Appendix C
Transportation and Land Use (TLU)

Summary List of Pending Priority Policy Options for Analysis

Policy No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2025 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Energy Security Fuel Savings (Gallons Saved 2009–2025) (million gallons)	Level of Support
		2015	2025	Total 2009-2025				
TLU-1a	Develop and Expand Alternative Renewable Fuels (overlap with 1b)	4.27 (2017)	11.58	82.94	–$13,210	–$159	36,446	Pending
TLU-1b	Develop and Expand Low-GHG Fuels (overlap with 1a)	6.20 (2017)	12.62	106.41	–$13,895	–$131	37,290	Pending
TLU-2	Add-On Technologies for Existing Vehicles and New Vehicles	0.52	1.84	13.99	-$1,259	-$90	TBD	Pending
TLU-3	Smart Growth Planning	Not Quantified Separately; Included in Other Analyses						Pending
TLU-4	Improving Transportation System Management (TSM)	3.05	7.20	65.91	$820	$12	7,452	Pending
TLU-5	Increasing Choices in Modes of Transportation	0.13	0.50	3.50	$782	$223	396	Pending
TLU-6	Factoring GHG Emissions Into Transportation and Land Use (TLU) Planning Processes	0.66	1.96	15.70	Net Savings	Net Savings	1,775	Pending
TLU-7	Incentive Programs for Increased Vehicle Fleet Efficiency	0.52	1.56	13.14	NQ	NQ	TBD	Pending
TLU-8	Increasing Freight Movement Efficiencies	0.59	1.10	11.52	$21	$2	1,302	Pending

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent.

Note: The numbering used to denote the above pending priority policy options is for reference purposes only; it does not reflect prioritization among these important draft policy options.

TLU-1a. Develop and Expand Alternative and Renewable Fuels

Policy Background

The 10 billion gallons of imported transportation fuel used annually in Florida is responsible for 40% of the greenhouse gas (GHG) production, creates a significant imbalance in trade, and contributes to our strategic dependence. Oil prices increased by 100% between July 2, 2007, and July 1, 2008, with no end in sight, increasing the cost of gasoline and damaging the economy of Florida as well as that of other states. Increased efficiency and the development of alternatives could mitigate these adverse effects. Development of large-scale, domestic, alternative fuels will provide a cost-competitive alternative that can stabilize the value of automotive fuels and other petroleum-derived products and stimulate local economies.

Alternative fuels from biomass, cellulosic residues, and energy crops have been identified by the U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (US DOE) as our best near-term opportunity to reduce oil dependence and GHG emissions. The sunshine state of Florida ranks near the top in potential production of energy crops and residues (agricultural, forest, and municipal) for ethanol fuel. Development of this new industry in Florida will require substantial commercial investment and could result in more than 200 advanced biofuels plants that would directly employ more than 12,000 individuals around the state.

The 2008 Farm Bill (HR-2419) has an excellent program (Biomass Crop Assistance Program) to mitigate farming risks for energy crops which has not been sufficiently publicized in Florida and will greatly assist the development of this new industry. This Farm Bill also defines "advanced biofuels" very broadly to include liquid and gaseous fuels made from any renewable biomass except the starch from corn (to include the most current definition for advanced biofuel from the recently passed Farm Bill.)

The existing federal legislation and the 2006 Florida Energy Act provide incentives in the form of income and sales tax credits for investments in the production, storage, and distribution of biodiesel and ethanol. However, the Florida credits terminate on June 30, 2010, and are subject to relatively low statewide caps on the amount of credits allowable.

Policy Description

The problems associated with the development of large-scale production of renewable, advanced biofuels are similar in many ways to those for the development of renewable power. Shifting the proportion of power and fuel to renewables is clearly in the best interest of the state of Florida, the country, and the environment.

To effect large-scale changes over time, investments of private capital will be required. It is essential to create a large and stable market to manage risks and attract long-term investment.

Although this has been done in part by legislative mandates in Florida, which required Florida to use automotive fuel containing 10% ethanol by 2010, it is hoped that these mandates represent a starting point that can be expanded further to reach Florida's full potential for alternative fuel production. This will be facilitated by specifically ensuring market access for these fledgling alternative industries by providing policies that ensure a market for all advanced biofuels produced from non-food materials be purchased and used to reduce emissions in the state. Finally, it is essential to ensure fair market compensation for the new alternative product to provide market opportunity. Combining federal and state incentives for advanced biofuels should provide sufficient investment opportunity to build this new industry.

Policy Design

Goals: Development of a sufficient advanced biofuels production and distribution infrastructure to replace 25% of petroleum-based automotive fuel by 2025.

Timing: Expansion of advanced biofuels plant capacity in Florida starting in 2012.

Parties Involved: Farmers and other suppliers of feedstocks, infrastructure contractors, ethanol producers, importers, distributors, and petroleum companies.

Implementation Mechanisms

- Amend the 2006 Florida Energy Act by extending the expiration date for the credits and increasing the statewide cap (currently $6.5 million) on the credits allowed for investments in the production, storage, and distribution of biodiesel (B10–B100) and ethanol (E10–E100).
- Provide a production incentive to ethanol producers for ethanol that is produced in Florida from Florida-grown biomass and used in Florida automotive fuel, with a set maximum for cumulative annual production incentives.
- Provide the opportunity to lease public lands for the production of nonfood energy crops consistent with the purposes for which land was acquired and consistent with the identified management plan for the public land.
- Increase awareness of the USDA Biomass Crop Assistance Program designed to mitigate risk to farmers who produce energy crops.
- Provide the opportunity for public bonds to be used to finance advanced biofuels production in Florida.
- Provide favorable land taxation not to exceed agricultural rates for facilities that convert renewable feedstocks grown in Florida into advanced biofuels that are used in Florida.
- Develop a comprehensive marketing package to help recruit advanced biofuel industries into Florida and compare with opportunities provided in other states.
- Modify one of Florida's energy grant programs to promote and expand the use of advanced biofuels such as ethanol and biodiesel as clean, alternative transportation fuels. Accelerate the commercialization of new alternative fuel technologies and products by providing

grants of up to $100,000 each for the development of business plans, engineering studies, design studies, permit applications, and legal work for potential new biofuels facilities in Florida (based on the Renewable Fuels Research, Development, and Demonstration Program administered by the Illinois Department of Commerce and Economic Opportunity). This may overlap with the new Florida program described in Florida Statutes 377.804.
http://www.flsenate.gov/Statutes/index.cfm?mode=View%20Statutes&SubMenu=1&App_mode=Display_Statute&Search_String=377.804&URL=CH0377/Sec804.HTM

Related Policies/Programs in Place

Potential overlap with Agriculture, Forestry and Waste Management Policy Option 7 (AFW-7) and Government Policy Option 4 (GP-4).

A federal Web site that outlines all the various state tax incentives is available at:
http://www.eere.energy.gov/afdc/progs/in_matrx.php

Florida Grant Programs

Alternative Fuels Production Incentive

The Innovation Incentive Program is created within the Office of Tourism, Trade, and Economic Development (OTTED) to provide resources for business projects that allow the state to effectively compete for high-value research and development, including alternative and renewable energy projects. To qualify, an alternative and renewable energy project must involve collaboration with an institution of higher education, provide the state a minimum full return on investment within a 20-year period, include matching funds provided by the applicant or other available sources, and be located in the State of Florida. Additional criteria may apply. For the purposes of this incentive, alternative and renewable energy means electrical, mechanical, or thermal energy produced by a method that uses one or more of the following energy sources: ethanol, cellulosic ethanol, hydrous ethanol, bio-butanol, biodiesel, biomass, biogas, hydrogen fuel cells, ocean energy, hydrogen, solar, hydro, wind, or geothermal (reference House Bill 7135, 2008, and Florida Statutes 377.804).

http://www.myfloridahouse.gov/Sections/Bills/billsdetail.aspx?BillId=39607&SessionId=57&SessionIndex=-1&BillText=&BillNumber=7135&BillSponsorIndex=0&BillListIndex=0&BillTypeIndex=0&BillReferredIndex=0&HouseChamber=H&BillSearchIndex=0

Renewable Energy Grants

The *Renewable Energy Technologies Grants Program* (http://www.dep.state.fl.us/energy/energyact/grants.htm) provides matching grants for demonstration, commercialization, research, and development projects relating to renewable energy technologies, including those that generate or use hydrogen or biomass resources (reference Florida Statutes 377.804).

The potential interaction between federal and state policy actions related to the Renewable Fuel Standard (RFS) at the national level and various state and regional GHG mitigation policies is worth understanding in order to most effectively formulate state and regional policies within the existing context of federal policies regarding transportation fuels.

The most recently passed federal law, the Energy Independence and Security Act (EISA) of 2007, expanded the federal Renewable Fuel Standard significantly. Under the new law, fuel suppliers are required to blend 9 billion gallons of renewable fuel into gasoline in 2008. Fuel suppliers must increase the amount of renewable fuel blended into transportation fuels annually to reach a level of 36 billion gallons in 2022.

In the United States, a significant amount of gasoline is currently being blended with a relatively small portion of alternative fuel in the form of ethanol. Virtually all light-duty motor vehicles in a fleet can handle gasoline blended with ethanol when ethanol makes up 10% or less of the volume of the fuel. The nation is quickly moving toward a standard of a minimum of 10% ethanol blended into gasoline to serve multiple goals: increasing use of alternative fuels, reducing reliance upon imported petroleum and petroleum products, reducing air pollution by producing cleaner burning fuel, and reducing GHG emissions from the combustion of transportation fuels.

In comparison with the 9 billion gallon renewable fuel requirement for 2008, the United States consumed roughly 5 billion gallons of biofuels in 2006. The U.S. ethanol industry has successfully increased the amount of production from an estimated 1.8 billion gallons in 2001 to an estimated 6.5 billion gallons in 2007.

The 2022 RFS goal of 36 billion gallons is not likely to be achievable through corn ethanol alone, and the EISA limits the amount of corn ethanol that may be credited toward the RFS goals at 15 billion gallons beginning in 2015. The remainder of the RFS goal—21 billion to 36 billion gallons—is expected to be reached through "advanced biofuels." As a result, the federal policy expects that advanced or "second-generation" biofuels will be commercially available in 2015 and will provide the majority of the fuel to meet the federal RFS in the longer term.

State governments and regional associations of state governments are considering and adopting a range of policies to reduce GHG emissions from the combustion of transportation fuels. Included in this set of policies are those that overlap or interact to some extent with the federal RFS as formulated in the 2007 EISA. The low-carbon fuel standard (LCFS) is the policy most often considered by individual states as a means to reduce the carbon intensity of transportation fuels being used.

There are two other sets of policies considered by states that may complement the federal policies. One set of policies would incentivize or provide for increased capacity for production and blending of alternative fuels and distribution of those fuels to fuel stations. The other set of policies would incentivize or provide for increased capacity of motor vehicle fleets to use blends of fuel that reduce the portion of petroleum-based products below the 90% threshold for

gasoline and the 95% threshold for diesel fuel; these policies would also increase the percentage of alternative fuels (corn ethanol, advanced biofuels, and other renewables) above the 10% (E10) threshold for gasoline blends and the 5% (B5) threshold for diesel blends. Some policies that fall into this second category include promotion of flex-fuel vehicles that can safely and effectively use the higher blends of fuels and provision of the fuel station infrastructure necessary for pumping these higher blends.

Estimated GHG Reductions and Net Costs or Cost Savings

Table C-1a-1.

	2015	2025	Units
GHG emission savings	3.01	11.58	$MMtCO_2e$
Net present value (2009–2025)	N/A	–$1,506	$ Million
Cumulative reductions (2009–2025)	N/A	86.60	$MMtCO_2e$
Cost-effectiveness	N/A	–$17	$/MtCO_2e$
Gallons saved (fuel displaced by alternative fuels)	1,443	4,729	Million gallons
Gallons saved (2009–2025)	N/A	36,446	Million gallons

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; N/A = not applicable; $/MtCO_2e$ = dollars per metric tons of carbon dioxide equivalent.

Data Sources:

Life cycle impacts of biofuels were obtained from Argonne National Laboratory's (ANL's) Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model (v1.8)

Fuel consumption, fuel economy, and gasoline and ethanol prices were obtained from the Energy Information Administration's (EIA's) Annual Energy Outlook (AEO), June 2008 release

Price of biodiesel and conventional diesel were obtained from the US DOE Alternative Fuels Price Report, April 2008

Quantification Methods:

A scenario was developed in which, by 2025, ethanol sales in Florida would represent 30% of gasoline sales, with 10% of the ethanol used in flex-fuel vehicles (E85) and the remainder used by conventional vehicles operating on E10. For analysis purposes, ethanol was assumed to be used in the form of either E10 or E85. In reality, flex-fuel vehicles will be able to operate on any blend of ethanol up to 85%. The analysis assumptions are intended to reflect that range of blends. All ethanol would come from corn feedstocks through 2014. Starting in 2015, the market share of cellulosic ethanol would ramp up so that by 2025, 10% of all ethanol would be from cellulosic feedstocks. Biodiesel (B20 from soy) would make up 10% of total Florida diesel sales by 2025. The cumulative impact of this increase in biofuels is displacement of approximately 25% of on-road transportation fuels by 2025.

Cost is calculated as the incremental cost of biofuels per gallon of gasoline equivalent (for ethanol) or diesel equivalent (for biodiesel) multiplied by total consumption of each fuel. The Center for Climate Strategies (CCS) accounts for the consumer price of fuel plus the federal subsidy in the form of an excise tax credit to blenders for ethanol and biodiesel. The current subsidy during 2008 amounts to $0.51/gallon for ethanol and $1.00/gallon for biodiesel from virgin oils. Ethanol and gasoline prices in future years are drawn from the AEO, June 2008. Based on information from the US DOE's Alternative Fuels Price Report, April 2008 , the difference in the average price of biodiesel compared with conventional diesel in the lower Atlantic region is approximately $0.59/gallon. This difference, combined with the $1.00 subsidy, results in an assumed full cost of biodiesel of $1.59 more per gallon than the cost of conventional diesel.

Key Assumptions:

- Program starts in 2010, first year of emission reduction.
- Program results in displacement of 25% of on-road transportation fuels by 2025.
- Program applies to all on-road vehicles, "replacing" current gasoline and diesel fuel.
- Baseline accounts for
  - 0% existing ethanol market share.
  - 0% existing biodiesel market share.

Key Uncertainties

None noted.

Additional Benefits and Costs

None noted.

Feasibility Issues

None noted.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-1b. Develop and Expand Low-GHG Fuels

Alternative fuels can have a key role in the transformation of the energy sector, climate stabilization, and the renaissance of rural areas. There are "good" and "bad" alternative fuels depending on how they are produced, used, and traded which, in turn, determines their ultimate economic, environmental, and social impacts. Alternative fuel production, trade, and use must be cost-effective, equitable, and sustainable.

TLU-1b recommends the following to develop and expand low-GHG and alternative fuels:

- Integrate and better coordinate policy frameworks.
- Assess and monitor benefits and impacts of alternative fuels production, trade, and use.
- Address negative indirect effects of alternative fuels production, trade, and use.
- Reward positive impacts and investments attained through carbon management.
- Build consensus for new projects by supporting informed and continuous dialogue engaging all relevant stakeholders.
- Increase investments in research, development, and demonstration.

Public policy with regard to investment in research and development (R&D) should focus on the production of cost-effective, second-generation alternative fuels; build on sustainability lessons learned from first-generation alternative fuels to be used for second-generation alternative fuels; increase conversion technology performance; and maximize climate change mitigation. In addition, public policy should

- Build capacity to enable producers to manage carbon and water,
- Make sure that trade policies and climate change policies work together, and
- Open competition in the transport sector to all options and methods that can displace carbon and imported oil, including demand reduction.

Policy Description

This option seeks to reduce GHG emissions by decreasing the carbon intensity of vehicle fuels sold in Florida. An LCFS would require all fuel providers in Florida to ensure that the mix of fuel they sell into the Florida market meets, on average, a declining standard for GHG emissions measured in carbon dioxide equivalent (CO_2e) per unit of fuel energy. The state should develop, with industry and stakeholder input, a set of standards for low-carbon fuels, which include biodiesel, cellulosic ethanol, hydrogen, compressed natural gas, liquefied petroleum gas, electricity, and low-carbon blends such as E10 or E85. The standard would be measured on a life cycle basis in order to include all emissions from fuel production to consumption.

Fuel providers (defined as refiners, importers, and blenders of on-road vehicle fuels) will need to report on an annual basis that the fuel mixtures they provide to the market meet the LCFS. Fuel retailers should be encouraged to provide this information to consumers at the point of sale to the extent that the information is available.

Policy Design

Goals: Create an LCFS for transportation fuels (gasoline and diesel) sold in Florida that would reduce the carbon intensity of Florida's on-road vehicle fuels. In addition to the reduction standard and program timing, life cycle model and boundary conditions should be addressed in creating the program.

Timing: Following the design period, the program proposal for standards would be reviewed, discussed, and decided upon in the appropriate legislative venue.

Parties Involved: Florida Energy and Climate Commission (FECC), fuel providers, Florida Department of Economic Development, and the Florida Department of Environmental Protection

Table C-1b-1 shows life cycle ("well-to-wheels") GHG impacts of various biofuels options.

Table C-1b-1. Estimated alternative fuels impacts on GHG emissions

Fuel/Technology	Blend	Feedstock	Reduction (GHGs per mile)*
Ethanol	E10	Corn†	1.4%
Ethanol	E10	Sugarcane	4.6%
Ethanol	E10	Cellulosic	7.4%
Ethanol	E85	Corn	15.9%
Ethanol	E85	Sugarcane	51.7%
Ethanol	E85	Cellulosic	83.8%
Liquid natural gas			TBD
Compressed natural gas			TBD
Biodiesel	B20	Soy	17.7%

* Ethanol reductions estimated relative to gasoline; biodiesel reductions estimated relative to diesel fuel. Actual reductions depend on many factors in the production, distribution, and use of fuels.

† Corn ethanol estimations assume a fossil-fuel boiler.

Source: GREET v1.8 outputs.

Implementation Mechanisms

A Governor's Executive Order would initiate the process for development of the LCFS, followed by a detailed report. The appropriate state agencies will undertake a study to develop the framework for the LCFS. Once the study is completed, it would be introduced to the state's

legislative proceedings, at which point the appropriate state agency will conduct public hearings on the proposal. Once adopted, an appropriate state agency will initiate a rulemaking proceeding that establishes and implements the LCFS.

The LCFS is market-based and performance-based, allowing averaging, banking, and trading to achieve the lowest cost and consumer-responsive solutions. An LCFS is also fuel-neutral where fuel providers will choose which fuels to sell and in what volumes.

Fuel providers—defined as refiners, importers, and blenders of passenger vehicle fuels—would demonstrate on an annual basis that the fuel mixtures they provide to the market meet the target by using credits previously banked or purchased.

Related Policies/Programs in Place

RFSs in Florida and the United States.

Florida's state RFS is among the most progressive standard in the country.

Timing: Achieve by 2022 under the Federal RFS and 2010 under the Florida RFS.

Parties Involved: FECC, relevant federal and state governments, producers, marketers, blenders, consumers, and refiners.

Estimated GHG Reductions and Net Costs or Cost Savings

Table C-1b-2. Title

	2015	2025	Units
GHG emission savings	2.71	12.62	$MMtCO_2e$
Net present value (2009–2025)	N/A	–$1,482	$ Million
Cumulative reductions (2009–2025)	N/A	107.93	$MMtCO_2e$
Cost-effectiveness	N/A	–$14	$/MtCO_2e$
Gallons saved (fuel displaced by alternative fuels)	1,470	3,687	Million gallons
Gallons saved (2009–2025)	N/A	37,290	Million gallons

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; N/A = not applicable; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent.

Data Sources:

Life cycle impacts of biofuels were obtained from ANL's GREET model (v1.8).

Fuel consumption, fuel economy, and gasoline and ethanol prices were obtained from EIA's AEO, June 2008 release.

Price of biodiesel and conventional diesel was obtained from US DOE Alternative Fuels Price Report, April 2008.

Quantification Methods: In order to estimate potential GHG emission reductions, a scenario was developed that is intended to reflect current Federal law (per the 2007 Renewable Fuel Standard) and Florida state law (minimum 10% ethanol content by 2010). Table C-1b-3 shows the assumptions used for this scenario.

Table C-1b-3. Title

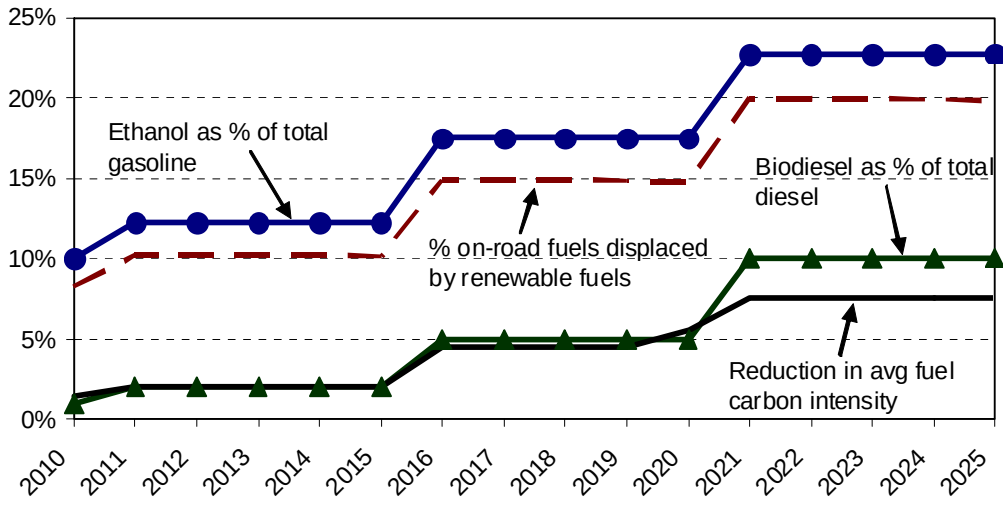
Time Period	E85 Ethanol Market Share	E10 Ethanol Market Share	% Ethanol in Gasoline	Ethanol Feedstocks			% Biodiesel in Diesel	% Renewable Fuels
				% Corn	% Sugarcane	% Cellulosic		
2010	0%	100%	10%	95%	5%	0%	1%	8%
2011–2015	3%	97%	12%	90%	10%	0%	2%	10%
2016–2020	10%	90%	18%	75%	15%	10%	5%	15%
2021–2025	17%	83%	23%	65%	20%	15%	10%	20%

In this scenario (Table C-1b-3), by 2025, ethanol sales in Florida would represent 23% of gasoline sales. For analysis purposes, ethanol was assumed to be used in the form of either E10 or E85. In reality, flex-fuel vehicles will be able to operate on any blend of ethanol up to 85%. The analysis assumptions are intended to reflect that range of blends. In addition, 95% of ethanol is assumed to come from corn feedstocks, with 5% from sugarcane in 2011, with a 90% corn/10% sugarcane mix assumed from 2011 to 2015. Starting in 2016, it is assumed that cellulosic ethanol would begin to make up a significant portion of the ethanol market. Biodiesel (from soy) is assumed to make up 10% of total Florida diesel sales by 2025.

Figure C-1b-1 illustrates the assumed blends of ethanol and biodiesel as percentages of gasoline and diesel, respectively, as well as the overall renewable fuel blend and estimated resulting reduction in average fuel carbon intensity. The cumulative impact of this increase in biofuels is anticipated to be approximately a 6% reduction in average fuel carbon intensity in 2020 and approximately an 8% reduction in 2025.

Cost is calculated as the incremental cost of biofuels per gallon of gasoline equivalent (for ethanol) or diesel equivalent (for biodiesel) multiplied by total consumption of each fuel. CCS accounts for the consumer price of fuel plus the federal subsidy in the form of an excise tax credit to blenders for ethanol and biodiesel. This subsidy amounts to 51 cents per gallon for ethanol and 1 dollar per gallon for biodiesel from virgin oils. Ethanol and gasoline prices in future years are drawn from the Energy Information Administration's Annual Energy Outlook, June 2008. Based on information from the U.S. Department Energy's Alternative Fuels Price Report, April 2008, the difference in the average price of biodiesel compared with conventional diesel in the Lower Atlantic region is approximately $0.59 per gallon. This difference, combined with the one dollar subsidy, results in an assumed full cost of biodiesel of $1.59 more per gallon than the cost of conventional diesel.

Figure C-1b-1. Title



Key Assumptions:

- Program starts in 2010, first year of emission reduction.
- Program applies to all on-road vehicles, "replacing" current gasoline and diesel fuel.
- Baseline accounts for
  - 0% ethanol existing market share.
  - 0% existing biodiesel market share.

Key Uncertainties

Transportation fuel providers would need to undertake changes in their production and distribution methods in order to achieve the goals. Because the policy does not prescribe particular technology pathways, there is uncertainty surrounding which fuels and technologies fuel providers will use to meet the standard. The program assumes that providers will use the most cost-effective options to meet the standard, but costs are unknown at this time.

Additional Benefits and Costs

Use of biodiesel reduces diesel particulate matter emissions, which have adverse public health effects. Use of ethanol also reduces air pollutant emissions.

Feasibility Issues

There are feasibility issues associated with transporting large volumes of biofuels to and within the state, as well as distributing biofuels to consumers. For example, ethanol has historically not been moved in the pipeline network used for transport gasoline and diesel fuel. However, the pipeline industry is currently in the process of adapting technology for pipeline distribution of ethanol.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 2. Add-On Technologies for Existing Vehicles and New Vehicles

Low-rolling-resistance (LRR) tires can reduce vehicle fuel use and associated carbon dioxide (CO_2) emissions by as much as 4.5%. Manufacturers currently use LRR tires on new vehicles, but they are not easily available to consumers as replacement tires. When installing original equipment tires, carmakers use LRR tires as a way to contribute to meeting the federal corporate average fuel economy (CAFÉ) standards. When replacing the original tires, consumers often purchase less efficient tires. Currently, tire manufacturers and retailers are not required to provide information about the fuel efficiency of replacement tires. In addition, there is no current minimum standard for fuel efficiency that all replacement tires must meet.

The rolling resistance of the various tires that consumers can purchase varies significantly, depending on tread design, composition, cross-section geometry, and inflation pressure. State policy can improve the fuel economy of their light-duty vehicle (LDV) fleet by setting minimum energy efficiency standards for replacement tires and requiring that greater information about LRR replacement tires be made available to consumers at the point of sale.

In addition, other add-on technologies may be considered that result in more fuel-efficient operation of motor vehicles. One example of these technologies would be the addition of real-time indicators of miles per gallon (mpg) for those vehicles that do not already provide such information to motor vehicle operators. The installation of technologies that provide drivers with current fuel efficiency (mpg) information has the potential to increase driver awareness of fuel consumption rates under different vehicle operating conditions.

Provide consumers with information about fuel efficiency and cost in relation to the purchase, maintenance, and operation of their vehicles. Consumers would receive real-time information on mpg while their vehicles are in operation and alerts when tire pressure is too low (by using devices such as Air Alert Valve Caps). Generally, a set of four light-emitting diode (LED) self-calibrating tire pressure valve caps such as Tire Alert **cost** about $22.00, and real-time mpg monitoring systems such as Scan Gauge are about $100.00. Consumers would also receive public education and information relating to the impact that vehicle maintenance practices have on vehicle operation. Finally, consumers would be encouraged to consider a vehicle's mpg before and at the time of purchase of their vehicles.

An additional set of add-on technologies that would enable existing vehicles to be converted to operate on alternative fuels is available in the marketplace.

Independent review of the validity of any claims relating to add-on technologies should be provided so consumers can assess the effectiveness of such claims.

Policy Design

Goals: Require that replacement tires be LRR tires that achieve an average 4.0% gain in fuel economy.

Timing: The requirement would begin in 2010.

Parties Involved: State government and industry.

Implementation Mechanisms

An appropriate, a state agency would initiate a fuel-efficient tire replacement program. The program could include consumer education, product labeling, and minimum standards. The technical feasibility and cost of such a program should also be considered, along with the relationship between tire fuel efficiency and tire safety, potential effects on the life of the tire, and impacts on the potential for tire recycling. In addition, the program would exempt certain classes of tires that sell in low volumes, including specialty and high-performance tires.

The minimum standard is likely to be less stringent than the standard for energy efficiency of original equipment tires. Such a regulation would improve the fuel efficiency of the state's overall LDV fleet but not necessarily the fuel efficiency of all tires since consumers would still make choices in the marketplace. In the future, replacement tires would likely be more fuel efficient than those purchased before standards were enacted but, on average, they are not likely to be as fuel efficient as the original equipment tires provided by automobile manufacturers.

Information and Education

Provide information to the general public and commercial businesses (i.e., taxi and food delivery services) that use LDVs for daily business explaining that improved fuel efficiency is directly related to the decreased rolling resistance of a vehicle's tires. Information on the potential annual cost savings of using LRR tires would also be provided. For example, a car averaging 15,000 miles/year would have annual fuel savings estimated to be $124. A chart of recommended tire models would be included with information on product labeling and minimum standards. Best scientific information, including the results from tests conducted by the tire manufacturers, the California Energy Commission, and the National Academy of Sciences (NAS), would be reviewed and incorporated.

The manufacturers of the LRR tires would be contacted to encourage the promotion of their products through regional newspaper and television advertising. The producers of LRR tires may provide free promotional materials.

Promotion and Marketing

State lead by example—The state will lead by example by initiating a fuel-efficient tire replacement program that includes all-weather, fuel-efficient tires and would require legislative approval for rental rates for vehicles, both owned and leased.

Over time, all state fleet tires in need of replacement will be changed to LRR tires, if available for the vehicle type and season.

Voluntary LRR standards—Establish voluntary LRR standards that achieve an average 4.0% gain in fuel economy.

Encourage procurement of LRR tires—

- Encourage local and county governments to act consistently with standards and support state procurement on their behalf.
- Encourage federal agencies located within the state to act in accordance with and support state actions.
- Encourage businesses that depend on vehicles to conduct their daily business to act in accordance with and support state actions.

Marketing program—Develop a marketing program for tire dealers and consumers to encourage the purchase of LRR tires. This effort might include a voluntary labeling program for tire fuel efficiency.

University research—Encourage the Florida University System to conduct research on alternative noncombustible applications for used tires.

Web site—All state-supported programs would have dedicated detailed Web sites. In addition to information and materials, program participation by the various governmental agencies and individual businesses (i.e., success stories) would also be documented and extolled.

Technical assistance—Contact the LRR manufacturers and tire distributors to coordinate objectives and obtain technical support for outreach materials.

Funding mechanisms and/or incentives—Replacement of tires on state fleet vehicles is already budgeted through the Florida Department of Transportation (FDOT) annual funding processes.

Voluntary and/or negotiated agreements—Work with the manufacturers and affected parties to achieve objectives with flexibility in their timelines.

Codes and standards—The State of California and Germany have developed substantial information pertaining to LRR tires because of legislative actions that require tires to be replaced with more efficient ones. Their documentation identifies testing methods and LRR standards. The appropriate state agency can review the information and establish suitable Florida standards.

Pilots and demonstrations—Coordinate with product developers to help them promote their technologies.

Reporting—The state will develop a system for tracking purposes so it can eventually determine the turnover to LRR tires and the benefits achieved from the conversion. A simple tracking system would be established relatively easily by contacting the primary tire distributors of the major Florida cities on an annual basis, and estimates can be gathered from their inventories.

Enforcement—No enforcement actions will be necessary when the program is instituted as a voluntary program. After mandatory labeling is in effect, spot checks at the primary tire distributors in the main Florida cities would be conducted annually by the county health departments and the state staffs.

Related Policies/Programs in Place

In October 2003, California adopted the world's first fuel-efficient replacement tire law (AB 844 [Assembly Bill 844]). This law directed the California Energy Commission to develop a State Efficient Tire Program that includes the following elements: (1) develop a consumer education program, (2) require that retailers provide labeling information to consumers at the point of sale, and (3) promulgate through a rule development process a minimum standard for the fuel efficiency of replacement tires sold. The California rule development process began in January 2007.

Estimated GHG Reductions and Net Costs or Cost Savings

It was assumed that this policy would have the effect of improving the fuel economy—by 4% on average—of all light-duty gasoline and diesel vehicles (including light-duty trucks) that installed replacement tires in 2030. It was assumed that this improvement would be phased in linearly over a 20-year time frame starting in 2011 and ending in 2030. For example, fuel economy is assumed to improve by 0.20% in 2011, by 0.40% in 2012, and so on until the maximum 4% improvement is attained in 2030. The improvement applies to all vehicles scheduled to replace tires during a given year. It is assumed that vehicles are scheduled to replace tires approximately every 45,000 miles.

Table C-2-1. Title

	2010	2015	2020	2025	Units
GHG emission savings	0	0.52	1.21	1.84	$MMtCO_2e$
Net present value (2006–2020)	$0	$121	$544	$1259	$ Million
Cumulative emissions reductions (2006–2020)	0	1.34	6.04	13.99	$MMtCO_2e$
Cost-effectiveness	N/A	$90	$90	$90	$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; N/A = not applicable; $/MtCO_2e$ = dollars per metric tons of carbon dioxide equivalent.

Data Sources:

- Tires and passenger vehicle fuel economy, Transportation Research Board/National Research Council (NRC), 2006.

- California State Fuel-Efficient Tire Report, California Energy Commission, January 2003.

Quantification Methods:

CCS evaluated and compared a series of existing assessments as follows:

At the request of the United States Congress, the National Research Council of the National Academy of Sciences (NRC/NAS) conducted a study in 2006 of the feasibility of reducing rolling resistance in replacement tires, which concluded that

> "Reducing the average rolling resistance of replacement tires by a magnitude of 10% is technically and economically feasible.
>
> Tires and their rolling resistance characteristics can have a meaningful effect on vehicle fuel economy and consumption."

A 2003 study by the California Energy Commission found that about 300 million gallons of gasoline per year can be saved in that state with LRR tires. A set of four LRR tires would cost consumers an estimated $5 to $12 more than conventional replacement tires. The fuel-efficient tires would reduce gasoline consumption by 1.5% to 4.5%, saving the typical driver up to $411 over the 50,000-mile life of the tires, assuming a 4.0% fuel efficiency increase associated with the LRR tires and a gasoline price of $3.50/gallon. Consumers would save more than $470 million annually at current retail prices or approximately $1.4 billion over the 3-year lifetime of a typical set of replacement tires.

In support of CCS's role in the Florida State Climate Action Plan process, CCS is developing the VEGA Tool to analyze various policies affecting GHG emissions from the on-road transportation sector.

On-road vehicle emissions contribute approximately 30% of the total GHGs emitted in Florida, according to the Year 2005 inventory recently completed for the state. There is an opportunity to reduce overall GHG emissions through policies affecting the on-road vehicle sector. The Climate Action Plan process currently being undertaken by the State of Florida is considering inclusion of several such policies related to on-road transport.

Providing information to consumers is not expected to produce measureable reductions in GHG emissions on its own. However, it has the potential to increase the effectiveness of other related programs. As a result, the GHG emissions reductions that may be associated with these programs is incorporated into the estimates for other TLU policies.

Key Assumptions:

The estimate of costs associated with LRR replacement tires accounts for faster tire wear (assuming that tires have lower tread) and an increase in the cost of production that is passed through to consumers. According to the NRC/NAS study, consumers would pay an additional $12.00/year to replace tires (including installation), and they would pay an additional $1.00 per tire because of increased production costs.

Key Uncertainties

The LRR fuel-efficient tires program is based on existing off-the-shelf technologies and tires that are already available in the marketplace. These tires are comparable with the tires included as original equipment on newly purchased LDVs.

Additional Benefits and Costs

None noted.

Feasibility Issues

None noted.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 3. Smart Growth Planning

Policy Description

Smart Growth Planning looks at how land use planning, site planning, and urban design at the community level can help achieve carbon and GHG emission reduction goals. The essence and intention of smart growth within the context of climate change is to establish a policy framework, clear guidelines, and measurement parameters for the development of new (and the redevelopment of older) human habitat communities that will have a net-zero-carbon effect on the general environment and reduce overall GHG emissions. This can be accomplished through the complex interactions of the three primary elements of community development that have a direct impact on GHG emissions and affect climate change:

- Construction energy and building lifetime energy use—measured by the protocols of Leadership in Energy and Environmental Design (LEED™) Green Building Rating System, Green Globes, or the Florida Green Building Coalition (FGBC);
- Individual vehicle miles traveled (VMT) generation and other transportation energy use (e.g., deliveries, maintenance, buses, security, health, fire, and safety) necessary to support human communities; and
- The changing of land uses from carbon-sequestering land uses (e.g., forests, agriculture, parks, and wetlands) to carbon-releasing land uses (e.g., building sites and roadways) and development patterns.

Taken singularly in isolated policies, these three factors—land use changes, individual VMT and transportation energy use in necessary daily lifestyle support, and the life cycle energy use of buildings—may not be able to achieve the necessary reductions in GHG emissions to meet climate change goals. Considered together in an integrated set of policies and guidelines, however, they can accomplish the goal of a carbon-neutral footprint for human community activities.

There are multiple levels at which VMT generation can be managed. This section focuses on VMT generation from land use planning, site planning, and an urban design perspective at the community level. In addition to this, the following policies focus on reducing VMT by transportation system management (TSM; covered in TLU-4), increasing mode choices (TLU-5), and land use–transportation coordination (TLU-6). Smart growth planning also helps reduce VMT.

In the aggregate, measured at various levels of development from small to large, the balance of carbon-sequestering and carbon-releasing land uses must *at least* balance and eventually become negative in releasing carbon to reduce GHG emissions and reverse existing adverse trends in our atmosphere.

In accordance with Florida's schedule for increasing standards for both building energy efficiency and appliance energy efficiency outlined in HB 697 [House Bill 697] and HB 7135, community development and redevelopment patterns should follow a similar schedule of reduced overall energy use and increased efficiencies, thereby reducing GHG emissions and the energy and resources necessary to provide all the requisites for human lifestyle support.

Policy Design

Goals:

- Require that municipalities increase the penetration of green initiatives into all aspects of their operations and programs by adopting an approach that encourages internal and external stakeholders to work together to develop integrated energy and environmental solutions to reduce GHG emissions through multi-pollutant prevention, environmental improvements, greater operational efficiency, and expanded public acceptance of green initiatives.
- Require that community development proposals submitted for review are certified by LEED, Green Globes, FGBC, or other approved certification to ensure that the new development results in a net reduction in GHG emissions relative to a business as usual (BAU) Baseline scenario.
- Encourage and incentivize communities to adopt programs requiring buildings larger than a certain number of square feet (sq ft)—for example, 25,000 sq ft or 50,000 sq ft—to have LEED Silver, Green Globes, or the FGBC certification.
- Develop and adopt a State of Florida minimum set of Green Building Standards (as has been developed in California and is being considered in other states).
- Work with LEED, Green Globes, and FGBC to establish both standards and a review methodology to ensure that new development and its location results in a net reduction in GHG emissions relative to a BAU Baseline scenario
- Minimize GHG emissions from development through a phased-in approach with both short-term and long-term goals.
- Encourage compact urban development and mixed use development.
- Maximize the ability to appropriately retrofit existing buildings using development standards. Address the retrofitting and remediation of existing buildings through consideration of both existing development and redevelopment as appropriate.
- Encourage pedestrian-friendly development and urban infill development.
- Encourage and incentivize communities to adopt and support LEED-ND (LEED-Neighborhood Development), Green Globes neighborhood design, or the FGBC neighborhood design standards, currently in the pilot project testing phase.
- Require that local governments adopt site planning and urban design standards that help reduce VMT and GHG emissions, such as

- Encouraging communities to adopt design standards that increase street network density and connectivity in new development and redevelopment projects (i.e., reduce cul-de-sacs and increase street network densities)
- Encouraging pedestrian friendly environment by
  - Creating design guidelines that require main entries of all residential, retail, and commercial buildings to be directly accessible from sidewalks.
  - Incentivizing greater sidewalk coverage in all future residential, commercial, and retail developments (meaning that all streets within such developments should have sidewalks).
  - Providing incentives to design or locate residential projects consistent with LEED, Green Globes, or the FGBC standards to encourage a greater proportion of dwelling units to be developed within a one-half mile walking distance of at least two or more commercial, retail, or entertainment centers.
- Encouraging mixed use development that increases the job–housing balance by giving incentives to increase floor area ratio (FAR) for mixed use projects.
- Encouraging or requiring compact development. Encourage counties and municipalities to adopt incentive programs that allow building owners to exceed building height and density limits if a building meets the LEED, Green Globes, or the FGBC standards. This will help reduce emissions from VMT as well as from building operations.

Timing: Establish a consortium of universities to provide both research and training to local, state, and regional officials as they implement the goal that new development does not increase GHG emissions.

Parties Involved: Local, state, and regional governments, private property owners, development companies, and investors.

Implementation Mechanisms

Maximize the opportunities to retrofit existing buildings to meet LEED, Green Globes, FGBC, or other approved certification programs to reduce energy consumption and thus reduce GHG emissions.

Establish incentives and promote redevelopment projects that establish more energy-efficient land use patterns. Redevelopment should result in a mix of uses that result in a reduction of VMT when compared with the existing land use pattern.

Related Policies/Programs in Place

Potential overlap with ESD-13a [Energy Supply and Demand 13-a], ESD-13b, and ESD-14.

Governments and government agencies are beginning to require that all new buildings meet certain LEED, Green Globes, and the FGBC certification threshold standards. In 2003, for example, the U.S. General Services Administration, which manages 1,800 federal buildings,

began requiring all new building projects to strive for the LEED Silver, Green Globes, or the FGBC standards and, at a minimum, to meet the LEED, Green Globes, or the FGBC standards for basic certification.

State-Level Initiatives: Governors in Arizona, California, Colorado, Maryland, New Mexico, and Rhode Island have signed recent executive orders requiring all new construction to meet LEED requirements. Other state and local governments have enacted similar requirements.

Financial Incentive Programs: Governments are also creating financial incentives to build green. In July 2005, the Pennsylvania Legislature created incentives rewarding new schools that were built to meet LEED Silver, Green Globes, or the FGBC certification requirements.

Development Incentives: In Arlington, Virginia, innovative incentive programs allow building owners to exceed building height and occupant density limits if a building meets LEED, Green Globes, or the FGBC standards. The permissible zoning variances increase for buildings that meet higher standards—LEED Silver, Gold, and Platinum. In addition, buildings that fail to meet the LEED, Green Globes, or the FGBC standards are asked to contribute $0.03/sq ft to a Green Building Fund, which educates the public about the value of green building.

Tax Incentives: Other states, including Maryland, New York, and Oregon, provide tax incentives to encourage builders to meet LEED requirements. Santa Monica, California, and Issaquah, Washington, provide for the accelerated review of building permits to boost green construction.

Estimated GHG Reductions and Net Costs or Cost Savings

Potential levels of GHG emissions reductions are not estimated at this time. Many development characteristics are location-dependent and, as a result, are complex to aggregate to a statewide level. Some portions of the GHG emissions reduction potential may be incorporated into complementary policy actions in TLU, AFW, and ESD sectors.

An important indication of the potential for savings comes from analyses of LEED-certified buildings: The most obvious benefits from green buildings relate to lower environmental and operating costs, which result from improved energy and water efficiency. Green buildings have documented energy-efficiency improvements ranging from 25% to 65% and water-efficiency improvements up to 90%. The resulting financial savings are sufficient to offset any concerns about potential small increases in initial cost.

It is recommended that the State of Florida undertake a study to estimate the potential energy savings and GHG emissions reductions associated with different scenarios for development, with a focus on the numerous urban metropolitan areas within the state.

Key Uncertainties

Patterns of development are subject to economic cycles and many private investment decisions.

Additional Benefits and Costs

Smart Growth can result in additional co-benefits.

Feasibility Issues

None noted.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 4. Improving Transportation System Management (TSM)

Policy Description

Transportation System Management is the concept of pairing transportation demand with transportation supply to help transportation networks serve the demand in an effective and efficient manner. Effective system management may utilize a variety of strategies based on advanced technologies, market-based incentives, regulations, and design standards. Each strategy provides a relatively small benefit to GHG reduction, but when applied in concert, substantial gains can be achieved. TSM strategies attempt to reduce the number of trips being taken by single-occupant vehicles (SOVs), shorten trip lengths, reduce vehicle delay, increase the reliability of the transportation network, and reduce idling and other transportation actions that result in increased GHG emissions. The goal of TSM is to reduce the daily VMT per capita on the transportation network. Effective TSM will also reduce vehicle hours traveled (VHT) per capita, which measures the amount of traffic congestion delay. Reduction of either VMT or VHT is highly correlated with a reduction in GHG emission.

TSM attempts to both improve transportation system performance and alter travel behavior through a combination of technological improvements, incentives, design, and restrictions. Technological improvements include traffic signal coordination, lane management, traveler information displays, and other intelligent transportation system applications. Incentives can include policies that financially favor desired behavior or allow users to gain a time advantage and include value pricing and smart parking strategies. System design is also important since infrastructure and technology can be adapted to encourage less driving, and it includes access management applications and intersection improvements. Finally, users can be barred from performing certain actions that would negatively impact the efficiency of the transportation system. TSM policies can be instituted at every level of government. Some can have a virtually instant effect, while others require many decades to reap full benefits.

Policy Design

Goals: Develop and implement policies and strategies that include program funding, financial and development incentives, infrastructure investment, and regulatory requirements to promote transportation system management improvements that result in reduced VMT and/or VHT which, in turn, result in reduced GHG emissions. These actions, taken in concert with other aggressive transportation and land use policy actions, should be designed to reduce urban area VMT by 7%–10% by 2020 and by 9%–12% by 2050; VHT can be reduced by amounts that are associated with these VMT reductions. VHT reduction is recognized as a means of reducing driver delay while also reducing excess fuel consumption in congested traffic.

- Reduce existing and future trips and trip lengths in an effort to reduce both VMT and VHT. Driving less, in terms of both hours and miles driven, will result in a decrease of GHG emissions. This can be achieved through the aggressive implementation of specific

transportation demand management strategies and coordinated transportation and land use decision making.

- Distribute existing and future trips in terms of both time and geography—when trips are taken and where trips are taken—in order to reduce congestion and smooth traffic flow. Reducing congestion and smoothing traffic flow by changing people's driving patterns—either by changing the time of day they drive or the route they take—will result in less idling and stop-and-go driving. This will reduce VHT and GHG emissions and can be achieved through increased investment in supporting transportation infrastructure, implementation of specific TSM strategies, and the aggressive implementation of specific transportation demand management strategies.
- Improve transportation system operations to improve travel conditions on the transportation network. This includes traffic signal coordination, real-time traveler information, advanced computerized lane and parking space management, value pricing at toll locations, intersection improvements such as roundabout conversions, advanced incident management, and other traffic operations applications. This will reduce the frequency of transportation actions that contribute to high levels of GHGs (e.g., jackrabbit starts, idling, and excessive braking). It will require an increased investment in TSM-related infrastructure and aggressive implementation of non-capacity operational strategies that improve the flow of vehicles on the transportation network.

Timing: TSM strategies have a variety of implementation time frames. Some, such as workplace-based strategies, can begin implementation almost immediately. Others that are based on infrastructure construction will have an implementation timeline of 4 to 10 years. Systemic changes to the urban landscape have the longest horizon—up to 25 years.

Parties Involved: State government agencies (FDOT, Florida Department of Community Affairs [DCA], and the Florida Department of Environmental Protection [DEP]), regional government (metropolitan planning organizations [MPOs], regional planning councils [RPCs], and regional transportation authorities [RTAs]), local transportation providers (public transit agencies, airports, seaports, and expressway/bridge authorities), and local governments.

Implementation Mechanisms

Collectively, the implementation mechanisms recommended under this policy attempt to reduce GHG emissions by enhancing system efficiency and modifying travel behavior and conditions through TSM strategies. Those strategies will require a combination of program funding, financial and development incentives, infrastructure and technology investment, and regulatory requirements implemented at the local, state, and regional levels.

Reduce Existing and Future Trips and Trip Lengths: These implementation mechanisms are intended to result either in the reduction of trip lengths or the complete elimination of certain trips. This will result in a reduction of both VMT and VHT that will reduce GHG emissions. Implementation mechanisms intended to reduce trips and trip lengths include

- Encouraging and/or incentivizing public and private sector employers to implement *telework programs* for eligible employees. This will result in fewer work-based vehicle trips.
- Encouraging and/or incentivizing public and private sector employers to implement *job-sharing* programs for eligible employees. This will result in fewer work-based vehicle trips.
- Encouraging and/or incentivizing public and private sector employers to implement *carpooling/vanpooling* programs for eligible employees. This will result in fewer work-based vehicle trips.
- Requiring and/or incentivizing enhanced *coordination between land use and transportation decision making* to reduce distances between clusters of affordable housing and employment opportunities. This will reduce work-based vehicle trip lengths.

Distribute Existing and Future Trips in Terms of Both Time (When a Trip Is Taken) and Geography (Where a Trip Is Taken): These implementation mechanisms are intended to change peoples driving patterns and behaviors (either by changing the time of day that they drive or the route that they take), resulting in reduced congestion and smoother traffic flows. Reducing congestion and smoothing traffic flow will result in less idling and stop-and-go driving which, in turn, will result in fewer GHG emissions. Implementation mechanisms intended to change people's driving patterns and behaviors include

- Encouraging and incentivizing transportation facility operators to implement *value-pricing (variable-pricing) policies.* This will encourage travelers to change the time of day they make various types of trips and result in fewer vehicle trips during peak operating hours. Alternatively, this will encourage travelers to change the routes by which they make various types of trips and will result in a more even distribution of vehicle trips across the transportation network.
- Encouraging and incentivizing public and private parking facility operators to implement *smart parking policies.* This will encourage travelers to change the time of day they make various types of trips and will result in fewer vehicle trips during peak hours.
- Encouraging and incentivizing local governments and private developers to build up the *supporting transportation network* (e.g., lower functional class street network), improve local transit routes that support express bus routes and premium transit options, and construct more sidewalks and bike paths). This will encourage travelers to make appropriate route and mode choices and result in a more even distribution of vehicle trips across the transportation network.
- Encouraging and/or incentivizing public and private sector employers to implement *flex time and compressed time programs* for eligible employees. This will result in fewer work-based vehicle trips during peak hours and, in the case of compressed time programs, fewer work-based trips overall.

Improve transportation system operations to reduce occurrences of transportation actions that contribute to high levels of GHGs (e.g., jackrabbit starts, idling, and excessive braking). These

implementation mechanisms are intended to maximize the efficiency of the transportation system through the application of technology and advanced design. Management of the supply of transportation capacity through the application of various technologies and design strategies will result in reduced congestion and smoother traffic flows which, in turn, will result in less idling and stop-and-go driving and reduced GHG emissions. Implementation mechanisms intended to change people's driving patterns and behaviors include

- Increasing investment in *intelligent transportation system* (ITS) technologies at all levels. In particular, investment should be focused on technologies that smooth the flow of traffic (e.g., reducing congestion, braking, and idling), resulting in a reduction of VHT and GHG emissions.
- Increasing investment in *incident management programs* and technologies. Quickly responding to incidents will reduce the negative impacts that incidents have on the smooth flow of traffic. Incident management can also include roadside assistance programs such as FDOT's "Road Rangers." Incident management will result in a reduction in incident-related stop-and-go traffic, in turn reducing VHT and GHG emissions.
- Increasing investment in *traffic signal coordination.* This will smooth the flow of traffic on the roadway network and result in reduced idling, braking, and jackrabbit starts, in turn reducing VHT and GHG emissions.
- Encouraging and/or incentivizing *access management programs* at all levels, particularly those that coordinate land use and transportation decision making. This will reduce conflicts on the roadway and make vehicular movements more predictable (including for transit vehicles, bicyclists, and pedestrians). It will also result in smoother traffic flows and reduced stop-and-go traffic conditions, reducing VHT and GHG emissions.
- Increasing investment in *traveler information technologies* will provide travelers with a more predictable travel experience and let them make rational choices that maximize their efficient use of the transportation network. This will result in less congestion and VHT and, in some cases, reduced VMT.
- Increasing investment in *managed lanes technology.* Real-time lane management allows for the more efficient flow of vehicles through the transportation network, maximizing available capacity and smoothing traffic flow. This will result in less congestion and VHT and, in some cases, reduced VMT.

Related Policies/Programs in Place

TBD

Estimated GHG Reductions and Net Costs or Cost Savings

Table C-4.1. Title

	2010	2020	Units
GHG emission savings	0.73	4.55	$MMtCO_2e$
Net present value (2006–2020)		$390	$ Million
Cumulative emissions reductions (2006–2020)		30.21	$MMtCO_2e$
Cost-effectiveness		$12.91	$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/MtCO_2e$ = dollars per metric tons of carbon dioxide equivalent.

Data Sources:

Reducing Oil Use and CO_2 Emissions in the Transport Sector, International Energy Agency.

Improving Transportation Choices, Natural Resources Defense Council (NRDC).

Online TDM Encyclopedia, Victoria Transportation Policy Institute.

Saving Oil in a Hurry, International Energy Agency.

Quantification Methods:

Based on the implementation mechanisms and goals stated above, the recent literature was reviewed to identify appropriate effectiveness rates for the selected measures. Data were compiled using phase-in implementation periods and lagged penetration rates, as appropriate. Cost information was collected where available

Key Uncertainties

None Noted

Additional Benefits and Costs

None Noted

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-5. Increasing Choices in Modes of Transportation

Policy Description

An important strategy in reducing GHG emissions produced from transportation sources is reducing the growth rate in VMT per capita. Providing modal alternatives to the SOV can reduce the number of trips on the highway system and VMT per person. Modal alternatives can include bus transit, rail transit, paratransit, ridesharing, greenways, on-and off-road bicycle facilities, and all types of pedestrian facilities.

Public transit vehicles generate much lower levels of GHGs per person-mile than SOVs. The challenge is that transit (bus and rail) accounts for only 2% of trips made in the United States today, compared with 5% in Canada and 10% in Western Europe.[1] An expansion of transit services will require a substantial increase in funding for both infrastructure and operations. Increased transit use is key to reducing the growth rate of VMT. A higher rate of transit use can be achieved by expanding transit services, increasing transit's competitiveness with other modes, ensuring safety and security of transit systems, and educating the public about transit options available in their community.

Many employers partner with local governments and nonprofit agencies to promote and fund local carpooling and vanpooling programs. These rideshare alternatives, combined with employee incentives, telecommuting, and parking strategies are often effective in reducing travel demand and ultimately, VMT. High-occupancy vehicle (HOV) lanes or high-occupancy toll (HOT) lanes on major transportation corridors can encourage ridesharing by providing reduced travel times and/or tolls for vehicles carrying passengers

Bicycling and walking do not generate GHGs. A convenient and comprehensive bicycle and pedestrian network can be a pleasant, stress-free option to driving on congested roadways. Although each modal alternative by itself may not significantly reduce GHGs, an integrated system of bicycle, pedestrian, and public transportation facilities could provide a significant benefit in enhancing mobility while reducing the growth rate in VMT.

Policy Design

Goals: Double transit ridership to equal levels found in Canada. Increase the percentage of people that walk, bicycle, carpool, vanpool, or telecommute. Develop and implement policies and strategies that include program funding and financial incentives that expand non-automobile infrastructure and provide modal alternatives to SOV travel.

Timing: 1–30 years.

[1] Transportation Research Board. 2001. "Making Transit Work: Insight from Western Europe, Canada, and the United States—Special Report 257, Washington, DC.

Parties Involved: Public transit agencies, local governments, MPOs, RTAs, FDOT, and local businesses.

Implementation Mechanisms

Improve Availability and Accessibility of Service

- Create new public transportation systems and options, including bus rapid transit (BRT). New transit systems and routes can serve areas presently without transit, or they can add new destinations from areas currently served.
- Encourage local governments and developers to provide and expand bicycle and pedestrian networks. A more complete infrastructure will entice travelers to shift from SOVs to walking or bicycling for appropriate trips. Better bicycle and pedestrian access also promotes transit use, since all transit trips begin and end as pedestrian trips.
- Create new rail systems for passengers and freight. Work with rail companies to expand intercity passenger services. Partner with ports and rail lines to expand freight rail facilities to reduce the need for trucks on the roadways and incorporate rail services in the planning and design of new transportation corridors.
- Construct new or expand existing HOV or HOT lanes. This will encourage travelers to shift from SOVs to HOVs for all types of trips, particularly during peak hours. Transit vehicles can also use HOV/HOT lanes to gain a time advantage over using standard traffic lanes.

Increase the Competitiveness of Alternative Modes

- Increase investment in public transit systems to provide more frequent service and longer service hours, making transit more time competitive with SOV travel. This will encourage travelers to shift from automobiles because their wait time for their needed bus or train will be shorter.
- Hold steady or decrease the user cost of transit, making transit more cost competitive with SOV travel. As fuel prices increase, people will find significant cost savings in moving to alternative modes. Group discounts and employer pass programs can also reduce the cost to the user.
- Increase capital investment and management procedures to ensure reliability of transit service. Users, particularly those who can afford a car, will be more likely to use transit if the service is reliably on time.
- Simplify and streamline the use of transit by requiring fewer transfers.
- Allocate preferred and discounted parking spaces to vanpools and carpools.
- Offer "guaranteed ride home" programs to those who regularly use transit, vanpools, or carpools. Under these programs, people who must work beyond their usual shift ending time receive free or discounted taxis or door-to-door transit. This gives flexibility to the worker's schedule and encourages the use of alternative modes.

Ensure That Alternative Modes Are Safe and Secure

- Public transportation must be secure. Patrons should be able to observe law enforcement and counterterrorism procedures and feel safe while using public transportation services. The public is mindful of the vulnerability of mass transit systems, and people are more likely to ride if they feel secure.
- Crime must be kept to minimum on the streets and on transit. If the streets are not safe, people will not walk or ride a bicycle. Similarly, if transit vehicles and stations are unsafe, everyone who can drive will do so.
- Passengers must be safe from injury on the transportation system. This includes traffic control measures, intersection markings, and proper signage.

Educate the Public and Market the Availability of Alternative Modes

- The benefits of alternative modes must be promoted to the public. Direct mail, traditional advertising, schools, and employers can distribute information on transit and bicycle/pedestrian facilities to the public. The more knowledge the public has about their options, the more interested they will be in using alternative modes of transportation.

Related Policies/Programs in Place

TBD

Estimated GHG Reductions and Net Costs or Cost Savings

Table C-5.1. Title

	2010	2020	Units
GHG emission savings	0.01	0.51	$MMtCO_2e$
Net present value (2006–2020)		$626	$ Million
Cumulative emissions reductions (2006–2020)		2.44	$MMtCO_2e$
Cost-effectiveness		$256.71	$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent.

Data Sources:

Making Transit Work: Insight From Western Europe, Canada, and the United States—Special Report 257. Transportation Research Board: Washington, DC, 2001.

Current and historical transit ridership, by mode type (urban/rural, bus, or paratransit) from National Transit Database and/or state sources.

Operating cost per passenger and per passenger-mile, by mode type (urban/rural, bus, or paratransit) from National Transit Database and/or state sources.

Revenue per passenger and per passenger-mile, by mode type (urban/rural, bus, or paratransit) from National Transit Database and/or state sources.

Quantification Methods:

This analysis examines the reductions in GHGs possible by shifting from personal motor vehicles to transit, which emits fewer GHGs per passenger-mile. The calculation of GHG reductions must account for the reduction in the number of private VMT and also account for the partially offsetting increase in transit VMT. In addition to these direct reductions from individuals' shift of modes, two more long-term, indirect effects are estimated: (1) the shifting of trips from personal vehicles to transit can reduce the number of vehicles on the road, and thus the amount of congestion in urban areas,and (2) reducing congestion improves traffic flow and can improve actual average vehicle fuel economy. Studies have also demonstrated that increased transit service can help shape land-use patterns, enabling densities and proximity to the center of urban areas. This has been shown to result in reduced VMT by those living in transit corridors, even if they never use transit.

Direct quantification was undertaken for improvements in service frequency, reductions in travel time, and the introduction of new and expansion of existing routes and services for bus, BRT, commuter rail, and vanpools.

Travel time improvements provide a well-documented means of improving transit service and ridership. There is a direct benefit to riders because the improved service reduces the "generalized cost" (time cost plus financial cost) of their trip. In addition to co-benefits in improving service frequency, there is about a –0.4 elasticity for transit travel time. Estimated percentage reductions in travel time will be multiplied by this elasticity to calculate the ridership increase.

Service frequency increases ridership by existing riders and attracts new riders. As waiting time between vehicles has been shown to be valued about two times more strongly on average than actual travel time, this mechanism can prove very effective. There is a reported –0.5 elasticity for service frequency alone (time between buses), while the aggregate impacts for service improvements in time between vehicles and travel time have shown an elasticity of between –0.6 and –1.0, incorporating the time and frequency impacts of aggregate increases in service miles provided. As above, the service frequency elasticity will be applied to improvements in this parameter. As a redundancy check, the aggregate elasticity was also applied to the total increase in vehicle revenue service miles to capture both factors together.

For service expansions and introduction, both the literature and a first-order statistical analysis show a long run elasticity for service expansion of between 0.6 and 1.0. An elasticity of 1.0 was applied to service increases.

Key Assumptions:

Transit services can be expanded and introduced at the same average operating cost as current services. A mix in transit modes that includes BRT, commuter rail, and vanpools decreases the average net operating cost of bus service, which is almost the only service being offered.

New or improved services will be able to attract ridership in a manner consistent with service improvements in other similar areas of the country (i.e., the Florida transit market is not at saturation). Current fuel price increases provide a strong argument for this assumption.

Key Uncertainties

Funding availability for the provision of additional transit service.

Additional Benefits and Costs

The provision of transit service has other more direct benefits and cost impacts. Most important are travel time benefits that accrue to transit users, reduced air pollution, and congestion relief that affects road users on parallel routes.

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 6. Factoring GHG Emissions Into Transportation and Land Use (TLU) Planning Processes

Policy Description

This option seeks to ensure that local and state land use and transportation planning considers the impact of land use and transportation decisions on the reduction of GHG emissions. Transportation accounts for the second largest contributor to GHG emissions in Florida and represents approximately 40% of emissions in Florida.

Florida has a long history of comprehensive planning by local governments, the cornerstone of which was the enactment and amendment of the Local Government Comprehensive Plan (LGCP) and Land Development Regulation Act. Each local government is required to adopt a comprehensive plan that contains certain required elements: a capital improvements element; a future land use plan; a traffic circulation element; a general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element; a conservation element; a recreation and open space element; a housing element; a coastal management element (where appropriate); and an intergovernmental coordination element. Local zoning codes and land development regulations must be consistent with the policies articulated in the comprehensive plan.

In addition to the comprehensive plan, Florida has adopted as the cornerstone of its growth management transportation framework a policy called concurrency. The policy is based on the premise that public facilities shall be in place concurrent with or prior to the impacts of a particular development. "Concurrency in Florida is tied to provisions in the state growth management act, requiring the adoption of level of service standards, elimination of existing service deficiencies, and provision of infrastructure to accommodate new growth reflected in the comprehensive plan. Plans and development regulations must aim at achieving and maintaining the desired level of service, and comprehensive plans are reviewed by the state for consistency between the capital improvement element and the various elements of the plan, including the future land use plan."[2]

With respect to transportation facilities, the general rule is that transportation facilities needed to serve new development shall be in place or under construction within 3 years after the local government approves a building permit or its functional equivalent that results in traffic generation. The implementation of transportation concurrency has been problematic, and the Florida Legislature has adopted a number of exceptions to the general policy. First, in 2005, proportionate fair share mitigation or "pay and go" option for concurrency was adopted that "allows developments to proceed under certain circumstances, notwithstanding a failure to meet transportation concurrency, where applicants contribute their fair share of the cost of

[2] Transportation Concurrency—Best Practices Guide, Florida Department of Community Affairs, p.6.

improving the transportation facility."[3] The improvement must be financially feasible within a 10-year time frame and be in or added to the 5-year capital improvements element. Second, specific exceptions from the concurrency requirement are provided for certain public transportation facilities, infill or redevelopment projects, and projects whose impacts are considered insignificant or de minimis.

It is generally accepted that the implementation of the concurrency policy in Florida has had the unintended consequence of encouraging developers to build outside existing urban cores because of the lack of excess transportation capacity within these areas, thereby requiring expensive transportation improvements to meet concurrency standards. Development outside of the urban core results in longer trips (both commuting and non-commuting) that yield more VMT. Lower density development at the urban fringe and ex-urban development contributes to the premature conversion of natural and agricultural lands, thereby reducing the GHG buffering capacity of the landscape.

During the 2008 session of the Florida Legislature, the Legislature adopted HB 697, which was signed into law on June 17, 2008. The new law requires local governments to include in their local government comprehensive plans policies that address energy efficiency and the reduction of GHGs. The following elements of the comprehensive plan are amended to require

- Future Land Use Element—includes energy-efficient land use patterns and GHG reduction strategies.
- Traffic Circulation Element—includes strategies to reduce GHG reductions.
- Housing Element—addresses energy efficiency in design and construction of new homes.

The Energy Bill, HB 7135, amends the State Comprehensive Plan to include goals related to energy and global climate change. The Bill also provides that each MPO is encouraged to consider strategies that integrate transportation and land use planning "to provide for sustainable development and reduce greenhouse gas emissions."

On a broader scale, long-range visioning activities being conducted at the community and regional levels in Florida are identifying alternatives to current growth practices. Regional visioning enable communities to develop a comprehensive approach to planning for future land use, transportation, conservation, economic development, housing, and other community needs. It provides an opportunity for regions to alter current growth patterns, thus modifying future transportation needs and associated energy consumption by enabling people to make fewer trips, make shorter trips, or use alternative transportation modes.

In addition, the Florida Department of Transportation (FDOT) produces the Florida Transportation Plan (FTP), a long-range plan that identifies the goals and objectives for the next 20 years to address the needs of the state transportation system. The FTP is a plan for all of

[3] Ibid.

Florida, not FDOT, and establishes a policy framework to guide investment in the transportation system by all public and private partners.

A metropolitan planning organization (MPO) is made up of local elected and appointed officials responsible for coordinating transportation planning in a metropolitan area of at least 50,000 people. The 26 MPOs in Florida are responsible for developing long-range transportation plans (LRTPs) and programs, and for setting transportation funding priorities for the metropolitan areas (s. 339.179, F.S.). These LRTPs are developed based upon future land use and growth assumptions contained in the LGCPs. FDOT's five year work program is developed based on the project priorities submitted annually by the MPOs and county commissions from counties not included in MPO areas.

Policy Design

Goals:

6.1—All local government comprehensive plans shall be revised to include policies and objectives that address energy-efficient land use and GHG reduction strategies, including

- Policies that increase density within the urban service area;
- Policies that prioritize compact development and maximize internal trips within the development;
- Policies that prioritize transit-oriented development within urban service areas and encourage the use of transit;
- Policies that prioritize affordable workforce housing in proximity to major employment centers;
- Policies that prioritize targeted infrastructure investments in GHG-efficient locations;
- Policies that encourage the reduction of trip length and vehicle hours of delay ; and
- Policies that prioritize the preservation of green space, natural, and agricultural areas.

Florida DCA is initiating a rulemaking process to comply with recently passed state law on these issues.

6.1a—Any future plan amendment must be supported by data and analysis to demonstrate how the amendment is based upon energy-efficient land use patterns and GHG reduction strategies.

TLU 6.1(b) -- Require local governments to adopt minimum densities that apply within the urban development boundary or urban service area.

6.2—By December 31, 2009, all local governments shall adopt land development regulations that implement the amended policies that address energy efficiency and GHG reduction strategies.

6.3—By July 1, 2009, amend the LGCP and Land Development Act to allow local governments to enact mobility fee structures as an alternative to transportation concurrency.

6.4—By December 31, 2010, amend the FTP to develop goals, objectives, and strategies for addressing climate change, reducing GHG emissions and providing modal alternatives to highways for travel.

6.5—By July 1, 2010, review state law to identify programs that fund capacity improvements and should be amended to include GHG emissions in the funding criteria.

6.6—By July 1, 2010, modify the Efficient Transportation Decision Making (ETDM) process to include climate change considerations (e.g., VMT and GHG emissions) in the evaluation of candidate projects for long-range transportation plans and the 5-year transportation work program.

6.7—All MPOs should address expanding transit options and reducing GHG emissions during the update of LRTPs and subsequent development of project priorities.

6.8—By July 1, 2009, require all transportation authorities to give priority to projects that reduce VMT and consider the GHG impact of constructing new roads.

6.9—By date 2020, reduce VMT and associated VHT within urban service areas by 10% on a per capita basis. Start goal levels with 10% and then project out for the other milestones in the Governor's Executive Order until at least 2025. T he Florida GHG emissions targets established under Executive Order 07-126 are 10% below current levels by 2012, 25% below current levels by 2017, and 40% below current levels by 2025.

6.10—By July 1, 2009, establish growth policies that provide incentives for developing regional visions that integrate transportation and land use planning to provide for sustainable growth and reduce GHG emissions.

6.11—Assess Impact Fees Programs for effectiveness and suggest improvements to incentivize reductions in GHG emissions impacts.

6.12—Reevaluate level of service (LOS) standards for local governments.

6.13-- Federal, state, regional and local governments should seek to leverage and expand funding opportunities to meet current and future public transportation needs. (E.g. expand authority to levy the Charter County Transit Surtax to all counties)

6.14--FDOT and DEP should work with the US Department of Transportation and Environmental Protection Agency to improve modeling tools for assessing GHG emissions for transportation plans and projects. Once developed, these modeling tools should be used to evaluate the GHG emissions impact of transportation choices.

6.15-- Maximize the use of existing transportation infrastructure before building new roads.

Implementation Mechanisms

To assist local governments in implementing the requirements of HB 697, the Florida DCA should prepare model comprehensive plan policies to address the new policies required in the Future Land Use Element, Traffic Circulation Element, and the Housing Element. Provisions in Florida law that govern the Florida Transportation Planning Process should be amended to require consideration of GHG reduction in setting and prioritizing transportation projects. Priority should be given to projects that reduce GHG emissions or encourage compact development in urban areas. RTAs should also be required to consider GHG reduction in the setting of project priorities.

Related Policies/Programs in Place

TBD

Estimated GHG Reductions and Net Costs or Cost Savings

Table X-6.1. Title

	2015	2025	Units
GHG emission savings	0.66	1.96	$MMtCO_2e$
Net present value (2006–2020)	Net Savings	Net savings	$ Million
Cumulative emissions reductions (2006–2020)	TBD	15.70	$MMtCO_2e$
Cost-effectiveness	Net Savings	Net savings	$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent

Data Sources:

Total population and population density by Census tract, 1990 and 2000.

Per-capita VMT by Census tract population density in Florida, from Center for Urban Transportation Research (CUTR) VMT forecasting model.

Forecast statewide population growth.

Quantification Methods:

Achieve quantifiable VMT reduction goals of 10% per capita reduction of 2020 the projection off-baseline in urban areas through smart growth The State of Florida will help growth and development efforts achieve VMT reduction goals through a series of policies that includes

implementation mechanisms identified below . Scientific research shows that VMT reduction in urban areas is quantifiable through improved planning software. Florida agencies will assist local and/or regional governments in using the latest planning technology that measures VMT impacts to assist with decision making on future growth and development. The more aggressively the policies are pursued, the greater the potential reduction in VMT.

This analysis considers potential GHG reductions from fewer personal (noncommercial) VMT as a result of a shift toward more compact development patterns. The analysis relies on estimates of per capita VMT by Census tract population density range, as developed by Polzin, et al. for the CUTR VMT forecasting model. The CUTR model is based on analysis of 2001 Nationwide Household Travel Survey data. The model provides estimates of per capita VMT by state for five density ranges. The model is currently set up for years 2005, 2035, and 2055; for this analysis, results were interpolated for CCS analysis years.

The observed relationship between per capita VMT and population density is a rough proxy for the effects of Smart Growth development as described above. Higher levels of population density are associated with overall shorter trips because destinations are closer together. In addition, areas with higher population densities are more likely to have pedestrian-friendly design (e.g., walkability and mixed-use development) and to support transit service. It is difficult to separate the individual effects of the various Smart Growth strategies at this aggregate level of analysis, but the analysis should provide an indicator of what can be achieved through a combined set of Smart Growth policies.

The specific method used to estimate GHG benefits of Smart Growth strategies is as follows:

- Total population in 2000 is identified by five Census tract density ranges as identified in the CUTR model (<500, 500–1,999, 2000–3,999, 4,000–9,999, and 10,000 or more persons per square mile).
- The change in population from 1990 to 2000, and associated share of change by density range, is identified from Census data.
- For the Baseline scenario, new population growth between 2000 and 2020 (as determined from CCS baseline assumptions) is allocated to tract density ranges based on the share of growth in the 1990–2000 timeframe.
- The proportion of existing housing stock (population) that would be redeveloped over this time frame is estimated at 15%, of which two-thirds is redeveloped in place and one-third is redeveloped elsewhere, with this redevelopment allocated to tract density ranges based on the 1990–2000 share of population growth. (The 15% and two-thirds figures come from the 2007 Growing Cooler report Section 1.7.3, citing analysis of Census data by Nelson [2006]).
- For the Climate Action scenario, a significant shift in the proportion of new development and relocated redevelopment is assumed to take place; with higher-density tracts (> 2,000 persons per square mile) receiving 50% of new development under this scenario compared

with only XX percent under the Baseline scenario. Total population by tract density under this scenario is then calculated.

- Total personal-travel VMT is calculated under the Baseline and Climate Action scenarios, based on VMT per capita (from the CUTR model) and total 2025 population by tract density range and the percent reduction in personal-travel VMT is calculated.
- The percent reduction in VMT is adjusted by 90% to estimate the percent reduction in GHG emissions. This factor is the same as that used in the Growing Cooler report to account for the fact that higher-density areas may experience somewhat lower travel speeds and therefore slightly reduced fuel economy.

Key Assumptions:

- Fraction of new population growth and redevelopment by Census tract density, under Baseline scenario.
- Assumed shift in the fraction of new population growth and redevelopment from lower-density to higher-density Census tracts, under Climate Action vs. Baseline scenario.
- Percent of residential building stock redeveloped (off-site) over the analysis time frame.

Key Uncertainties

Smart Growth scenario analysis depends upon patterns of development that involve decisions of many individual property owners and private capital investors. As result, the scenarios show what is possible under a development scenario but should not be considered as predicted outcomes.

The estimates developed using this methodology are consistent with results found in meta-analysis in the published literature, such as the recent *Growing Cooler* report from the Urban Land Institute (ULI).

Additional Benefits and Costs

Smart growth generally has very low direct costs to implement; the costs consist of governmental costs of altering regulations and zoning and costs providing education and technical assistance. Tax incentives are an income transfer that results in a public sector cost but offsets developer revenue. As most smart growth policies (e.g., allowing higher density and mixed use, reducing parking requirements) are deregulatory in nature, they are opening the development market and have significant indirect benefits. An exception is growth boundaries, which restrict the land, use market and have an indirect cost.

Alternative patterns of development have a large number of additional impacts, which may provide both benefits and costs. Smart growth provides a range of co-benefits that are well documented in other places. Prominent among these is the reduced cost of providing utilities and infrastructure, because smart growth makes better use of existing facilities and

infrastructure and, on average, has lower demand. Improved air quality, public health (e.g., due to walking), and quality of life are also notable co-benefits.

Feasibility Issues

Smart growth policies are being considered and implemented around the country in a wide range of communities. Because most policies are deregulatory in nature, this significantly lowers political barriers.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 7. Incentive Programs for Increased Vehicle Fleet Efficiency

Policy Description

Florida can reduce its GHG emissions by improving the fuel economy of the LDV fleet. The first policy step would be to charge a state agency with tracking the fuel economy of the state's entire fleet. Once a baseline for Florida's fuel economy is established, the state could then establish goals for improving the fleet's fuel economy.

Policy options for meeting a goal of higher fuel economy include consumer education about vehicle purchases, monetary incentives through a feebate system or tax credits, investment in a plug-in hybrid infrastructure, and a state policy for scrapping older vehicles that do not have good fuel economy. Information about vehicle fuel economy and benefits to consumers from higher fuel economy are available at www.fueleconomy.gov. For example, as the federal agencies responsible for that Web site explain, "The difference between a car that gets 20 mpg and one that gets 30 mpg amounts to $775 per year (assuming 15,000 miles of driving annually and a fuel cost of $3.10)."

This option includes several policies and programs to encourage the purchase of low-GHG-emission vehicles through monetary and convenience rewards and incentives throughout the state:

- Procurement of efficient fleet vehicles.
- Tax credits for efficient vehicles.
- Incentive programs for major corporate fleet owners, including rental car and taxi companies.
- CO_2-based registration fees and vehicle licensing fees.
- Procurement of efficient fleet vehicles (public, private, or other).
- *Feebates*—This is a study option rather than an implementation option. The state would participate in a multistate study of the feasibility and effectiveness of a regional feebate system with other eastern states.
- *Tax Credits for Low-GHG Vehicles*—Amend the current income tax credit program for hybrid, alternative fuel, and low-emission vehicles so that it continues in its present form beyond 2010.
- *Operating Incentives for Low-GHG Vehicles*—Provide for preferential state-controlled (e.g., state highways) and local-government controlled (e.g., parking) infrastructure and access for alternative-fuel vehicles (E10, E85, natural gas, propane, 100% electric, and others).

- *Excise Taxes*—Change new vehicle excise taxes so that they increase taxes for relatively high-emitting vehicles and reduce taxes for relatively low-emitting vehicles. Overall, excise tax revenue would remain the same.
- *Labeling*—Promote a consumer labeling program that provides buyers with better information on the GHG emissions of new vehicles.

Policy Design

Goals: TBD

Timing: TBD

Parties Involved: Florida DEP, consumer organizations, Florida Automobile Dealers Association.

Implementation Mechanisms

The proposed policies and programs in this option will need to be passed through the legislative process and be implemented by state and local government agencies in partnership with affected parties.

Related Policies/Programs in Place

While feebates are set as a new proposal, they are not completely unlike the application of existing taxes such as vehicle sales tax and gas guzzler tax. The difference is the method of calculation. In the case of feebates, the calculation will be on a vehicle's "green rating" and can adopt the GHG scores for vehicles as determined by the U.S. Environmental Protection Agency (US EPA) (http://www.epa.gov/greenvehicle/)

Some European countries have implemented feebate programs, and some U.S. states are considering both the rebate portion and the gas guzzler tax elements of feebate-type programs. Canada introduced the Vehicle Efficiency Incentive (VEI) program, which took effect in March 2007. The program includes both rebate and tax components.

Estimated GHG Reductions and Net Costs or Cost Savings

It was assumed that this policy would have the effect of improving the average fuel economy of all new light-duty gasoline and diesel vehicles (including light-duty trucks) in a given model year by 2% on average. It was assumed that this improvement would be phased in linearly over a 5-year time frame starting with Model Year 2011 and reaching the full targeted 2% for Model Year 2015 vehicles. For example, the average fuel economy of Model Year 2011 light-duty vehicles is assumed to improve by 0.40%, Model Year 2012 vehicles by 0.80%, and so on until the maximum 2% improvement is attained for Model Year 2015 and later vehicles.

Table C-7-1. Title

	2010	2015	2020	2025	Units
GHG emission savings	0	0.52	1.19	1.56	$MMtCO_2e$
Net present value (2006–2020)	0				$ Million
Cumulative emissions reductions (2006–2020)	0	1.23	6.01	13.14	$MMtCO_2e$
Cost-effectiveness	N/A				$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent.

Data Sources:

CCS conducted a review of the most relevant research and analysis on feebate proposals with these findings:

- There has been significant conceptual development of the feebate idea, especially at the national level;
- There is a need for a greater understanding of potential benefits and costs of state-level and multistate coordinated feebate programs; and
- There has not been sufficient pilot testing of feebate programs in the United States to provide implementation experience.

CCS assessed recent studies of potential GHG emission reductions from a national feebate program based on modeling work conducted by the US DOE's Oak Ridge National Laboratory (ORNL). CCS also reviewed other relevant recent studies and analyses of feebates conducted by the Canadian government, the State of California, and public interest research groups (PIRGs). The ORNL and other studies assume a national feebate rate high enough to produce responses from both consumers and manufacturers. ORNL's estimate of the national potential for reduction in carbon dioxide emissions is approximately 11 million metric tons of carbon dioxide equivalent ($MMtCO_2e$) in 2010 and 66 $MMtCO_2e$ in 2020.

Some attempts have recently been made to estimate the GHG emissions reduction potential from individual state feebate programs, such as those proposed for Arizona and California. For example, a recent PIRG analysis suggests that a single state feebate program for Arizona would result in an estimated reduction of 0.1 $MMtCO_2e$ GHG emissions in 2020.

These recent estimates of the potential impacts of individual state programs are contingent on assumptions and analytical methods that have not undergone thorough peer review. Therefore, the results of these analyses are preliminary and should be interpreted with some caution. Further analysis and study of the potential benefits and costs of individual state and multistate feebate programs would greatly increase confidence in projected results.

Quantification Methods:

The VEGA Tool is being developed by CCS, in support of its role in the Florida State Climate Action Plan process, to analyze various policies affecting GHG emissions from the on-road transportation sector.

On-road vehicle emissions contribute approximately 30% of Florida's total GHG emissions, according to the Year 2005 inventory recently completed for the state. Thus, there is a large opportunity to reduce overall GHG emissions through policies affecting the on-road vehicle sector. The Climate Action Plan process currently being undertaken by the State of Florida is considering inclusion of several such policies related to on-road transport.

Key Assumptions:

Key Uncertainties

Consumer reaction to incentive programs varies.

Additional Benefits and Costs

Incentive programs that significantly reduce GHG emissions through vehicle fuel efficiency also have the potential to significantly reduce the amount of transportation fuel consumed from imported sources, thus reducing the dependency of the United States on foreign sources of fuels.

Feasibility Issues

The feasibility of vehicle efficiency incentive programs may be affected by the availability of vehicles in the marketplace provided by the limited number of automobile manufacturing firms.

Related Policies/Programs in Place

New federal CAFÉ standards are under development. Rulemaking documents are available at: http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/

The Florida DEP is undertaking a rulemaking process related to adoption of state clean car GHG standards. State law requires that the Legislature approve such clean car regulations before they go into effect. Rulemaking documents are available at: http://www.floridadep.org/air/rules/ghg/california.htm

The results shown in Table C-7-2 compare the estimated GHG emissions reduction potential from two sets of new car standards:

- The federal "CAFÉ -35"standard for new passenger cars and light trucks.
- The state "Clean Cars 1 & 2" standard for new passenger cars and light trucks.

The numbers in Table C-7-2 represent a summary of analyses conducted by the California Air Resources Board (CARB), available at: http://www.arb.ca.gov/cc/ccms/ccms.htm

Table C-7-2. State of Florida Results for CARB analysis of the impact of state clean car standards

Year(s) of Analysis	Estimated GHG Reduction From Proposed Federal CAFÉ-35 Standards ($MMtCO_2e$)	Estimated GHG Reduction From Expected State Clean Car 1 & 2 Standards ($MMtCO_2e$)	Estimated Additional GHG Benefit From State Standards Over and Above Federal Standards ($MMtCO_2e$)
2016 single-year results	5.8	7.4	1.6
2020 single-year results	11.7	15.9	4.2
2009–2020 cumulative results	56.9	79.5	22.5

GHG = greenhouse gas; CAFÉ = corporate average fuel economy; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent.

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU 8. Increase Freight Movement Efficiencies

Policy Description

Currently in the United States, nearly 70% of all freight (by weight) is delivered by truck. Existing infrastructure makes it unlikely that this distribution will be significantly changed at any point in the near future, but the State of Florida can make significant strides in improving the efficiency and environmental impact of the necessary freight movements within its boundaries and current infrastructure. The expansion of the Panama Canal will dramatically increase the number of and frequency of goods passing through Florida's 14 deep-water ports in the next decade, increasing the need for an established, efficient freight transportation system within the State of Florida.

There has been tremendous growth in freight traffic, and national freight forecasts estimate an 89% increase in tons of freight by 2035 ("Transportation Invest in our Future—America's Freight Challenge," American Association of State Highway and Transportation Officials [AASHTO], May 2007To meet this increased demand while minimizing GHG emissions will require many simultaneous actions in both the trucking and rail industries.

Within the trucking industry, market forces are creating new technology aimed at cutting the GHG emissions of large trucks spurred in part by widespread anti-idling laws and the price of diesel fuel), particularly in conjunction with the US EPA's SmartWay®. This program provides a wide array of fuel-saving techniques and actions for truck and rail companies as well as measures for states to adopt. According to the American Trucking Associations, Inc. (ATA), a new 2008 truck produces one-tenth the fine particulate emissions and about one-half the smog-forming nitrogen oxides (NO_x) emissions as a similar truck manufactured just 2 years ago. The ATA estimates that through a variety of measures, the trucking industry nationally could save 86.1 billion gallons of diesel fuel and reduce the carbon output of the industry by 904.7 $MMtCO_2$ over a 10-year period while maintaining the level of freight movement the country relies on.

The trucking industry has the ability to reduce its carbon footprint and GHG emissions in a very short period of time through measures such as installing auxiliary power units, using wide-base tires, and limiting the speed trucks can travel, thereby lowering fuel consumption and emissions.

There is a need for increased public support for these measures, because about 97% of motor carriers have fewer than 20 trucks, and many smaller trucking companies are simply unable to afford the upgrades and add-ons that would make a significant impact on their fuel efficiency and consumption.

From an energy consumption and GHG emission perspective, the use of intermodal transportation to haul freight can be more efficient than moving that same freight by a single

mode of transport, depending on the distance, weight, and time sensitivity of the shipment. Domestic rail intermodal traffic grew—for the first time in 3 years—by 5.4% during the second quarter of 2008. In response, rail companies have been investing in increased capacity at record levels with major intermodal capacity expansions in the South that will increase and improve rail intermodal service for Florida. This investment includes major expansions by both CSX and Norfolk Southern (NS) railroad companies into Florida on high-volume intermodal corridors from the Midwest and also includes a current project to nearly double the capacity on the major intermodal corridor between Jacksonville and Miami.

This policy option should focus on reducing the trucking industry's carbon footprint and GHG emissions, while maintaining the current level of service to the state and nation, and encouraging the development and expansion of intermodal and long-distance rail capacity to support both local and transcontinental rail service into and out of Florida. The U.S. Department of Transportation's (US DOT's) Federal Highway Administration (FHWA) lists two major categories of emissions-reducing strategies that Florida can utilize in these goals:

- Technical strategies, which modify a piece of equipment or its fuel to reduce emissions; and
- Operational strategies, which change the way a piece of equipment is used, resulting in lower emissions.

Policy Design

Goals: Reduce overall GHG emissions generated by freight movement through combinations of the following technical and operational strategies.

Technical Strategies

- Reduce road freight bottlenecks in known urbanized, congested areas and assess the feasibility and costs associated with increased and appropriately sited inland port development in Florida.
- By 2010, FDOT and its partners will assess the feasibility and costs associated with inland port development in Florida.
- Support the reduction of emissions by railroads through increased deployment of innovative US EPA–approved reduced carbon emissions from hybrid and genset locomotives.
- Support incentives for shippers to use rail for freight movements.
- Encourage increased participation in the SmartWay® program for both truck and rail industries.
- Assess the level of advancements in global positioning system (GPS) and other technologies for all modes of freight movement.
- Provide tax incentives, grant programs, or other reliable funding sources to trucking companies to encourage:

  - The purchase and installation of devices that eliminate the need to idle, including battery-electric auxiliary power systems, vehicle battery systems, thermal energy storage systems, and fueled auxiliary power systems. In addition, provide an exemption for the additional weight caused by the installation of these units with respect to highway weigh stations.
  - Investment in hybrid truck and alternative fuel technologies as they become available in class 7 and class 8 trucks over the next 3 years and beyond.
- Assess the possibility of changes in truck weight and configuration restrictions to maximize trip efficiency.
- Purchase and use wide-base tires, which reduce drag and thereby increase fuel efficiency.
- Consider supporting a national reduced speed limit and/or national fuel economy standards for trucks.
- By 2015, FDOT will develop a plan to convert all weigh stations in Florida to weigh-in-motion stations and will continue to pursue new technologies that improve efficiency at weigh stations and truck stops, including truck stop electrification.
- Purchase and install equipment so that trucks can utilize the technologies at electrified truck stops.
- Continue development of idling reduction standards for all heavy-duty diesel engines, pursuant to Governor Christ's Executive Order 07-127.
- Promote other GHG-emissions-reducing technologies as they are developed.

Operational Strategies

- Through the FDOT Strategic Intermodal System (SIS) Plan, the Florida Rail System Plan, and continued participation in multi-partnered coalitions among states, railroads, and freight industries—exemplified by the I-95 Corridor Coalition—the State of Florida will continue its efforts to identify and remove physical and operational freight-related bottlenecks for efficient movement of freight by all modes of transportation.
- By 2015, FDOT and its partners will develop a plan to seek additional funding for implementing improvements that will remove identified freight bottlenecks, including funding improvements to SIS connector routes.
- Reconvene the Freight Stakeholders Task Force to identify actions that support the efficient movement of freight and identify opportunities for intermodal freight movement.
- To encourage railroad capital investment and to increase capacity and efficiency, FDOT will continue to support and expand initiatives such as
  - SIS program,
  - Florida rail plans and rail programs,
  - Federal tax credits to short-line railroads,

- American Association of Railroads (AAR) GO21 program,
- The increase of federal tax credits to Class I railroads, and
- The promotion of public–private partnerships to expand freight rail capacity

- FDOT and its partners will continue to support and identify opportunities for increased intermodal freight movements through the Intermodal Strategic Plan and other local, state, and regional planning activities.

Timing: Implementation during the time period 2010 to 2015.

Parties Involved: FDOT, local governments, Florida Legislature, MPOs, RPOs, the Florida Trucking Association, railroads, shippers, developers, US DOT, and other state DOTs.

Implementation Mechanisms

As noted.

Related Policies/Programs in Place

Florida DEP is undertaking rulemaking related to idling reduction for heavy-duty vehicles.

62-285.420 Heavy-Duty Vehicle Idling Reduction.

(1) Applicability. This rule applies to any heavy-duty diesel engine powered motor vehicle. For the purposes of this rule:

(a) Heavy-duty diesel engine powered motor vehicle means a motor vehicle:

1. With a gross vehicle weight rating equal to or greater than 8,500 pounds;

2. Used on roads for the transportation of passengers or freight; and

3. Serving a commercial, governmental, or public purpose.

(b) Gross vehicle weight rating means the value specified by the manufacturer as the maximum design loaded weight of a single vehicle.

(2) Requirement. Owners or operators of heavy-duty diesel engine powered motor vehicles are prohibited from idling for more than five consecutive minutes. Idling is the continuous operation of a vehicle's main drive engine while the vehicle is stopped.

Additional rulemaking information and documents may be found at: http://www.floridadep.org/air/rules/heavy_duty.htm

Estimated GHG Reductions and Net Costs or Cost Savings

Table C-8-1. Title

	2012	2020	Units
GHG emission savings	0.39	0.63	$MMtCO_2e$
Net present value (2008–2050)	–$11	$30	$ Million
Cumulative emissions reductions (2008–2050)	1.6	5.9	$MMtCO_2e$
Cost-effectiveness	–$29	$48	$/MtCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/MtCO_2e$ = metric tons of carbon dioxide equivalent.

Data Sources:

Federal Highway Statistics 2006.

Florida DOT.

US EPA SmartWay Partnership.

AAR's *National Rail Freight Infrastructure Capacity and Investment Study*

AASHTO's *Freight Demand and Logistics Bottom Line Report*

American Trucking Association's *"Sustainability Task Force: Strategies for Further Reduction of the Trucking Industry's Carbon Footprint (October 2007*

Quantification Methods:

Estimate the reduction in CO_2 emissions from reduced idling by (1) estimating the portion of emissions and fuel consumption in the Florida inventory that is attributable to Class 8 diesel trucks traveling on long-haul trips, (2) estimating the portion of total fuel consumption that would be consumed during idling, and (3) applying a targeted reduction of 80% to this amount starting in 2008 and a reduction of 90% starting in 2015.

Estimate the mode shift potential from long-haul trucking to intermodal rail by estimating the amount of heavy-duty truck traffic on long-haul trips, the commodity mix share that is amenable to an intermodal shift, the investment costs necessary to upgrade intermodal terminals and rail bottlenecks, and the expected mode shift that is likely based on logistics cost cross-price elasticities.

Key Assumptions:

This analysis assumes that idle reductions are achieved only by Class 8 diesel trucks, these trucks idle for an average of 6 hours per day, they consume 0.8 to 1.2 gallons of diesel fuel per hour during idling, and that an 80% (by 2010) or 100% (by 2020) reduction of diesel idling from these Class 8 trucks will be achieved. The cost analysis will assume a 5-year lifetime for idling

technology equipment, applied to 80% of Class 8 vehicles starting in 2008 and 90% of Class 8 vehicles starting in 2015, at a cost of $6,000 per vehicle and a cost of $4.80/gallon for diesel fuel. Program administration costs, enforcement costs, and fines have not been factored into the cost analysis. Reduced vehicle maintenance costs have not been factored into the analysis. Track improvements and intermodal terminal expansion will occur over 10 years beginning in 2009.

Key Uncertainties

None noted.

Additional Benefits and Costs

None noted.

Feasibility Issues

None noted.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

Acronyms and Abbreviations

AAR	American Association of Railroads
AASHTO	American Association of State Highway and Transportation Officials
AEO	Annual Energy Outlook
AFW	Agriculture, Forestry, and Waste Management
ANL	Argonne National Laboratory [US DOE]
ATA	American Trucking Associations, Inc.
BAU	business as usual
BRT	bus rapid transit
CAFÉ	corporate average fuel economy [standards]
CARB	California Air Resources Board
CCS	Center for Climate Strategies
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CUTR	Center for Urban Transportation Research
DCA	[Florida] Department of Community Affairs
DEP	[Florida] Department of Environmental Protection
EIA	Energy Information Administration [US DOE]
EISA	Energy Independence and Security Act
ESD	Energy Supply and Demand
ETDM	Efficient Transportation Decision Making
FAR	floor area ratio
FDOT	Florida Department of Transportation
FECC	Florida Energy and Climate Commission
FGBC	Florida Green Building Coalition
FHWA	Federal Highway Administration
FTP	Florida Transportation Plan
GHG	greenhouse gas
GPS	global positioning system
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation
HB	House Bill
HOT	high-occupancy toll
HOV	high-occupancy vehicle
ITS	intelligent transportation system
LCFS	low-carbon fuel standard
LDV	light-duty vehicle
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design [Green Building Rating System™]
LEED-ND	LEED-Neighborhood Development

LGCP	Local Government Comprehensive Plan
LOS	level of service
LRR	low-rolling resistance [tires]
LRTP	long-range transportation plan
MPO	metropolitan planning organization
NAS	National Academy of Sciences
NO_x	nitrogen oxides
NRC	National Research Council
NRDC	Natural Resources Defense Council
NS	Norfolk Southern [railroad]
ORNL	Oak Ridge National Laboratory [US DOE]
OTTED	Office of Tourism, Trade, and Economic Development
PIRG	public interest research group
R&D	research and development
RFS	Renewable Fuel Standard
RPC	regional planning council
RTA	regional transportation authority
SIS	Strategic Intermodal System
SOV	single-occupancy vehicle
TLU	Transportation and Land Use
TSM	Transportation System Management
ULI	Urban Land Institute
US DOE	U.S. Department of Energy
US DOT	U.S. Department of Transportation
US EPA	U.S. Environmental Protection Agency
USDA	U.S. Department of Agriculture
VEI	Vehicle Efficiency Incentive [program]
VHT	vehicle hours traveled
VMT	vehicle miles traveled

Units of Measure

$/tCO2e	dollars per metric ton of carbon dioxide equivalent
MMtCO2e	million metric tons of carbon dioxide equivalent
mpg	miles per gallon
sq ft	square feet