EnergySmart TRANSPORTATION

The Colorado EnergySmart Transportation Initiative

A Framework for Considering Energy in Transportation

March 2012

DOT DEPARTMENT OF TRANSPORTATION

Governor's Energy Office

SSTI State Smart Transportation Initiative

Acknowledgements

This report was prepared under the joint guidance of **Michelle Scheuerman**, Planning Section Manager, of the Colorado Department of Transportation (CDOT) and **Eric Sundquist**, Managing Director at The Center on Wisconsin Strategy, at the University of Wisconsin-Madison who manages the Start Smart Transportation Initiative (SSTI). Michele Mackey served as the Project Manager for the EnergySmart Transportation Project at SSTI.

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The SSTI Team

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Beth Tener, ESTI Assistant Manager and Co-facilitator, is the Principal at the New Directions Collaborative and is a facilitator and management consultant who has worked for over 20 years in the business, government, and social sectors to advance initiatives with sustainability goals. She has a depth of experience in designing and facilitating strategic planning meetings, cross-sector dialogues and collaborations, and peer networks. In previous work with Arthur D. Little, she worked with over 100 organizations to implement environmental strategies, from defining goals to strengthening internal management systems and engaging employees.

Pat Field, ESTI Principal Facilitator, is the Managing Director of North American Programs at the Collaborative Building Institute (CBI) and is an Associate Director of the MIT-Harvard Public Disputes Program. Patrick has helped thousands of stakeholders reach agreement on natural resource, land use, water, and air quality issues across the United States and Canada.

Dear Readers:

The EnergySmart Transportation Initiative (ESTI) is a landmark for the state of Colorado. In this work, we have set the stage for making significant progress in managing energy use, protecting our environment and improving the transportation system on which we all rely.

This report sets forth compelling arguments for managing transportation energy use and provides a pragmatic template for how we can do that. Further, the initiatives recommended here reflect the practical reality that it is up to the state, working closely with regional and local partners, to consider how to support reductions in energy use while improving quality of life.

We are pleased that this has been an integrated effort of our two agencies, which itself is a true benefit of the Initiative. We have taken on this complex problem from a number of perspectives and have shown that we can do more together than we could ever do separately. The process of developing this report also demonstrated the value of collaborative thinking, between our agencies and all of the other partners who joined the Collaborative. The benefit of this engagement will endure as we roll out transportation programs that support economical reductions in energy use going forward.

As many states across the country are grappling with the same sets of issues, we are interested in sharing our experience and learning with others. Please take some time to read this report and to consider how you might build upon our foundation for a better and more efficient approach to transportation planning.

Sincerely,

Donald E. Hunt
Executive Director
Colorado Department of Transportation

T.J. Deora
Director
Governor's Energy Office

State
Smart Transportation
Initiative

Dear Readers:

The SSTI seeks to advance innovative approaches to economic, environmental and social challenges faced by state transportation agencies.

Energy use and emissions are one of the most important of those challenges. Fortunately, fresh thinking and the willingness to adapt policy and practice can make real progress in this area, with benefits to both the environment and the economy.

The Colorado Department of Transportation (CDOT) requested technical support to run a collaborative process to develop a framework for reining in energy use and emissions from transportation. SSTI was eager to support CDOT's request, in part because:

- Colorado's legislature enacted a new requirement to address greenhouse gas emissions (GHGs) in its long-range plan.
- CDOT sought to build on existing cross-agency collaborations to create a productive framework to consider energy use and GHG emissions in transportation planning.
- Colorado citizens' have strong commitment to natural resource protection. This conservation ethic extends to saving money and building vibrant communities.

The CDOT's EnergySmart Transportation project is now ready to share with SSTI's 19 state DOT partners, and the transportation community nationwide.

We believe that Colorado's work helps lead the way in developing a framework for reducing energy use and emissions in transportation. We have been impressed with the collaboration and strategies that have emerged from this project. We look forward to finding ways to share CDOT's learning with other states, and to return to Colorado in late 2012 to help take stock of progress and next steps.

Sincerely,

Eric Sundquist
Managing Director, SSTI

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Executive Summary

An effective transportation system is critical to maintaining Colorado's economy, environment and quality of life. The transportation system provides the vital connections that link our homes to our work places and carry products to market. The Colorado Department of Transportation (CDOT) and its partner agencies are charged with figuring out what our future transportation system will look like, how it will accommodate more residents over time, how it will be paid for, and how it will contribute to a more vibrant economy and a cleaner environment. That's a tall order under any circumstances as it raises a number of challenges, many of them inter-related.

But Colorado is also facing a "perfect storm" of opportunities where realistic, reasonable, and achievable approaches can reach many of these goals simultaneously. Solutions that are good for reducing congestion are often more energy efficient and can improve communities, and provide safer, more efficient, and more environmentally sustainable transportation. By measuring energy use and seeking to make the system more efficient, Colorado can make meaningful changes and become "energy smart" across its transportation sector. This is the challenge that Colorado has taken on in the EnergySmart Transportation Initiative (ESTI).

Participants in the Collaborative

Colorado Department of Transportation
& The Governor's Energy Office
together with:

- Colorado Department of Public Health & Environment (CDPHE)
- Colorado Department of Local Affairs (DOLA)
- Federal Highway Administration (FHWA)
- Environmental Protection Agency (EPA)
- Federal Transit Administration (FTA)
- Denver Regional Council of Governments (DRCOG)
- Grand Valley Metropolitan Planning Organization (GVMPO)
- North Front Range Metropolitan Planning Organization (NRFMPO)
- Pikes Peak Area Council of Governments (PPACG)
- Pueblo Area Council of Governments (PACOG)
- Regional Air Quality Council (RAQC)
- Regional Transportation District (RTD)
- Statewide Transportation Advisory Committee (STAC)
- U.S. Department of Housing and Urban Development (HUD)

Mission and Goals

The mission of the ESTI was to develop a framework for considering energy efficiency and greenhouse gas emissions (GHG) in transportation decision-making. Improving the energy efficiency and reducing associated GHG emissions impacts of Colorado's transportation sector will:

- Retain more dollars and jobs in the Colorado economy;
- Address air quality issues, such as ozone and GHG emissions;
- Improve the environment and the health of Coloradans;
- Demonstrate that Colorado is a national leader in transportation innovation; and

- Overall, enhance the quality of life for Colorado's citizens.

EnergySmart Transportation Initiative Approach

Beginning in May 2011, a Collaborative Team of federal and state agencies, Metropolitan Planning Organizations (MPOs), and rural planning partners came together to leverage resources, and promote efficiency and effectiveness among agencies by collectively exploring ways to develop "energy smart transportation" strategies.

Several work groups were formed to develop:

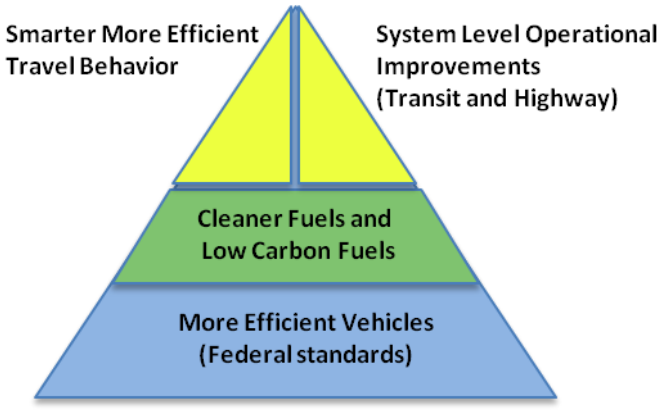
- Approaches to incorporating the consideration of energy efficiency and GHG emissions in transportation planning;
- Strategies to increase energy efficiency and reduce GHG emissions from transportation; and
- Methods to measure and analyze the GHG impact of potential strategies.

Incorporating Energy Efficiency and GHG Emissions in Transportation Planning

Energy can be considered at various points in the transportation planning process to make "energy smart" transportation decisions. A work group on transportation planning considered several possibilities, including:

- **Policies** - Adopt a new high-level policy to consider energy in transportation infrastructure planning and spending across all aspects of the CDOT's work (planning, purchasing, facilities, design, and construction).
- **Long-Range Transportation Planning** - Incorporate consideration of energy efficiency and GHG emissions into the guidance, development, and public outreach for the next Statewide Long-Range Transportation Plan. Integrate energy efficiency into corridor visions, modal transportation plans, and scenario planning.
- **STIP and TIP Development** - Encourage the use of GHG emissions and energy as a secondary evaluation criterion for project selection and provide tools to measure impacts and make decisions.
- **Project Development** - Incorporate energy considerations into the CDOT Design Manual and construction specifications.

Strategies to Increase Energy Efficiency and Reduce GHG Emissions from Transportation



As noted in the pyramid graphic, federal standards will increase the efficiency of the vehicles on our nation's roadways over time. However, the state has numerous ways to enhance the number of efficient vehicles and to encourage energy efficiency in the transportation sector. The Advanced Technology Vehicles and Alternative Fuels Work Group considered almost 20 strategies to increase the use of alternative fuels such as compressed natural gas (CNG), biofuels, and electricity and enhance the deployment of advanced vehicles such as conventional hybrids, plug-in hybrids, pure electric, and CNG vehicles. Encouraging more efficient travel behavior and system operation also leads to additional energy savings. The Smart Systems/ Trips Work Group reviewed almost 60 potential strategies to provide better transportation services by improving the efficiency of the system, improving travel times, reducing congestion, or providing citizens with more travel choices in real-time while promoting energy efficiency.

Each group prioritized a short list of strategies, based on ease/feasibility of implementation and energy reduction potential. These strategies were then analyzed for their GHG reduction potential. While a smaller group of strategies was selected for analysis, there are other strategies that could and may be enacted in the coming years.

Near-Term Priority Strategies for Advanced Technology Vehicles/Alternative Fuels

1. **Promote public/private partnerships and shared station agreements to support natural gas vehicle (NGV) use in fleets** – This strategy would identify opportunities to establish public-private partnerships among government and private fleets and the natural gas industry to develop a statewide network of liquefied natural gas (LNG) and CNG fueling infrastructure and expand deployment of natural gas vehicles in public and private fleet applications.
2. **Truck Stop Electrification Pilot Program** – This pilot program would identify a CDOT rest area to test the feasibility of truck stop electrification. Currently, long-term idling is prevalent at rest areas in order to provide comforts such as heat, air conditioning, and entertainment options to the sleeper cab during daily, mandatory 6 - 8-hour rest breaks. Truck stop electrification provides an alternate power source to the truck cab.
3. **Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets** – This strategy would aggregate the demand for alternative fuel and advanced technology vehicles for public fleets through a single bid process to improve vehicle availability and reduce costs through economies of scale.
4. **Sustainability in Design and Construction** – This strategy would identify opportunities to encourage sustainable construction practices for CDOT projects including the development

of a comprehensive list of design and construction activities, an evaluation process, and recommended performance goals for sustainable construction evaluations.

5. **Energy Literacy Program** – This strategy combines a number of concepts to increase awareness of transportation energy use, its impacts, and ways to reduce transportation energy use. This effort is anticipated to complement other strategies and produce additional energy reduction benefits.
6. **Investigate Long-term Policy Options to Address the Impact of Decreased Infrastructure Revenues from Increased Penetration of Alternative Fuels and Fuel Efficient Vehicles** – A CDOT effort could include determining the impact of alternative fuel vehicles and high efficiency vehicles on the state's ability to continue to support infrastructure maintenance and construction.

Near Term Priority Strategies for Smart Systems/Trips

1. **Enhance Real-time Traveler Information (Smart Phone Application)** – This strategy focuses on the development of a smart phone application to provides travelers with real-time traveler information such as: estimated trip time, road closures and traffic conditions, and best time of day to travel on a given route. Additional enhancements to the application could include building in alternate route trip data, integration of travel modes, information on alternative fueling station locations, and coordination with merchants to provide incentives from proximate businesses when a travel delay is anticipated.
2. **I-70 Rolling Speed Harmonization Pilot** – Speed harmonization involves the use of variable speed limit signs and law enforcement to regulate speed and reduce turbulence providing congestion relief and safety benefits. Speed harmonization has the potential to reduce incidents, improve safety, and reduce traffic delays. Delays slow traffic and burn more fuel in the process causing increased GHG emissions. The Smart Systems/Trips Work Group recommended exploring the effectiveness of speed harmonization in reducing congestion and GHG emissions. This strategy builds on preliminary efforts of CDOT to pilot rolling speed harmonization on a heavily used stretch of I-70 in the mountains.
3. **Truck Fleet Enhancements** – This strategy incorporates aerodynamic and other enhancements that increase the fuel efficiency of truck fleets. This strategy builds on the EPA SmartWay program, a voluntary grant funded effort to assist trucking companies with the purchase of add-ons to reduce nitric oxide and/or nitrogen dioxide (NOx) and GHG emissions. Two EPA SmartWay strategies identified were: low rolling resistance tires and truck fairings.
4. **Enhance Transit Traveler Information and Improve Scheduling/Fares** – This strategy involves technological enhancements to provide better traveler information to transit riders, and to provide for more efficient scheduling and fares. Increased energy efficiency and reductions in GHG emissions could be achieved through a combination of increased transit ridership due to improvements in traveler information, scheduling and fares and through more efficient transit operations. This strategy could build upon existing efforts by the Regional Transportation District (RTD) to deploy a SmartCard, an electronic fare option that can increase efficiency in boarding, reduce idling time and provide additional data on transit use.

Measuring GHG Impacts

A Data and Measurement Work Group analyzed the petroleum displaced (in gallons) and carbon dioxide (CO_2) Equivalent (CO_2e) emissions (in metric tons) for some of the priority strategies. This served to put into practice the analysis required for including energy in decision-making. Lessons learned included:

- Data and modeling tools are available, though data collection was time consuming, as data needed to be collected from a variety of agencies.
- The relative scale of impacts of various strategies varied widely, primarily based on scope, e.g., from regional pilot projects to statewide implementation.
- There is no single action that will make large-scale impacts, but rather a series of actions will add up to meaningful energy reductions and dollars saved.
- Diverse assumptions made some strategies difficult to scope.
- Synergies among several of the strategies could create additional benefits.
- Encouraging citizens to consider the role of energy in their transportation decisions will require additional education and thus an Energy Literacy Program is a priority.

Next Steps

The ESTI is an important first step in achieving an "energy smart" transportation system. While this report marks the conclusion of this Initiative, it is only the beginning of ongoing efforts to consider energy efficiency and GHG emissions in transportation decision-making. Several of the strategies recommended by the Initiative are currently moving forward. The Collaborative Team has agreed to reconvene during 2012 to continue the dialogue established as part of this Initiative and to check on the progress of strategies moving forward. The CDOT and GEO have committed to working together to advance an Energy Literacy Program, an effort that is already underway. The next update to the Statewide Long-Range Transportation Plan will incorporate key elements of the Initiative, particularly those developed by the Planning Processes Work Group. Additionally, the Statewide Long-Range Transportation Plan will build upon the work of the Data and Measurement Work Group through the estimation of statewide GHG emissions from a GHG model currently being developed by CDOT.

1.0 Context and Purpose of Initiative

The Colorado EnergySmart Transportation Initiative (ESTI) is an exciting collaboration of transportation, energy, housing, transit and environmental agencies, and is designed to tap into unrealized potential to make the Colorado transportation system more energy efficient and sustainable, to reduce emissions, and to promote economic development across the state. During the past year, the Collaborative Team has been considering strategies to improve how our transportation system functions and how much energy it uses. The Initiative has clearly demonstrated much more can be done if we work together.

1.1 Rationale for Creating the EnergySmart Transportation Initiative

Colorado, like all states, is faced with increasing energy costs for transportation, placing an increasing burden on consumers and adversely affecting the state's economy. As gas pump prices rise, it is politically and economically imperative to optimize energy efficiency in government's transportation planning, operations, and related decisions. By implementing modest changes in transportation efficiency, Colorado can make meaningful changes in the money retained in the local economy and in addressing air quality issues.

In 2009, the state legislature passed Senate Bill 09-108, "Funding Advancements for Surface Transportation and Economic Recovery Act of 2009," (FASTER), which mandated that reduction of greenhouse gas (GHG) emissions and environmental stewardship be addressed in long-range transportation planning. In response to this legislation, in the summer of 2010, CDOT hosted an American Association of State Highway and Transportation Officials (AASHTO) sponsored Climate Change Workshop where representatives from the Governor's Office, federal and state agencies as well as regional partners from Metropolitan Planning Organizations (MPOs) and Transportation Planning Regions (TPRs) opened a dialogue on how to address climate change and GHG emissions reduction from a transportation perspective. At the end of the workshop, there was consensus that additional inter-agency collaboration would be useful and that there was a need to leverage resources and develop consistent messaging.

About CDOT

CDOT manages the state transportation system, under the direction of the Transportation Commission, which includes 11 Commissioners from various districts. CDOT oversees construction of and maintains over 9,000 miles of highway and 3,447 bridges in CO. Its Planning Staff coordinates a comprehensive statewide multimodal planning process with the 15 transportation planning regions (TPRs), five of which are metropolitan planning organizations (MPOs). See **Appendix A** - Background on the Colorado Transportation Planning Process for more detail on transportation planning in Colorado.

CDOT applied for and received a technical assistance grant from the State Smart Transportation Initiative (SSTI) for a collaborative effort of federal, state, regional and local decision makers to develop a framework for considering how energy efficiency and reductions in GHG emissions can

be included in transportation decision-making and planning. See **Appendix B –** Background on the State Smart Transportation Initiative.

About SSTI

The State Smart Transportation Initiative (SSTI) is funded by the U.S. Department of Transportation (USDOT)/Federal Highway Administration (FHWA) and The Rockefeller Foundation.

SSTI operates in three ways:

- As a community of practice, where participating agencies can learn together and share experiences as they implement innovative Smart Transportation policies.
- As a source of in-depth, no-cost direct technical assistance to the agencies on transformative and replicable reform efforts.
- As a resource to the wider transportation community, including local, state, and federal agencies, in its effort to reorient practices to changing social and financial demands.

Incorporating energy and emissions reduction into transportation planning requires coordinated efforts of multiple partners in state, regional, and local government. No single agency can address these challenges alone.

States are interested in energy and transportation for variety of reasons, including reducing the amount of money their citizens spend on transportation fuels, addressing where those fuels come from, meeting state climate action goals on GHG reductions, and/or to streamline government making it more efficient by integrating energy, transportation and environmental programs.

In addition, federal regulation on the Scope of Statewide Transportation Planning (23 CFR 450.206) mandates that air quality and environmental stewardship be included in the transportation planning process, which is increasingly being interpreted to include GHGs.[1] As a result, many states are seeking ways to measure GHGs in an effort to comply with this regulation in their transportation planning.

Given the intersection of their missions and interests, CDOT engaged the Governor's Energy Office (GEO) to co-sponsor and jointly oversee this Initiative, working together to consider ways to capture efficiency savings in the transportation system and to enhance the use of cleaner burning fuels. Since about a third of the energy used in Colorado serves the transportation system, participating in this Initiative was a logical step for the GEO as it seeks to expand its efforts in the transportation sector. Bringing together the expertise of CDOT and GEO to consider how to

About GEO

Housed in the Governors' Office, the Governor's Energy Office (GEO) seeks to promote sustainable economic development in Colorado through advancing the State's energy market and industry to create jobs, increase energy security, lower long-term consumer costs and protect our environment.

[1] *Integrating Climate Change into the Transportation Planning Process*, Report from Federal Highway Administration, July 2008,

manage and fuel the transportation system taking into account the economy, energy use, and the environment, efficiently leverages state efforts and resources in a way that will hopefully place Colorado as an "energy smart" leader in the country.

1.2 Mission, Goals, and Objectives

In the spring of 2011, a small multi-agency group began working on a roadmap for the ESTI, which was guided by a joint mission statement and Charter for participants.

Mission

The mission of the ESTI is "to develop a framework for considering energy efficiency and GHG emissions in transportation decision-making ultimately enhancing all transportation services to our citizens, promoting clean transportation technologies and improving the economy of our state."

Goals

To accomplish this mission, ESTI representatives sought to identify strategies that would increase energy efficiency and reduce GHG emissions associated with Colorado's transportation sector.

Specifically, the goals of the Initiative were to:

- Retain more dollars and jobs in the Colorado economy;
- Address air quality issues, such as ozone and GHG emissions;
- Improve the environment and the health of Coloradans;
- Demonstrate that Colorado is a national leader in transportation innovation; and,
- Overall, enhance the quality of life for Colorado's citizens.

Objectives

To achieve the goals identified above, the Initiative's objectives were to:

- Develop a framework to improve the planning process to encompass transportation energy usage and GHG emissions.
- Identify new tools to evaluate energy aspects and associated GHG emissions in transportation planning.
- Identify, encourage, and disseminate new and/or enhanced programs and initiatives that showcase innovation in energy reduction.
- Better align and coordinate the actions of state, regional, and local agencies that affect energy usage, economic development, and GHG emissions reduction of transportation to ensure efficient, effective decision-making.
- Develop concurrent clear and consistent messages on energy reduction, economic growth, and GHG emissions that can be used by a variety of agencies and partners.

2.0 Understanding the Energy Impacts of Transportation

The work of incorporating energy and GHG issues into wider planning, design, engineering, and project management responsibilities has become an important issue for many state departments of transportation (DOTs). This section provides an overview of the larger energy and GHG landscape in Colorado and in the United States to give a sense of the magnitude of the issue and the opportunities for cost savings.

2.1 Transportation Sector Energy Use: The National and State Context

Fuel Consumption in the U.S. and Colorado

On average, oil accounts for about 94 percent of the energy that our nation uses for transportation[2]. In 2010, the United States consumed 22 percent of the world's oil[3]. About half of the oil that we use is imported, which equates to approximately one half billion gallons per day[4].

In 2009 (the most recent year available in the U.S. Energy Information Administration's (EIA) State Energy Data System), Colorado consumed 74.7 million barrels of oil for transportation purposes- over 3 billion gallons. The breakdown of petroleum fuel types is shown in Table 1 below.

Fuel	Aviation Gasoline	Distillate Fuel Oil (Diesel)	Jet Fuel	LPG	Lubricants	Motor Gasoline	Total
Consumption (thousand barrels)	83	14,064	10,842	66	298	49,364	74,717

Table 1. Colorado usage of oil in transportation in 2009, by product[5]

Including natural gas and ethanol used for transportation, the composition of the state's transportation energy usage can be seen in the following chart.

[2] US EIA SED Database, http://www.eia.gov/petroleum/ or http://www.eia.gov/totalenergy/data/annual/index.cfm
[3] *B.P. Statistical Review of World Energy 2011,* http://www.bp.com/sectionbodycopy.do?categoryId=7500&contentId=7068481
[4] Ibid.
[5] http://www.eia.gov/state/seds/hf.jsp?incfile=sep_use/tra/use_tra_CO.html&mstate=Colorado

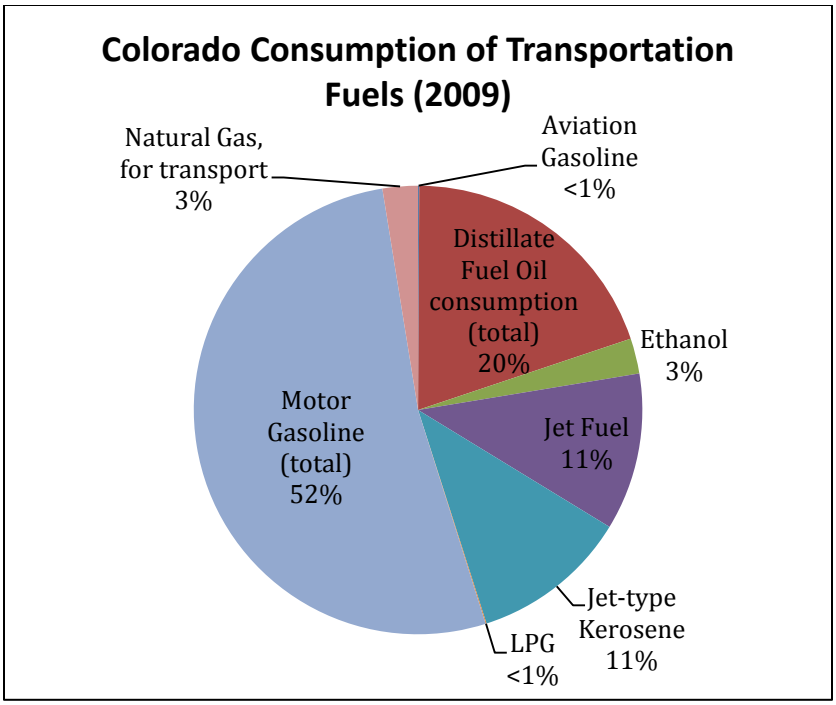


Figure 1. Colorado transportation fuel consumption by source

Nearly all of Colorado's transportation petroleum comes from the Suncor refinery in Commerce City and five pipelines bringing refined products in from Kansas, Texas, and Wyoming[6].

GHG Emissions from Transportation

The transportation sector is responsible for the second largest portion of GHG emissions in the state, accounting for nearly one quarter of statewide GHG emissions in 2005[7]. Virtually all (about 96%) of those emissions are CO_2, and the remaining emissions are nitrous oxide emissions from gasoline engines.[8] Figure 2 shows gross GHG emissions in Colorado by sector in 2000.

Colorado VMT grew by 3.1 percent annually between 1990 and 2005, compared to 2.5 percent nationally[9]. In Colorado, VMT is projected to grow by another 2.1 percent annually between 2005 and 2020[10], a figure more than double AASHTO's recommended 1 percent annual growth rate[11].

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[6] *Denver/North Front Range Fuel Supply Costs and Impacts 2011,* http://raqc.org/postfiles/reports/fuels_study/DenverNorthFrontRangeFuelSupplyCostImpacts_EAIInc_2011_REV%202.pdf

[7] *Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020,* http://www.coloradoclimate.org/ewebeditpro/items/O14F13894.pdf

[8] *Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020 Appendix C. Transportation Energy Use,* http://www.coloradoclimate.org/ewebeditpro/items/O14F11170.pdf

[9] *Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020,* http://www.coloradoclimate.org/ewebeditpro/items/O14F13894.pdf

[10] Ibid

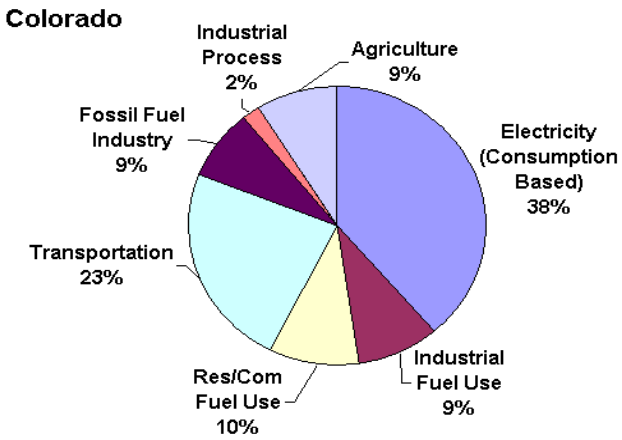

Figure 2. Gross GHG Emissions by Sector, 2000[12]

Emissions Growth Rate Forecasts for the Transportation Sector Nationally and in Colorado

In Colorado, transportation GHG emissions have been growing at a rate of nearly 3 percent per year over the past 20 years, mirroring national trends[13]. From 1990 to 2010, nationwide transportation emissions rose by 17 percent due, in large part, to increased demand for travel and the stagnation of fuel efficiency across the U.S. vehicle fleet. Over the same time period, total emissions increased by 11 percent[14].

Vehicle Fuel Efficiency Outlook

The principal means to reduce transportation emissions include improving vehicle efficiency, increasing the use of cleaner burning fuels, reducing travel, and improving the efficiency of transportation system operations.

In Colorado, and in the nation as a whole, vehicle fuel efficiency has improved little since the late 1980s, but is now slated to improve dramatically based on new federal efficiency standards. EPA is finalizing the first-ever national GHG emissions standards under the Clean Air Act, and the National Highway Traffic Safety Administration (NHTSA) is finalizing Corporate Average Fuel Economy (CAFE) standards under the Energy Policy and Conservation Act. The new standards apply to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2025. In a separate effort, additional rules for heavy-duty vehicles are also being promulgated. Figure 3 below illustrates the increase in fuel economy which is projected

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[11] *Real Transportation Solutions for Greenhouse Gas Emissions Reductions*, AASHTO, http://climatechange.transportation.org/mwg-internal/de5fs23hu73ds/progress?id=4bx68tkQmJ

[12] *Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020*, http://www.coloradoclimate.org/ewebeditpro/items/O14F13894.pdf

[13] *Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020 Appendix C. Transportation Energy Use*, http://www.coloradoclimate.org/ewebeditpro/items/O14F11170.pdf

[14] *2012 Draft U.S. Greenhouse Gas Inventory Report*, *Trends in Greenhouse Gas Emissions,* http://epa.gov/climatechange/emissions/downloads12/2.%20Trends.pdf

to reduce nationwide emissions from transportation by an estimated 21 percent between now and 2030[15].

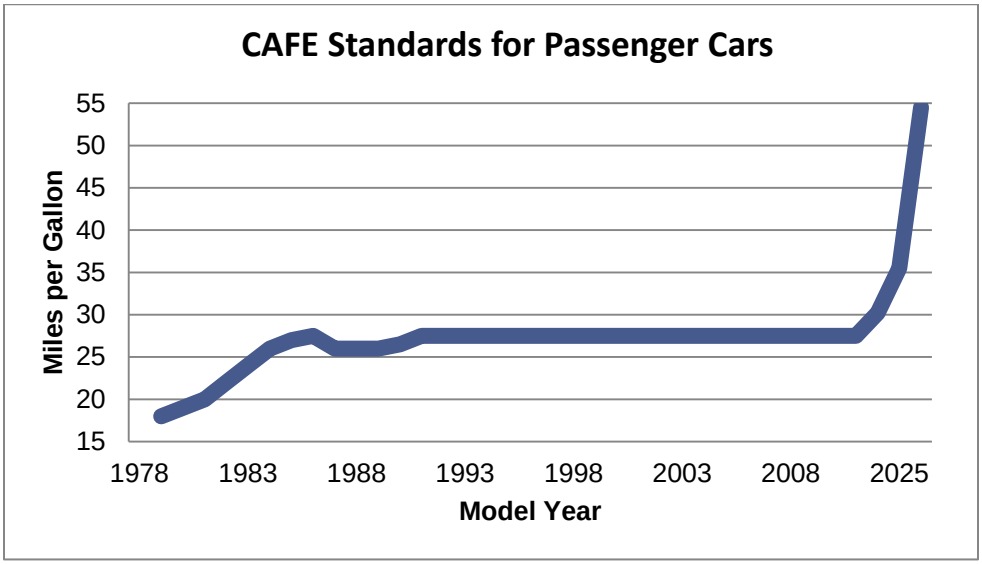

Figure 3. CAFE Standards for Passenger Cars

Over the lifetime of vehicles sold during the period 2012 to 2016, this national program is projected to reduce Colorado's GHG emissions by 192 million metric tons and reduce Colorado fuel consumption by the equivalent of 360 million barrels of oil[16].

The recent federal fuel economy standards will significantly increase the efficiency of the vehicles on our nation's roadways over time. However, state and local policies can further enhance efficiency in numerous ways by influencing the number of efficient vehicles, the fuels used, and aspects of travel behavior and systems operation. Figure 4 below illustrates the various opportunities for increasing the efficiency of the transportation system[17].

[15] *EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks*, http://www.epa.gov/otaq/climate/regulations/420f10014.htm

[16] Based on 2009 data, Colorado passenger vehicles represent 2.0% of total US registered passenger vehicles.

[17] *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*, Cambridge Systematics, July 2009, http://commerce.uli.org/misc/movingcoolerexecsum.pdf

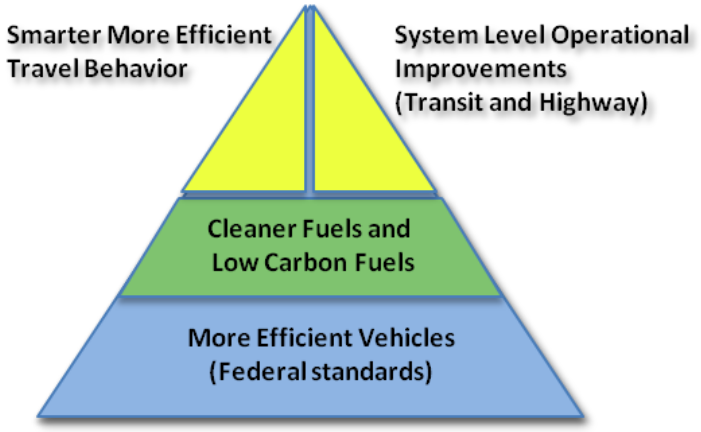

Figure 4. Opportunities for Transportation Systems Changes

2.2 Transportation Energy Economic Costs and Cost Savings

As Figure 5 illustrates, in 2009 Colorado residents spent approximately $1,500 per person on transportation fuel and that amount has likely increased as gasoline prices have risen since 2009[18].

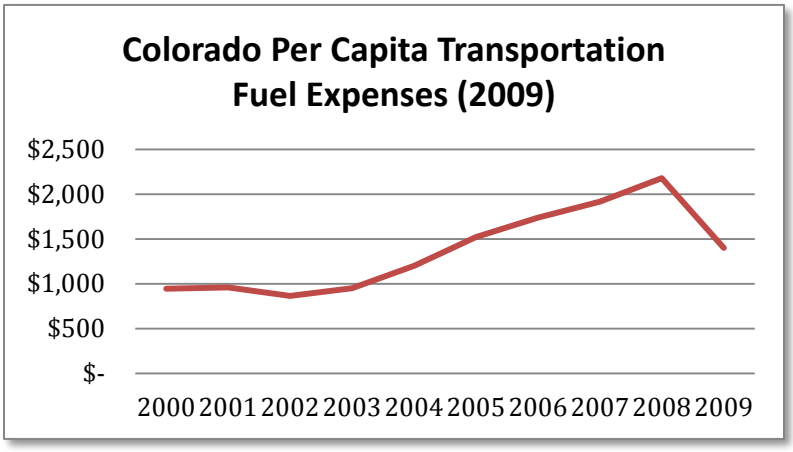

Figure 5. Colorado Per Capita Transportation Fuel Expenses [19]

Using 2010 as a baseline, if the state and its partners could generate projects that would reduce annual motor gasoline consumption by 1% each year for five years, this would result in approximately $400 million in savings for the citizens of the state as Table 2 illustrates.

[18] *Opportunities and Barriers in Colorado's Alternative Fuels Market*, Governor's Energy Office, 2012 (presentation)
[19] Ibid.

Barrels of Motor Gasoline Sold in CO in 2010[20]	Consumption of Motor Gasoline in Gallons in Colorado in 2010	Dollars Spent on Transportation Fuel in Colorado in 2010[21]	Colorado Retail Gasoline Price All Grades All Formulations (Dollars per Gallon) Average[22]
49,977,000	2,099,034,000	$7,233,271,164	$3.446
Saving from a 1% Reduction in Annual Gasoline Consumption			
1st Year	20,990,340	$72,332,712	
2nd Year	20,990,340	$72,332,712	
3rd Year	20,990,340	$72,332,712	
4th Year	20,990,340	$72,332,712	
5th Year	20,990,340	$72,332,712	
5-year savings to Colorado from a 1%/year reduction	**104,951,700**	**$361,663,558**	

Table 2. Fuel Savings and Economic Benefit of a 1% per year Improvement in Transportation Energy Efficiency

2.3 What Would it Take to Reduce Energy Use?

The Collaborative Team examined the potential options for reducing the energy needed by residents and businesses in Colorado to meet all of their transportation needs and to reduce energy use in the transportation system overall. The following chart offers a framework for looking at ways to reduce that energy use.

Figure 6 illustrates a variety of opportunities to reduce energy use in the transportation system and offers a systems approach for how to consider energy across the diverse parts of the transportation sector.

[20] *State consumption data, 2010: EIA: State Energy Data System* http://205.254.135.7/state/seds/hf.jsp?incfile=sep_fuel/html/fuel_mg.html

[21] Dollars spent on transportation fuel in Colorado 2010 was calculated by multiplying consumption of Motor Gasoline in Gallons in Colorado (2010) by the Retail Gasoline Price (Dollars per Gallon 2011).

[22] *Weekly Retail Gasoline and Diesel Prices*, http://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_sco_a.htm

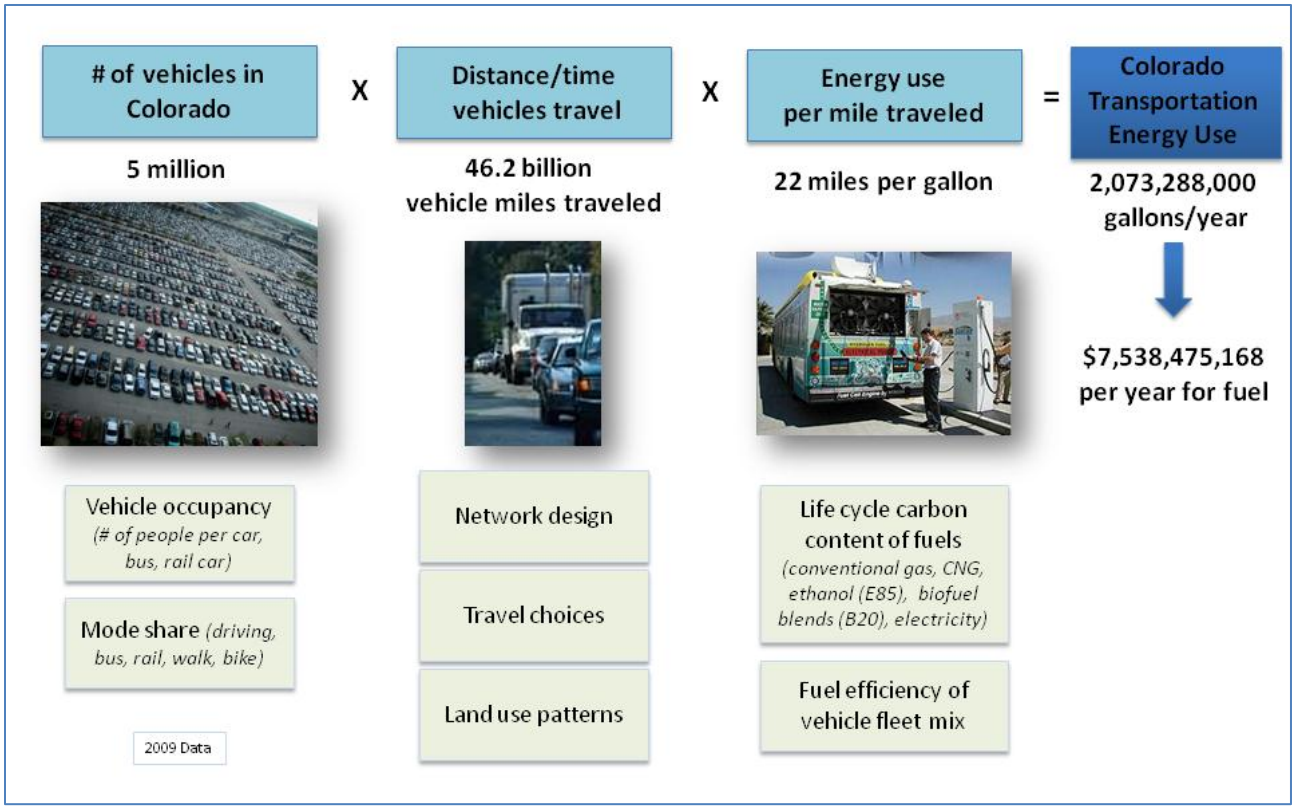

Figure 6. The Transportation and Energy Equation

Some areas that were evaluated include: improving the efficiency of the transportation system by raising vehicle occupancy, offering more travel choices, boosting transit and ridesharing (shifting to more fuel efficient modes), improving traffic flow by making driving behavior smoother, using lower carbon content fuels (such as natural gas and electricity) and improving the fuel efficiency of the fleet.

3.0 EnergySmart Transportation Collaborative Process

From the inception of this Initiative, it was recognized that a collaborative process was needed. Some of the factors that drive GHG emissions from transportation are in the direct interest of state agencies but many are not, e.g., funding decisions at the local and state levels, transportation technologies and fuels, infrastructure investments, fuel choices, land use policies, and individual behavior. Since Colorado already has a variety of efforts directly or indirectly associated with addressing the link between transportation and the environment, it made sense to engage a range of planning partners and agencies in this Initiative. Colorado has a well-established tradition of collaboration and cross-agency coordination among federal, state and regional/local governments on transportation planning.

3.1 Agency Interviews and Participant Selection

To gather input that would assist in developing the collaborative process, the consultants conducted more than 20 interviews with various stakeholders involved in transportation planning related issues including federal, state, regional, and local agencies, as well as other transportation partners.

The interviews explored how Colorado might consider energy use in transportation, where successful practices and programs were already in place, (see **Appendix C** – Energy and GHG Reduction Strategies in Transportation) and what type of collaborative process design would work most effectively. In addition, several meetings of an advisory council within CDOT were held to gather input on project design and lessons learned from past experiences with collaborative projects.

Participants in the Collaborative

Colorado Department of Transportation
& The Governor's Energy Office
together with:

- Colorado Department of Public Health & Environment (CDPHE)
- Colorado Department of Local Affairs (DOLA)
- Federal Highway Administration (FHWA)
- Environmental Protection Agency (EPA)
- Federal Transit Administration (FTA)
- Denver Regional Council of Governments (DRCOG)
- Grand Valley Metropolitan Planning Organization (GVMPO)
- North Front Range Metropolitan Planning Organization (NRFMPO)
- Pikes Peak Area Council of Governments (PPACG)
- Pueblo Area Council of Governments (PACOG)
- Regional Air Quality Council (RAQC)
- Regional Transportation District (RTD)
- Statewide Transportation Advisory Committee (STAC)
- U.S. Department of Housing and Urban Development (HUD)

Based on this input CDOT and GEO selected 13 agencies to participate in the ESTI Collaborative Process (see sidebar for list of agencies). These agencies are integral to the activities and decision points that affect energy use in transportation.

3.2 Collaborative Process Design and Approach

The aim of the collaborative process was to engage participants to develop a shared understanding of the energy impacts of transportation, determine which activities/decisions have the greatest impacts on GHG emissions, and identify practical strategies to make reductions that the state could proceed to implement. In addition, the process explored how to incorporate these goals into the transportation planning process.

A scoping meeting of representatives from the selected 13 agencies focused on developing and agreeing on the objectives and project approach that provided the basis for the collaborative process.

The kick off collaborative process meeting was held in May 2011 to discuss the issues and to shape the project approach. Participating agencies agreed to a nonbinding Charter defining the goals and operating procedures for the group's work. (See **Appendix D** – Charter and Accompanying

Operating Procedures for the full text.)

At the second Collaborative Team meeting at the end of June 2011, the Collaborative Team split into four Work Groups. These groups were:

- Advanced Technology Vehicles and Alternative Fuels;
- Smart Systems/Trips;
- Planning Processes;
- Data and Measurement.

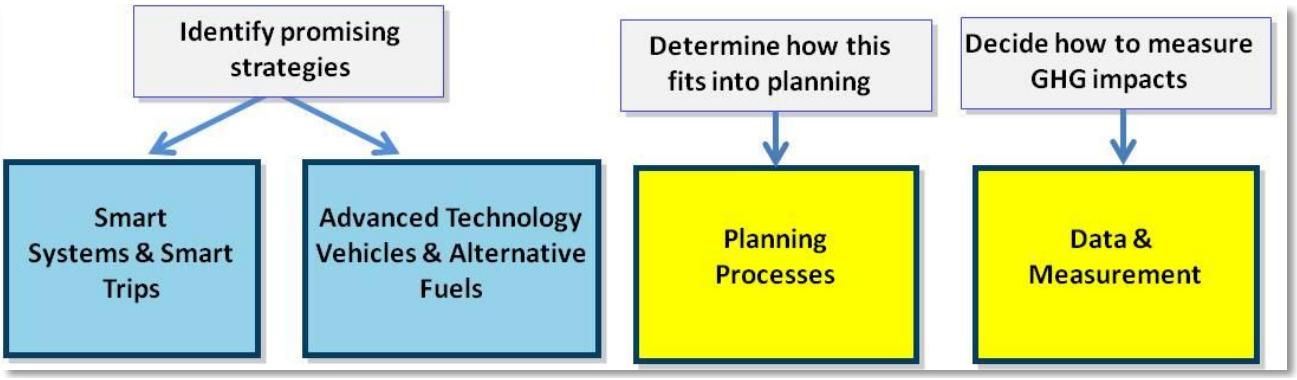

Figure 7. EnergySmart Transportation Work Groups

Each Work Group was composed of a diverse mix of participants from federal, state and local agencies. See **Appendix E** – Work Group Participants for a list of participants in each group. The Work Groups each met at least three times as well as coming together for cross-walk meetings where they discussed their findings jointly.

- **The Advanced Technology Vehicles and Alternate Fuels Work Group** considered about 20 strategies to increase the use of alternative fuels such as compressed natural gas (CNG), biofuels and electricity, and to enhance the deployment of advanced vehicles such as conventional hybrids, plug-in hybrids, pure electric, and CNG vehicles. The Work Group also conducted screenings to prioritize the most viable strategies for Colorado.

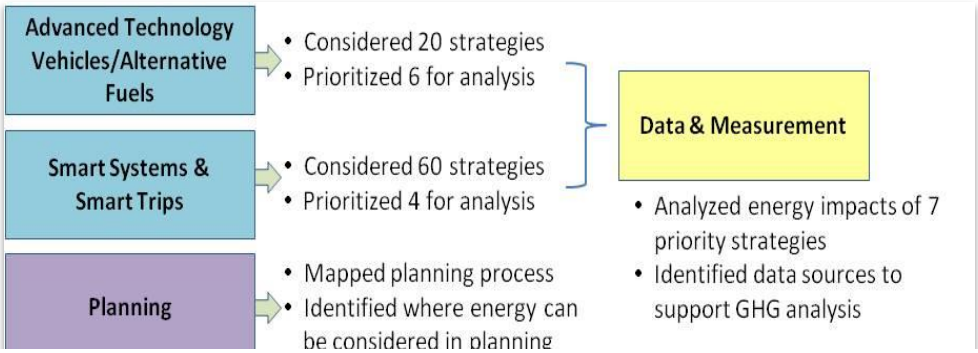

Figure 8. Prioritizing and Measuring Impacts of Energy Reduction Strategies

- **The Smart Systems/Trips Work Group** reviewed about 60 potential strategies to provide better transportation services and promote energy efficiency by improving the efficiency of the system, improving travel times, reducing congestion, or providing citizens with more travel choices. The Work Group conducted a screening process to prioritize the most viable strategies in Colorado.

- **The Planning Processes Work Group** reviewed state and regional planning processes and identified key decision points where energy and GHG emissions can be considered, and explored how to integrate "energy smart" transportation decisions within the planning and project development processes. This group also reviewed the other Work Groups' high-rated strategies to determine where they fit into the planning process and advised the Collaborative Team.

- **The Data and Measurement Work Group** measured the associated GHG emission reduction impacts of the seven highest priority strategies in order to explore the order of magnitude of the energy reduction impacts of various strategies, and as a way to practice analyzing GHG impacts as part of the decision-making process.

The work groups evaluated strategies using a common screening process (described in section 4.0 Choosing Energy Reduction Strategies). Strategies that were not selected for further evaluation generally fell in to the following categories:

- The measure fell outside of the control or influence of Collaborative Team participants;
- The idea might not be well enough scoped to allow for analysis;
- The strategy was already the subject of existing efforts;
- Proposed measures were very long-term and therefore not able to achieve rapid reductions.

As a result of the prioritization, a shorter list of strategies was selected from the original options. The Data and Measurement Work Group evaluated these to determine GHG impacts. The prioritized strategies are not meant to form a comprehensive plan, but rather a focused, specific set of efforts that can be acted on in the near-term.

4.0 Energy Reduction Strategies

The following section describes the work of two Work Groups, the Advanced Technology Vehicles and Alternative Fuels Work Group and the Smart Systems/Trips Work Group. These two groups studied various energy reduction strategies and considered the capacity of these strategies to make a difference in reducing transportation energy use. The two groups met numerous times in the five months between June and October 2011 to complete their work together.

Each of these Work Groups reviewed and discussed a large number of strategies and employed a common set of criteria in evaluating strategies. These criteria included:

- Feasibility (Is the project feasible? What might be barriers to action and success?)
- Cost to implement
- Potential energy savings
- Resulting cost savings (energy, labor, etc.)
- Other benefits (technology development, economic development, etc.)
- Implementation (Who would implement the project and were they ready to take the project on in the short term? CDOT, GEO, others?)

4.1 Advanced Technology Vehicles and Alternative Fuels

Higher priority was given to those strategies that could be deployed for immediate use in Colorado by either CDOT or GEO or one of the partners in the Collaborative. The Advanced Technology Vehicles and Alternate Fuels Work Group screened an initial list of 20 strategies to determine which projects were practical and would have the largest near-term impact. Applying the criteria identified above, six strategies were prioritized by giving particular emphasis to feasibility of implementation and energy reduction potential.

The greatest opportunities the group discussed fell into three broad areas; strategies that could:

- Increase the use of lower carbon fuels such as CNG, biofuels, and electricity.
- Increase access to alternative fuel infrastructure
- Increase the use of newer and emerging technologies such as electric vehicles, CNG vehicles, traditional hybrids, and plug-in hybrids.

The following section highlights the strategies that the Advanced Technology Vehicles and Alternative Fuels Work Group selected for evaluation and recommended for action.

Strategies

Promote Public/Private Partnerships and Shared Station Agreements to Support Natural Gas Vehicles Use in Fleets

This strategy seeks to identify opportunities to establish public-private partnerships among government and private fleets and the natural gas industry to establish a cohesive network of LNG and CNG fueling infrastructure across the state and expand deployment of natural gas vehicles (NGVs) in fleet applications. Colorado has one of the largest proven reserves of natural gas in the United States; however, the current lack of LNG/CNG fueling infrastructure and sparse Original Equipment Manufacturer (OEM) NGV availability are significant barriers to a robust NGV market share. Obtaining commitments from public fleets to procure and operate NGVs, as well as reaching agreements to share station access between public and private fleets can reduce the lack of infrastructure barrier in a more timely and cost-effective fashion than acting as an individual agency. Moreover, firm and public commitments for a broad application of NGVs in fleets sends a strong market signal to OEMs that could drive increased NGV production and availability in Colorado. Given that Colorado is a net exporter of natural gas, stimulating demand for NGVs will support job creation and excise tax revenues in the state. Use of natural gas as a transportation fuel will directly reduce the amount of petroleum consumed in the state.

Truck Stop Electrification Pilot Program

There is significant opportunity to reduce fuel consumption and emissions associated with idling at truck rest stops. When idling, trucks burn one gallon of fuel per hour[23] and will idle for an average of 6.5 hours a day. Truck stop electrification (TSE) seeks to reduce idling by providing an alternate power supply to run the electrical systems of the truck, allowing the driver to have access to electricity, internet and heating or cooling without running the large truck engine. In order to be economically feasible, the team found that a rest area must have a minimum of 20 stalls. Currently, there are no truck electrification facilities in Colorado. There are 6 rest areas with at least 20 stalls operated by CDOT that are being assessed as places to locate such electrification facilities. Private implementation is another possibility that could have a much greater impact since private rest areas are usually larger. A barrier to this strategy is that state rest areas are not allowed to generate revenue.

Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets

The Work Group used the 2010 Colorado Clean Cities assessment[24] of 95 city, county and state fleets as an indicator of what strategies public fleets are currently assessing and implementing to reduce their dependence on petroleum. This report indicated that public fleets in Colorado are

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[23] TRB Paper No. 06-2567, *Estimation of Fuel Use by Idling Commercial Trucks*, *L. Gaines, A. Vyas* and J. *Anderson* Center for Transportation Research Argonne National Laboratory, January, 2006.

[24] Building Partnerships to Reduce Petroleum Use in Transportation, http://www1.eere.energy.gov/cleancities/index.html

successfully using alternative fuels (natural gas, electricity, biofuels) and advanced technologies (hydraulic hybrids, regenerative breaking, aerodynamics), as well as idle reduction, GPS routing/VMT reduction and overall fuel economy improvements from conventional vehicles to reduce their petroleum consumption. The level of annual petroleum displacement will vary depending on the number of vehicles procured by public fleets. Public fleet turnover rates have slowed over recent years, as a result of reduced public spending, and many municipal and county fleet vehicles are considered to be approaching the end of their useful life. Thus, replacing these aging vehicles is likely to be a priority as funds become available. Many of these fleets are very interested in switching to alternative fuels; however, they lack the significant initial capital required to fund the fueling infrastructure required to support a robust alternative fuel vehicle program, such as natural gas. Therefore, now is the time to develop a coordinated approach for consolidated fleet procurement that assures public fleets of all sizes the ability to replace their aging vehicles with new and cleaner vehicles best suited for their individual fleet's application. Consolidating the public fleet procurement process will also greatly support the state's aforementioned NGV vehicle initiative and many co-benefits can be expected if these two strategies are optimally aligned and executed in conjunction with each other. In addition to NGVs, fleets can also be expected to reduce petroleum consumption through expanded use of other alternative fuels and advanced technologies, improved overall fuel economy, idle reduction, VMT reduction and other innovative approaches.

Sustainability in Design and Construction

Both the Advanced Technology Vehicles and Alternative Fuels and the Smart Systems/Trips Work Groups recommended CDOT pursue green construction practices in their own construction, maintenance, and rebuilding activities.

Although many of the energy-related impacts of transportation are not directly within CDOT's control, construction is an area where CDOT has more influence to affect the work of its employees and contractors. Several CDOT regions are already taking action in this area. For example, CDOT Region 2 has maintenance policies that call for recycling asphalt, which reduces the GHG emissions required in making new asphalt. CDOT Region 6 has also adopted some green maintenance and construction practices. In situations when CDOT is contributing funding to grantee agencies, CDOT could use green construction practices as a factor in its selection of grant recipients. For projects that CDOT is funding directly, it was suggested that CDOT could either require green practices, or offer "bonus points" when reviewing construction bids.

Examples of green construction practices include using clean fuels in construction vehicles and support equipment, generators and engines, reducing vehicle idling, using more fuel-efficient equipment, recycling materials, and using environmental criteria in material selection.

Benefits of greening construction practices include:

- Reducing emissions from fossil fuels; and
- Increased fuel efficiency, which reduces cost and GHG emissions, and can create other benefits of extending equipment life and reducing other emissions such as particulates.

CDOT plans to contract with a consultant to develop a CDOT sustainability evaluation tool for construction. The goal of the work is to develop a comprehensive list of design and construction activities, define the evaluation process, and recommend performance goals for sustainable construction evaluations. It is anticipated that specific goals and strategies may be identified and measured at a later time.

Also recommended as part of this strategy is the revision of the CDOT Design Manual to include energy considerations and other sustainability measures, impacting project design, construction, operations, and maintenance.

One model to consider is the *Illinois-Livable and Sustainable Transportation Rating System (I-LAST) and Guide*[25] developed by Illinois DOT in cooperation with the engineering and construction community. This program, modeled after the U.S. Green Building Council's LEED green building certification program, includes a scoring system for road and transportation construction projects. Each road project is scored based on performance on the following categories: planning, design, environment, water quality, transportation, lighting, materials, and innovation. One other resource is a case study issued by the U.S. Environmental Protection Agency, entitled *Reducing GHG in the Construction Industry*.[26]

Investigate Long-term Policy Options to Address the Impact of Decreased Infrastructure Revenues from Increased Penetration of Alternative Fuels and Fuel-efficient Vehicles

The Work Group recommended that CDOT continue to explore the impact of alternative fuel vehicles and high efficiency vehicles on the state's ability to support infrastructure maintenance and construction, and explore policy options to address this. As an example, CDOT recently conducted a study on a Mileage Based User Fee (MBUF). Colorado is also doing some work with transportation facility pricing and some parts of the state have experience with high occupancy toll (HOT) lanes and tolled facilities.

4.2 Smart Systems/Trips

The Smart Systems/Trips Work Group identified opportunities to reduce transportation energy use by looking at programs and policies that either:

- Offer travelers lower carbon choices and more efficient routing to change their individual travel behavior and/or;
- Reduce energy use by making the transportation system itself more efficient.

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[25] *Illinois-Livable and Sustainable Transportation Rating System (I-LAST) and Guide,* http://www.dot.il.gov/green/documents/I-LASTGuidebook.pdf

[26] *Reducing GHG in the Construction Industry*, http://epa.gov/sectors/pdf/construction-sector-report.pdf

Colorado has been a leader in intermodal transportation and has a number of excellent existing programs including expansion of the rapid transit services in the Denver area (FasTracks), Safe Routes to Schools, a state bicycle policy, and many other programs. **Appendix C** – Energy and GHG Reduction Strategies in Transportation includes several of these programs.

The Smart Systems/Trips Work Group reviewed almost 60 potential strategies to improve transportation services and energy efficiency by either improving the efficiency of the system, improving travel times, reducing congestion, or providing citizens with more travel choices in real-time. A broad range of opportunities was considered including traditional Transportation Demand Management (TDM) and new and innovative consumer-facing approaches. Some of the areas explored included:

- Boosting options for multimodal and inter-model transportation such as transit, bikes, and walking;
- Offering more traveler choices, shared modes, and time of travel flexibility;
- Offering social network based real-time ride share options for campuses, businesses and institutions to reduce barriers to ridesharing;
- Providing more real-time and historic trend information for travelers on traffic and alternative routes, and related incentives to manage travel at peak times.
- Offering consumer interactive technologies such as applications or "apps" or other means to reduce individual usage through better synthesized data access and retrieval;
- Boosting fleet efficiency programs and actions for private and government fleets of vehicles including EPA's SmartWay program;
- Reducing idling through specific place-based system efficiency improvements;
- Traditional Intelligent Transportation Systems (ITS);
- Transit system improvements such as real-time bus routing or reducing unproductive transit run times; and
- Improved highway construction practices to reduce delays and better inform the public of alternative routes.

The following section highlights the strategies that the Smart Systems/Trips Work Group selected for evaluation and recommended for action.

Enhance Real Time Traveler Information (Smart Phone Application)

The Smart Systems/Trips Work Group explored options to enhance real-time traveler information, focusing in particular on the use of Smart Phone "apps". The Work Group recommended the development of a smart phone application that provides travelers with real-time traveler information such as: estimated trip time, road closures and traffic conditions, and best time of day to travel on a given route. Additional enhancements to the application could include building in alternate route trip data, integration of travel modes, information on alternative fueling station locations, and coordination with merchants to provide incentives from proximate businesses when a travel delay is anticipated.

Truck Fleet Enhancements

This strategy incorporates a variety of enhancements that increase the aerodynamics or fuel efficiency of trucks. This strategy builds upon the EPA SmartWay program, a voluntary, grant-funded effort to assist trucking companies with the purchase of add-ons to reduce nitric oxide or nitrogen dioxide (NOx) and GHG emissions. Discussions focused on two strategies in particular- the use of low rolling resistance tires, and truck fairings to increase vehicle aerodynamics.

I-70 Rolling Speed Harmonization Pilot

Speed harmonization involves the use of variable speed limit signs and law enforcement to regulate speed and reduce turbulence providing congestion relief and safety benefits. Speed harmonization has the potential to reduce incidents, improve safety, and reduce traffic delays. Delays slow traffic and burn more fuel in the process causing increased GHG emissions. The Smart Systems/Trips Work Group recommended exploring the effectiveness of speed harmonization in reducing congestion and GHG emissions. This strategy builds on preliminary efforts of CDOT to pilot rolling speed harmonization on a heavily used stretch of I-70 in the mountains.

Enhancements to Transit Traveler Information and Improving Scheduling/Fares

This strategy involves technological enhancements to provide better traveler information to transit riders, and to provide for more efficient scheduling and fares. Increased energy efficiency and reductions in GHG emissions could be achieved through a combination of increased transit ridership due to improvements in traveler information, scheduling and fares and through more efficient transit operations. This strategy could build upon existing efforts by the Regional Transportation District (RTD) to deploy a SmartCard, an electronic fare option that can increase efficiency in boarding, reduce idling time and provide additional data on transit use.

5.0 Planning Processes

The Planning Processes Work Group began its work by developing a common understanding of how the planning process worked, via the background document included in **Appendix A** – Background on the Colorado Transportation Planning Process.

The group used the following approach to assess how energy considerations could fit into transportation planning:

- Review what could be learned from existing examples where energy has been considered in planning, from experiences of regional planning groups and other states;
- Brainstorm the various levels of planning and how energy could be considered (e.g., policy, planning, project levels or at a state-wide or local level); and

The kind of policy changes being considered have been successfully implemented before. For example, the Transportation Commission passed a bicycle/pedestrian policy directive in 2009. A procedural directive was developed and approved outlining how the policy would be implemented. Design standards for bike paths and sidewalks are being incorporated into the CDOT Design Manual and a new state-wide bicycle and pedestrian plan is being prepared.

- Develop a map of the policies and steps in the planning process (see Figure 9) to provide a framework for the Work Group to identify where and how energy considerations could fit into planning. (This work was completed by a sub-group in between meetings of the full Work Group.)
- Identify past example(s) that could be models for how a new policy objective can be integrated into planning decision-making. The bicycle/pedestrian policy was chosen as a good example to illustrate how a policy could affect the entire transportation planning process (see sidebar); and
- Brainstorm how energy considerations can be incorporated into transportation planning, based on the map described above.

Planning and investment decisions that are made today commit government agencies and taxpayers to future costs associated with the use of energy from transportation choices. Oftentimes, energy use is not considered as a part of the transportation planning process.

Energy can be considered at various points in the multi-level transportation planning process to make "energy smart" transportation decisions. Figure 9 illustrates the various decision-making points within the long-range transportation planning process where energy can be considered. These are grouped into three main categories: 1) Policies, 2) Long-Range Transportation Plan Process, and 3) Project Development.

The following are possible actions in each area:

Policies

- Adopt a new high-level CDOT policy to consider energy in transportation infrastructure spending across all aspects of CDOT's work (planning, purchasing, facilities, design, construction).
- Revise CDOT policies and guidance documents issued by the Transportation Commission that provide direction for the regional and statewide transportation planning process to consider energy efficiency and GHG emissions reduction.
- Revise the CDOT Context Sensitive Solutions Policy Directive to include energy consumption considerations.

Long-range Transportation Plan Process

Resource Allocation

- Consider how current or future energy use can be considered in allocating limited resources, e.g., incorporated as a consideration in various investment categories.

Plan Development

- In the next Statewide and Regional Plan Guidebook to be revised for the next Statewide Long-Range Transportation Plan, include guidance on how to address planning factors, which would include energy efficiency and GHG emissions reductions. Examples of

information to include are tools for GHG analysis and modeling, and strategies to reduce energy use.
- Include energy efficiency in the scope of work for consultants to assist with development of the next Statewide Long-range Transportation Plan.
- Incorporate the consideration of energy impacts into the development, and public outreach for the next Statewide Long-Range Transportation Plan.

Corridor Visions

- Add energy information to the corridor visions as appropriate. Include energy as one of many goals in the Corridor Visions Guidance. If planning shifts from corridor approaches to performance-based systems approaches, then energy can be incorporated as one of the key performance measures along with safety, etc.

System/Corridor Prioritization

- Create priorities within the system (i.e., designating some corridors as having higher priority than others), which could potentially save energy by concentrating investments on priority corridors and projects that maintain the system or have the potential to reduce GHG emissions.

Modal Plan Integration

- Incorporate energy efficiency into the State Freight and Passenger Rail Plan, and other modal plans, such as aviation. Improve integration and linkages of other modes and modal plans into the next Statewide Long-Range Transportation Plan.

System Needs Analysis and Scenario Planning

- Incorporate GHG emission reduction as a component of future scenario planning, as well as the cost and benefits of a multimodal transportation system and the relationship between transportation, economic development and land use. (Note: CDOT is considering a land-use transportation pilot aimed at rapidly growing rural communities that would use a program like CommunityViz to help citizens imagine different land use patterns and their impacts on transportation. Economic data and environmental data on energy and GHG emission could be the outputs from the selected tool.)

Data Elements

- Encourage MPOs/TPRs to collect information to consider energy and GHGs. Utilize the new GHG model for modeling and analysis.

Public Education

- Educate and engage the public about the costs and benefits of different transportation measures and in ways to reduce energy use in transportation. Reducing energy consumption is easier for the public to relate to than GHG emission reduction since they can see the savings that accrue to them personally from using energy more

efficiently. Energy efficiency in transportation can be framed as a way of keeping local dollars circulating in the local economy.

Project Development

- Encourage the use of GHGs and energy as secondary evaluation criteria for project selection in Transportation Improvement Program (TIP) and STIP development.
- Commit to work with individual MPOs interested in including energy into secondary project selection criteria. It will be helpful to have performance measures that can enable consistent comparisons across projects. Certain performance measures are quantifiable, such as VMT and travel speeds.
- Commit to work with TPRs to incorporate energy into the project selection process. Rural areas need some way to consider energy/GHGs that is simple enough to be used across all projects and to help decide among projects.
- Share tools and simple approaches to measure impacts and make decisions with MPOs and TPRs.
- Incorporate energy considerations into the CDOT Design Manual and construction specifications.
- Fomalize the CDOT GreenLites program.
- Develop and implement model bid specifications for road construction incorporating energy efficiency, anti-idling, and other energy factors.

Other Ideas

- Update the CDOT Environmental Stewardship Guide to include energy efficiency and GHG emissions reduction.
- Review energy section of the CDOT National Environmental Policy Act (NEPA) Manual for any needed updates to reflect energy efficiency in project analysis.
- Raise awareness of planners on the energy implications of decisions. An educational process is needed for planners (e.g., in CDOT, MPOs and TPRs along with GEO) to raise understanding of how to improve energy efficiency in the transportation system and the energy implications of various decisions. Energy considerations need to be translated into values, metrics and priorities, e.g., connecting energy literacy with simple value statements such as “fix it first” or “fewer VMT means less wear and tear on roads, to extend the life of infrastructure we have.”

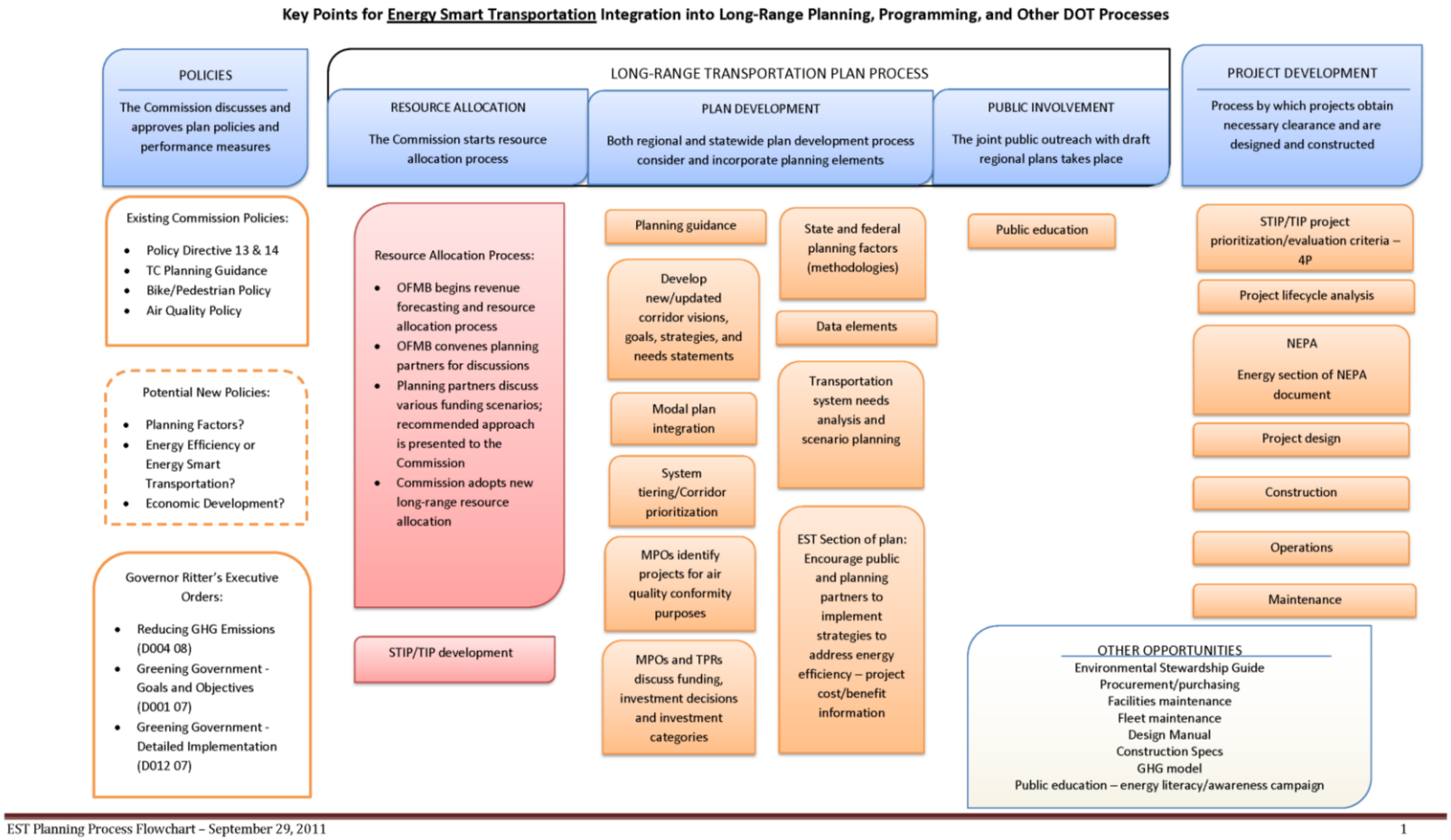


Figure 9. Key Points for EnergySmart Transportation Integration

6.0 Energy Literacy

In several of the Work Group discussions, the need for enhanced "energy literacy" was identified as important. Within the state agencies, many said it would be helpful for staff to understand and consider short and long-term energy implications of decisions, e.g., what wastes energy, what are the implications of our actions in the context of costs, environmental impacts, energy security, and job creation.

The Collaborative Team process itself was valuable to raising awareness of these issues. Materials developed through the course of this project will be useful for further efforts to raise energy literacy more broadly. One goal of the Collaborative Team process was to develop simple clear ways to explain the connection between energy and transportation, and what it takes to reduce energy use. In developing communications for the ESTI, the Initiative team refined various ways to define and frame the message and got feedback on what points resonated most strongly with participants and selected stakeholders.

In addition, GEO and CDOT plan to coordinate efforts to increase awareness of the impacts of transportation on energy use, ways to reduce transportation energy use, and existing transportation programs and projects that incorporate energy efficiency and GHG emissions reductions. This effort is anticipated to complement other strategies and produce additional benefits.

7.0 Data and Measurement

As part of the ESTI, the Data and Measurement Work Group surveyed and identified data sources and modeling approaches for measuring energy use and GHG emissions in the transportation system. The aim was to find the most direct and useful data and modeling tools available for the state of Colorado. The Work Group analyzed the GHG reduction impacts of seven priority strategies developed by the Advanced Technology Vehicles and Alternative Fuels Work Group and the Smart Systems/Trips Work Group.

The following strategies were analyzed:

- Enhance Real Time Traveler Information (Smart Phone App);
- Truck Fleet Enhancements;
- Promote Public/Private Partnerships and Shared Station Agreements to Support natural gas vehicle (NGV) Use in Fleets;
- Truck Stop Electrification Pilot Program;
- Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets;

- I-70 Rolling Speed Harmonization Pilot; and
- Enhancements to Transit Traveler Information and Improve Scheduling/Fares.

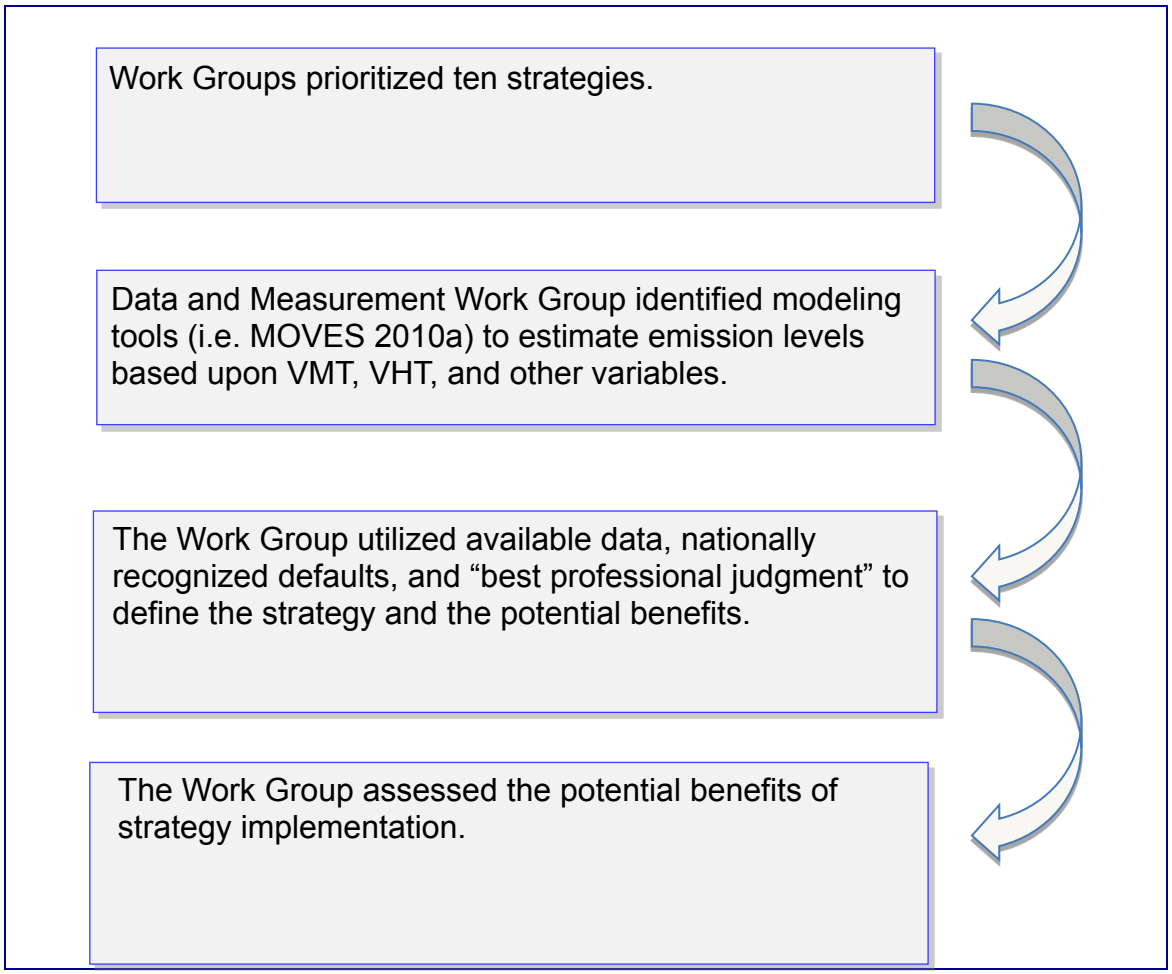


Figure 10. General Process for Strategy Analysis

Process for Data Analysis

The primary goal was to analyze the petroleum displaced (in gallons) and GHGs (CO_2e emissions in metric tons) for each strategy. To do this, the group had to build out a variety of assumptions for each proposal, estimate and analyze the effectiveness and the scope and scale of each project, as well as its timing for implementation (shown in Figure 11).

Where there was uncertainty in the scope of a project, the team bracketed the uncertainty, tested multiple options, and chose a sensible one. Also, some of the work included scoping out some of the parameters that might make the project more successful, narrowing the scope, or including phases so that it could be better analyzed. A Strategy Evaluation Matrix was developed (see **Appendix F** – Energy Smart Transportation Strategy Evaluation Matrix) which provided a consistent framework to

analyze each strategy. The criteria used to analyze each strategy included estimates of:

- Petroleum displaced in gallons (with a low and high estimate)
- Estimated reduction in vehicle miles traveled (VMT) where applicable
- Estimated emission savings (metric tons of CO_2 emissions)
- Estimated cost of implementation
- Relative ease of implementation (easy, medium, hard)
- Partnership potential

Results of the Data Analysis

Of the ten strategies recommended and identified above, seven were analyzed by the Data and Measurement Work Group. The three strategies not analyzed were those that required additional discussion and refinement to properly scope (Sustainability in Design and Construction) and/or those that were of a nature not given to quantification (Energy Literacy). The Work Group analyzed the GHG emissions savings (metric tons CO_2e) from strategies at a low and high level of implementation and for two time horizons- 2015 and 2025. The emissions reduction in 2015, and 2025 were estimated to be:

- 2015: 100,000 mt CO_2e (low) to 120,000 mt CO2e (high)
- 2025: 880,000 mt CO_2e (low) to 2,100,000 mt CO_2e (high)

This represents a reduction in GHG from transportation sources of roughly 0.4% in 2015 and between 2% and 5% in 2025. Strategies varied widely in terms of the level of reduction- ranging from relatively limited reductions for small-scale pilot programs to significant reductions from strategies with statewide implementation. Taken together, however, if implemented the strategies have the potential to achieve significant reductions in both energy use and GHG emissions. Estimates of the gallons of gallons of petroleum displaced in 2015, and 2025 were estimated to be:

- 2015: 2,500,000 gal. (low) to 3,800,000 gal. (high)
- 2025: 1,800,000 gal. (low) to 3,100,000 gal. (high)

For comparison purposes, strategies analyzed were divided into two groups- statewide strategies and pilot strategies. The following charts illustrate the relative contribution of each strategy to the estimated fuel reduction and emissions reduction in 2015 and 2025 at high levels of deployment.

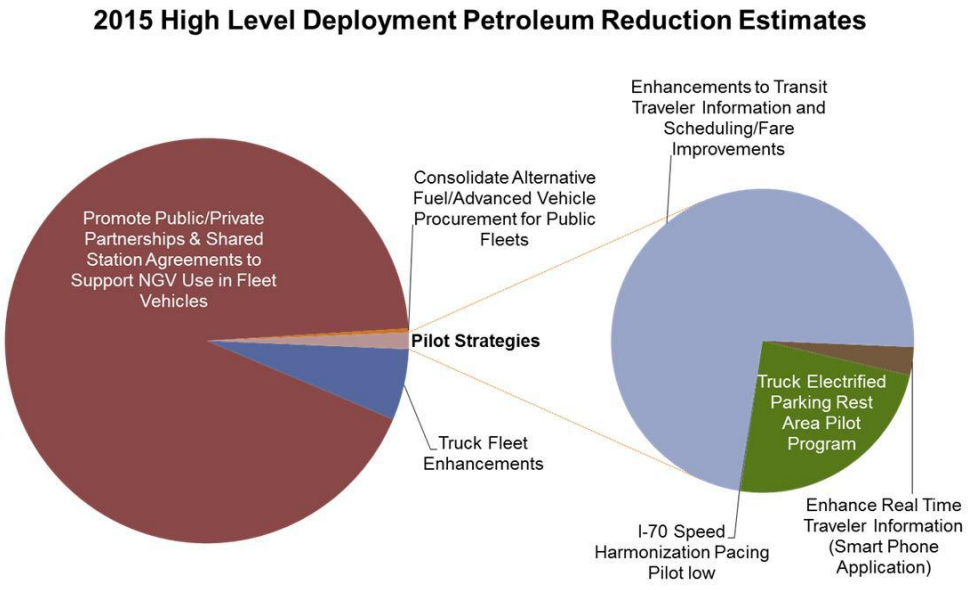


Figure 11. 2015 High Level Deployment Petroleum Reduction Estimates

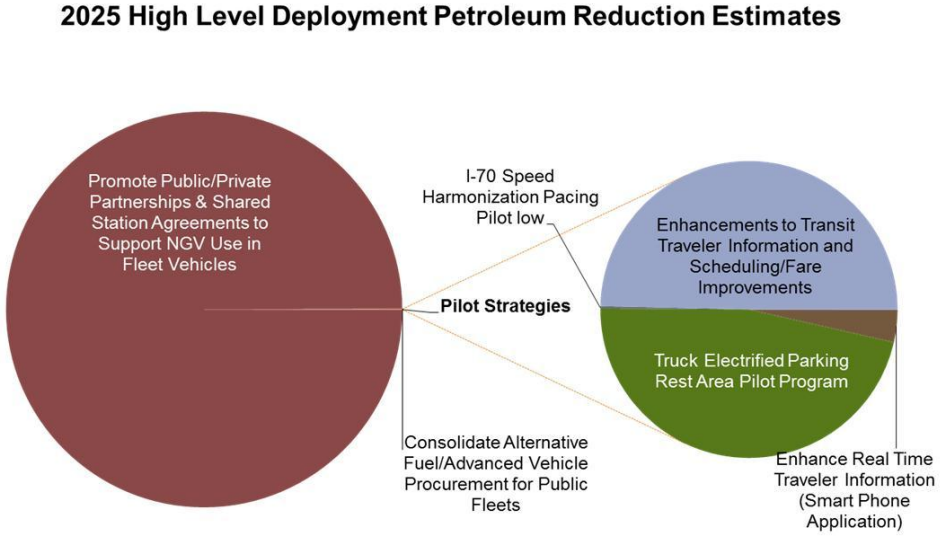


Figure 12. 2025 High Level Deployment Petroleum Reduction Estimates

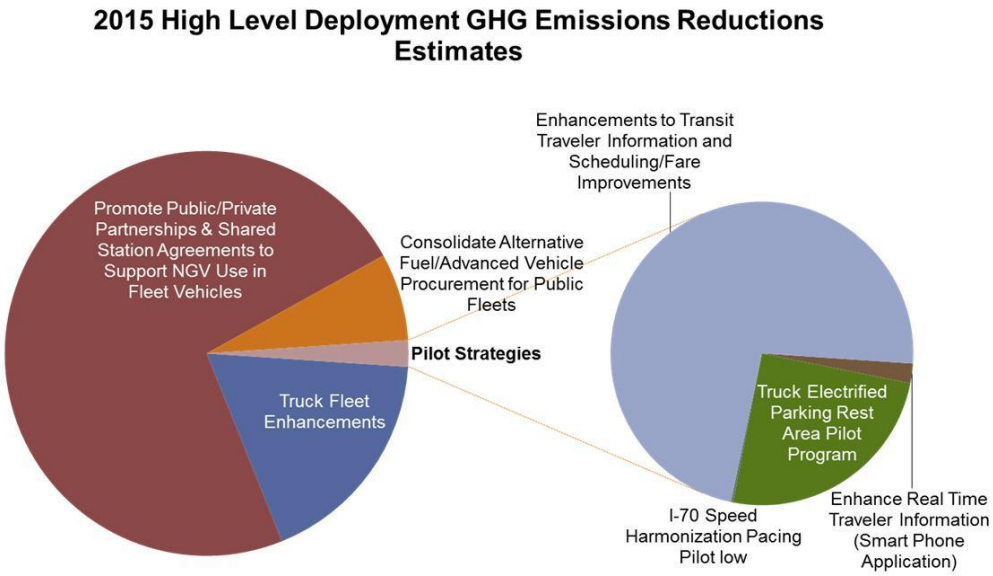


Figure 13. High Level Deployment GHG Emissions Reductions Estimates

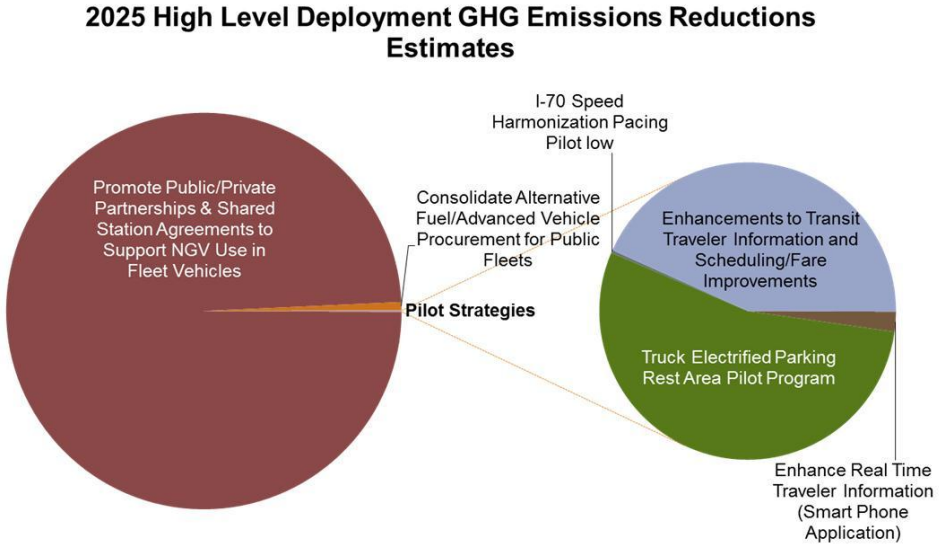


Figure 14. High Level Deployment GHG Emissions Reductions Estimates

Figures 15 illustrates the estimated fuel reduction and emissions reduction of pilot strategies in 2015 and 2025 at low and high levels of deployment.

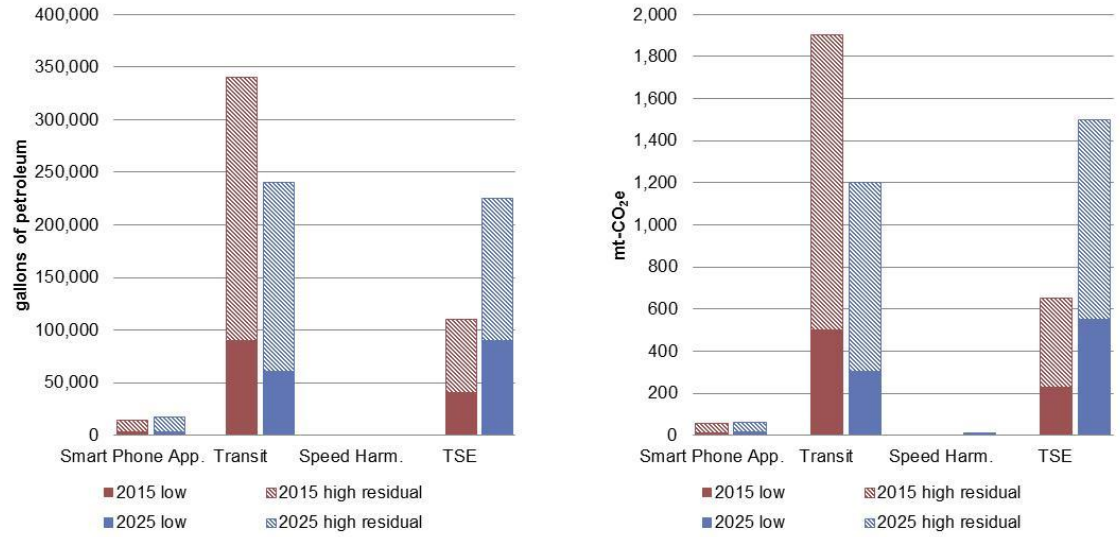


Figure 15. Pilot Strategies Fuel Reduction and GHG Emissions Reduction Estimates

Figures 16 illustrates the estimated fuel reduction and emissions reduction of statewide strategies in 2015 and 2025 at low and high levels of deployment.

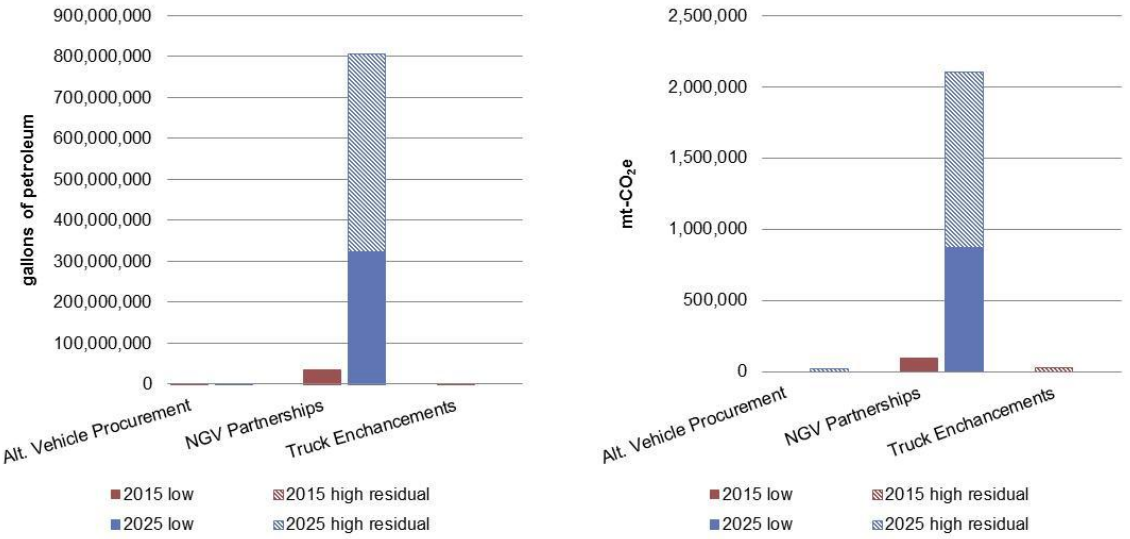


Figure 16. Statewide Strategies Fuel Reduction and GHG Emissions Reduction Estimates

Lessons Learned About GHG Analysis

Some of the key lessons learned through the analysis included:

The relative scale of impacts from the strategies varied widely, primarily based on scope:

- Scopes of the strategies varied considerably ranging from regional pilot projects to statewide implementation. While the pilot project strategies produce nominal

short-term impacts now, they could have much greater impacts in the future, if implemented on a larger scale.

- Strategies that were analyzed for statewide implementation yielded much greater benefits than strategies analyzed for limited implementation or pilot projects.

CDOT GHG Emissions Model

Colorado has developed a high quality Revenue Model to provide revenue forecasts under a variety of conditions. This model is now being adapted to test new policies and strategies in terms of their future GHG impacts.

CDOT is now developing a new GHG module to estimate the emissions impacts of new policies and strategies, including new federal standards. Unlike most models, this approach uses real fleet data and tracks a multitude of factors as they change over time.

Some strategies were difficult to scope due to regional differences with the state or questions about assumptions:

- Regional differences made scoping at a statewide scale challenging.
- Some strategies were not fully developed with many details unresolved, others centered on making assumptions about future participation rates or behavior change – both scenarios further complicated scoping and required exercising professional judgment.

The Work Group documented their process and the resources available for calculating GHG emissions in transportation and presented it at the final meeting of the ESTI. This process raised the understanding and tools available to staff within CDOT to do this work, as work continues on how to consider energy efficiency and GHG emissions in transportation decision-making. Collaborating with other planning partners in defining and measuring what it means to be EnergySmart will be one of the main legacies of the Initiative.

8.0 Implementation and Next Steps

The ESTI collaborative process made some significant accomplishments in a short period of time. The Collaborative Team met four times over the course of six months between May and November 2011. Four Work Groups each met an additional three to four times each between August and October 2011.

Strategies

Collectively, the Advanced Technology Vehicles and Alternate Fuels and Smart Systems/Trips Work Groups reviewed and considered nearly 80 strategies. Strategies were screened with a common set of criteria emphasizing those strategies that could be

implemented in the short to medium term. Ultimately these two Work Groups recommended ten strategies to be advanced for further consideration and potential implementation. Recommended strategies ranged from specific and well-defined pilot programs (I-70 Speed Harmonization) to conceptual ideas that require significant additional discussion, refinement and scoping prior to any sort of implementation (Long-Term Policy Options). Similarly, strategies ranged from those already underway (Smart Phone App) to those where potential implementation is several years away.

Data and Measurement

The Data and Measurement Work Group analyzed seven of the ten strategies recommended. The results of analysis showed significant variation between strategies in terms of the level of GHG emissions reductions and petroleum displacement. Taken together, however, the seven strategies have the potential to significantly reduce both GHG emissions and petroleum consumption.

Planning Processes

The Planning Processes Work Group considered various points in the transportation planning process where energy could be considered. The group identified several possible actions in three general areas: policies, long-range transportation plan process, and project development.

The Colorado Transportation Commission formally "kicked off" the process to develop the next Statewide Long-Range Transportation Plan in February 2012. Colorado's five MPOs and 10 TPRs will develop Regional Transportation Plans (RTPs) concurrent with the development of the Statewide Plan. The plan development process encompasses aspects of each of the three general areas considered by the Planning Processes Work Group, beginning with policy discussion and action by the Transportation Commission, and concluding with the adoption of the next Statewide Plan and Statewide Transportation Improvement Program (STIP). The recommendations of the Planning Processes Work Group provide a solid foundation for the consideration of energy efficiency and GHG in upcoming planning processes.

Implementation

In the months since the conclusion of the ESTI, several strategies have made progress in moving forward. The progress of these strategies is outlined below.

Promote Public/Private Partnerships and Shared Station Agreements to Support Natural Gas Vehicles (NGV) Use in Fleets

Colorado is working towards aggregating the demand for NGVs to improve vehicle availability and reduce costs through economies of scale. GEO has reached across state lines and is working with nine partner states. The states have signed a Memorandum of Understanding (MOU) designed to increase the use of NGVs in each state's fleet. Specifically, the MOU, signed by Gov. John Hickenlooper along with the governors of

Oklahoma, Wyoming, and Pennsylvania (see **Appendix H** – Compressed Natural Gas (CNG) Memorandum of Understanding (MOU)), calls for a Multi-State Request for Proposal to aggregate annual fleet vehicle procurements. The MOU commits the states to purchase natural gas vehicles for implementation into their state fleets while also coordinating efforts with local governments. Since November 2011, when the MOU was announced, seven additional states have signed on, including Kentucky, Maine, New Mexico, Ohio, Texas, Utah, and West Virginia, further expanding the demand for affordable NGVs.

Truck Stop Electrification Pilot Program

Funding has been secured for a Truck Stop Electrification Pilot Program in FY 12 and FY 13. The pilot will take place at a CDOT rest area in CDOT Region 4. CDOT is currently in the process of evaluating Region 4 rest areas for the most suitable location.

Sustainability in Design and Construction

The CDOT Environmental Programs Branch has recently issued a Scope of Work to contract with a consultant to develop a CDOT sustainability evaluation tool for construction processes. The selected consultant will develop a comprehensive list of design and construction activities, define evaluation processes, and recommend performance goals for sustainable construction evaluations. A Sustainability Program is also currently in development which will recommend initiatives for maintenance and construction programs.

Enhance Real-time Traveler Information (Smart Phone Application)

CDOT's ITS unit has contracted with a consultant to develop a CDOT smart phone app to provide travelers with real-time information using data from the CoTrip website. The intent of the app is to provide "personalized" traveler information and travel demand management strategies combined with time-sensitive business incentives that can result in effectively reducing congestion on the I-70 corridor from Golden to Vail. It is anticipated that the app will be ready for release in summer 2012. If successful, the app may be adapted for use on I-25 and other high volume corridors.

I-70 Rolling Speed Harmonization Pilot

CDOT, in coordination with the Colorado State Patrol (CSP) and local police, tested Rolling Speed Harmonization on a heavily used stretch of I-70 in the mountains. Several tests were conducted on a nearly 40 mile stretch of the Interstate in the fall and winter. Speed Harmonization was then implemented for several Sundays during the high traffic ski season. Large amounts of data were collected and will be analyzed to assess the benefits of speed harmonization in terms of safety and congestion relief. Depending on the results of data analysis, the program may be utilized again during heavy travel times in the summer and winter seasons.

Energy Literacy

CDOT and GEO remain committed to working together to create opportunities to increase energy literacy. Although the specifics of such an effort are yet to be defined, CDOT and GEO are continuing to explore opportunities.

Next Steps

The ESTI is an important step in efforts to consider energy efficiency and GHG reduction in transportation decision-making. To continue to build upon the dialogue and relationships built as part of this initiative, the Collaborative Team has agreed to reconvene during 2012 to review progress made in implementing strategies, and to discuss new opportunities. Successful implementation rests not just with CDOT, but with the multiple partners to this effort. As the ESTI concludes, the planning process for the next Statewide Long-Range Transportation Plan begins. The ESTI provides a solid foundation to build upon as the long-range transportation vision for the state is developed and implemented through the Statewide and Regional Transportation Plans, and Transportation Improvement Programs. With the ESTI serving as a foundation, Colorado is better prepared to realize an "energy smart" transportation system.

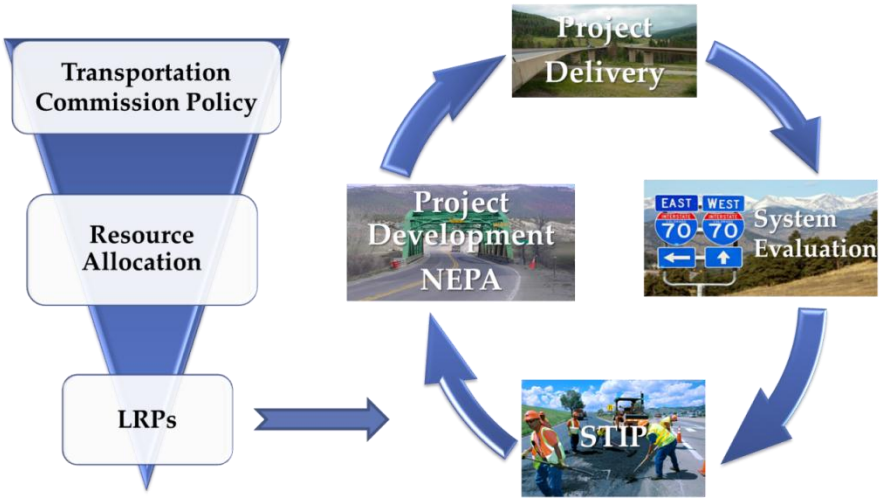
Appendices

Appendix A Background on the Colorado Transportation Planning Process

Colorado's transportation planning process is a coordinated effort of the regional and statewide transportation planning processes per state and federal regulations resulting in long-range plans (LRP) that look at transportation needs for a minimum of 20 years. In accordance with these regulations, CDOT carries out a continuing, cooperative and comprehensive statewide multimodal planning process with the 15 transportation planning regions (TPRs), five of which are metropolitan planning organizations (MPOs). The process includes the development of long-range multimodal regional transportation plans (RTP) used to formulate a long-range multimodal statewide transportation plan. This statewide transportation plan sets the vision for transportation throughout the state integrating all modal plans, including passenger and freight rail, bicycle and pedestrian, transit and aviation. The process also includes the development of a statewide transportation improvement program (STIP) that identifies short-term project needs and priorities.

Public involvement is a key component in the development of both the Statewide and Regional Transportation Plans and takes place throughout the entire process at both the regional and statewide levels. Input from citizens, government leaders, environmental resource and regulatory agencies, Native American Tribes, and community organizations is critical to identifying local and regional transportation needs.

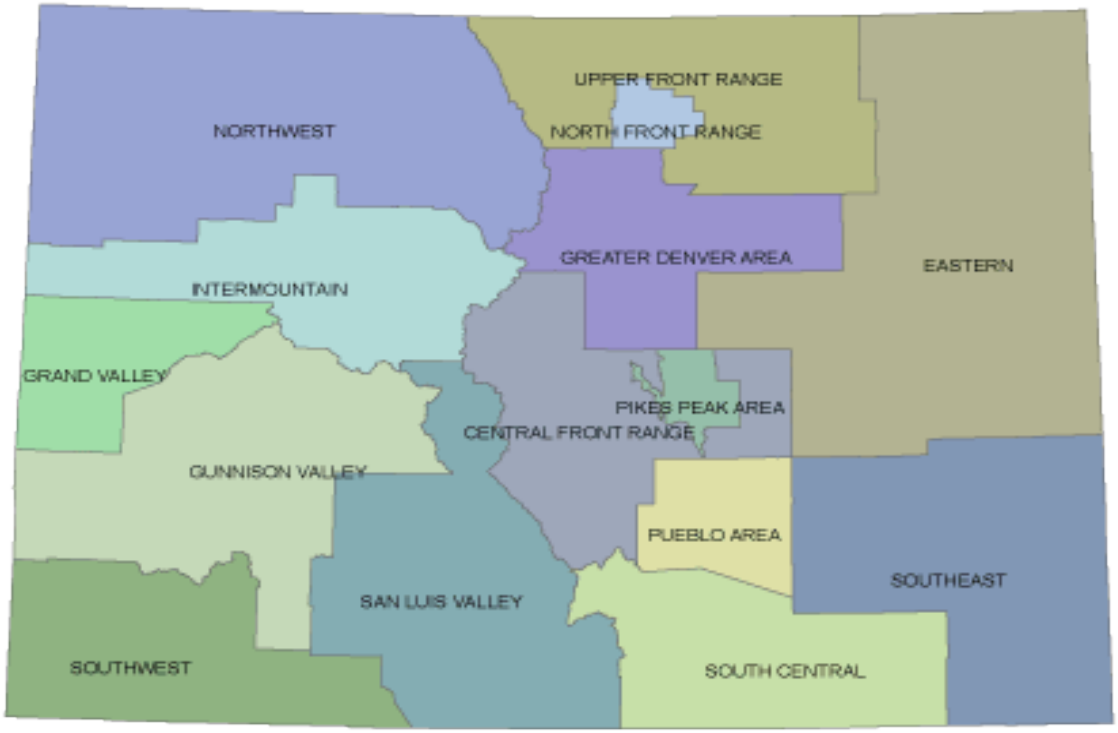
Statewide and Regional Planning Process Overview



Development of a 20-year Statewide Transportation Plan begins at the local level with the business community, residents and local officials within each of the TPRs (10 non-urban and five MPOs). Each TPR is comprised of the municipalities and counties within its established boundaries. State law enables elected officials from the counties and municipalities in the non-urban TPRs to form Regional Planning Commissions (RPCs) through an intergovernmental agreement.

MPOs are located in urban areas with a population of 50,000 or more. An MPO is a federally-designated entity established by agreement between the governor and the units of local government responsible for transportation planning processes. The five MPOs have more complex planning requirements than the ten non-urban TPRs.

Colorado Transportation Planning Regions



TPR	Counties Represented
Northwest	Moffat, Routt, Jackson, Grand, Rio Blanco
Intermountain	Garfield, Eagle, Pitkin, Lake, Summit
Gunnison Valley	Delta, Gunnison, Ouray, Montrose, San Miguel, Hinsdale
Southwest	Dolores, Montezuma, La Plata, San Juan, Archuleta
San Luis Valley	Chaffee, Saguache, Mineral, Rio Grande, Alamosa, Conejos, Costilla
Central Front Range	Park, Fremont, Custer, Teller, El Paso
South Central	Huerfano, Las Animas
Southeast	Crowley, Kiowa, Otero, Bent, Prowers, Baca
Eastern	Logan, Sedgwick, Phillips, Washington, Yuma, Kit Carson, Cheyenne, Lincoln, Elbert
Upper Front Range	Larimer, Weld, Morgan

MPO	Cities and Counties Represented
Denver Regional Council of Governments	57 cities, towns and counties including Denver, Jefferson, Douglas, Arapahoe, Boulder, Adams, Broomfield, Gilpin, Clear Creek, and southwest Weld
North Front Range	Cities of Fort Collins, Loveland, Greeley, Evans, Berthoud, and Windsor and the towns of Eaton, Johnstown, Timnath, LaSalle, Miliken, Severance and Garden City as well as the surrounding urban portions of Weld and Larimer counties
Pikes Peak Area Council of Governments	Park, Teller and El Paso counties and the cities within them, including Colorado Springs
Pueblo Area Council of Governments	City of Pueblo and Pueblo County
Grand Valley	Cities and Towns in Mesa County

The MPOs and non-urban TPRs prepare RTPs, which include constrained, and vision components and identify the needs, corridor strategies, and/or projects anticipated to be constructed over the next 20+ years. RTPs are forwarded to CDOT for integration into the Statewide Long-Range Transportation Plan.

The long-range Statewide Transportation Process outlines a comprehensive, multimodal transportation vision. It provides a statewide perspective that reflects the policies of the Transportation Commission and integrates the needs, revenues and costs identified in all 15 RTPs. It contains a constrained component based on Transportation Commission *resource allocation*, the cost to sustain the system at current performance levels, and a vision of how the system could perform by reducing congestion, improving safety and maintaining the existing transportation system. As a multimodal plan, all modes of transportation - highway, transit, freight, aviation and bicycle/pedestrian - are included. The Statewide Long-Range Transportation Plan is corridor-based, including approximately 350 corridors statewide. Corridor visions include strategies aimed at meeting each corridor's unique transportation needs.

Corridor Vision Benefits

Benefits	Links transportation goals to investment decisions
	Reflects community values
	Promotes a collaborative planning process
	Increases system efficiency and sets the stage for corridor planning
	Identifies strategies aimed at meeting each corridors unique transportation needs
	Provides accountability by linking improvements to corridor visions

The Statewide Long-Range Transportation Plan is implemented by programming priority projects into the short-term, six-year Statewide Transportation Improvement Plan (STIP). The STIP is updated every four years. STIP projects must be consistent with the corridor visions identified in the Statewide Long-Range Transportation Plan. All federally funded and regionally significant projects are identified in the STIP. Projects are selected in cooperation with local officials in TPRs based on a set of criteria developed to solve or improve a particular congestion, safety, or system quality needs on the transportation system. MPOs develop their own TIPs, which are then included without modification into the STIP. Non-urban TPRs do not develop TIPs, and their projects and priorities are included directly in the STIP.

In non-urban TPRs, regional priorities are established by the RPCs through their regional transportation planning process. Projects are selected through the CDOT Region Project Priority Programming Process *(4P),* which generally occurs once every two years. The 4P process utilizes the "fiscally-constrained," regionally prioritized corridor strategies outlined in the RTP as the basis for projects and priorities to be included in the six-year STIP.

Statewide Transportation Advisory Committee (STAC)

Representatives of each of the 15 TPRs form the Statewide Transportation Advisory Committee (STAC), which serves to advise CDOT and the Transportation Commission on transportation planning related issues and reviews the regional and statewide transportation plans prior to their adoption. Colorado's two Native American tribes, the Ute Mountain Ute Tribe and the Southern Ute Tribe also have representation on the STAC as non-voting members. The STAC meets monthly prior to each Transportation Commission meeting. The Chair of the STAC provides regular updates on STAC activities, issues and recommendations to the Transportation Commission.

Colorado Transportation Commission

Colorado's transportation system is managed by CDOT under the direction of the Transportation Commission. The commission is comprised of 11 commissioners who represent specific transportation districts. Each commissioner is appointed by the Governor, confirmed by the state Senate, and serves a four-year term. The Transportation Commission reviews and approves the Statewide Long-Range Transportation Plan and the Statewide Transportation Improvement Program (STIP). The Transportation Commission also promulgates transportation policy, including guidance directing Colorado's transportation planning processes.

Appendix B Background on the State Smart Transportation Initiative

Transportation is a basic social and economic need. Providing affordable choices to meet transportation needs is an acknowledged responsibility of government. However, mobility solutions conceived a generation ago might not be economically or environmentally sustainable today.

The mission of the State Smart Transportation Initiative (SSTI) is to promote "smart transportation" practices that foster equitable economic development and environmental sustainability, while maintaining high standards of governmental efficiency and transparency.

SSTI operates in three ways:

1. As a "community of practice" where participating agencies can learn together and share experiences as they implement innovative smart transportation policies.

2. As a source of direct technical assistance to these agencies on transformative and replicable smart transportation reform efforts.

3. As a resource to the wider transportation community, including local, state, and federal agencies, in its effort to reorient practice to changing social and financial demands.

Appendix C Energy and GHG Reduction Strategies in Transportation

The table below includes a comprehensive list of strategies to address energy and GHG reduction in transportation. This table was compiled based on research of national publications. Strategies currently implemented in Colorado are indicated.

Strategy	Colorado
SYSTEMS PLANNING AND DESIGN	
Bottleneck Relief	X
Managed Lanes	X
HOV/HOT Lanes	X
Toll lanes or road	X
Truck only lanes	
Transit	
Fixed guideway transit	X
Intercity rail/bus	X
High Speed Rail	X
Rail system improvements	X
Bus system improvements	X
Planning and schedule improvements	X
Evaluate Transit fare structure	X
Enhanced information services	X
Bicycle/Pedestrian facilities and accommodation	X
Freight	
SmartWay trailer fairings	X
SmartWay low rolling resistance and single-wide tires	
GPS to reduce VMT and idling	X
Truck stop electrification	X
Automated truck clearance operations	
Reduce share of travel by SOV	X
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS	
Traffic signal timing optimization and synchronization	X
Transit/bus priority measures (queue jumps, signal preemption, bypass lanes, shoulder running)	X
Intermodal passenger transfer service	X
Incident and work zone management	X
Integrated highway information management (including emergency, incident and disaster management)	X
Ramp metering	X
Active traffic management (speed harmonization, lane control, queue warning, hard shoulder running)	X
Travel information systems (real time)	
Advance traffic management systems	X

Speed management (limits, enforcement)	X
Truck and bus idle reduction	X
Global/advanced positioning systems	X
Use of new sensors and detectors for lights and signals	X
Transit frequency, LOS and coverage	X
Traffic congestion management	X
Intelligent demand management	X
PRICING AND PAYMENT	
Congestion pricing	X
Cordon pricing	X
Roadway pricing	X
Mileage based user fee/VMT fee	X
User fees	X
Pay as you drive insurance	X
Transit fare measures (discounts/incentives)	X
Fuel tax	X
Carbon tax	
LAND USE AND SMART GROWTH	
Integrated land use and transportation planning	X
Transit Oriented Development	X
Smart streets/living streets	
Compact/mixed use/urban design	X
Funding incentives and technical assistance to local governments for code revision, planning, design practices, TOD	X
Bicycle/Pedestrian access	X
Parking management and pricing (parking restrictions [especially in CBD], unbundle parking from employee benefits, variable rate parking)	X
Access management/control	X
Right-of-Way (ROW) management	X
Freight villages/consolidated facilities	
TRAVEL DEMAND MANAGEMENT	
Employer-based commute programs (provision of transit passes/fares/commuter checks)	X
Ridesharing, carpooling and vanpooling programs, including on-line ride matching	X
Car sharing	X
Guaranteed ride home	
Telework, flex time, compressed work week	X
Satellite offices	X
Non-work TDM programs (e.g., school pool, etc)	
Bike share programs (e.g., B-cycle)	X
Ski train/ski bus	

Safe Routes to School Program	X
PUBLIC EDUCATION	
Energy Literacy Program	X
Marketing/promotion (what we have done and what we are doing) - press release, brochures, fact sheets, etc.	X
Tools for making informed decisions	
Use of signing and variable message sign (VMS)	X
Driver education to change behaviors (incorporate vehicle maintenance, operation and transportation choice, GHG reduction information)	X
Eco driving	X
Expand transit use marketing and employer sponsored transit fare programs	
Traffic integration information	
Personalized information services	X
Avoided travel and trip shifting	X
Ozone aware programs	X
Idle reduction awareness	X
VEHICLE AND FUEL POLICIES	
Alternative fuel/high-efficiency vehicle purchases (government fleet and consumers)	X
Hybrid vehicles	X
Electric vehicles	X
Flex-fuel vehicles	X
Alternative fuel infrastructure	
CNG	X
Plug-in stations	X
Diesel retrofits	X
Government fleet purchases	X
Incentives:	X
Alternative fuel infrastructure tax credit	
Alternative fuel, advanced vehicle and idle reduction equipment tax credit	
Fuel cell motor vehicle tax credit	
Biodiesel income tax credit	
Alternative fuel excise tax credit	
Qualified plug-in electric drive motor vehicle tax credit	X
Grants:	
Electric vehicle supply equipment grants	X
Truck emissions reduction and fuel efficiency grant program authorization	X
Alternative fuels research grant	
Exemptions:	X

Low emission vehicle sales tax exemption	
Alternative fuel vehicle weight limit exemption	
Alternative fuels tax and vehicle decal	
Alternative fuel tax exemption	
Idle reduction equipment excise tax exemption	
CONSTRUCTION AND MAINTENANCE PRACTICES	
Low-energy/GHG pavement and materials	X
Fast construction and staging techniques	
Bid preference for alternative fuels or for fuel and delay savings	
Construction and maintenance equipment and operations	X
Alternative energy sources or carbon offsets	
Work zone management	X
ROW management (e.g., vegetation)	X
Rest area sustainability improvements (solar, emissions, resource consumption)	X
Use of ROW for alternative energy sources (solar, wind, etc)	X
Other greening initiatives	X
OTHER	
Innovative financing/funding	X
Public Private Partnerships	X
LEED like branding for transportation projects	X
High performance building requirement for some grantees (as required by statute)	X

Appendix D Charter and Accompanying Operating Procedures

Colorado Department of Transportation and
The Governor's Energy Office

EnergySmart TRANSPORTATION

Planning for a More Efficient Colorado

Charter and Operating Procedures

Whereas, Colorado, like all states, is faced with increasing energy costs for transportation, adversely affecting the state's economy by exporting billions of dollars annually to pay for transportation fuels; and

Whereas, by implementing modest changes in transportation efficiency, Colorado can make meaningful changes in the money that state residents could retain in the local economy; and

Whereas, many parts of the state face air quality issues, such as ozone and particulate emissions; and

Whereas, transportation is a contributor to air pollution and emissions and cleaner air improves public health and the environment for all Coloradans;

Whereas, with constrained federal and state dollars expected in the years to come, the transportation sector must find ways to maximize the use of existing infrastructure and funds; and

Whereas, the state legislature passed Senate Bill 09-108, which mandates that reduction of greenhouse gas emissions and environmental stewardship shall be addressed in long-range transportation planning; and

Whereas, transportation and other agencies within the state have missions that affect and complement each other in some way; and

Whereas, no single agency can address these challenges alone; and

Whereas, the Colorado Department of Transportation is committed to the continuing, cooperative, and comprehensive (3-C) planning process and the work and involvement of all our planning partners; and

Whereas, considering Colorado's transportation energy use requires the collaborative efforts of state and federal agencies, rural Transportation Planning Regions (TPRs), and Metropolitan Planning Organizations (MPOs); and

Whereas, many states are seeking practical ways to consider the issues of energy, air pollution and greenhouse gases in their transportation planning and programming; and

Whereas, Colorado's EnergySmart Transportation Initiative will strive to be an innovative and practical model, which could provide national leadership, especially for the western and mountain states; and

Whereas, the state has a unique window of opportunity to lead the way in developing a framework for considering energy use of the transportation system, through a technical assistance grant from the State Smart Transportation Initiative (SSTI) funded by the U.S. Department of Transportation and the Rockefeller Foundation.

Therefore, the Colorado Department of Transportation and Governor's Energy Office hereby establish the EnergySmart Transportation Initiative.

Colorado Department of Transportation and
The Governor's Energy Office

EnergySmart TRANSPORTATION

Planning for a More Efficient Colorado

Mission, Goals and Objectives

Mission Statement

The EnergySmart Transportation Initiative will develop a framework for considering energy efficiency and greenhouse gas emissions in transportation decision-making ultimately enhancing all transportation services to our citizens, promoting clean transportation technologies and improving the economy of our state.

Goals

The goals of the Colorado EnergySmart Transportation Initiative are to identify strategies to improve the energy efficiency and reduce associated greenhouse gas (GHG) emissions impacts of Colorado's transportation sector. This will:

- Retain more dollars and jobs in the Colorado economy;
- Address air quality issues, such as ozone and greenhouse gas emissions;
- Improve the environment and the health of Coloradans;
- Demonstrate that Colorado is a national leader in transportation innovation; and,
- Overall, enhance the quality of life for Colorado's citizens.

Objectives

To achieve the Initiative's goals of identifying strategies to improve energy efficiency and reduce associated GHG emissions impacts of Colorado's transportation sector, the Initiative's objectives include:

- Develop a framework to improve the planning process to encompass transportation energy usage and greenhouse gas (GHG) emissions.
- Identify new tools to evaluate energy aspects and associated GHG emissions in transportation planning.
- Identify encourage, and disseminate new and/or enhanced programs and initiatives that showcase innovation in energy reduction.
- Better align and coordinate the actions of state, regional, and local agencies that affect energy usage, economic development, and GHG emissions reduction of transportation to ensure efficient, effective decision-making.

- Develop concurrent clear and consistent messages on energy reduction, economic growth, and GHG emissions that can be used by a variety of agencies and partners.

Colorado Department of Transportation and
The Governor's Energy Office

EnergySmart TRANSPORTATION

Planning for a More Efficient Colorado

Accompanying Operating Procedures

Membership

The membership of the Collaborative Team is intended to bring together federal agencies, state agencies, Transportation Planning Regions (TPRs) and Metropolitan Planning Organizations (MPOs) to achieve the stated missions, goals, and objectives. The Collaborative Team can agree to add members or alter its membership. The Collaborative Team membership will include staff from the various agencies with sufficient time, substantive knowledge, and interest to advance the Initiative's missions, goals, and objectives. The current proposed membership is attached.

In order to ensure full executive understanding and support, it is expected that Collaborative Team members will communicate project Initiative to their agency's executive management and report feedback to the Collaborative Team. Additionally, it is further expected that executives will be engaged at key times in the Initiative.

Responsibilities

The Collaborative Team is expected to meet approximately monthly face-to-face from May 2011 until early 2012.

Additionally, with the support of the consulting team, Collaborative Team members, along with additional staff who have specific substantive knowledge, are also expected to participate in one or more Working Groups. The Working Groups are expected to meet at least three times either in person, on conference calls, or online between July 2011 and October 2011.

Deliberation and Decision-making

The Collaborative Team will seek to share information, undertake tasks, and complete action items in a mutually supportive, constructive, and efficient fashion. Much of the work will be in generating shared information, ideas, options, and considering practical strategies for Colorado. In so much as the Collaborative Team develops

recommendations, it will seek to build broad consensus around those recommendations with most or all members supporting such recommendations. It will primarily deliberate, coordinate, and communicate on issues. Collaborative Team members recognize that each agency has its own mission, constraints, and responsibilities. Nothing in the Initiative is intended to supplant or supersede such individual authority.

The Collaborative Team will make decisions regarding its own operations, including its guidance document, meeting agendas, and other related matters. In making such process and operational decisions, the Collaborative Team will pursue consensus of all or most members.

Role of Consulting Team

The consulting team will provide technical assistance to the Collaborative Team as identified. The consulting team will work in a fair, non-partisan, inclusive, and supportive fashion with all members.

Funding for this Initiative

Each member of the Collaborative Team is responsible for his/her own time, travel and other costs related to participation in the Initiative. The consulting team is funded independently from the participants and is accountable to the Collaborative Team as a whole.

Time Frame

The Collaborative Team is expected to undertake its work from May 2011 through early 2012.

Commitment

By participating, we agree to pursue the mission, goals, and objectives of this charter in a collaborative process expected to be completed in early 2012. We agree to dedicate sufficient staff, venue, and information resources to participate in Collaborative Team meetings, Work Groups, and other efforts necessary to complete the work at hand. We also agree to consider how best to address the recommendations of this effort, as is practical. This Charter does not affect, supplant, or supersede the mission and responsibilities each participant already has by law and regulation.

Appendix E Work Group Participants

(Names in Bold are Work Group Leaders)

Participants in the Advanced Technology Vehicles and Alternative Fuels Work Group

Name	Organization	Title
Rebecca White	CDOT	Local Government Liaison
Alex Schroeder	GEO	Senior Manager for Transportation Fuels
Patrick Hamel	CDPHE	Sustainability Unit Program Manager
Sabrina Williams	CDOT	Air Quality Specialist
Greg Davis	EPA	Mobile Sources Program Manager
Sonia Hamel	SSTI	Consultant

Participants in the Smart Systems/Trips Work Group

Name	Organization	Title
Sandi Kohrs	CDOT	Planning & Performance Branch Manager
Jeff Sudmeier	CDOT	MPO & Regional Planning Unit Manager
Stan Szabelak	RTD	Engineering Project Manager
Steve Cook	DRCOG	Metro Vision Planning & Operations Director
Laura Farris	EPA	Climate Change Coordinator
Bill Haas	FHWA	Planning & Environment Team Leader
Earl Wilkinson	Pueblo	Public Works Director
Steve McCannon	RAQC	Mobile Sources Program Manager
Dave Beckhouse	FTA	Planning & Program Development Team Leader
Aaron Dicken	CDOT	Mobility Analyst
Guadalupe Herrera	HUD	Sustainability Officer
Bruce Coltharp	CDOT	ITS Planner
Ignacio Correa-Ortiz	RTD	Senior Architect/Urban Designer
Michelle Scheuerman	CDOT	Planning Section Manager
Sonia Hamel	SSTI	Consultant

Participants in the Planning Processes Work Group

Name	Organization	Title
Tracey MacDonald Wolff	CDOT	Statewide Planning Unit Manager
Michelle Scheuerman	CDOT	Planning Section Manager
Craig Casper	PPACG	Transportation Director
Cindy Cody	EPA	Sustainability Coordinator
Steve Cook	DRCOG	Metro Vision Planning & Operations Director
Lesli Ellis	NFR MPO	Senior Environmental Planner
Bill Haas	FHWA	Planning & Environment Team Leader
Andy Hill	DOLA	Director, Community Development Office
Garry Kaufman	CDPHE	Mobile Sources Program Manager
Vince Rogalski	STAC	Chairman
Kate Cook	CDPHE	Transportation Planning Manager
Kim Livo	STAC	Fuels/Emission/Remote Sensing
Beth Tener	SSTI	Consultant
Ken Simms	GV MPO	Transportation Planner

Participants in the Data and Measurement Work Group

Name	Organization	Title
Aaron Dicken	CDOT	Mobility Analyst
Alex Schroeder	GEO	Senior Manager for Transportation Fuels
Michelle Scheurman	CDOT	Planning Section Manager
Craig Casper	PPACG	Transportation Director
Steve Cook	DRCOG	Metro Vision Planning & Operations Director
Kathleen Collins	CDOT	Transportation Planning Analyst
Jeff Houk	FHWA	Air Quality Specialist
Kim Livo	CDPHE	Fuels/Emission/Remote Sensing
Scott Richrath	CDOT	Performance and Policy Analysis Unit Manager
Jill Schlaefer	CDOT	Air Quality & Noise Programs Manager
Amy Schmaltz	CDOT	MPO & Regional Planning Liaison
Ken Simms	GV MPO	Transportation Planner
Jeff Sudmeier	CDOT	MPO & Regional Planning Unit Manager
Stan Szabelak	RTD	Engineering Project Manager
Sabrina Williams	CDOT	Air Quality Specialist

Energy Smart Transportation Strategy Evaluation Matrix

Strategy	Estimated Energy Benefits at 2015/2025 Horizon Year					
	Est. Petroleum Displaced (gallons)		Est. VMT Reduction		Est. Emission Savings (mt CO2e)	
	2015	2025	2015	2025	2015	2025
Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets	40,000	90,000			500	6,000
	110,000	225,000			8,600	14,000
Enhance Real Time Traveler Information (Smart Phone Application)	2,700	3,300			11	12
	14,000	17,000			55	60
Enhancements to Transit Traveler Information and Scheduling/Fare	90,000	60,000	4,700,000	4,700,000	500	300
	340,000	240,000	18,800,000	18,800,000	1,900	1,200
I-70 Speed Harmonization Pacing Pilot	1,000	1,200			6	8
Promote Public/Private Partnerships & Shared Station Agreements to Support NGV Use in Fleet Vehicles	32,606,000	321,370,000			90,000	870,000
		806,420,000				2,100,000
Truck Electrified Parking Rest Area Pilot Program	40,000	90,000			225	550
	110,000	225,000			650	1,500
Truck Fleet Enhancements	1,100,000				8,800	
	2,000,000				22,000	

Cumulative Analysis:

		Est. Total Emission Savings (mt-CO2e)		Est. Petroleum Displaced (gallons)		Est. Reduction in GHG From Transportation Sources (% of Total)		Projected GHG Emissions from Transportation Sources	
		2015	2025	2015	2025	2015	2025	2015	2025
Estimated Energy Benefits From Deployment of All Recommended Strategies	Low	100,000	880,000	33,900,000	321,600,000	0.3%	2.3%		
	High	120,000	2,100,000	35,200,000	807,100,000	0.4%	5.4%	33,500,000	38,800,000

Appendix G Worksheets from the Final Project Evaluation Process

<table>
<tr><th>Strategy</th><th>Enhanced Real Time Traveler Information (Smart Phone Application)</th></tr>
<tr><td>Work Group</td><td>Smart Systems/Trips</td></tr>
<tr><td>Lead Agency/ Champion</td><td>CDOT</td></tr>
<tr><td>Potential Partners</td><td>Public/private partnership opportunity</td></tr>
<tr><td>Energy Savings Potential</td><td>Estimated petroleum displaced (gallons)
<table>
<tr><th></th><th>2015</th><th>2025</th></tr>
<tr><td>Low</td><td>2,700</td><td>3,300</td></tr>
<tr><td>High</td><td>14,000</td><td>17,000</td></tr>
</table>
Estimated emission savings (mt CO_2 e)
<table>
<tr><th></th><th>2015</th><th>2025</th></tr>
<tr><td>Low</td><td>11</td><td>12</td></tr>
<tr><td>High</td><td>55</td><td>60</td></tr>
</table></td></tr>
<tr><td>Cost Effectiveness</td><td>TBD</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Gallons of petroleum displaced via travel time savings and vehicle delay avoidance</td></tr>
<tr><td>Ease of Implementation</td><td>Easy</td></tr>
<tr><td>Benefits</td><td>• Congestion mitigation
• Reduced petroleum use
• Potential ROI from advertising on www.cotrip.org</td></tr>
<tr><td>Duration</td><td>Long term</td></tr>
<tr><td>Description</td><td>Develop smart phone app (iPhone and Droid) that provides travelers real-time traveler information from the CoTrip web site. The initial intent of the App is to provide “personalized” traveler information and travel demand management strategies combined with time-sensitive business incentives that can result in effectively reducing congestion on the I-70 corridor from Golden to Vail. Personalized information will be provided based on the traveler’s location and projected direction of travel by using GPS coordinate data from the user’s smart phone. The App will use traveler information provided by the Cotrip.org web site including predictive travel times and travel times based on historical data. Future enhancements may include alternate route and mode planning and trip planning. The App would provide information to travelers so they could change their travel behavior, thereby resulting in reduced peak congestion. It would provide targeted traveler information and incentive offers to influence travelers to change their travel times, plans and modes. It is anticipated that the app would be developed in two phases, with the first phase focusing on the I-70 corridor from Golden to Vail and the second phase incorporating the remainder of the state highway system in Colorado.</td></tr>
<tr><td>Scenario Descriptions and Assumptions</td><td>CDOT’s current efforts to develop a smart phone App clearly define I-70 from Golden to Vail as the initial deployment corridor.
The following assumptions were made to estimate the benefits of this strategy:
• Half of all weekend, peak period travelers (Saturday, WB:7-</td></tr>
</table>

	11AM; Sunday, EB: 11-4PM) would benefit from the use of the App • Low: App users would realize a benefit of 1minute travel time savings per vehicle and a 30 seconds delay savings per vehicle while traveling the corridor • High: App users would realize a benefit of 5 minute travel time savings per vehicle and a 2.5 minute delay savings per vehicle while traveling the corridor • Fuel consumption and emission factors were based on average posted speed
Scenario Development Resources	• CDOT ITS RFP – *Smart Phone Application, Advertising and Marketing on CDOT's Traveler Information Website* • CDOT ITS CMAQ project analysis estimates
Strategy Assessment Metrics	• Average weekend traffic • Travel time/delay savings
Energy Quantification Tools	• MOVES 2010 emission factors

<table>
<tr><th>Strategy</th><th>I-70 Rolling Speed Harmonization Pilot</th></tr>
<tr><td>Work Group</td><td>Smart Systems/Trips</td></tr>
<tr><td>Lead Agency/ Champion</td><td>CDOT</td></tr>
<tr><td>Potential Partners</td><td>Colorado State Patrol</td></tr>
<tr><td>Energy Savings Potential</td><td>Estimated petroleum displaced (gallons)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>1,000 (due to avoided incident delay)</td><td>1,200 (due to avoided incident delay)</td></tr>
</table>
Estimated emission savings (mt CO_2e)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>6 (due to avoided incident delay)</td><td>8 (due to avoided incident delay)</td></tr>
</table></td></tr>
<tr><td>Cost Effectiveness</td><td>To be determined.</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Improved crash/incident rate and congestion mitigation subsequently reducing vehicle petroleum use and emissions</td></tr>
<tr><td>Ease of Implementation</td><td>Easy</td></tr>
<tr><td>Benefits</td><td>• Safety
• Congestion mitigation
• Reduced petroleum use</td></tr>
<tr><td>Duration</td><td>To be determined.</td></tr>
<tr><td>Description</td><td>Implement speed harmonization on select high-speed high-volume interstates, freeways and expressways. Primary implementation would be by CDOT, with local jurisdictions as potential partners. Speed harmonization uses detectors to measure volume, speed and occupancy and variable speed limit and/or overhead signs to display speed limits to travelers. Frequent variable speed limit signs and enhanced enforcement help to reduce speeds to manageable steady flows and reduce "turbulence" that causes accidents and creates more congestion, which impacts highway capacity. Speed harmonization provides safety benefits to reduce rear-end and other crashes as well as reduced intensity of injuries due to reduced speeds. It provides travelers better travel expectations (travel reliability and predictability), better throughput and reduced travel time. Speed harmonization reduces energy use by reducing congestion and smoothing traffic flow thereby reducing unnecessary idling and reducing travel time. Recently, as a proof of concept, speed harmonization was successfully applied on eastbound I-70 from the Eisenhower/Johnson Tunnels to Georgetown by using Colorado State Patrol vehicles in each lane as the lead vehicle to reduce speeds.</td></tr>
<tr><td>Scenario Descriptions and Assumptions</td><td>CDOT has completed two speed harmonization pilot projects to study the operational impacts and benefits of this strategy.
All benefits derived for this strategy were based upon a reduced crash rate and subsequent reduced incident delays on the corridor due to the speed harmonization effort. The following assumptions were made:
• Pacing deployment on I-70, eastbound, from Silverthorne (exit 205) to Empire Junction (exit 232)
• Benefits assumed for Sunday, EB travelers from 11AM – 4PM,</td></tr>
</table>

	for 8 months of each year (32 Sundays) • Travel time benefits of speed harmonization were calculated using average historic speed for the corridor during the designated time period • Delay benefits calculated using crash rate for corridor of 1.48 MVMT and estimated delay of 38 minutes/incident • Avg. pacing speed: 55 MPH • Avg. historic speed on corridor without pacing: 52 MPH • Avg. historic speed typically avoided due to incident delays: 30 MPH
Scenario Development Resources	• CDOT, Region 1, speed harmonization pilot results • CDOT, Traffic Analysis Unit, traffic volume data • I-70 PEIS, average historic speed data for corridor
Strategy Assessment Metrics	• Average weekend traffic • Travel time/delay savings
Energy Quantification Tools	• MOVES 2010 emission factors

<table>
<tr><th>Strategy</th><th>Truck Electrified Parking Rest Area Pilot Program</th></tr>
<tr><td>Work Group</td><td>Alternative Fuel & Advanced Vehicle Technology</td></tr>
<tr><td>Lead Agency/ Champion</td><td>CDOT</td></tr>
<tr><td>Potential Partners</td><td>CDPHE</td></tr>
<tr><td>Energy Savings Potential</td><td>Estimated petroleum displaced (gallons)
<table>
<tr><th></th><th>2015</th><th>2025</th></tr>
<tr><td>Low</td><td>40,000</td><td>90,000</td></tr>
<tr><td>High</td><td>110,000</td><td>225,000</td></tr>
</table>
Estimated emission savings (mt CO_2e)
<table>
<tr><th></th><th>2015</th><th>2025</th></tr>
<tr><td>Low</td><td>225</td><td>550</td></tr>
<tr><td>High</td><td>650</td><td>1,500</td></tr>
</table></td></tr>
<tr><td>Cost Effectiveness</td><td>To be determined</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Idle reduction</td></tr>
<tr><td>Ease of Implementation</td><td>Easy to medium. There’s no dedicated funding source or public deployment and no government incentives to the private sector to implement this technology</td></tr>
<tr><td>Benefits</td><td>• Idle reduction
• Reduced petroleum use
• Potential Return on Investment (ROI) from user fees</td></tr>
<tr><td>Duration</td><td>Long term</td></tr>
<tr><td>Description</td><td>Truck electrified parking is an approach currently being deployed to reduce heavy truck idling at truck stops and rest areas. Drivers of the nearly 500,000 long-haul trucks in the United States must rest for specific periods prescribed by the U.S. Department of Transportation’s Hours of Service regulation. Long-term idling is prevalent in the heavy truck sector to provide heating and cooling to the sleeper cab. However, idling increases fuel and maintenance costs, emissions, and noise.
This strategy would identify a CDOT rest area to serve as a pilot/test area for truck stop electrification. This pilot program would be used to test feasibility of truck stop electrification at a certain scale and help to build interest in additional facilities at private truck stops across the state.</td></tr>
<tr><td>Scenario Descriptions and Assumptions</td><td>Planning efforts conducted by CDOT to deploy a truck electrified parking include the following assumptions:
• Idling trucks consume approximately 1 gallon/hour of diesel fuel
• Electrified parking stalls consume approximately 4.3 kW of electricity per hour
• Estimated utilization rate of each electrified parking stall is 6.24 hours/day
• Low estimate for deployment: 2015 – 1 TEP location with 20 stalls; 2025 – 3 TEP locations with 20 stalls each
• High estimate for future deployment: 2015 – 3 TEP locations with 20 stalls each; 2025 – 5 TEP locations, 2 with 20 stalls each and 3 with 40 stalls each
• Recent CAFÉ requirements for heavy trucks estimated air quality and fuel economy improvements in the following horizon years to be:</td></tr>
</table>

	○ 2015: 5% reduction in CO_2 ; 5% improvement in fuel economy ○ 2025: 20% reduction in CO_2 and 20% improvement in fuel economy
Scenario Development Resources	• CDOT Mobility & Freight Analysis, *TEP Deployment worksheet* • Argonne National Laboratory, *Analysis of Technology Options to Reduce the Fuel Consumption of Idling Trucks*
Strategy Assessment Metrics	• Petroleum displaced • GHG reduction
Energy Quantification Tools	• MOVES 2010 emission factors

<table>
<tr><th>Strategy</th><th>Enhancements to Transit Traveler Information and Improve Scheduling/Fares</th></tr>
<tr><td>Work Group</td><td>Smart Systems/Trips</td></tr>
<tr><td>Lead Agency/ Champion</td><td>RTD</td></tr>
<tr><td>Potential Partners</td><td>Transit Agencies</td></tr>
<tr><td>Energy Savings Potential</td><td>Petroleum Displaced (gallons)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>90,000 (0.5%)
340,000 (2%)</td><td>60,000 (0.5%)
240,000 (2%)</td></tr>
</table>
Emission Savings (mt CO_2 e)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>500 (0.5%)
1,900 (2%)</td><td>300 (0.5%)
1,200 (2%)</td></tr>
</table></td></tr>
<tr><td>Cost Effectiveness</td><td>Petroleum Displaced ($/gallon)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>$585,000
(0.5%)
$2,340,000
(2%)</td><td>$381,000
(0.5%)
$1,524,000
(2%)</td></tr>
</table>
Emissions Savings ($ / mt CO_2e)
<table>
<tr><th>2015</th><th>2025</th></tr>
<tr><td>*</td><td>*</td></tr>
</table>
*Since this calculation is not specific to any one strategy to increase transit ridership, it is not possible to quantify costs at this time.</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Gallons of petroleum are displaced via reduction in single-occupancy vehicle commuters that have switched to transit.</td></tr>
<tr><td>Ease of Implementation</td><td>Easy</td></tr>
<tr><td>Benefits</td><td>Potential Economic Benefits
<table>
<tr><th>Year</th><th>Consumer Fuel Savings[1]</th><th>Economic Benefits to State</th><th>Clean Tech Jobs</th></tr>
<tr><td>2015 (0.5%)</td><td>$585,000</td><td>*</td><td>*</td></tr>
<tr><td>2015 (2.0%)</td><td>$2,300,000</td><td>*</td><td>*</td></tr>
<tr><td>2025 (0.5%)</td><td>$380,000</td><td>*</td><td>*</td></tr>
<tr><td>2025 (2.0%)</td><td>$1,500,000</td><td>*</td><td>*</td></tr>
</table>
[1]Avg. local price of gas, $3.48, used to calculate consumer fuel savings. Savings does not account for cost of transit ridership.

<u>Adjusted Cost-Effectiveness (Economic Benefits Considered)</u>
Petroleum Displaced ($/gallon)
<table>
<tr><th>2015</th><th>2025</th></tr>
</table></td></tr>
</table>

	<table><tr><td>*</td><td>*</td></tr></table> **Emissions Savings ($ / mt CO_2e)** <table><tr><td>2015</td><td>2025</td></tr><tr><td>*</td><td>*</td></tr></table>
Duration	Ongoing
Description	This strategy quantifies the benefit associated with increasing transit ridership – thereby reducing single-occupancy vehicle commutes. While this calculation is based on RTD data and the Denver metro area, the analysis can be extrapolated to increases in transit ridership from other areas of the state.
Scenario Descriptions and Assumptions	• This strategy assumed two scenarios: 1) that transit ridership increased by 0.5% from RTD's 2010 boardings for both bus and light rail; and 2) that transit ridership increased by 2.0%. • The average, daily one-way commute distance of 10.6 miles was used to calculated reduction in VMT (DRCOG, 2010). • The increase in energy -- diesel or electricity associated with increased bus and light rail ridership was calculated by using national averages (Btu/passenger mile). • Price of fuel was held constant at: $3.48/gal (gas and diesel). • Methodology is from CAPPA V1.5 developed by ICLEI.
Scenario Development Resources	• BTS: Table 4-24: Energy Intensity of Transit Motor Buses • 2011 Public Transportation Fact Book -- Appendix A: Historical Tables (Sept. 2011) • VTPI: Table 3 Average Fuel Consumption 2001 (Btu/pass mile) • 2017-2025 Model Year Light-Duty Vehicle GHG Emissions and CAFE Standards (July 2011)
Strategy Assessment Metrics	• Gallons of petroleum displaced by increased transit ridership. • GHG emissions benefits achieved from increased transit ridership.
Energy Quantification Tools	CAPPA V1.5

<table>
<tr><th>Strategy</th><th>Promote Public/Private Partnerships and Shared Station Agreements to Support Natural Gas Vehicle (NGV) Use in Fleet Vehicles</th></tr>
<tr><td>Work Group</td><td>Alternative Fuels and Advanced Vehicle Technology</td></tr>
<tr><td>Lead Agency/ Champion</td><td>GEO</td></tr>
<tr><td>Potential Partners</td><td>• GEO
• State Agencies
• Energy Producers
• CO Clean Cities
• Local Governments
• Private Fleets
• L/CNG Fueling Station Providers
• Vehicle Suppliers (OEMs and Conversions)</td></tr>
<tr><td>Energy Savings Potential</td><td>Petroleum Displaced/Year (gallons)<table><tr><td>2015</td><td>2025</td></tr><tr><td>32,606,000</td><td>321,370,464 (10%)
806,423,884 (25%)</td></tr></table>Emission Savings/Year (mt CO2e)<table><tr><td>2015</td><td>2025</td></tr><tr><td>88,411</td><td>874,174 (10%) 2,083,252 (25%)</td></tr></table></td></tr>
<tr><td>Cost Effectiveness</td><td>Petroleum Displaced ($/gallon)<table><tr><td>2015</td><td>2025</td></tr><tr><td>$6.02</td><td>$12.18 (10%)
$12.44 (25%)</td></tr></table><b>Emissions Savings ($ / mt CO2e)<table><tr><td>2015</td><td>2025</td></tr><tr><td>$2,219</td><td>$ 4,477 (10%) $ 4,814(25%)</td></tr></table>The projected cost-effectiveness decreases as market share increases due to the high incremental cost of light-duty natural gas vehicles relative to the lower volume of fuel consumption as compared to medium and heavy-duty sized vehicles. As additional light-duty vehicles enter the market share and an economy of scale is achieved, it could be reasonably expected that this incremental cost would decrease resulting in increased cost-effectiveness. Furthermore, the base cost-effectiveness evaluation</td></tr>
</table>

<table>
<tr><td></td><td>did not consider the potential benefits of income tax credits currently available through the Colorado Department of Revenue for motor vehicles titled and registered in Colorado that use are converted to use an alternative fuel</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Gallons of petroleum are displaced via increased utilization of natural gas as transportation fuel.</td></tr>
<tr><td>Ease of Implementation</td><td>Hard</td></tr>
<tr><td>Benefits</td><td>Increased utilization of natural gas as transportation fuel has potential to achieve significant economic benefits for the State. Colorado is a leading producer of natural gas and is home to the third largest proven reserve of this resource in the U.S. Increased production of natural gas should directly provide economic benefits to Colorado’s economy from the increased collection of severance taxes, property taxes, royalties and revenues from drilling, completion, recompletion and extraction. Additionally, an increase of natural gas extraction and production is likely to increase the number of “Clean Technology Jobs” in the State.

Colorado drivers should also benefit from NGVs as natural gas has demonstrated potential to be a significantly lower priced commodity than conventional gasoline and diesel fuels.

<table>
<tr><th>Year</th><th>Consumer Fuel Savings</th><th>Economic Benefits to State</th><th>Clean Tech Jobs</th></tr>
<tr><td>2015</td><td>$81,900,000</td><td>$99,000,000</td><td>1,650</td></tr>
<tr><td>2025 (10%)</td><td>$441,000,000</td><td>$544,000,000</td><td>32,000</td></tr>
<tr><td>2025 (25%)</td><td>$1,071,000,000</td><td>$1,250,000,000</td><td>89,000</td></tr>
</table>
</td></tr>
<tr><td>Duration</td><td>Long-term</td></tr>
<tr><td>Description</td><td>Strategy would identify opportunities to establish public-private partnerships among government and private fleets and the natural gas industry to create additional liquefied natural gas (LNG) and compressed natural gas (CNG) fueling stations. This strategy takes advantage of the tremendous potential to expand natural gas use among fleet vehicles and helps increase the use of a clean, home-grown fuel. The strategy focuses on addressing a key barrier to more widespread adoption of NGVs —the availability of NGV fueling stations and vehicles to support those facilities. This strategy has application in both urban and rural parts of the state, including corridors like SH59 and US34 in the Eastern Plains that have a high percentage of heavy-duty commercial VMT, and in urban areas with large fleets. The CDOT-GEO partnership takes advantage of CDOT’s large heavy-duty maintenance fleet and locations across the state and GEO’s relationship with industry, other agencies and partnership-building expertise.

Key assumptions of this strategy:
1. Create natural gas hubs to support volume required for filling stations
– Municipalities/counties
– Natural gas industry fleets</td></tr>
</table>

	– Local fleets 2. Connecting hubs to build natural gas highway – CNG refueling stations– located every 60 – 100 miles – LNG refueling stations – located every 150 – 250 miles 3. Select CNG and LNG sites by doing the following: – Prioritized station locations by existing infrastructure, available fleets, etc. – Scaled stations in the different locations based on expected load – Create network for connectivity throughout state
Scenario Descriptions and Assumptions	• The Greenhouse Gas and Regulated Emissions and Energy Use in Transportation (GREET) Fleet Footprint Calculator was utilized to quantify baseline GHG emissions and GHG emissions benefits resultant from 3 natural gas vehicle deployment scenarios in Colorado. • "The Colorado Plan for Natural Gas Vehicles and Infrastructure" provided the three scenarios that were modeled for projected energy and GHG benefits: o 2015: Kickstart—natural gas achieves a 1.84% market share of total transportation fuel o 2025: Low—natural gas achieves a 10% market share of total transportation fuel o 2025L: High—natural gas achieves a 25% market share of natural gas as transportation fuel. • Colorado Motor Vehicle Registration Data was used to determine the quantity of vehicles by type for each scenario. • Only on-road motor vehicles were considered. It is possible that off-road vehicles, e.g., construction equipment could also utilize natural gas as transportation fuel. • Price of fuel was held constant at: o $3.50/gal (gas and diesel) o $2.00/GGE-DGE (natural gas) • GREET national default values were used for: o Average Fuel Economy o Average Vehicle Life o Average Annual VMT
Scenario Development Resources	• The Colorado Plan for Natural Gas Vehicles and Infrastructure (August 2011) • North American Natural Gas Market Dynamics: Natural Gas Vehicles--A Review (CERI 2005) • North American Natural Gas market Dynamics: Global LNG—A Review (CERI 2005) • 2017-2025 Model Year Light-Duty Vehicle GHG Emissions and CAFE Standards (July 2011) • EPA and NHTSA Adopt First-Ever Program to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium-and Heavy-Duty Vehicles (August 2011)
Strategy Assessment Metrics	• Gallons of petroleum displaced by utilization of natural gas as transportation fuel. • GHG Emissions benefits achieved from use of natural gas as

	transportation fuel.
Energy Quantification Tools	GREET Fleet Footprint Calculator (V1.1a)

<table>
<tr><th>Strategy</th><th>Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets</th></tr>
<tr><td>Work Group</td><td>Alternative Fuels and Advanced Vehicle Technology</td></tr>
<tr><td>Lead Agency/ Champion</td><td>GEO</td></tr>
<tr><td>Potential Partners</td><td>• GEO
• State Agencies
• CO Clean Cities
• Local Governments
• RAQC</td></tr>
<tr><td>Energy Savings Potential</td><td>Petroleum Displaced/Year (gallons)<table><tr><td>2015</td><td>2025</td></tr><tr><td>40,000 (Low),
110,000 (High)</td><td>90,000 (Low),
225,000 (High)</td></tr></table>Emission Savings/Year (mt CO2e)<table><tr><td>2015</td><td>2025</td></tr><tr><td>500 (Low) 8,600
(High)</td><td>6,000 (Low),
14,000 (High)</td></tr></table></td></tr>
<tr><td>Cost Effectiveness</td><td>Unknown.
Cost of implementation will vary based on the vehicles selected by individual fleets.</td></tr>
<tr><td>Energy Reduction Mechanism</td><td>Gallons of petroleum are displaced via increased utilization of alternative fuel/advanced technology vehicles, as well as traditional vehicles with high fuel economy standards.</td></tr>
<tr><td>Ease of Implementation</td><td>Hard</td></tr>
<tr><td>Benefits</td><td></td></tr>
<tr><td>Duration</td><td>Long-term</td></tr>
<tr><td>Description</td><td>Strategy would consolidate the procurement process for public fleets. Consolidation of the procurement process will aggregate demand for alternative fuel and advanced technology vehicles, as well as traditional vehicles with high fuel economy in the State. Aggregating vehicle demand should increase the availability and decrease the cost of these vehicles in Colorado. This should result in an increased rate of vehicle penetration across all public fleets.
<u>Light-Duty Vehicles</u>
Currently, Colorado State Fleet Management (SFM) leads the process for light-duty fleet vehicle procurement by soliciting bids from vendors and generating a vehicle price list. Smaller public fleets (i.e., local governments) generally “piggy-back” off of this list with the exception of large municipalities (e.g., Denver). Thus, if SFM did not request a bid for a certain make/model of vehicle it generally precludes smaller fleets from being able to purchase it. Furthermore, first generation alt. fuel/adv. tech vehicles are</td></tr>
</table>

	usually produced in limited quantities that are less than total demand. Therefore, OEMs generally work with larger fleets to consolidate vehicles among a select number of larger fleets. This results in smaller fleets not given the opportunity to procure these emerging technology vehicles until several years of production have taken place. Bringing light-duty fleet managers together to generate a more comprehensive bid list should result in a price list that includes additional vehicles desired by smaller public fleets. In addition, by aggregating demand across all public fleets a greater quantity of these vehicles requested for purchase should decrease prices while simultaneously delivering market signals to manufacturers that these vehicles are in high demand for the state. <u>Mid-Size and Heavy-Duty Vehicles</u> Unlike light-duty vehicles, medium and heavy-duty vehicles (3/4 ton and above) generally have very specialized applications (e.g., snow removal, agriculture, etc.). Thus, individual state agencies control their own fleets and there is no centralized pricing system in place. This makes it difficult to track medium and heavy-duty alt. fuel/adv. tech. vehicle demand and usage across the state. Furthermore, the availability of emerging technology vehicles in this weight class is generally extremely limited and procurement opportunities limited to the largest fleets. Public fleets are also often faced with a "chicken or egg" dilemma pertaining to alternative fueling infrastructure, natural gas in particular. Bring public fleets together will provide an opportunity for fleet managers to share information and explore potential partnerships, such as station sharing agreements, which could provide additional vehicle options.
Scenario Descriptions and Assumptions	• Baseline: CO Clean Cities 2010 Report to DOE • Represents active stakeholder group (95 members) with demonstrated desire to participate. • Low: 2.5% Annual Incremental Improvement • High: 5.0% Annual Incremental Improvement • Improvements can be achieved from any combination of alt. fuel/adv. tech vehicles, improved fuel efficiencies, idle reduction technologies or more fuel efficient vehicles, which provides flexibility for individual fleets. • Significant overlap with natural gas strategy-- Projected Fuel savings/ GHG benefits associated with natural gas subtracted out • Conservative estimate: Likely additional fleets will opt-in.
Scenario Development Resources	• The 2010 Colorado Clean Cities Annual Report to DOE
Strategy Assessment Metrics	• Gallons of petroleum displaced by utilization of alternative fuel/advanced technology vehicles and increased fuel economy vehicles in public fleets. • GHG Emissions benefits achieved from petroleum displacement.
Energy Quantification Tools	Excel Spreadsheet

Appendix H Compressed Natural Gas (CNG) Memorandum of Understanding (MOU)

On November 9, 2011, Gov. John Hickenlooper and the governors of Pennsylvania, Oklahoma and Wyoming signed an MOU pledging to replace some of their aging gasoline-powered vehicle fleets with those running on CNG.

The MOU is an agreement that the states will work cooperatively to develop a request for proposals for a bulk purchase of CNG vehicles. A significant number of Colorado's 8,700-vehicle fleet are past due for replacement due to budgetary constraints. There are currently about 1,200 CNG vehicles in the state and 28 stations.

To date, the governors of twelve states have signed the MOU.

Memorandum of Understanding

This Memorandum of Understanding (MOU) describes a coordinated effort between the undersigned States (States) to attract automobile manufacturers in the U.S. to develop a functional and affordable original equipment manufacturer (OEM) fleet natural gas vehicle (NGV) that will also meet public demand. The States recognize the benefits and unique attributes of clean burning natural gas and understand the significant opportunity compressed natural gas (CNG) presents to save State and taxpayer dollars by encouraging an energy future that utilizes domestic energy resources to fuel our nation's transportation needs. Through the joint solicitation of a Multi-State Request for Proposal (Joint-RFP) that aggregates annual State fleet vehicle procurements, the States will endeavor to provide a demand base sufficient to support the design, manufacture, and sale of functional and affordable OEM NGVs by automotive manufacturers in the United States.

In anticipation of soliciting a Joint-RFP, the States will endeavor to coordinate with local agencies, municipalities, and companies to determine the number of NGVs each State can commit to purchase and the required specifications necessary to meet fleet needs. The Joint-RFP shall require that the ultimate cost of an OEM NGV should be comparably priced to an equivalent gasoline powered model and that warranty and reliability concerns are not compromised. Simultaneously, the States understand the need for continued development and expansion of CNG fueling infrastructure and should endeavor to encourage private investment, predicated on demonstrating an anticipated increase in State NGVs, to meet growing demand.

Pursuant to the terms of the Joint-RFP, to be executed at a later date, the States intend, where practical, to transition new fleet vehicle acquisitions, in committed volumes, to a resulting OEM NGV. Such future acquisitions should, when economically feasible, rely on traditional distribution channels that incorporate local businesses in procurement processes. In continued recognition of the benefits of CNG, the States should also endeavor to pursue fleet vehicle conversions to CNG, where economically compelling, based on a life-cycle cost analysis. The States will also reach out to fellow Governors to determine broader interest and participation in the principles and process outlined in this MOU.

This MOU embodies the principle understandings of the States but shall not create any legal relationship, rights, duties, or obligations binding or enforceable at law or in equity. Notwithstanding the foregoing, each State shall in good faith endeavor to reach a mutually agreeable and economically beneficial Joint-RFP, as contemplated herein. This MOU does not create additional state power, enhance existing state power, or interfere with federal authority or law. This MOU shall continue to demonstrate the States' understanding until execution of the Joint-RFP, or until otherwise discontinued by either State.

Set forth by:

State of Oklahoma

Mary Fallin

Mary Fallin, Governor
November 9, 2011

State of Colorado

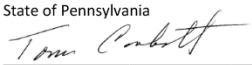
John Hickenlooper, Governor
November 9, 2011

Page **1** of **2**

State of Wyoming

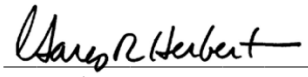
Matthew H. Mead, Governor
November 9, 2011

State of Pennsylvania



Tom Corbett, Governor
November 9, 2011

State of Utah



Gary R. Herbert, Governor
November 16, 2011

State of Maine

Paul R. LePage, Governor
December 2, 2011

State of New Mexico

Susana Martinez, Governor
December 22, 2011

State of West Virginia

Earl Ray Tomblin, Governor
January 16th, 2012

State of Kentucky

Steven L. Beshear, Governor
January 27, 2012

State of Texas

Rick Perry, Governor
February 6, 2012

State of Ohio

John R. Kasich, Governor
March 2, 2012

State of Mississippi

Phil Bryant, Governor
March 21, 2012

Appendix I How Other States are Measuring GHGs in the Transportation Sector

The following are brief summaries of what some states (and the District of Columbia) require in including GHG emission disclosure or reduction in planning. Some Metropolitan Planning Organizations (MPOs) and communities have additional requirements not included here.

New York

GHG reduction has been a requirement in state energy plans since 2003, making the state an early adopter of such a standard. The New York Energy Plan covers an analysis of transportation plans, programs, and projects for GHG emissions from both operation and construction/maintenance. The GHG emission requirements apply to MPOs as well as to state agencies. The requirement is that GHG emissions analysis is made transparent in the planning and construction process. A GHG build/no-build analysis of transportation plans and projects are then done using spreadsheets that the state has created. These spreadsheets are now being updated to use the MOVES model.

Oregon

Oregon state law sets GHG and VMT reduction targets for the transportation sector. Two state laws (HB 2186 and HB 2001) require MPOs to evaluate alternative transportation and land use scenarios to reduce GHGs. The MPOs have to do scenario planning, but are not required to use a common model. Another state law requires the state and the MPOs to develop analysis procedures and a toolkit for emissions (SB 1059.) Oregon created a state-level policy-screening tool that calculates VMT by household size and characteristics, such as auto ownership. The model is called GreenSTEP and is similar to CDOT's attempt to measure GHG emissions using its revenue-forecasting model. The U.S. FHWA is working on a national model of GreenSTEP.

California

The California state GHG plan (AB 32) sets GHG reduction targets for all sectors of the economy. Another state law, SB375, sets individual targets for the MPOs based on the GHG-reduction targets in AB32. Emissions reductions are assigned to transportation and then applied to MPOs, with the state setting individual emissions budgets for the MPOs. Land development laws have their own interpretation of NEPA and offer incentives for compliance or penalties for non-compliance. If adopted emissions budgets are not met, development faces stricter requirements; if the emissions budgets are met, land development is exempt from the California Environmental Quality Act. MPOs also have to have a Sustainable Communities Strategy and make sure projects are consistent. The MPOs have travel modeling criteria they must employ.

District of Columbia

The 2008 National Capital Region Climate Action Plan sets goals for transportation and land use. The MPOs then have to consider GHG reduction goals through transportation, land use and energy use with GHG analyses conducted for regional long-range transportation plans. GHG emissions are estimated from various future land use and transportation scenarios using the MOVES model.

Washington

Similar to Oregon, Washington state law requires VMT and GHG reduction goals on a per capita basis, not a total reduction. The Washington State DOT is required to reduce emissions and promote fleet electrification. Executive Order 09-05 requires the four largest MPOs to develop regional transportation plans to meet state GHG/VMT reduction goals.

Other States

Other states have provisions in their Climate Action Plans that are not enforceable, unlike State Implementation Plans for air pollutants, or in state law that may not be implemented yet. Those states are Florida, Iowa, Kansas, New Hampshire, Washington and Colorado. Still other states require project-level analyses of GHG emissions, such as New York, Massachusetts, Washington, Vermont, and California. Some Climate Action Plans have provisions for project-level analyses that have not been implemented, such as Arkansas, Florida, Iowa, Kansas, Maryland, Minnesota, Montana, and Wisconsin.

Appendix J Recognition Board

Colorado Department of Transportation
and
The Governor's Energy Office

Planning for a More Efficient Colorado

On behalf of the Colorado Department of Transportation and the Governor's Energy Office, we commend the commitment and dedication of all Collaborative Team members in developing a framework for considering energy efficiency and greenhouse gas emissions in transportation decision-making ultimately enhancing all transportation services to our citizens, promoting clean transportation technologies and improving the economy of our state.

Donald E. Hunt, Executive Director
Colorado Department of Transportation

T.J. Deora, Director
Governor's Energy Office

Partnering Agencies

Strategies moving forward:

- Enhance Real Time Traveler Information (Smart Phone Application)
- Truck Fleet Enhancements
- I-70 Rolling Speed Harmonization Pilot
- Enhance Transit Traveler Information and Improve Scheduling/Fares
- Promote Public/Private Partnerships & Shared Station Agreements to Support NGV Use in Fleet Vehicles
- Truck Stop Electrification Pilot Program
- Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets
- Energy Literacy Program
- Sustainability in Design and Construction
- Investigate Long-term Policy Options to Address the Impact of Decreased Infrastructure Revenues From an Increased Penetration of Alternative Fuel and Fuel Efficient Vehicles