savings)

3.7 million NC LDV registrations / yr.

@ \$10/vehicle = \$37 million / yr for programs to reduce emissions from travel.

Regional commuter programs can reduce VMT @ 2 cents/mile.

\$37 million / yr / \$0.02/mile = 1,850,000,000 VMT = 2% of total statewide VMT; 3% of total urban LDV VMT.

NOT (yet) converted to GHG and reported separately in reductions table; TWG needs to discuss what program this option should fund; need to avoid double-counting.

- **Data Sources:**

VMT reductions/\$ from:

ICF, *Commuter Connections Strategic Review: Final Report*, For Maryland Department of Transportation, Office of Planning and Capital Programming, November 7, 2004.

- **Quantification Methods:**

Above.

- **Key Assumptions:**

\$2-\$14 surcharge has no direct effect on behavior. All reductions come from supporting other programs.

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 – 3b Feebates to change fleet mix

Mitigation Option Description

Feebates (fee / rebates) charge or rebate a sliding scale of fees and rebates for new cars based on their emissions of greenhouse gases, fuel consumption, and/or other measures of a vehicle's environmental impacts. Provides an incentive for manufacturers to sell cost-effective efficiency technologies, and for consumers to buy lower-emitting vehicles.

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- or no-GHG transportation alternatives. E.g. hybrid tax credits, transit infrastructure??

Timing: Should be implemented as soon as possible.

Parties involved: All new vehicles registered in North Carolina.

Other:

Implementation Mechanisms

Legislation:

The feebate can be linked to several parameters:

1. The simplest is to set the fee or the rebate in proportion to the amount of fuel consumed by the vehicle per mile driven.

Specify the rate (in dollars per mile) and the “pivot point” between fees and rebates. The location of this pivot point will determine the net revenue flow.

Design variations:

2. Emissions could be considered relative to other vehicles within each class or across classes.
3. The feebate could be set as a multiplier for an excise tax so that the fee or rebate is determined not only by the emissions rate of the vehicle but by its price as well.

Generally the feebate design needs to: be simple, minimize the number of pivot points, be well-documented, be designed to maximize consumer attention.

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.

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.

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.

Existing 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.

These studies have spurred an interest in multi-state feebate programs as a way to increase the size of the affected market, and thus the incentive for manufacturers to shift technology mix. This policy option assumes only a NC-level policy.

Types(s) of GHG Reductions

Mainly CO₂

Estimated GHG Reductions and Costs (or Cost Savings)

- **Data Sources:**
- **Quantification Methods:**

Some attempts have recently been made to estimate the GHG emissions reduction potential from individual state feebate programs, including programs proposed for the states of Arizona and California. A rough extrapolation to NC suggests that a stand-alone feebate program is unlikely to produce reductions of more than 0.5 MMtCO₂e in 2020. These recent estimates of the potential impacts of individual state programs are contingent upon assumptions and analytical methods that have not undergone thorough peer review. Therefore, the results of these analyses are preliminary and should be interpreted with caution. Further analysis and study of the potential benefits and costs of individual state and multi-state feebate programs would greatly increase confidence in projected results.

- **Key Assumptions:** That the NC program is stand-alone.

Key Uncertainties

Consumer response to a one-time fee.

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 4 – Truck Stop—and Places Where Trucks Stop—Electrification

Mitigation Option Description

Reduce idling-induced emissions from heavy-duty diesel trucks by providing electrical hook-ups to power heating, cooling, and other needs while stopped.

Mitigation Option Design

- **Goals:**
 1. To reduce the engine emissions from diesel trucks (typically, tractor trailers) by allowing truck drivers to “plug in” engine heaters, HVAC, and other electrical devices
 2. To use Truck Stop Electrification to support Idle Reduction/Elimination (IR/E) policies.
- **Timing:** Conduct pilot projects at major truck stops on Interstate highways (principally, I-40 and I-85) and other places where trucks stop; progress to include all major truck stops statewide with at least one electrified stop in each of the 17 urban areas in North Carolina.
- **Parties involved:** Affects all long-haul truck drivers of tractor/semi-trailers and combination trailers. USDOT requires all truck drivers to rest for at least 10 continuous hours after an 11-hour driving stint within every (24) hour day and 34 continuous hours once per week.
- **Other:** Note that Truck Stop Electrification may entail all off-board (shore power system) or some on-board/some off-board systems. The all off-board option may be owned by the proprietor of the truck stop. On-board equipment is owned by the driver/owner or trucking company.

Implementation Mechanisms

Third-party vendors, truck stop owners, and trucking companies will play key roles in the advancement and absorption rate of this option. A state-shared responsibility for funding and promotion, coupled with a strong, phased-in Idle Reduction/Elimination policy, is one possible approach. Acquiring feedback during the initial projects (some of which are already in place in N.C.; see map on following page) and modifying the program accordingly will be critical as well.

Related Policies/Programs in Place

[In progress] Could not locate policies or laws to enforce participation; TSE is typically discussed during anti-idling legislation. Pennsylvania, Oregon, and Washington¹ appear to have an existing program, for example—as do certain city, and perhaps county or other such, jurisdictions.

Types(s) of GHG Reductions

CO2, carbon black.

Estimated GHG Reductions and Costs (or Cost Savings)

For round 1 analysis, see TLU-8, Anti-idling. May analyze separately in second round.

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

Pending

Barriers to Consensus

TBD

TLU-5 Tailpipe GHG Standards

Mitigation Option Description

Adopt the State Clean Car Program (also known as the “Pavley” standards or “California GHG emission standards”) to reduce emissions of GHGs from vehicle operation.

Mitigation Option Design

- **Goals:** Use California GHG emissions standards for cars and light trucks to reduce GHG emissions. California standards require reductions of GHG emissions of about 30 percent from new vehicles, phased in from 2009 to 2016, through a variety of means.³ Other Clean Car Program elements include standards requiring reductions in smog- and soot-forming pollutants, and promoting introduction of very low-emitting technologies into new vehicles.
- **Timing:** The General Assembly could enact legislation in 2007 so that NC can implement the California standards.⁴
- **Parties involved:** Would apply to MY 2011* new cars and light trucks. Would directly affect automobile manufacturers, car dealers, and consumers. Compliance concerns would affect manufacturers and dealers.

Implementation Mechanisms

Regulatory program beginning with vehicle model year 2011.

Types(s) of GHG Benefit(s):

Principally CO₂ reductions with some reduction also in N₂O, CH₄, and refrigerant losses.⁵

Related Policies/Programs in place:

Federal regulation of tailpipe emissions.

³ For detailed information see: <http://www.arb.ca.gov/cc/ccms/ccms.htm>.

⁴ The California standards currently are being litigated, and timing may be affected as a result.

⁵ See: http://www.arb.ca.gov/cc/factsheets/cc_isor.pdf

Estimated GHG Savings and Costs Per Ton:

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2012	2020	Total 2008-2020			
	Transportation and Land Use						
TLU-5	Tailpipe GHG standards	0	8.09	In progress	In progress	In progress	TBD

- **Data Sources:**
 - CCS, Draft North Carolina Greenhouse Gas Inventory and Reference Case Projections, 2006.

- **Quantification Methods:**

CCS compared results from New England states, California, and a National PIRG model that were obtained using comparable modeling methods. CCS found that while all three modeling efforts were valid, reasonable, and comparable, some of the PIRG model assumptions and methods were relatively conservative, while the California and New England modeling results were relatively optimistic. CCS further refined the PIRG model results consistent with a middle range scenario that produced results less conservative than the PIRG results and less optimistic than the California and New England results. While PIRG projected a 13.7% reduction in light duty vehicle emissions with this policy for Arizona, a CCS refinement estimated a 15.5% reduction in emissions for Arizona. CCS applied this same refined percentage reduction in emissions to the CAPAG reference case for North Carolina.

- **Key Assumptions:** The three modeling efforts have established a valid and reasonable method of projecting GHG emissions reductions from this policy. The CCS comparison of the three modeling methods provides some independent professional validation of the models and their results. The key assumption of the emissions reduction projected by CCS is that the most likely scenario for emissions reductions is one that would fall between the more conservative scenario projected by the PIRG model and the more optimistic scenario projected by the California and the New England models.

Key Uncertainties:

Fleet turnover rates for light duty vehicles and future patterns of consumer purchase choices between passenger cars and light duty trucks (i.e. SUVs).

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-6 Biofuels Bundle

Policy Description

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

Replacing gasoline with ethanol can reduce GHGs to the extent that the ethanol is produced with lower GHG content. Biodiesel has a lower GHG content than fossil diesel, so using biodiesel instead of fossil diesel reduces GHG emissions.

This option is linked with policy options AFW-2: Biodiesel Production and AFW-6: Policies to Promote Ethanol Production. This option seeks to develop the demand for biofuels, whether produced locally or out-of-state, while Options AFW-2 and AFW-6 pursue the GHG benefits that would be achieved beyond the TLU-7 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 North Carolina by the specified years, as shown under Goal Levels, below. These goals of this policy would 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	Percentage of Gasoline to be Replaced by Biofuels	Percentage of Diesel to be Replaced by Biofuels
1	2010	10% (E10 equivalent)	5% (B5 equivalent)
2	2015	15% (E15 equivalent)	10% (B10 equivalent)
3	2020	20% (E20 equivalent)	15% (B15 equivalent)
4	2025	25% (E25 equivalent)	20% (B20 equivalent)

Parties involved: State of North Carolina, fuel retailers, fuel wholesalers, business owners, car dealers, biofuels producers, and alternative vehicle advocates and 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 and public demonstrations.

Funding mechanisms, market-based mechanisms, and incentives:

Pursue DOE and State funding for more alternative 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.

1. 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 NC DOR 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 State Revenues, DOT highway funds. 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.

2. Develop a \$.25/gallon credit for biodiesel and ethanol use in North Carolina vehicles.

Monthly tax credit would be claimed on same form (Biodiesel and Fuel Alcohol Providers Form) as marketers currently file with NC DOR 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 State Revenues, DOT highway funds. 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.

3. Create a tax credit for biodiesel producers

A provision was included in the 2006 NC budget. See budget text in following section. Not clear how this will be implemented but it appears to be an income tax credit that's

related to the amount the taxpayer paid during the previous year in motor fuels taxes on the biodiesel.

GENERAL ASSEMBLY OF NORTH CAROLINA

SESSION 2005

SESSION LAW 2006-66

SENATE BILL 1741 (Budget Bill) signed by Gov Easley 7-10-06

<http://www.ncleg.net/Sessions/2005/Bills/Senate/PDF/S1741v8.pdf>

TAX CREDIT FOR BIODIESEL PRODUCER

SECTION 24.8.(a) Article 3B of Chapter 105 of the General Statutes is amended by adding a new section to read:

"§ 105-129.16F. Credit for biodiesel producers.

(a) Credit. – A biodiesel provider that produces at least 100,000 gallons of biodiesel during the taxable year is allowed a credit equal to the per gallon excise tax the producer paid under Article 36C of this Chapter on the biodiesel. For the purposes of this section, 'biodiesel' is liquid fuel derived in whole from agricultural products, animal fats, or wastes from agricultural products or animal fats. The credit does not apply to tax paid on diesel fuel included in a biodiesel blend. The credit may not exceed five hundred thousand dollars (\$500,000) and is subject to the limitations of G.S. 105-129.17.

(b) Sunset. – This section is repealed for taxable years beginning on or after TLU TWG Mitigation Options Description, CCS, 9/08/06 15 January 1, 2010."

SECTION 24.8.(b) This section is effective for taxable years beginning on or after January 1, 2008.

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. Additionally, production issues should be included in the trigger, such as water use in growing corn (or other crops) for the biofuels, such that the production of the biofuels does not increase GHG emissions or cause other resource problems.

Voluntary and or negotiated agreements: Provide financial incentives for alternative fuels distributors. Provide state funds and/or loan guarantees for construction of alternative fuels distribution facilities. Also, provide grow receipts tax exemptions, production tax credits and reduction in excise taxes on alt fuel sales.

Pilots and demos: Show example of existing multi-fuel pumps in North Carolina 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.

Research and development: Pursue in-state biofuels production from a variety of sources. The State should push for significant federal funds for research and development needed to commercialize cellulosic ethanol technology and processes as 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 alt 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.

Types(s) of GHG Reductions

CO₂ emissions are reduced by offsetting the use of petroleum-derived gasoline and diesel. In order to assess the CO₂ benefit of using ethanol, the energy requirements of producing ethanol from starch needs to be compared to the energy requirements of producing gasoline. Current research indicates that starch-based ethanol production provides up to 18-29% reduction in CO₂ from starch-based ethanol production compared to gasoline. To assess the benefits of using biodiesel, the overall energy required to produce biodiesel (e.g., life-cycle costs and benefits) must be compared to the energy requirements of producing fossil fuel diesel. 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.⁶ This biodiesel reduces lifecycle GHG emissions by as much as 41% compared with petroleum diesel.

Estimated GHG Savings and Costs per Ton CO₂e

The table below shows the total CO₂e reductions associated with implementing the program described above in the Program Design section. Note that some of these reductions would be attributable to the use of biofuels as a result of the national Renewable Fuel Standard (RFS) in the Energy Policy Act of 2005. The total emission reductions attributable to the RFS versus the incremental reductions attributable to TLU -7 are broken out in the table below.

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008-2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2012	2020	Total 2008-2020			
	Transportation and Land Use						
TLU-6	Biofuels bundle - Ethanol - Biodiesel Total	0.83 <u>0.31</u> 1.14	1.88 <u>1.37</u> 3.25	In progress	In progress	In progress	TBD

⁶ See Data Sources below.

- **Data Sources:**

Environmental, Economic, and Energetic Costs and Benefits of Biodiesel and Ethanol Biofuels, Jason Hill, et. al., University of Minnesota, published in Proceedings of the National Academy of Sciences of the United States of America, volume 103, no. 30, July 25, 2006.

Well-to-Wheels Analysis of Advanced Fuel/Vehicle Systems— A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions, General Motors, Argonne National Lab, and Air Improvement Resource, Inc., May 2005.

“Documentation of Inputs to Macroeconomic Assessment of the Climate Action Team Report to the Governor and Legislature,” California Climate Action Team, January 2006.

“State and Federal Standards for Mobile-Source Emissions,” National Research Council of the National Academies, Washington, DC, 2006.

- **Quantification Methods:** Well-to-wheels CO₂ equivalent emission factors from a recent Argonne National Laboratory Study were used to estimate the benefits of offsetting conventional gasoline with starch-based ethanol in the amounts specified by the ethanol goals. Well-to-wheels emission factors take into account the energy required to produce, process, and transport each fuel type (i.e., starting with the oil well for gasoline and the crop for starch-based ethanol).

Based on this source of information, the use of starch-based ethanol to replace gasoline is assumed to reduce CO₂e by 18.3%. The quantity of diesel fuel projected to be replaced in North Carolina with biodiesel was estimated based on the penetration rates of the above goals. A reduction in CO₂ emissions of 41% was applied to the quantity of diesel fuel replaced by biodiesel. (Hill et al, July 2006).

- **Key Assumptions:** This policy option assumes that the ethanol and biodiesel demand will be met with fuels available from a national market. Therefore, it is expected that the ethanol production would be starch-based and the emission factors used here reflect that.

Key Uncertainties

Some uncertainty remains regarding the ethanol production life-cycle emission factors as well as the availability of ethanol and biodiesel at the levels needed by this policy.

Contributing Issues

EPA has reported that the use of B20 biodiesel can lead to a 21% reduction in HC, 11% reduction in CO, and a 10% reduction in PM. Toxic emission reductions can also be significant. However, some brands of biodiesel can lead to increased exhaust emissions of NO_x and some air toxics, depending on feedstock and blend level. EPA reports a 2% increase in NO_x emissions for B20 blends. In contrast, certain brands of biodiesel, such as Blue Sun Biodiesel B20, can reduce NO_x emissions by 4 to 5 percent, according to a recent analysis performed by the National Renewable Energy Laboratory. Effects on newer diesel vehicles are likely to be different. An increased penetration of biofuels reduces our foreign fossil fuel dependency.

Feasibility Issues

Members of the CCAG have expressed concern over the land and water resources needed to produce the amount of biofuels required by this policy option.

TLU 7 – Procure Efficient Fleets

Mitigation Option Description

Reduce GHGs by increasing the efficiency of government fleets; increase fleet use of alternative fuels and of more efficient engines.

Mitigation Option Design

- **Goals:**

Increase government fleet use of low-GHG fuels and more efficient vehicles to reduce greenhouse gas emissions from fleets, principally carbon dioxide (CO₂), but also including other emissions affecting ozone, sulfur, and carbon monoxide loadings.

- **Timing:**

Statewide GHG reduction targets for fleets phased in over period of probably 8-10 years to allow fleet turnover to absorb most of the costs of replacing existing fleets. Other measures regarding more frequent maintenance and part specifications could be phased in much faster.

- **Parties involved:**

All government fleet vehicles. (An additional state procurement policy could touch private fleet operators as well.) On-road passenger cars and light-duty trucks would be the principal units being targeted. (Bus fleets and heavy-duty trucks are also existing and future targets.)

- **Other:**

It should be noted that some places in North Carolina are already implementing green vehicle fleets in whole or part.

Implementation Mechanisms

Although hybrid cars and higher-fuel efficiency cars comprise the biggest part of the potential market for creating greener state vehicle fleets, better purchasing decisions on tires and maintenance schedules can also contribute significantly to higher fuel efficiencies and lower emissions. A statewide policy specifying target adoption rates would need to come with an incentive or enforcement package.

To assure the use of cleaner fuels and more efficient vehicles the State can set up a system to accrue “alternative fuel use credits”. Credit can be accrued through the use of biodiesel, ethanol, CNG, propane, hydrogen, electricity and the purchase of advanced technology vehicles such as

hybrid electric vehicles. Such legislation was introduced during the 2005 session (SB1148). Text from bill:

The State fleet shall accrue a total of 2,000,000 alternative fuel use credits during each calendar year 2006 and 2007. The State fleet shall accrue a total of 5,000,000 alternative fuel use credits during each calendar year 2008 and 2009. The State fleet shall accrue a total of 10,000,000 alternative fuel use credits during the calendar year 2010 and each calendar year thereafter.

(e) Formulas for Calculating Credits. – Alternative fuel use credits are calculated as follows:

(1) Subject to subdivision (2) of this subsection, one alternative fuel credit accrues for each one gallon of one hundred percent (100%) alternative fuel utilized by a State fleet vehicle. When alternative fuel is blended with petroleum-based fuel, the alternative fuel credit accrues for each one gallon of alternative fuel utilized by a State vehicle at a rate that is based on the percentage of alternative fuel that is utilized by a State fleet vehicle. (For example, one alternative fuel use credit accrues for every five gallons of B20 that is utilized by a State fleet vehicle.)

Thus, in 2012, the goal of that language is to move 10,000,000 gallons of fuel from fossil to bio.

Related Policies/Programs in Place

Many cities, including Raleigh, Durham, Greensboro, Hickory, Conover, Charlotte and others have converted part or all of their fleets to cleaner-burning fuels such as B20, compressed natural gas (CNG), ethanol, and electric hybrids. North Carolina has vigorously acquired flexible fuel vehicles (FFVs) and uses E85, E10, and biodiesel on more than 3,000 vehicles.ⁱⁱ

Budget provision 19.5 of the 2005 NC budget requires the displacement of 20% petroleum from state fleet vehicles by 2010. These mandated goals affecting state fleets greater than 10 vehicles will result in more expanded use of Biodiesel (B20) and ethanol (E85). For example NC DOT has already announced expansion of B20 refueling to over 100 state refueling facilities in NC.

Types(s) of GHG Reductions

Mainly CO₂

Estimated GHG Reductions and Costs (or Cost Savings)

Because most of the GHG reductions and costs for this option come from alternative fuel use, they are incorporated into costs and benefits reported under TLU-6, Biofuels Bundle.

- **Data Sources:** Please see TLU-6
- **Quantification Methods:** Please see TLU-6
- **Key Assumptions:** Please see TLU-6

State procurement of efficient fleets will help the state lead by example, and spur the alternative fuels market (both provision and infrastructure). CCS analysis suggests that this option will not add meaningful additional CO₂ emissions reductions to the reductions that would be gained through TLU-6 and through existing actions.

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 – Idle Reduction/Elimination Policies

Mitigation Option Description

Implement state and local policies to reduce hours of operation and thus emissions from idling trucks and buses (principally), perhaps off-road engines as well.

Mitigation Option Design

- **Goals:**
 1. To reduce greenhouse gas emissions from heavy vehicles.
 2. Reinforce Truck Stop Electrification (TSE) support.
- **Timing:** Phased in; at full strength within five years of initiation.
- **Parties involved:** All heavy truck and bus fleets, public and private.
- **Other:** Exemptions for emergency vehicles, maintenance tasks, and similar cases. Note that “idling” here does not cover idling while stopped in traffic.

Implementation Mechanisms

This would require working with trucking groups, truck stops, and places where trucks stop as well as with government to formulate an agreeable policy approach, phasing schedule, and legislative content.

Related Policies/Programs in Place

About 15 states and a number of local governments have adopted anti-reduction legislation.ⁱⁱⁱ More are sure to follow or are already being discussed at some level. Toronto has had a law in place since 1996. Many North Carolina counties and the State Board of Education (Policy No. EEO-M-003) have adopted school bus idling policies already.^{iv} The Clean School Bus USA program (USEPA) should also be consulted.^v

Types(s) of GHG Reductions

Mainly CO₂, some carbon black

Estimated GHG Reductions and Costs (or Cost Savings)

Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)
	2012	2020	Total 2008–2020		

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)
		2012	2020	Total 2008–2020		
	Transportation and Land Use					
TLU-5	Truck-stop Electrification	TBD	TBD	TBD	TBD	TBD
TLU-9	Anti-idling	.1	0.2	TBD	TBD	TBD

• **Data Sources**

Idle-reduction technologies and policies could reduce per-vehicle fuel use by 3% to 9% annually:

J. Ang-Olson and W Schroerer, “Energy Efficiency Strategies for Freight Trucking: Potential Impact on Fuel Use and Greenhouse Gas Emissions”, *Transportation Research Record*.

• **Quantification Methods / Key Assumptions:**

10%	Percent of heavy duty travel (by VMT) by public sector.
50%	Percent of public sector heavy duty VMT observing anti-idling through 2012
40%	Percent of private sector heavy duty VMT observing anti-idling through 2012
80%	Percent of public sector heavy duty VMT observing anti-idling through 2020
70%	Percent of private sector heavy duty VMT observing anti-idling through 2020
95%	VMT-equivalency conversion factor of idling to non-idling vehicles in 2012.
95%	VMT-equivalency conversion factor of idling to non-idling vehicles in 2020.
2.05%	Calculate expected percent reduction in VMT-equivalency of conventional vehicles for 2010.
3.55%	Calculate expected percent reduction in VMT-equivalency of conventional vehicles for 2040.

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-9 Diesel Retrofits / Retirement

Mitigation Option Description

Reduce diesel emissions from older diesel engine/emission systems through retrofit and/or retirement. Incentivize and encourage retrofits through a combination of funding and education/promotion.

Mitigation Option Design

- **Goals:**
 1. **Retrofit NC school buses with DOC pollution control devices.** Reduce children's exposure to diesel emissions by retrofitting school buses in North Carolina with diesel oxidation catalyst (DOC) pollution control devices, and diesel particulate filters; auxiliary benefit of reducing some GHGs and carbon black.
 2. **Speed retirement and/or retrofit of all older diesels through information and incentives.**
- **Parties involved:**
 1. **NC school buses.**
 2. **All NC diesel truck owners**
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

- Utilize various funding mechanisms to purchase DOC pollution control devices for school buses that are not equipped with pollution control devices.
- Information and education: An information and education component will be needed to provide truck and bus owners, school districts, and municipal organizations with information regarding the significant emission reductions that could be achieved by retrofitting or retiring certain truck or bus engines with high annual emissions and replacing them with vehicles meeting the new emission standards. Provide information on potential funding partners, grants, or loans available from a number of organizations for this purpose.
- Funding mechanisms or incentives: Develop a loan or grant program allow truck owners to accelerate new vehicle purchases or to apply retrofit technologies to their fleets.

Related Policies/Programs in Place

School buses: Currently in North Carolina there is an ongoing effort to retrofit school buses across the State with diesel pollution control devices. An estimated 15% of the school buses in the State are already equipped with some type of pollution control device. Sources of funding include Federal and State grants, local funding and gifts from private industry. The primary purpose of these diesel pollution control devices is to reduce particulate matter.

Types(s) of GHG Reductions

TBD

Estimated GHG Reductions and Costs (or Cost Savings)

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **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-10 Fuel Tax / Fee

Mitigation Option Description

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

Amount to be determined.

- Small amounts (~5-10 cents) would have some demand impact, but would be more appropriately seen as a way to fund transportation-related policies than to reduce consumption and emissions directly.
- Larger amounts would have a more meaningful direct impact on consumption and emissions. Revenue could still be used to fund transportation-related policies, but could also be used to reduce other taxes and fees.

For this draft, using 50 cents / gallon.

Mitigation Option Design

- **Goals:**
 1. Reflect [some of] the health and environmental (sep. GHG) costs of carbon combustion in the fuel being sold.
 2. Fund options other than SOV driving.
 3. By reflecting the costs of combustion, reduce the growth in use.
- **Timing:** Phase in over [4] years.
- **Parties involved:** All fuels. Could be adjusted by carbon content.
- **Other:** TBD

Implementation Mechanisms

Use existing gas tax collection mechanisms. Revenue may flow to same or different end use than current gas tax. For this first round of analysis, impacts can be assumed to vary directly with fee levels; that is, a 10 cent/gallon fee has one-fifth the GHG impact of a 50 cent/gallon fee.

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

Estimated GHG Reductions and Costs (or Cost Savings)

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)
		2012	2020	Total 2008–2020		
	Transportation and Land Use					
TLU-11	Fuel tax (50 cents/gallon)	6.4	13.9	TBD	TBD	TBD

Rough analysis:

LDVs

\$2.00	Baseline fuel price
20	Average LDV fuel economy
\$0.10	Average cost/mile for fuel, baseline

\$0.50	Fuel tax
0.125	Average cost/mile for fuel, with tax
0.4	Elasticity of fuel consumption wrt price (through 2012)
0.75	Elasticity of fuel consumption wrt price (through 2020)
25%	Increase, %
10%	Calculate expected percent reduction in fuel consumption, 2012
19%	Calculate expected percent reduction in fuel consumption, 2020

HDVs

\$2.00	Baseline fuel price
2.5	Average HDV fuel economy
\$0.80	Average cost/mile for fuel, baseline

\$0.50	Fuel tax
1.00	Average cost/mile for fuel, with tax
0.4	Elasticity of fuel consumption wrt price (through 2012)
0.75	Elasticity of fuel consumption wrt price (through 2020)
25%	Increase, %
10%	Calculate expected percent reduction in fuel consumption, 2012
19%	Calculate expected percent reduction in fuel consumption, 2020

- **Data Sources:** Economics literature
- **Quantification Methods:** Above
- **Key Assumptions:**

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-11 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:** To reduce GHG emissions from automobiles by influencing individual drivers to reduce their annual VMT.
- **Timing:**
Proposal would require insurance companies to offer PAYD as part of their menu of insurance choices in NC. A pilot project could be implemented first on a smaller scale as soon as possible. Option design is to have full NC light duty fleet PAYD coverage by 2020.
- **Parties involved:** optional/mandatory for insurance companies, government incentives, available to all motorists insured in NC.

Implementation Mechanisms

- Require insurance companies to offer PAYD as part of their menu of insurance choices in NC.
Implementation technologies to be determined through rule-making, taking into account available and other required technology.
 - Insurance companies could charge motorists in lump sum e.g. 10,000-12,000 first and charge for additional payments as needed with the total premium calculated at the end of the term based on recorded mileage (motorists credited or charged for extra mileage).
 - Insurance companies could bill motorists based on their monthly vehicle mileage similar to other utilities.

Variations / policy design could address geographic and/or equity concerns.

Related Policies/Programs in Place

GMAC and On-Star Offers Low-Mileage Discount Rates
(http://www.onstar.com/us_english/jsp/low_mileage_discount.jsp)

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%, as indicated below:

- 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 (www.fhwa.dot.gov/policy/13-hmpg.htm). This Federal Highway Administration’s Value Pricing Pilot Program is now providing funding for PAYD insurance simulation projects in GA and MA.

- Progressive Insurance (www.progressive.com) offers distance-based insurance in Oregon, Michigan, and Minnesota. The program uses GPS to track vehicle location and use.

“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.” <https://tripsense.progressive.com/about.aspx>

Types(s) of GHG Reductions

CO2

Estimated GHG Reductions and Costs (or Cost Savings)

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2012	2020	Total 2008-2020			
TLU-11	Pay As You Drive Insurance	2.3	5.3	TBD	<i>Expected net savings</i>	TBD	

- **Data Sources:** See below
- **Quantification Methods:**

VMT impacts: literature. 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:

- 2012 reduction = Statewide LDV * 4% reduction = **3.6%** of total statewide HDV + LDV

- 2020 reduction = Statewide LDV * 8% reduction = **7.2%** of total statewide HDV + LDV

- Convert to CO2

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 percent 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 percent.⁷ (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 percent to 20 percent. The 8 percent 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.

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.

⁷ 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.

Key Assumptions:

- (1) State regulation of the North Carolina automobile insurance industry requires insurance companies to offer PAYD insurance
- (2) eventual application of PAYD insurance to the entire fleet of NC light duty motor vehicles.

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

Key Uncertainties

TBD

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....”⁸

Other equity issues may be addressed through policy design.

Feasibility Issues

TBD

Status of Group Approval

Pending

Level of Group Support

TBD

Barriers to Consensus

TBD

⁸ 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>

TLU-12 Advanced Technology Incentives

Mitigation Option Description

Technology will play a vital role in dramatically reducing carbon emissions from the cars of the future. Fuel cells, plug-in hybrid, low weight carbon-fiber bodies, and other technologies will require research, development, and commercialization. Because of its strong research university and both its high-tech and auto parts manufacturing, there may be an opportunity for North Carolina (esp. through the Department of Commerce) to encourage advanced automobile technology research and recruit the new generation of manufacturers.

The study would evaluate if there is an economic opportunity around the development and commercialization of advanced technology vehicles and suggest possible models for the Department of Commerce to take advantage of such opportunities.

Mitigation Option Design

- **Goals:**
 1. To enable North Carolina's economy to establish itself in the research, development, and commercialization of advanced automotive technologies.
 2. To grow North Carolina's capacity to recruit sustainable industry.
- **Timing:** long range e.g. 10 year investment plan
- **Parties involved:** NC Department of Commerce, NC Economic Development Board
- **Other:** TBD

Implementation Mechanisms

Tax incentives; education of industrial recruiters, possible formation of a NC Advanced Technology Institute

Related Policies/Programs in Place

Existing sustainable business recruiting efforts by the Department of Commerce.

Types(s) of GHG Reductions

CO₂

Estimated GHG Reductions and Costs (or Cost Savings)

By their nature, R&D initiatives cannot be predicted to produce certain kinds of technologies, and hence cannot be predicted to produce certain amounts of emissions reductions. This policy

option potentially has substantial emissions benefit upside, but CCS is unable to estimate impacts for this level of policy intent.

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **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-13 Buses – Clean Fuels

Mitigation Option Description

Expands TLU-7 to include transit bus fleets.

Mitigation Option Design

- **Goals:**
Included with TLU-6
- **Timing:** TBD
- **Parties involved:** TBD
- **Other:** TBD

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

Estimated GHG Reductions and Costs (or Cost Savings)

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **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

ⁱ http://www.treehugger.com/files/2005/10/truck_stop_elec.php

ⁱⁱ <http://www.eere.energy.gov/afdc/pdfs/37133.pdf#search=%22green%20vehicle%20fleet%2C%20NC%22>

ⁱⁱⁱ <http://atri-online.org/research/idling/Cab%20Card%20July%202006.pdf>

^{iv} <http://www.ncbussafety.org/idling.html>

^v <http://www.epa.gov/cleanschoolbus/>