Appendix I
Transportation and Land Use Sectors
Policy Recommendations

Summary List of Policy Recommendations

Policy No.	Policy Recommendation		GHG Reductions ($MMtCO_2e$) 2012	GHG Reductions ($MMtCO_2e$) 2020	GHG Reductions ($MMtCO_2e$) Total 2008–2020	Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO2e)	Level of Support
TLU-1	Adopt South Carolina Clean Car Standards		0.21	1.14	7.04	–$323 to $1,598	–$46 to $227	Super-majority (Two objections)
TLU-2	Transportation System Management		0.01	0.04	0.22	< $0	< $0	Unanimous
TLU-3	Tax Credits for Efficient Vehicles		0.02	0.12	0.68	$244	$359	Unanimous
TLU-4	Improve Development Patterns		0.41	2.31	14.02	< $0	< $0	Unanimous
TLU-5	Transit & Bike-Pedestrian		0.02	0.02	0.22	–$1	–$1	Unanimous
TLU-6	Alternative-Fuel Infrastructure		0.02	0.24	0.77	$54	$70	Unanimous
TLU-7	Diesel Engine Emission Reductions and Fuel Efficiency Improvements	Efficiency Improvements	0.03	0.19	0.96	–$110	–$114	Unanimous
		Biodiesel	0.05	0.38	1.95	–$291 to $319	–$15 to $164	Super-majority (Two objections)
TLU-8	Stricter Enforcement of Speed Limits		0.10	0.12	1.18	Not quantified	Not quantified	Unanimous
TLU-9	Make Full Use of CMAQ Funds		Not quantified					Unanimous
TLU-10	Commuter Choice and Commuter Benefits Programs		0.12	0.43	2.63	–$631	–$240	Unanimous
TLU-12*	Low-GHG Fuel Standard		0.38	3.67	17.89	$20 to $3,276	$1 to $183	Super-majority (Two objections)
TLU-14	Rail		Not quantified					Unanimous
	Sector Total Before Adjusting for Overlaps		**1.37**	**8.64**	**47.57**	**Not quantified**		
	Sector Total After Adjusting for Overlaps**		**0.75**	**5.53**	**29.29**	**$2,582**	**$88**	
	Reductions From Recent Actions		**0.45**	**3.51**	**16.37**	**Not quantified**		
	Sector Total Plus Recent Actions		**1.20**	**9.04**	**45.66**	**$2,582**	**$88**	

GHG = greenhouse gas; MMtCO2e = million metric tons of carbon dioxide equivalent; $/tCO2e = dollars per metric ton of carbon dioxide equivalent; CMAQ = Congestion Mitigation and Air Quality.

All costs are reported in 2005 U.S. dollars, net present value as of January 1, 2009. Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings associated with the recommendations. Totals in some columns may not add to the totals shown due to rounding.

The numbering used to denote the above policy recommendations is for reference purposes only; it does not reflect prioritization among these recommendations.

* TLU-12 overlaps with AFW-4. The individual totals for TLU-12 do not reflect this overlap.

** Accounts for overlap between TLU-12 and AFW-4.

Note: Originally proposed policies TLU-11 and TLU-13 were combined with other policies.

TLU-1. Adopt South Carolina Clean Car Standards

Policy Description

This policy would adopt legislation to require a reduction in greenhouse gas (GHG) emissions from new cars and light trucks sold in South Carolina. The goal is to work with neighboring states and encourage participation in a regional clean car initiative that would incorporate the four main global warming pollutants: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) resulting directly from the operation of the vehicle (tailpipe emissions), as well as hydrofluorocarbon (HFC) emissions resulting from leakage from or operation of the air conditioning system.

Policy Design

Goals: Adopt South Carolina Clean Car standards.

Timing: If adopted, the standards would be implemented if and when other states in the region adopt similar standards that both create better economies of scale for manufacturing and distributing clean cars throughout the Southeast, and reduce the cost per vehicle (i.e., acquisition plus operating costs) for South Carolina consumers.

Parties Involved: State, auto dealers.

Other:

- Ensure that, to the extent possible, South Carolina dealers are able to trade stock with dealers in neighboring states.
- Encourage neighboring states to adopt the standards as well.

Implementation Mechanisms

Work with the Southern Growth Policies Board to encourage participation in a regional clean car initiative.

Related Policies/Programs in Place

- California's Clean Car standards and additional states that have adopted California's Clean Car standards.[1]
- The U.S. Environmental Protection Agency (EPA) is developing GHG standards for motor vehicles in response to a recent Supreme Court ruling.

[1] The 13 states have about one-third of the nation's registered automobiles. Michael Benjamin, Jon Taylor, and Paul Hughes. California Air Resources Board Technical Assessment: Comparison of Greenhouse Gas Reductions Under CAFE Standards and ARB Regulations Adopted Pursuant to AB1493. January 2, 2008. Available at: http://www.arb.ca.gov/cc/ccms/ab1493_v_cafe_study.pdf. In one view, these states are such a large portion of the auto industry sales, that automotive manufacturers would most likely improve technologies for all vehicles, rather than utilize inefficient two-tier production lines.

- The Energy Independence and Security Act of 2007[2] ("Energy Bill") established a 35-mile-per-gallon (mpg) corporate average fuel economy (CAFE) requirement for cars and light-duty trucks—that is, a 35-mpg requirement for the new-vehicle fleet—to be reached by 2020.

The California (AB 1493) standards differ from the new federal CAFE requirements in many ways (Table I-1).

Table I-1. Comparison of California Clean Car standards and federal CAFE requirements

Features of the Standards	California Clean Car	H.R. 6 "Energy Bill" CAFE
Type of standard/what is regulated on new cars	GHG emissions per mile	Miles per gallon
Main target dates	2016	2020
Ending targets, in mpg equivalents	36 mpg[3]	35 mpg

GHG = greenhouse gas; mpg = miles per gallon; CAFE = corporate average fuel economy.

Type(s) of GHG Reductions

CO_2, CH_4, and N_2O resulting directly from the operation of the vehicle (tailpipe emissions), as well as HFC emissions resulting from leakage from or operation of the air conditioning system.

Estimated GHG Reductions and Net Costs or Cost Savings

Summary

Having been signed by President Bush, the new CAFE requirements now become part of the South Carolina baseline. If the South Carolina Clean Car standards approximate or mirror the California Clean Car standards, they would produce additional GHG emission reductions on top of the new CAFE requirements because the California Clean Car standards reach *higher* mpg equivalencies *sooner*. Also, because the California Clean Car standards allow more ways to reduce emissions than the CAFE requirements provide, all else being equal, the California standards should be able to produce equivalent, cheaper mpg improvements.

Analyzing the new CAFE requirements' impact on the baseline, and thus the additional reductions that could be gained from new state standards, is made very difficult by the fact that the Energy Bill not only sets new mpg targets, but also changes the way those targets will be implemented. The law requires the National Highway Traffic Safety Administration (NHTSA) to

[2] See The White House. "Energy Security for the 21st Century." Available at: http://www.whitehouse.gov/infocus/energy/

[3] California Attorney General's Office. "A Comparison of California GHG Standards and the Senate CAFE Target." November 9, 2007. Available at: http://ag.ca.gov/cms_attachments/press/pdfs/n1493_energybill_attachment.pdf "The automobile industry is asserting, in its litigation against the States, that the model year 2016 standards are equivalent to 43.2 miles per gallon (mpg) for the PC/LDT1 [passenger car/light-duty truck] category and 26.7 mpg for the LDT2 category. In California, the PC/LDT1 category has about 58% of the entire fleet. (Other States have roughly that percentage, or have more LDT2s, and so compliance with California's standards will most assuredly ensure compliance with the California standards adopted by other States.) Thus, even assuming the automobile industry's assertions (which are based solely on tailpipe emissions of carbon dioxide from traditional gasoline powered vehicles), the California standards when fully phased in are equivalent to a fleet-wide average of approximately 36 mpg."

develop the details of the new approach. In advance of those details, analyses must make assumptions about how the new CAFE requirements would be implemented. Those assumptions are explicit in the analysis below, which provides an estimate of the reductions that can be expected from implementing South Carolina Clean Car standards consistent with the California Clean Car standards.

GHG Reductions

Table I-2 presents the impacts the state Clean Car standards would have on South Carolina (incremental to the impact of the new CAFE requirement of 35 mpg).

Table I-2. Potential impacts of the California Clean Car standards on South Carolina

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO$_2$e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-1	Adopt South Carolina Clean Car Standards	0.21	1.14	7.04	–$323 to $1,598	–$46 to $227	SM

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

This analysis is based on a document recently released by the California Air Resources Board (CARB) that compares the impacts of the California Clean Car standards and CAFE requirements on California and other states.[4] It estimates the amount of GHG emissions that each of the two would reduce independently of one another.

The 2007 Energy Bill mandates that fleet-wide average fuel economy reach 35 mpg in model year 2020. It directs the Secretary of Transportation to establish the implementation schedule and the precise mpg standards for each vehicle class. Since precise standards have not yet been established, CARB estimated that implementation would begin in model year 2011, and that the fuel economy of each vehicle class would increase at a steady rate of 3.37% per year. The Transportation and Land Use (TLU) Technical Work Group (TWG) used this assumption in its analysis.

The California Clean Car standards are stated in terms of GHG emissions (grams per mile [g/mi]). The CAFE requirement is stated in terms of mpg. Although the one metric is not directly convertible to the other, CARB's analysis provides a best-fit translation.

The TLU TWG's analysis adapts CARB's analysis to South Carolina and judges CARB's methodology to be a sound comparison of the two standards for California's light-duty vehicle (LDV) fleet. For South Carolina, we use available data on the national fleet. We are not aware of any detailed data on vehicle population and activity rates for the South Carolina fleet. We also delay the implementation of the California standards by 2 years relative to California's schedule,

[4] California Attorney General's Office. "A Comparison of California GHG Standards and the Senate CAFE Target." November 9, 2007. Available at: http://ag.ca.gov/cms_attachments/press/pdfs/n1493_energybill_attachment.pdf

in accordance with the policy design of TLU-1. Beginning implementation with the 2011 model year rather than 2009, South Carolina will reach the final standard in 2018 rather than 2016.

We calculate the impact of simultaneous enforcement of both the California standards and the CAFE requirements. One standard may be stricter for passenger cars, while the other is stricter for larger trucks and sport utility vehicles (SUVs). With simultaneous enforcement, the stricter standard in each vehicle class ultimately determines vehicle emissions.

Step by step, we calculate GHG emissions as follows:

1. Calculate proportions of LDV vehicle miles traveled (VMT) by vehicle age (activity rates) from MOBILE6 defaults for the national fleet.[5]

2. Apportion forecast VMT in each calendar year to vehicle model years.

3. Calculate average emission rates for the LDV fleet in each model year for three policy scenarios:
   a. CAFE requirements only,
   b. California Clean Car standards only, and
   c. CAFE requirements + California Clean Car standards.

4. For each calendar year, calculate emissions from vehicles in each model year under the three policy scenarios.

5. For each calendar year, calculate total LDV emissions under the three policy scenarios.

Table I-3 compares LDV emission reductions in South Carolina under each of the three scenarios to baseline emissions.

Table I-3. Comparison of emission reductions from California Clean Car standards and federal CAFE requirements

Policy Scenarios	Emission Reductions ($MMtCO_2e$)		
	2012	2020	2008–2020
New CAFE requirements	0.35	3.83	16.88
California Clean Car standards	0.23	3.97	18.33
CAFE requirements + California Clean Car standards	0.56	4.97	23.92

$MMtCO_2e$ = million metric tons of carbon dioxide equivalent; CAFE = corporate average fuel economy.

Estimation of Cost/Cost Savings

Before the passage of the new CAFE requirements, CARB estimated that the California Clean Car standards would add an average cost of $1,064 per vehicle, and that the fuel savings would

[5] U.S. Environmental Protection Agency, Office of Transportation and Air Quality. User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model. EPA420-R-03-010. August 2003. Available at: http://www.epa.gov/OMSWWW/models/mobile6/420r03010.pdf

more than offset that additional cost. CARB further estimated that the fuel savings, by starting immediately, would immediately begin offsetting the higher costs of a leased or financed vehicle.

Also before the passage of the new CAFE requirements, an analysis by Sierra Research, Inc., commissioned by the Alliance of Automobile Manufacturers, estimated that the average cost of compliance with the Clean Car standards would be around $3,000 per vehicle, and that savings on fuel would offset less than half of that cost for consumers.[6] The Sierra finding was largely a result of its assumption that greater fuel economy would encourage consumers to drive significantly more (the "rebound effect"). The CARB analysis also took this effect into account, but estimated its impact to be smaller.

Sierra also expected more expensive technologies and options to be used, where CARB anticipated simpler, less costly technologies. More than $2,000 of the cost increase estimated by Sierra resulted from the use of expensive lightweight aluminum body structures typically found in sport luxury cars. Such structures are not feasible for use in typical passenger vehicles. In addition, the California Clean Car standards prohibit the use of such weight-reduction approaches.[7]

A review of different dollar/ton estimates of the California standards prepared for CARB, Northeast States for Coordinated Air Use Management, and the TLU TWG produces an estimate of between $117 saved for each metric ton of CO_2 equivalent (tCO_2e) reduced at the high end, and roughly one-third of that (~$39 saved for each ton) at the low end.[8,9] All of the analyses found that there would be net cost savings to consumers from the implementation of the California Clean Car standards.

With the passage of the 2007 Energy Bill, a portion of the estimated costs and benefits will be incurred under the new baseline. Since the new CAFE requirements and the California Clean Car

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[6] Sierra Research. "Review of the August 2004 Proposed CARB Regulations to Control Greenhouse Gas Emissions From Motor Vehicles: Cost Effectiveness for the Vehicle Owner or Operator." Appendix C to the Comments of the Alliance of Automobile Manufacturers. SR2004-09-04. 2004. (Not available online.)

[7] California Environmental Protection Agency, Air Resources Board. "Regulations To Control Greenhouse Gas Emissions From Motor Vehicles: Final Statement of Reasons." August 4, 2005, p. 169. Available at: http://www.arb.ca.gov/regact/grnhsgas/fsor.pdf

[8] For $117/ton, see New Mexico Climate Change Advisory Group. Final Report. "Appendix I: Transportation and Land Use Policy Recommendations." p. I-4. December 2006. Available at: http://www.nmclimatechange.us/ewebeditpro/items/O117F10152.pdf

[9] For $38/ton, see North Carolina Climate Action Plan Advisory Group. Draft Final Report. "Appendix G: Transportation and Land Use Policy Options," p. G-27. Available at: http://www.ncclimatechange.us/: "The California Air Resources Board (CARB) estimated that the cost of compliance in a new vehicle in model year 2016 would be approximately $1,000. To determine the net impact on consumers, CARB calculated the increase in monthly loan payments and the savings from reduced fuel consumption. CARB forecasts that consumers would achieve a net savings, starting at the time of purchase, of approximately $3.50 to $7.00/month. Extrapolating this estimate of net savings to the North Carolina vehicle fleet would require an estimate of the NC Vehicle fleet in 2020, and NC does not make such a forecast. Total light duty vehicles in NC in 2006 were 5,097,000. If all of those turn over by 2020, and each saves $5/month, then net benefits would be: (5,097,000 vehicles * $60/vehicle/year) / 8.1 tons = $37.80 $/ton savings."

standards impose similar requirements on auto manufacturers, many of the options for compliance will be the same. It is likely that auto manufacturers will implement the more cost-effective technologies first, to comply with the new CAFE requirements. Therefore, the 2007 Energy Bill will most likely make the California Clean Car standards appear more expensive per ton of emissions reduced than prior to the bill's passage.

In the absence of a detailed analysis of auto production cost curves, lower and upper bounds were developed to represent the likely cost-effectiveness of implementing the California Clean Car standards in addition to the new CAFE requirements. Average cost figures for emission control technologies developed by CARB, presented in Table I-4, were used to calculate the cost impact. CARB's figures show automakers implementing more cost-effective technologies to achieve initial emission reductions, and then adding less cost-effective technologies to achieve additional reductions.

Based on the assumed implementation schedule for the new CAFE requirements, the California standards are expected to be more stringent than CAFE for cars and small trucks but less stringent for large trucks. Therefore, cost-effectiveness was calculated based only on the cost impact of cars and small trucks.

For the upper bound of compliance cost, it was assumed that automakers use the less expensive technologies to comply with the less stringent CAFE requirements for cars and add the more expensive technologies to comply with the stricter California standards. The adopted California standard for cars in 2020 is 205 grams of GHGs/mi. The corresponding CAFE requirement is estimated at 237 g/mi.[10] The additional cost of compliance with the California standards is assumed to be roughly the same as the incremental cost of reducing emissions from 233[11] to 205 g/mi per the schedule in Table I-4.

[10] California Environmental Protection Agency, Air Resources Board. "Comparison of Greenhouse Gas Reductions Under CAFE Standards and ARB Regulations Adopted Pursuant to AB 1493." January 2, 2008. Available at: http://www.arb.ca.gov/cc/ccms/ab1493_v_cafe_study.pdf

[11] 233 g/mi. is the closest figure to 237 g/mi. represented in CARB's cost table. 233 g/mi. is therefore used as an approximation of the emissions impact of the CAFE requirement at 2020.

Table I-4. Cost of compliance with the California Clean Car standards

Passenger Cars and Small Trucks/SUVs			Large Trucks/SUVs		
Standard (g/mi)	Average Cost of Control	Incremental Cost per g/mi Reduction	Standard (g/mi)	Average Cost of Control	Incremental Cost per g/mi Reduction
323	$17	—	439		—
301	$58	$1.86	420	$85	$2.58
267	$230	$5.06	390	$176	$3.03
233	$367	$4.03	361	$277	$3.48
227	$504	$22.83	355	$434	$26.17
222	$609	$21.00	350	$581	$29.40
213	$836	$25.22	341	$804	$24.78
205	$1,064	$28.50	332	$1,029	$25.00

SUVs = sport utility vehicles; g/mi = grams per mile.

Source: Average cost figures from California Environmental Protection Agency, Air Resources Board, Fact Sheet: "Climate Change Emission Control Regulations," December 10, 2004, available at: http://www.arb.ca.gov/cc/factsheets/cc_newfs.pdf

Based on the assumed implementation schedule for the new CAFE requirements, the California standards are expected to be more stringent than CAFE for cars and small trucks but less stringent for large trucks. Therefore, cost-effectiveness was calculated based only on the cost impact of cars and small trucks.

For the upper bound of compliance cost, it was assumed that automakers use the less expensive technologies to comply with the less stringent CAFE requirements for cars and add the more expensive technologies to comply with the stricter California standards. The adopted California standard for cars in 2020 is 205 grams of GHGs/mi. The corresponding CAFE requirement is estimated at 237 g/mi.[12] The additional cost of compliance with the California standards is assumed to be roughly the same as the incremental cost of reducing emissions from 233[13] to 205 g/mi per the schedule in Table I-4.

For the lower bound of compliance cost, the average cost of emission reductions across all technology options represented in Table I-4 was used. This scenario assumes that manufacturers will use a mix of cheaper and more expensive technologies to comply with the CAFE requirements and a similar mix of cheaper and more expensive technologies to further reduce emissions to comply with the California standards. Since the CAFE requirements and the California Clean Car standards are structured differently, the technology options for compliance with each will not be entirely the same. For example, manufacturers can most likely implement relatively cheap improvements to the air conditioning systems of cars to partly comply with the

[12] California Environmental Protection Agency, Air Resources Board. "Comparison of Greenhouse Gas Reductions Under CAFE Standards and ARB Regulations Adopted Pursuant to AB 1493." January 2, 2008. Available at: http://www.arb.ca.gov/cc/ccms/ab1493_v_cafe_study.pdf

[13] 233 g/mi. is the closest figure to 237 g/mi. represented in CARB's cost table. 233 g/mi. is therefore used as an approximation of the emissions impact of the CAFE requirement at 2020.

California standards.[14] Such an improvement would not contribute to compliance with the CAFE requirements.

For both the upper- and lower-bound scenarios, the total impact to consumers of the greater purchase cost of the vehicle and the savings on fuel that result from greater fuel efficiency was calculated. It is assumed that new cars are purchased with a 5-year loan at an interest rate of 5%, that the average car travels 12,000 miles a year,[15] and that a gallon of gasoline costs $2.12.[16] Based on these assumptions, the following cost-effectiveness values were calculated for TLU-1:

- Lower bound: –$46/t$CO_2$e (cost savings)
- Upper bound: $227/t$CO_2$e

Data Sources:

- Default values for fleet population and activity by vehicle age from EPA's MOBILE6 model. Available at: http://www.epa.gov/otaq/m6.htm
- VMT projections from Center for Climate Strategies, "Draft South Carolina Greenhouse Gas Inventory and Reference Case Projections 1990–2020," produced for the South Carolina Climate, Energy and Commerce Advisory Committee. Available at: http://www.scclimatechange.us/plenarygroup.cfm
- California Environmental Protection Agency, Air Resources Board, Fact Sheet: "Climate Change Emission Control Regulations," December 10, 2004. Available at: http://www.arb.ca.gov/cc/factsheets/cc_newfs.pdf
- California Environmental Protection Agency, Air Resources Board, "Regulations To Control Greenhouse Gas Emissions from Motor Vehicles: Final Statement of Reasons," August 4, 2005. Available at: http://www.arb.ca.gov/regact/grnhsgas/fsor.pdf
- California Environmental Protection Agency, Air Resources Board, "ARB Staff Reponses to Comments Raising Significant Environmental Issues Regarding the Proposed Regulations to Control Greenhouse Gas Emissions From Motor Vehicles," August 4, 2005. Available at: http://www.arb.ca.gov/regact/grnhsgas/att3.pdf
- California Environmental Protection Agency Air Resources Board, "Comparison of Greenhouse Gas Reductions Under CAFE Standards and ARB Regulations Adopted Pursuant to AB 1493," January 2, 2008. Available at: http://www.arb.ca.gov/cc/ccms/ab1493_v_cafe_study.pdf

[14] Simple, cost-effective technology upgrades to reduce emissions from air conditioning systems may be available, as this area has not been subject to intensive regulations and, thus, extensive exploration by the automobile industry. Improvements and changes in the air conditioning systems do have cost implications to the consumer, especially when they relate to repair and replacement costs for upgraded and new systems.

[15] This figure represents the average mileage of cars during their first 10 years on the road, per MOBILE6 default activity values.

[16] This figure represents the average projected cost of a gallon of gasoline between 2010 and 2020, provided by Erika Hartwig of the South Carolina Energy Office .

- U.S. Congress, Energy Independence and Security Act of 2007, H.R. 6. Available at: http://thomas.loc.gov/cgi-bin/query/F?c110:8:./temp/~c110YXjDUV:e24923
- Natural Resources Defense Council, "Comments on the Proposed Adoption of Regulations by the California Air Resources Board (CARB) To Control Greenhouse Gas Emissions From Motor Vehicles," September 23, 2004. Available at: http://www.nrdc.org/globalWarming/crh0904.pdf
- Daniel Sperling et al., "Analysis of Auto Industry and Consumer Response to Regulations and Technological Change, and Customization of Consumer Response Models in Support of AB 1493 Rulemaking," Institute of Transportation Studies, University of California, Davis, June 1, 2004. Available at: http://www.its.ucdavis.edu/publications/2004/UCD-ITS-RR-04-17.pdf
- Fuel prices provided by the South Carolina Energy Office.

Key Assumptions:

- New LDVs in South Carolina will be 50% passenger cars and small trucks and 50% large trucks and SUVs. This assumption is consistent with CARB's assumption for the national fleet.
- No implementation schedule has been set for the CAFE requirements. We assume that its phase-in begins in 2011, with a steady proportional increase in fuel economy of 3.37% per year for both vehicle classes. This assumption is consistent with CARB's analysis.
- Both the California Clean Car standards and the CAFE requirements would be enforced simultaneously. This assumption differs from CARB's analysis, which compared the separate enforcement of the two standards.
- Fleet turnover rates and average activity rates for the national fleet are representative of South Carolina's fleet of LDVs.
- The California Clean Car standards would grant emission credits to vehicle manufacturers for improvements in air conditioning systems and/or increased use of biofuels in vehicles. We assume that any such developments would be solely attributable to the standards and would not occur in the absence of the standards. (If credits were granted for improvements that would occur in the absence of the standards, the effectiveness of the standards would be diminished relative to a baseline without the standards.)

Key Uncertainties

- Predicting how long it will take to resolve lawsuits over this issue is beyond the ability of this group. Clearly, the law will be in litigation for some time.
- NHTSA's design and implementation of regulations under the new CAFE requirements are unknown.
- According to auto manufacturers, vehicles for the 2011 model year are already being designed. New engine lines take 6–7 years to develop. Because of the timelines and requirements in the California GHG standards that occur in the 2010–2013 timeframe, the

auto industry says that the only way to meet the standards in the early years would be to drop models.

- The current highest court rulings on these claims found that in the courts' views, sufficient existing technology exists to allow manufacturers to meet the California standards.[17,18]

Additional Benefits and Costs

None cited.

Feasibility Issues

Feasibility issues include, among others, consensus by neighboring states to adopt regional Clean Car standards, and increased costs per vehicle to South Carolina consumers

Status of Group Approval

Complete.

Level of Group Support

Super Majority (two objections).

Barriers to Consensus

Increased costs per vehicle for South Carolina consumers.

[17] The September 12, 2007, decision in U.S. District Court for the District of Vermont can be found at: http://www.vtd.uscourts.gov/Supporting%20Files/Cases/05cv302.pdf

[18] The December 11, 2007, decision in U.S. District Court for the Eastern District of California can be found at: http://ag.ca.gov/cms_attachments/press/pdfs/n1509_656_order_12-12-07.pdf

TLU-2. Transportation System Management

Policy Description

Transportation system management (TSM) improves vehicle flow on the roadway system, which can reduce fuel use and GHG emissions. Coordinated operation of the regional transportation network can improve system efficiency, reliability, and safety. Tools to reduce traffic congestion include high-occupancy vehicle lanes, improved mass transit services, roundabouts at intersections, synchronized signals, incident management, variable message signs, varying work schedules, and other forms of intelligent transportation systems.

Coordinating a variety of tools within a congested corridor can maximize benefits to motorists and transit users. For example, low-cost bus lanes can be implemented by converting the shoulders of a congested urban freeway to allow peak-hour bus use. An incident management system—the South Carolina Department of Transportation (SC DOT) currently provides a Motorist Assistance Patrol in several interstate corridors—would respond to disabled vehicles and remove them quickly from the bus lanes. Computer-controlled coordinated signal systems on the arterial routes reduce delay for motorists and offer the option for buses to preempt traffic signals to improve reliability and reduce transit travel times.

Policy Design

Goal: Use infrastructure management to reduce emissions by 10% by 2020 relative to the baseline in the most congested corridors in each of South Carolina's three largest metro areas—Charleston, Columbia, and Greenville. The goal would be achieved by implementing pilot TSM projects in these corridors. The pilot projects should include:

- Installation of necessary fiber optic cable and computerized traffic control systems to coordinate signal timing in the corridor;
- Transit service improvements, including limited-stop or express bus service with traffic signal preemption equipment; and
- At least one other TSM strategy that would be effective in the corridor.

Timing: Begin implementation as soon as possible.

Parties Involved: SC DOT Office of Planning, SC DOT Traffic Engineering, metropolitan planning organization (MPO) planners, and transit officials.

Other: None cited

Implementation Mechanisms

Additional funding is needed to enable SC DOT engineering staff to effectively manage an expanded computerized traffic signal system. Like all "expert systems," this technology requires ongoing maintenance and attention to work effectively.

Related Policies/Programs in Place

- Coordinated signal systems in Wade Hampton Boulevard (US 29) and Woodruff Road (SC 146) corridors in Greenville.
- SC DOT Motorist Assistance Patrol.
- Variable message signs in some interstate corridors.
- SmartRide—limited-stop commuter bus service between Columbia and the Lugoff/Camden and Newberry areas.
- CARTA Express—limited-stop commuter alternative that connects area residents into downtown Charleston.
- York County—82x Express Bus service to Charlotte. Started in 2001, 214 daily riders.
- Proposals to implement limited-stop commuter service in the I-385 corridor serving Mauldin and Simpsonville
- This policy would support:
    - TLU-4—Improve Development Patterns
    - TLU-5—Transit & Bike-Pedestrian
    - TLU-10—Commuter Choice and Commuter Benefits

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-5 presents the estimated GHG reductions and net costs of or cost savings from TLU-2.

Table I-5. Estimated GHG reductions and net costs of or cost savings from TLU-2

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO$_2$e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-2	Transportation System Management	0.01	0.04	0.21	< 0	< 0	UC

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

Data Sources:

- Network traffic projections for the Greenville, Columbia, and Charleston urban areas provided by SCDOT and MPOs. (Not available online.)

- Traffic counts and projections on designated congested corridors in the Greenville urban area provided by the Greenville MPO. (Not available online.)
- Annual VMT by vehicle and facility type from the U.S. Department of Transportation, Federal Highway Administration (FHWA), "Highway Statistics 2005 (VM-1)," March 15, 2007. Available at: http://www.fhwa.dot.gov/policy/ohim/hs05/

Quantification Methods:

The Greenville MPO identified its most congested corridors as candidates for TSM measures. The Center for Climate Strategies (CCS) then estimated annual VMT on these corridors using available traffic counts and projections. VMT for each segment is estimated as the length of the segment times the mean of traffic counts from each available count site on the segment. Total VMT on these corridors accounts for about 8% of the Greenville area network total. The Columbia and Charleston areas were assumed to have a similar concentration of traffic on congested corridors eligible for TSM measures. Accordingly, traffic on candidate corridors in these areas was estimated as about 8% of the total network VMT. While more detailed modeling could refine this estimate, that modeling is beyond the scope of this analysis, and the level of uncertainty associated with identifying corridors and estimating baseline emissions does not warrant additional modeling at this time.

VMT were distributed between LDVs and HDVs based on national averages for urban roads.[19,20] Baseline GHG emissions are estimated using average grams of GHGs emitted per VMT from the state GHG inventory.

Emissions from congested conditions (due to vehicle idling, rapid acceleration and deceleration, and suboptimal travel speeds) are most likely to occur in South Carolina cities during peak travel periods. During the off-peak period, TSM measures to smooth traffic flow are less likely to have an impact on GHG emissions. Therefore, emission reductions were applied to peak-period emissions only. Peak period travel was estimated as 50% of total travel on the designated corridors.[21]

The stated goal of the policy is to reduce baseline emissions by 10% by 2020. Given the time needed to plan, fund, and implement TSM measures, it is assumed that emission reductions begin in 2010, increase steadily, and reach 10% in 2020. This percentage is multiplied by the baseline GHG emissions to derive tons of emissions reduced.

This method produces a conservative estimate of emission reductions because the baseline figure underestimates GHG emissions on these corridors. A disproportionate amount of vehicle idling occurs on these corridors, as cars and trucks wait at crowded intersections and negotiate traffic accidents. Additional fuel burned by vehicles idling and traveling at suboptimal speeds

[19] U.S. Department of Transportation, Federal Highway Administration. "Highway Statistics 2005 (VM-1)." March 15, 2007. Available at: http://www.fhwa.dot.gov/policy/ohim/hs05/

[20] U.S. Department of Transportation, Federal Highway Administration. "Highway Statistics 2006." February 27, 2008. Available at: http://www.fhwa.dot.gov/policy/ohim/hs06/

[21] Texas Transportation Institute. 2007 Urban Mobility Report. Exhibit A-1. September 2007. Available at: http://mobility.tamu.edu/ums/

represents additional GHG emissions on these corridors. These emissions are not captured by the grams per VMT factor applied. Existing emission models do not allow the estimation of these additional emissions with any degree of certainty.

Costs and Benefits:

The costs and benefits of the policy remain unquantified. Actual costs and benefits will depend on the types of programs and systems chosen to meet the goal. Experience with these programs elsewhere has shown high cost-effectiveness, reducing delay and emissions.

TSM improves vehicle flow on the roadway system, which can reduce fuel use and GHG emissions. One way to meet the transportation-related GHG goal would be to implement pilot TSM projects in the most congested corridors in each of South Carolina's three largest metro areas. The policies chosen include:

- Installation of necessary fiber optic cable and computerized traffic control systems to coordinate signal timing in the corridor;
- Transit service improvements, including limited-stop or express bus service with traffic signal preemption equipment; and
- At least one other TSM strategy that would be effective in the corridor.

The meta-analysis for the agreed-upon TSM options will be limited to policies 1 and 2.

Coordinated Signal Timing

Several different examples can help to estimate the level of benefits South Carolina's communities can expect, including Boston, Massachusetts, Toronto, Canada, and the state of California.

Boston's comprehensive study of its historic Back Bay and its transportation remains one of the most detailed signal-timing studies. In the late 1980s, the city was unsure how to deal with both a densely populated residential and employment center, as Back Bay was and still is. Part of the city's plan was based on signal-timing improvements. Improving the arterials allowed more traffic to flow faster and reduced delay. The travel time reduction was over 30%. Travel time counts indicated that the arterials were carrying 30%-40% more traffic during peak hours, shifting from local roads. Computer analysis further indicated that while the plan would not reduce overall VMT, it would reduce daily vehicle hours of travel by an estimated 5%.[22]

Based on Boston's experience and that of Sacramento, California, EPA noted the cost scenarios for a similar timing plan. Costs vary greatly, depending on the type of improvements and the number of signals. EPA estimated that the timing optimization program for downtown Sacramento involved over 200 locations and cost about $100,000. For Boston, a new computerized traffic signal control system involving 300 downtown intersections and including

[22] Summarized from U.S. Environmental Protection Agency (EPA). Transportation Control Measures Information Documents. "Traffic Flow Improvements." Available at: http://www.epa.gov/otaq/stateresources/policy/transp/tcms/traff_improv.pdf

several new timing strategies, interconnection, and controller timing is estimated to cost about $4,000,000.[23]

More recently, in Toronto, 3 signal networks were installed, encompassing 75 signalized intersections. An on-street evaluation conducted from May to June 1993 found an 8% average decrease in travel time, a 22% average decrease in vehicle stops, a 17% average decrease in vehicle delay, a 5.7% average decrease in fuel consumption, a 3.7% average decrease in hydrocarbons, and a 5% average decrease in carbon monoxide emissions.[24]

Most informative, California studied the benefits of signal-timing plans, coordinated traffic signals, and adaptive-signal control at locations statewide. Between 1983 and 1993, the program included local agencies and 334 projects, improving 12,245 signals at a cost of $16.1 million, or $1,091 per signal. The TRANSYT-7F model estimates from 163 of the 334 FETSIM (fuel-efficient traffic signal management) projects (49%), representing 55% of the total number of signals retimed, demonstrated positive results from signal retiming of coordinated signal systems. The study found an average 7.7% reduction in travel time, 13.8% reduction in delays, 12.5% reduction in stops, and 7.8% reduction in fuel use. The variation in improvements depended on the quality of existing timing plans, the network configuration, traffic patterns, and signal equipment. Regardless, the benefit-to-cost ratio for these actions was 17:1.[25]

Express/Limited-Stop Buses With Signal Preemption

Just as signal timing can offer benefits, so can express/limited-stop buses with signal preemptions, similar to those in Chicago, Illinois, Portland, Oregon, and Arizona.

Recently, traffic congestion in the Chicago metropolitan area has become so severe, that bus service is slowed significantly. Pace, the metro area's public bus service, determined that timeliness was more important to its customers than expanded coverage. In response, some Pace buses have signal-preemption capacity. Preliminary studies show a 33% decrease in travel time without congesting cross streets. Other transit systems have found this technology reduces bus travel time by 5%–10%, depending on the number of intersections and the amount of traffic.[26]

Within the city limits, a feasibility study concluded that it was cost-effective to invest in a cooperative vehicle-highway automation system to improve the performance of bus rapid-transit

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[23] Ibid.

[24] U.S. Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Benefits Database, "Fuel Consumption Fell by 5.7 Percent, Hydrocarbons Declined by 3.7 Percent, and Carbon Monoxide Emissions Were Reduced by 5.0 Percent When an Adaptive Signal Control System Was Implemented in Toronto, Canada," Spring 1995. Available at: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/5c36f979ce2c926a852569bc006c5713/acfc2902273c2ccb852569610051e299?OpenDocument

[25] U.S. Department of Transportation, Research and Innovative Technology Administration. Intelligent Transportation Systems Benefits Database. "The Estimated Benefit-to-Cost Ratio for Optimizing Signal Timing Plans, Coordinating Traffic Signal Control, and Implementing Adaptive Signal Control in California Was 17:1." January 7–11, 2001. Available at: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/42419C3E5993E9CD852569EA0071D556?OpenDocument&Query=BApp

[26] National Governors Association. State Innovations To Reduce Vehicle Emissions. 2000, pp. 19–20. Available at: http://www.nga.org/Files/pdf/EMISSIONSREPORT.pdf

operations and freight movement in Chicago, which included signal preemption. The findings concluded that each application could break even. The deployment of precision-docking technology and transit signal priority would be cost-effective, as long as they provided relatively small improvements in bus travel times (1–4 seconds and 7 seconds per stop, respectively, over a 15–20-minute bus run). Furthermore, there were consistently large to very large benefit-to-cost ratios.[27]

Many case studies discuss the possibility of benefits for these projects. For other drivers, models in Tucson, Arizona, and Seattle, Washington, indicate these changes can decrease the delay of traveling on main streets by 18.5%, while decreasing the delay of traveling on cross streets by 28.4%.[28] By contrast, Portland, Oregon's, TriMet public transportation system reversed course. When the signal priority was not used, bus times increased by 1.5%-4.2%.[29]

Combined, these TSM strategies are cost-effective from a social perspective, with a proven track record of success. Most persuasively, these strategies offer emission benefits as well as improvements in travel time and other delays, maximizing the use of the current transportation system. California demonstrated how the benefits outweighed the costs 17 to 1. The two Chicago studies illustrate how signal preemptions are cost-effective as well. Both strategies can effectively help reduce GHG emissions now in South Carolina's largest cities.

Key Assumptions:

- The majority of GHG emissions on the designated corridors are attributed to VMT, not to congested conditions.
- The three urban areas have roughly the same concentration of traffic on their most congested corridors.
- 50% of traffic occurs during the peak period.

Key Uncertainties

The amount of GHG emissions specifically from congested conditions, including stop-and-go conditions and vehicle idling, is unknown.

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[27] U.S. Department of Transportation, Research and Innovative Technology Administration. Intelligent Transportation Systems Benefits Database, "In the Central Area of Chicago, a Feasibility Study Indicated That Driver Assistance Technologies and Transit Signal Priority for Bus Rapid Transit Would Be Cost-Effective." August 19, 2004. Available at: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/E4EE23B6F59B0C168525733A006D5983?OpenDocument&Query=BApp

[28] U.S. Department of Transportation, Research and Innovative Technology Administration. Intelligent Transportation Systems Benefits Database, "In Tucson, Arizona, Models Indicated Adaptive Signal Control in Conjunction With Transit Signal Priority Can Decrease Delay for Travelers on Main Streets by 18.5 Percent While Decreasing Delay for Travelers on Cross-Streets by 28.4 Percent." January 7–13, 2001. Available at: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/11AA42D96.87F6C785256A9B004FB057?OpenDocument&Query=BApp

[29] U.S. Department of Transportation, Research and Innovative Technology Administration. Intelligent Transportation Systems Benefits Database, "When Transit Signal Priority Was Not Used in Portland, Oregon, Bus Travel Times Increased Up to 4.2 Percent During Peak Periods and Up to 1.5 Percent in Non-Peak Periods." May 19–22, 2003. Available at: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/545B3597D5614D9085256DDC006D8EF9?OpenDocument&Query=BApp

Additional Benefits and Costs

By reducing congestion, this policy would also improve mobility on key corridors in South Carolina's urban areas. There is also a potential additional cost from induced travel. If smoother traffic conditions attract more vehicles to the designated corridors, there may be fewer or no net benefits from the policy.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-3. Tax Credits for Efficient Vehicles

Policy Description

South Carolina has already made significant progress in the area of tax incentives for alternative-fuel and energy-efficient vehicles. A maximum $300 sales tax rebate will be available beginning July 1, 2008, but will most likely be pushed back to July 1, 2009, given the current fiscal year budget, for in-state purchases of new, used, or leased low-GHG vehicles, including pure electric, hybrid, plug-in hybrid, flex-fuel, lean-burn, hydrogen, and vehicles with a city fuel-economy EPA rating of 30 mpg or higher (Act No. 83, 2007). A maximum $500 sales tax rebate will be offered for EPA-certified equipment that converts a conventional vehicle to an alternative-fuel vehicle that will operate on propane, compressed natural gas, liquefied natural gas (LNG), hydrogen, or E85 (gasoline containing 85% ethanol) (Act No. 83, 2007). The current law will require sales tax rebates to be phased out on July 1, 2013; however, with the proposed amendment in the statehouse, the sales tax rebates will be phased out on July 1, 2014. A $2,000 income tax credit will also be available beginning January 1, 2008, for in-state purchases of plug-in hybrid vehicles (Act No. 83, 2007). The income tax credits for plug-in hybrids will be phased out on January 1, 2011. In 2006, the state began offering an income tax credit for alternative-fuel and hybrid vehicles equal to 20% of the federal credit (Act No. 312, 2006). There is no phase-out period for this state income tax credit; however, this will need to be corrected in state law, since after 2008 there will be no further guidance from federal legislation, unless the Energy Policy Act of 2005 extends incentives for alternative-fuel vehicles.

Despite the good intentions of the legislation, some improvements are necessary in light of the finding that South Carolina has the lowest per-capita number of alternative-fuel vehicles in the country, and needs to act to diversify its passenger fleet.[30] The sales tax rebates in Act No. 83, 2007 are capped collectively at $4,150,000. In the short term, this cap may not present a problem. However, as these vehicles become more common in the long term, it will be difficult to determine which buyers will be able to claim the rebate. The same concept applies to the state income tax credit for plug-in hybrid vehicles, which is capped at $200,000. Additionally, the language in Section 12-63-20 (A)(1)(e)(3) regarding the 20% phase-in each year of the program is restrictive and confusing.

Other state incentives that were considered included reduced or free registration fees for low-GHG vehicles. The South Carolina Climate, Energy, and Commerce Advisory Committee (CECAC) decided that a reduced or free registration fee would not be an additional incentive, due to the low cost of state fees, and the program would be difficult and costly to administer.

The CECAC also evaluated the option of a feebate for all vehicles, which would tax high-GHG emission vehicles and offer tax incentives for low-GHG emission vehicles. The CECAC decided this policy should not be pursued at this time.

[30] StateMaster. "Energy Statistics: Alternative Fuel Vehicles (per Capita) (Most Recent) by State." National Priorities Project Database. 2001. Available at: http://www.statemaster.com/graph/ene_alt_fue_veh_percap-alternative-fuel-vehicles-per-capita

Policy Design

Goals:

- Increase sales of low-GHG vehicles, including pure electric, hybrid, plug-in hybrid, flex-fuel, lean-burn, hydrogen, and vehicles with a city fuel-economy EPA rating of 30 mpg or higher as follows:
    - Flex fuel (E85)—15% per year from fiscal year (FY) 2009–2010 to FY 2013–2014;
    - Fuel cell/lean burn—10% per year from FY 2009–2010 to FY 2013–2014;
    - Hybrid/plug-in hybrid—20% per year from FY 2009–2010 to FY 2013–2014;
    - 30+ mpg non-hybrids—10% per year from FY 2009–2010 to FY 2013–2014; and
    - Conversion equipment for plug-in, propane, natural gas, LNG, and E85—10% per year from FY 2009–2010 to FY 2013–2014
- Maintain and enhance the current state tax rebates and state income tax credits for low-GHG emission vehicles with the following improvements to the timing and caps that are needed in state legislation presented in Act No. 83, 2007:
    - SC Code 12-63-20(A)(1)—Expand the sales tax rebates listed under Section 12-63-20(A) beyond FY 2013–2014 to FY 2019–2020.
    - Section 12-63-20 (A)(1)(e)(3)—Remove legislation regarding the 20%, 5-year phase-in of the sales tax rebates listed under Section 12-63-20(A).
    - SC Code 12-63-20(E)(1)—Remove the $2,050,000 cap related to $300 rebate claims for E-85 flex-fuel vehicles. If the cap has to be maintained, a technical change to provide the sales tax rebate on a first-come, first-served basis is recommended. Currently, the section specifies that the cap applies proportionately to all eligible claimants.
    - SC Code 12-63-20(E)(3)—Remove the $2,100,000 cap related to $300 rebate claims for hybrids, plug-in hybrids, electric, hydrogen-fueled, lean-burn, and high-fuel-economy vehicles, as well as equipment to convert conventional vehicles to operate on alternative fuels. If the cap has to be maintained, a technical change to provide the sales tax rebate on a first-come, first-served basis is recommended. Currently, the section specifies that the cap applies proportionately to all eligible claimants.
    - SC Code 12-6-3376(A)-(B)—Remove the $200,000 cap related to the $2,000 tax credit for plug-in hybrid vehicles. If the cap has to be maintained, a technical change to provide the sales tax rebate on a first-come, first-served basis is recommended. Currently, the section specifies that the cap applies proportionately to all eligible claimants.
- Revise the following state legislation presented in Act No. 213, 2006:
    - SC Code 12-6-3376(A)-(B)—Strike and insert an amendment to Act 312, 2006 that states: “Section 12-6-3377. (A) A South Carolina resident taxpayer who is eligible for and purchases a new or used vehicle in South Carolina that meets or exceeds the minimum standards of the CAFE requirements or the California Clean Car standards by at least 10 percent is allowed a credit against the income taxes imposed pursuant to this chapter in an amount equal to 20 percent of the purchase price of the new or used vehicle up to a maximum of $2,000 in a calendar year. The credit allowed by this section is nonrefundable, and if the amount of the credit exceeds the taxpayer’s liability for the

applicable taxable year, any unused credit may be carried forward and claimed in the five succeeding taxable years.

- "(B) The credit amount allowed by this section must be calculated by, and the eligible vehicles qualifying for this income tax credit must be determined by, the South Carolina Department of Revenue and the South Carolina Energy Office."

Timing: These improvements to legislation should be made by the end of the 2008 legislative session, since beginning July 1, 2008, the majority of the state incentives for low-GHG emission vehicles will go into effect.

Parties Involved: South Carolina General Assembly, South Carolina Biomass Council, South Carolina Automobile Dealers Association, retailers of vehicles, South Carolina Department of Revenue, South Carolina Energy Office (SCEO), alternative vehicle advocates, and private vehicle owners.

Implementation Mechanisms

Amendments to Act No. 83, 2007, as defined above in the Goals section.

The state should also fund an education campaign to make consumers aware of the tax credits, and of the benefits of driving low-emission vehicles.

Related Policies/Programs in Place

2006–2007—In FY 2007 budget appropriations, the South Carolina General Assembly established $300 sales tax rebates for flex-fuel, hydrogen fuel cell, and plug-in hybrid vehicles. The appropriation also established up to $500 in sales tax rebates for hybrid to plug-in hybrid conversion equipment.

2006–2007—Act. No. 312: The South Carolina General Assembly established the state income tax credit for alternative-fuel and hybrid vehicles that mimicked the federal tax credits established in the Energy Policy Act of 2005. The state income tax credit is worth 20% of the federal income tax credit.

2008–2012—Act. No. 83: The South Carolina General Assembly passed a series of sales tax and income tax credits that expanded upon the FY 2007 budget appropriations, as outlined above.

Type(s) of GHG Reductions

Primarily CO_2.

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-6 presents the estimated GHG reductions and net costs of or cost savings from TLU-3.

Table I-6. Estimated GHG reductions and net costs of or cost savings from providing tax credits for efficient vehicles

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effective-ness ($/tCO2e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-3	Tax Credits for Efficient Vehicles	0.02	0.12	0.68	$244	$359	UC

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

Data Sources:

- SCEO, the South Carolina Bureau of Economic Advisers (SC BEA), and the South Carolina Department of Revenue have projected vehicle sales according to the policy goals (see Table I-6). (Not available online.) Vehicle sales are projected as follows:
  - Step 1: To estimate current sales of alternative-fuel vehicles, SCEO calculated the proportion of vehicle models currently offered in South Carolina that fall into each of the following categories:
    - Flex fuel,
    - Hybrid, and
    - 30+ mpg non-hybrids.
  - Step 2: SC BEA estimated the number of new and used vehicles sold in South Carolina each year and assumed that vehicle sales will increase by 40,000 vehicles per year. (Not available online.)
  - Step 3: For FY 2007–2008, SCEO estimated the number of sales of new and used flex-fuel, hybrid, and 30+ mpg non-hybrid vehicles as the total sales from Step 2 multiplied by the vehicle proportions from Step 1. (Not available online.)
  - Step 4: No data are available on offerings of conversion kits or of fuel-cell/lean-burn vehicles. SCEO assumed that 100 conversion kits were sold in FY 2007–2008, and that sales of fuel-cell/lean-burn vehicles will begin in FY 2010–2011 at 500 vehicles. (Not available online.)
  - Step 5: SCEO assumed that sales in each category would increase annually by the percentages specified in Table I-7, if the tax credits detailed in Act No. 83, 2007 are implemented and enhanced, as described in this policy. (Not available online.)
- Annual LDV mileage by vehicle age from EPA's MOBILE6 model. Available at: http://www.epa.gov/otaq/m6.htm
- Emission reduction impacts of alternative fuels and technologies from Argonne National Laboratory, "The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model," version 1.7. Available at: http://www.transportation.anl.gov/software/GREET/
- Annual national growth in sales of passenger cars and light-duty trucks, 1999–2005, from the U.S. Department of Transportation, Bureau of Transportation Statistics, *National*

Transportation Statistics, Table 1-17, as of April 12, 2007. Available at: http://www.bts.gov/publications/national_transportation_statistics/

Table I-7. Projected South Carolina alternative technology vehicle sales and rebate costs

Alternative Technologies	FY 2009–2010	FY 2010–2011	FY 2011–2012	FY 2012–2013	FY 2013–2014	Annual Increase
Flex fuel (E85)	$19,071	$21,932	$25,221	$29,005	$33,355	15%
Fuel cell/lean burn	$0	$500	$550	$605	$665	10%
Hybrid/plug-in hybrid	$4,551	$5,461	$6,553	$7,864	$9,436	20%
30+ mpg non-hybrids	$2,350	$2,585	$2,844	$3,128	$3,440	10%
Conversion equipment for plug-in, propane, natural gas, LNG and E85	$121	$133	$146	$161	$177	10%
Total vehicles	$26,093	$30,611	$35,314	$40,763	$47,073	
Total Cost to State	$7,827,900	$9,183,300	$10,594,200	$12,228,900	$14,157,300	

FY = fiscal year; E85 = gasoline containing 85% ethanol; mpg = miles per gallon; LNG = liquefied natural gas.

Quantification Methods:

- Sales projections from SCEO in Table I-7, above, are used to estimate the impact of this policy from FY 2009–2010 to FY 2019–2020. Sales are estimated with and without the tax rebates as follows:
  - Trend sales are projected to reflect likely sales in the absence of any tax rebates. We start with the estimated current year vehicle sales by category and project future sales in each category using the national annual average growth rate in new car and light truck sales of 1.4%.
  - To project sales under the tax rebate scheme for years after 2013–2014, total vehicle sales in South Carolina were projected to 2019–2020. For each future year, the market share of each vehicle category in 2013–2014 (as implied by the SCEO projections) is held constant.
  - Vehicle sales induced by the policy equal sales with the tax credits minus trend sales without the tax credits.
- The resulting vehicle/technology categories are refined to better capture differences in emissions. The plug-in hybrid vehicle category is broken out, based on the assumptions below. The ethanol proportion of fuel consumption by flex-fuel vehicles was also estimated. A 2002 study by the U.S. Department of Transportation (U.S. DOT) found that E85 constituted only about 1% of the fuel consumed by flex-fuel vehicles between 1996 and 2000.[31] Based on SCEO's expectations for increases in E85 sales, flex-fuel vehicles were estimated to run on E85 for 10% of their mileage.
- Using per-mile emission reduction factors from GREET, the total emission reductions in each year were calculated from the induced alternative vehicle sales.

[31] Associated Press. "Federal Program To Reduce Fuel Use Instead Increases It." January 6, 2006. Available at: http://www.dallasnews.com/sharedcontent/dws/bus/stories/010606dnbusfuel.4fa74d14.html

- Cost estimates reflect the total rebate cost to the state from all vehicles sold, not just the cost of rebates paid for induced vehicle sales. The number of vehicles eligible for the proposed income tax rebate was estimated based on the assumptions below. Indirect costs or cost savings to consumers or manufacturers from the sale of clean technology vehicles are excluded.

Key Assumptions:

- Increased alternative-vehicle sales beginning in FY 2009–2010 are attributable to TLU-3, rather than to the existing legislation.
- The market share of alternative-technology vehicle sales would not increase in the absence of the tax credits.
- Under the tax credit scheme, sales of alternative-technology vehicles increase steadily during the first 5 years of the tax credit, and then maintain a steady market share thereafter.
- Starting in FY 2010–2011 at 5%, the plug-in hybrid share of hybrid vehicle sales increases steadily by 5% each year up to 50% in 2019–2020.
- Flex-fuel vehicles run on E85 for 10% of mileage and on gasoline for the remaining 90%. (This assumption is based on SCEO's expectations for increases in E85 fuel pumps and total sales statewide.)
- All hybrid and plug-in hybrid vehicles will exceed the CAFE requirements or California Clean Car standards in a given year by 10%.
- Half of non-hybrid vehicles with fuel efficiency of 30 mpg or better will exceed the CAFE requirements or California Clean Car standards in a given year by 10%.

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-4. Improve Development Patterns

Policy Description

South Carolina is growing rapidly, and the location and design of development have substantial impacts on GHG emissions. Growth can be accommodated in a variety of ways that reduce emissions. The overall goal of this policy is to help South Carolina grow in a way that protects the state's environment, climate, economy, and quality of life. Following are two examples:

- Infill and brownfield developments produce less vehicle travel and emissions than development on lower-density exurban or "greenfield" locations. Households and workers in areas with higher density and mixed uses take shorter trips and use more alternatives to automobile travel. "Brownfields" are one type of infill location—commercial or industrial properties that are abandoned or are not being fully used because of actual or perceived environmental contamination. "Greyfields," another type of infill and redevelopment opportunity, are the declining commercial strips left behind by 1960s-style commercial development, characterized by seas of parking and cheap one-story buildings that are difficult to reuse. Communities from Nashville to Raleigh have capitalized on these underutilized and relatively centrally located sites to create new mixed-use urban villages with traditional, walkable street networks and a rich mix of retail, office, and residential uses.
- Infrastructure and service boundaries are essentially policies that concentrate infrastructure and services, such as roads, schools, water, and sewer, in areas where growth is desired. Such policies reduce both the extent of sprawl and the cost of providing infrastructure and services.

Policy Design

Goals:

The goal of this policy is to stabilize statewide VMT at today's levels by 2010 ("2010 VMT") by working with local governments. Each local government would be free to implement land-use tools that it determines are best suited for managing VMT within its respective jurisdiction. Such tools would be designed to promote more efficient development patterns by encouraging and promoting highly connected street networks, higher residential and employment densities, and mixed land uses in new and existing development. Coordination with transportation agencies and MPOs will be necessary.

State actions to accomplish this policy include the following:

- Amend the Comprehensive Planning Act to require all counties in South Carolina to establish planning commissions and to work with those commissions to prepare and implement comprehensive plans that stabilize VMT within their jurisdictions at today's levels.
- Expand the state incentives for brownfield redevelopment in South Carolina. These incentives could include grants or loans, with preferences given to projects that meet sustainable development principles.

- Amend the Comprehensive Planning Act to require planning commissions to assess the impact of their comprehensive plans on GHG emissions.
- Reestablish the Division of Regional Development and provide adequate funding for the Division to meet its responsibilities under the law.
- Implement the related recommendations of the Quality of Life Task Force.[32]
- Implement the five recommendations and the strategies that have been outlined in detail for each of the recommendations in the *Growing by Choice or Chance* report.[33]
- Expand the state incentives for conservation, such as by improving the tax credits for conservation easements.
- Increase the amount of funding for the South Carolina Conservation Bank and the South Carolina Heritage Trust program.
- Provide state incentives and resources to encourage planning and implementation of plans.

One model for developing and distributing VMT goals is the "conformity" requirements under the U.S. Clean Air Act. Conformity requires that state, and by extension regional and local, transportation plans "conform" to the goal of complying with air quality standards that protect human health. Attaining those standards requires action at three levels:

1. The federal government (and/or California + states adopting California standards) sets vehicle technology standards;

2. The state funds and sets design parameters for transportation systems in the state; and

3. Regions and local jurisdictions make the transportation and land-use decisions.

Setting and attaining a VMT goal would follow a similar path at each level. The suggested goal is given in this policy. Further policy development will answer the following questions:

- How does the state facilitate the development of VMT goals (qualitative or quantitative) established at the local levels on a place-by-place basis?
- How does the state facilitate regional cooperation to enable efficient VMT management between areas with different growth rates?

Recommended actions at this point are:

- Mandate a study by planning commissions, together with councils of government (COGs), about how regional VMT management could or would work, with recommendations to be made to the state.

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[32] Quality of Life Task Force Report. February 6, 2003. Available at: www.scgovernor.com/NR/rdonlyres/75BF67C5-746E-41AA-8A26-BA73EF0BA851/0/QualityofLifeTaskForceReportFINAL.pdf

[33] South Carolina Quality Growth Initiatives Statewide Committee. Growing by Choice or Chance: State Strategies for Quality Growth in South Carolina. Urban Land Institute and University of South Carolina, South Carolina Real Estate Center, 2004. Available at: http://www.uli.org/AM/TemplateRedirect.cfm?template=/ CM/ContentDisplay.cfm&ContentID=10994

- Require that this study emphasize the ancillary benefits of planning and coordination for infrastructure, water, and conformity with new Clean Air Act ozone standards.

Timing: Begin implementing these actions immediately.

Parties Involved: State, regional, and local planning authorities.

Other: None cited.

Implementation Mechanisms

Implement the recommendations of the Quality of Life Task Force, which fall under four categories:[34]

1. Community Growth

- Community Schools
  - Eliminate minimum acreage requirements; cap student populations for future facilities.
  - Require coordination among school boards and local governments to plan school sites and avoid conflicts.
  - Favor restoration and construction of community-based small schools over new construction of remote mega-schools.
- Efficient Public Investment
  - Require fact-based decision making: major projects should conform to adopted plans, developed by local authorities, to keep politics from guiding infrastructure decision making.
  - Require public entities to plan where they build and only build where they plan.
  - Require local governments to coordinate with other local authorities to designate priority investment areas that will receive funding preferences.
  - Give highway system maintenance precedence over new roads.
- Affordable Housing
  - Reduce regulations that are inefficient and excessively impact housing affordability, particularly for lower-income and minority families.
  - Support private-sector efforts in affordable housing and community development.
- Traditional Neighborhoods
  - Remove legal impediments to traditional neighborhood designs, and provide incentives for the construction and revitalization of traditional neighborhoods.
- Public Transportation
  - Integrate transportation planning with land-use planning, so public transit can make a comprehensive contribution to economic development and mobility.

[34] Quality of Life Task Force Report. February 6, 2003. Available at: www.scgovernor.com/NR/rdonlyres/75BF67C5-746E-41AA-8A26-BA73EF0BA851/0/QualityofLifeTaskForceReportFINAL.pdf

- Evaluate public transportation opportunities, including intra-regional and inter-regional systems.

- Traditional Communities
  - Evaluate rural communities, and designate those that have served as ancestral habitation for more than 100 years as historic areas; require that eminent domain processes respect this designation.
- Downtown Revitalization
  - Work with Community Builders, Main Street programs, and other nongovernmental organizations to encourage downtown renewal and revitalization projects.

2. Land Conservation

- Conservation Incentives
  - Raise the per-acre cap in the Conservation Incentives Act; raise the maximum annual credit.
  - Increase funding for the South Carolina Conservation Bank.
- Heirs' Property
  - Endorse and support existing private initiatives addressing this issue.
- Focus Area Expansion
  - Encourage public–private partnerships in promoting conservation initiatives based on the ACE basin model.[35]
- Traditional Agriculture and Forestry
  - Support farmland protection initiatives.
- Best Development Practices
  - Develop and promote incentive-based standards for use by landowners to implement conservation measures in their land management practices or for new development.
- Natural Resource Education
  - Support curricular efforts to teach students the value of conservation of South Carolina's natural resources.

3. Regulatory Reform

- Incentives for Infill and Redevelopment of Greyfield and Brownfield Areas
  - Include local and state incentives, such as expedited, prioritized processing of approvals, reduced impact fees; and other economic incentives.
- Property Rights Legislation Consistent With the Qualify of Life Task Force Vision Statement[36]

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[35] ACE (Ashepoo-Combahee-Edisto) basin model. Available at: http://www.dnr.sc.gov/marine/mrri/acechar/esmodel.htm

[36] Quality of Life Task Force Report. February 6, 2003. Available at: www.scgovernor.com/NR/rdonlyres/75BF67C5-746E-41AA-8A26-BA73EF0BA851/0/QualityofLifeTaskForceReportFINAL.pdf

- Provide property owners and local governments the opportunity and flexibility to mediate land-use regulation disputes.

- Additional Protection for Isolated Freshwater Wetlands Based on Function and Size
  - Adopt new regulations that are graded by function and size, as opposed to "one-size-fits-all."
- Annexation and Condemnation Laws
  - Reform annexation and condemnation laws.

4. Resource Inventory/Uniform Vision

- Sponsor a Statewide Visioning Process Based on Citizens' Input and a Bottom-Up Approach.
- Support Coordination of Existing Resource Data for Use in All Aspects of Land-Use Planning.
- Support Training and Technical Assistance to Local Governments in Vision-Driven Planning.

Related Policies/Programs in Place

Comprehensive Planning:

The South Carolina Comprehensive Planning Act authorizes local governments to establish planning commissions. If established, these commissions have certain powers and responsibilities, including "the function and duty . . . to undertake a continuing planning program for the physical, social, economic growth, development, and redevelopment of the area within [their] jurisdictions." In addition, these commissions must prepare comprehensive land-use plans that address the following elements: (1) population, (2) economic development, (3) natural resources, (4) cultural resources, (5) community facilities, (6) housing, (7) land use, (8) transportation, and (9) priority investment. The planning commissions must review their plans at least every 5 years and update them at least every 10 years. They have "the power and duty" to recommend to the local governing authority measures for implementing the plan, such as zoning ordinances, subdivision regulations, landscaping ordinances, and capital improvement programs. After receiving a favorable recommendation from the planning commission and holding a public hearing, the local governing authority may adopt the land-use plan in whole or in part or reject it.

The South Carolina Comprehensive Infrastructure Development Act, passed in 1997, created a division within the South Carolina Budget and Control Board, called the Division of Regional Development (DRD), and gave it responsibility "for the creation of a state infrastructure development plan, for the coordination of regional infrastructure development plans, and for the coordination of state programs and resources that impact or affect infrastructure development." The law directs the 10 regional COGs to develop regional infrastructure plans in cooperation with the DRD, and the DRD must consider those plans in creating the statewide infrastructure plan. The South Carolina General Assembly never provided any funding for the DRD, and the Budget and Control Board has dissolved it. Nevertheless, the law is still on the books.

The Priority Investment Act (PIA, or S. 266) became law on May 23, 2007. The act amends the Local Government Comprehensive Planning Enabling Act of 1994 to improve the local

government comprehensive planning process and to provide local governments new zoning tools.

The PIA adds two new elements to the comprehensive planning process. It provides for a specific transportation element requiring local governments to consider all transportation facilities (including roads, transit projects, pedestrian and bicycle projects) as part of a comprehensive transportation network. The act also adds a new priority investment element, which requires local governments to analyze available public funding for public infrastructure and facilities over the next 10 years and to recommend projects for expenditures of those funds for needed public infrastructure. This element will require more prioritized planning for public infrastructure and facilities, such as water, sewers, roads, and schools.

Additionally, the priority investment element requires a basic level of coordination between local governments. The PIA requires that the priority investment element be developed through coordination with "adjacent and relevant jurisdictions and agencies." All governmental entities and utilities—counties, municipalities, public service districts, school districts, public and private utilities, transportation agencies, and other public entities—that are affected by or have any planning authority over the public project identified in the priority investment element must be consulted in the coordination process. The act provides for a basic level of coordination requiring written notification to the other agencies and an opportunity for comment on the proposed projects.

The PIA also provides for two new zoning tools to promote affordable housing and traditional neighborhood design. It requires that local governments carefully analyze regulatory requirements affecting the affordability of housing and identify those housing regulatory requirements that are not necessary to protect the public health, safety, or welfare. Local governments must also analyze market-based incentives that may be made available to encourage the development of affordable housing. The PIA allows local governments to identify priority investment zones in which local governments may adopt market-based incentives or relax or eliminate nonessential housing regulatory requirements in order to encourage affordable housing. Additionally, it allows local governments to identify priority investment zones to encourage traditional neighborhood design—communities with mixed residential and commercial uses that look and function like traditional towns and neighborhoods. The act defines market-based incentives to include density bonuses; relaxed zoning regulations, such as lot area requirements or setbacks; reduced or waived fees; fast-track permitting; and design flexibility. Nonessential housing regulatory requirements may include requirements like minimum lot size, setbacks, open-space requirements, landscaping, impervious surfaces, and parking requirements.

Quality of Life/Quality Growth Initiatives

In his first State of the State address in January 2003, Governor Mark Sanford declared that maintaining and improving the state's quality of life was one of the top priorities of his administration. This was soon followed by the report from the Governor's Quality of Life Task Force, whose recommendations are summarized in the preceding section.[37]

[37] Ibid.

Another important effort is the South Carolina Quality Growth Initiative, launched in 2001 by the Urban Land Institute and the South Carolina Real Estate Center at the University of South Carolina. The sponsors assembled a broad-based steering committee of 36 people, composed of developers, public officials, scholars, business leaders, environmental advocates, and concerned citizens from across the state, to guide and oversee the initiative. A statewide symposium and four regional forums were held solicit to the public's views on growth and development issues. In 2004, the steering committee issued its final report, *Growing by Choice or Chance: State Strategies for Quality Growth in South Carolina,* which sets forth 10 basic principles of quality growth and 5 recommended actions at the state level.[38]

Brownfield Redevelopment

Current state law encourages brownfield redevelopment by offering liability protection contracts for non-responsible purchasers of contaminated property (S.C. Code §44-56-71- et seq.) and by providing state income tax credits (§12-6-355), job tax credits (§12-6-3360(e)(2)), reduced investment minimum for fee in lieu of property taxes (§4-12-30(B)(3)), and 5-year property tax exemption at the option of local government (§12-37-220(44)).

Open Space Protection

Finally, conservation and open-space protection include programs designed to protect and conserve important lands and natural resources in the state and to provide active and passive parks for public use and enjoyment. This policy could also include measures to discourage the expansion of urban growth areas or urban growth boundaries. Policies that increase the value of rural lands for agricultural or forestry uses to serve local markets can promote these objectives.

The principal sources of funding for conservation at the state level are the South Carolina Conservation Bank and the Heritage Trust program. Both programs are funded by a portion of the deed recording fees, which are collected when real estate is sold in the state. A few counties in the state currently provide significant funding for conservation and open-space protection.

Existing state law funding promoting open-space protection includes the Conservation Bank Act (§48-59-10), the Heritage Trust Program of the South Carolina Department of Natural Resources (§57-17-10), and the Conservation Easement Act (§27-8-20).

Type(s) of GHG Reductions

Primarily CO_2.

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-8 presents the estimated GHG reductions and net costs of or cost savings from TLU-4.

[38] South Carolina Quality Growth Initiatives Statewide Committee. Growing by Choice or Chance: State Strategies for Quality Growth in South Carolina. Urban Land Institute and University of South Carolina, South Carolina Real Estate Center, 2004. Available at: http://www.uli.org/AM/TemplateRedirect.cfm?template=/CM/ContentDisplay.cfm&ContentID=10994

Table I-8. Estimated GHG reductions and net costs of or cost savings from improving development patterns

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO2e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-4	Improve Development Patterns	0.41	2.31	14.02	< 0	< 0	UC

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

Data Sources:

- VMT from Center for Climate Strategies, "Revised Draft South Carolina Greenhouse Gas Inventory and Reference Case Projections 1990-2020," Table C2, produced for the South Carolina Climate, Energy, and Commerce Advisory Committee, May 2008. Available at: http://www.scclimatechange.us/ewebeditpro/items/O60F17146.pdf.
- Population projections from SC DOT.

Quantification Methods:

Light-duty VMT per capita was calculated for each year from 2008 to 2020. Per capita VMT increases steadily from 10,900 in 2008 to 12,200 in 2020 in the baseline projections. According to the stated goal, the reduction in GHG emissions was calculated with no growth in per-capita VMT after 2010.

For cost information, a variety of literature finds that integrated transportation and land-use planning produces substantial net savings on the total costs of buildings + land + infrastructure + transportation. Some components may be higher, even though total costs are reduced. The preponderance of literature suggests net savings overall.[39] A National Academy of Sciences/Transportation Research Board review found substantial regional and state-level infrastructure cost savings from more compact development.[40,41] A statewide study in 1997 determined that through compact growth, South Carolina would reduce its infrastructure costs for a 20-year period (1995–2015) by nearly $5 billion.[42]

Key Assumptions: This goal applies to light-duty VMT only.

[39] U.S. Environmental Protection Agency. Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality. EPA 231-R-01-022. January 2001. Available at: http://www.epa.gov/piedpage/pdf/built.pdf

[40] Robert Burchell et al. Sprawl Costs: Economic Impacts of Unchecked Development. Washington, DC: Island Press, 2005. Available at: http://www.islandpress.com/media/PDF/Burchell PR.pdf

[41] Robert Burchell et al. The Costs of Sprawl—Revisited. TCRP Report 39. Transportation Research Board. Washington, DC: National Academy Press, 1998. Available at http://www.trb.org/news/blurb_detail.asp?id=2578

[42] URS and TranSystems. South Carolina Statewide Transit Plan: Executive Summary. Prepared for South Carolina Department of Transportation, February 2008. Available at: http://www.scdot.org/inside/multimodal/pdfs/StatewideTransitPlanExecutiveSummary.pdf

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-5. Transit & Bike-Pedestrian

Policy Description

This policy would enable personal trip-making to move from single-occupant vehicles (SOVs) to lower-GHG-emitting transportation options, such as walking, bicycling, ridesharing, and mass transit,* and would ensure that the state's transportation system is fully integrated with and appropriately serves the development patterns called for under TLU-4.

*[*Note: As used throughout this policy, the term "mass transit" encompasses both public and specialized transit services operating both within and between rural and urban areas. The term also includes intercity bus; conventional passenger rail service, such as Amtrak; and commuter rail, high-speed rail, and other forms of fixed-guideway transit, such as light rail.]*

Policy Design

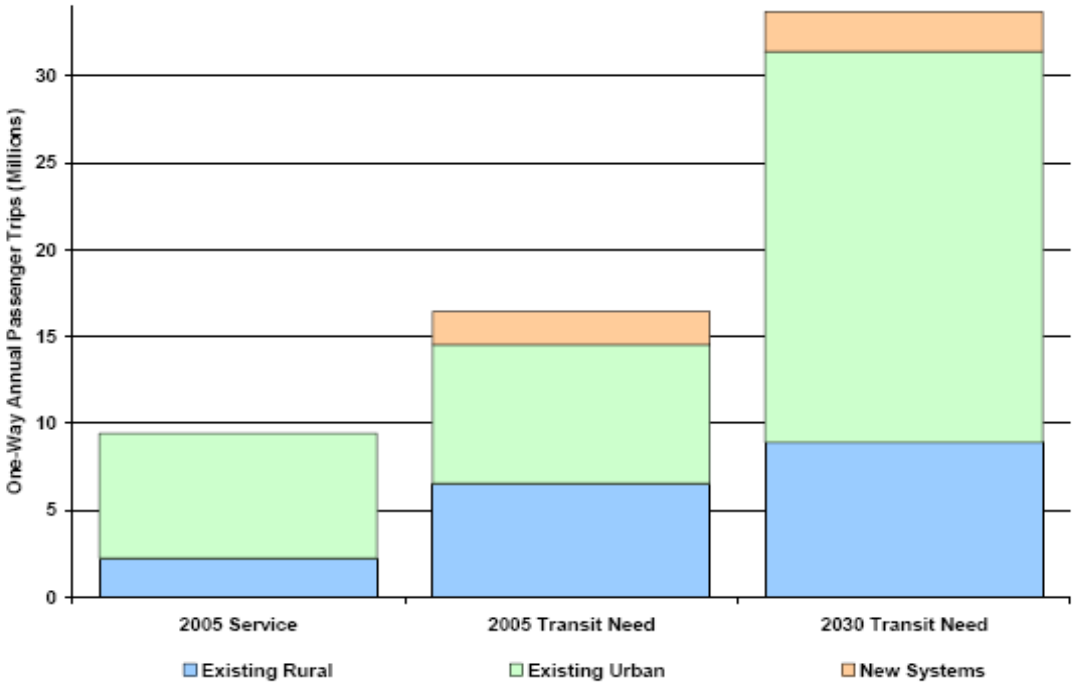
Goals: Enable personal trip making to move from SOVs to lower-GHG-emitting transportation options, such as walking, bicycling, ridesharing, and mass transit by achieving the following goals:

- Increase personal mobility options and opportunities by expanding and improving bicycle and pedestrian networks and related facilities, both as feeders and as stand-alone modes of travel in all areas of the state.
- Increase personal mobility options and opportunities by promoting and creating rideshare programs within the public and private sectors.
- Increase personal mobility options and opportunities by improving and expanding the state's existing network of mass transit systems and services.
- Increase personal mobility options and opportunities by implementing "complete streets" policies to ensure that all new roadways and streets accommodate all modes of personal transportation where practical and feasible.

As shown in Figure I-1, there is substantial unmet demand for transit in South Carolina: "as of 2005 transit service in South Carolina was meeting only 57% of the total estimated transit demand of 16.4 million passenger trips. By 2030, the total demand for transit will exceed 33 million trips annually."[43] In addition to reducing emissions independently by helping meet existing demand, implementation of the above set of policies will support the TLU-4 goal of stabilizing per-capita VMT at today's levels by 2010.

[43] Ibid.

Figure I-1. Transit Service Versus Transit Need



Source: SCDOT Planning and Mass Transit Offices

Timing: The timing for achieving the above goals will vary, as detailed below.

- Many of the state transportation programs required to achieve the above goals are in place and are being implemented to some degree or another.
- Although many of the state transportation programs required to achieve the above goals are in place, additional fiscal resources may be needed to implement them fully. This can only be accomplished through the state transportation budgeting and programming processes, as well as by identifying new sources of revenue.
- To fully achieve the above goals, new state transportation programs will need to be created through the state legislative process.
- The need for improving and expanding the state's existing network of mass transit systems and services will typically be generated through existing and new transportation planning processes at the state, regional, and local levels.

Parties Involved: Governor's office and cabinet agencies, South Carolina legislature, South Carolina Department of Health and Environmental Control (SC DHEC) (various offices: Air Quality [to document improvements], Division of Obesity Prevention and Control [for advising on the health component to more physically active transportation]), Palmetto Cycling Coalition, South Carolina Coalition for Promoting Physical Activity, MPOs, COGs, municipalities, counties, mass transit agencies and providers, private-sector employers, railroads.

Other: Federal transportation agencies such as FHWA, the Federal Transit Administration (FTA), and the Federal Railroad Administration (FRA).

Implementation Mechanisms

- Implement the State Multimodal Transportation Plan, including the Statewide Transit Plan, that SC DOT is scheduled to adopt in early 2008.
- In the event the gas user fee is increased, include 1.75 cents/gallon to fund transit.
- Create a new state mass transit aid program to fund 50% of the annual operating costs of mass transit systems in South Carolina, to be administered by SC DOT. Require SC DOT to audit both the financial records of each aid recipient annually and the performance (efficiency and effectiveness) of each aid recipient every 5 years.
- Create a new state mass transit aid program, to be administered by SC DOT, to fund 90% of the costs of mass transit projects designed to test and evaluate the costs and benefits of innovative ways for the state's mass transit systems to provide mobility. Encourage the deployment of innovative technologies.
- Create a new state mass transit aid program, to be administered by SC DOT, to fund 50% of the nonfederal share of capital improvement projects of the state's mass transit system. Design all facility renovation or new facility construction projects funded under this program to meet appropriate Leadership in Energy and Environmental Design™ (LEED) standards promulgated by the U.S. Green Building Council.[44]
- Create a new state program to aid communities in the retrofitting of pedestrian and bicycle infrastructure that was frequently omitted from the mid-1940s to the mid-1990s. This could be stand-alone funding or designated to combine with existing federal programs, such as Transportation Enhancements, Safe Routes to Schools, and others.

Related Policies/Programs in Place

Public Transit Aids

SC DOT receives annual funding from FTA for public transportation activities in the state. SC DOT also receives one-quarter of a cent of the state's gasoline user fee (approximately $6 million annually) and approximately $0.1 million annually from the State General Fund. These state funds, together with local funds, are used to match federal funds made available under a variety of programs. (See Annex A for a description of these programs.)

Bicycle & Pedestrian

- SC DOT Commission Resolution regarding bicycling and walking.
- Engineering Directive Memorandum 22 (Bicycling Provisions in projects).
- Complete Streets policies in place locally (e.g., CHATS, SPATS, City of Columbia).

[44] LEED certification provides independent, third-party verification that a building project meets the highest green building and performance measures. All certified projects receive a LEED plaque, which is the nationally recognized symbol demonstrating that a building is environmentally responsible, profitable, and a healthy place for living and working.

- Biannual bicycle and pedestrian conference held by SC DOT in conjunction with a planning conference. This effort is a portion of the outreach/technical assistance effort of the Pedestrian and Bicycle Engineer at SC DOT to provide continuing assistance to local governments (municipalities, counties, MPOs, and COGs) toward improving facilities for the nonmotorized modes.
- Annual Bike Month (League of American Bicyclists) and National Bike-to-Work Day are held during May. Many local governments promote this activity. Palmetto Cycling Coalition is a partner.
- Safe Routes to Schools office has been established at SCDOT (and all state departments of transportation [DOTs].)

Type(s) of GHG Reductions

Primarily CO_2.

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-9 presents the estimated GHG reductions and net costs of or cost savings from enhancing mass transit and bike-pedestrian incentives.

Table I-9. Estimated GHG reductions and net costs of or cost savings from enhancing mass transit and bike-pedestrian incentives

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-5	Transit & Bike-Pedestrian	0.02	0.02	0.22	–$1	–$1	UC

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

Data Sources:

- Light-duty VMT and fuel consumption from Center for Climate Strategies, *Final South Carolina Greenhouse Gas Inventory and Reference Case Projections, 1990–2020*, prepared for the Climate, Energy, and Commerce Advisory Committee of the Office of the Governor of South Carolina, June 2008.
- Transit passenger miles, operating expenses, and capital expenses from the U.S. Department of Transportation, Federal Transit Administration, National Transit Database, 2006. Available at: http://www.ntdprogram.gov/ntdprogram/

Quantification Methods:

The cost-effectiveness of investments in transit and transit promotion will vary, depending on how those investments are made. The language of this policy gives the state and its constituents wide flexibility in making those investments. The Goal analyzed in this policy is expanding transit service with funding from an additional 1.75-cent/gallon gasoline fee. An alternative goal

would be to analyze the implementation of the full Statewide Transit Plan. The Implementation Mechanisms above will help increase the amount of revenue available, but without a funding scenario available for meeting the full need, the analysis here is of the potential service provided by revenue from the 1.75-cent/gallon fee.

A given investment in transit and/or transit promotion may or may not produce net benefits. Therefore, while this process needs to make general policy recommendations, it will remain the responsibility of the state and its constituents to maximize the cost-effectiveness of investments made.

Quantifying the costs and benefits of increasing transit service and use in South Carolina is complicated by the fact that the increases will be on top of a small base. Extrapolating the impact of a small change off of a large base is relatively straightforward; the reverse, less so. Complicating the analysis, both the costs of service and the benefits of that service are subject to substantial uncertainty. As a result, two general approaches to quantifying the likely costs and benefits of what would be a roughly 40% increase in transit funding in South Carolina are offered here. Within the first approach, three scenarios are presented in an attempt to bound the likely costs and benefits.

Estimating the Costs and Benefits of Increased Transit Funding in South Carolina—Approach 1

South Carolina's transit systems serve a wide variety of valuable social purposes. Currently, they do not provide mobility on a scale that produces particularly low costs per passenger mile. Speaking generally, costs per passenger mile should fall with the kind of substantial investment proposed under this approach. However, other scenarios are possible, and a scenario in which service needs to increase at the rate same at as ridership increases is not necessarily implausible.

Following is the method used for calculating the effect that an increase in spending, commensurate with the proposed sales tax for transit funding, would have on transit ridership.

1. *Revenue.* First calculate the total funds raised from the proposed 1.75-cent tax based on projected gasoline consumption to 2020.

2. *Cost per passenger mile.* Next calculate the ratio of transit spending to transit ridership in South Carolina using available data from eight transit agencies.

3. *Revenue / cost per passenger mile = new transit VMT and reduced auto VMT*. Estimate the increase in transit ridership that would result from an increase in transit spending. Assume that one transit passenger mile replaces one VMT.

4. *Decreased auto VMT = decreased emissions.* From the corresponding decrease in VMT, calculate the emission savings.

5. *Cost.* The total cost of the policy is equal to the funds raised from the proposed sales tax.

6. *Savings.* The savings from the policy are equal to the savings from reduced VMT. The right quantification for this value varies depending on what is included. The following three scenarios are shown. Table I-10 presents the results of these scenarios.

a. *Scenario 1: Savings = reduced private costs*. Private savings are equal to the American Automobile Association (AAA)-calculated cost of driving: 54.1 cents/mile. The latest AAA calculation is based on a gasoline price of just under $3/gallon,[45,46] and as such is low.

b. *Scenario 2: Savings = the full public + private costs of driving.* CCS does not know of a "full costs of transportation" study for South Carolina. The most recent and comprehensive "full costs" study in the country was done for the Minneapolis-St. Paul region. That report concluded that the total cost of a mile of auto travel was between 84 cents and 162 cents, with a mid-range estimate of 114 cents.[47] Because this study is not specific to South Carolina, it is not used as the basis for the ultimate quantification. However, while clearly there are many differences between Minneapolis-St. Paul and most places in South Carolina, most of the costs (roads, gasoline, parking, health costs of air pollution, etc.) are likely to be comparable to cities in South Carolina, and the study offers useful insight into the full savings from transit. The mid-range cost of 114 cents is used for the analysis.

c. *Scenario 3: Savings are at least as great as costs.* The AAA cost does not include public costs; therefore, it is too low. Arguably, the AAA cost is high because it includes full private costs, and not all private costs will be able to be shed as a result of driving less. Similarly, it is not known whether the Minneapolis-region analysis costs are too high or too low: the estimates of full costs of health impacts from emissions are widely variable, and the ones included in the analysis are by no means either the highest or the lowest in the literature. To help the CECAC's decision-making process, this scenario asks: What are the minimum savings per mile that would pay for the costs of this policy? CCS has determined that number is 95 cents/mile.

[45] "AAA Reports Cost of Owning, Operating A New Vehicle Is 54.1 Cents per Mile." Available at: www.AAA.com.

[46] AAA Exchange. "Your Driving Costs: How Much Are You Really Paying To Drive?" Available at: http://www.aaaexchange.com/main/Default.asp?CategoryID=16&SubCategoryID=76&ContentID=353

[47] David Anderson and Gerard McCullough. "Full Costs of Transportation in the Twin Cities Region." Center for Transportation Studies, University of Minnesota, 2000. Available at: http://www.cts.umn.edu/trg/research/reports/TRG_05.html

Table I-10. Results of three scenarios for bounding costs and benefits under Approach 1

Quantification Factors	2006	2020
VMT (million)		
LDGV and LDGT	45,872	59,117
Emissions ($MMtCO_2e$)		
LDGV and LDGT		24.07093
Fuel Consumption (million gallons)		
Gasoline		2,453
Diesel		800
Funds Raised (1.75-cent tax on gasoline)		
Gasoline (million $)		$42.92
2006 SC Transit Agencies (Source: National Transit Database)		
Passenger miles (million)	51.81	
Operating expenses (million $)	$42.90	
Capital expenses (million $)	$6.30	
Miles/$	1.05	
VMT Reduction (million)		**45.20**
Emissions Reduction ($MMtCO_2e$)		**0.018**
Cost/Benefit (all values except "$/ton" in millions)		
Cost		**$42.92**
Savings Scenario 1		
Personal savings from reduced personal VMT @ $0.54/mile		$24.45
		$18.47
$/ton		$1,004
Savings Scenario 2		
Societal savings from reduced VMT @ $1.14/mile		$51.52
		($8.60)
$/ton		–$467
Savings Scenario 3		
Break-even savings from reduced personal VMT @ $0.95/mile		$42.94
		($0.01)
$/ton		–$1

VMT = vehicle miles traveled; LDGV = light-duty gasoline vehicle; LDGT = light-duty gasoline truck; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; NTD = National Transit Database.

Summary of Approach 1

The CECAC process is directed to estimate the total societal costs and benefits of policies. Thus, Scenario 1 is too low. Scenario 3 is well within the band of generally accepted total societal costs for VMT. Given increasing gasoline prices and improved information about the costs of local air pollution and of controlling local air pollution in South Carolina, more likely than not, total costs will be at least those in Scenario 3.

On the cost side, the assumption that service will continue to cost the same to provide as under the current smaller systems is conservative. As noted in the *South Carolina Statewide Transit Plan*: "[C]ities could realize an order of magnitude difference in ridership just by increasing the frequency on existing routes and without increasing their service area."[48]

Thus, as a general summary of Approach 1, it is likely that transit investments in South Carolina will at least pay for themselves, producing CO_2 reductions at a net savings. The results of Scenario 3 are used in the summary table at the beginning of this appendix.

Estimating the Costs and Benefits of Increased Transit Funding in South Carolina—Approach 2

A wide variety of empirical experience suggests that the policies and investments listed in this recommendation's Policy Design and Implementation Mechanisms sections are likely to produce substantial net savings:

Transit Investments Generally

There is broad literature on the role of transit as a part of a modern economy and as a key contributor to creating and maintaining certain aspects of quality of life. Overarching reviews of that literature are done only periodically. One of the most comprehensive reviews is Cambridge Systematics (CS), Inc.'s, *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, 1999. The study demonstrates that transit produces net economic returns on investment nationally:

> "For every $10 million invested, over $15 million is saved in transportation costs to both highway and transit users. These costs include operating costs, fuel costs, and congestion costs."[49]

The analysis lists the following additional types of benefits from transit investments. This list and CS's bottom-line estimate of transportation benefits are presented, not to suggest that South Carolina would necessarily see the same multipliers, but to support a finding that non-CO_2 benefits would, at a minimum, exceed costs:

- "Transit capital investment is a significant source of job creation. This analysis indicates that in the year following the investment 314 jobs are created for each $10 million invested in transit capital funding.

[48] URS and TranSystems. South Carolina Statewide Transit Plan: Executive Summary, p. 18. Prepared for South Carolina Department of Transportation, February 2008. Available at: http://www.scdot.org/inside/multimodal/pdfs/StatewideTransitPlanExecutiveSummary.pdf

[49] Cambridge Systematics, Inc., and Economic Development Research Group. Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact. October 1999. Available at: http://www.apta.com/research/info/online/documents/vary.pdf

- "Transit operations spending provides a direct infusion to the local economy. Over 570 jobs are created for each $10 million invested in the short run.
- "Businesses would realize a gain in sales 3 times the public sector investment in transit capital; a $10 million investment results in a $30 million gain in sales.
- "Businesses benefit as well from transit operations spending, with a $32 million increase in business sales for each $10 million in transit operations spending.…
- "Business output and personal income are positively impacted by transit investment, growing rapidly over time. These transportation user impacts create savings to business operations, and increase the overall efficiency of the economy, positively affecting business sales and household incomes. A sustained program of transit capital investment will generate an increase of $2 million in business output and $0.8 million in personal income for each $10 million in the short run (during year one). In the long term (during year 20), these benefits increase to $31 million and $18 million for business output and personal income respectively.
- "Transit capital and operating investment generates personal income and business profits that produce positive fiscal impacts. On average, a typical state/local government could realize a 4 to 16 percent gain in revenues due to the increases in income and employment generated by investments in transit.
- "Additional economic benefits which would improve the assessment of transit's economic impact are difficult to quantify and require a different analytical methodology from that employed in this report. They include "quality of life" benefits, changes in land use, social welfare benefits and reductions in the cost of other public sector functions.
- "The findings of this report compliment studies of local economic impacts, which carry a positive message that builds upon the body of evidence that shows transit is a sound public investment. [L]ocal studies have shown benefit/cost ratios as high as 9 to 1."

Transit and Non-SOV Options Information and Promotion

Per public dollar, a transportation management organization (TMO) can accommodate seven times as many commuters as new highway investment.[50] (Benefits from TMO investments are also noted in TLU-10, but the same investments are not double-counted.)

Further National Studies

Nationally, households using public transportation save a significant amount of money. A two-adult "public transportation household" saves an average $6,251 every year, compared to an equivalent household with two cars and no access to public transportation. A "public transportation household" is defined as a household located within ¾ mile of public transportation, with two adults and one car.[51]

[50] Minnesota Department of Transportation. Modal Options Identity Project. "Measurement and Evaluation." 2006. (Not available online.)

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

Summary of Approach 2

Most studies on the subject find *net savings/net positive returns* from investments in transit and transit promotion.

Summary of Approaches 1 and 2

Without studying likely investments and expenditures in South Carolina more closely, it is not possible to provide a single, hard cost-effectiveness figure. Nevertheless, the preponderance of evidence supports a conclusion that substantial investments in transit, transit promotion, and related programs (walk/bike access to transit, etc.) will produce CO_2 reductions at *net savings*.

Key Assumptions:

Transit ridership will increase proportionally with transit spending.

The new 1.75-cent sales tax for transit would take effect in 2010.

Key Uncertainties

Described in detail under TLU-4, above.

Additional Benefits and Costs

None cited.

Feasibility Issues

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

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-6. Alternative-Fuel Infrastructure

Policy Description

This policy seeks to increase market penetration of alternative fuels in South Carolina through accelerated development of an alternative-fuel infrastructure. Potential measures include establishing storage and distribution systems, connecting key corridors in the Southeast to offset the expense of equipment and installation, and developing convenient locations of stations offering alternative fuels at competitive prices. This policy will provide consumers more choices in transportation fuel (such as ethanol, biodiesel, compressed natural gas, propane, electricity, and hydrogen); and will reduce GHG emissions through increased consumer access to cleaner-burning alternative fuels; will aid decision makers, businesses, and the general public in the increased production and use of alternative fuels, and the technology necessary for the expansion of alternative fuels; and will support energy supply diversity, benefit the environment, and create economic opportunities in South Carolina.

Policy Design

Goal: Support the implementation of the TLU-12 (Low-GHG Fuel Standard) goal of decreasing the net life-cycle carbon in South Carolina's total transportation fuels by 10% in 2020. Expanding alternative-fueling infrastructure is key to increasing the market penetration of alternative fuels and the number of alternative-fuel vehicles in South Carolina.

Timing: begin policy development immediately to reach 10% by 2020.

Parties Involved: State, all industries in the fuel production, supply, and distribution chain.

Other: None cited.

Implementation Mechanisms

To be successful, this policy would incentivize fuel production and increase the efficiency of the distribution network, including bulk fuel distribution terminals, blending facilities, rail service, over-the-road tankers, and fueling stations. Funds for these implementation mechanisms could be generated through, for example, a portion of the fuel user fee, vehicle registrations, or Congestion, Mitigation, and Air Quality funds.

This policy would benefit from the following actions:

Incentives for Retailers and Distributors

- Pursue expanded incentives for retailers, including tax credits, grants, or low-interest loans for infrastructure installation. Specifically, create a grant program for alternative-fuel infrastructure development and large commercial storage facilities to be funded at $1 million/year for up to 5 years. At approximately $20,000/pump, this would fund 50 new E85 pumps/year. The grant program would be administered by the South Carolina Department of Agriculture.

- Provide state funds and/or loan guarantees for construction of storage and distribution infrastructure.
- Provide state funds for statewide marketing of availability and benefits of alternative fuels.

Incentives for Consumers

- Pursue expanded incentives for vehicle purchase and demonstrated fuel use.
- Create a fuel-cost buy-down program to ensure reduced fuel costs.

Information and Education

- Use information and education outreach to encourage retailers and distributors to install infrastructure. Provide retailers, fleets, and the public with information about the beneficial environmental and economic effects of using alternative fuels.
- Provide alternative-fuel interstate signage through state funding or reduced costs. Specifically, the state should appropriate a one-time fund of $1 million for the production of E85 and biodiesel signage that can be posted on the exits of retail stations that offer alternative fuels. The money would be used over the next 5 years to enhance public awareness of alternative-fuel availability and the effectiveness of the alternative-fuel infrastructure grant program. SC DOT should be designated to oversee the interstate signage program.
- Implement reduced rates for alternative fuels.

Revisions to Existing Legislation

- SC Code 12-63-20(B)(1)-(B)(2)—Commence the incentive payment for alternative-fuel purchase in FY 2008–2009; extend the incentive payment beyond FY 2011–2012 to FY 2019–2020; and remove fiscal year caps ($1.5 million/year from FY 2009 through FY 2012) on incentive payments for retailers selling alternative fuels.
- SC Code 12-63-20-(C)(1)-C(2)—Eliminate the cap of $100,000/year/taxpayer for 5 years for electricity produced from biomass resources and for methane gas fuel produced from biomass resources; extend the incentive payment from FY 2017–2018 to FY 2019–2020; and remove fiscal year caps ($100,000/year/taxpayer for 5 years) on incentive payments for production of electricity or methane gas from biomass resources.
- SC Code 12-6-3610—Remove fiscal year caps on the tax credit for ethanol and biodiesel dispensing equipment.

Related Policies/Programs in Place

- Palmetto State Clean Fuels Coalition—a collaboration of public and private agencies and businesses working to promote the acquisition and use of alternative-fuel vehicles and to create a network of alternative-fuel facilities.
- South Carolina incentives for fuel production.
- South Carolina incentives for fuel distribution.
- South Carolina tax credits for installation of alternative fueling infrastructure.
- Federal tax Credit for Alternative-Fuel Vehicle Refueling Property.

- South Carolina incentives for alternative-fuel vehicles.
- Federal tax credits for alternative-fuel vehicles.
- The Energy Policy Act of 2005 includes provisions requiring an increasing volume of renewable fuel to be included in the gasoline sold in the United States. The act instructs EPA to establish a Renewable Fuel Standard program to oversee the increase. In April 2007, EPA issued a rulemaking that requires refiners, blenders, and importers of motor vehicle fuels to increase the proportion of renewable fuel in their products.
- U.S. Department of Agriculture (USDA) Biomass Fuel Incentive Program.
- USDA energy grants and loans.
- SC DHEC Underground Storage Tank Division Alternative Fuels Checklist for Installation, available at: http://www.scdhec.gov/environment/lwm/forms/d-2101.pdf
- Existing network of public and private fueling facilities.

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-11 presents the estimated GHG reductions and net costs of or cost savings from TLU-6.

Table I-11. Estimated GHG reductions and net costs of or cost savings from developing an infrastructure for alternative-fuel vehicles

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-6	Alternative-Fuel Infrastructure	0.02	0.24	0.77	$54	$70	UC

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

Data Sources:

SCEO estimates that sales of E85 and B100 will grow by 35% per year with the new incentive payment to retailers of 5 cents/gallon for E85 and 25 cents/gallon for B100. Projections are based on sales data from the South Carolina Department of Revenue for 2004–2007. Total projected sales are presented in Table I-12.

Table I-12. Projected sales of B85 and B100 in South Carolina

Biodiesel Fuel	FY 2009–2010 (gallon)	FY 2010–2011 (gallon)	FY 2011–2012 (gallon)
E85	4,455,000	6,014,260	8,119,240
B100	3,307,500	4,465,124	6,027,920

E85 = gasoline containing 85% ethanol; B100 = 100% biodiesel fuel.

- Projected fuel consumption from Center for Climate Strategies, *Final South Carolina Greenhouse Gas Inventory and Reference Case Projections, 1990–2020*, prepared for the Climate, Energy, and Commerce Advisory Committee of the Office of the Governor of South Carolina, June 2008.
- Impacts of B100 (–54% per mile) and E85 (–18% per mile) based on CCS analysis using GREET model (version 1.7). Available at: http://www.transportation.anl.gov/software/GREET/

Quantification Methods: TLU-6 is expected to support the implementation of TLU-12 and the goal of decreasing the net life-cycle carbon in South Carolina's total transportation fuels by 10% in 2020. The figures provided here represent the projected emission reductions from implementation of TLU-6 in the absence of TLU-12.

Alternative-fuel sales in years after 2011–2012 are projected based on two scenarios: the extension of the tax credit and the expiration of the tax credit. (See below for the key assumptions used in those projections.) The impact of the proposed policy on alternative-fuel sales is calculated as the difference between the two scenarios. The impact of the proposed policy begins in FY 2012–2013, when the existing tax credit is set to expire.

The impact of the additional alternative fuel sales on GHG emissions is calculated using reduction factors derived from the GREET model.

The cost of this policy represents the government cost of incentive payments to retailers, the alternative-fuel interstate signage fund, and the grant program for alternative-fuel infrastructure development. It is assumed that the latter two funds will be used in full and will contribute to the total sales projected under the first scenario above.

Key Assumptions:

- Sales of E85 and B100 in FY 2009 through 2012 are attributable to the existing tax credit.
- If the existing tax credit expires as planned in 2012, growth in alternative-fuel sales will track growth in overall fuel sales in subsequent years.
- If the existing tax credit is extended past 2012, per this policy, growth in alternative-fuel sales will continue at 35%/year.
- Projected alternative-fuel sales in FY 2009–2012 can all be attributed to the proposed policy.

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-7. Diesel Engine Emission Reductions and Fuel Efficiency Improvements

Policy Description

This policy would reduce on- and off-road diesel emissions and the use of diesel fuel in the public and private sectors by promoting a variety of technology practices that provide alternatives to or greater efficiency in diesel fuel use. This policy has the collateral benefits of improving air quality and reducing exposure to air toxics.

Policy Design

This policy would promote and fund technologies that provide alternatives to and greater efficiency in petroleum diesel fuel use through continued implementation of effective existing state programs and support of new state programs, including the following:

- *Multisector Technologies:*
    - Broaden use of anti-idling technologies currently available but not widely used for locomotives, trucks, and other diesel engines (applicable sectors: freight, public and private fleets).
    - Substitute engine rebuilds, repowers, and replacements with more fuel-efficient engines or add-on technologies (applicable transportation sectors: ferries, freight, public and private fleets).
    - Develop technologies to reduce rolling resistance (such as single-wide tires), low-viscosity lubricants, weight reduction and improvements to aerodynamics (applicable sectors: freight, public and private fleets).
    - Augment or replace petroleum fuel use with biodiesel, biogas, natural gas, or other low-carbon fuels (applicable sectors: ferries, freight, ports, public and private fleets).
    - Replace freight-handling equipment with battery electric, hybrid, or plug-in electric hybrid equipment (applicable sectors: ports, freight).
- *Existing Programs:* Where applicable, existing effective emission reduction programs for public fleets will promote and fund the technological options listed above.
- *New Programs:* The state also needs new programs to reduce private-fleet diesel emissions and diesel fuel use. Successful examples include programs similar to California's Carl Moyer grant program or the Texas Emission Reduction Program. Options could include development of a State Infrastructure Bank targeting low- and no-interest loans and revolving funds for private- and public-sector use to support scrappage of inefficient technology with more efficient technology.
- Other options may include placing diesel emission reduction equipment and fuel use requirements into state and local government public construction contracts to leverage private fleet conversion or creating regulatory requirements to switch fuels and retrofit existing engines and equipment in various fleet sectors.

Goals: Targets and timetables for fuel use reduction and installation of diesel idle-reduction equipment in the sectors identified above follow. The state should provide funding for grant and incentive programs to augment the current funding provided by the state legislature in the upcoming legislative session. Goals should be periodically evaluated for progress, and for the availability and price of fuels and technologies.

- Broaden use of anti-idling technologies.
  - Public fleets: 50% of vehicles by 2015, with 100% beginning in 2020.
  - Private long-haul fleets and other fleets: 25% of vehicles by 2015, 50% by 2020, 75% by 2035, and 100% by 2050.
- Substitute engine rebuilds, repowers, and replacements with more fuel-efficient engines or add-on technologies.
  - No goals are recommended. These are primarily applicable to marine and locomotive applications. Although they have some limited potential, there is little information on which to base a goal.
- Implement technologies to reduce rolling resistance.
  - Private long-haul fleets: 50% of vehicles by 2015, 100% by 2020.
- Replace petroleum fuel use with low-carbon, cost-effective fuels produced in South Carolina or in the U.S. Southeast.
  - Public fleets: 100% biodiesel use (B100) by 2015.
  - Private fleets: 25% B20 (fuel blend of 20% biodiesel) use by 2015, 75% B20 use by 2020, and 100% B20 use by 2035.
- Replace freight-handling equipment with battery electric, diesel hybrid, or plug-in diesel electric hybrid equipment.
  - Battery: 10% of equipment by 2015, 25% by 2020, 50% by 2035.
  - Diesel hybrids: 25% of equipment by 2015, 50% by 2020, reducing to 25% in 2035, and 0% in 2050 as they are replaced by plug-in hybrids.
  - Plug-in diesel hybrids: 0% by 2015, 10% by 2020, 25% by 2035, and 50% by 2050.

Timing: By 2020 with milestones.

Parties Involved: State legislature, state agencies, regional air agencies, city and county governments, EPA (especially EPA SmartWay), U.S. Department of Energy (DOE), South Carolina Trucking Association, railroads, ports.

Implementation Mechanisms

Set strong goals and targets short of a fuel mandate, and provide grants and incentives.

Related Policies/Programs in Place

Over the past several years, and particularly since diesel fuel prices have increased substantially, truck owners and operators have accelerated their use of fuel-saving techniques, devices, and

technologies. They have also have every reason to shut off their engines when it is practical and economical to do so.

The private sector, trade groups, and vendors offer training and education about technologies currently available and under development. Manufacturers and vendors are constantly marketing their products.

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-13 presents the estimated GHG reductions and net costs of or cost savings from TLU-7.

Table I-13. Estimated GHG reductions and net costs of or cost savings from reducing emissions from and improving the fuel efficiency of diesel engines

Policy No.	Policy Recommendation		GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
			2012	2020	Total 2008–2020			
TLU-7	Diesel Engine Emission Reductions and Fuel Efficiency Improvements	Efficiency Improvements	0.03	0.19	0.96	–$110	–$114	UC
		Biodiesel	0.05	0.38	1.95	–$291 to $319	–$150 to $164	SM

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; UC = unanimous consent; SM = super majority.

Data Sources:

- Vehicle population data from U.S. DOT, FHWA, "Highway Statistics, 2006," February 27, 2008. Available at: http://www.fhwa.dot.gov/policy/ohim/hs06/
- Vehicle annual idling hours estimated by the Puget Sound Clean Air Agency and the Washington State Department of Ecology. Provided via personal communication.
- Truck annual mileage assumptions based on two sources: U.S. EPA, Office of Transportation and Air Quality, *User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model*, EPA420-R-03-010August 2003, available at: http://www.epa.gov/OMSWWW/models/mobile6/420r03010.pdf; and U.S. Census Bureau, "Vehicle Inventory and Use Survey," 2002 data releases, available at: http://www.census.gov/svsd/www/vius/products.html
- Current year fuel economy assumptions based on U.S. DOE, Office of Energy Efficiency and Renewable Energy, "Transportation Energy Data Book—Chapter 4: Light Vehicles and Characteristics," 2005 data, available at: http://cta.ornl.gov/data/chapter4.shtml; and information provided in personal communications by the Puget Sound Clean Air Agency and the Washington State Department of Ecology. (Note that assumed HDV fuel consumption rates are based in part on tests performed by EPA on a sample of heavy heavy-duty (Class 8)

trucks (greater than 33,000 pounds [lb] gross vehicle weight [GVW]), and may not be representative of fuel consumption rates for medium heavy-duty trucks (14,000–33,000 lb GVW). Therefore, the numbers presented here should be considered an estimate of the potential maximum.)

- Baseline future improvements in truck fuel economy based on U.S. DOE, Energy Information Administration (EIA), *Annual Energy Outlook 2007: With Projections to 2030,* IDOE/EIA-0383(2007), February 2006. Available at: http://tonto.eia.doe.gov/ftproot/forecasting/0383(2007).pdf. (Assumes 0.57% annual improvement in HDV fuel economy.)
- Fuel economy impacts of truck efficiency strategies based on the U.S. EPA FLEET (Freight Logistics Environmental and Energy Tracking) Performance Model and SmartWay Transport Partnership. Available at: http://www.epa.gov/smartway/smartway_fleets_software.htm
- Impacts of biodiesel (B20) on life-cycle GHG emissions per mile (–11%) based on CCS analysis using GREET model (version 1.7). Available at: http://www.transportation.anl.gov/software/GREET/
- National fuel price forecasts from U.S. DOE, EIA, *Annual Energy Outlook 2008: With Projections for 2030*, DOE/EIA-0383(2008), March 2008 (revised). Available http://www.eia.doe.gov/oiaf/aeo/
- Historical retail prices of B20 from U.S. DOE, Office of Energy Efficiency and Renewable Energy, "Clean Cities Alternative Fuel Price Report," 2001–2007. Available at: http://www.eere.energy.gov/afdc/price_report.html

Quantification Methods:

Anti-Idling

- The total gallons of diesel fuel consumed by idling are estimated at 0.82 gallons per idling hour, using vehicle population figures and estimates of annual idling hours per vehicle. Also estimated are the proportion of total idling that could be reduced in each year and the resulting reduction in GHG emissions.
- Cost analysis includes installation of PonyPack auxiliary power units on new combination trucks, at a cost of $5,600.
- Fuel use in PonyPack is 0.2 gallons/hour, compared to an average rate of 0.75 gallons/hour for the truck engine.
- For other HDVs, no equipment installation is required. Idling is reduced through training, education, and regulation.

Truck Efficiency

- The average improvement in truck fuel efficiency is estimated at 6%, based on data from the EPA FLEET Performance Model. Also estimated are the potential fuel savings for all long-haul trucks registered in South Carolina and the resulting reduction in GHG emissions.
- Cost estimation includes:

- Installation of single-wide tires and wheels on new combination trucks, in lieu of dual tires and wheels, at a cost savings of $1,040 per truck.
- Installation of trailer side skirts on a combination truck trailer, at a cost of $2,400, and installation of NoseCone on single-unit trucks at a cost of $700.
- Use of low-friction engine and drive-train lubricants, at a cost of $118/year for combination trucks and $18/year for single-unit trucks.

Biodiesel

- The total amount of diesel fuel consumed by private and public fleets after implementation of anti-idling and efficiency measures is first estimated. Then the additional emission reductions from displacement of diesel fuel with biodiesel are calculated according to the policy goals.
- The cost of the biodiesel component as the additional cost of biodiesel fuel at the pump is calculated, plus the additional social cost of the federal subsidy to biodiesel blenders. The current federal subsidy for biodiesel from virgin oils is $1/gallon. Therefore, a gallon of B20 has an inherent subsidy of 20 cents.
- The key driver in the cost of biodiesel is the future price of biodiesel compared to conventional diesel. To CCS's knowledge, neither EIA nor any other U.S. government agency issues biodiesel price forecasts. In the absence of official forecasts, high- and low-price scenarios for biodiesel are developed as follows:
  - The high-price scenario assumes that the current price of B20 relative to diesel remains constant to 2020. At present, the retail costs of B20 and diesel are about the same per gallon nationwide, but B20 is more expensive on a per-mile basis.[52] Federal subsidies to producers of biodiesel also increase the total cost of B20 over diesel.
  - The low-price scenario assumes that the recent trend of falling biodiesel prices will continue in future years. The price of biodiesel relative to diesel fell an average of 2.4% per year from 2001 to 2007.[53] If this trend continues, a gallon of B20 will cost about 29% less than a gallon of diesel at the pump in 2020.

Cargo-Handling Equipment

- To quantify the impact of this measure, an emissions inventory of cargo-handling equipment at South Carolina ports is needed. Although the ports themselves own cranes and lift trucks, a majority of cargo-handling equipment is privately owned.[54] The additional impact of this measure is expected to be very small.

Key Assumptions:

- Emission reduction benefits generally will increase linearly between 2015 and 2020. The benefits for years before 2015 are estimated by linear extrapolation.

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[52] B20 is currently only slightly more expensive than diesel on a per-gallon basis in South Carolina. According to Jeff McCormick of the South Carolina Budget and Control Board, the current additional cost of B20 relative to diesel for state fleets is 5.4 cents/gallon.

[53] We estimate the annual decline in price using a least-squares regression analysis.

[54] Source: David Schronce, South Carolina State Ports Authority.

- The annual growth in diesel vehicle populations is 1.15%.
- The current federal subsidy of $1/gallon of biodiesel from virgin oils will be extended at least through 2020.
- The additional cost of B20 relative to diesel at retail pumps will equal the current cost differential for the state fleet and will hold steady at least until 2020.
- These policies apply only to vehicles registered in South Carolina.

Key Uncertainties

None cited.

Additional Benefits and Costs

The incentives provided to replace petroleum fuels with low-carbon fuels may be detrimental to other markets, resulting in secondary costs.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

7a. Unanimous.

7b. Super Majority (two objections).

Barriers to Consensus

Concerns expressed include secondary costs and detrimental effects on the petroleum market from the implementation of 7b.

TLU-8. Stricter Enforcement of Speed Limits

Policy Description

Reduced vehicle speeds can improve fuel economy and safety and decrease CO_2 emissions. In many cases, vehicle speeds could be reduced by increased enforcement of existing speed limits. Significant enforcement resources spread among multiple government units may be needed for this measure to achieve the expected reductions.

Policy Design

Goal: Reduce the average speed of speeding vehicles by 5 miles per hour (mph) on all highways and major speedways, thereby reducing emissions. Reducing speed to 55 mph on highways typically improves fuel efficiency in both LDVs and HDVs.[55,56]

Timing: Undertake a feasibility study to determine if this policy is viable.

Parties Involved: Federal, state, local governments and academic experts.

Implementation Mechanisms

Implementation would depend on the results of the feasibility study, but would probably involve raising and deploying additional enforcement personnel, increasing signage, and employing a significant public information campaign.

Related Policies/Programs in Place

None cited.

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-14 presents the estimated GHG reductions and net costs of or cost savings from stricter enforcement of speed limits.

[55] Greg Dierkers et al. CCAP Transportation Emissions Guidebook—Part One: Land Use, Transit & Travel Demand Management. Guidebook Emissions Calculator. Washington, DC: Center for Clean Air Policy. Available at: www.ccap.org/guidebook.

[56] Cummins. "Every Drop: Secrets of Better Fuel Economy." 2006. Available at: http://www.kenworth.com.au/kenworth/pdf/Cummins_Fuel_Economy_Guide.pdf

Table I-14. Estimated GHG reductions and net costs of or cost savings from stricter enforcement of speed limits

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO2e)	Level of Support
		2012	2020	Total 2008–2020			
TLU-8	Stricter Enforcement of Speed Limits	0.10	0.12	1.18	NQ	NQ	UC

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent.; NQ = not quantified; UC = unanimous consent.

Data Sources:

- VMT from the Center for Climate Strategies, *Final South Carolina Greenhouse Gas Inventory and Reference Case Projections, 1990–2020*, prepared for the Climate, Energy, and Commerce Advisory Committee of the Office of the Governor of South Carolina, June 2008.
- Annual VMT by vehicle and facility type from U.S. DOT, FHWA, "Highway Statistics 2005 (VM-1)," March 15, 2007. Available at: http://www.fhwa.dot.gov/policy/ohim/hs05/
- Annual VMT by facility type from SC DOT projections.
- U.S. EPA, Office of Transportation and Air Quality, SmartWay Transport Partnership, *A Glance at Clean Freight Strategies: Reducing Highway Speed,* EPA420-F-04-007, February 2004. Available at: http://www.epa.gov/smartway/smartway_fleets_strategies.htm
- Greg Dierkers et al., *CCAP Transportation Emissions Guidebook*, Guidebook Emissions Calculator, Center for Clean Air Policy. Available at: www.ccap.org/guidebook
- Speed reports from automatic traffic recorders provided by SC DOT.

Quantification Methods:

- VMT for each future year are calculated for rural and urban highways using FHWA data on VMT by vehicle and facility type and SC DOT projections of VMT by facility type.
- The amount of vehicle travel by LDVs and HDVs that could be slowed by 5 mph under the proposed policy is based on the key assumptions below. As a general rule, the fuel efficiency of vehicles traveling on highways increases as speeds are reduced to 55 mph (EPA 2004, Dierkers et al.). It is assumed that stricter speed enforcement would target only those vehicles traveling 5 mph or more over the speed limit on highways with limits of 55 mph or more. The average reduction in speed by targeted vehicles would be 5 mph.
- The reduction in CO_2 emissions from the improved fuel economy of targeted vehicles is calculated, along with cumulative reductions beginning in 2010.
- The direct cost of this policy to public agencies will include hiring and deploying additional enforcement personnel, increasing signage, and mounting a public information campaign. The proposed feasibility study should attempt to estimate the costs of the program.

Key Assumptions:

- Each 1-mph reduction of speed from 70 mph to 55 mph yields a fuel economy increase of 0.1 mpg for heavy-duty diesel trucks (EPA 2004).
- Each 1-mph reduction of speed down to 55 mph yields a 1% reduction in CO_2 emissions per mile (Dierkers et al.).
- The 50% of vehicle travel on South Carolina's highways and freeways that occurs at speeds of over 60 mph could be slowed by stricter enforcement of existing speed limits. (This assumption is based on speed reports for a single day from 10 randomly chosen sites on South Carolina highways. The sites represent a mix of urban and rural freeways and highways in all parts of the state.)

Key Uncertainties

None cited.

Additional Benefits and Costs

Additional costs include the value of time lost due to slower travel speeds. Additional benefits include savings on fuel and potential improvements in highway safety.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-9. Make Full Use of CMAQ Funds

Policy Description

This policy would fully allocate all Congestion Mitigation and Air Quality (CMAQ) funding to reduce transportation-related emissions and fund various emission reduction strategies with emphasis on projects that reduce GHGs, and would facilitate funding of local matches to support selection and implementation of high-GHG-impact projects.

Policy Design

Goals:

- Responsively expend all CMAQ funds allocated to the state to reduce emissions in accordance with federal guidelines.
- Invest in projects and programs that reduce air pollutants in nonattainment and maintenance areas.
- Quantify emission reductions to establish prioritization of projects.
- Include public participation in diversifying projects that reduce GHG emissions.
- Increase public awareness concerning statewide strategies to reduce congestion and emissions.

Timing: Programs to achieve these goals are currently underway. During the next funding cycle, SC DOT will enhance public awareness of the air quality benefits of existing programs. The public participation process can be created immediately and implemented during each funding cycle.

Parties Involved: SC DOT, FHWA, SC DHEC, statewide public participation.

Other: FTA, MPOs, EPA as needed.

Implementation Mechanisms

Annual funding is available to states. SCDOT and nonattainment areas receive an allocation based on a pre-established formula. All new projects are selected, evaluated, and approved for inclusion in the Statewide Transportation Improvement Program.

Related Policies/Programs in Place

- U.S. DOT, CMAQ Improvement Program.
- SC DOT Incident Responder Program.
- Rock Hill-Fort Mill Area Transportation Study—CMAQ Project Funding Process.

The primary purpose of the CMAQ Improvement Program is to improve air quality in EPA-designated nonattainment and maintenance areas by reducing transportation-related emissions. A *nonattainment area* is an area formally designated (in the Code of Federal Regulations) by EPA

as not meeting the National Ambient Air Quality Standards (NAAQS). A *maintenance area* is a former nonattainment area that has subsequently attained the NAAQS and has been officially redesignated as an attainment area by EPA. Because CMAQ funds are intended to improve air quality, funds must be spent in nonattainment or maintenance areas.

Funding for the CMAQ Improvement Program is apportioned to states based on the population within the nonattainment areas and the severity of the air quality problem, with all states guaranteed to receive a minimum of 0.5% of each year's federally approved CMAQ budget. CMAQ funds require a state or local match. The typical split between federal and project sponsor is 80% federal and 20% state and/or local match.

Funds are apportioned to the state DOTs annually. Once the funds are apportioned, they are available for 4 years, and may be "obligated" (or dedicated) to specific CMAQ projects. Eligible projects include:

- Transit and public transportation programs,
- Traffic flow improvements,
- Travel demand management strategies,
- Ridesharing programs,
- Pedestrian and bicycle programs,
- Education and outreach,
- Inspection and maintenance programs,
- Extreme Cold Start programs,
- Alternative "clean" fuels,
- Public–private partnerships, and
- Experimental pilot projects.

Each of the last 3 years South Carolina has received approximately $10 million in CMAQ contract authority. Taking into account obligation limitations and other federal rescissions, the amount of CMAQ funding to the state is a yearly matched total of approximately $7.7 million. Subtracting the matched mandatory amount of $2.5 million ($2 million federal) for York County, approximately $5.2 million annually in matched CMAQ discretionary funds remain for the Statewide Motor Assistance Program (MAP).

SC DOT realized that consequences from highway incidents include traffic congestion, increased fuel consumption, and increased air pollution. A single incident can cause traffic delays that can result in devastating secondary incidents. Minimizing the time needed to return a highway to normal flow can greatly reduce traffic delays and the negative impacts on both highway travelers and the environment. The MAP was created and implemented as an incident management tool to assist with traffic flow. The program covers over 400 miles and operates 7 days a week on many of South Carolina's interstate and primary routes. SC DOT's MAP serves motorists traveling in the Beaufort, Charleston, Columbia, Florence, Grand Strand/Myrtle Beach, Rock Hill, and Greenville/Spartanburg urban areas.

In March 2008, EPA revised the NAAQS to increase the stringency of the 8-hour ozone standard. As a result, all counties with air quality monitors in South Carolina exceed the new standards. Because the resultant nonattainment designations may include several counties—even those without monitors, or partial counties—it is feasible that many counties in South Carolina will be designated as nonattainment areas.

Type(s) of GHG Reductions

None cited.

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-15 presents the estimated GHG reductions and net costs of or cost savings from making full use of CMAQ funds.

Table I-15. Estimated GHG reductions and net costs of or cost savings from making full use of CMAQ funds

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-9	Make Full Use of CMAQ Funds	Not quantified					UC

CMAQ = Congestion Mitigation and Air Quality; GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; UC = unanimous consent.

Data Sources: None.

Quantification Methods: This policy is not quantified because it does not specify any particular types of projects or programs to reduce GHG emissions. The policy will most likely support the achievement of emission reductions estimated for other policies, including TLU-2, TLU-4, and TLU-5.

Key Assumptions: Not applicable.

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

TLU-10. Commuter Choice and Commuter Benefits Programs

Policy Description

This policy would reduce SOV commutes through broader implementation of Commuter Choice and Commuter Benefits programs, which in turn would increase the number of employers providing such programs. Certain elements of these programs would be applicable to both the public and the private sectors, while others would be specific to one or the other.

[Note: The programs and actions recommended under this policy complement the programs and actions recommended under TLU-2—Transportation System Management, TLU-4—Improve Development Patterns, and TLU-5—Transit & Bike-Pedestrian.]

Policy Design

Goals: Enable all employers in the state with over 50 employees to provide options for employees to reduce SOV commutes and GHG emissions.

The Commuter Benefits programs provide employees with alternative transportation options and incentives under programs, such as:

- Employers contracting with transit agencies to provide service directly to employment centers,
- Carpools,
- Pre-tax transit fare programs,
- Parking cash-out programs, and
- Guaranteed ride-home service.

Under these Commuter Benefits options, the total number of employee commuter trips would not be reduced. Rather, the trips would be consolidated into fewer vehicles and thereby decrease total VMT.

The Commuter Choice programs, on the other hand, are designed to reduce total employee trips by substituting telecommuting for trips to and from a place of employment. The telecommuting option includes the development and use of neighborhood telecommuting centers that offer office-type services in locations close to commuters' residences. As an incentive to develop and provide such services, a tax credit can be offered to companies. Government spending to encourage commuter choice can stimulate a large private-sector match.

Timing: The timing for creating and implementing the above-listed programs will vary, because many will require, if feasible, the enactment of legislation and the promulgation of regulations.

Parties Involved: Governor's office, cabinet agencies, and all other state agencies, state legislature, counties and municipalities, school districts, universities and colleges, mass transit agencies and providers, private-sector employers.

Other: None cited.

Implementation Mechanisms

Commuter Benefits Programs

- Enact legislation to encourage, if feasible, all private-sector employers of over 50 employees to offer Commuter Benefits programs.
- Enact legislation to require, if feasible, all colleges and universities to offer Commuter Benefits programs.
- Enact legislation to require, if feasible, all state agencies, counties, and municipalities to offer Commuter Benefits programs.
- Enact legislation to require, if feasible, all school districts to offer Commuter Benefits programs.
- Enact legislation to require, if feasible, all state agencies to charge appropriate parking fees to cover the costs of constructing and maintaining parking lots and/or facilities for employees.
- Enact legislation creating a state vanpool program.
- Develop an appropriate incentive structure to encourage the implementation of Commuter Benefits and Commuter Choice programs.

Commuter Choice Programs

- Establish a public–private partnership to develop and run telecommuting centers that offer office-type services in locations close to commuters' residences.
- Establish best practices in transportation demand management (TDM), and assist employers of over 500 employees in developing and implementing TDM plans.

Related Policies/Programs in Place

- IRS Section 132(f) of the Internal Revenue Code.
- EPA's Best Workplaces for Commuters^{sm} Program.
- SmartRide Program (Camden/Lugoff to Columbia) (Newberry/Little Mountain/Chapin to Columbia).
- Charleston Park and Ride.
- City of Rock Hill Park and Ride.

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-16 presents the estimated GHG reductions and net costs of or cost savings from Commuter Choice and Commuter Benefits programs.

Table I-16. Estimated GHG reductions and net costs of or cost savings from Commuter Choice and Commuter Benefits programs

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-10	Commuter Choice	0.12	0.43	2.63	–$631	–$240	UC

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO2e = dollars per metric ton of carbon dioxide equivalent; UC = unanimous consent.

Data Sources:

- Employment figures from U.S. Census Bureau, "County Business Patterns for 2005" (http://censtats.census.gov/cbpnaic/cbpnaic.shtml), and South Carolina Employment Security Commission (http://www.sces.org).
- U.S. Department of Labor, Bureau of Labor Statistics (BLS), "Employment Projections 2006–2016 Summary," USDL 07-1847, December 4, 2007. Available at: http://www.bls.gov/news.release/ecopro.nr0.htm
- Average daily commute trip length in South Carolina from U.S. DOT, FHWA and Bureau of Transportation Statistics, "National Household Travel Survey," 2001. Available at: http://www.bts.gov/programs/national_household_travel_survey/ and http://nhts.ornl.gov/
- EPA COMMUTER model. Available at: http://www.epa.gov/oms/stateresources/policy/pag_transp.htm
- Best Workplaces for Commuters, "Business Savings Calculator." Available at: http://www.bwc.gov/resource/calc.htm

Quantification Methods:

The number of employees affected by the policy statewide is calculated. About 890,000 people work for nongovernment employers who have more than 50 employees. State and local governments employ an additional 300,000 people. Therefore, this policy would apply to 1.2 million workers statewide, or more than half of the state's employed workers.

Annual employment growth rates from the U.S. Department of Labor's Bureau of Labor Statistics are applied to calculate the number of affected employees in each year to 2020. The total commuter trip VMT of these employees is calculated using average trip lengths from the 2001 National Household Travel Survey.

The success of this policy depends heavily on the availability of alternatives to driving alone to work. Possible alternatives include carpooling, public transit, walking, bicycling, and telecommuting. At present, many urban and rural locations in South Carolina offer few viable alternatives to driving alone to work. To calculate the VMT reduction from commuter benefit programs, we assume a ramp-up period to 11.5% reduction in 2020. The ability of the average

employer to reduce employees' VMT by this amount will depend upon the implementation of other policies, particularly TLU-5—Transit & Bike-Pedestrian.

The first-order costs and benefits of Commuter Benefits programs are considered. The cost to employers includes any cash incentives to employees, as well as administrative costs and some small capital costs. Employers save money on parking facilities and, in the case of telecommuter incentives, on office space. The net cost to employers is around –$100/tCO$_2$e for the scenarios considered. The cost to employees is simply the value of cash incentives. The average was –$140/tCO$_2$e. any foregone state and federal tax revenue were not considered.[57]

The estimated net present value and cost-effectiveness are in line with the tremendous savings that have been realized by Commuter Choice/Commuter Benefit programs implemented throughout the country and documented by a number of studies. For example:

- Unlimited Access transit at the University of California-Los Angeles costs $810,000/year, and has total benefits of $3,250,000/year[58]—a more than 400% return on investment. Similar programs at other universities show similar results.[59] The many educational institutions in South Carolina could see similar savings.
- Universities are in some senses unique institutions, but the general types of challenges (especially the demand for and costs of providing parking) and the types of benefits enjoyed in response to Commuter Benefits programs are equally available to businesses. A report on this topic notes:

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

- Information about and promotion of Transit and non-SOV options are likewise highly cost-effective. Per public dollar, a TMO can accommodate the transportation needs of seven times as many commuters as new highway investment.[61]

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[57] Calculated using the Best Workplaces for Commuters Business Savings Calculator. Available at: http://www.bwc.gov/resource/calc.htm.

[58] Jeffrey Brown, Daniel Hess, and Donald Shoup. "Fare-Free Public Transit at Universities: An Evaluation." Journal of Planning Education and Research 2003;23:69–82. Available at: http://jpe.sagepub.com/cgi/content/abstract/23/1/69

[59] Jeffrey Brown, Daniel Hess, and Donald Shoup. "Unlimited Access." Transportation 2001;28:233–267, Kluwer Publishers. Available at: http://www.uctc.net/scripts/countdown.pl?525.pdf

[60] Ibid., p. 260.

Key Assumptions:

- The average reduction in employee VMT by employers providing Commuter Benefits programs is 11.5%. (This assumption is based on the average results of several possible program configurations for businesses in downtown, urban, and suburban locations, as determined by EPA's COMMUTER model.)
- All commercial establishments with 50 or more employees will provide benefits.
- All state and local government agencies, colleges, universities, and schools will provide benefits.

Key Uncertainties

Key assumptions noted above under the quantification section are relevant here.

Additional Benefits and Costs

Any reduction in miles driven results in a net savings to drivers, due to savings on gas and vehicle maintenance. The value of this benefit is in the range of $600 per metric ton of GHGs.

Implementing this policy will also help reduce criteria pollutants, which in turn will help areas in the state meet the new NAAQS ozone and particulate standards. Besides creating public health risks, a violation of the NAAQS could lead to economic development difficulties with recruiting new facilities and developing new roadway projects.

Feasibility Issues

The success of this policy depends heavily on the availability of alternatives to driving alone to work. Possible alternatives include carpooling, public transit, walking, bicycling, and telecommuting. At present, many urban and rural locations in South Carolina offer few viable alternatives to driving alone to work.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

[61] Minnesota Department of Transportation. Modal Options Identity Project. "Measurement and Evaluation." 2006. (Not available online.)

TLU-12. Low-GHG Fuel Standard

Policy Description

This policy seeks to reduce GHG emissions by decreasing the carbon intensity of all passenger vehicle fuels sold in the state. Toward this end, South Carolina should observe the California plan to reduce GHG fuel emissions as it is put into practice and note the real-world successes and failures of that template. Low-carbon fuels include biodiesel, cellulosic ethanol, hydrogen, compressed natural gas, liquefied petroleum gas, electricity, and low-carbon blends, such as E10 and E85.

The California standard is 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 demonstrate annually that their fuel mixtures provided to the market meet the low-carbon standard. Options for compliance may include blending or selling increasing amounts of lower-carbon fuels, using previously banked credits, and purchasing credits from fuel providers who earned credits by exceeding the standard. Penalties for noncompliance will be determined during the implementation process.

A low-GHG fuel standard in South Carolina must take into consideration the state's dependence on Gulf Coast refineries and on the existing transportation system via two major pipelines originating in the Gulf and terminating in New York Harbor. Incentivizing the production, development, and marketing of low-GHG fuels should continue and will promote their availability and use. With respect to the state's dependence on Gulf Coast refineries and on existing transportation systems, producing alternative fuels within the State and encouraging further in-State production of these fuels as much as possible has multiple economic benefits (e.g. job creation).

There is also a need to acknowledge regional assets in the development of specific fuels and to use the state's resources to stimulate technological innovation to further develop these fuels.

Policy Design

Goal: Reduce the carbon intensity of South Carolina's on-road vehicle fuels by at least 10% by 2020.

Timing: None cited.

Parties Involved: None cited.

Other: Meeting the ambitious goal as laid out in California's low-GHG fuel standard may not be possible because the standard will be implemented and measured in California on a life-cycle basis in order to include all emissions from fuel production to consumption. There are key differences between the life cycle of fuels in California and South Carolina, in particular:

- California has a number of refineries, whereas South Carolina depends on refineries along the Gulf, and
- California has an internal pipeline system, whereas South Carolina's pipeline links to the Gulf States.

Compliance Pathways: The low-GHG fuel standard does not specify any particular fuel or vehicle technology. Table I-17 shows three possible compliance scenarios that would meet the standard for South Carolina. These scenarios assume that both the gasoline- and diesel-fueled vehicle stocks will reduce the carbon intensity of fuels by 10%. For gasoline-powered vehicles, the necessary concentration of biofuels depends heavily on the market penetration of other alternative-vehicle types, such as plug-in hybrids, and the proportion of ethanol generated from cellulosic feedstocks.

Table I-17. Low-carbon fuel standard compliance scenarios for South Carolina (2020)

Alternative-Fuel Compliance Pathways	Compliance Scenarios		
	1	2	3
Cellulosic ethanol feedstock	30%	30%	0%
Plug-in hybrid market share of cars and light trucks	0%	10%	0%
Total ethanol consumption (million gallons)	911	624	1,811
Proportion of ethanol blended as E85	68%	47%	90%
Total biodiesel consumption (million gallons)*	191	191	191

*Figures reflect total required consumption if all biodiesel is derived from soy and blended as B20.

E85 = gasoline containing 85% ethanol.

Table I-18 shows the life-cycle ("well to wheels") impacts of various biofuels options on GHG emissions.

Table I-18. Estimated biofuel impacts on GHG emissions

Fuel/Technology	Blend	Feedstock	Reduction (grams of GHGs per mile)*
Ethanol	E10	Corn	1.5%
Ethanol	E10	Cellulosic	7.2%
Ethanol	E85	Corn	17.6%
Ethanol	E85	Cellulosic	83.2%
Biodiesel	B20	Soy	9.9%
Biodiesel	B20	Canola	11.2%
Biodiesel	B20	Palm	12.0%
Biodiesel	B100	Soy	53.9%

GHGs = greenhouse gases; E10 = gasoline containing 10% ethanol; E85 = gasoline containing 85% ethanol; B20 = gasoline containing 20% biodiesel fuel; B100 = 100% biodiesel fuel.

* 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.

Sources: GREET version 1.7 outputs; (S&T)2 Consultants, Sensitivity Analysis of GHG Emissions From Biofuels in Canada, 2006. Available at: http://www.ghgenius.ca/

Implementation Mechanisms

Currently, South Carolina does not have required fuel blends like other states with air quality concerns. This has allowed South Carolinians to enjoy relatively cheaper fuels because of the diversity of fuel options. However, with stricter March 2008 EPA air requirements, required fuel blends may be a policy the state should consider.

The concept of blended fuels has been discussed by such groups as the South Carolina Biomass Council and the Palmetto State Clean Fuels Coalition. Fortunately, South Carolina may enjoy some benefits of a fuel mandate, as it is considered a prime area for terminal storage, due to available land and lower land costs than at northern terminals.

The new EPA requirements may present many opportunities for economic development in the growth of the alternative-fuel business, as well as expansion opportunities for existing oil companies, at little additional cost to consumers. Currently, Marathon Petroleum is blending ethanol at the terminal level, and several other major oil companies may be blending in the near future, including Exxon Mobil, BP, and Amerada Hess.

The CECAC recommends phasing in alternative-fuel blends into projected fuel sales in the future to reach the goal of 10% reduction in the carbon intensity of fuels. This initiative will cost the state nothing, but may affect fuel prices slightly.

Toward that end, the CECAC recommends that South Carolina identify potential low-GHG fuels that are available in the region, such as ethanol from cellulosic sources, biodiesel from soybeans, wind, and solar, and provide incentives for further developing these fuel sources to make them available and sustainable. The state should continue its financial commitment to the development of hydrogen in fuel cell technology to hasten its practical use as a transportation fuel.

Additionally, South Carolina should promote an active discussion among states in the region regarding a regional adoption of a low-GHG fuel standard. A multistate approach would result in greater benefits and cost reductions than would be achieved with a single-state adoption of a low-GHG standard.

Related Policies/Programs in Place

Incentives available and related to low-GHG fuel distribution are included in TLU-6 regarding Alternative Fuel Infrastructure.

Type(s) of GHG Reductions

Primarily CO_2

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-19 presents the estimated GHG reductions and net costs of or cost savings from adopting a low-GHG fuel standard.

Table I-19. Estimated GHG reductions and net costs of or cost savings from adopting a low-GHG fuel standard

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-12	Low-GHG Fuel Standard	0.38	3.67	17.89	$20–$3,276	$1–$183	SM

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

Data Sources:

- On-road GHG emissions from Center for Climate Strategies, "Revised Draft South Carolina Greenhouse Gas Inventory and Reference Case Projections 1990-2020," Table 1, produced for the South Carolina Climate, Energy, and Commerce Advisory Committee, May 2008. Available at: http://www.scclimatechange.us/ewebeditpro/items/O60F17146.pdf
- National fuel price forecasts from U.S. DOE, EIA, *Annual Energy Outlook 2008: With Projections for 2030, (Revised Early Release),* DOE/EIA-0383(2008), March 2008. Available at: http://www.eia.doe.gov/oiaf/aeo/
- Historical retail prices of B20 from U.S. DOE, Office of Energy Efficiency and Renewable Energy, "Clean Cities Alternative Fuel Price Report," 2001–2007. Available at: http://www.eere.energy.gov/afdc/price_report.html

Quantification Methods:

The result of the 10% reduction in carbon intensity is based upon the current carbon intensity for vehicle fuels in South Carolina and the forecast levels of fuel consumption for the 2020 horizon year. A ramp-up period is estimated so that the 10% goal would be reached in the horizon year.

Because the policy does not prescribe particular technology pathways, and because technology in this area is changing quickly, there is substantial uncertainty about which fuels and technologies fuel providers will use to meet the standard. The cost of the policy is estimated based on a scenario in which all GHG reductions are achieved through increased use of biofuels. This scenario corresponds to Scenario 1 under the Compliance Pathways section, above.

The cost of this policy is calculated as the additional cost to consumers and the government. The consumer cost represents higher prices at the fuel pump, while the government cost represents federal subsidies paid to blenders of biofuels. (See assumptions below.) At present, both ethanol and biodiesel cost more than their conventional alternatives at the pump.

In evaluating the cost of alternative-fuels policies, the key driver is the future price of alternative fuels compared to conventional fuels. If alternative fuels are cheaper than conventional fuels, the policy will achieve cost savings; if the opposite is true, the policy will have associated costs.

There is substantial uncertainty about how the prices of conventional fuels will change in the future as a result of changes in global petroleum supply and demand. There is also substantial uncertainty about how the prices of biofuels will change. Factors include markets for agricultural commodities, technological developments, petroleum prices, and infrastructure for production and distribution of biofuels. EIA produces annual forecasts of retail prices for gasoline, diesel, and ethanol E85. To our knowledge, neither EIA nor any other U.S. government agency issues biodiesel price forecasts.

Given the high degree of uncertainty in projecting fuel costs, both high- and a low-price scenarios are produced for TLU-12 as follows, and as compared in Figures I-2 and I-3.

High-Price Scenario

Biodiesel

- The high-price scenario assumes that the current price of B20 relative to diesel remains constant to 2020. At present, the retail costs of B20 and diesel are about the same per gallon nationwide, but B20 is more expensive on a per-mile basis.[62] Federal subsidies to producers of biodiesel also increase the total cost of B20 over diesel.

Ethanol

- For the high-price scenario, we draw ethanol E85 prices from EIA's *Annual Energy Outlook 2008* (AEO 2008), which forecasts a steady drop in E85 prices relative to gasoline prices on a per gallon basis. However, on a mile-for-mile basis and including subsidies, AEO 2008 projects that ethanol will still be more expensive than gasoline at 2020.

Low-Price Scenario

Biodiesel

- The low-price scenario assumes that the recent trend of falling biodiesel prices will continue in future years. The price of biodiesel relative to diesel fell an average of 2.4%/year during the period 2001–2007.[63] If this trend continues, a gallon of B20 will cost about 29% less than a gallon of diesel at the pump in 2020.

Ethanol

- The low-price scenario assumes that E85 prices will fall relative to gasoline prices at the same 2.4%/year beginning in 2008.

Key Assumptions:

- The program applies to both HDVs and LDVs.
- Reductions in fuel carbon intensity begin in 2012.
- The current federal subsidy of $1/gallon of biodiesel from virgin oils will be extended at least through 2020.

[62] B20 is currently only slightly more expensive than diesel on a per-gallon basis in South Carolina. According to Jeff McCormick of the South Carolina Budget and Control Board, the current additional cost of B20 relative to diesel for state fleets is 5.4 cents/gallon.

[63] We estimate the annual decline in price using a least-squares regression analysis.

- The current federal subsidy of $0.51/gallon of ethanol will be extended at least through 2020.

Key Uncertainties

Transportation fuel providers would need to change their production and distribution methods to achieve the goals. Because the policy does not prescribe particular technology pathways, and because technology in this area is changing quickly, there is substantial uncertainty about 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 compliance costs are unknown at this time.

Additional Benefits and Costs

Secondary costs, such as impacts on cost of food, are not included in the analysis.

Figure I-2. Comparison of E85 price scenarios to gasoline prices

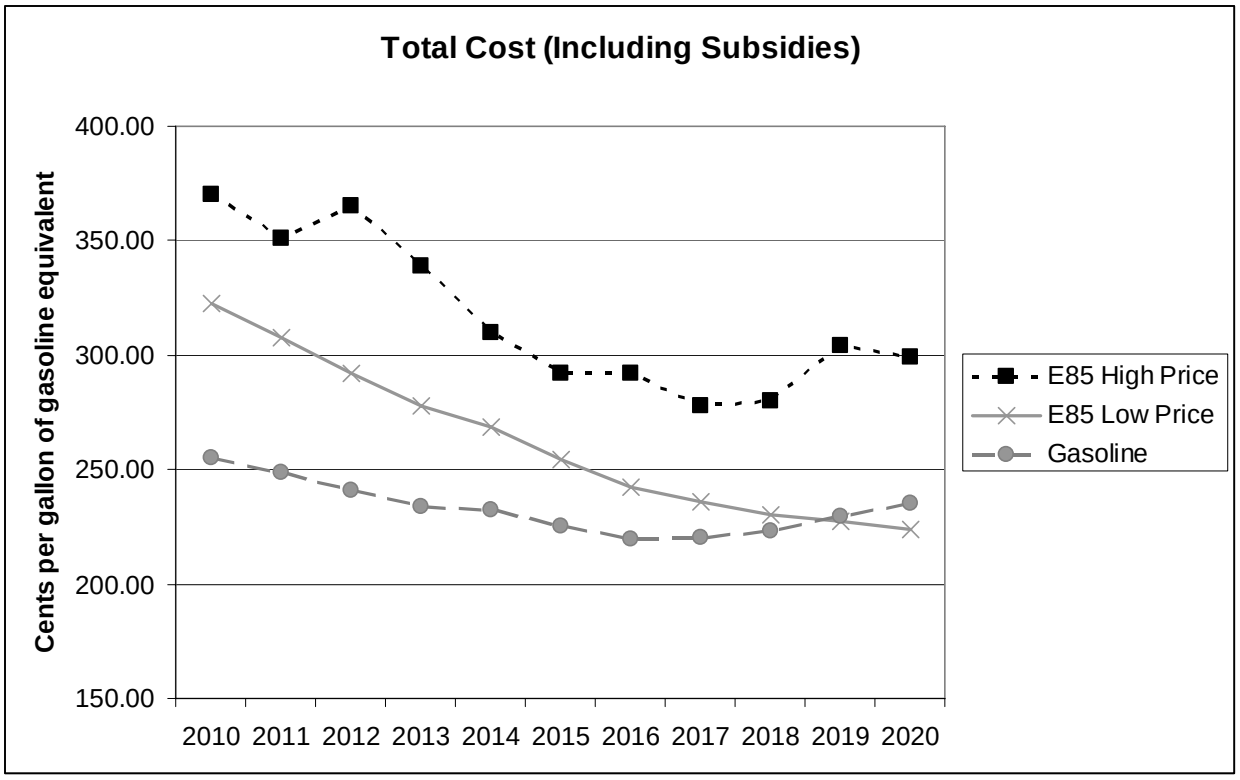
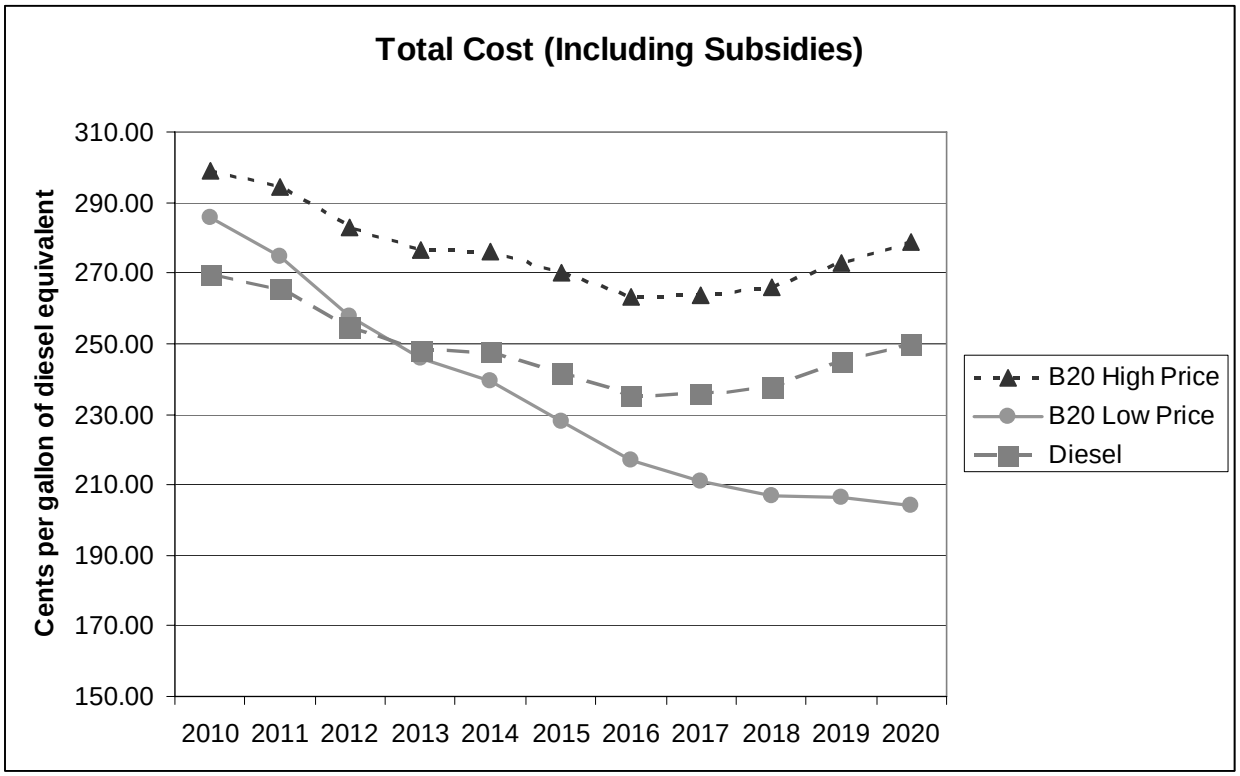


Figure I-3. Comparison of B20 price scenarios to diesel prices



Key Assumptions:

- The program applies to both HDVs and LDVs.
- Reductions in fuel carbon intensity begin in 2012.
- The current federal subsidy of $1/gallon of biodiesel from virgin oils will be extended at least through 2020.
- The current federal subsidy of $0.51/gallon of ethanol will be extended at least through 2020.

Key Uncertainties

Transportation fuel providers would need to change their production and distribution methods to achieve the goals. Because the policy does not prescribe particular technology pathways, and because technology in this area is changing quickly, there is substantial uncertainty about 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 compliance costs are unknown at this time.

Additional Benefits and Costs

Secondary costs, such as impacts on cost of food, are not included in the analysis.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Super Majority (two objections).

Barriers to Consensus

Environmental sustainability issues regarding the production of alternative fuels, including the detrimental effects of corn ethanol production and supplemental secondary costs of alternative-fuel productions, such as the rising cost of food are two barriers to consensus.

TLU-14. Plan for Enhanced Rail

Policy Description

Rail transport is one of the most energy-efficient means to move people and freight over commonly traveled routes on land. Improved freight rail service and new passenger rail services have the potential to reduce overall GHG emissions, compared to movement by highway. Technology improvements, such as anti-idle devices and more efficient engines, can reduce direct emissions from locomotives operating on the rail network. A robust and efficient rail network can play a key role in sustaining South Carolina's economy under future carbon emission constraints, while providing many social, economic, and environmental benefits.

Policy Design

Freight rail service in South Carolina provides a combination of statewide and regional transportation functions. Nearly all of the state's freight rail system is owned, operated, and maintained by the private sector. Rail facilities are operated by two Class I railroads—CSX Transportation and Norfolk Southern—and 11 short-line railroads. Class I railroads operate 2,058 miles of track, and short lines operate 319 miles, for a total of 2,377 state freight rail miles.

The soon-to-be completed State Multimodal Transportation Plan addresses the potential for both intermodal freight and intermodal passenger facilities in certain high-density travel corridors of the state. However, the state highway and mass transit systems are the primary focus of the new state plan; a detailed analysis of the state's rail system was not undertaken and is not included in the plan.

Because a detailed and comprehensive analysis of South Carolina's rail system and its role in the movement of people and goods does not currently exist, the CECAC does not have sufficient information to develop specific policy recommendations for the rail system. Therefore, the CECAC recommends that South Carolina immediately undertake a detailed and comprehensive analysis of the state's rail system.

Goal: Prepare a State Rail Plan for South Carolina that provides broad, strategic direction for the collaborative development of an integrated rail system that efficiently moves goods and people throughout the state and beyond. This direction is needed so that the impact of an intermodal transportation network is maximized to enhance South Carolina's economic development and mobility needs. The State Rail Plan should explicitly address the following:

- Freight Rail Infrastructure & Operations
    - Existing Conditions and Review of Previous Studies
    - Present and Future Needs Assessment
- High-Speed/Commuter Rail Infrastructure & Operations
    - Existing Conditions and Review of Previous Studies
    - Present and Future Needs Assessment
- Intermodal Connectivity

    - Opportunities for Connectivity to Ports, Airports, Highways, and Transit
- Right-of-Way Preservation
    - Review of Rail Right-of-Way Inventory
    - Strategic Preservation and Possible Rail Banking
- Rail Relocation
    - Location/Definition of Need and Resultant Impact(s)
- Safety (Crossings, Operations, etc.)
    - Existing Conditions
    - Present and Future Needs Assessment
- Emergency Preparedness
    - Evacuation, Security, and Defense Utilization
- Regulations and Oversight Structure
    - Federal and State
    - Identification and Analysis of State Agency Roles
- Statewide Needs vs. Available Funding Analysis
    - Prioritization of Project Needs and Identification of Available Funding
- Funding Opportunities
    - Federal, State, Local Opportunities
    - Partnership Opportunities With Freight Railroads and Private Interests
- Recommendations
    - Strategies and Projects
    - Funding and Oversight

While not explicitly identified above, a public involvement plan would be developed at the outset and implemented throughout the planning process, in order to successfully forge ongoing public and private partnerships. At the outset of the process, key public and private stakeholders would be identified and invited to participate, including railroads, business interests, and state agencies.

Timing: Assuming that S. 585 is passed by the state legislature during its 2008 session, the State Rail Plan would be completed at the end of calendar year 2009. (For details about S. 585, see Implementation Mechanisms, below.)

Parties Involved: Governor's office and cabinet agencies, such as SC DOT and the South Carolina Department of Commerce (SC DOC), state legislature, MPOs, COGs, local units of government (e.g., municipalities and counties), economic development councils, private-sector businesses and manufacturers, railroads (including Amtrak), South Carolina Port Authority.

Other: Federal transportation agencies, such as FHWA, FTA, and FRA.

Implementation Mechanisms

The primary implementation mechanism would be passage of an amended version of S. 585 by the current session of the state legislature, with sufficient funding. Passed by the Senate in June 2007 and referred to the House, S. 585 is a joint resolution directing SC DOC to prepare a statewide rail plan. The CECAC believes that S. 585 should be amended to specify that SC DOT be either the co-lead agency or the lead agency for preparing the plan. This amendment will ensure that the State Rail Plan will benefit directly from the SC DOT's soon-to-be adopted Statewide Transportation Plan that addresses corridor, transit, and rail right-of-way planning across the state and will address all of the issues identified in the above outline.

Related Policies/Programs in Place

Passenger rail service in South Carolina is currently limited to Amtrak's long-distance trains passing through the state. These trains are:

- Crescent—Service between New York and New Orleans, with stops in Spartanburg, Greenville, and Clemson, SC.
- Silver Star—Service between New York and Miami, with stops in Camden, Columbia, and Denmark, SC.
- Silver Meteor—Service between New York and Miami, with stops in Dillon, Florence, Kingstree, North Charleston, and Yemassee, SC
- Palmetto—Service between New York and Miami, with stops in Dillon, Florence, Kingstree, North Charleston, and Yemassee, SC.

The Southeast High-Speed Rail Corridor encompasses two distinct corridors through South Carolina. One is from Washington, DC, to Raleigh, NC, to Atlanta, GA, passing through the South Carolina Upstate (Spartanburg and Greenville). The other is from Washington, DC, to Raleigh, NC, to Savannah, GA, to Jacksonville, FL, passing through the South Carolina Central Midlands (Columbia). Virginia, North Carolina, South Carolina, and Georgia have joined the business communities in each state to form a four-state coalition to plan, develop, and implement high-speed rail in the Southeast. The system will be developed incrementally, upgrading existing rail rights of way. To date, the coalition's efforts have focused on the Washington, DC, to Raleigh to Atlanta segment of the corridor.

In September 2005, the Georgia, South Carolina, and North Carolina DOTs contracted with the U.S. DOT's Volpe Center to evaluate the overall suitability and costs of developing high-speed passenger train service between Charlotte, Atlanta, and Macon, GA. The analysis, which is expected to be published during 2008, will:

- Recommend rail top speeds and technologies that balance potential ridership and revenues with infrastructure and operating costs,
- Forecast ridership over at least a 25-year time horizon,
- Assess whether operating revenues might exceed operating costs and infrastructure maintenance costs,
- Compare this corridor's performance with similar rail corridors in other regions, and

- Determine other quantifiable economic impacts of high-speed rail corridor investments.

Two metropolitan areas in South Carolina—Charleston and Columbia—have completed preliminary evaluations of the feasibility of commuter rail service within their respective urban areas. To qualify for federal funding, any proposed commuter rail project must comply with a rigorous planning process prescribed by law and by U.S. DOT regulations. The first step in this planning process is the completion of an Alternatives Analysis. The MPO for the Charleston area has received federal funding to conduct an Alternatives Analysis for the Charleston to Summerville corridor. The MPO for the Columbia area has not yet received federal funding for a comparable analysis of the Columbia to Camden rail corridor.

Type(s) of GHG Reductions

Primarily CO_2.

Estimated GHG Reductions and Net Costs or Cost Savings

Table I-20 presents the estimated GHG reductions and net costs of or cost savings from implementing TLU-14.

Table I-20. Estimated GHG reductions and net costs of or cost savings from developing an efficient integrated rail system

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
TLU-14	Rail	Not quantified					UC

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

Estimating this policy's emission reduction potential would require a strategic study of potential passenger and freight rail demand in South Carolina. The State Rail Plan should address this need. Regarding costs, if diesel prices continue to increase relative to trucking, the case for having a good freight rail system will be strengthened.

Data Sources: None cited.

Quantification Methods: None cited.

Key Assumptions: None cited.

Key Uncertainties

None cited.

Additional Benefits and Costs

None cited.

Feasibility Issues

None cited.

Status of Group Approval

Complete.

Level of Group Support

Unanimous.

Barriers to Consensus

Not applicable.

Annex A: Federal Transit Aids
[Annex to TLU-5: Transit & Bike-Pedestrian]

SECTION 5303: Metropolitan Planning Program

Eligible Recipients: MPOs.

Guidelines: This program provides for transportation planning activities within the urbanized areas of the state. An allocation is distributed to each state based on the state's urbanized area population, as defined by the U.S. Census Bureau. Each state, in cooperation with the MPOs, must develop an allocation formula. This formula must be approved by FTA and ensure to the maximum extent possible that no MPO is allocated less than the base amount received by administrative formula under the FY 1991 allocation. Beginning in FY 2008, this program will be administered by the SC DOT Planning Office under the consolidated planning grant.

Allocation of Funding: Funds are allocated by a formula that is similar to the formula used to distribute FHWA planning funds.

Match: The federal share is 80%; the local share is 20%. The state does not provide match for this program; therefore, MPOs must provide the entire 20% local match.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5304: Statewide Planning and Research Program

Eligible Recipients: Public bodies and private nonprofit organizations.

Guidelines: This program supports statewide public transit projects, which may include statewide transit planning, management training, service development, workshops, and cooperative research. In addition, the state may use a portion of these funds to supplement MPO funds allocated by the state to its urbanized areas, as appropriate.

Allocation of Funding: Federal funds are allocated by formula.

Match: The federal share is 80% and requires an additional 20% match.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5307: Urbanized Area Formula Program

Eligible Recipients: The Governor, or the Governor's designee, is the designated recipient for urbanized areas with populations between 50,000 and 200,000. Funds are made available to designated recipients with legal authority to receive and dispense federal funds—i.e. local officials and publicly owned operators representing urbanized areas with populations greater than 50,000. Generally, a transportation management area is an urbanized area with populations of 200,000 and greater.

Category 1: Large Urbanized Areas (population greater than 200,000). These areas include Charleston, Columbia, and Greenville. In this category, urbanized areas deal directly with FTA.

Category 2: Small Urbanized Areas (population 50,000–200,000). These areas include Anderson, Florence, Myrtle Beach, Rock Hill, Spartanburg, and Sumter. In this category, funds are apportioned to the Governor of each state. This responsibility has been delegated to SC DOT.

Guidelines: Federal funding is apportioned to the state on the basis of legislative formulas. For areas with populations of 50,000–199,999, the formula is based on population and population density. For areas with populations of 200,000 and greater, the formula is based on a combination of bus revenue vehicle miles, bus passenger miles, fixed-guideway revenue vehicle miles, and fixed-guideway route miles, as well as population and population density. These funds are used with transit capital or operating expenses and planning.

Match: The federal share should not exceed 80% of the new project cost for capital or planning. The federal share may be 90% for the cost of vehicle-related equipment attributed to compliance with the Americans with Disabilities Act (ADA) and Clean Air Act (CAA). The federal share may also be 90% for projects or portions of projects related to bicycles. The federal share may not exceed 50% of the new project cost of operating assistance. Large urbanized areas are exempt from receiving operating assistance.

State Share:

- Large Urbanized Area—the current formula provides up to 25% of the available state mass transit funds.
- Small Urbanized Area—the current formula provides 19% of the available state mass transit funds.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5309: Discretionary Funds

Eligible Recipients: SC DOT and public transportation providers.

Guidelines: Funding for this program must be used for mass transit capital projects only—buses, computer equipment, rail projects, transit facility projects, etc.

Allocation of Funding: Congress controls earmark funds to states for specific projects through appropriation. These funds are disbursed based on need and requests.

Match: The maximum federal share is 80%; the local share is at least 20%. (New-start projects can have a different ratio, receiving greater local shares.) The state may provide a 10% match, if available; otherwise, the agency must provide the entire 20% match.

SECTION 5310: Elderly Individuals and Individuals With Disabilities Program

Eligible Recipients: Private, nonprofit organizations and public bodies that certify to the Governor that no nonprofit corporations or associations are readily available in an area to provide the service (e.g., councils on aging, disabilities and special needs boards, local and public agencies).

Guidelines: These funds are used to assist private nonprofit, local, and public agencies in meeting the transportation needs of elderly individuals and individuals with disabilities. Most of the funds are used for purchasing service contracts from other providers and/or purchasing vehicles. Funds may also be used for mobility management. This program allows up to 10% of the apportionment for state administration.

Allocation of Funding: Federal funds are allocated by a formula that considers the number of elderly individuals and individuals with disabilities in each state.

Match: The federal share is 80%; the local share is 20%. The state does not provide match for this program; therefore, human service agencies must provide the entire 20% local match.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5311: Rural and Small Urban Areas

Eligible Recipients: Local governments, nonprofit organizations (including Native American tribes and groups), and public transit operators in areas with populations of less than 50,000.

Guidelines: Funding for this program is made available through formula grants to states. Funds may be distributed to public, private for-profit, or tribal organizations and used for administration, operations, or capital. Additional funding is made available through the Section 5311 Program grant to support the state's rural training and technical assistance programs. These funds are distributed to public, private for-profit, or tribal organizations under the Rural Transit Assistance Program guidelines.

Allocation of Funding: Funding is appropriated by a statutory formula that is based on the latest U.S. Census Bureau figures of areas with populations of less than 50,000. The amount that the state may use for state administration, planning, and technical assistance activities is limited to 15% of the annual apportionment. States must spend 15% of the apportionment to support rural intercity bus service, unless their governor certifies that the intercity bus needs of the state are adequately met. At the state level, a formula is derived to further distribute the funds to rural transit providers.

Match: The maximum federal share for capital and project administration is 80% (except for equipment designed to meet the requirements of the ADA, the CAA, or bicycle access projects, which may be funded at up to 90%). The maximum federal share for operating assistance is 50% of the net operating costs. The local share is 50%, which comes from program income, county/city allocation, and contract revenue. State funds are made available based on the rural transit funding formula.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5311 (b)(3): Rural Transit Assistance Program

Eligible Recipients: States, local governments, and local transit operators.

Guidelines: This program provides funding to assist in the development and implementation of training and technical assistance and other support services tailored to meet the specific needs of transit operators in nonurban areas.

Allocation of Funding: Funds are used to support statewide initiatives and training efforts of transit operators.

Match: No local match is required under this program.

Funding Availability: Funds are available the year appropriated, plus 2 years, for a total of 3 years of available funding.

SECTION 5316: Job Access and Reverse Commute Program

Eligible Recipients: Private nonprofit organizations, state or local governmental authorities, and public and private operators of public transportation services.

Guidelines: Reverse Commute grants are designated to develop transit services to transport workers to suburban job sites. Eligible activities for Job Access grants include capital and operating costs of equipment, facilities, and associated capital maintenance items related to providing access to jobs. Also included are the costs of promoting the use of (1) transit by workers with nontraditional work schedules, (2) transit vouchers, and (3) employer-provided transportation, including the transit benefits. For Reverse Commute grants, the following activities are eligible: operating costs, capital costs, and other costs associated with reverse commute by bus, train, carpool, van, mobility management, or other transit service.

Allocation of Funding: Through an FTA formula. SC DOT, in partnership with local agencies, is responsible for a competitive selection process when funding this program.

Match: The federal shares are 80% federal for capital and 50% for operating costs. Recipients can use up to 10% for administration at a 100% federal share.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.

SECTION 5317: New Freedom Program

Eligible Recipients: Private nonprofit organizations, state or local governmental authorities, and public and private operators of public transportation services.

Guidelines: The designated recipients are responsible for conducting the competitive selection process. Eligible activities encourage services and facility improvements to address the

transportation needs of individuals with disabilities that go beyond those required by the ADA. Operating costs, capital costs, and mobility management costs are eligible.

Allocation of Funding: Through an FTA formula. SC DOT, in partnership with local agencies, is responsible for a competitive selection process when funding this program.

Match: For capital costs, the federal share is 80% and the local share is 20%; for operating costs, the federal share is 50% and the local share is 50%. The state can use up to 10% for state administration at a 100% federal share with no match.

Funding Availability: Funds are available the year appropriated, plus 3 years, for a total of 4 years of available funding.