Appendix I: Transportation and Land Use - detailed policy description/analysis

Overview

The Transportation and Land Use sector includes GHG mitigation opportunities related to vehicle technologies, fuel choices, transit options, and demand for transportation services. The CCAG recommends a set of 13 policy options for the TLU sector that offer the potential for major GHG emissions reductions from the reference projection. As summarized in the table below, these 13 policy recommendations could lead to emissions savings from reference case projections of 14.5 $MMtCO_2e$ per year by 2020 and cumulative savings of 91 $MMtCO_2e$ from 2007 through 2020. The weighted average cost of saved carbon from the policy options for which quantitative estimates of both costs and savings were prepared was minus $32 per metric ton of CO_2 equivalent, meaning that there is a net savings to the Arizona economy in implementing these options.

For each recommended TLU policy, this technical appendix provides details on design, analysis, quantification of impacts, and other related information. (See Appendix E for explanation of the general methods applied.) When these TLU policies were quantified, some policies were considered to have overlapping impact. To avoid double-counting of GHG emission reductions, the following steps were taken:

- **Light-duty sector:** Implementation of the light-duty measures would cause overlap with each other. For example, the State Clean Car Program (TLU-1) reduces per-vehicle CO_2 emissions while the Smart Growth Bundle (TLU-2) reduces the overall Vehicle-miles Traveled (VMT) from the light-duty sector. Thus, the VMT that should be applied to TLU-1 is reduced by TLU-2 while the per-mile CO_2 reduction for TLU-2 would be reduced by TLU-1. The sum of the product of the fraction of emissions remaining after each individual measure (TLU-1, TLU-2, TLU-9, and TLU-10) was applied to the reference case projected emissions showed the total fraction of the reference case emissions that would be expected to remain with these four measures applied in combination. In 2020, these four measures provide a total reduction to the light-duty CO_2 emissions of 37% when applied individually. When applied in combination and accounting for the overlap, they reduce 2020 reference case projected light-duty CO_2 emissions by 33%.
- **Freight sector:** Implementation of the biodiesel option (TLU-12) would overlap with the idling reduction option (TLU-4) and the reduced speed limit for commercial vehicles option (TLU-14). It was assumed that a portion of the fuel conserved in TLU-4 and TLU-14 would be biodiesel fuel, in the same proportion as described in the biodiesel option; e.g., 1.5% of the fuel conserved through 2014 and 10% of the fuel conserved from 2015 through 2020 (in terms of B100). Since a 78% reduction in CO_2 emissions was already applied to these fuel quantities in the biodiesel option, the base CO_2 emissions from these fuel quantities were reduced by an additional 22% rather than the complete 100% reduction (as applied to the diesel portion of the fuel) from conserving these fuel quantities in TLU-4 and TLU-14.

Transportation and Land Use Sector Summary of Results

#	Policy Name	Estimated 2010 GHG Savings ($MMtCO_2e$)	Estimated 2020 GHG Savings ($MMtCO_2e$)	Estimated Costs or Cost Savings Per Ton ($/tCO_2e$)	Cumulative 2007–2020 GHG Savings ($MMtCO_2e$)	Level of CCAG Support
TLU-1	State Clean Car Program	0.3	5.6	-$90	32.5	Unanimous
TLU-2	Smart Growth Bundle	1.5	4.0	$0 (Net savings)	26.7	Unanimous
TLU-3	Promoting Multimodal Transit	Not available (included in TLU-2)				Unanimous
TLU-4	Reduction of Vehicle Idling	0.7	1.3	-$22	11.8	Unanimous
TLU-5	Standards for Alternative Fuels	Not available (enabling policy for TLU-12 and A-3)				Unanimous
TLU-7	Hybrid Promotion and Incentives	Not available (included in TLU-1)				Unanimous
TLU-8	Feebates	Not available				Super-majority
TLU-9	Pay-As-You-Drive Insurance	0	2.8	$0 (Zero Net cost)	12.3	Unanimous
TLU-10	Low Rolling Resistance Tires	0.0	0.8	Not available	4.8	Unanimous

TLU-11	Accelerated Replace-ment/ Retirement of High-emitting Diesel Fleet	0.2	0.03	Not available	1.2	Unanimous
TLU-12	Biodiesel Implemen-tation	0.1	1.1	$0 (Zero Net cost)	6.2	Unanimous
TLU-13	State Lead-By-Example (via Procure-ment and SmartWay)	0.03	0.04	$0 (Zero Net cost)	0.4	Unanimous
TLU-14	60 mph Speed Limit for Commercial Trucks	0.3	0.5	$35	5.2	Super-majority
Accounting for Policy Overlaps		-0.01	-1.5		-9.8	
Total All Options		**3.1**	**14.5**	**$ -32 (weighted average)**	***91.0***	

The savings in fuel, measured in barrels and dollars, associated with TLU policy recommendations are presented in the table below.

FUELS SAVINGS FROM TLU OPTIONS				
GASOLINE SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Gasoline Reduced	4,422,311	30,079,892	171,856,457	
Aggregate of TLU-1,3,9,10				
Gasoline Cost Savings (million $)	$393.8	$2,743.0		$9,647.3
Aggregate of TLU-1,3,9,10				
DIESEL SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Diesel Reduced				
TLU-4 Idling Reduction	1,728,519	3,102,881	29,617,707	
TLU-12 Biodiesel Implementation	335,603	3,213,032	20,086,318	
TLU-14 Reduced Speed Limit	808,463	1,161,024	12,258,875	
Total	2,872,585	7,476,936	61,962,900	
Diesel Cost Savings (million $)				
TLU-4 Idling Reduction	$174.2	$312.8		$2,068.0
TLU-12 Biodiesel Implementation	$0.0	$0.0		$0.0
TLU-14 Reduced Speed Limit	$81.5	$117.0		$871.2
Total	$255.7	$429.8		$2,939.2
TOTAL FUEL SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Fuel Reduced	7,294,895	37,556,828	233,819,357	
Fuel Cost Savings (million $)	$649.6	$3,172.8		$12,586.5

TLU-1 State Clean Car Program

Policy Description:

Adopt the "State Clean Car Program" (also known as the "Pavley" standards or "California GHG emission standards") in order to reduce the net emissions of GHGs from passenger vehicle operation.

Policy Design:

New cars and light trucks in all states must comply with Federal emission standards, and, generally speaking, states have the choice of adopting a stronger set of standards applicable in California. In 2005, California finalized a set of standards that would require reductions of GHG emissions of about 30% from new vehicles, phased in from 2009 to 2016, through a variety of means. The standards must still be approved by US EPA, and face a court challenge.

Implementation Method(s):

Standards take effect in Model Year 2011 (calendar year 2010).

Related Policies/Programs in Place:

Federal regulation of tailpipe emissions and fuel economy.

Types(s) of GHG Benefit(s):

Overwhelmingly CO_2 reductions.

Estimated GHG Savings and Costs per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.3	5.6	$MMtCO_2e$
Net Present Value (2006–2020)		-$2,944	$million
Cumulative Emissions Reductions (2006–2020)		32.5	$MMtCO_2e$
Cost-Effectiveness		-90	$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:** Diane Brown and Elizabeth Ridlington, Cars and Global Warming: Policy Options to Reduce Arizona's Global Warming Pollution from Cars and Light Trucks, AZ PIRG Education Fund: February 2006, www.arizonapirg.org/AZ.asp?id2=22371 . CCS, Arizona Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, March 2006.
- **Quantification Methods:** The AZ PIRG report used a model of light-duty vehicle fleet comparing the difference between base case emissions and emissions with fleet penetration over time of vehicles that meet lower GHG emissions standards consistent

with the California regulations. The AZ PIRG model calculated light-duty vehicle fuel use and emissions based upon scientifically valid methods. (See extended discussion in AZ PIRG report, pp. 22–26.)

CCS compared the AZ PIRG model results to results for the New England states and California that were obtained using comparable modeling methods. CCS found that while all three modeling efforts were scientifically valid and comparable, some of the AZ PIRG model assumptions and methods were relatively conservative, while the California and New England modeling results were relatively optimistic. CCS further refined the AZ PIRG model results consistent with a middle range scenario that produced results less conservative than the AZ PIRG results and less optimistic than the California and New England results. While AZ PIRG projected a 13.7% reduction in light duty vehicle emissions with this policy, the CCS refinement estimates a 15.5% reduction in emissions. CCS applied this refined percentage reduction in emissions to the CCAG approved reference case scenario to obtain a net estimated reduction of 5.6 $MMtCO_2e$ in 2020.

This analysis assumes the program will start with the 2011 model year. Some 2011 model year vehicles will be on the market in calendar year 2010, and so there are some small emissions reductions that are foreseeable for that first year of sales/implementation.

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

Key Uncertainties:

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

Ancillary Benefits and Costs, if applicable:

Some reduction in criteria pollutants is likely.

Feasibility Issues, if applicable:

Light-Duty Vehicle GHG emissions standards can be met with existing 'off-the-shelf' automotive technologies that are already in the marketplace.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-2 Smart Growth Bundle

Policy Description:

This bundle of options encompasses four components related to reducing GHG emissions through land use practices and policies. These policies contribute to GHG emission reductions by reducing vehicle trips and total vehicle miles traveled.

Policy Design:

Smart growth actions include the following programs and program elements:

- **Infill and Brownfield redevelopment.** Shifting housing and commercial development toward location efficient sites, such as infill and brownfields projects, and away from location inefficient sites, such as greenfields, reduces overall travel demand and expands lower emitting mode choices. Brownfields are commercial or industrial properties that are abandoned or are not being fully used because of actual or perceived environmental contamination. These properties have potential for redevelopment, but the uncertainty and risk of environmental liability and the cost of investigation and cleanup keep them from being redeveloped. Former industrial properties, abandoned gas stations, and vacant warehouses are all examples of brownfields. Redevelopment of these properties creates jobs, revitalizes neighborhoods, increases property and sales tax revenues, decreases urban sprawl, and reduces potential health risks to the local community. Infill development can also revitalize neighborhoods, increase tax revenues, and decrease urban sprawl.
- **Transit-oriented development (including multi-modal transit proposals previously covered under option TLU-3)** includes a shift to lower emitting mode choices by building compact development (including employment) around transit stops. Helps people meet daily needs by foot, bicycle, or transit.
- **Smart growth planning,** modeling, and tools includes a number of practices that allow, support, and encourage location efficient growth in communities that are proximate to household amenities (such as jobs, shopping, school, services, entertainment, etc.) as opposed to growth in areas that are not proximate and require greater travel distance and have less mode choice. Smart growth allows for mixed land uses within a project with a range of housing opportunities and multiple transportation options including pedestrian/bike access.
- **Targeted open space protection** includes programs designed to protect and conserve State lands and other open spaces, and develop and improve neighborhood, community, and regional parks in ways that encourage location-efficient growth and broader mode choice.

Goal levels: Target a reduction in growth in VMT from passenger vehicles of 2 to11% in the years 2007–2020 through a combined approach utilizing a number of programs that fall under those listed above.

Implementation Method(s):

Specific policy measures would include:

- Promote use of authority under Growing Smarter/Plus by counties to impose development fees consistent with municipal development fee statutes.
- Promote smart growth principles in new development by requiring bidders to include defined smart growth principles in bid packages.
- Promote use of authority under Growing Smarter/Plus by cities to create infill incentive districts and plans that could include expedited process incentives.
- Promote use by cities of a fee waiver system, similar to the Phoenix Infill Housing Program, to encourage development of single-family owner-occupied housing on vacant, orphaned, or underutilized land located in the mature portions of Arizona cities.
- Provide technical assistance to communities that want to pursue Smart Growth and disseminate lessons learned in cities such as Phoenix and Tucson.
- Provide Smart Growth information tools that identify the qualitative (e.g., improved quality of living) and quantitative benefits (e.g., reduced vehicle operation costs) of these Smart Growth communities.
- Encourage lenders to apply location-efficient mortgage principles, so transportation cost savings are recognized when calculating a household's borrowing ability.
- Encourage cities to review (and update where appropriate) their engineering plans and standards to make new road and sidewalk infrastructure more supportive of transit, bikes, and pedestrians.
- Promote and support telecommuting.[1]
- Promote and support affordable housing in new developments.
- Carefully review land swaps for potential to produce undesirable development patterns.
- Implement the vision set forth in the MoveAZ report.

Related Policies/Programs in Place:

Arizona and various counties and cities have been pursuing a variety of policies related to Smart Growth (e.g., Growing Smarter legislation and actions by Phoenix and Tucson). In addition, in 2004, the Arizona Department of Transportation completed a long-range transportation plan for the State entitled MoveAZ (www.moveaz.org). Adopted by the State Transportation Board, MoveAZ provides policy directions, performance-based evaluations of capital transportation projects, and tools for ADOT to use in planning and implementing a vibrant multi-modal transportation system for the State. If successful, these efforts will complement the other actions in the Smart Growth bundle and help it achieve VMT reductions more toward the upper range of estimates for that option.

Types(s) of GHG Benefit(s):

CO_2 reductions

[1] There was also a suggestion of hybrid access to HOV lanes, but this will be discussed in Hybrid Incentives (TLU-, and is not part of Smart Growth.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	1.47	4.0	$MMtCO_2e$
Net Present Value (2006–2020)		0 (Net savings)	$ million
Cumulative Emissions Reductions (2006–2020)		26.7	$MMtCO_2e$
Cost-Effectiveness		0 (Net savings)	$\$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:** CCS, Arizona Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, March 2006. Extensive Smart Growth literature.
- **Quantification Methods:** Modified Arizona reference cast forecast for 2008–2020 using 2–11% reduction in VMT.
- **Key Assumptions:** The value used for reduction in VMT. To be conservative, assumes "de minimus" increases in GHG emissions from increased use of alternate transit modes. Assumes that infrastructure savings offset other costs.

Key Uncertainties:

Sensitivity of VMT growth to policy shifts.

Ancillary Benefits and Costs, if applicable:

Benefits include reduced infrastructure costs, avoided health care costs from reduced air pollution and increased walking/biking, and other quality-of-life aspects. There will be front-end costs of program development and implementation for brownfields, infill, and transit-oriented development programs. A successful program requires dedicated resources to ensure that desired development is achieved. There are grants available from the EPA that assist with the initial establishment of a program or to fund environmental activities for a specific project; however, successful local and State brownfields programs have a dedicated source of funds for the program. Financial resources are required to fund staff (at least one full-time employee is typical), administrative expenses, promotion, education, etc., on an annual basis, which has averaged approximately $200,000 per year for the City of Phoenix.

Many successful programs have used financial incentives to jump-start private sector investment. As the market increasingly embraces Smart Growth, these may become less necessary. Most federal brownfields programs are not available directly to the private sector; therefore, the most effective programs nationwide provide local or state financial assistance. In the City of Phoenix, capital improvement bond funds are used to provide financial assistance directly to the private sector and to encourage the use of brownfields for public facilities. Phoenix secured $3.4 million from the 2000 Phoenix Bond Program and recently obtained $4 million from the 2006 program for brownfields redevelopment.

Feasibility Issues, if applicable:

Smart Growth developments sell at a premium.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-3 Promoting Multi-Modal Transit

Policy Description:

Arizona should promote multi-modal transit options.

Policy Design:

Arizona should enable and support shifts in passenger transportation mode choice (auto, bus, rail, bike, pedestrian, etc.) to lower emitting choices. This includes: making optimal use of CMAQ funds; expanding transit infrastructure (rail, bus, BRT); improving transit service, promoting and marketing transit (including tax-free and employer-paid commuter benefits); improving bike and pedestrian infrastructure; exploring commuter rail using existing rail corridors; considering re-establishing train service between Phoenix and Tucson; reviewing all proposed transportation projects for multi-modal flexibility (e.g., add BRT or light rail, if feasible); and conducting research into new transportation technologies and urban planning techniques.

Implementation Method(s):

Implement in concert with TLU-2, Smart Growth.

Related Policies/Programs in Place:

None cited.

Estimated GHG Savings and Costs Per tCO_2e:

Not quantified.

Data Sources, Methods, and Assumptions:

Quantified as part of TLU-2.

Key Uncertainties:

None cited.

Ancillary Benefits and Costs:

None cited.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-4 Reduction of Vehicle Idling

Policy Description:

Reduce idling from diesel and gasoline heavy-duty vehicles, buses, and other vehicles through the combination of a statewide anti-idling ordinance and by promoting and expanding the use of technologies that reduce heavy-duty vehicle idling, including: automatic engine shut down/start up system controls; direct fired heaters (for providing heat only); auxiliary power units; and truck stop electrification.

Policy Design:

Currently, only Maricopa County has an anti-idling ordinance. This ordinance has not been enforced due to a lack of enforcement funding and enforcement authority. This policy would build off of the Maricopa County ordinance, strengthen it, and make it applicable statewide by the end of 2008. The statewide ordinance should be designed to be easily enforceable by the appropriate state and local agencies. It is critical that a dedicated State-funding stream for enforcement is needed for this measure to be successful in reducing vehicle idling and to obtain the predicted reductions in GHG emissions. The ordinance would also need to limit exemptions as much as possible, to make it easier to enforce. However, idling that occurs for public health and safety reasons (such as emergency vehicles) should be exempted from this rule.

This measure will also reduce idling from heavy-duty vehicles through programs aimed at increasing voluntary adoption of idle reduction technologies. ADEQ and the county agencies would collaborate on outreach and education beginning in the year 2008, to coincide with the implementation and enforcement of a statewide anti-idling ordinance. The State would also seek funding for pilot projects and demonstrations from CMAQ (Congestion Mitigation Air Quality) funds, as well as funds available through EPA, DOE, and DOT. These pilot programs could be used to evaluate the effectiveness of various idle reduction technologies prior to more widespread use throughout the State. Pilot projects could include truck stop electrification as well as an expanded school bus pilot program. The outreach materials should emphasize the benefits of reducing idling, including a reduction in fuel costs, GHG emissions, and toxic emissions.

- **Goal levels:** Implement a statewide vehicle idling restriction ordinance that can be enforced and that minimizes allowable exemptions, and provide the necessary resources for enforcing the ordinance. Develop and pilot the truck stop electrification programs. Target an overall reduction in idling of 80% by 2010 and 100% by 2020.
- **Timing:** Have ordinance in place by 2008.
- **Parties:** Industry, ADEQ, counties, school districts, and truck stop owners.

Implementation Method(s):

Information and education: Provide general public, trucking industry, and bus companies with information indicating when and where idling is prohibited, and under what circumstances it is permitted. Indicate the benefits of reducing idling, including fuel savings,

toxic emission reductions, and GHG reductions. Provide a hotline number to call to report violations. Encourage trucking companies to do their own policing of measure. Reach out to busing companies, school districts, and truck stop owners to help bus and truck drivers be more aware of idling restrictions. Ensure that signs are also posted in venues associated with bus idling (e.g., sporting events, shows, etc.). Emphasize the fuel savings benefits, reductions in toxic emissions, and reduced engine wear associated with reducing idling.

Provide information to fleet carriers, shippers, retailers, bus companies, school districts, and others involved in the diesel fleet industry indicating the economic benefits, as well as the environmental benefits, of applying idle reduction technologies. Identify best practices within the industry and recognize companies with these best practices in place within Arizona to encourage companies to select these carriers for their shipments. Develop outreach materials with cost benefits information and toxic diesel health impacts. Outreach materials should also be geared toward making the general public aware of the GHG, toxics, and fuel-saving benefits of eliminating idling on personal vehicles, as well as on trucks and buses. Expand school bus idling program based upon the pilots currently being conducted.

Technical assistance: Coordinate with anti-idling product manufacturers to organize workshops/outreach programs to regulated communities to let them know of technological options that provide alternatives to the need for idling including products for cabin comfort, power for other functions (e.g., refrigerated trucks) and engine warm-up.

Funding mechanisms and or incentives: Propose legislation to partially fund idling technology loan grants for truck stop electrification and other idle reduction technologies in the State, focusing grants on high idling areas. Determine a dedicated funding stream that can be used to fund enforcement of anti-idling ordinance as well as for continued education and outreach. Funding the enforcing agency with an adequate share of the revenue from using the idling reduction facilities could be an option. CMAQ funds and federal money may be available for idle reduction programs. A plan needs to be developed to apply for the funds.

Voluntary and or negotiated agreements: Work with regulated entities to promote voluntary compliance assistance through distribution of materials, staff training, etc. Encourage participation in EPA's SmartWay Transport Partnership (or similar programs).

Codes and standards: Include proper language in ordinance so that the agency with enforcement responsibilities is clearly delineated and has full authority to enforce the ordinance. The language of the statewide ordinance should also make enforcement straightforward (e.g., such that any exemptions to the idling policy can be easily observed). In developing the statewide anti-idling ordinance, EPA's recent Model State Idling Law should be reviewed for potential ordinance language. For example, the EPA model rule contains the following language exempting vehicles used for emergency and public safety purposes: "A police, fire, ambulance, public safety, military, other emergency or law enforcement vehicle, or any vehicle being used in an emergency capacity, idles while in an emergency or training mode, and not for the convenience of the operator."

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

Reporting: Develop a system for tracking violations so that the State can eventually determine compliance rates and benefits achieved from the ordinance.

Enforcement: Phase enforcement program to initially conduct outreach (Phase 1), provide warnings for a limited period of time (Phase 2), then issuance of tickets (Phase 3).

Related Policies/Programs in Place:

Idling restrictions are currently in place in Maricopa County. House Bill 2538, (2001 regular session) requires counties containing portions of Area A[2] to implement and enforce ordinances limiting maximum idling time for Heavy Duty Diesel Vehicles weighing over 14,000 pounds gross vehicle weight rating (GVWR). Other counties in Arizona also have the option of adopting an ordinance. The Maricopa County ordinance states "No owner or operator of a vehicle shall permit the engine of such vehicle to idle for more than five (5) consecutive minutes except as provided in Section 4 (Exemptions) of this ordinance." Violators are subject to a civil penalty of $100 for the first violation and $300 for a second or any subsequent violation, and can be enforced by any law enforcement officer on private/public property. Truck stop/distribution center owners/operators are required to erect signs indicating the maximum idling time in Maricopa County is 5 minutes. Exemptions are allowed under a number of conditions. To date, however, no violators of this ordinance have been fined. (Maricopa County Ordinance can be found at www.maricopa.gov/aq/rules/docs/fin-VIRO.pdf)

ADEQ School Bus Idling program. A number of school districts are participating with ADEQ in their School Bus Idling Pilot project. Key elements of this project include having drivers turn off buses upon reaching a school or other location and not turn on the engine until the vehicle is ready to depart; parking buses at least 100 feet from a school air intake system; and posting appropriate signage advising drivers to limit idling near the school. This program could be expanded throughout the State.

Idle reduction programs are currently being used by some shippers/carriers/retailers in Arizona. As an example, Swift Transportation is a charter member of EPA's SmartWay Transport program. This company maintains a modern fleet with an average vehicle age of less than 3 years old. Idle strategies used include optimized idle and other technologies as well as driver training.

Types(s) of GHG Benefit(s):

Reducing idling will reduce black carbon emissions, as well as all other GHG exhaust emissions (CO_2, CH_4, N_2O) through reduced fuel consumption. However, it is important to also ensure that any technologies used to reduce idling have lower emissions than the diesel truck idling emissions they are replacing.

[2] See www.azdeq.gov/environ/air/vei/images/areaa.html.

Estimated GHG Savings and Costs per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.7	1.3	$MMtCO_2e$
Net Present Value (2006–2020)		-$258	$million
Cumulative Emissions Reductions (2006–2020)		11.8	$MMtCO_2e$
Cost-Effectiveness		-$22	$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:**

  American Transportation Research Institute, "Idle Reduction Technology: Fleet Preferences Survey," February 2006 for technology costs.

  EPA SmartWay Transportation Partnership (www.epa.gov/otaq/smartway/idlingtechnologies.htm#truck-mobile) for technology costs.

  "Analysis of Technology Options to Reduce the Fuel Consumption of Idling Trucks," ANL/ESD-43, Argonne National Laboratory, Transportation Technology R&D Center, June 2000 for information on technology impacts.

  Data from EPA's MOBILE6 model were used to estimate the proportion of CO_2 emissions attributable to Class 8 trucks.

  Data from USDOE/EIA *Annual Energy Outlook 2005* were used to estimate the amount of fuel consumed annually per truck.

  "Model State Idling Law," EPA420-S-06-001, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Transportation and Regional Programs Division, March 2006.

- **Quantification Methods:** The estimated reduction in CO_2 emissions from reduced idling was calculated based on estimating the portion of emissions and fuel consumption in the Arizona inventory that were attributable to Class 8 diesel trucks, estimating the portion of the total fuel consumption that would be consumed during idling, and applying a targeted reduction of 80% to this amount starting in 2008 and a reduction of 100% starting in 2015.

- **Key Assumptions:**

  This analysis assumes idle reductions are achieved only by Class 8 diesel truck population; these trucks idle for an average of 6 hours per day; they consume 0.8 to 1.2 gallons of diesel per hour during idling; and that an 80 or 100% reduction of diesel idling from these Class 8 trucks is achieved.

  The cost analysis assumes a 5-year lifetime for idling technology equipment, applied to 80% of Class 8 vehicles starting in 2008 and 100% of Class 8 vehicles starting in 2015, at a cost of $6,000 per vehicle and a $2.40 per gallon diesel cost savings.

  Program administration costs, enforcement costs, fines, and reduced vehicle maintenance costs have not been factored into the cost analysis.

Key Uncertainties:

Buses, as well as other diesel trucks and gasoline vehicles and trucks that have not been quantified here, could achieve a small additional reduction in idling emissions. The distribution of technologies that would be selected by these trucks or fleets to reduce their emissions is highly uncertain. This will have a significant impact on the overall cost/cost savings of this measure. The use of these technologies will also cause a slight decrease in the CO_2 and fuel consumption reductions achieved. The use of truck stop electrification would increase emissions from electricity generation. Equipment cost and lifetime will vary by technology employed. The cost value selected was based on cost data summarized by American Transportation Research Institute, representing the capital costs of a variety of idle reduction technology. The cost of $6,000 per vehicle represents a mix of higher and lower technology costs. The cost analysis does not take into account the number of vehicles that have already installed idle reduction technologies. The fuel cost assumed here is based on long-term projected fuel costs. Increases in this assumed fuel cost will lead to greater cost savings for this measure.

Ancillary Benefits and Costs:

Reductions in idling will also reduce emissions of toxics, NOx, and PM. California estimates that 70% of toxic risk comes from diesel engines.

Idle emission reductions will reduce fuel consumption, thus leading to a cost benefit from reduced operating costs.

Additional costs are associated with on-board idle reduction technologies, but fuel savings over time typically lead to a net savings.

Providing idling reduction technologies (electrification/portable power units) at mandatory truck stops, such as Port-of-Entries/weigh stations, could prevent idling in other locations throughout the State. Providing central warehousing infrastructure may avoid idling required for refrigeration or other critical needs. Providing any new infrastructure requires funding.

Feasibility Issues:

Ability to enforce remains critical.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

Feasibility Issues:

None cited.

Level of Group Support:

Supermajority.

Barriers to Consensus:

None cited.