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Table 5

Transportation and Land Use Efficiency Subcommittee

Summary List of Recommended Priority Policy Options

Policy Number	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2012	2020	Total 2008-2020			
TLU-1	Smart Growth Bundle	*0.08*	*0.14*	*2.21*	*Net Benefit*		Pending
TLU-2	GHG Impacts for State and Local Capital Funding	*To Be Quantified as Part of TLU-1 and TLU-3*					Pending
TLU-3	Expand and Improve Transit Infrastructure	*0.003*	*0.029*	*0.133*	*$17.7*	*$487*	Pending
TLU-4	Support Passenger Rail Service in Iowa	*0.001*	*0.001*	*0.012*	*$0.11*	*-$85*	Pending
TLU-5	Adopt Best Workplaces for Commuters in Iowa	*0.02*	*0.02*	*0.21*	*$17.9*	*$84*	Pending
TLU-6	Light Duty Vehicle Fuel Efficiency Incentives	*To Be Quantified as Part of TLU -8*					Pending
TLU-7	Fuel Efficient Operations for Light Duty Vehicles	*0.11*	*0.65*	*3.41*	*TBD*	*-$90*	Pending
TLU-8	New Vehicle Standards (Tailpipe GHG and Fuel Economy)	*In Process*					Pending
TLU-9	Freight Strategies (Truck and Rail)	*0.39*	*0.63*	*5.9*	*$30*	*$48*	Pending

Policy Number	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2012	2020	Total 2008-2020	2008–2020 (Million $)		
TLU-10	Fuel Strategies	*Scenario 1 – 10% LCFS*					Pending
		1.02	*2.54*	*17.30*	*-$352*	*-$20*	
		Scenario 2 – 20% LCFS					
		1.21	*5.19*	*27.49*	*$386*	*+$14*	

TLU-1 Smart Growth Bundle

Policy Description:

The Smart Growth Bundle includes policies that will align growth and development in Iowa with GHG reduction goals. Developing statewide policies to implement smart growth will have significant economic, social and ecological benefits for communities across Iowa.

This bundle of policies includes the following elements:

1. Downtown revitalization, infill and brownfields redevelopment
2. Transit-oriented development
3. Smart growth planning, modeling, and tools
4. Bicycle and pedestrian infrastructure
5. Growth management planning
6. Technical and financial support to local and regional agencies
7. Reforms of local zoning, tax, and building codes

Smart growth policies that affect land use and transportation patterns are proven to reduce Vehicle Miles Traveled (VMT). This will enable more Iowans to conveniently travel on foot, by bicycle or transit, or with shorter driving trips. Improving planning tools and software applied in Iowa will enable accurate quantification of VMT reduction of various smart growth policies. The combination of these policies will ensure maximum impact.

Achieving reductions in VMT through smart growth policies will occur through:

- Strategic Growth and Development - Enable local governments to improve community design and direct growth to locations that will result in reduced VMT. The state will establish and maintain a land use policy framework that ensures that local land use planning satisfies both state goals and local interests. This framework will include: greater coordination amongst local governments and state agencies, strategic development areas where metropolitan growth boundaries support reduction of VMT, and focused redevelopment strategies that ensure efficient use of land and existing infrastructure.

- Education and Technical Assistance – Communities will be given flexibility and choices to achieve VMT reduction goals through their growth and development. Local

governments and other stakeholders, like developers and private lending institutions, will be provided with technical assistance that will include diverse strategies for communities to consider using in reaching VMT reduction goals. (i.e., model zoning code provisions, local tax code reform to achieve smart growth, etc) Education will be provided to parties involved with implementation, as well as to the general public in order to overcome barriers to accepting smart growth and encourage sustainable lifestyles like biking and walking.

- Incentives and Funding Programs – Existing incentives, funding, and loan programs administered by the state that are applicable to growth and development will be assessed and realigned to support the elements of this smart growth bundle of policies. Rating systems and prioritization of funding will be reviewed and improved to meet smart growth objectives. New programs will be developed and existing programs will be revised to fill in gaps where no program exists to meet needs that can't be achieved, or are far less likely to be achieved, without funding assistance. (i.e., improved brownfields and grayfields incentives, increase technical assistance funding for Iowa Downtown Resource Center.)

Details of specific policies and programs that fall under the above three categories will be outlined in the Implementation Mechanisms category of this document.

Policy Design:

Goal levels:

- Achieve quantifiable VMT reduction goals of 10% per capita reduction of 2020 the projection off-baseline in urban areas through smart growth - The state of Iowa will enable growth and development to achieve VMT reduction goals through a series of policies, including implementation mechanisms identified below. Scientific research shows that VMT reduction in urban areas is quantifiable through improved planning software. Iowa agencies will assist local and/or regional governments in using the latest planning technology that measures VMT impacts to assist with decision-making on future growth and development. The more aggressively the policies are pursued, the greater the potential reduction in VMT that would be achievable.

Additional goal levels:

VMT reduction goals of 10% per capita reduction off baseline forecast for 2020
VMT reduction goals of 20% per capita reduction off baseline forecast for 2030
VMT reduction goals of 30% per capita reduction off baseline forecast for 2050

- Incorporate unique rural VMT reduction strategies - Although rural areas of the state will have more limited opportunities to reduce reliance on the automobile, smart growth

policies will still be implemented to reduce auto dependence within small communities and reduce the need to drive far away for employment, retail goods, or services.

- Integrate with Transit Policy When Applicable - Land use practices are a key component of reducing VMT with expanded and improved transit infrastructure. The implementation of the Smart Growth Bundle, Transit Infrastructure policy (TLU-4), will be coordinated whenever applicable to achieve maximum reduction of greenhouse gases through efficient implementation.

- Integrate GHG Reductions from Other Sectors When Applicable - Policies intended to reduce GHG through other sectors besides transportation, such as from generation or consumption of electricity will be tied to this when implementation mechanisms present an opportunity to achieve maximum GHG emissions from multiple sectors. (i.e., incentives for downtown revitalization will also be tied to green building standards when applicable)

Timing:

2009: Development of metropolitan growth boundaries and involve utility and service providers (water, wastewater).

2009: Administrative policies or actions that do not require new funding sources will begin.

2009: Policies that require state legislation should be considered during the legislative session.

2009-2010: Use of planning tools and software to analyze transit and land use scenarios for VMT reduction.

2009-2012: Adoption of metropolitan growth boundaries, and revisions to those boundaries every three years that will include VMT reduction measurements and goals.

2009-2012: Municipalities will develop and implement policies that support and promote high quality, dense developments at hubs and nodes along identified rapid transit routes. Other local policies will be adopted to reduce VMT through community design. State technical assistance will be provided, where needed, in order to relieve barriers to local implementation.

2012: State funding will be fully realigned to support VMT reduction.

2020: Full implementation with evident VMT reduction results achieved through this policy.

Parties Involved:

Cities, counties, Iowa State University Extension, University of Iowa, Metropolitan Planning Organizations and Councils of Governments, transit service providers and transit agencies, utility providers, water and sewer service providers, Environmental Protection Agency, Iowa Department of Natural Resources, Department of Transportation, Department of Economic Development, Department of Public Health, Iowa Finance Authority, Office of Energy Independence, USDA Rural Development, non-profit organizations with development-related

interests (environment, economic development, human services, etc), developers, planners, lenders, school districts, contractors, homebuilders, employers

Implementation Mechanisms

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	0.08	0.14	$MMtCO_2e$
Net Present Value (2008-2020)	Net benefit	Net benefit	$ Million
Cumulative Reductions (2008-2020)	0.53	2.21	$MMtCO_2e$
Cost-Effectiveness	Net benefit	Net Benefit	$/MtCO_2e$

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

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

- **Data Sources:**
  - Total population and population density by Census tract, 1990 and 2000.

- Per-capita VMT by Census tract population density in Iowa, from CUTR VMT forecasting model.

- Forecast statewide population growth

- **Quantification Methods:**

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

- Total population in 2000 is identified by five Census tract density ranges as identified in the CUTR model (<500, 500 – 1,999, 2000 – 3,999, 4,000 – 9,999, and 10,000 or more persons per square mile).

- The change in population from 1990 to 2000, and associated share of change by density range, is identified from Census data.

- For the Baseline scenario, new population growth between 2000 and 2020 (as determined from CCS baseline assumptions) is allocated to tract density ranges based on the share of growth in the 1990-2000 timeframe.

- The proportion of existing housing stock (population) that would be redeveloped over this timeframe is estimated at 15 percent, of which two-thirds is redeveloped in place and one-third is redeveloped elsewhere, with this redevelopment allocated to tract density ranges based on the 1990-2000 share of population growth. (The 15 percent and two-thirds figures come from the 2007 Growing Cooler report Section 1.7.3, citing analysis of Census data by Nelson (2006)).

- For the Climate Action scenario, a significant shift in the proportion of new development and relocated redevelopment is assumed to take place, with higher-density tracts (>2,000 persons per square mile) receiving 50 percent of new development under this scenario compared to only XX percent under the Baseline scenario. Total population by tract density under this scenario is then calculated.

- Total personal-travel VMT is calculated under the Baseline and Climate Action scenarios, based on VMT per capita (from the CUTR model) and total 2025 population by tract density range, and the percent reduction in personal-travel VMT is calculated.

- The percent reduction in VMT is adjusted by 90 percent to estimate the percent reduction in GHG emissions. This factor is the same as used in the Growing Cooler report to account for the fact that higher-density areas may experience somewhat lower travel speeds and therefore slightly reduced fuel economy.

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

Key Uncertainties

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

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

Additional Benefits and Costs

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

Alternative patterns of development have a large number of additional impacts, which may both provide benefits and costs. Smart growth provides a range of co-benefits that are well documented in other places. Prominent among these is the reduced cost of providing utilities and infrastructure, as smart growth makes better use of existing facilities and infrastructure and on average has lower demand. Improved air quality, public health (e.g., due to walking), and quality of life are also notable co-benefits.

Feasibility Issues

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

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-2 GHG Impacts for State and Local Capital Funding (to be a model for climate-friendly development patterns)

Policy Description:

The state of Iowa will be a leader in ensuring that the development of state facilities and that state capital funding programs are helping to meet GHG-reduction goals. This includes encouraging growth and development that reduces Vehicle Miles Traveled (VMT).

State government will locate new facilities and agency offices in central business districts or other established core business areas of municipalities. Any state of Iowa office that serves the public in an urban area will be accessible by public transportation within ¼ mile at a frequency rate that supports the needs of Iowans who visit and need that facility. New buildings for state offices located in downtowns will be high density and consider first floor retail to encourage mixed use and pedestrian orientation in downtowns. If these locations are not possible, suburban locations will have good access for bicyclists, pedestrians, and public transit.

Capital funding that Iowa administers will be a model for climate-friendly development. Some of this funding is administered in the form of grants and loans, and other capital funding goes directly to local governments. This policy would improve coordination between state agencies, local and regional governments to provide the technical assistance, incentives, and tools needed to reduce VMT through smart growth implementation and linking infrastructure planning to land use planning.

Existing infrastructure and community development funding sources will be reviewed to assess their potential to facilitate smart growth, and new funding programs will be developed to fill in needed funding gaps. Comprehensive planning and site planning information from local and regional governments will be submitted to the state for review specific state funding applications. The state will significantly reduce capital investments that result in VMT increase. Technical assistance and planning tools will be developed and disseminated in conjunction with the realignment of state funding assistance and approval processes.

Capital funding that can enable GHG reductions from other sectors than transportation, such as encouraging energy efficient buildings, will be included in this policy as well.

Policy Design:

Goal levels:

- Establish and adopt a statewide "complete streets" policy and design guidelines that incorporate transit, bicycle and pedestrian facilities in state, or state-facilitated and federally funded transportation projects.

- Establish a reliable source of capital funding for public transportation within the Iowa DOT that is able to serve increased demands and opportunities for transit infrastructure.

- Pass a state administrative policy regarding the location and accessibility of state offices and agencies.

- Transportation, water, and sewer funding will be targeted toward maintenance needs in central locations and areas with the ability to reduce VMT through community design.

- Development projects that are designed to serve higher density, more compact, pedestrian friendly development will be prioritized for state capital funding.

- Adopt a state-level amendment to the NEPA process for roadway studies to include GHG impacts including VMT.

Timing:

2009 Adopt complete streets policy, compilation of maintenance needs of infrastructure in central locations and areas with the ability to reduce VMT through community design, compile data on existing state capital funding programs, begin technical assistance and education to stakeholders and applicants for state funding.

2010 New infrastructure policy applied to selected state capital funding, create a state-level source of capital funding for public transportation, state NEPA policy development, pass state administrative policy on location of state facilities, begin applying community design principles to state or state-administered federal capital funding.

2010 – 2020 Full Implementation

Parties Involved: Department of Transportation, Department of Management, Department of Administrative Services, Iowa Finance Authority, the Department of Economic Development, the Department of Natural Resources, transit agencies, and local governments. Every state agency will be complying with the policy relating to the location of offices.

Implementation Mechanisms

Related Policies/Programs in place:

None identified.

Estimated GHG Savings and Cost Per Ton:

To Be Quantified as Part of TLU-1 and TLU-3

This strategy was considered as one of the key implementation mechanisms for TLU -1 and TLU -3; it both facilitates and initiates activities that are described within those strategies. As such, the potential greenhouse gas impacts were not estimated separated, but instead can be considered as being incorporated into the other two.

Key Uncertainties

None identified

Additional Benefits and Costs

Many of the same benefits and costs that are considered as part of the TLU -1 and TLU -3 analysis apply here as well.

Feasibility Issues

None identified.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-3 Expand & Improve Transit Infrastructure

Policy Description:

Improvements and expansion of existing transit service and implementation of new, innovative transit services can shift more passenger transportation to public transit, thereby reducing Vehicle Miles Traveled (VMT). Public transportation improvements are critical to support Smart Growth initiatives (as referenced in TLU-1) and are essential to an ongoing effort to reduce VMT. This policy includes four components of change that are needed on the state level to expand and improve transit infrastructure.

- Funding - The current levels and allocation formulas of state funding for transit are inadequate to substantially expand and improve transit infrastructure to reduce VMT. This proposal outlines several funding levels and potential sources to meet these needs, although other funding sources not listed in this proposal will also be considered in the years to come.
- Studies and Planning - While a few local metropolitan areas have completed rapid transit (i.e., Bus Rapid Transit, commuter rail) studies, the state will provide the technical assistance and leadership needed to assist or help initiate future studies with local and regional governments. Transit projects and local transit agency goals will be reflected in the State Transportation Plan and will be considered in any inventory of funding needs for traffic mitigation and studies of specific roadway capacity. Currently, travel demand models in Iowa are not able to directly consider the impacts of additional or expanded transit service on total VMT in an area. This ability needs to be researched further and implemented along with other tools that can provide quantifiable estimates of VMT reduction due to additional or expanded transit service along with land use patterns.
- Technical Assistance - The state will provide technical assistance, where needed, to promote transit oriented development around transit nodes or hubs. Land use and transportation coordination will be improved to increase ridership through land use changes that support transit use in urban areas.
- Transit Marketing and Promotion – Incentives and marketing strategies aimed at increasing transit use will be pursued as a means to shift more passenger transportation from cars to the existing transit systems and increase demand for transit.

Policy Design:

Goals:

The state will expand and improve transit infrastructure to reduce VMT and achieve an annual ridership increase of 100% by the year 2020. This will be measured on a per capita basis in order to prevent population demographics from affecting the transit ridership goal. The goal of this set of activities is for the state to provide the leadership and resources necessary to help create expanded transit and ridesharing networks throughout the state that will provide Iowans with choices and will reduce VMT.

Funding goals - Current state transportation financing policy emphasizes maintenance and capacity improvements to the road network to meet projected future VMT increases. The state will adopt revised transportation financing policies that meet the state's emission and greenhouse gas reduction goals by reducing VMT through support of public transit operating and capital investment. Goals for funding include:

- Direct more funding to help cover a significant percentage of annual operating costs for transit systems
- Support transit capital investments
- Designate state funding specifically for the purposes of transit services designed to reduce VMT
- Sources of this funding will be dedicated, reliable, predictable, and able to grow with inflation.

Funding, studies/ planning, technical assistance, and transit marketing/promotion will address the needs to:

- Improve service frequency on selected existing transit routes.
- Offer more forms of transit services and infrastructure (e.g. commuter rail, urban streetcars, bus, BRT, passenger stations, facilities, suburban park and ride lots).
- Reduce travel times on selected existing transit routes (signal prioritization, exclusive lanes, technology improvements, etc.).
- Improve service quality on selected transit routes (safety, cleanliness, enhanced bus stops/shelters, real-time schedule communications).
- Expand longer distance ridesharing activities by promoting carpool and vanpool services throughout the state.
- Reduce or eliminate transit fares paid by riders that hinder ridership growth, by implementing other funding strategies (e.g. employer subsidies, state incentive funds, etc.).

Timing:

2009: Administrative policies or actions that do not require new funding sources will begin.

2009: Policies that require state legislation will be considered during the legislative session.

2009-2010: Use of planning tools and software to analyze transit and land use scenarios for VMT reduction.

2010-2020: Full Implementation.

Implementation Mechanisms

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	0.003	0.029	$MMtCO_2e$
Net Present Value (2008-2050)	$6.6	$17.7	$ Million
Cumulative Reductions (2008-2050)	0.004	0.133	$MMtCO_2e$
Cost-Effectiveness	$2,174	$487	$/MtCO_2e$

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

- **Data Sources:**
    - Current and historical transit ridership, by mode type (urban/rural, bus or paratransit) – from National Transit Database and/or state sources
    - Operating cost per passenger and per passenger-mile, by mode type (urban/rural, bus or paratransit) – from National Transit Database and/or state sources
    - Revenue per passenger and per passenger-mile, by mode type (urban/rural, bus or paratransit) – from National Transit Database and/or state sources

- All data was collected for the transit agencies in the following Iowa cities: Ames, Bettendorf, Cedar Rapids, Coralville, Davenport, Des Moines, Dubuque, Iowa City, Sioux City, and Waterloo.

- **Quantification Methods:**

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

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

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

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

- **Key Assumptions:**
    - Transit services can be expanded and introduced at the same average operating cost as current services. The mix in transit modes provided to further include bus rapid transit, commuter rail, and van pools decreases the average net operating cost from the existing almost purely bus service being offered.

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

Key Uncertainties

Funding availability for the provision of additional transit service.

Additional Benefits and Costs

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

Feasibility Issues

None identified.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-4 Support Passenger Rail Service in Iowa

Policy Description:

Increasing passenger rail will reduce single occupant vehicle travel which reduces emissions of pollutants and greenhouse gases (GHG). The following is from the report "Vision for the future – U.S. intercity passenger rail network through 2050" prepared by the Passenger Rail Working Group:

> *"Traveling by public transportation is less carbon intensive than traveling in a single occupant vehicle. Partially or fully loaded rail coaches are more environmentally friendly than lower occupancy single vehicles. The average intercity passenger train produces 60 percent fewer CO2 emissions per passenger-mile than the average auto and half the GHG emissions of an airplane."*

Iowa is currently served by two Amtrak long distance routes. The California Zephyr runs east-west through southern Iowa from Omaha to Burlington and the Southwest Chief cuts across the southeastern tip of Iowa through Fort Madison. Total ridership on these routes in FY 2006 was 61,377 which is a 33 percent increase from FY 2002. These long-distance routes are important to connect Iowa with the rest of the nation and should continue.

The Iowa Department of Transportation (DOT) has participated in a study of the development of a Midwest Regional Rail System which would provide high-speed service (up to 79 mph) across Iowa from Omaha to the Quad-Cities ultimately connecting with Chicago. This service would provide an estimated user benefit to Iowa of $500 to $700 million. This system would require a significant investment to upgrade track and an operational subsidy the first few years of service.

The DOT is now partnering with Amtrak to study regional passenger service in Iowa. Initial feasibility studies have been completed for service from Chicago to Dubuque and Chicago to the Quad Cities. Studies are underway to look at extending the Chicago to Quad Cities service on to Iowa City and then on to Des Moines. Estimated ridership for the Chicago to Dubuque service is 74,500 and would require capital upgrades (primarily in Illinois) and an annual operating subsidy of $2.9 million. Estimated ridership for the Chicago to Quad Cities service is 102,700 and would require capital upgrades (primarily in Illinois) and an annual operating subsidy of $6 million.

The DOT, along with other interested partners and agencies, will develop and implement a statewide passenger rail system in Iowa. This will involve identification and implementation of funding to support capital and operating costs. The plan will identify a phased implementation of service and appropriate funding support based on type of service provided (i.e. long-distance

vs. regional vs. commuter service). In the short-term this effort should result in regional passenger rail service from Chicago to Dubuque and from Chicago to the Quad Cities to Iowa City. In the long-term, this will result in statewide passenger rail service consistent with yet to be developed long-range passenger rail plans.

Policy Design:

Goal levels: Establish a statewide passenger rail system in Iowa to supplement existing long-distance service and that provides connections to other modes of transportation.

Timing:

By 2010, the Iowa Department of Transportation and other interested parties and agencies will:

- Support the initiation and development of passenger rail feasibility studies.
- Develop and implement education, marketing, and promotion activities that support passenger rail service.
- Develop a Passenger Rail Advisory Committee.
- Identify and seek state funding for passenger rail capital and operating assistance.
- Seek federal funding to support passenger rail service.
- Develop a long-range passenger rail plan that identifies both short-term and long-term passenger rail service in Iowa along with an implementation strategy.

By 2012, the Iowa Department of Transportation and other interested parties and agencies will:

- Support implementation of regional rail service from Chicago to Dubuque and Chicago to the Quad Cities and on to Iowa City/Cedar Rapids and Des Moines by 2012.
- Work with local governments through the planning process to link passenger rail service with other modes of transportation including public transit, intercity bus service, bicycle, pedestrian, and aviation.
- Support implementation of other regional service including service extending from Des Moines to Omaha as deemed feasible and consistent with the passenger rail plan.

By 2015, the Iowa Department of Transportation and other interested parties and agencies will:

- Support implementation of other regional service including service extending from Des Moines to Omaha as deemed feasible and consistent with the passenger rail plan.

By 2030, the Iowa Department of Transportation, in coordination with other interested parties, will:

- Support full implementation of passenger rail service as envisioned in the passenger rail plan and connect all metropolitan areas of the state by 2030.

- This will be higher speed service that results in significant ridership.

Parties Involved: Iowa Department of Transportation, Passenger Rail Advisory Committee (yet to be created), Iowa Legislature, Amtrak, Midwest Interstate Passenger Rail Commission, Illinois Department of Transportation, local governments, and regional/metropolitan planning organizations, Iowa Department of Economic Development, Iowa League of Cities, Iowa Chamber Alliance, railroads, Congressional delegation and environmental organizations.

Implementation Mechanisms

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	0.001	0.001	$MMtCO_2e$
Net Present Value (2008-2020)	$0.14	-$0.11	$ Million
Cumulative Reductions (2008-2020)	0.001	0.012	$MMtCO_2e$
Cost-Effectiveness	$100	-$85	$/MtCO_2e$

- **Data Sources:**

Feasibility Report on Proposed Amtrak Service Chicago-Rockford-Galena-Dubuque

Feasibility Report on Proposed Amtrak Service Quad Cities-Chicago

- **Quantification Methods:**

Potential GHG reductions are calculated from reductions in modal shift from auto inter-city rail due to the installation of two new inter-city passenger rail services: Chicago- Quad Cities service and Chicago – Dubuque service. Rail ridership generated is considered to be shifted from personal vehicles. Increase in ridership after the initial feasibility results is assumed to be growing at the same rate as population increase. Annual costs were calculated by subtracting the annual revenue from operating expenses and by annualizing capital expenses over a 20-year period for rolling stock and 30-year period for infrastructure. Auto costs were calculated on a $0.505 per mile average mileage cost based on current IRS reimbursement guidance adjusted for improving fuel economy, and used an average auto occupancy of 1.78 (NHTS 2001). Locomotive emissions were calculated based on 772 passenger-miles/gallon.

- **Key Assumptions:**

Key Uncertainties

Funding availability for the provision of additional passenger rail service is a significant uncertainty.

Additional Benefits and Costs

Passenger rail service provides additional benefits and cost impacts, including mobility benefits.

Feasibility Issues

Additional passenger rail service is still in the study and planning phase and as a result it is expected that additional feasibility issues will be assessed as planning proceeds.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-5 Adopt Best Workplaces for Commuters in Iowa

Policy Description:

According to the 2001 National Household Travel Survey, 27 percent of total vehicle miles traveled (VMT) are to and from work, equivalent to 734 billion miles nationally. Assuming that same percentage applies to Iowa, over 8.5 billion miles of travel in 2006 was from Iowans going to and from work. Of those trips, 78 percent are done by single occupant vehicles (2000 census).

Many actions can be taken to reduce single occupant vehicle commuting. These include increasing the number of employees that telework, carpool, vanpool, ride transit, ride bicycles, and walk. In May, 2001, a new government-industry partnership was created and sponsored by the United States Environmental Protection Agency and the United States Department of Transportation titled, **Best Workplaces for Commuters**. This program recognizes employers and districts (e.g. downtown districts, malls, business parks) that subsidize employee transit/vanpool use, implement telework programs, and/or other activities that reduce traffic and air pollution. Benefits of designation include public recognition, training, access to web-based tools, one-on-one technical assistance, and networking opportunities. A 2005 survey of program participants found that programs that included a comprehensive benefits package (i.e. guaranteed ride home, on-site services, financial incentives, etc.) resulted in a 15 percent reduction of trips, pollutants, and fuel consumption. More information is available at www.bestworkplaces.org.

The state of Iowa and interested organizations should take action to reduce single-occupant vehicle commuting by encouraging and incentivizing participation in activities such as Best Workplaces for Commuters.

Policy Design:

Goal levels: Major employers and districts in all nine of Iowa's metropolitan areas will be designated as 'Best Workplaces for Commuters.'

Timing:
By 2012, the state of Iowa and other interested parties will:

- Educate, inform and market to employers and communities in Iowa's metropolitan areas regarding the Best Workplaces for Commuters program.
- Identify existing funding programs and make funding available to assist employers and commuters to take actions that will assist qualifying for designation (i.e. funding for van pools, subsidization of transit fees, etc.)

- Identify and implement public incentives (e.g. tax credits, deductions, etc.) to support actions that will assist qualifying for designation (i.e. funding for van pools, subsidization of transit fees, etc.)
- Evaluate opportunities to expand the goal level beyond Iowa's metropolitan areas into smaller communities and rural areas.

Parties Involved: Local governments, state agencies, environmental organizations, United States Environmental Protection Agency, United States Department of Transportation, metropolitan planning organizations, local governments, chambers, Iowa Chamber Alliance, Iowa League of Cities, transit providers, Transportation Management Associations, major employers, downtown development groups, etc.

Implementation Mechanisms

Enact legislation to require, if feasible, all employers in the counties listed in the quantification methods section to offer commuter benefits programs if they have over 100 employees at an individual work site and normally begin office hours between 6:00 and 9:00 am. Compliance with this requirement could be coordinated through the Iowa Department of Transportation or other agency as appropriate. Information, training and outreach should be provided to major employers to assist in the development of commute benefits programs.

Related Policies/Programs in place:

Vanpooling and ridesharing programs are offered in various locations throughout the state, such as through DART rideshare.

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	0.023	0.024	$MMtCO_2e$
Net Present Value (2008-2050)	$1.96	$17.9	$ Million
Cumulative Reductions (2008-2050)	0.023	.214	$MMtCO_2e$
Cost-Effectiveness	$84	$84	$/MtCO_2e$

- **Data Sources:**
  - National Household Transportation Survey data (trip length to work) for Des Moines area
  - Iowa County Business Patterns 2004
  - Worksite Trip Reduction Model and Manual
  - Iowa Population Forecast to 2030

- Iowa GHG Inventory and Projections
- Best Workplaces for Commuters Program and Benefits Calculator

- **Quantification Methods:**

Estimated number of effected employees by tabulating number of employers with more than 100 employees in the following counties:

Benton County
Black Hawk County
Bremer County
Dallas County
Dubuque County
Grundy County
Guthrie County
Harrison County
Johnson County
Jones County
Linn County
Madison County
Mills County
Polk County
Pottawattamie County
Scott County
Story County
Warren County
Washington County
Woodbury County

From Iowa County Business Patterns 2004 include employers from the following business sectors (as these are more likely to begin work day between 6 and 9 AM):

22 Utilities
31-33 Manufacturing
42 Wholesale Trade
51 Information
52 Finance and Insurance
53 Real Estate and Rental and Leasing
54 Professional, Scientific, and Technical Services
55 Management of Companies and Enterprises
56 Administrative and Support and Waste Management and Remediation Services
61 Educational Services

It was assumed that the best workplaces for commuters programs are put in place with employers with 100 more employees (represents about 235,000 employees statewide, in 17 counties – note that 3 of the original 20 counties included in analysis had no qualifying employers). Using data from the Worksite Trip Reduction Model and Manual, it was estimated that commute trip programs would reduce vehicle work trips by about 5% for effected employers. Based on

Subcommittee feedback, these estimates were adjusted to an assumed reduction in work trip VMT by 2% in Polk, Dallas, and Warren Counties, and by 5% in the other counties.

For 2004/2005 total annual VMT reduced by these programs was about 45 million miles (off of a total VMT baseline of about 31,570 million miles. From 2004/2005, the forecast of effected employees was increased at the same rate as population. These mile reductions were reduced from all light duty vehicle miles reduced from the Iowa GHG Inventory and Projections, and emissions reductions were calculated based on the Iowa GHG Inventory and Projections.

- **Key Assumptions:**

Assumes the programs are in place beginning in 2012. Assumes these programs are put in place with employers with 100 more employees (represents about 235,000 employees statewide, 671 employers, in 17 counties) by 2012. Assumes programs reduce employee trip to/from work VMT by 2% in Polk, Dallas, and Warren Counties, and by 5% in the other counties. Assumes the number of effected employees increases at the same rate as population is forecast to increase. Assumes 240 commute days per year at an average one-way commute distance of 10.7 miles. Assumes annual program administration cost of $2,600 per employer, plus commute benefits of $30 per month per employee who commutes to work using an alternative mode, based on Best Workplaces Per Commuters site. Benefits to employers include reduced parking costs. The analysis did not consider any foregone state and federal tax revenue.

Key Uncertainties

None noted

Additional Benefits and Costs

None noted

Feasibility Issues

None noted

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-6 Light Duty Vehicle Fuel Efficiency Incentives

Policy Description:

Iowa can reduce its greenhouse gas emissions by improving the fuel economy of the light duty vehicle fleet. The first policy option is to charge a state agency with tracking the fuel economy of Iowa's entire fleet. Once a baseline for Iowa's fuel economy is established, the state could then establish goals for improving the fuel economy of the entire fleet. For example, if the current fuel economy is 20 miles per gallon (mpg), goals of 21 mpg by 2012 and 25 mpg by 2020 could be adopted. All other things being equal, increasing fuel economy from 20 mpg to 25 mpg would reduce fuel consumption and greenhouse gases by 20 percent. Further reductions beyond 2020 are also likely. Iowa could establish a goal of 40 to 200 mpg by 2050, reflecting the climate council's goals of reducing emissions by 50 to 90 percent.

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

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

- *Feebates* – This is a study option rather than an implementation option. The state would participate in a multi-state study of the feasibility and effectiveness of a regional feebate system with other western states.
- *Tax Credits for Low-GHG Vehicles* – Amend the current income tax credit program for hybrid, alternative fuel, and low-emission vehicles so that it continues in its present form beyond 2010.
- *Operating Incentives for Low-GHG Vehicles* – Provide for preferential state-controlled (eg state highways) and local-government controlled (eg, parking) infrastructure and access for alternative fuel vehicles (E10, E85, natural gas, propane, 100% electric, others).

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

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

Policy Design:

Goal levels/Timing: Improve fuel economy of the light duty vehicle fleet in the State of Iowa by 20% by 2012, 100% by 2020, and 250% or more by 2050. Implementation to start on January 1, 2010.

Parties Involved: Iowa Department of Transportation, Iowa Department of Revenue, County Treasurers, Iowa Automobile Dealers Association, and Iowa Independent Automobile Dealers Association.

Implementation Mechanisms

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

Related Policies/Programs in place:

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

Some European countries have implemented feebate programs, and other US states are considering both the rebate portion and the 'gas guzzler tax' elements of feebate types programs. In 2007, Canada introduced the "Vehicle Efficiency Incentive (VEI) program, which took effect in March 2007. The program includes both a rebate and a tax component.

Estimated GHG Savings and Cost Per Ton:

Estimated GHG emissions reductions are quantified as part of the TLU -8 Analysis

Data Sources:

CCS conducted a review of the most relevant research and analysis on feebate proposals.

CCS made three findings:

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

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

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

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

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

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

- **Quantification Methods: TBD**
- **Key Assumptions:**

Key Uncertainties

Consumer reaction to incentive programs varies.

Additional Benefits and Costs

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

Feasibility Issues

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

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-7.1 Fuel Efficient Replacement Tires Program

Policy Description:

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

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

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

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

Policy Design:

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

Goal Levels: Establish voluntary energy efficiency standards that achieve an average 4% gain in fuel economy.

Timing: By January 1st, 2010 the state or appropriate agency would initiate a fuel efficient tire replacement program for the state fleet if all season/all weather tires are available and are incorporated into legislatively approved rental rates, establish voluntary energy efficiency standards for replacement tires, and develop a marketing program for fuel efficient replacement tires.

By January 1st, 2012 the state or appropriate agency would ensure that a proportion of tires replaced on state-owned and -leased vehicles will be LRR tires (if they are available for the vehicle type and are rated for all season/all weather service) and would consider legislation or administrative regulation to set LRR standards for tires with mandatory manufacture labeling.

By January 1st, 2015 the state or appropriate agency would ensure that 50% of all tires sold to consumers in the state of Iowa will be LRR tires. This percent of market penetration would increase to 100% of all tires sold to consumers in the state of Iowa will be LRR tires.

Parties Involved: Iowa Department of Transportation, Iowa Department of Natural Resources, Iowa Energy Center, LRR manufacturers, tire distributors.

Implementation Mechanisms

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

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

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

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

Promotion and Marketing:

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

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

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

Encourage Procurement of LRR Tires:

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

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

University Research: Encourage the Iowa university system to conduct research on alternative non-combustible applications for used tires.

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

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

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

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

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

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

Reporting: The state will develop a system for tracking purposes so that the state can eventually determine the turnover to LRR tires and the benefits achieved from the conversion. A simple

tracking system would be established relatively easily by contacting the primary tire distributors of the major Iowa cities on an annual basis and estimates can be gathered from their inventories.

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

Related Policies/Programs in place:

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

Although the climate in California is significantly more moderate than Iowa, "All Season/All Weather" LRR Tires may be made available. Michelin tire manufacturers are currently researching and developing "all-weather tires."

Estimated GHG Savings and Cost Per Ton:

Assuming 20% market penetration by 2012 to achieve the goal of 50% market penetration by 2015 with an increase to 100% at Year 2020, achieving an average 4% improvement in fuel economy:

	2012	2020	Units
GHG Emission Savings	0.11472	0.648	$MMtCO_2e$
Net Present Value (2008-2020)	TBD	TBD	$ Million
Cumulative Reductions (2008-2020)	0.1712	3.4072	$MMtCO_2e$
Cost-Effectiveness	-$90	-$90	$/MtCO_2e$

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

- **Data Sources:**
  - Tires and Passenger Vehicle Fuel Economy, Transportation Research Board/National Research Council, 2006.
  - California State Fuel-Efficient Tire Report, California Energy Commission, January 2003.

- **Quantification Methods:**

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

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

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

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

- **Key Assumptions:**

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

Key Uncertainties

The low rolling resistance fuel efficient tires program is based upon existing off-the-shelf technologies and products that already exist in the consumer marketplace. These tires are already available in the marketplace, and are comparable with the tires included as original equipment on newly purchase light-duty vehicles.

Additional Benefits and Costs

None noted

Feasibility Issues

None noted

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-7.2 Consumer Information on Vehicle Miles Per Gallon (MPG)

Policy Description:

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

Policy Design:

This policy is designed to impact consumer choice and behavior.

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

Timing: Program would begin in 2010, with program expansion as resources are made available.

Parties Involved: Iowa Department of Transportation, product manufacturers, product distributors, Iowa Automobile Dealers Association, Iowa Independent Automobile Dealers Association, independent repair shops, Iowa Energy Center.

Implementation Mechanisms

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

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

Key Uncertainties

None noted

Additional Benefits and Costs

None noted

Feasibility Issues

None noted

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-8 New Vehicle Standards for Increased Fuel Economy and Reduced Greenhouse Gas Emissions

Policy Description:

Iowa can reduce its greenhouse gas emissions by improving the fuel economy of the light duty vehicle (LDV) fleet. The first policy option is to charge a state agency with tracking the fuel economy of Iowa's entire fleet. Once a baseline for Iowa's fuel economy is established, the state could then establish goals for improving the fuel economy of the entire fleet. For example, if the current fuel economy is 20 miles per gallon (mpg), goals of 21 mpg by 2012 and 25 mpg by 2020 could be adopted. All other things equal, increasing fuel economy from 20 mpg to 25 mpg would reduce fuel consumption and greenhouse gases by 20 percent. Further reductions beyond 2020 are also likely. Iowa could establish a goal of 40 to 200 mpg by 2050, reflecting the Iowa Climate Change Advisory Council's overall goals of reducing GHG emissions by 50 to 90 percent by 2050.

A key policy option to achieve improved fuel economy would be adopting California's car standards, as recommended by the Office of Energy Independence. This option is problematic because, at present, the U.S. Environmental Protection Agency (USEPA) has not approved the waiver required for the adoption of California's car standards. In addition, a policy limited to new vehicles would not affect the fuel economy of existing vehicles, potentially leading to a "jalopy effect" whereby owners retain their existing and less efficient vehicles for longer periods of time. In addition, state level adoption of car standards that differ from those in other states in our region would create an uneven vehicle market and would likely create barriers to dealer trades within that market.

Iowa would adopt the State Clean Car Program in order to reduce GHG emissions from new light-duty vehicles, with an expectation that the most significant greenhouse gas emissions reductions beyond the new federal CAFÉ standards would come from the "Tier 2" state clean car standards expected to be proposed in the near future.

Under the current federal law, states have the option of choosing between the federal standard for air pollution emissions and the state standard. This policy assumed the standards, which must still be approved by USEPA, would take effect in Iowa beginning with Model Year 2012 (calendar year 2011). Other Clean Car Program elements can include standards requiring reductions in smog- and soot-forming pollutants, and promoting introduction of very low-emitting technologies into new vehicles.

New cars and light trucks in all states must comply with Federal emission standards, and, generally speaking, states have the choice of adopting a stronger set of standards applicable in

California. In 2005, California finalized a set of GHG standards for new light duty vehicles, phased in from 2009 to 2016. More than a dozen states already have adopted or stated an intention to adopt the Clean Car Program standards, including Arizona, California, Connecticut, Maine, Massachusetts, Montana, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Utah, Vermont and Washington.

In December 2006, Japan revised its fuel economy targets upwards to improve the fleet average fuel economy of new passenger vehicles from 13.6 km/L to 16.8 km/L in 2015, and increase of 24 percent. ICCT estimates that this standard is equivalent to an average of 125 g/km for CO2 emissions. In a 2007 review, the European Union announced an EU objective of 120 g CO2/km by 2012 to be met through an integrated approach, and is estimated to result in fleet emissions of 130 g/km in 2012. China's standards took effect as Phase I in July 2005, increasing fuel efficiency from 26 in 2002 to 28.4 in 2006. Phase II is due to take effect in January 2008 and January 2009. Starting in 2006, the South Korean standards for mandatory fuel economy are 34.4 mpg for vehicles with engine displacements under 1,500 cubic centimeters and 26.6 mpg for vehicles with over 1,500 cubic centimeter engines.

Policy Design:

Goal levels/ Timing: Improve fuel economy by 20% by 2012, 100% by 2020, and 250% or more by 2050. Implementation to start in model year 2012 (calendar year 2011), with an 8 year phase in period. Go beyond the current federal emissions standards for cars and light trucks within the parameters of the next tier of the federal and state standards that can be considered within the planning horizon Under the federal Clean Air Act, states can choose between the federal standard or go with the more stringent state standards, provided that the necessary waiver has been granted by the USEPA. For further consideration of state standards, the state of Iowa would undertake a public involvement and consideration process before or during legislative or regulatory process for transparency, and for consideration of the range of potential impacts.

Timing: To meet federal compliance, a rule writing process would take place by the appropriate agencies so that Iowa can implement the California standards. Regulatory program could begin with calendar year 2011, vehicle model year 2012.

Parties Involved: Applies to model year 2012 new cars and light trucks. The law would directly affect automobile manufacturers, car dealers, and consumers. Iowa Department of Transportation, Iowa Department of Revenue, County Treasurers, Iowa Automobile Dealers Association, and Iowa Independent Automobile Dealers Association.

Other: The state clean car standards currently are being litigated. The timing may be affected by the date of enactment of legislation, likely litigation, and the regulatory process.

Implementation Mechanisms

- The first step is to charge a state agency with tracking the fuel economy of Iowa's entire fleet. Once a baseline for Iowa's fuel economy is established, the state could then establish goals for improving the fuel economy of the entire fleet.

- The second step would be to initiate a state rule-making process beginning with vehicle model year 2012. As an alternative to a state rule-making process, the state would support raising the federal CAFÉ standards to provide for the equivalent level of GHG reductions.

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	TBD	TBD	$MMtCO_2e$
Net Present Value (2008-2050)	TBD	TBD	$ Million
Cumulative Reductions (2008-2050)	TBD	TBD	$MMtCO_2e$
Cost-Effectiveness	TBD	TBD	$/MtCO_2e$

- **Data Sources:**
    - CCS, Draft Iowa Greenhouse Gas Inventory and Reference Case Projections
    - Diane Brown and Elizabeth Ridlington, Cars and Global Warming: Policy Options to Reduce Arizona's Global Warming Pollution from Cars and Light Trucks, AZ PIRG Education Fund: February 2006, http://www.arizonapirg.org/AZ.asp?id2=22371.
    - Elizabeth Ridlington, Tony Dutzik, and Christopher Phelps, Cars and Global Warming: Policy Options to Reduce Connecticut's Global Warming Pollution from Cars and Light Trucks, Spring 2005.
    - Feng An, Deborah Gordon, Hui He, Drew Kodjack, and Daniel Rutherford, The International Council on Clean Transportation, "Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update" (July 2007)

- **Quantification Methods:**

  • The California Air Resources Board (CARB), the Public Interest Research Groups (PIRGs), and a coalition of New England States have all calculated the impact of the first tier of the state clean car standards on GHG emissions. CCS reviewed and compared results of these

analyses of clean car programs, and found all three modeling efforts to be reasonable and valid. The PIRG model has been applied in Connecticut, Arizona, and New Mexico. The model estimated a 13.7% reduction in GHG emissions from passenger vehicles by 2020 in Arizona and a 12% reduction in Connecticut. Both CARB and the New England states estimated higher reductions, in the range of 18-19%. The primary sources of variation in these modeling efforts are: (1) the mileage accumulation rates of VMT by passenger vehicle type, and (2) the fleet turnover rate.

• The analysis for estimation of GHG emissions reductions from vehicle standards assumes that the effects of the Clean Car Program in Iowa will mainly determined by the level of the "Tier 2" of the state clean car standards or the level of the next increase in the federal CAFÉ standards.

- **Key Assumptions:**

  The prior modeling efforts have established a valid and reasonable method of projecting GHG emissions reductions from state clean car policies. 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 PIRG model and the more optimistic scenario projected by the California and the New England models.

  In addition, some recent analysis by the California Air Resources Board shows that while the Tier 1 level of state clean car standards and the recently enacted new CAFÉ standards (from the federal Energy Act of 2007) both result in new car standards at an estimated 35 MPG, the state clean car standards are expected to reach that goal sooner in time, which would result in greater GHG emissions reductions during the period of analysis. In addition, the CARB analysis shows that a significant level of additional GHG emissions reductions are possible, through the Tier 2 iteration of the state Clean Car Standards planned for the near future.

Key Uncertainties

The net emissions impact of this policy depends on fleet turnover rates for light duty vehicles and future patterns of consumer purchase choices between passenger cars and light duty trucks. The timing of these policies also depends upon the decisions within the analysis period of both the federal courts and the United States Congress.

Additional Benefits and Costs

GHG emissions reductions from new vehicle standards are also expected to reduce the level of demand for imported oil and oil products, including refined gasoline.

Feasibility Issues

The off-the-shelf technologies for increased fuel economy are currently being offered in the marketplace by some manufacturers. Further advances in LDV fuel economy are expected to become commercially available in the time period analyzed.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-9 Freight Strategies (Truck and Rail)

Policy Description:

The movement of freight on Iowa's transportation system plays a critical role in our economy. Iowa also serves as a crossroad for the movement of freight across the country. In fact, it is estimated that 43 percent of all freight movement in Iowa is just passing through the state. There has been tremendous growth in freight traffic with truck traffic having grown over 50 percent in the last 15 years and expected to grow another 50 percent by 2020. National freight forecasts estimate an 89 percent increase in tons of freight by 2035 (AASHTO – Transportation Invest in our Future, America's Freight Challenge, May 2007). To meet this increased demand while minimizing greenhouse gas emissions (GHG) will require many actions. This policy option focuses on infrastructure activities to support a greater increase in freight hauled on rail while considering federal EPA emissions reduction changes that are currently being implemented with over-the-road diesel truck engines.

The use of rail to haul freight is more efficient from an energy consumption and GHG emission perspective. According to EPA data, freight railroads account for just under two percent of U.S. GHG emissions from transportation sources. The American Association of Railroads (AAR) estimates that for every ton-mile of freight moved by rail instead of truck, two-thirds less GHG emissions are emitted. AAR also estimates that if 10 percent of long-haul freight now moving by truck moved by rail instead, annual GHG emissions would fall by more than 12 million tons.

The Iowa Department of Transportation (DOT) and all other involved parties will assure the most efficient movement of freight while reducing GHG emissions. This also has the effect of delaying large investment needs to add capacity to the state highway system. With such large growth in freight forecast it is unlikely that freight movements by truck could ever be reduced but shifting more of the growth to rail would minimize the growth of GHG emissions. This effort will require activities within Iowa, within the Midwest and nationally.

Policy Design:

Goal levels: Reduce overall greenhouse gas emissions generated by freight movement through a combination of the following actions:

Timing:

By 2010, the Iowa Department of Transportation and other interested parties, will:

- Through regional, statewide and national planning activities, seek to remove bottlenecks (both physical and operational) for the efficient movement of freight by all modes of transportation.
- Establish a Statewide Freight Advisory Committee of public and private parties to identify actions to support the efficient movement of freight and opportunities for intermodal freight movement.
- Support initiatives to encourage railroad capital investment to increase capacity (e.g. tax credits).
- Assist the identification of opportunities for increased intermodal freight movements (e.g. the development of the ethanol terminal in Manly, IA where ethanol is brought in by truck from multiple plants and shipped by rail).
- Seek continued and increased legislative appropriations for the Rail Revolving Loan and Grant Program. This funding supports rail improvements including the construction of rail spurs to industry to encourage use of rail.
- Continue to utilize federal Congestion Mitigation and Air Quality (CMAQ) funding to support rail freight improvements.
- Seek opportunities to support truck stop electrification including the utilization of federal Congestion Mitigation and Air Quality (CMAQ) funding. This could also include incentives (e.g. tax credits) to encourage installation of equipment.
- Provide incentives to trucking firms and truck owners to equip their vehicle(s) with devices that eliminate the need to idle including battery-electric auxiliary power systems, vehicle battery systems, thermal energy storage systems, fueled auxiliary power systems, etc.
- Provide incentives to trucking firms and truck owners including local and state municipalities to invest in hybrid truck technology as it becomes available in class 7 and 8 trucks over the next three years and beyond.

Parties Involved: Iowa Department of Transportation, local governments, Iowa Legislature, regional/metropolitan planning organizations, Iowa Department of Economic Development, Iowa's Motor Truck Association, railroads, shippers, developers, U.S. Department of Transportation, and other state DOTs.

Implementation Mechanisms

Related Policies/Programs in place:

Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	0.39	0.63	$MMtCO_2e$
Net Present Value (2008-2050)	-$11	$30	$ Million
Cumulative Reductions (2008-2050)	1.6	5.9	$MMtCO_2e$
Cost-Effectiveness	-$29	$48	$/MtCO_2e$

- **Data Sources:**
    - Federal Highway Statistics 2006
    - Iowa DOT
    - US EPA SmartWay Partnership
    - American Association of Railroad's *National Rail Freight Infrastructure Capacity and Investment Study*
    - AASHTO *Freight Demand and Logistics Bottom Line Report*

- **Quantification Methods:**

Estimate the reduction in CO2 emissions from reduced idling based on estimating the portion of emissions and fuel consumption in the Iowa inventory that is attributable to Class 8 diesel trucks traveling on long-haul trips, estimate the portion of the total fuel consumption that would be consumed during idling, and apply a targeted reduction of 80 percent to this amount starting in 2008 and a reduction of 90 percent starting in 2015.

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

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 a 80 (by 2010) or 100 (by 2020) percent reduction of diesel idling from these Class 8 trucks will be achieved. The cost analysis will assume a 5-year lifetime for idling technology equipment, applied to 80 percent of Class 8 vehicles starting in 2008 and 90 percent of Class 8 vehicles starting in 2015, at a cost of $6,000 per vehicle and a $4.80 per gallon diesel cost. Program administration costs, enforcement costs, and fines have not been factored into the cost analysis. Reduced vehicle maintenance costs have not been factored into the analysis. Track improvements and intermodal terminal expansion will occur over 10 years beginning in 2009.

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

TLU-10.2 Fuel Strategies

Policy Description:

Increased use of renewable fuels typically results in lower GHG emissions when compared to the petroleum-based alternatives. Iowa's long standing 10% ethanol blended fuel has displaced billions of gallons of gasoline over the course of its use in Iowa. Iowa currently leads the nation in ethanol and biodiesel production and maintains incentives that support renewable fuels. Currently, over 70% of all gasoline sold in Iowa is a 10% ethanol blend.

In December 2007, President Bush signed the Energy Independence and Security Act of 2007 creating a Federal Renewable Fuel Standard (RFS). The Federal RFS mandates that by the year 2022, 36 billion gallons of renewable fuels will be used in the United States (current use is estimated at 7.5 billion gallons). The standard is laid out to not only increase the production and use of renewable fuels, but also to reduce GHG emissions. The standard specifies a 50% reduction in GHG emissions from biomass-based diesel and advanced biofuels; a 20% reduction in GHG emissions from renewable fuels; and a 60% reduction in GHG emissions from cellulosic biofuel as compared to the GHG emissions created by burning traditional fossil fuels. The recent implementation of the United States Environmental Protection Agency's (USEPA's) Renewable Fuel Standard will help create additional demand for Iowa's renewable fuels across the country. State renewable fuel exports will continue to grow as other states begin formalizing their own state standards for renewable fuels and GHG controls. The state of Iowa has also implemented an incentive program that provides tax credits to retail dealers that increases with increasing volume of biofuels sold.

The Midwest Governor's Association (MGA) Goals

The MGA has developed dual goals for biobased products and transportation within the Midwest region:

(1) Reduce the region's dependence upon fossil fuel for transportation purposes, and

(2) Increase utilization of regionally produced biofuels and other low-carbon advanced transportation fuels for all transportation energy consumed in the region. Iowa should support and exceed the progress made through the MGA.

Iowa Objectives

In addition to supporting implementation of the MGA platform for biofuels, Iowa should design and implement programs to increase demand for biofuels and the infrastructure to support the increased demand, and to foster development of biofuels with lower carbon footprints and greater sustainability.

Policy Design:

The following policy options can help Iowa meet these broad biofuels objectives:

1. Market Pull and Distribution Infrastructure
   - Promote Broad Renewable Fuels Standards
   - Include specific carve-outs for lower-carbon advanced biofuels
   - Create incentives to increase demand for fuel-efficient lower-carbon vehicles
   - Expand state government's use of biofuels and advanced transportation fuels
   - Develop regional quality standards for biodiesel and other fuels
   - Adopt retail tax incentives to encourage retailers to sell biofuels, advanced transportation fuels and biobased products

2. Advance Conversion Technology Commercialization
   - Mitigate risk in developing next-generation technologies

3. Broaden Existing Bioenergy Incentives and Create New Incentives Promoting Biomass
   - Including different liquid fuels, natural gas, heat, and electricity

4. Develop Next-Generation Regulation for New Technologies
   - Provide regulatory exemptions to allow experimentation

5. Provide Technical Assistance to Advanced Technology Projects
   - Fund front-end engineering and design studies and other feasibility studies

6. Increase Regional Research Collaboration
   - Coordinate state and private research to develop an information clearinghouse on advanced bioenergy research and demonstration projects
   - Promote regional commercial-scale demonstrations of various biomass feedstocks

7. Develop the Midwestern Infrastructure for the Manufacture of Biobased Products
   - Support research for determining how the biomaterials supply chain can mature and how new products can achieve economic viability

8. Develop Midwestern Biobased Products
   - Adopt biobased product procurement rules at the state level
   - Participate in regional biobased product procurement program
   - Create a regional certification program

9. Overcome the Difficulty of Biomass Feedstock Logistics
   - Employ technical assistance and incentives to projects that are seeking to develop a supply of cellulosic biomass for bioenergy projects

10. Create a Uniform, Regional Low-Carbon Fuels Policy
    - Implement at the state level as a standard
    - Report annually on progress
    - Convene affected stakeholders to develop the common policy

11. Develop Incentives to Increase Fuel Efficiency and Reduce Greenhouse Gas Emissions

- Incent consumer purchase of efficient biofueled vehicles
- Incent biofuels producers to improve efficiency and reduce greenhouse gas emissions
- Seek development of co-located industries that share products and by-products to improve economic efficiency and lower GHG emissions

12. Create Local Wealth
    - Ensure that the benefits of biofuels, advanced transportation fuels, and biobased product development accrue to public and private entities in the communities where they are produced
    - Give bonding authority or access to bonding funds to co-ops, municipal utilities, and other local and community-owned entities to fund biomass projects
    - Wherever possible, make the opportunity available for local ownership in projects receiving public investments

13. Promote a Perennial Biomass Supply
    - Support the development of a perennial biomass supply
    - Encourage landowners to grow perennial crops and supply products to a bioenergy plant in a way that targets improvements in soil/water quality, wildlife habitat, soil erosion, and carbon sequestration

14. Create Collaborative Workforce Development Programs
    - Collaborate between industry, governments, and educational institutions to develop curriculum at all levels of the educational system on biofuels, advanced transportation fuels, and biobased products

Implementation Mechanisms

Related Policies/Programs in place:

Federal Renewable Fuels Standards, Iowa Biofuels Incentives, Iowa Power Fund, Renewable Fuels Infrastructure Board

Estimated GHG Savings and Cost Per Ton:

Key Uncertainties

Additional Benefits and Costs

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TLU-10.3b Low Carbon Fuel Standard (Scenario 2 – 20% Reduction)

Policy Description:

This option seeks to reduce GHG emissions by decreasing the carbon intensity of vehicle fuels sold in Iowa. The Low Carbon Fuel Standard (LCFS) would require all fuel providers in Iowa to ensure the mix of fuel they sell into the Iowa market meets, on average, a declining standard for GHG emissions measured in CO2 equivalent per unit of fuel energy. The State should regulate quality standards for low carbon fuels. Low carbon fuels include, but are not limited to, biodiesel, cellulosic ethanol, hydrogen, compressed natural gas, liquefied petroleum gas, electricity, and low carbon blends such as E10 or E85. The standard would be measured on a lifecycle basis in order to include all emissions from fuel production to consumption.

Fuel providers (defined as refiners, importers, and blenders of on-road vehicle fuels) will need to demonstrate on an annual basis that their fuel mixtures provided to the market met the low carbon standard. Options for compliance may include: blending or selling increasing amounts of lower carbon fuels, using previously banked credits, and purchasing credits from fuel providers who earned credits by exceeding the standard. Penalties for noncompliance will be determined during the implementation process.

Policy Design:

Goal levels: Create a Low Carbon Fuel Standard for transportation fuels (gasoline and diesel) sold in Iowa that would reduce carbon intensity of Iowa's on-road vehicle fuels by at least 20 percent by 2020. In addition to the reduction standard and program timing, the following issues should be addressed in creating the program:

- Credit Generation and Trading
- Lifecycle Model and Boundary Conditions

Timing: Following design period, program would be implemented prior to 2020. Fuel providers would be required to meet the 20% reduction standard no later than 2020. If interim targets for reduction in carbon intensity are established, they will reflect the likely importance of cellulosic ethanol to meeting the standard and the likelihood that cellulosic ethanol will not be available in large commercially quantities until 2015 or later.

Parties Involved: Fuel providers, Iowa Department of Economic Development, Iowa Department of Environment and Natural Resources.

Compliance Pathways: The Low Carbon Fuel Standard does not specify any particular fuel or vehicle technology. The table below shows three possible compliance scenarios that would meet the standard for gasoline in California. As envisioned in California, much of the reduction in passenger vehicle fuel carbon intensity would be met by increasing ethanol use.

Low Carbon Fuel Standard Compliance Scenarios for California

Scenario Number-->	**1**	**2**	**3**
Total Petroleum Displaced by Low-Carbon Fuels (B gal)	3	3.1	3.2
Low-Carbon Fuels			
Total Ethanol Demand (B gal)	2.7	3.8	4.7
Number of Flex Fuel Vehicles (millions)	3	6	8.5
Number of Plug-in Hybrids (millions)	4.1	1.7	0
Number of Hydrogen Fuel Cell Vehicles (millions)	0.5	0.5	0.2

Source: Office of the Governor (State of California), "The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting Our Economy." White Paper. January 8, 2007.

http://gov.ca.gov/index.php?/fact-sheet/5155/

The table below shows lifecycle ("well-to-wheels") GHG impacts of various biofuels options.

Estimated Biofuel Impacts on GHG Emissions

Fuel/Technology	**Blend**	**Feedstock**	**Reduction (grams of GHGs per mile)***
Ethanol	E10	corn	1.5%
Ethanol	E10	cellulosic	7.2%
Ethanol	E85	corn	17.6%
Ethanol	E85	cellulosic	83.2%
Biodiesel	B20	soy	9.9%
Biodiesel	B20	canola	11.2%
Biodiesel	B20	palm	12.0%
Biodiesel	B100	soy	53.9%

* Ethanol reductions estimated relative to gasoline; biodiesel reductions estimated relative to diesel fuel. Actual reductions depend on many factors in the production, distribution, and use of fuels.
Sources: GREET v1.7 outputs; (S&T)2 Consultants, *Sensitivity Analysis of GHG Emissions From Biofuels in Canada*, 2006.

Implementation Mechanisms

A Governor's Executive Order would initiate the process for development of the LCFS, followed by a detailed report and rule-making proceedings that would involve consultation before implementation. The appropriate state agencies will undertake a study to develop the framework for the LCFS. Once the study is completed, it would be introduced to the State's legislative

proceedings, at which point the appropriate state agency will conduct public hearings on the proposal. Once adopted, an appropriate state agency will initiate a rule-making proceeding, establishing and implementing the LCFS.

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

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

Related Policies/Programs in place:

Renewable Fuels Standards (U.S. and Iowa)
Iowa's state renewable fuel standard is the most progressive standard in the country. The standard will be implemented beginning in the calendar year 2009 with incentives eligible in 2010. The Iowa standard, in cooperation with the Federal RFS, guides production and sets goals for renewable fuel use over a span of 14 years.

Goal levels:
-25% biofuel sales in Iowa by 2019.
-36 billion gallons produced in the U.S. by 2022
-50% reduction in GHG emissions from biomass-based diesel and advanced biofuels
-20% reduction in GHG emissions from renewable fuels
-60% reduction in GHG emissions from cellulosic biofuels
(Goals defined in Iowa RFS and the 2007 Energy Independence and Security Act)

Timing: Achieve by 2022 under the Federal RFS and 2019 under Iowa RFS

Parties Involved: Federal Government, State Government, Producers, Marketers, Blenders, Consumers, and Refiners.

Infrastructure
For the past three years, Iowa has been building its renewable fuel infrastructure for retail sites as well as points of bulk distribution.

The Renewable Fuels Infrastructure Board (RFIB) oversees the funding of biodiesel bulk facilities to create an extensive distribution network for biodiesel. The RFIB also funds retail

locations that require new equipment for E85 due to incompatibility issues with existing equipment (moving from a hydrocarbon based fuel to an alcohol based fuel). This program is administered by the Iowa Department of Economic Development.

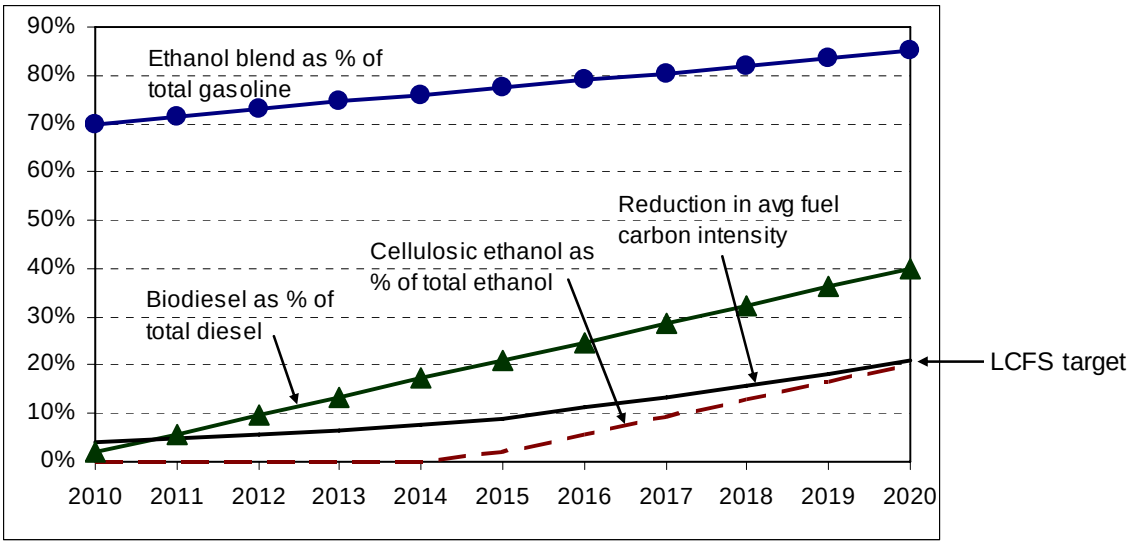
Estimated GHG Savings and Cost Per Ton:

	2012	2020	Units
GHG Emission Savings	1.21	5.19	$MMtCO_2e$
Net Present Value (2008-2050)		$386	$ Million
Cumulative Reductions (2008-2050)		27.49	$MMtCO_2e$
Cost-Effectiveness		$14	$/MtCO_2e$

- **Data Sources:** Lifecycle impacts of biofuels obtained from Argonne National Laboratory's GREET model (v1.7). Fuel consumption, fuel economy, and gasoline and ethanol prices obtained Energy Information Administration's Annual Energy Outlook, 2007 and 2008 releases. Price of biodiesel and conventional diesel obtained from U.S. Department of Energy Alternative Fuels Price Report, January 2008.
- **Quantification Methods**: The estimate of greenhouse gas emissions reductions from the low carbon fuel standard is based upon a 20% reduction in average carbon intensity of gasoline and diesel fuel sold in Iowa. A ramp-up period is estimated so that the 20% goal would be reached at the horizon year, 2020.

  The GHG "credit" attributed to this mitigation option is the incremental reduction on top of any reduction due to current (baseline) use of biofuels. Ethanol currently makes up approximately 70% of Iowa gasoline sales; biodiesel sales are currently small and assumed to be zero.

  In order to estimate the likely ramp up in biofuels usage needed to meet the LCFS, a scenario was developed, shown in the figure below. In this scenario, by 2020, ethanol sales in Iowa would represent 85% of gasoline sales, with 40% of the ethanol used in flex-fuel vehicles (E85) and the remainder used conventional vehicles operating on E10. All ethanol would come from corn feedstocks through 2014. Starting in 2015, the market share of cellulosic ethanol would ramp up so that by 2020, 20% of all ethanol would be from cellulosic feedstocks. Biodiesel (from soy) would make up 40% of total Iowa diesel sales by 2020. The cumulative impact of this increase in biofuels is a 20% reduction in average fuel carbon intensity in 2020.



Cost is calculated as the incremental cost of biofuels per gallon of gasoline equivalent (for ethanol) or diesel equivalent (for biodiesel) multiplied by total consumption of each fuel. We account for the consumer price of fuel plus the federal subsidy, in the form of an excise tax credit to blenders, for ethanol and biodiesel. This subsidy amounts to 51 cents per gallon for ethanol and 1 dollar per gallon for biodiesel from virgin oils. Ethanol and gasoline prices in future years are drawn from the Energy Information Administration's Annual Energy Outlook, 2008. Based on information from the U.S. Department Energy's Alternative Fuels Price Report, January 2008, the difference in the average price of biodiesel compared with conventional diesel in the Midwest is approximately $0.17 per gallon. This difference, combined with the one dollar subsidy, results in an assumed full cost of biodiesel of $1.17 more per gallon than the cost of conventional diesel.

- **Key Assumptions**:
    - Program starts in 2010, first year of emission reduction
    - Program reaches 20% carbon intensity reduction goal by 2020
    - Program applies to all on-road vehicles, "replacing" current gasoline and diesel fuel.
    - Baseline accounts for:
        - 70% ethanol existing market share, blended as E10 with ethanol feedstock for baseline usage assumed to be 100% corn.
        - 0% existing biodiesel market share.

Key Uncertainties

Transportation fuel providers would need to undertake changes in their production and distribution methods in order to achieve the goals. Because the policy does not prescribe particular technology pathways, there is uncertainty surrounding which fuels and technologies

fuel providers will use to meet the standard. The program assumes that providers will use the most cost-effective options to meet the standard, but compliance costs are unknown at this time.

Additional Benefits and Costs

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

Feasibility Issues

There are feasibility issues associated with transporting large volumes of biofuels to and within the state, as well as distributing biofuels to consumers. For example, ethanol cannot move in the pipeline network used for transport gasoline and diesel fuel. These issues would need to be resolved in order to achieve the LCFS.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD