Montana Climate Change Action Plan

Final Report of the Governor's Climate Change Advisory Committee

November 2007

Executive Summary

Background

Recognizing the profound consequences that global warming could have on the economy, environment, and quality of life in Montana, Governor Brian Schweitzer issued a letter on December 13, 2005, directing the Montana Department of Environmental Quality (MDEQ) to establish a Climate Change Advisory Committee (CCAC). Under this initiative, the CCAC evaluated state-level greenhouse gas (GHG) reduction opportunities in various sectors of Montana's economy while taking into consideration the Governor's charge to develop policy recommendations that would "save money, conserve energy, and bolster the Montana economy."

The Climate Change Advisory Committee

MDEQ Director Richard Opper appointed a broad-based group of 18 Montana citizens to the CCAC. The CCAC was supported by a panel of scientific experts, public and private sector technical and policy specialists, and staff from MDEQ. These individuals evaluated options and made recommendations on existing programs in Montana, policies to reduce GHG emissions, and the potential cost of those policies. The CCAC met six times from July 2006 through July 2007 to evaluate the recommendations from technical work groups (TWGs) representing four sectors of Montana's economy:

1. Energy Supply (ES)
2. Residential, Commercial, Institutional, and Industrial (RCII)
3. Transportation and Land Use (TLU)
4. Agricultural, Forestry, and Waste Management (AFW)

A fifth TWG, Cross-Cutting Issues (CC), developed strategies that cut across many sectors of Montana's economy and evaluated the issues of inventorying, forecasting, reporting, and registering Montana's GHG emissions.

The CCAC followed a process designed and implemented by the nonprofit Center for Climate Strategies (CCS). Staff from the CCS provided facilitation services and technical expertise to the CCAC as it formulated its recommendations. The MDEQ provided coordination and oversight to the process.

Inventory of Montana's Greenhouse Gas Emissions

Montana's GHG emissions were last inventoried in 1990. The inventory was updated to the present, and a forecast was made of expected GHG emissions through 2020. The inventory shows that Montana's electricity generation, heating needs, commerce, agricultural practices, and transportation needs accounted for 0.6% of the GHG emissions in the United States in 2005. The state's forests, cropland, and rangeland provide a vast terrestrial carbon sink that helps balance the state's emissions. A 14% increase in GHG emissions from 1990 to 2005 moved Montana from a net carbon sink to a net carbon emitter, and the state now averages net emissions of approximately 12 million metric tons of carbon dioxide equivalents ($MMtCO_2e$) per year.

Montana also has a higher rate of GHG emissions per capita—nearly double the national average. The reasons for this are varied but include the state's large fossil fuel production industry, substantial agricultural industry, large distances for transportation, cooler climate, and low population base.

Climate Change Advisory Committee Recommendations

The CCAC agreed upon 54 policy recommendations that are designed to help reduce Montana's emissions of GHGs to 1990 levels by the year 2020. Some of the recommendations can be implemented immediately, and some will require the support of the Montana State Legislature. Some will cost money to implement, and many will save money by reducing energy needs and costs. Others will require technological advances to fully implement. Most of these recommendations will have additional benefits beyond reducing GHG emissions, including reduced reliance on imported fossil fuels, reduction in air pollution, increased opportunity for Montana agriculture to provide renewable fuels, healthier forests, and the opportunity for Montana to be a leader in developing new technologies to produce cleaner burning fuels while sequestering GHGs.

The CCAC advised that the overall results of its recommended policy options be compared using two GHG emissions calculation approaches to identify which long-term emissions reduction goals could be met. The first is a "consumption-based" approach based on a projection of the amount of energy consumed by Montana residents, businesses, industries, and institutions. This includes emissions that result from all electricity, natural gas, and transportation fuel use in Montana as well as emissions from all non-energy sectors of the economy (e.g., agricultural and industrial processes). This approach shows how the actions of Montanans can affect the amount of GHGs emitted for the energy needed in-state. The second approach is "production-based." It includes everything in the consumption-based calculation plus GHG emissions from electricity produced in Montana for export to other states. The difference in emissions is significant, because Montana exports, on average, more than 40% of the electricity it produces each year. More information on these approaches can be found in Chapter 4 and Appendix G. In this document, unless otherwise noted, all GHG emission reductions are reported in terms of $MMtCO_2e$, costs reflect net present values (NPVs), and cost-effectiveness (cost-per-ton) is reported as $\$/MtCO_2e$ reduced or removed.

Figure EX-1 shows the projected growth in Montana's GHG emissions under a no-action scenario (business as usual) for the energy that is consumed in Montana only (i.e., calculating GHG emissions using the consumption-based approach). It also shows the projected emissions if all of the CCAC's recommendations are implemented as well as the CCAC's recommended GHG emission target for Montana in 2020. Figure EX-1 indicates that the CCAC's goal of reducing GHG emissions to 1990 levels by the year 2020 can be met and exceeded if all recommendations are implemented.

Figure EX-1. Reference case Montana consumption-based gross GHG emissions

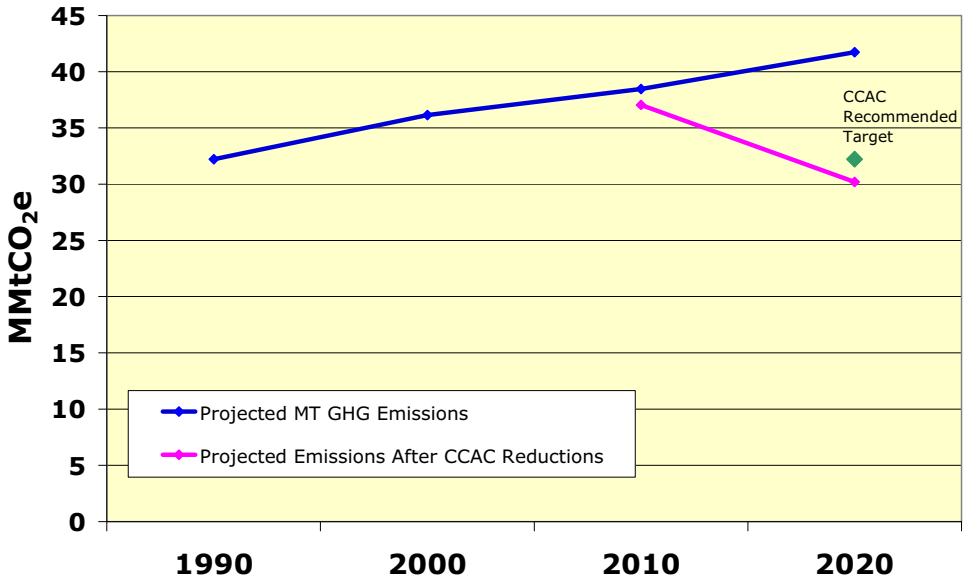
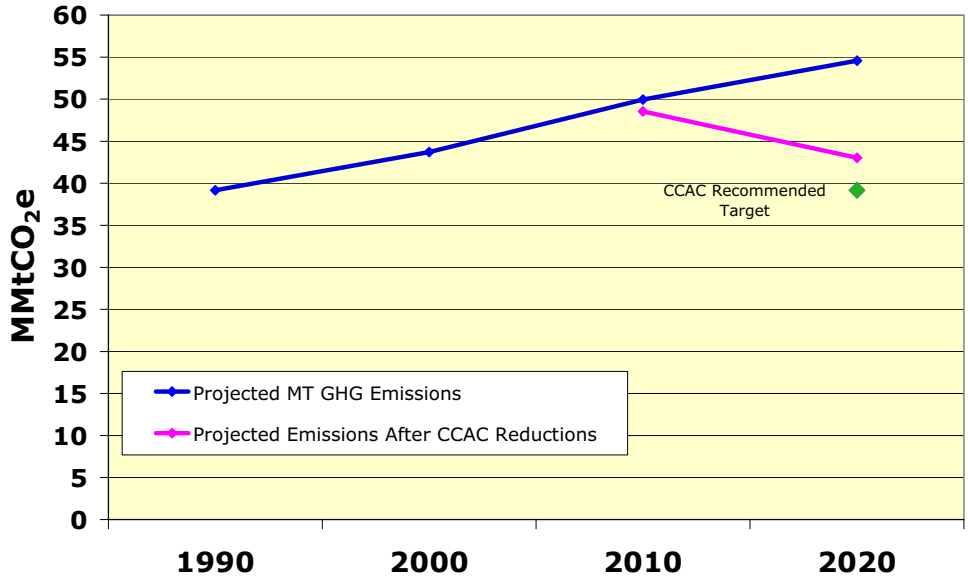


Figure EX-2 shows the projected growth in Montana's GHG emissions under a no-action scenario (business as usual) for both the energy that is consumed in Montana and the electricity that is produced and exported from Montana (i.e., calculating GHG emissions using the production-based approach). As in Figure EX-1, this graph shows the projected GHG emissions if all the CCAC's recommendations are implemented as well as the CCAC's recommended GHG emissions target for Montana in 2020. Figure EX-2 indicates that the CCAC's goal of reducing emissions to 1990 levels by the year 2020 will not be fully met under the production-based approach. This is because the 54 recommended policy options do not significantly reduce emissions from the electricity that is currently produced in Montana and exported out of state.

Figure EX-2. Reference case Montana production-based gross GHG emissions



Under the consumption-based approach with the GHG reductions from the policy options, the four sectors of Montana's economy (as defined in the CCAC process) would provide the following reductions as shown in Figure EX-3:

- 29.0% of the reductions (18.4 $MMtCO_2e$) would come from the RCII sector,
- 34.5% (21.9 $MMtCO_2e$) would come from the ES sector,
- 9.6% (6.1 $MMtCO_2e$) would come from the TLU sector, and
- 26.9% (17.1 $MMtCO_2e$) would come from the AFW sector.

Figure EX-3. Sector shares of recommended GHG reductions

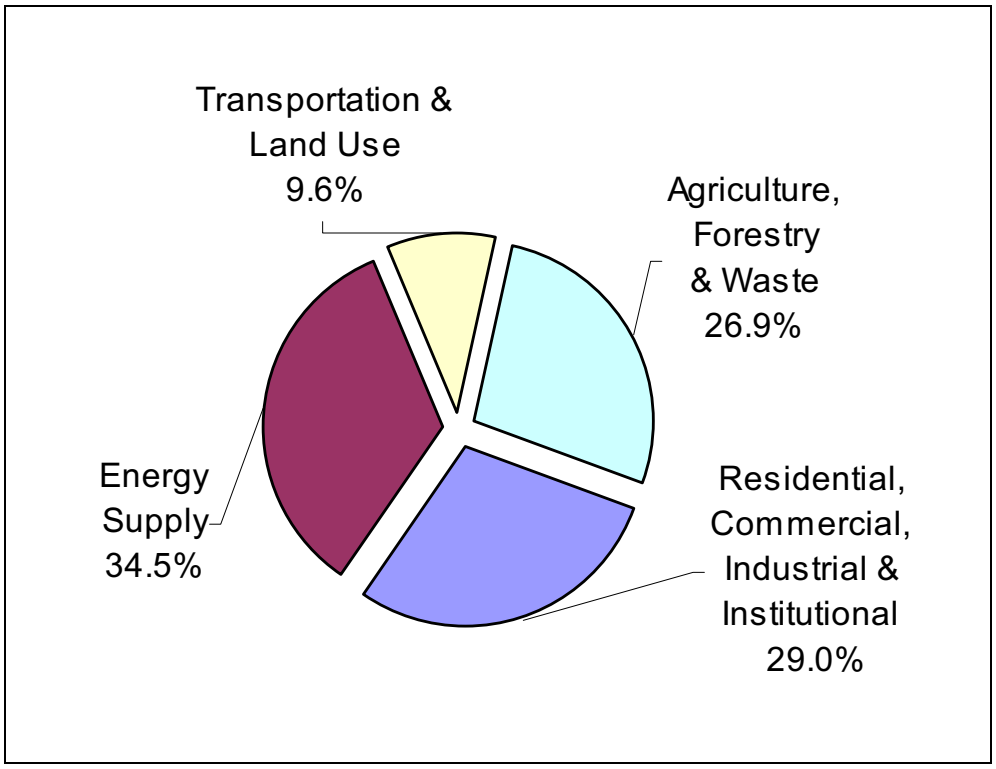
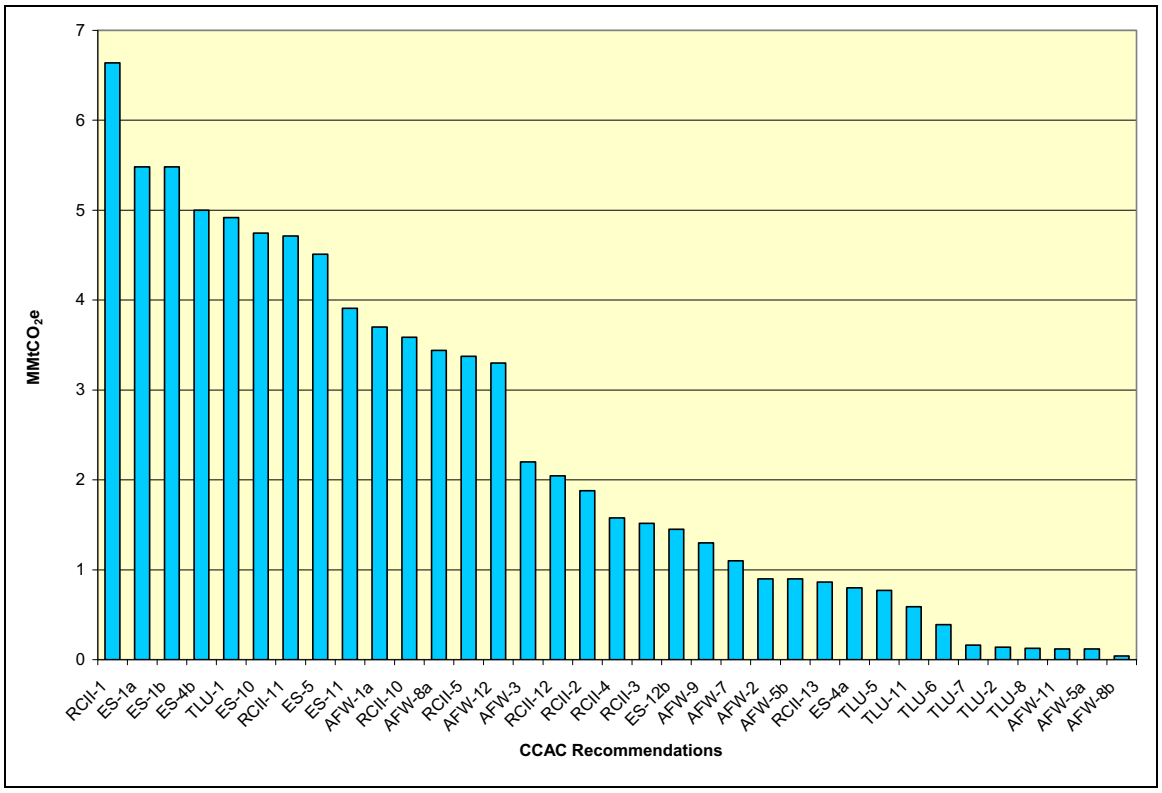


Figure EX-4 illustrates the range of GHG emission reductions that would result from implementing the individual recommendations of the CCAC as listed in Table EX-1. It is important to note that in Figure EX-4, each policy recommendation is illustrated as though it were a stand-alone option. Individual policy recommendations sometimes address the same GHG emissions, however, so the results of Figure EX-4 cannot be summed to produce total GHG emission reductions. Such overlaps have been accounted for in cumulative assessments of the CCAC's recommendations (e.g., in Figures EX-1 through EX-3).

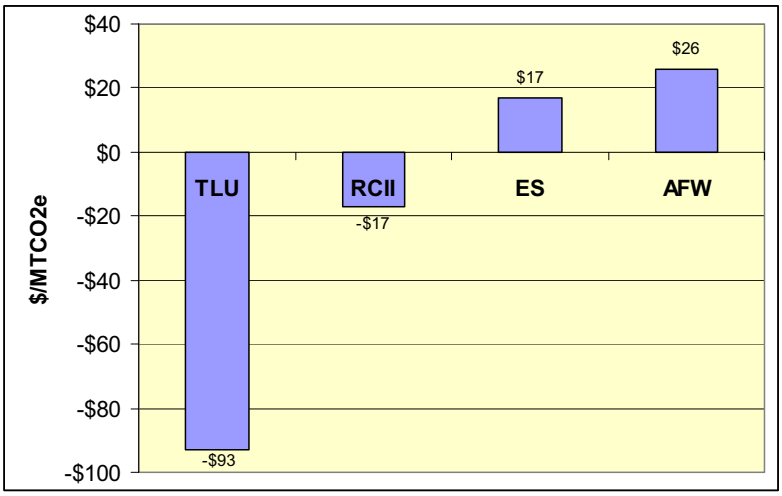
Figure EX-4. Policy recommendations ranked by GHG emission reductions



Costs of Implementation

There is considerable variation in the net costs or benefits of implementing the CCAC's recommendations as shown in Figure EX-5.

Figure EX-5. Overall cost-per-ton-reduced by sector

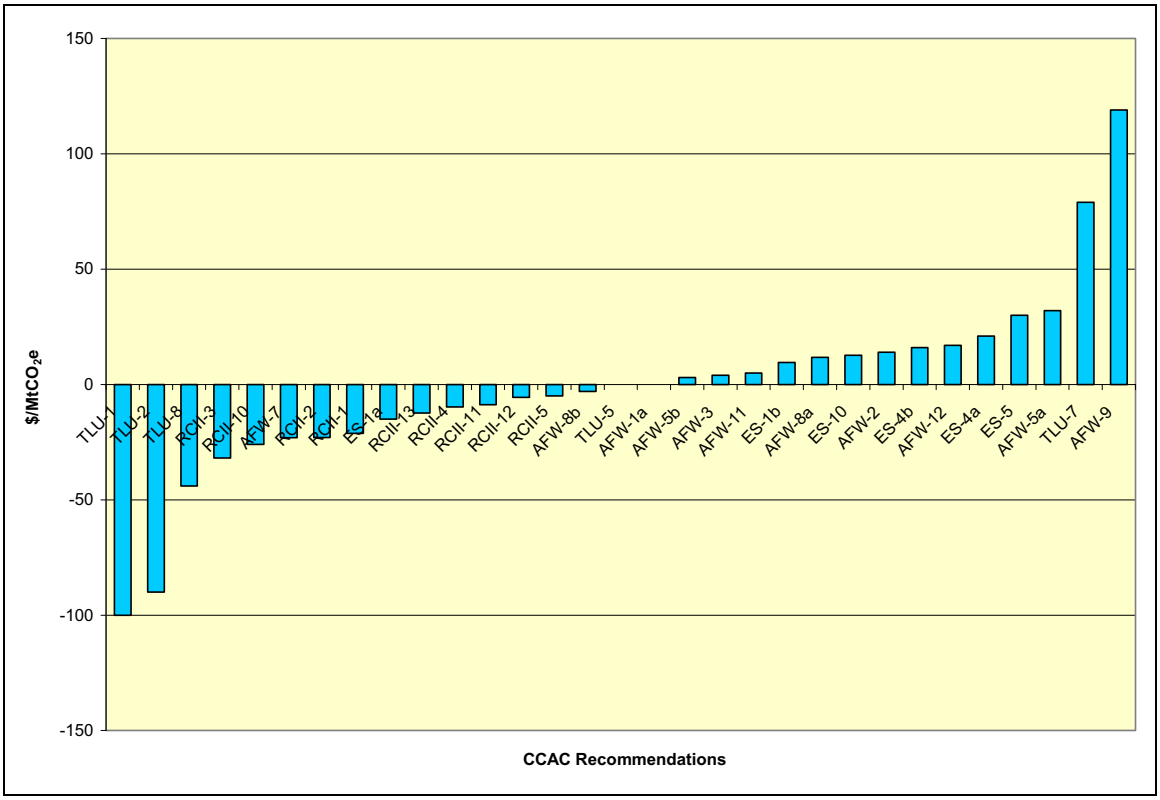


As Figure EX-5 illustrates, there are net costs to reducing a ton of carbon emissions from the ES and the AFW sectors. Conversely, there are net economic benefits to reducing emissions from

the TLU and the RCII sectors. Most of the savings for these latter two sectors comes from reduced energy costs due to more efficient energy usage. Cumulatively, there is a slight economic benefit from implementing all of the CCAC's recommendations.

Figure EX-6 provides a ranking of individual policy recommendations based on their respective costs per $MtCO_2e$.

Figure EX-6. Policy recommendations ranked by cost-per-ton reduced



List of Recommendations

Table EX-1 lists all of the CCAC's individual policy recommendations. The recommendations are grouped by sector, and the table provides information on the amount of GHG reduction each recommendation would provide over the period 2007–2020 and their respective net costs or benefits on a cost-effectiveness (i.e., cost-per-ton-reduced) basis. Some recommendations are not quantified but are important to the success of the overall effort to reduce GHG emissions. For example, consumer education is not quantified by itself but is important to many of the policy recommendations.

Table EX-1. Policy options recommended by the CCAC

	Policy Option		GHG Reductions ($MMtCO_2e$) Total 2007–2020	Cost Effectiveness ($/tCO_2e$)
	RESIDENTIAL, COMMERCIAL, INSTITUTIONAL, AND INDUSTRIAL			
RCII-1	Demand-Side Management Programs, Efficiency Funds and Requirements (and Financial Incentives)		6.6	–$21
RCII-2	Market Transformation and Technology Development Programs		1.9	–$23
RCII-3	State-Level Appliance Efficiency Standards and State Support for Improved Federal Standards		1.5	–$36
RCII-4	Building Energy Codes		1.6	–$10
RCII-5	"Beyond Code" Building Design Incentives and Mandatory Programs		3.4	–$5
RCII-6	Consumer Education Programs		*Not quantified*	
RCII-10	Industrial Energy Audits and Recommended Measure Implementation		3.6	–$26
RCII-11	Low-Income and Rental Housing Energy Efficiency Programs		4.7	–$9
RCII-12	State Lead by Example		2.0	–$6
RCII-13	Metering Technologies With Opportunity for Load Management and Choice		0.9	–$12
	Sector Total After Adjusting for Overlaps		**18.4**	**–$17**
	Reductions From Recent Actions			
RCII-1	Expand Energy Efficiency Funds		6.5	
RCII-11	Low-Income Energy Efficiency Programs		0.4	
	Sector Total Plus Recent Actions		**25.3**	
	ENERGY SUPPLY			
ES-1	Environmental Portfolio Standard (Renewables and Energy Efficiency)	Efficiency / Conservation	5.4	–$15
		Renewable Energy	5.5	$10
ES-2	Renewable Energy Incentives (Biomass, Wind, Solar, Geothermal)		*Not quantified separately (see ES-1 and ES-4)*	
ES-3	Research and Development (R&D), Including R&D for Energy Storage and Advanced Fossil Fuel Technologies		*Not quantified*	
ES-4	Incentives and Barrier Removal (Including Interconnection Rules and Net Metering Arrangements) for Combined Heat and Power (CHP) and Clean Distributed Generation (DG)	Distributed Renewables	0.8	$21
		Combined Heat and Power	5.0	$16
ES-5	Incentives for Advanced Fossil Fuel Generation and Carbon Capture and Storage (CCS), Including Combined Hydrogen and Electricity Production with Carbon Sequestration	Reference Case	4.5	$30
		High Fossil Fuel Scenario	24.4	$30
ES-6	Efficiency Improvements and Repowering of Existing Plants		*Not quantified*	
ES-7	Demand-Side Management		*Not quantified separately (see ES-1 and RCII-1)*	
ES-8/9	Market-Based Mechanisms to Establish a Price Signal for GHG Emissions (GHG Cap-and-Trade or Tax)		*Not quantified*	

ES-10	Generation Performance Standards or GHG Mitigation Requirements for New (and/or Existing) Generation Facilities, With/Without GHG Offsets		4.7	$13
ES-11	Methane and CO_2 Reduction in Oil and Gas Operations, Including Fuel Use and Emissions Reduction in Venting and Flaring	Reference Case	3.9	*Likely net benefit*
		High Fossil Fuel Case	6.6	*Likely net benefit*
ES-12	GHG Reduction in Refinery Operations, Including in Future Coal-to-Liquids Refineries	Coal-to-Liquids High Fossil Fuel Case	35	*Not estimated*
		Petroleum Refining – Reference Case	1.5	*Not estimated*
		Petroleum Refining – High Fossil Fuel Case	2.2	*Not estimated*
	Sector Total After Adjusting for Overlaps (Among ES Options and After Demand Reductions From RCI Options)	**Reference Case**	**21.9**	**$17**
		High Fossil Fuel Case	**79.4**	**$24**
	TRANSPORTATION AND LAND USE			
TLU-1	Light-Duty Vehicle Clean Car Standards		4.92	–$100
TLU-2	Fuel Efficient Replacement Tires Program		0.14	–$90
TLU-3	Consumer Information on Vehicle Miles Per Gallon		*Included in TLU-1 and TLU-2*	
TLU-4	Financial and Market Incentives for Low GHG Vehicle Ownership and Use		*Included in TLU-1*	
TLU-5	Growth and Development Bundle		0.77	<$0
TLU-6	Low-Carbon Fuels		0.39	N/A
TLU-7	Heavy-Duty Vehicle Emissions Standards and Retrofit Incentives		0.16	$79
TLU-8	Heavy-Duty Vehicle and Locomotive Idle Reduction		0.13	–$44
TLU-9	Procurement of Efficient Fleet Vehicles		*Included in TLU-1, TLU-6 through TLU-8, and TLU-11*	
TLU-10	Transportation System Management		*Not quantified*	
TLU-11	Intermodal Freight Transportation		0.59	N/A
TLU-12	Off-Road Engines and Vehicles GHG Emissions Reductions		*Not quantified*	
TLU-13	Reduced GHG Emissions From Aviation		*Not quantified*	
	Sector Total After Adjusting for Overlaps		**6.1**	**–$93**
	AGRICULTURE, FORESTRY, AND WASTE MANAGEMENT			
AFW-1	Agricultural Soil Carbon Management – Conservation/No-Till		3.7	$0
	Agricultural Soil Carbon Management – Organic Farming		*Not quantified*	
AFW-2	Biodiesel Production (Incentives for Feedstocks and Production Plants)		0.9	$14
AFW-3	Ethanol Production		2.2	$4
AFW-4*	Incentives for Enhancing GHG Benefits of Conservation Provisions of Farm Bill Programs		15	$12
AFW-5	Preserve Open Space and Working Lands – Agriculture		0.12	$32
	Preserve Open Space and Working Lands – Forests		0.9	$3
AFW-7	Expanded Use of Biomass Feedstocks for Energy Use		1.1	–$23
AFW-8	Afforestation/Reforestation Programs – Restocking		3.4	$12
	Afforestation/Reforestation Programs – Urban Trees		0.04	–$3
AFW-9	Improved Management and Restoration of Existing Stands		1.3	$119
AFW-10	Expanded Use of Wood Products for Building Materials		*Not quantified*	
AFW-11	Programs to Promote Local Food and Fiber		0.12	$5

AFW-12	Enhanced Solid Waste Recovery and Recycling	3.3	$17
	Reductions From Recent Actions	**0**	**$0**
	Sector Total Plus Recent Actions	**17**	**$26**
	CROSS CUTTING ISSUES		
CC-1	GHG Inventories and Forecasts	*Not quantified*	
CC-2	State GHG Reporting	*Not quantified*	
CC-3	State GHG Registry	*Not quantified*	
CC-4	State Climate Public Education and Outreach	*Not quantified*	
CC-6	Options for State GHG Goals or Targets	*Not quantified*	
CC-7	The State's Own GHG Emissions	*Not quantified*	

N/A = not applicable

* AFW-4 reductions were left out of the totals because they were not counted in the inventory.

Chapter 5
Transportation and Land Use

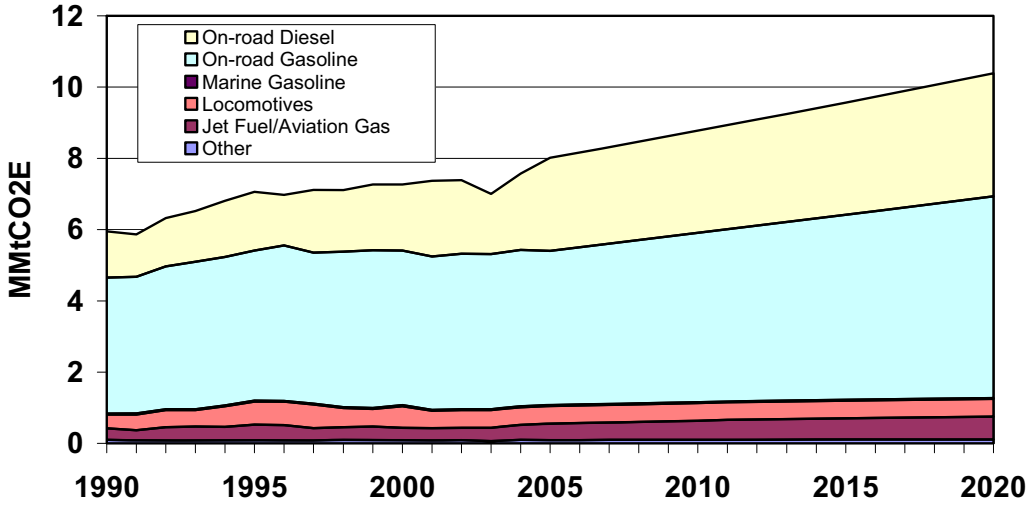
Overview of GHG Emissions

The transportation sector is a major source of greenhouse gas (GHG) emissions in Montana—currently accounting for about 20% of the state's gross GHG emissions. The transportation technologies and fuels used are key determinants of those emissions, along with population, economic growth, and various land use policies that all affect the demand for transportation services. GHG emissions from the transportation sector totaled about 7.3 million metric tons of carbon dioxide equivalents ($MMtCO_2e$) in 2000.

Figure 5-1 shows historical and projected transportation and land use (TLU) GHG emissions by fuel and source and illustrates their rapid growth. TLU emissions are expected to grow significantly from 1990 to 2020. Montana state projections suggest on-road vehicle miles traveled (VMT) will continue to increase at an estimated rate of 1.92% annually, with relatively higher growth in freight VMT also expected.

In 2005 Congress enacted the Energy Policy Act which contained a provision for a national renewable fuel standard that will likely increase the use of alternative fuels in Montana. This was classified as a "recent action" and was accounted for in the TLU Technical Work Group (TWG) analysis.

Figure 5-1. Historical and projected GHG emissions from the transportation and land use sector, Montana, 1990 to 2020



$MMtCO_2e$ = million metric tons of carbon dioxide equivalents

Key Challenges and Opportunities

The principal means of reducing TLU emissions includes improving vehicle fuel efficiency, substituting gasoline and diesel with lower emission fuels, modal switches to lower emission means of travel, and various strategies to decrease the growth in fuel use and VMT.

In Montana and in the nation as a whole, vehicle fuel efficiency has improved little since the late 1980s, yet many studies have documented the potential for substantial increases consistent with maintaining vehicle size and performance. The use of alternative fuels with lower GHG emissions is growing in Montana, and larger market penetration is possible. Montana also has taken some steps to increase transit options and encourage alternative growth and development patterns.

Overview of Policy Recommendations and Estimated Impacts

The Climate Change Advisory Committee (CCAC) recommends a set of 13 policy options for the transportation and land use sector that offer the potential for major economic benefits and emissions savings. These policy recommendations could lead to emissions reductions from reference case projections of 1.01 $MMtCO_2e$ for the year 2020, cumulative savings of nearly 5.54 $MMtCO_2e$ from 2006 through 2020, and net cost *savings* of more than $321 million to the Montana economy through the year 2020 on a net present value (NPV) basis.[1] The weighted average cost of saved carbon from the policy options for which quantitative estimates of both costs and savings were prepared was –$67/$MtCO_2e$.

The estimated impacts of the individual policies are shown in Table 5-1 below. The CCAC policy recommendations described briefly here (and in more detail in Appendix H) not only result in significant emissions and costs savings but also offer a host of additional benefits as well. These benefits include (but are by no means limited to) reduced local air pollution, more livable, healthy communities, and economic development and job growth from in-state alternative fuel production.

In order for the TLU policy options recommended by the CCAC to yield the levels of savings described here, the options should be implemented in a timely, aggressive, and thorough manner. Notably, the state Clean Car Program must clear several hurdles before Montana or any other state can adopt it, including EPA approval of the original California Clean Car Program (that other states can then opt into) and a court challenge to the underlying notion of regulation of GHG emissions from vehicles. If, for any reason, Montana is not able to implement the Clean Car Program, other options could play a larger role. For example, the policies to be studied under the Financial and Market Incentives for Low GHG Vehicle Ownership and Use (TLU-4) could improve fuel efficiency through some combination of "feebates," vehicle excise taxes that vary with fuel economy, and other programs. Feebate proposals usually have two parts: 1) a fee on relatively high emissions/lower fuel economy vehicles and 2) a rebate or tax credit on low emissions/higher fuel economy vehicles. A multistate approach to feebates is recommended here because of the drawbacks of Montana (or any state) acting alone in this area.

Greater use of lower carbon fuels (TLU-6) can be accomplished through a combination of voluntary and mandatory measures. The Low Carbon Fuel Standard recommended as part of TLU-6 can increase the use of ethanol and biodiesel.

[1] The net cost savings are based on fuel expenditures, operations, maintenance, and administrative costs, and amortized, incremental equipment costs. All NPV analyses here use a 5% real discount rate.

To be most effective, the group of policies aimed at Growth and Development (TLU-5) will require change at every level of government, and as such will be most effective with focused leadership by the state, including training, outreach, and technical assistance to local governments.

Table 5-1. CCAC-recommended policy options and results for the TLU sector

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2006–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2010	2020	Total 2007–2020			
TLU-1	Light-Duty Vehicle Clean Car Standards	0.00	0.95	4.92	–$492	–$100	UC
TLU-2	Fuel Efficient Replacement Tires Program	0.00	0.03	0.14	–$86	–$90	UC
TLU-3	Consumer Information on Vehicle Miles Per Gallon (MPG)	*Included in TLU–1 and TLU–2*					UC
TLU-4	Financial and Market Incentives for Low GHG Vehicle Ownership and Use	*Included in TLU–1*					UC
TLU-5	Growth and Development Bundle	0.00	0.14	0.77	<$0	<$0	UC
TLU-6	Low Carbon Fuels	0.00	0.04	0.39	N/A	N/A	UC
TLU-7	Heavy-Duty Vehicle Emissions Standards and Retrofit Incentives	0.00	0.02	0.16	$12.8	$79	UC
TLU-8	Heavy-Duty Vehicle and Locomotive Idle Reduction	0.01	0.02	0.13	–$5.6	–$44	UC
TLU-9	Procurement of Efficient Fleet Vehicles	*Included in TLU-1, TLU-6 through TLU-8, and TLU–11*					UC
TLU-10	Transportation System Management	*Not quantified*					UC
TLU-11	Intermodal Freight Transportation	0.02	0.09	0.59	N/A	N/A	UC
TLU-12	Off-Road Engines and Vehicles GHG Emissions Reductions	*Not quantified*					UC
TLU-13	Reduced GHG Emissions from Aviation	*Not quantified*					UC
	Sector Total After Adjusting For Overlaps	0.02	0.96	6.1	–$492	–$93	

Transportation and Land Use Sector Policy Descriptions

The TLU sector includes emissions and mitigation opportunities related to vehicle technologies, fuel choices, transit options, and demand for transportation services.

TLU-1 Light-Duty Vehicle Clean Car Standards

The CCAC recommends that Montana adopt the Light-Duty Vehicle Clean Car Standards (also known as the "Pavley" standards or California GHG Emission Standards) in order to reduce GHG emissions from new light-duty vehicles (LDVs). The standards, which must still be approved by the United States Environmental Protection Agency (US EPA), would take effect in

model year 2011 (calendar year 2010). Other Clean Car Program elements include standards requiring reductions in smog- and soot-forming pollutants and promoting introduction of very low-emitting technologies into new vehicles.

New cars and light trucks in all states must comply with federal emission standards and, generally speaking, states have the choice of adopting the stronger set of standards applicable in California. In 2005, California finalized a set of standards that would require reductions of GHG emissions of about 30% from new vehicles, phased in from 2009 to 2016, through a variety of means. Eleven states have already adopted the California Clean Car Program standards: California, Connecticut, Maine, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

TLU-2 Fuel Efficient Replacement Tires Program

The CCAC recommends that Montana improve the fuel economy of the LDV fleet by setting minimum energy efficiency standards for replacement tires and requiring that greater information about low-rolling resistance (LRR) replacement tires be made available to consumers at the point of sale.

Manufacturers currently use LRR tires on new vehicles, but they are not readily available to consumers as replacement tires. When installing original equipment tires, carmakers use LRR tires as a way to contribute to meeting the federal corporate automobile fuel economy (CAFE) standards. When replacing the original tires, consumers often purchase less efficient tires. Currently, tire manufacturers and retailers are not required to provide information about the fuel efficiency of replacement tires. An appropriate state agency would initiate a fuel efficient tire replacement program. The program could include consumer education, product labeling, and minimum standards elements. These programs would be developed under a rule development process that would incorporate the best scientific information, including the results from tests of tires conducted by the tire manufacturers, data from the California Energy Commission, and other data reviewed by the National Academy of Sciences.

TLU-3 Consumer Information on Vehicle Miles Per Gallon (MPG)

The CCAC recommends that Montana work to provide consumers with information about the fuel efficiency and cost in relation to the purchase, maintenance, and operation of their vehicles. Consumers would receive real-time information on the miles per gallon (MPG) while their vehicles are in operation and alerts when their tire pressure is too low (i.e., devices like Air Alert Valve Caps). Generally, a set of four light-emitting diode (LED) tire alert self-calibrating tire pressure valve caps cost about $22.00, and MPG monitoring systems, such as ScanGauge, are about $100.00. In addition, consumers would receive public education and information relating to the impact that vehicle maintenance practices have on the operation of their vehicles. Finally, consumers would be encouraged to consider the MPG of vehicles before and at the time of vehicle purchase.

TLU-4 Financial and Market Incentives for Low GHG Vehicle Ownership and Use

The CCAC recommends that Montana further study and develop policy options that create incentives and disincentives for the purchase and operation of vehicles with varying fuel economy. The policies to be studied and developed includes the following:

1. *Feebates.* A multistate feebate program, including other western states of Arizona, California, and New Mexico. Feebate proposals usually have two parts: 1) a fee on relatively high emissions/lower fuel economy vehicles; and 2) a rebate or tax credit on low emissions/higher fuel economy vehicles. Legislation for this policy option will be needed.

2. *Excise Taxes.* A change in new vehicle excise taxes that increases taxes for relatively high-emitting vehicles and reduces taxes for relatively low-emitting vehicles. Overall, excise tax revenue would remain the same.

3. *Labeling.* A consumer labeling program that provides buyers with better information on the GHG emissions of new vehicles.

Together, these incentives could change the vehicle fleet technology mix through a combination of demand- and supply-side changes.

TLU-5 Growth and Development Bundle

The CCAC recommends that Montana pursue a bundle of options that encompass several components intended to reduce GHG emissions through promotion of multimodal transit options and land use practices and policies. These policies contribute to GHG emissions reductions by reducing vehicle trips and VMT.

Potential actions include the following programs and program elements:

1. Infill, densification, and brownfield redevelopment;

2. Mixed-use and transit-oriented development;

3. Smart Growth planning, modeling, and tools;

4. Targeted open space protection;

5. Expanding transit infrastructure and service; and

6. Expanding transportation choices.

In general, neighborhood center development/redevelopment options are recommended to reduce VMT resulting from inefficient development patterns and locations. Smart Growth principles should be implemented to manage the location, density, development pattern, and infrastructure and to meet basic human needs of new growth.

TLU-6 Low Carbon Fuels

The CCAC recommends that Montana seek to increase the use and market penetration of low carbon fuels (LCFs) to offset traditional fossil fuels such as gasoline, diesel, jet fuel, and others derived from crude oil. Additionally, the policy aims to increase production opportunities for LCFs derived from Montana crops and other low carbon transportation alternatives such as hydrogen, natural gas, and electricity. TLU-6 will evaluate the merits of LCFs based on their net carbon impact and will remain consistent with Agriculture, Forestry, and Waste Management Policy Option 2 (AFW-2), which increases biodiesel production in the state.

Various options or a combination of options to increase LCF use would include:

- Carbon fuel accounting,
- Fuel quality standards,
- LCF infrastructure development,
- LCF standard and credits for compliance,
- High carbon fuel tax,
- State government fleet 'leadership' programs for adoption of LCFs, and
- Carbon reduction requirements.

LCFs demonstrate tangible economic benefits to rural economies. An LCF policy provides for strong, proactive measures to address economic and environmental issues where agricultural concerns yearn for economic sustenance and higher crop prices, or new and higher paying industry jobs to sustain the existing economy.

TLU-7 Heavy-Duty Vehicle Emissions Standards and Retrofit Incentives

The CCAC recommends that Montana work with other states and the EPA to advance GHG emissions standards for on-road heavy-duty vehicles (HDVs). In addition, the state would adopt incentive programs to reduce particulate matter (PM) emissions from existing on-road HDVs. Diesel particulate matter includes black carbon aerosols, which are thought to contribute to global warming through positive radiative forcing.

Approaches to diesel engine emission reductions include vehicle scrappage and replacement, repowering (engine replacement), and retrofit with exhaust after-treatment devices. Two devices commonly used to reduce diesel PM emissions are diesel oxidation catalysts and diesel particulate filters. These devices can be used on certain model year engines of heavy-duty trucks, motor coaches, and transit and school buses.

TLU-8 Heavy-Duty Vehicle and Locomotive Idle Reduction

The CCAC recommends that Montana reduce the amount of time that trucks, buses, and locomotives idle. It would involve promoting and expanding the use of technologies that reduce

long-term idling, including the use of truck stop electrification. It would also encourage development of local ordinances banning unnecessary idling by HDVs and locomotives in most situations.

Truck stop electrification involves truck plazas that are equipped with electrification systems that allow drivers to shut off their engines and draw electrical power and in some cases, heating, cooling, and communication and entertainment options from a ground source. Different systems may or may not require the purchase of an adaptor to connect to the tractor.

In addition to truck stop electrification, other available technologies that reduce HDV idling include automatic engine shut-down/start-up system controls, auxiliary power units, and direct-fired heaters. Technologies to reduce locomotive idling include automatic engine shut-down/start-up system controls and hybrid-electric switcher engines.

TLU-9 Procurement of Efficient Fleet Vehicles

The CCAC recommends that Montana state and local government agencies "lead by example" by enacting procurement policies and/or joining the EPA SmartWay program and utilizing the SmartWay Upgrade Kits that result in adoption of lower emitting vehicle fleets. There are three primary components of the EPA SmartWay program: creating partnerships, reducing all unnecessary engine idling, and increasing the efficiency of LDVs, HDVs, rail, and intermodal operations.

Targets are listed under the Policy Design section of Appendix H and will be based on the availability of energy-saving technologies and overall efficiency of the life of the vehicle.

This policy option strengthens Montana's commitment to reduce GHG emissions through fuel efficiency in vehicles owned by the state while also encouraging private and public agency fleets that have the potential to develop incentive programs for local governments to help with the initial costs of purchasing such vehicles.

TLU-10 Transportation System Management

The CCAC recommends that Montana seek to reduce GHG emissions from the transportation sector through improvements to transportation system management. These efforts would focus on the improvement, management, and operation of the transportation infrastructure, with a focus on the roads and highway systems.

TLU-11 Intermodal Freight Transportation

The CCAG recommends that Montana encourage the expansion of intermodal rail service for Montana shippers. In addition, the state would strive to increase the competitiveness of rail rates for all Montana shippers. Transportation of freight by railroad generally results in less fuel use and GHG emissions than transportation by truck. The best candidates for diversion from truck to

rail are commodities that can move by intermodal rail transportation, which involves shipping containers or truck trailers placed on rail flatcars.

TLU-12 Off-Road Engines and Vehicles GHG Emissions Reductions

The CCAC recommends that Montana reduce emissions from off-road engines. Off-road (also called non-road) engines and vehicles are significant emitters of GHGs and consumers of petroleum-based fuels. Emissions from off-road engines can be reduced by adoption of GHG emissions standards and through retrofit technologies. The efforts would be expected to be consistent with efforts to reduce off-road emissions of other regulated air pollutants. In the state of Montana, these reductions would affect the following equipment categories: airport service, construction, industrial, lawn and garden, agriculture, light commercial, logging, recreational (including snowmobiles and snow coaches), and recreational marine.

TLU-13 Reduced GHG Emissions from Aviation

The CCAC recommends that Montana encourage the federal government to take actions to reduce GHG emissions from the aviation portion of the transportation sector. Those actions could include promotion and use of existing aircraft technologies and programs to reduce emissions, such as Reduced Vertical Separation Minimums (RVSM), Required Navigation Performance (RNP), System for Assessing Aviation's Global Emissions (SAGE), and Voluntary Airport Low Emissions (VALE) Program.

Working in cooperation with other state governments, the State of Montana would seek to develop and encourage a set of federal policies that would significantly reduce GHG emissions reductions from the in-air operation of airplanes.

Appendix H
Transportation and Land Use Policy Recommendations

Summary List of Policy Option Recommendations

	Policy Options	GHG Reductions ($MMtCO_2e$)			Net Present Value 2006–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2010	2020	Total 2007–2020			
TLU-1	Light-Duty Vehicle Clean Car Standards	0.00	0.95	4.92	–$492	–$100	UC
TLU-2	Fuel Efficient Replacement Tires Program	0.00	0.03	0.14	–$86	–$90	UC
TLU-3	Consumer Information on Vehicle Miles Per Gallon (MPG)	*Included in TLU–1 and TLU–2*					UC
TLU-4	Financial and Market Incentives for Low GHG Vehicle Ownership and Use	*Included in TLU–1*					UC
TLU-5	Growth and Development Bundle	0.00	0.14	0.77	<$0	<$0	UC
TLU-6	Low Carbon Fuels	0.00	0.04	0.39	N/A	N/A	UC
TLU-7	Heavy-Duty Vehicle Emissions Standards and Retrofit Incentives	0.00	0.02	0.16	+$12.8	+$79	UC
TLU-8	Heavy-Duty Vehicle and Locomotive Idle Reduction	0.01	0.02	0.13	–$5.6	–$44	UC
TLU-9	Procurement of Efficient Fleet Vehicles	*Included in TLU-1, TLU-6 through TLU-8, and TLU–11*					UC
TLU-10	Transportation System Management	*Not quantified*					UC
TLU-11	Intermodal Freight Transportation	0.02	0.09	0.59	N/A	N/A	UC
TLU-12	Off-Road Engines and Vehicles GHG Emissions Reductions	*Not quantified*					UC
TLU-13	Reduced GHG Emissions from Aviation	*Not quantified*					UC
	Sector Total Before Adjusting For Overlaps	0.03	1.29	7.10	–$570	–$89	UC
	Sector Total After Adjusting For Overlaps	0.02	0.96	6.1	–$321	–$93	UC

$MMtCO_2e$ = million metric tons of carbon dioxide equivalents; GHG = greenhouse gas; N/A = not applicable.

TLU-1. Light-Duty Vehicle Clean Car Standards

Policy Description

Adopt the State Clean Car Program (also known as the "Pavley" standards or California GHG Emission Standards) in order to reduce greenhouse gas (GHG) emissions from new light-duty vehicles (LDVs). The standards, which must still be approved by the United States Environmental Protection Agency (US EPA), would take effect in model year 2011 (calendar year 2010). Other Clean Car Program elements include standards requiring reductions in smog- and soot-forming pollutants and promoting introduction of very low-emitting technologies into new vehicles.

New cars and light trucks in all states must comply with federal emission standards and, generally speaking, states have the choice of adopting a stronger set of standards applicable in California. In 2005, California finalized a set of standards that would require reductions of GHG emissions of about 30% from new vehicles, phased in from 2009 to 2016, through a variety of means. Eleven states have already adopted the California Clean Car Program standards: California, Connecticut, Maine, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

Policy Design

This policy design is focused on achieving high levels of efficiency by requiring vehicles sold in Montana to meet higher levels of efficiency than is required nationally. This policy recognizes that Montana by itself would not have influence in setting standards, but by joining efforts of other states would ensure that efficient vehicles are sold in Montana, and that less efficient vehicles that could no longer be sold in other states are not sent to Montana because of lower standards there.

Goal Levels: Go beyond the federal emissions standards for cars and light trucks within the parameters of the California standards. (Note: States can choose between the federal standard or go with the more stringent California standards, in which Montana would need a bidding process or public involvement before or during legislative or regulatory process for transparency.)

Timing: A regulatory program could begin with vehicle model year 2011. To meet federal compliance, a rule-writing process would take place by the appropriate agencies so that Montana can implement the California standards.

Parties Involved: Applies to model year 2011 new cars and light trucks. The law would directly affect automobile manufacturers, car dealers, and consumers. Compliance concerns would affect manufacturers and dealers.

Other: The California standards currently are being litigated and have not been approved by the EPA. Timing will be affected by the date of enactment of legislation, likely litigation, and the regulatory process.

Implementation Mechanisms

Regulatory Program: Institute a regulatory program beginning with vehicle model year 2011.

Related Policies/Programs in Place

None.

Estimated GHG Savings and Cost Per Ton

Light-Duty Vehicle Clean Car Standard	2010	2020	Units
GHG emission savings	0.00	0.95	$MMtCO_2e$
Net present value (2006–2020)	N/A	–$492	$ Million
Cumulative emissions reductions (2006–2020)	0.00	4.92	$MMtCO_2e$
Cost-effectiveness	N/A	–$100	$/MtCO_2e$

N/A = not applicable.

Data Sources:

- Center for Climate Strategies (CCS), Draft Montana Greenhouse Gas Inventory and Reference Case Projections.
- Diane Brown and Elizabeth Ridlington, "Cars and Global Warming: Policy Options to Reduce Arizona's Global Warming Pollution from Cars and Light Trucks," AZ Public Interest Research Group (PIRG) Education Fund: February 2006, http://www.arizonapirg.org/AZ.asp?id2=22371
- Elizabeth Ridlington, Tony Dutzik, and Christopher Phelps, "Cars and Global Warming: Policy Options to Reduce Connecticut's Global Warming Pollution from Cars and Light Trucks," Spring 2005.

Quantification Methods:

- CCS compared results from New England states, California, and a National PIRG model obtained using comparable modeling methods. CCS found that while all three modeling efforts were valid, reasonable, and comparable, some of the PIRG model assumptions and methods were relatively conservative, while the California and New England modeling results were relatively optimistic. CCS further refined the PIRG model results consistent with a middle range scenario that produced results less conservative than the PIRG results and less optimistic than those from California and New England.
- While PIRG projected a 13.7% reduction in LDV emissions with this policy for Arizona, a CCS refinement estimated a 15.5% reduction. CCS applied this same refined percentage reduction in emissions to the reference case for Montana. A linear ramp-up period is also assumed, reaching 100% of the 15.5% reduction by year 2020.

Key Assumptions:

The three modeling efforts have established a valid and reasonable method of projecting GHG emissions reductions from this policy. The CCS comparison of the three modeling methods provides some independent professional validation of the models and their results. The key assumption projected by CCS is that the most likely scenario for emissions reductions would fall

between the more conservative scenario projected by the PIRG model and the more optimistic scenario projected by the California and New England models.

Key Uncertainties

Fleet turnover rates for light-duty vehicles and future patterns of consumer purchase choices between passenger cars and light-duty trucks, e.g., sport utility vehicles (SUVs).

Additional Benefits and Costs

None identified.

Feasibility Issues

Possible vehicle registration leakage (e.g., people might go to Idaho to purchase their vehicles to avoid these standards).

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-2. Fuel Efficient Replacement Tires Program

Policy Description

Improve the fuel economy of the LDV fleet by setting minimum energy efficiency standards for replacement tires and requiring that greater information about low-rolling resistance (LRR) replacement tires, including all season/all weather LRR tires, be made available to consumers at the point of sale. Snow and mud LRR tires are currently available, and tire manufacturers, such as Michelin, are currently researching and developing fuel efficient all weather replacement tires.

Vehicle manufacturers currently use LRR tires on new vehicles, but they are not easily available to consumers as replacement tires. When installing original equipment tires, carmakers use LRR tires to meet federal corporate automobile fuel economy standards (CAFE). When replacing the original equipment tires, consumers often purchase less fuel-efficient tires and potentially more costly tires (depending on annual vehicle miles traveled [VMT]). Currently, tire manufacturers and retailers are not required to provide information about the fuel efficiency of replacement tires.

An appropriate state agency would initiate a fuel efficient tire replacement program. The program would include consumer education, product labeling, and minimum standards elements.

These programs would be developed under a rule development process. All programs would incorporate the best scientific information, including the test results of tires conducted by the tire manufacturers, the California Energy Commission, and the National Academy of Sciences.

Policy Design

This policy is designed to encourage consumer choice and example by state government.

Goal Levels: Establish voluntary energy efficiency standards that achieve an average 4.5% gain in fuel economy.

Timing: By 2009, the state or appropriate agency would initiate a fuel efficient tire replacement program for the state fleet if all season/all weather tires are available and are incorporated into legislatively approved rental rates, establish voluntary energy efficiency standards for replacement tires, and develop a marketing program for fuel efficient replacement tires.

By 2011, the state or appropriate agency would ensure that a proportion of tires replaced on state-owned and -leased vehicles will be LRR tires (if they are available for the vehicle type and are rated for all season/all weather service) and would establish legislation to set LRR standards for tires with mandatory manufacture labeling.

Parties Involved: Montana Department of Environmental Quality (MDEQ), Montana Department of Transportation (MDT), LRR manufacturers, tire distributors, Montana University System.

Implementation Mechanisms

The program would include consideration of the technical feasibility and cost of such a program, the relationship between tire fuel efficiency and tire safety, potential effects on tire life, and impacts on the potential for tire recycling. In addition, the program would exempt certain classes of tires that sell in low volumes, including specialty and high-performance tires.

The minimum standard is likely to be less stringent than the energy efficiency of original tires provided by the automobile manufacturers on new purchase vehicles. Such a regulation would improve the fuel efficiency of the overall LDV fleet but not necessarily the fuel efficiency of all tires since consumers would still make choices in the marketplace. The replacement tires in the future would be, on average, more fuel efficient than those historically purchased but are likely to be, on average, not as fuel efficient as the tires included as original equipment by the automobile manufacturers.

Information and Education: Provide information to general public and commercial businesses (i.e., taxi and food delivery services) that use light-duty vehicles for daily business that the improved fuel efficiency is directly related to decreased rolling resistance. Information on the potential annual costs savings using LRR tires would also be provided. For example, a car averaging 15,000 miles per year would have fuel savings of over $80 (at $2.25 per gallon). A chart of recommended tire models would be included with information on product labeling and minimum standards elements. Best scientific information including the results from tests of tires conducted by the tire manufacturers, the California Energy Commission, and the National Academy of Sciences would be reviewed and incorporated.

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

Promotion and Marketing:

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

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

Voluntary LRR Standards: Establish voluntary LRR standards that achieve an average 4.5% gain in fuel economy.

Encourage Procurement of LRR Tires:

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

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

University Research: Encourage the Montana University System to conduct research on alternative noncombustible applications for used tires.

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

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

Funding Mechanisms and/or Incentives: Replacement of tires on state fleet vehicles is already budgeted through the MDT annual funding processes.

Voluntary and or Negotiated Agreements: Work with the manufactures and affected parties to achieve objectives with flexibility of the timelines.

Codes and Standards: The State of California has developed substantial information pertaining to LRR tires because of legislative actions that require tires to be replaced with more efficient ones. Associated documentation identifies testing methods and LRR standards. The appropriate state agency can review the information and establish suitable Montana standards.

Pilots and Demonstrations: Coordinate with product developers to help them promote their technologies.

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

Enforcement: No enforcement actions are necessary initially since this is a voluntary program. After the mandatory labeling is in effect, spot checks at the primary tire distributors in the main Montana cities would be annually conducted by the county health departments and the state staffs.

Related Policies/Programs in Place

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

Although the climate in California is significantly more moderate than that in Montana, all season/all weather LRR tires may be made available. Michelin tire manufacturers are currently researching and developing all-weather tires.

Estimated GHG Savings and Cost Per Ton

Assuming 5% market penetration with an increase to 10% at Year 2020:

Fuel Efficient Tire Replacement	2010	2020	Units
GHG emission savings	0.00	0.03	$MMtCO_2e$
Net present value (2006–2020)	N/A	–$86	$ Million
Cumulative reductions (2006–2020)	0.00	0.14	$MMtCO_2e$
Cost-effectiveness	N/A	–$90	$/MtCO_2e$

N/A = not applicable; $MMtCO_2e$ = million metric tons of carbon dioxide equivalents.

Data Sources:

- Tires and Passenger Vehicle Fuel Economy, Transportation Research Board/National Research Council (NRC), 2006.
- California State Fuel-Efficient Tire Report, California Energy Commission, January 2003.

Quantification Methods:

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

At the request of the United States Congress, the National Research Council of the National Academy of Sciences (NRC/NAS) conducted a study of the feasibility of reducing rolling resistance in replacement tires. The 2006 NRC/NAS study made the following conclusions:

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

A 2003 study commissioned by the California Energy Commission found that about 300 million gallons of gasoline per year can be saved in that state with LRTs. A set of four LRTs would cost consumers an estimated $5 to $12 more than conventional replacement tires. The fuel-efficient tires would reduce gasoline consumption by 1.5% to 4.5%, saving the typical driver $50 to $150 over the 50,000-mile life of the tires. Consumers would save more than $470 million annually at current retail prices or approximately $1.4 billion over the 3-year lifetime of a typical set of replacement tires.

CCS estimated the reduction in GHG emission from this policy using the Montana Greenhouse Gas Inventory and Reference Case Projections as a baseline and using an emission reduction factor of 4.5% (the upper end of the range of reported fuel conservation due to LRR replacement tires).

Key Assumptions:

The estimate of costs associated with LRR replacement tires accounts for faster tire wear (assuming that tires have lower tread) and an increase in the cost of production that is passed through to consumers. According to the NRC/NAS study, consumers would pay an additional

$12.00 per year to replace tires (including installation), and they would pay an additional $1.00 per tire because of increased production costs.

Key Uncertainties

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

Additional Benefits and Costs

Reductions in criteria air pollutants.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-3. Consumer Information on Vehicle Miles Per Gallon (MPG)

Policy Description

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

Policy Design

This policy is designed to impact consumer choice and behavior.

Goals: Greatly increase the awareness and availability of consumer information on MPG to result in greater fuel efficiency across the state.

Timing: Program would begin in 2008, with program expansion as resources are made available.

Parties Involved: MDEQ, MDT, Montana Motor Vehicle Division, product manufacturers, product distributors, Montana University System.

Implementation Mechanisms

Information and Education: The manufacturers of such energy-saving technologies would be contacted to encourage promotion of their relevant products through regional newspaper and television advertising in addition to working with potential distributors (auto shops, car dealerships, electronic stores) to provide information about the products. In addition to these technologies, vehicle maintenance and operations that have effects on the fuel efficiency of private vehicles can be implemented in driver education courses.

Promotion and Marketing:

- Establish consumer information for both add-on technologies and original equipment that provide real-time MPG information, tire pressure valves, and early and late engine check warnings lights.
- Encourage local and county governments to act consistently with and support state procurement on their behalf.
- Encourage federal agencies located within the state to act accordingly with and support state actions.
- Encourage businesses that depend on vehicles to conduct daily business to act accordingly with and support state actions.

- Develop a marketing program with vehicle and product manufacturers and consumers to encourage the purchase of energy saving technologies. This effort might include a voluntary labeling program for "green purchases."

State Lead by Example:

- The state will lead by example by initiating a consumer information program for energy efficient driving practices and devices for all state vehicles, both owned and leased.
- Encourage the Montana University System to conduct research on energy saving technologies and their effects on changing consumer behavior.
- MDT will use its Web site to post consumer-friendly information or links to information on fuel efficiency in relation to the purchase, maintenance, and operations of vehicles.
- All state-supported programs would have dedicated detailed Web sites. In addition to information and materials, program participation by the various governmental agencies and individual businesses (i.e., success stories) would also be documented and extolled.

Technical Assistance: Contact the product manufacturers and distributors to coordinate objectives and obtain technical support for outreach materials.

Voluntary and or Negotiated Agreements: Work with the manufacturers and affected parties to achieve objectives with flexibility of the timelines.

Codes and Standards: The appropriate state agency can review the technical and feasibility information and establish suitable Montana standards.

Pilots and Demonstrations: Coordinate with product developers to help them promote their technologies on the shelf and on the Internet.

Reporting: The state will develop a tracking system so it can eventually determine the effects of the consumer information program on consumer choices and driving behavior as well as its benefits. A simple tracking system could be established relatively easily by contacting the primary vehicle dealerships and auto shops of the major Montana cities on an annual basis, and estimates could be gathered from their inventories.

Enforcement: No enforcement actions are necessary initially since this is a voluntary program.

Related Policies/Programs in Place

None.

Estimated GHG Savings and Cost Per Ton

Consumer Information on Vehicle MPG	2010	2020	Units
GHG emission savings	Included in TLU-1 and TLU-2	Included in TLU-1 and TLU-2	$MMtCO_2e$
Net present value (2006–2020)			$ Million
Cumulative emissions reductions (2006–2020)			$MMtCO_2e$
Cost-effectiveness			$/MtCO_2e$

$MMtCO_2e$ = million metric tons of carbon dioxide equivalents

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-4. Financial and Market Incentives for Low GHG Vehicle Ownership and Use

Policy Description

The three components studied and developed under this option would create financial incentives for the purchase and operation of vehicles that emit lower levels of GHGs.

Policy Design

The Climate Change Advisory Committee (CCAC) recommends that Montana further study and develop policy options that create incentives and disincentives for the purchase and operation of vehicles with varying fuel economy. The following are some of the policies to be studied and developed:

1. *Feebates.* A multistate "feebate" program, including the neighboring western states of Arizona, California, and New Mexico. Feebate proposals usually have two parts: 1) a fee on relatively high emissions/lower fuel economy vehicles and 2) a rebate or tax credit on low emissions/higher fuel economy vehicles. Legislation will be needed for this policy option.

2. *Excise Taxes.* A change in new vehicle excise tax that would increase taxes for relatively high-emitting vehicles and reduce taxes for relatively low-emitting vehicles. Overall, excise tax revenue would remain the same.

3. *Labeling.* A consumer labeling program that provides buyers with better information on the GHG emissions of new vehicles.

Together, these incentives could change the vehicle fleet technology mix through a combination of demand- and supply-side changes.

Goal Levels: Prepare a detailed study of options and impacts.

Timing: Complete in 2010.

Parties Involved: Industry, MDEQ, and Montana Department of Revenue.

Implementation Mechanisms

There is an important need for a greater understanding of the potential effects of single-state or multistate feebate programs on the types of vehicles that manufacturers put into the marketplace. Existing analysis shows that 90% of the benefits of feebate programs are likely to arise from the manufacturing (supply side) response rather than the consumer (demand side) response. Because individual states such as Montana have a small share of the national new vehicle market and thus are unlikely to have a significant influence on the supply side by themselves, states in the southwest have been exploring coordinated multistate programs. A consistent set of feebate programs across multiple states may include a large enough share of the U.S. market to have a more significant effect on supply side decisions made by automobile manufacturers.

With that in mind, incentives and disincentives that should be studied and developed include the following:

- **Feebates.** A "Multistate LDV GHG Fee and Rebate Study and Pilot Program" would consider the expected impacts of individual state feebate programs as well as coordinated or consistent multistate programs. Ideally, such a multistate study would include a number of western states in order to assess boundary issues and coordination issues. Initial analysis suggests that the Montana new car market may be too small to have an effect on the types of vehicles that manufacturers put into the marketplace. A consistent set of feebate programs across multiple states may include a large enough share of the U.S. market to have a more significant effect on automobile manufacturers' supply-side decisions. The study would also identify and assess the actual benefits and costs of a pilot feebate program implemented at the county or metropolitan level in the western United States.

  Economic analyses of these proposals have found that feebate programs would work on two levels. First, the feebates would directly affect consumer choices for vehicle purchases because of financial incentives. Second, the feebates could indirectly affect the types of vehicles that automobile manufacturers choose to put into the marketplace.

- **Excise Taxes.** Examine options similar to Bill 2438 in the 2005 Massachusetts Legislature which directs the Secretary of Taxation and Revenue to set a variable excise tax on new passenger vehicles ranging from 0% to 10%, based on the vehicle's CO_2 emission rate. The tax would be lowest on the lowest emitting vehicles and highest on the highest emitting vehicles, subject to certain guidelines and constrained by maintaining the current average excise tax of 3% (an annual adjustment of the schedule of taxes would maintain this average). One option would be to link the excise tax structure so that it is set at zero for vehicles that comply with the European Union GHG standards.[1] New Mexico currently has a zero excise tax for hybrid cars.
- **Consumer Labeling.** Examine options similar to an EU program begun in 2001, and a recent proposal by a researcher at Resources for the Future.[2] It would require dealers to place a GHG label on each new vehicle that includes the estimated amount of CO_2 (in pounds) produced annually and places the vehicle into one of five distinct groupings from "best" to "worst."

Type(s) of GHG Benefit(s)

Reduction in all GHG exhaust emissions through reduced fuel consumption.

Related Policies/Programs in Place

While feebate proposals have been described in academic studies, there has been no implementation of a full feebate program in the United States. While there are individual "gas

[1] For a discussion of EU standards, see *Pew Center*, "Comparison of Passenger Vehicle Fuel Economy & GHG Emission Standards Around the World," 12/04, http://www.pewclimate.org/global-warming-in-depth/all_reports/fuel_economy, pp. 11–12.

[2] http://www.rff.org/rff/News/Features/Combating-Global-Warming-One-Car-at-a-Time.cfm

guzzler" taxes and tax incentives for hybrid vehicle purchases, there is not yet any history of an on-the-ground example of a comprehensively implemented feebate program.

States such as Arizona, California, and New Mexico, however, are joining together to form a multistate feebate program.

Estimated GHG Savings and Cost Per Ton

Included in the estimation for TLU-1. Not estimated for this policy option separately from the GHG emissions reductions estimated for TLU-1. Following the study called for under this option, the state could develop quantifiable options that are specific to the policies described in this option.

Data Sources, Methods, and Assumptions

CCS conducted a review of the most relevant research and analysis on feebate proposals. CCS made three findings:

1. There has been significant conceptual development of the feebate idea, especially at the national level;

2. There is a need for a greater understanding of potential benefits and costs of state level and multistate coordinated feebate programs; and

3. There has not been sufficient pilot testing of feebate programs in the United States to provide implementation experience.

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

Some attempts have recently been made to estimate the GHG emissions reduction potential from individual state feebate programs, including programs proposed for the states of Arizona and California. For example, a recent PIRG analysis suggests that a single-state feebate program for Arizona would result in an estimated 0.1 $MMtCO_2e$ GHG emissions reductions in 2020. These recent estimates of the potential impacts of individual state programs are contingent upon assumptions and analytical methods that have not undergone thorough peer review. Therefore, the results of these analyses are preliminary and should be interpreted with some caution. Further analysis and study of the potential benefits and costs of individual state and multistate feebate programs would greatly increase confidence in projected results.

Key Uncertainties

Both the US DOE and the Canadian Transport Ministry have studied the potential impacts of national-level feebate programs in recent years. While these studies have informed the debate about the advantages and disadvantages of national feebate programs, there remains considerable uncertainty about the potential benefits and costs of state- or multistate-level feebate programs. There is an important need for a greater understanding of the potential effects of single-state or multistate feebate programs on the types of vehicles that manufacturers put into the marketplace.

Additional Benefits and Costs

None identified.

Feasibility Issues

Requires multistate cooperation.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-5. Growth and Development Bundle

Policy Description

This bundle of options encompasses several components intended to reduce GHG emissions through promotion of multimodal transit options and land use practices and policies. These policies contribute to GHG emissions reductions by reducing vehicle trips and VMT.

Potential actions include the following programs and program elements:

1. Infill, densification, and brownfield redevelopment;
2. Mixed-use and transit-oriented development;
3. Smart growth planning, modeling, and tools;
4. Targeted open space protection;
5. Expanded transit infrastructure and service; and
6. Expanded transportation choices.

In general, neighborhood center development and redevelopment options are recommended to reduce VMT resulting from inefficient development patterns and locations. Smart Growth principles should be implemented to manage the location, density, development pattern, infrastructure, and basic human needs of new growth. Options for achieving these principles include:

- Directed Growth—Enable local governments to direct growth to locations that will be most cost-effective to serve and result in lower VMT. This goal can be achieved through a combination of education, partnerships, funding programs, and policy changes at state and local levels.
- Market Incentives—Create market incentives to encourage voluntary adherence to Smart Growth principles. Collaboration between the state and private lending institutions would be required to identify and implement lending policies that create incentives for Smart Growth developments.
- Alternative Revenue Sources—Reduce local governments' reliance on property tax to fund public capital improvements, and operating and maintenance needs, thus eliminating the incentive to expand the jurisdictions' property tax base (sprawl). Provide alternative funding sources to schools and local governments.

Policy Design

Goal Levels: Implement a package of policies and incentives, such as the implementation mechanisms identified below, that will significantly reduce urban VMT below the 2020 baseline. The scientific research literature indicates that VMT reductions of 3% to 11% are possible in

urban areas as a result of implementing the recommendations set forth below. How aggressively the package of policies and incentives is implemented will determine the precise extent of the reduction. For this policy option, the CCAC established an urban VMT reduction target, measured against the 2020 baseline, of between 3% and 11%, preferably at the higher end of this range.

Timing:

- State policy changes should be promoted during the 2009 legislative session, but the building of a widespread coalition to provide the necessary political will should begin immediately.
- Actions that do not require legislative changes or securing new funding sources should begin within 3 months after the adoption of this policy.

Parties Involved: MDT, Governor's Office, Montana Association of Counties, Department of Commerce, League of Cities and Towns, Montana Smart Growth Coalition, EPA Smart Growth Division.

Implementation Mechanisms

Access Management and Cooperative Planning

MDT will continue to strengthen its access management program, including the development of corridor access management plans that proactively seek to ensure that the capacity of the existing corridor to transport people and goods is not impaired. The order of priority for this planning should focus on urban and suburban highways in and near Montana's fastest growing areas.

- The state will encourage local governments to use arterial access management as a tool to manage growth while maximizing transportation system performance and safety. This will involve mechanisms to better link local access management policies to land use plans.
- MDT will continue and expand cooperative transportation planning efforts in Montana's communities, in part to help cities and counties develop 20-year multimodal transportation plans that are coordinated with local land use plans.
- MDT will work with local governments to encourage smart growth principles in transportation and land-use planning and ensure multimodal transportation solutions that are consistent with community goals.
- MDT will develop a Smart Growth transportation planning tool kit for local government's use to support multimodal transportation networks.
- MDT will substantially increase, from present levels, the percentage of Surface Transportation Program (STP) discretionary funds that are used for the purpose of creating effective multimodal transportation networks in and around existing cities and towns.
- MDEQ and the Montana Department of Natural Resources and Conservation (DNRC) will initiate a rule-making that examines the agencies' water quality and quantity rules and regulations that relate to land use development. In undertaking this review, the agencies will consider the effect their rules and regulations will have on facilitating the sprawl and will take into account the cumulative impact of the new development on Montana's surface and ground waters.

Directed Growth

- Fund a state-level Community Technical Assistance Program to provide Smart Growth model codes that create location-efficient communities designed to encourage the use of nonmotorized transportation and public transit. The Program would also compile and distribute information on Smart Growth design standards and funding sources.
- Require all elementary schools to be located on sites with good pedestrian and bicycle access.
- Require all state government work centers to be located in the central business district (CBD) or other established core business area of municipalities or, if this is not possible, in a suburban location with good pedestrian and bicycle access.
- Create a Governor's Smart Growth Council consisting of representatives from the Montana Association of Realtors, Montana Building Industry Association, Montana Association of Planners, and other entities to develop and distribute information on the GHG savings and other cost advantages of implementing Smart Growth principles.
- Require local growth policies to include a database of infill properties, including those that qualify as brownfields, and strategies for redevelopment.
- MDT will continue to expand existing transit service and create new transit services, taking advantage of federal funds made available through the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

Market Incentives

- Enable and encourage local governments to adopt financial incentives for infill or location-efficient development such as fast-track permitting, reduction of building permit fees, and reduction of system development or impact fees.
- Encourage lending institutions to adopt location efficient mortgage principles, such as recognizing transportation cost savings when calculating a household's borrowing ability.

Alternative Revenue Sources

- Encourage use of local option fuel taxes to help local governments fund transportation infrastructure that supports smart growth, including capital improvements and operation and maintenance. The state could also enable local government to adopt local option sales taxes, which could be used for this purpose.
- Adopt alternative funding sources for schools.
- Encourage the use of developer impact fees. In the long term, such fees could provide significant cost savings to local governments that could be redirected toward the city–county multimodal transportation funding.

Related Policies/Programs in Place

A variety of state and local policies and programs are in place to promote expansion of transportation choices and smart growth land use patterns. MDT has an access management program to ensure that land development does not jeopardize transportation system performance

and safety. MDT funds cooperative planning efforts with local governments. MDT also spends approximately $5 million per year on bicycle and pedestrian improvements.

Estimated GHG Savings and Cost Per Ton

Growth and Development Bundle	2010	2020	Units
GHG emission savings	0.00	0.14	$MMtCO_2e$
Net present value (2006–2020)	N/A	<$0	$ Million
Cumulative emissions reductions (2006–2020)	0.00	0.77	$MMtCO_2e$
Cost-effectiveness	N/A	<$0	$/MtCO_2e$

$MMtCO_2e$ = million metric tons of carbon dioxide equivalents; N/A = not applicable.

Data Sources:

Baseline VMT from Montana Greenhouse Gas Inventory and Reference Case Projections, 1990–2020.

A variety of simulation modeling and empirical studies have attempted to estimate the impacts of smart growth land use policies on VMT. Virtually all of this research focuses on urban areas (either local urban neighborhoods or metropolitan areas). For a summary of relevant literature, see:

- US EPA, *Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality, 2001*. http://www.epa.gov/dced/built.htm
- Cambridge Systematics, Inc., *Transportation Impacts of Smart Growth and Comprehensive Planning Initiatives: Final Report,* prepared for National Cooperative Highway Research Program, May 2004.
- Federal Highway Administration, Toolbox for Regional Policy Analysis, http://www.fhwa.dot.gov/planning/toolbox/index.htm

Regarding cost impacts, a variety of literature finds that integrated transportation and land use planning produces net savings on the total costs of buildings + land + infrastructure + transportation. However, some components may be higher even though total costs are reduced. The preponderance of literature suggests net savings overall (see US EPA, *Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality,* 2001). A National Academy of Sciences/Transportation Research Board review found substantial regional and state-level infrastructure cost savings from more compact development (see Robert Burchell, et al., *The Costs of Sprawl—Revisited (TCRP Report 39),* Transportation Research Board, Washington, DC, 1998).

Quantification Methods:

As described below, assume policy bundle results in 7% reduction in urban area VMT.

Calculate impact on total baseline transportation GHG emissions based on 7% reduction in baseline urban area VMT in 2020.

Key Assumptions:

Estimated GHG emissions reductions have been calculated against the mid-range of the possible reduction in VMT at 7%. The 7% estimated reduction is determined as the middle of the range, 3%–11%, which was based on the findings of the scientific research literature. Benefits (VMT and GHG reduction) increases linearly beginning in 2011 up to 2020.

Key Uncertainties

Achieving the target reduction in VMT depends on implementation of the policy initiatives at all levels of government. It is possible that required planning could be done in a way that does not change development patterns and thus does not reduce VMT and emissions. That is, the policy language does not require these outcomes.

External forces can have a significant effect on VMT and land development patterns, which creates additional uncertainty regarding the impacts of this policy option. For example, fuel prices affect vehicle use. A major increase in fuel prices would help to encourage use of alternative travel modes and might increase the benefits of this option. Conversely, a reduction in fuel prices would make it more difficult to reduce VMT through smart growth and multimodal transportation planning efforts. Land development patterns are strongly influenced by regional and state macroeconomic forces. The ability of governments to influence land use patterns depends to some extent on developer demand.

Additional Benefits and Costs

Land use policies such as the densification of developed land, mixing of compatible land uses and other urban design measures have beneficial "spin-offs" for other strategies. Land use-based policies further mode-switching policies because these policies help create an environment that is easier served by transit, biking, and walking.

Benefits include reduced infrastructure costs noted above, avoided health care costs from reduced air pollution and increased walking and biking, and other quality-of-life aspects.

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

Feasibility Issues

Land use changes will not have a large impact on transportation systems or CO_2 emissions over the short-term. However, over longer time spans, land use changes aimed at creating denser, mixed-use settlements may offer important opportunities to reduce transportation energy intensity and CO_2 emissions.

Land use-based measures targeting densification and land-use mix will primarily but not exclusively affect only urban areas as they have the characteristics to address densification. The effectiveness of these policies also depends upon the willingness of local governments—largely in urbanized areas—to implement land use policies and regulations. In addition, policies that affect land use and transportation take a long time not only to implement but also a long time to accrue their effects. Typically, transit-oriented development strategies take more than 20 years to implement.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-6. Low Carbon Fuels

Policy Description

This policy will seek to increase the use and market penetration of low carbon fuels (LCFs) to offset traditional fossil fuels such as gasoline, diesel, jet fuel, and others derived from crude oil. Additionally, the policy aims to increase production opportunities for LCFs derived from Montana crops and other low carbon transportation alternatives such as hydrogen, natural gas, and electricity. TLU-6 will evaluate the merits of LCFs based on their net carbon impact and will remain consistent with AFW-2, which increases biodiesel production in the state.

Various options or a combination of them to increase low carbon fuel use would include

- Carbon fuel accounting,
- Fuel quality standards,
- Low carbon fuel infrastructure development,
- Low Carbon Fuel Standard (LCFS) and credits for compliance,
- High carbon fuel tax, and
- State government fleet 'leadership' programs for adoption of low carbon fuels.

Carbon Reduction Requirements

LCFs demonstrate tangible economic benefits to rural economies. An LCF policy provides for strong, proactive measures to address economic and environmental issues where agricultural concerns yearn for economic sustenance and higher crop prices or new and higher paying industry jobs to sustain the existing economy.

Policy Design

This policy is designed to increase the use of LCFs through a combination of voluntary measures and standards.

Goal Levels: Create an LCF target for transportation fuels sold in Montana and reduce carbon intensity of Montana's passenger vehicle fuels by at least 10% by 2020. This minimum reduction should be based solely on implementation of LCF programs.

Timing: LCF targets will take place by the end of 2015.

Parties Involved: Fuel and Agriculture Industry, MDEQ, MDT, Montana Department of Revenue, auto dealerships, Montana University System (research).

Implementation Mechanisms

The following options or a combination of the options described below could be implemented to increase LCF use.

Carbon Fuel Accounting. All of these policy options should be evaluated based on fuel life cycle or net accounting that measures the net carbon emission per usable unit of energy delivered. In the case of traditional fuels, this includes carbon emissions of harvesting, mining, processing, transportation, and other energy inputs and carbon outputs from production to consumption. Biofuels should undergo the same net carbon accounting, including fertilizer, fuel used on the farm for seeding and harvesting, processing, and transportation.

Low Carbon Fuel Standard. A benchmark for promotion of LCFs should be based on energy output per volume of GHG generated, allowing policy to promote fuels with a favorable GHG-to-Energy ratio. The LCFS will require all fuel providers in Montana to ensure that the mix of fuel they sell into the Montana market meet, on average, a declining level of GHG emissions measured in grams of CO_2 equivalent per unit of fuel energy sold. The standard will also be measured on a life cycle basis in order to include all emissions from fuel production to consumption.

An LCF Standard is market- and performance-based, allowing averaging, banking, and trading to achieve lowest cost and consumer-responsive solutions. An LCF Standard is also fuel neutral where fuel providers will choose which fuels to sell and in what volumes. This provides flexible options for compliance including blending or selling increasing amounts of LCFs, using previously banked credits, and purchasing credits from fuel providers who earned credits by exceeding the standard.

An Executive Order would initiate this process, followed by a detailed report and regulatory proceedings before implementation. The appropriate state agencies will undertake a study to develop the framework for the LCFS. Once the study is completed, it will be introduced to the State's legislative proceedings, at which point the appropriate state agency will conduct public hearings on the proposal. The final report is expected to be finalized by 2010 and upon the adoption of this report, an appropriate state agency will initiate a regulatory proceeding, establishing and implementing the LCFS.

Credits for Compliance. Fuel providers, defined as refiners, importers, and blenders of passenger vehicle fuels, would demonstrate on an annual basis that their fuel mixtures provided to the market met the target by using credits previously banked or purchased. Providers that exceed the performance target for the compliance period will be able to generate credits in proportion to the degree of over performance and quantity of fuel provided. These credits can be used for future use or sold to other regulated fuel providers. Penalties for noncompliance will be determined during the implementation process.

High Carbon Fuel Tax. Options encouraging consumer demand shifts may also be required since fuel providers may not be able to shift to lower-carbon options if the market is unresponsive. The high carbon fuel tax will place a percentage tax on each gallon of fuel sold based on that fuel's GHG emissions measured in grams of CO_2 equivalent per unit of fuel energy sold. The fuel will also be measured on a life cycle basis in order to include all emissions from fuel production to consumption.

This carbon tax provides an economic incentive for both producers and consumers to shift production to fuels with lower carbon content. A tiered system, whereby conventional petroleum

is taxed at a high rate and LCFs are taxed at a low rate, if at all, will also generate some revenue for a State Carbon Trust Fund. Revenues collected would finance loans, incentives, and rebates for direct investment in research by Montana institutions, infrastructure for transportation alternatives, and Montana production of LCFs.

While there is much political aversion to a new tax or fee, this policy option provides the strongest option for the greatest market-based reductions in carbon fuel use. A carbon tax would be implemented through a new fuel tax infrastructure whereby the tax would need to be collected at the refinery level (as opposed to the distribution level). Revenues can directly move other goals, favorably shift the market toward LCFs, and assist with funding programs (e.g., in-state crop production and public transportation demonstration projects). A carbon tax tied to road use also provides additional incentives for local production and distribution.

State Government Fleet Lead by Example Programs. State agencies may explore how they can implement the purchasing of LCFs or alternative fuel vehicles into contracts. The award of construction contracts is another area in which the state can immediately have an effect on GHG emissions. After these programs are implemented, the benefits of GHG emission reductions, as well as lower fuel costs should be documented. The appropriate state agencies would publish a report detailing the benefits of the program.

Carbon Reduction Requirements. Reduction in carbon-intensive fuels can also be achieved directly through voluntary or mandated goals. Options include a specific mandate (e.g., 10% of fuel used in Montana markets will be either ethanol or biodiesel by 2025) or flexible mandates (e.g., by 2020, the total amount of GHG emissions from fuel consumption will be 90% of current levels), or a yearly reduction by current producers. Legislative action will put these goals in place. Policy will also be designed to avoid a situation similar to the "flex fuel hoax," where ethanol-capable vehicles were purchased for compliance, but no ethanol had been used. Any requirement should account for actual fuel use, and punishments for failure to meet these goals will be implemented.

Transportation Alternatives. State agencies would calculate the carbon reduction benefits of alternative transportation vehicles such as hydrogen, natural gas, and electricity, including neighborhood electric vehicles (NEVs) and other specialized transportation. Policy would be created to provide incentives for these vehicles and infrastructure for their use based on the achievable GHG reductions.

Type(s) of GHG Benefit(s)

Reduction in criteria air pollutants.

Related Policies/Programs in Place

California is in the process of finalizing their report for an LCFS, which is expected to be completed by June 30, 2007. Implementation of the LCFS is expected by the end of 2008.

Estimated GHG Savings and Cost Per Ton

Low Carbon Fuels	2010	2020	Units
GHG emission savings	0.00	0.04	$MMtCO_2e$
Net present value (2006–2020)	N/A	N/A	$ Million
Cumulative emissions reductions (2006–2020)	0.00	0.39	$MMtCO_2e$
Cost-effectiveness	N/A	N/A	$/MtCO_2e$

$MMtCO_2e$ = million metric tons of carbon dioxide equivalents.

Data Sources:

- CCS, Draft Montana Greenhouse Gas Inventory and Reference Case Projections.
- David Crane and Brian Prusnek. White Paper, "The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting Our Economy," January 8, 2007.
- Alexander E. Farrell (UC Berkeley)and Daniel Sperling (C Davis)."A Low-Carbon Fuel Standard for California, Part 1: Technical Analysis," May 30, 2007.

Quantification Methods:

CCS applied a declining value in carbon intensity of 10% (defined in gCO_2e/Btu) in LDV fuels to the reference case for Montana to determine its emissions savings.

Key Assumptions:

Benefits of GHG reductions follow a linear increase beginning in year 2011 up to year 2020. Quantification also assumes that the units of energy per gallon of fuel sold and combustion efficiency remains constant.

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

The market penetration of LCFs is dependent on the increasing innovation and/or regulation by the State to ensure that the fuel put on the market by providers meets, on average, a declining level of GHG emissions.

According to MDT, the current fuel tax infrastructure does not support the collection of high carbon fuel taxes at the distribution level. In order to establish a high carbon fuel tax, the state would need to develop a new fuel tax infrastructure, and legislation may be needed.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-7. Heavy-Duty Vehicle Emissions Standards and Retrofit Incentives

Policy Description

The State of Montana would seek to work with other states and the U.S. Environmental Protection Agency (US EPA) to advance GHG emissions standards for on-road heavy-duty vehicles (HDVs). In addition, the state would adopt incentive programs to reduce particulate matter (PM) emissions from existing on-road HDVs. Diesel particulate matter includes black carbon aerosols, which are thought to contribute to global warming through positive radiative forcing.

Approaches to diesel engine emission reductions include vehicle scrappage and replacement, re-powering (engine replacement), and retrofit with exhaust after-treatment devices. Two devices commonly used to reduce diesel PM emissions are diesel oxidation catalysts and diesel particulate filters. These devices can be used on certain model year engines of heavy-duty trucks, motor coaches, and transit and school buses.

Policy Design

This policy includes working with other states to set national emissions standards while at the same time initiating voluntary efforts to retrofit equipment, leading by example with initiatives to retrofit the state's own equipment and provide education and technical assistance. An incentive program would be used to encourage retrofits. A voluntary program with information and education would be aimed at target audiences, including impacts on children.

Goal Levels:

- The state would encourage the retrofit of on-road heavy-duty diesel vehicles of model year 2006 or earlier. (Beginning with model year 2007, HDVs must meet stringent new EPA emissions standards and therefore have very low black carbon emissions.)
- The state would develop and implement a diesel retrofit incentive program with a goal of retrofitting 50% of the pre-2007 HDVs registered in the state that would still be in use in 2020. (The vast majority of HDVs in the 2020 fleet will meet the 2007 EPA standards and therefore not require retrofits.)
- The state would lead by example by initiating a retrofit program for the state-owned and state-leased vehicle fleet, with a goal of reaching a minimum of 80% of the pre-2007 vehicles fleet, subject to available funding.

Timing:

- The state could lead by example by seeking to initiate a diesel retrofit program for the state-owned and leased vehicle fleet by 2009 if funding is available.
- By 2009, a voluntary diesel retrofit program will be established by a state agency, focused on private HDVs registered in the state. Information packages would be developed about the health effects of air pollutants on human health, particularly on children. The program would

create incentive options and marketing strategies, track retrofit and research activities, and spearhead the progression of on-road HDV GHG emissions standards with other states and the EPA.

- HDV retrofit incentives will be available for vehicle owners by 2011.

Parties Involved: MDT, MDEQ, local governments, Montana Metropolitan Planning Organizations, relevant industries (e.g., utilities, parcel delivery services), public and private educational institutions and organizations, Department of Health and Human Services, Montana University System.

Implementation Mechanisms

Rebate and Tax Credits: The appropriate state agency would establish a voluntary program to retrofit diesel engines in a rebate program. Users of heavy-duty diesel engines who retrofit with emission controls would also qualify for a credit against Montana income or business taxes (whichever is relevant) to a percentage (such as 25%) of the retrofit costs. Some retrofits reduce emissions of black carbon, which contributes to the greenhouse effect.

Local Ordinances: The state would encourage communities to establish local ordinances requiring retrofitting of HDVs, including garbage and construction trucks. In addition, transit companies contracted by the public school system to transport students, regardless of the purpose (e.g., daily transport, sporting events, educational trips) would also be required to participate in the retrofit programs.

Encourage New Federal Standards: The state would encourage the EPA to initiate the development of new GHG emission standards for HDVs.

Air Pollution Control Measures in Non-Attainment Areas: The state and some counties have the regulatory authority to require air pollution control measures in areas designated by the EPA as "non-attainment" for air pollution under the federal Clean Air Act. Exhaust emissions from engine combustion can be identified through technical studies and targeted by state or county air pollution control measures.

State Lead by Example: Implement a voluntary diesel retrofit program by an appropriate state agency.

Promotion and Marketing:

- Encourage local and county governments to act consistently with and support state actions.
- Encourage federal agencies located within the state to act accordingly with and support state actions.
- The state will develop information packages about the effects of air pollutants in diesel emissions on human health, particularly on children.
- Encourage transit companies contracted with a public school district to act accordingly with and support state actions. Educational information will be provided by a state agency to both the transit companies and the public education system about health effects of air pollutants from diesel emissions on children's health.

- Assist in the development of on-road HDV GHG standards with other states and the EPA.
- Encourage the Montana University System to conduct research on on-road HDV GHG standards and emission reduction technologies.
- As in TLU-2 and other options discussed below, all state-supported programs would have dedicated detailed Web sites. In addition to information and materials, efforts of the various governmental agencies and businesses would be documented and publicized.

Technical Assistance:

- Contact the manufacturers of the various diesel emission reductions technologies to coordinate objectives and obtain technical support for outreach materials.
- The EPA created the Retrofit Technology Verification Process. This program evaluates the emission reduction performance of retrofit technologies, including their durability, and identifies engine operating criteria and conditions that must exist for these technologies to achieve those reductions.
- The EPA has also developed the Voluntary Diesel Retrofit Program to address pollution from diesel construction equipment and HDVs that are currently on the road. Program information is available to help fleet operators, air quality planners in state and local government, and retrofit manufacturers create effective retrofit projects.

Funding Mechanisms and/or Incentives:

- Funding for retrofit incentives would be proposed through legislative action. The owners of the retrofitted heavy-duty diesel engines would qualify for a credit against Montana income or business taxes (whichever is relevant) to a percentage of the retrofit costs (tax credit). Another option is feebates incurred as part of the engine maintenance costs, which would be based on the age of the engine.
- Funding may be available through the EPA Voluntary Diesel Retrofit Program and/or the EPA funding programs to reduce air toxics at the local level. Also refer to "Related Policies/Programs in Place" for more possible funding avenues.
- The Montana University System can obtain applicable grant funding independently.

Voluntary and/or Negotiated Agreements: Work with regulated entities to promote voluntary compliance assistance through distribution of materials, staff training, and so on. Encourage participation in EPA's National Clean Diesel Campaign.

Codes and Standards: Refer to the information provided in the previous sections.

Pilots and Demonstrations: Coordinate with product developers to help them promote their technologies.

Reporting: The state will develop a tracking system so emissions reductions from the application of heavy-duty diesel replacement technologies can be derived. The state can annually contact the primary shipper companies in the main Montana cities to gather estimates from their inventories.

Enforcement: No enforcement actions are necessary since this is a voluntary program. However, the EPA will penalize any manufacturer who does not comply with their standards.

Related Policies/Programs in Place

Congestion Mitigation and Air Quality Improvement Program: A heavy-duty diesel engine retrofit may be eligible for funds through the federal Congestion Mitigation and Air Quality Improvement (CMAQ) Program, provided that the vehicle operate predominantly within or in close proximity to an EPA-designated air quality nonattainment or maintenance area and primarily benefit those areas. If the truck is privately owned, CMAQ funding would be contingent upon meeting the public–private partnership provisions of the guidance. Funds under the program also may be used for school bus programs in nonattainment and maintenance areas to retrofit or replace engines with the latest technologies that reduce emissions. Several urban areas in Montana are likely to be designated nonattainment under the new fine particulate standard.

Emissions Standards for 2007 and Newer Vehicles: On December 21, 2000, the EPA signed emission standards for model year 2007 and later heavy-duty highway engines. The rule included two components: 1) emission standards and 2) diesel fuel regulation. The rule focused on PM and nitrogen oxides (NO_x). The stringent standard for PM took effect in the 2007 heavy-duty engine model year. The NO_x standard for diesel engines will be phased in between 2007 and 2010. As a result, model year 2007 and new HDVs have very low PM emissions.

Diesel Emissions Reduction Act: A new energy law enacted in August 2005 created a national program to clean up older diesel engines. The legislation, known as the Diesel Emissions Reduction Act (DERA), provides federal funding to help finance voluntary retrofit incentive programs (both grants and loans) at both the national and state level.

EPA Voluntary Diesel Retrofit Program: The EPA has also developed the Voluntary Diesel Retrofit Program with a designated Web site. The program addresses pollution from diesel construction equipment and HDVs that are on the road today. The program Web site is designed to help fleet operators, air quality planners in state and local government and retrofit manufacturers understand this program and obtain the information they need to create effective retrofit projects. Funding will depend on the President's FY07 budget.

National Clean Diesel Campaign: In addition, the EPA has created the National Clean Diesel Campaign (NCDC). The NCDC will work aggressively to reduce the pollution emitted from diesel engines across the country through the implementation of varied control strategies and the aggressive involvement of national, state, and local partners.

MDEQ No-Idle Zone: MDEQ is working with a few schools to reduce idling by educating and signing areas around schools where large and small vehicles need to shut off engines while waiting to pick up students.

Estimated GHG Savings and Cost or Cost Savings

Heavy-Duty Vehicle Emission Reduction & Retrofit	2010	2020	Units
GHG emission savings	0.00	0.02	$MMtCO_2e$
Net present value (2006–2020)	N/A	$12.8	$ Million
Cumulative emissions reductions (2006–2020)	0.00	0.16	$MMtCO_2e$
Cost-effectiveness	N/A	$79.0	$/MtCO_2e$

Data Sources:

- Truck population data (by model year), mileage accrual data, and PM2.5 emission factors from MOBILE6 model.
- Cost of retrofit devices (including installation) from California Air Resources Board, *Evaluation of Port Trucks and Possible Mitigation Strategies*, Preliminary Draft, April 2006.

Quantification Methods:

- Assume HDVs of model year pre-1994 are retrofitted with diesel oxidation catalysts (DOCs) and HDVs of model year 1994–2006 are retrofitted with diesel particulate filters (DPFs).
- DOCs reduce PM emissions by 25%; DPFs reduce PM emissions by 85% (California Air Resources Board technology verification levels).
- Obtain population of pre-2007 HDVs in operation in 2020 from MOBILE6 (by model year and by two weight classes: 14,000–33,000 lbs gross vehicle weight [GVW] and 33,001–80,000 lbs GVW)
- Assume retrofit program begins in 2011 and is completed in 2015.
- Assume program retrofits 50% of the pre-2007 HDVs that would be operating in 2020.
- Calculate PM2.5 emission reductions achieved in each year from 2011 to 2020.
- PM2.5 emissions from HDVs are 75.6% elemental carbon (black carbon), according to MOBILE6. Calculate black carbon emission reduction.
- Assume that a 1-ton reduction in PM2.5 emissions is equivalent to a 2,053-ton reduction in CO_2 equivalent emissions. This is the midpoint of a method suggested in Mark Z. Jacobson, "Correction to 'Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming,' " *Journal of Geophysical Research*, 110:D14105, 2005.
- Assume cost for DOC (purchase plus installation) is $1,200 for GVW 14,000–33,000 lbs and $2,000 for GVW 33,000+.
- Assume cost for DPF (purchase plus installation) is $7,000 for GVW 14,000–33,000 lbs and $8,500 for GVW 33,000+.
- Calculate total retrofit costs by year (all retrofits occur from 2011 to 2015).
- Use a 4% discount rate to calculate net present value (NPV).

Key Assumptions: See above.

Key Uncertainties

There is a great deal of uncertainty in the global warming impact of aerosol black carbon emissions (such as diesel PM). The Intergovernmental Panel on Climate Change (IPCC) has not assigned a global warming potential to black carbon emissions.

Additional Benefits and Costs

This strategy will reduce diesel PM emissions. Many scientific studies have linked breathing PM to a series of significant health problems, including aggravated asthma, difficult breathing, chronic bronchitis, heart attacks, and premature death. Diesel PM is of specific concern because it is likely to be carcinogenic to humans when inhaled.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-8. Heavy-Duty Vehicle and Locomotive Idle Reduction

Policy Description

This policy option involves reducing the amount of time that trucks, buses, and locomotives idle. It would involve promoting and expanding the use of technologies that reduce long-term idling, including the use of truck stop electrification. It would also encourage development of local ordinances banning unnecessary idling by HDVs and locomotives in most situations.

Truck stop electrification involves truck plazas that are equipped with electrification systems that allow drivers to shut off their engines and draw electrical power and in some cases, heating, cooling, and communications and entertainment options from a ground source. Different systems may or may not require the purchase of an adaptor to connect to the tractor.

In addition to truck stop electrification, other available technologies that reduce HDV idling include automatic engine shut-down/start-up system controls, auxiliary power units, and direct fired heaters. Technologies to reduce locomotive idling include automatic engine shut-down/start-up system controls and hybrid-electric switcher engines.

The state would encourage local ordinances to ban unnecessary idling by HDVs and locomotives in certain situations. The state would encourage consistency among these ordinances. The ordinances would likely include exceptions for situations when idling is unavoidable, such as cold weather, traffic delays, and other idling that occurs for public health and safety reasons (such as emergency vehicles).

A dedicated state funding stream for enforcement would be identified in order for this measure to be successful in reducing vehicle idling and the resulting reductions in GHG emissions.

Policy Design

This policy uses a combination of voluntary actions, incentives, contractual mechanisms, and standards with eventual enforcement.

Goal Levels:

- Reduce fuel consumption from heavy-duty diesel vehicle idling at rest areas and truck stops in two steps: 40% in Phase I by 2010 and 85% in Phase II by 2020.
- Require that 85% of the transportation services that a public school district has contracts with for transporting students and that uses HDVs must have anti-idling policies and/or in-house electrification systems to reduce fuel consumption and emissions from idling by 2011.
- Reduce locomotive idling in switch yards by 50% by 2020.

Timing: Establishment of local ordinances will be strongly supported by the state, but local governments will need to determine their time schedules.

- Installation of electrification systems at truck stops and rest areas by 2011.

- Attempt to have local ordinances in place by 2011 with relevant documentation available for distribution.
- The two-stage phase-in periods for the reduction in heavy-duty diesel vehicle idling are 2010 (Phase I) and 2020 (Phase II).
- Transportation services that have contracts with a public school district and that use HDVs to transport students must have anti-idling rules and/or electrification systems installed by 2011.

Parties Involved: MDEQ, MDT, local governments, Montana Metropolitan Planning Organizations, relevant public educational parties, truck stop owners and managers, trucking associations, school districts, chartered bus service companies, railroad companies such as Burlington Northern Santa Fe (BNSF) and MontanaRail Link (MRL).

Implementation Mechanisms

Toll Free Technical Assistance: The appropriate state agency would provide the general public, trucking industry, bus companies, and railroads with information (with a phone number to answer questions) indicating when and where (possibly specified by a map) idling is prohibited, and under what circumstances it is permitted. The benefits of reducing idling, including fuel savings, toxic emission reductions, and GHG reductions would be detailed.

Information and Education to Targeted Audiences: Encourage trucking companies and railroads to do their own proctoring. Reach out to busing companies, school districts, and truck stop owners to educate bus and truck drivers about the idling restrictions. Emphasize the fuel savings benefits, reductions in toxic emissions, and reduced engine wear associated with reducing idling. Provide information to fleet carriers, shippers, retailers, bus companies, school districts, and others involved in the diesel fleet industry indicating the economic benefits, as well as the environmental benefits, of applying idle reduction technologies. Identify best practices within the industry and recognize companies with these best practices in place within Montana to encourage companies to select these carriers for their shipments.

Develop outreach materials with cost benefits information and toxic diesel health effects in both indoor (cabin) and outdoor ambient air on both children and adults. Outreach materials should also be geared toward making the general public aware of the GHGs, toxics, and fuel-saving benefits of eliminating unnecessary idling on personal (passenger) vehicles, as well as on trucks and buses. Expand the school bus idling program based upon the pilots currently being conducted.

Promotion and Marketing: The state will develop information packages about the health effects of air pollutants from the idling emissions on human health, particularly the drivers, in and outside the truck cab or bus.

As with other policies, efforts will be supported by the appropriate state agency with a dedicated detailed Web site. Beyond information and materials, those participating in successful idling reduction efforts would have those efforts documented and publicized.

Technical Assistance: Coordinate with the impacted communities to organize workshops/outreach programs to let them know about technological options that provide

alternatives to the need for idling including products for cabin comfort, power for other functions (e.g., refrigerated trucks), and engine warm-up.

Funding Mechanisms and/or Incentives: Propose legislation to partially fund idling technology loan grants for truck stop electrification and other idle reduction technologies in the state, focusing grants on high idling areas.

Identify a dedicated funding stream that can be used to fund enforcement of local anti-idling ordinances and fund continued education and outreach. Funding the enforcing agency with an adequate share of the revenue from using the idling reduction facilities would be an option. Federal funds (EPA or DOE) may be available for idle reduction projects. A plan needs to be developed to apply for the funds.

Tax credits may be available for installing electrification through the National Energy Bill. Truck stop owners could offer their own incentives for the use of electrification (e.g., credits for free hours of electrification with the purchase of a specified amount of diesel).

At rest areas, individual meters could measure the amount of energy used by each trucker and the truckers could pay for the energy usages via a currency feed apparatus housed in a safe location from the cost savings derived by the increased fuel efficiency of not idling.

Voluntary and/or Negotiated Agreements: Work with regulated entities to promote voluntary compliance assistance through distribution of materials, staff training, and so on. The state would attempt to establish a Memorandum of Understanding (MOU) with BNSF and MRL regarding switchyard idle reduction. Encourage participation in EPA's SmartWay Transport Partnership (or similar programs). The SmartWay Transport Partnership is a voluntary collaboration between the EPA and the freight industry designed to increase energy efficiency while significantly reducing GHGs and air pollution.

Codes and Standards: Include concise language in local ordinances so that the agency with enforcement responsibilities is clearly delineated and has full authority to enforce the ordinances. The language should also include any exemptions to the idling policy, which can be easily observed. In developing the local anti-idling ordinances, the EPA's recent Model State Idling Law should be reviewed for potential ordinance language.

Pilots and Demonstrations: Coordinate with product developers to help them promote their technologies. Investigate availability of funds for pilot or demonstration projects on idle reduction technologies from EPA, US DOE, and the U.S. Department of Transportation. If funding is available, develop a pilot program to evaluate the effectiveness of various idle reduction technologies, including implementation of truck stop electrification and expanded school bus idling program. Evaluate the effectiveness of the pilot programs before implementing on a broader scale.

Related Policies/Programs in Place

- Lewis and Clark County has Rule 3.101, which applies to both diesel and locomotive engines and limits the amount of idling time when the health department has declared poor air quality (idling is limited to 2 hours within any 12-hour period).

- MDEQ has a voluntary program, *Clean Air Zone Montana,* aimed at reducing school children's exposure to vehicle emissions by discouraging idling of school buses and other vehicles and by helping schools obtain funding for bus maintenance and retrofitting.
- This option also supports progress toward EPA Strategic Plan Goal 1, Clean Air and Global Climate Change, Objective 1.1, Healthier Outdoor Air. The Regional Geographic Initiatives Program enables the Regions to work with states, local governments, and others in specific geographic areas on problems identified as high priorities by the Regions.
- Approximately 16 states and dozens of local counties have laws restricting the time a vehicle can idle its main engine. For a list of state and local anti-idling laws compiled by EPA in April 2006, go to http://www.epa.gov/smartway/documents/420b06004.pdf. EPA has also released a model for a state idling law, based on workshops with trucking industry stakeholders and state environmental agencies (see http://www.epa.gov/smartway/documents/420s06001.pdf)
- The Montana Legislature passed Senate Bill (SB) 449 by Sen. Gillan that requires that state agency vehicles purchased after January 1, 2008, meet or exceed CAFE standards.

Estimated GHG Savings and Cost or Cost Savings

Heavy-Duty Vehicle & Locomotive Idle Reduction	2010	2020	Units
GHG emission savings	0.01	0.02	$MMtCO_2e$
Net present value (2006–2020)	N/A	–$5.6	$ Million
Cumulative emissions reductions (2006–2020)	0.01	0.13	$MMtCO_2e$
Cost-effectiveness	N/A	–$44.0	$/MtCO_2e$

Data Sources:

- Identification and characteristics of truck stops in Montana obtained from www.gocomchek.com
- Information on current truck stop electrification projects in Montana (none) obtained from EPA SmartWay Interactive Activity Map (www.epa.gov/smartway).
- Estimate of truck idling hours per night obtained from Nicholas Lutsey, Christie-Joy Broderick, Daniel Sperling, Carollyn Oglesby. "Heavy-Duty Truck Idling Characteristics—Results from a Nationwide Truck Survey," paper submitted for the 2004 Annual Meeting of the Transportation Research Board, 2004.
- Information on fuel use per engine idle hour obtained from *Fleet Managers Guide to Fuel Economy*, The Maintenance Council, American Trucking Association, 1998.
- Population of school buses from Montana Office of Public Instruction.
- Rail-yard fuel use from MDEQ.

Quantification Methods:

School Buses		
Number of school buses, 2005	2,606	80,000
School days per year	180	6
Trips per bus per day	4	480,000
School bus trips per year	1,876,320	
		50%
Idling time per trip, current (min)	15	
Idling time per trip, w/ regulation (min)	5	240,000
Reduction in idling time per trip (min)	10	
		0.0333
Reduction in idling time per year (hours)	312,720	0.0006
		0.0023
CO_2 emission factor (g/hour)	3,300	
Reduction in CO_2 emissions/year (metric tons)	1,032	
Reduction in CO_2 emissions/year ($MMtCO_2$)	0.0010	
Trucks		
Total truck stops in state with truck parking	36	
Number with TSE	0	
Number without TSE	36	
Average spaces per truck stop	32	
Estimated occupancy per night	80%	
Idling hours per truck per night	5.9	
	Phase I (2010)	Phase II (2020)
Percent of idling reduced by TSE	40%	85%
Fuel/engine idle hour (AC)	1	1
Fuel/engine idle hour (no AC)	0.6	0.6
% of Idling hours with AC	25%	25%
% of Idling hours without AC	75%	75%
Reduction in idling hours/year	793,866	1,686,966
Reduction in fuel use/year	555,706	1,180,876
MMBtu (million)	0.0771	0.1638
MMtC	0.0015	0.0031
$MMtCO_2$	0.0054	0.0115
N_2O ($MMtCO_2e$)	0.000005	0.000011
CH_4 ($MMtCO_2e$)	0.000000	0.000001
Total Reduction ($MMtCO_2e$)	0.005	0.012
Locomotives		
Fuel use per major yard, currently (gal)	80,000	
Major switch yards in Montana	6	
Total Montana yard fuel use, currently (gal)	480,000	

Portion of idling that can be eliminated	50%	
Reduction in fuel use/year (gal)	240,000	
MMBtu (million)	0.0333	
MMtC	0.0006	
$MMtCO_2$	0.0023	

Key Assumptions:

- Benefits of truck idle reduction increase linearly between 2010 and 2020.
- Benefits of school bus and locomotive idle reduction constant from 2011 to 2020.
- School buses currently idle 15 minutes per trip on average; implementation of this policy would reduce idling per trip to 5 minutes.
- Rail-yard fuel use can be reduced by 50%.
- Cost of diesel fuel assumed to be $2.50 per gallon.
- Cost of truck stop electrification service (IdleAire) assumed to be $1.20 per hour.
- Cost savings estimated as difference between fuel cost and IdleAire service.

Key Uncertainties

- Number of overnight truck parking spaces in Montana.
- Utilization of overnight truck parking spaces.
- Extent of school bus idling and effectiveness of policy at reducing bus idling.
- Willingness of railroads to cooperate with locomotive idle reduction efforts.

Additional Benefits and Costs

Reducing idling by HDVs and locomotives would reduce PM emissions. Many scientific studies have linked breathing PM to a series of significant health problems, including aggravated asthma, difficult breathing, chronic bronchitis, heart attacks, and premature death. Diesel PM is of specific concern because it is likely to be carcinogenic to humans when inhaled.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-9. Procurement of Efficient Fleet Vehicles

Policy Description

Montana state and local government agencies could "lead by example" by enacting procurement policies and/or joining the EPA SmartWay program and utilizing the SmartWay Upgrade Kits that result in adoption of lower emitting vehicle fleets. There are three primary components of the EPA SmartWay program: creating partnerships, reducing all unnecessary engine idling, and increasing the efficiency of LDVs and HDVs, rail, and intermodal operations.

Targets are listed under the Policy Design section and will be based on availability of energy saving technologies and overall efficiency of the life of the vehicle.

This policy option strengthens Montana's commitment to reduce GHG emissions through fuel efficiency in vehicles owned by the state while also encouraging private and public agency fleets with the potential to develop incentive programs for local governments to help with the initial costs of purchasing such vehicles.

Policy Design

This is an enabling option that would have the state government lead by example, ensuring that its own fleet of vehicles meets or exceeds the targets set for the state as a whole while providing available means for all public and private vehicles to also exceed these standards on a voluntary basis.

Goals: Where the fuel and vehicle-type requirements of TLU-1, TLU-6, TLU-7, and TLU-8 are higher, the state vehicle fleet would conform to the higher requirements.

Timing: By 2020.

- The state will set a goal where at least 70% of all HDVs and at least 90% of all light-duty passenger vehicles are "fuel efficient," meeting on average, a higher MPG, for the state's HDV and LDV fleets.

Parties Involved: Montana state and local government agencies, private industries and fleets, trucking industry.

Implementation Mechanisms

Executive Order: This order would establish that the state or appropriate agency will immediately

- Identify barriers to purchasing hybrid vehicles and research and develop solutions to procure hybrid or other lower GHG emitting vehicles in the state,
- Ensure that the overall state of Montana fleet considers EPA fuel efficiency rating calculated over the life cycle of the vehicles purchased for the fleet, and

- Ensure that LCFs are purchased for the state motor pool fleet wherever they are available and if applicable for the vehicle type.

Participation in EPA SmartWay Program

State and local agencies with vehicle fleets could sign on as SmartWay carrier partners. They would then measure their environmental performance with the fleet model and come up with a plan to improve that performance. The partnership provides information and suggested strategies to improve fuel economy and environmental performance of vehicle fleets.

EPA SmartWay Shippers: State or local agencies that buy transportation services or ship goods could sign on as SmartWay shippers. As shipper partners, state agencies would seek to select SmartWay partners when they purchased the services of carriers. One way that the state could help would be to add SmartWay certification to the list of factors that they may consider when selecting carriers. Alternatively, they could encourage the carriers that they do business with to join the partnership. Shippers can also implement direct strategies, for instance, developing no-idle policies for their loading areas.

SmartWay Affiliates: State and local agencies could sign on to SmartWay as affiliates. As affiliates, they would help to distribute information on the program to interested parties. This could be as easy as putting a link on their Web site, or it could involve a more active role.

EPA SmartWay Loan Initiative: Incentives to reduce emissions in the trucking industry are also available through the EPA SmartWay Loan Initiative. The US EPA is partnering with the Small Business Administration (SBA) to make loans available to purchase SmartWay Upgrade Kits. This loan initiative uses SBA Express Loans and partners with Bank of America, Business Loan Express, Superior Financial Group, and other SBA lenders to help small trucking companies finance the purchase of SmartWay Upgrade Kits. Participating lenders will provide quick approval and affordable monthly payments. Small trucking firms can borrow from $5,000 to $25,000 with no collateral, an easy online or telephone application, and flexible loan terms.

SmartWay Upgrade Kits: A variety of fuel- and emissions-saving technologies, typically consisting of engine idle reduction technology, LRR tires, improved aerodynamics, and exhaust after-treatment devices. In tests, these kits can reduce fuel consumption by 10% to 15%, saving more than $8,000 in fuel costs annually. They also reduce pollution: carbon dioxide and nitrogen oxide emissions are cut 10% to15%, and when a kit includes an exhaust after-treatment device, PM emissions are reduced by 25% to 90%.

Related Policies/Programs in Place

Arizona and New Mexico have programs that could be used as models.

Estimated GHG Savings and Cost Per Ton

GHG reductions and costs for this enabling option are incorporated into those reported under TLU-1, TLU-6 through TLU-8, and TLU-11.

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-10. Transportation System Management

Policy Description

The State of Montana would seek to reduce GHG emissions from the transportation sector through improvements to transportation system management. These efforts would focus on the improvement, management, and operation of the transportation infrastructure, with a focus on the roads and highway systems.

Policy Design

Goals: Promote the development of efficiencies in Montana's transportation system to achieve fuel savings and improved safety.

Timing: Ongoing and continuous.

Parties Involved: MDT, urbanized areas, county road supervisors, Montana transit providers.

Implementation Mechanisms

- Relying on existing sources and employing models such as SIDRA, MDT will evaluate potential locations for roundabout installation. MDT will report on its roundabout evaluation criteria and list all locations evaluated annually for potential roundabout installation, to be no less than 15 intersections or locations annually. MDT will encourage the installation of roundabouts when the installation is based on sound engineering principles. MDT will work cooperatively with local governments seeking information on the principles of roundabout installation. MDT will assist the cities and counties in their analysis of roundabout suitability for intersections under their jurisdiction. MDT will consider roundabout treatment at planned right-angle intersections for new construction and upgrades and when completing routine safety reviews. Roundabouts have safety benefits because crashes generally are of reduced severity. Roundabouts can also reduce traffic queuing and delay, thus saving fuel and reducing GHGs.
- MDT will continue its commitment to providing a multimodal transportation system by continuing to invest in bicycle and pedestrian facilities. MDT spends an average of roughly $5 million annually on these facilities and expects this level of commitment to continue or increase.
- All urban areas (i.e., > 5,000 population) will continue to include consideration of bicycle and pedestrian facilities in their urban transportation plans.
- MDT will complete signal synchronization on all state managed routes (mostly arterials) in urban areas (i.e., > 5,000 population) by 2009. Signal synchronization reduces start/stop traffic on arterial routes because the lights are timed to continuously move traffic forward at the target pace. This strategy also helps reduce traffic queuing thus saving fuel and reducing GHGs.
- MDT will complete conversion of all traffic lights to LED bulbs by 2010 and will work with cities to convert lights under city jurisdiction. LED bulbs conserve energy.

- MDT will continue to expand transit services in Montana communities and seek additional federal funds to support this expansion.
- All urban transportation plans will be updated by 2012 with an emphasis on operations and safety. The operations elements in urban transportation plans will improve traffic flow and reduce conflict points; they can also result in turn lanes, reconfiguration of intersections, or access control. In metropolitan areas, the transportation plans will meet air quality conformity requirements for criteria pollutants.
- Congestion management plans for all high-volume construction projects will be routinely implemented by 2009. These plans implement strategies to keep traffic flowing through construction zones, thus reducing fuel use and reducing GHG emissions.
- Access management will continue to be pursued consistent with State of Montana statutes and Transportation Commission policies. Currently, MDT is implementing access management on US 93 (north and south) and US 212 from Red Lodge to Laurel. MDT is developing access management plans in a number of rapidly developing urban/suburban areas (Bozeman, Billings). In addition, MDT is developing plans for bypass projects in Billings, Kalispell, and Great Falls that will be access controlled. The appropriate goal is to continue and strengthen access management within the state.
- State and local governments should ensure that all new streets are designed to provide a full range of transportation options (i.e., multimodal or encompassing vehicular, bicycle, and pedestrian uses).
- The state should seek to ensure the preservation of railroad rights-of-way for future freight and passenger transportation, including utilizing the option of rail-banking where appropriate.

Related Policies/Programs in Place

None identified.

Estimated GHG Savings and Cost or Cost Savings

Not quantified.

Key Uncertainties

To implement these strategies, continued Federal-Aid Highway Program funding will be needed.

Additional Benefits and Costs

Increased safety and reduced traffic queuing and delay.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-11. Intermodal Freight Transportation

Policy Description

Transportation of freight by railroad generally results in less fuel use and GHG emissions than transportation by truck. The best candidates for diversion from truck to rail are commodities that can move by intermodal rail transportation, which involves shipping containers or truck trailers placed on rail flatcars. This option would encourage the expansion of intermodal rail service for Montana shippers. In addition, the state would strive to increase the competitiveness of rail rates for all Montana shippers.

With the closure of the intermodal facility in Shelby, intermodal transfers are not currently possible on the BNSF mainline in Montana. MDT has initiated a study to perform logistics and marketing research in support of container on flatcar shuttle train service on the BNSF mainline to the Port of Seattle or Tacoma. It is expected that the results of this study will suggest actions for the state to support reestablishment of intermodal rail service for Montana shippers seeking rail access to markets outside the state.

Policy Design

Continued study of intermodal shuttle train research with recommendations to increase efficiency of transportation in Montana through intermodal transportation is needed. Policies to increase use of intermodal transportation will be an outcome of the research underway.

Goals

- MDT and appropriate partners will complete the Stage I Intermodal Shuttle Train Research Study in 2008.
- State of Montana will pursue competitive rates and access to service for Montana rail shippers.
- Target outcome of these efforts is 1 intermodal unit train to Port of Seattle or Tacoma by 2010 and 4 intermodal unit trains by 2020.

Timing: See goals above.

Parties Involved: MDT, railroads.

Implementation Mechanisms

Implementation mechanisms will be determined in part by the Intermodal Shuttle Train Research Study. They might include the following:

- Montana will implement the strategies coming from this research project starting in 2009.
- State support for improvements to intermodal transfer facilities in the state.
- State identification of potential intermodal shippers.

- State discussions with railroads operating in the state.

Related Policies/Programs in Place

Montana has a Rail Competition Council that seeks to ensure competitive railroad rates for the state's shippers.

MDT is initiating an Intermodal Shuttle Train Research Study, as noted above.

Type(s) of GHG Reductions

By reducing heavy-duty truck travel, this option would primarily reduce CO_2 emissions.

Estimated GHG Savings and Cost per $MtCO_2e$

Intermodal Freight Transportation	2010	2020	Units
GHG emission savings	0.02	0.09	$MMtCO_2e$
Net present value (2006–2020)	N/A	N/A	$ Million
Cumulative emissions reductions (2006–2020)	0.02	0.59	$MMtCO_2e$
Cost-effectiveness	N/A	N/A	$/$MtCO_2e$

Data Sources:

- Railroad distance from Shelby to Tacoma, Washington, from BNSF Web site.
- Railroad fuel efficiency from the Association of American Railroad's Railroad Facts and *Rail vs. Truck Fuel Efficiency: The Relative Fuel Efficiency of Truck Competitive Rail Freight and Truck Operations Compared in a Range of Corridors, Prepared for the Federal Railroad Administration,* prepared by Abacus Technology Corporation, April 1991.

Quantification Methods:

Assume one 100-car double-stack intermodal train begins service in 2010, running from Shelby to the Port of Tacoma, Washington. Train runs 6 days per week. Assume 40-foot containers are drayed from Great Falls to Shelby. Train eliminates truck trips (pulling 53-foot trailers) between Great Falls and Tacoma, WA. Train frequency increases to 2 per week in 2013, 3 per week in 2016, and 4 per week in 2019. See calculations below.

Distances		
Rail: Shelby to Tacoma, WA	757	miles
Truck: Great Falls to Shelby	86	miles
Truck: Great Falls to Tacoma, WA	654	miles
Train length	100	cars
TEUs/train (double-stack)	400	
Cargo weight/TEU	8	tons
Cargo weight/train	3,200	tons
Rail fuel efficiency (double-stack)	400	ton-miles/gal
Rail emission factor (double-stack)	24.6	g CO_2/ton-mile
Train emissions	59,555	kg CO_2

TEUs/dray truck	2	
Dray truck trips/day	200	
Dray truck fuel use/day	2,867	gallons
Dray truck emissions/day	27,897	kg CO_2
TEUs/long-haul truck	2.65	
Long-haul truck trips/day	151	
Long-haul truck fuel use/day	16,453	gallons
Long-haul truck emissions/day	160,113	kg CO_2
Total Annual Emissions		
Rail + dray	27,285	$MtCO_2$
All truck	49,955	$MtCO_2$
Difference	22,670	$MtCO_2$
Emission reduction, 2010	0.023	$MMtCO_2$
Emission reduction, 2020	0.091	$MMtCO_2$

TEUs= trailer equivalent units.

Summary comparison of truck-only vs. intermodal rail

	Truck-Only	Intermodal Rail
Total distance (miles)	654	843
Annual emissions, 2010 ($MtCO_2$)	49,955	27,285
Emissions per ton-mile (g CO_2/ton-mile)	76.5	32.4

Key Assumptions: See above.

Key Uncertainties

The success of this strategy depends on sufficient shipper demand and willingness of the railroads to provide intermodal service. Because MDT has not yet completed the shuttle rail research study, there is significant uncertainty as to the level of shipper demand for such service and the likelihood that the railroads would reestablish intermodal service.

Additional Benefits and Costs

By shifting freight from truck to rail, this option could result in small additional benefits related to highway congestion and highway safety.

Feasibility Issues

As noted above, the success of this strategy depends on sufficient shipper demand and willingness of the railroads to provide intermodal service. These factors are largely outside government control.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-12. Off-Road Engines and Vehicles GHG Emissions Reductions

Policy Description

Off-road (also called non-road) engines and vehicles are significant emitters of GHGs and consumers of petroleum-based fuels. Emissions from off-road engines can be reduced by adoption of GHG emissions standards and through retrofit technologies. The efforts would be expected to be consistent with efforts to reduce off-road emissions of other regulated air pollutants. In the State of Montana, these reductions would affect the following equipment categories: airport service, construction, industrial, lawn and garden, agriculture, light commercial, logging, recreational (including snowmobiles and snow coaches), and recreational marine.

Policy Design

This policy would include a combination of state government leadership in retrofitting its own off-road equipment, a voluntary diesel retrofit program encouraging local governments and business, particularly airports to participate, use of existing air quality pollution control authority and setting standards for off-road engines, and eventual tax incentives for retrofits.

Goal Levels: After the appropriate state agency has concurred, the state will adopt CO_2 emissions standards for the various off-road equipment categories based on engine horsepower, within 2 years of when a municipality or another state has established such regulations.

Timing:

- The state would lead by example by initiating a diesel retrofit program for 40% of the state-owned and leased off-road engines and vehicles by 2010.
- The state would set a goal of 30%–40% of lawn and garden equipment by 2015.
- The state will implement a voluntary diesel retrofit program by 2010.
- The state will develop information about the emissions reductions from retrofit technologies on the various off-road engines and vehicles by 2010.

Parties Involved: Relevant industries, airports, general public, MDT, MDEQ, and local, county, and federal governmental agencies.

Implementation Mechanisms

- **Encourage Use of New Technologies:** Emission control technology is now available to retrofit or rebuild existing engines for any kind of off-road diesel engine including marine.
- **Use Existing Regulatory Authority Where it Exists:** The state and some counties have the regulatory authority to require air pollution control measures in areas designated by EPA as "non-attainment" for air pollution under the federal Clean Air Act. Exhaust emissions from engine combustion can be identified through technical studies and targeted by state or county air pollution control measures.

- **Construction Contract Requirements:** Construction contracts funded by the state and local communities would be required to use best available control technology (BACT) and other emissions mitigation measures for all diesel engines.
- **Emissions Standards:** The state will establish CO_2 emissions standards for the various equipment categories based on engine horsepower.
- **State Lead by Example:** The state would initiate a diesel retrofit program for these equipment categories owned or leased by the state.
- **Voluntary Retrofit Program:** Implement a voluntary diesel retrofit program by an appropriate state agency; state tax incentives will be available at a later date corresponding to the new federal emissions standards for particulates and nitrogen oxides.
- **Emissions Standards:** The state will establish CO_2 emissions standards for the various equipment categories based on engine horsepower.

Promotion and Marketing

- Encourage local and county governments to act consistently with and support state actions.
- Encourage federal agencies located within the state to act accordingly with and support state actions.
- Encourage private businesses that use these types of equipment within the state to act accordingly with and support state actions.
- Encourage the airports located in the primary Montana cities to act accordingly with and support state actions.
- The state will develop information about the emissions reductions from retrofit technologies on the various off-road engines and vehicles.
- Implement a voluntary diesel retrofit program by an appropriate state agency; state tax incentives will be available at a later date corresponding to the new federal emissions standards of particulates and nitrogen oxides.
- All state-supported programs should have good information and materials for promoting the program and dedicated detailed Web sites. As discussed in other options, publicity about successful program partners will help spread public awareness.

Technical Assistance:

- Contact the manufacturers of the various off-road emission reductions technologies to coordinate objectives and obtain technical support for outreach materials.
- The EPA has developed the Voluntary Diesel Retrofit Program with a designated Web site. The program will address pollution from diesel construction equipment and HDVs that are currently on the road. The program Web site is designed to help fleet operators, air quality planners in state and local government, and retrofit manufacturers understand this program and obtain the information they need to create effective retrofit projects.

Funding Mechanisms and/or Incentives:

- The appropriate state agency would establish a voluntary program to retrofit diesel engines in a rebate program.
- Users of off-road diesel engines who retrofit with emission controls would qualify for a credit against Montana income or business taxes (whichever is relevant) to a percentage (such as 25%) of the retrofit costs.
- Funding for feebates and/or tax credits for new off-road engines and vehicles would be proposed through legislative action. Owners would qualify for a credit against Montana income or business taxes (whichever is relevant) to a percentage (such as 10%) of the original costs (tax credit). Another option is to impose an additional fee as part of the engine maintenance costs, which would be based on the age of the engine.
- Funding may be available through the EPA Voluntary Diesel Retrofit Program, which will be dependent on the President's FY07 budget.
- Potentially, manufacturers may offer incentives to purchase new off-road engines and vehicles when the new emission standards are in effect (refer to the last section).
- In addition to the above-mentioned standards, the CCAC recommends that the legislature create a "pleasure fuel fee" to apply to fuel used for off-road luxury vehicles.

Codes and Standards: The state will rigorously review and research the CO_2 emissions standards for the various off-road equipment categories as established by another regulatory agency before adoption. The Manufacturers of Emission Controls Association will also be contacted for additional information.

Pilots and Demonstrations: Coordinate with product developers to help them promote their retrofit technologies.

Reporting: A tracking system will be difficult to develop since this is a voluntary program; however, if tax credit programs are initiated, emissions reductions can be estimated from both the installation of off-road retrofit technologies and the acquisition of new off-road engines and vehicles.

Enforcement: No enforcement actions are necessary since this is a voluntary program.

Related Policies/Programs in Place

The EPA promulgated the Clean Air Non-road Diesel Rule in 2004. The new emissions standards apply to diesel engines used in most construction, agricultural, industrial, and airport equipment. The particulate and nitrogen oxides standards will take effect for new engines beginning in 2008, with interim standards in 2010, and fully phased in for most engines by 2014. This comprehensive rule will reduce emissions from off-road diesel engines by integrating engine and fuel controls as a system to gain the greatest emission reductions. Engine manufacturers will produce engines with advanced emission-control technologies similar to those upcoming for highway trucks and buses.

In addition, the EPA limited the fuel sulfur levels in non-road diesel fuel to prevent damage to the emissions control systems starting in 2007. The fuel sulfur levels will be limited to a maximum of 500 parts per million (ppm), the same as for current highway diesel fuel. Starting in 2010, fuel sulfur levels in most non-road diesel fuel will be reduced to 15 ppm.

Type(s) of GHG Reductions

Not quantified.

Estimated GHG Savings and Cost Per Ton

Off-Road Engines & Vehicles GHG Reductions	2010	2020	Units
GHG emission savings	Not quantified	Not quantified	$MMtCO_2e$
Net present value (2006–2020)			$ Million
Cumulative emissions reductions (2006–2020)			$MMtCO_2e$
Cost-effectiveness			$/MtCO_2e$

$MMtCO_2e$ = million metric tons of carbon dioxide equivalents.

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.

TLU-13. Reduced GHG Emissions From Aviation

Policy Description

The State of Montana would encourage the federal government to take actions reducing GHG emissions from the aviation portion of the transportation sector. Those actions could include promotion and use of existing aircraft technologies and programs to reduce emissions, such as Reduced Vertical Separation Minimums (RVSM), Required Navigation Performance (RNP), System for Assessing Aviation's Global Emissions (SAGE), and Voluntary Airport Low Emissions (VALE) Program.

Since the state and local governments do not have authority over in-air operations of airplanes, the state would work with other states to encourage the United States federal government to take significant actions in this arena.

Working in cooperation with other state governments, the State of Montana would seek to develop and encourage a set of federal policies that would significantly reduce GHG emissions reductions from the in-air operation of airplanes.

Policy Design

This policy recognizes the contribution of aviation sector for GHG emissions and the limited ability of Montana or any individual state to impact this sector. Consequently, the policy is to observe and encourage federal actions.

Goal Levels: Seek development of federal government policies to reduce GHG emissions from aviation.

Timing: Activities to begin immediately.

Parties Involved: Appropriate state government agencies.

Implementation Mechanisms

None cited.

Related Policies/Programs in Place

None cited.

Estimated GHG Savings and Cost Per Ton

Not estimated. GHG emissions reductions would be calculated for the nation as a whole, and would be credited consistent with United Nations Framework Convention on Climate Change (UNFCCC) guidelines on a national basis.

Key Uncertainties

None identified.

Additional Benefits and Costs

None identified.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent.

Barriers to Consensus

None identified.