REPORT TO STAKEHOLDERS FROM TRANSPORTATION AND LAND USE WORKING GROUP

Date: June 15, 2004
To: GHG Stakeholder Advisory Group
From: Transportation and Land Use Working Group
Re: Recommendations regarding Options to reduce GHG emissions from Transportation and Land Use

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The purpose of this document is to report to the Stakeholder Group on the work by the Transportation and Land Use (TLU) Working Group concerning potential greenhouse gas reduction options related to transportations and land use options in Maine.

The TLU Working Group met three times, on February 5th, March 9th, and May 20th, 2004. The first part of this document is a 14 page memo summarizing the areas of consensus and provides a description of alternative options or approaches preferred in areas where consensus was not reached. The second part is a technical report from CCAP, describing the assumptions and technical analysis behind each of the options.

SUMMARY OF AREAS OF CONSENSUS AND DESCRIPTION OF ALTERNATIVE OPTIONS OR APPROACHES PREFERRED BY GROUP MEMBERS IN AREAS WHERE CONSENSUS WAS NOT REACHED

TRANSPORTATION AND LAND USE WORKING GROUP
MAINE GREENHOUSE GAS STAKEHOLDER ADVISORY GROUP

ORGANIZATION ABBREVIATIONS:

AVCOG = ANDROSCOGGIN VALLEY COUNCIL OF GOVERNMENTS (BOB THOMPSON REPRESENTED MUNICIPAL INTERESTS)
CSE = COALITION FOR SENSIBLE ENERGY
DEP = MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENE = ENVIRONMENT NORTHEAST
MADA = MAINE AUTOMOBILE DEALERS ASSOCIATION
MCC = MAINE CLEAN COMMUNITIES
MBTA = MAINE BETTER TRANSPORTATION ASSOCIATION
MCC = MAINE COUNCIL OF CHURCHES
MCSC = MARGARET CHASE SMITH CENTER FOR PUBLIC POLICY
MDOT = MAINE DEPARTMENT OF TRANSPORTATION
MMTA = MAINE MOTOR TRANSPORT
MODA = MAINE OIL DEALERS ASSOCIATION
MTA = MAINE TURNPIKE AUTHORITY
NRCM = NATURAL RESOURCES COUNCIL OF MAINE
SENHALL = SENATOR CHRIS HALL
PSR = PHYSICIANS FOR SOCIAL RESPONSIBILITY
SPO= MAINE STATE PLANNING OFFICE

Consensus Items

TLU 2.2 Land Use & Location Efficiency

There is **consensus** that these measures should be endorsed and strengthened.

TLU 2.1 Develop Policy Packages to Slow VMT Growth

The working group decided to use VMT reductions of 1.3% in 2010, and 3.8% in 2020 to reflect the savings from TLU 2.2 and 2.3.

[Included in TLU 2.2, 2.3 and 2.4, below]

TLU 2.2a Review and amend state/local policies that encourage sprawl (Refer in Appendix to Paula Thomson's memo which targets several state policies for review).

- A number of WG members were concerned about the use of the term "sprawl," which has political connotations. Whatever terminology is to be used, WG members agreed they were referring in this option to inappropriate development, in inefficient locations, which encourage energy consumption.

There was unanimous agreement to support this measure.

TLU 2.2b Target Infrastructure Funding and development incentives to efficient locations

- Regional planning and development districts [or other appropriate entities] should develop conservation and development plans with associated capital investment goals and strategies that meet regional needs and are consistent with the broad concepts of efficient land use planning and management.
- DECD, MDOT, SPO and other state agencies, as appropriate, should work with the regional planning and development districts to develop coordinated investment programs that implement the regional investment goals and strategies.
- DECD, MDOT, SPO and regional planning and development districts [or other appropriate entities] should work cooperatively to develop integrated strategies that allow for coordinated investment of state and federal program funds for infrastructure improvements which maximize the limited availability of resources and target infrastructure improvements to efficient locations.

There was **consensus** agreement to support this measure, as modified.

TLU 2.2c Infill, Brownfield Redevelopment

There was **consensus** agreement to encourage the State to be proactive in identifying potential sites and to take advantage of federal monies available for these programs.

TLU 2.2d Transit-Oriented Development

- The WG noted the need for a clear definition of TOD.

There was **consensus** agreement that Maine should review state policies to encourage development which is tied to, encourages and accommodates transit.

All referenced documents are located at the end of the Technical TLU document created by CCAP.

Memo from Steve Linnell on TOD

TLU 2.2e Support Smart Growth Planning & Modeling

- MDOT and regional planning and development districts should work to identify methods and techniques that integrate local and regional land use planning and economic development strategies with multi-modal transportation planning and investment.

- Regional planning and development districts should seek broad public support by developing public outreach strategies to maximize citizen input for the initiatives noted above.

  The WG agreed to modify the second bullet, by coordinating it with crosscutting educational efforts.

  There was **consensus** agreement to support this measure, as modified.

TLU 2.2f Target Open Space Protection to complement smart growth and infill [see The Nature Conservancy memo below].

[Coordinate with Agriculture/Forestry WG]

In Maine there are new efforts underway to coordinate land use decisions with transportation planning and or municipal comprehensive planning. Most of these are voluntary efforts, lack significant funding and are in their early stages. (Some of these were described by Kathy Fuller at the Transportation sub meeting):

- Support program funding of the **Beginning with Habitat.** It can serve as a guide for other planning, including transportation and other land use for the purpose of Green House Gas reductions.

- Support additional funding of the **Gateway One** pilot project and determine where else in Maine such increased coordination would be useful.

  Provide incentives (priority order etc) through Maine DOT, **Sensible Transportation Act,** to encourage compact mixed-use development and cross municipal planning.

There was **consensus** agreement to support the measures excepted immediately above from The Nature Conservancy's memo. TNC's memo also proposed:

- **Land for Maine's Future** is a program designed to support opens space (open space, working forest, farms, water access) conservation at a local and state-wide level. Funding has run out.

  Recommendation: Support a substantial land bond to be placed on November ballot

On this bond issue provision, MADA, MODA, Maine Tourism, MMTA and MBTA objected because their respective Boards had taken no position on this electoral proposal

TLU 2.3 Increase Low-GHG Travel Options

- Give appropriate [GHG] credit for existing alternative modes projects and use them as a base for expanding services and programs.

There was **consensus** agreement to support this measure.

TLU 2.3a Finding Funding for Transit

- Advocate for and obtain funding above and beyond current funding allocations for transit projects.
- Work with Congressional delegation to get back Maine's fair share of fuel taxes, which could increase transit funds by $14.5 million per year.
- Find ways to expand the pool of operating funds for expansion of existing and development of new transit services. This is to be done without invading or diminishing constitutionally dedicated highway funds or existing highway tolls. This measure should also be coordinated with a DOT study being undertaken to examine alternative funding mechanisms.

There was **consensus** agreement to support this measure, as modified..

TLU 2.3c Expand New and Existing Transit Service including rail, light rail, bus lines, and ferries.

- Create more mass transit that travels between towns and communities. (In addition to transit service provided within an existing town or city)

There was **consensus** agreement to support this measure, as modified.

TLU 2.3d Create New and Improve Existing Non-motorized Facilities

- Give priority to non-motorized access at all major developments in order to stimulate the transit and economic benefits derived from pedestrian scale streetscapes.

There were concerns expressed about the scope of this measure-- would it prohibit gas stations? The WG agreed the intent here was to improve pedestrian safety and encourage citizens to walk at a large shopping center, and to coordinate with transit. Bob Thompson will craft language to include in report to SAG.

- Create/build longer and interconnected bike paths. Create bike paths that are not accessible to automobiles to encourage people to ride their bikes rather than use their cars. This could be especially effective for paths that run between towns and cities, and amongst their principal employers.

There was discussion that this measure should also support continued construction of paved shoulder bike paths. DOT will craft language which includes this.

- Create more and expand existing pedestrian facilities linking neighborhoods with schools, employers, commercial areas, etc.

There was **consensus** agreement to support these measures, as modified.

TLU 2.4 Incentives and Disincentives

- Create financial incentives for people to use alternative forms of transportation on a consistent basis. Consider options such as tax write offs for money spent using transit, reimbursements by the State or Employer for subsidizing the cost of tickets.

It was noted that this topic is also addressed in the recent Executive Order.

There was **consensus** to support this measure, but concerns were expressed about reducing tax revenues.

TLU 2.4a Commuter Choice

(See Commuter Choice Memo in Appendix 3 for more detail)

- Implement Commuter Choice tax incentives for vanpool and transit riders allowing them to pay up to $100 per month using pre-tax dollars.
- Additional regular funding for expanded vanpool program. Could use 15 new vans today

- Preferred parking for carpools/vanpools/low GHG vehicles (including hybrids), and those vehicles in the Maine Clean Car Label program. MDOT is launching a pilot program using colored signs.
- Dedicated fund for cooperative marketing of transit and GO MAINE program directed at commuters
- Encourage integration of alternative modes into new employee benefits info
- Regular updated notices to all employees on commuter options
- Provide seed money and/or subsidies, matching money to employers to start van pools
- Encourage employers to meet the criteria of EPA's Best Workplaces for Commuters http://www.bestworkplacesforcommuters.gov/

- There was **consensus** to recommend this measure, as modified, to the SAG as a voluntary program which should be expanded.

TLU 2.4k Benefits for Low-GHG Vehicles

- There was **consensus** to recommend preferential parking to the SAG. DEP's clean vehicle sticker program was mentioned as a possible tool with this recommendation.

All referenced documents are located at the end of this document:

Natural Resources Council of Maine handout on Preferential Parking**.**

At the conclusion of the WG's discussion on VMT measures, the technical consultant pointed out that the calculation of the reduction in VMTs was now projected to be 1.3% in 2010, and 3.8% in 2020.

TLU 4.2.d Encourage Anti-Idling Measures

There was **consensus** agreement to support the following measure: "Support programs to fund infrastructure or develop incentives to reduce truck, locomotive, and marine engine idling through electrification and other technologies, enforcement and congestion management."

All referenced documents are located at the end of this document:

Natural Resources Council of Maine Handout on Truck Stop Electrification

TLU 7.2 Improve GHG Data Collection

Recommend that all State of Maine agencies work towards consistency and compatibility amongst
data collection/retrieval systems that will allow reliable and predictable access to and analysis of data that is directly relevant to the goals of Maine's GHG/Climate Control efforts.

There was **consensus** agreement on this measure.

Non-Consensus and Not Discussed Items

TLU 1.1a Implement Tailpipe GHG Emission Standards

- The Working Group was divided over this measure

- Supporters noted that Maine would join other states, New York, Massachusetts and Connecticut, in the region that have indicated interest in adopting CA GHG standards, once finalized.

Note: In addition to Maine, New York, Massachusetts, and Vermont, three additional states, Connecticut, Rhode Island, and New Jersey, have recently adopted the LEV 2 tailpipe emission standards.

- Opponents expressed concerns about competitiveness impacts in Maine and potential legal exposure for the State.

- There was significant support to "wait and see" how the CA standards are defined and the outcome of the likely lawsuit in CA.

- Some supported a "trigger" mechanism where Maine would adopt the standards after a percentage of other states did.

Favoring the option were CSE, NRCM, MCC, MCSC, PSR, AVCOG, DEP.

Opposing it were MMTA, MBTA, Maine Tourism, MADA AND MODA.

TLU 1.1b Adopt Advanced Technology Component (formerly ZEV) of LEV II Standards

As noted above, opponents provided analysis showing minimal GHG benefits for the ZEV standard.

Proponents indicated that states with the "ZEV Mandate" receives product preference before non-mandate states.

All referenced documents are located at the end of this document:

Natural Resources Council of Maine Handout on ZEV Mandate sent to Technical Consultant.

Alliance of Auto Mfrs. Handout on CO2 Lifecycle

Favoring the option were CSE, NRCM, MCC, PSR, Maine Clean Communities, ENE.

Opposing it were MMTA, MBTA, Maine Tourism, MADA, DEP MODA, AVCOG, MTA.

Upon further reflection, the DEP has expressed the view that the option ought to remain open for consideration by the SAG, and they are not opposed to the measure.

TLU 1.1c Fund R&D on Low-GHG Vehicle Technology

[not discussed]

TLU 1.3.b GHG Feebates (state or regional)

- Supporters noted that this program will help "market transformation" to lower GHG cars, and that the measure should be crafted so as to be revenue neutral.
- Administering the feebates at the time of registration would avoid any potential "leakage" (i.e., if Maine residents were to buy high-GHG vehicles in another state to avoid paying the fee, or if out-of-state residents were to buy low-GHG vehicles in Maine in order to get the rebate)
- It is part of the Action Plan for the GHG plans in Massachusetts, Rhode Island, Connecticut, and New York.
- Opponents noted that this program is a "tax," which hits working people hardest. Given the political climate about taxes, this will be politically unpopular.
- The AVCOG representative felt this would be an additional burden on local municipal officials.

All referenced documents are located at the end of this document:

Natural Resources Council of Maine Handout on Feebates

Favoring the option were NRCM, MCC, PSR, DEP, ENE, MCSC.

Commercial vehicles were exempted, in addition to those above, MDOT and CSE supported.

Opposing it were MMTA, MBTA, Maine Tourism, MADA, MODA, and AVCOG.

TLU 1.3d Provide Tax Credits for low-GHG Vehicles

[Included in TLU 1.3b, above]

TLU 2.3b Improve Existing Transit Service (length and location of routes, frequency, convenience, quality)

- Implement transit measures aimed at tourism. Provide shuttle services within Boothbay Harbor, Camden, Kennebunk, Ogunquit, Freeport and other frequently visited towns

- Implement more transit measures associated with large employers. Such as local municipalities, MBNA, LL Bean and others. These employers could create transit incentive programs for their employees – such as promoting the use of alternative forms of transportation, implementing van pooling, or carpooling. [See also 2.4a, Commuter Choice]

There was near consensus on these measures IF the first word in each bullet was changed from "implement" to "encourage." NRCM objected, feeling "implement" was the preferable term and that "encourage" was not strong enough. While supporting the option as modified [to use "encourage"], the following organizations also supported the use of the term "implement": CSE, DOT, NRCM, MCSC, MCC, SPO, PSR and DEP.

TLU 2.3g Initiate a Fix-it-First policy
[not discussed]

TLU 2.4d Pay As You Drive Insurance (PAYD) (See Handout provided by Natural Resources Council of Maine)

The proposal was changed to "Allow Maine car insurance companies to experiment with voluntary PAYD pricing programs."

There was near consensus agreement on this measure. MODA opposed it because it could adversely affect commercial technicians who drive many miles. MADA opposed it because of insufficient experience elsewhere to determine impact on insurance industry.

TLU 2.4b VMT Tax
[not discussed]

TLU 2.4c Fuel Tax with targeted use of revenues
[not discussed]

TLU 2.4f Location Efficient Mortgage

It was noted the Buildings and Facilities WG was working on this.

TLU 2.4j VMT Offset Requirements from large developments
[not discussed]

TLU 3.1 Set a Low-GHG Fuel Standard
(See Appendix 3 for more information)

- Adopt a Renewable Fuel Standard appropriate to Maine

    - By 2020 all gasoline sold in Maine should be at least E-10 (10% ethanol)
    - By 2020 all diesel sold in Maine should be at least B-5 (5% biodiesel)

- See Appendix for report of subcommittee in favor
- Opponents expressed concerns about supply, distribution and price volatility
- MODA opposes imposition of "boutique" standards, prefers passage of a Federal Renewable Fuel Standard
- MADA objects because of concerns about the option's affect on manufacturers' warranties, and because this is inconsistent with Maine policies on ozone

Favoring the option "as is" were CSE, NRCM, MCC, PSR, Senator Hall, DEP, MAINE CLEAN COMMUNITIES.

Favoring the option if it was adopted in a regional approach through NESCAUM were CSE, NRCM, MCSC, MCC, PSR, AVCOG, MBTA, ENE, Senator Hall, DEP.

There was support for seeking passage of the Federal Renewable Fuel Standard.

* Several state agencies noted that they did not have explicit authority to support this measure.

TLU 3.2 Low GHG Fuel for State Fleets

(Subcommittee Detailed Recommendations for Working Group Consideration

- Maximize use of B-20 (and/or other low-GHG fuel) in public fleets, where feasible
  E.g., MDOT maintenance, state contracts, Maine Turnpike, municipal
- Expand use of CNG and LPG in urban vehicle fleets
- Incorporate diesel power into the medium duty fleet; use B20 in on- and off-road vehicles
- Continue/increase the purchase of low-GHG vehicles (e.g., hybrids)
    - Continue/increase the purchase of FFVs by CFM
    - Purchase diesel light vehicles when consistent with air quality regulation
    - Purchase CNG and LPG biofuel light vehicles where practicable and available.
    - It was noted that this option should be reconciled with a new alternative fuels

Study commissioned by the Legislature, as well as the terms of a recent Executive Order signed by the Governor

Favoring the option "as is" were CSE, SPO, NRCM, DEP, MCC, PSR, Senator Hall, DEP, MCSC and ENE.

The other organizations opposed the measure.

MADA specifically objected to the bullet advocating purchase of diesel light vehicles, because it is unable to sell these vehicles and finds the measure inconsistent with other state policies and discriminatory.

Current diesel vehicles do not currently comply with these standards; it is expected that they can comply when low sulfur diesel fuel becomes available in 2006.

There was near consensus to approve the option if it was adopted in a regional approach through the New England Governors and Eastern Premiers. The sole dissenter was MADA, which objected to the bullet advocating purchase of diesel light vehicles, which it found discriminatory.

As a cross-cutting issue, there was consensus to pursue advanced technologies which have potential to reduce GHG.

TLU 3.3 Low-GHG Fuel Infrastructure

- Invest in and provide incentives for fueling infrastructure for low-GHG fuels (biodiesel, ethanol, CNG, LPG)
  - Establish CNG infrastructure in other metropolitan areas and along the Turnpike
  - Take advantage of existing propane fueling infrastructure
- Expand incentives for in-State production of biofuels
- Provide incentives for the sale of low-GHG fuels
- Provide incentives for the purchase of low-GHG vehicles (E85, CNG)
- Consider use of CNG vehicles at LNG port

Favoring the option "as is" were CSE, SPO, NRCM, MCC, AVCOG, MCSC, PSR, DEP, and ENE.

The other organizations opposed the measure.

MADA specifically objected to the bullet advocating purchase of diesel light vehicles, because it is unable to sell these vehicles and finds the measure inconsistent with other state policies and discriminatory.

Manufacturers of diesel vehicles do not currently comply with these standards; it is expected that they can comply when low sulfur diesel fuel becomes available in 2006.

TLU 3.4 Hydrogen Infrastructure
[not discussed]

TLU 4.0 FREIGHT MEASURES
[not discussed]

There was no discussion of or proposals on measures 4.2e, 4.3a, 4.3b, 4.3c, or 4.4a

TLU 4.2.e Maintenance and Driver Training (Freight)
TLU 4.3a Develop and fund a long-term regional infrastructure plan for rail and marine
TLU 4.3b Remove Obstacles to Freight Rail
TLU 4.3c Develop Intermodal Transfer Facilities
TLU 4.4a Procurement of low-GHG Fleet Vehicles (Freight)

A new measure received majority, but not consensus support: “Encourage Maine’s Congressional delegation to continue to work to raise the weight limit for freight trucks from 80,000 to 100,000 pounds on the interstate north of Augusta.”

Supporters noted this will get trucks off the secondary roads where there is stop and go traffic which increases idling and GHG.

Opponents felt that while this was desirable, the change would provide incentives to keep more trucks on the road, rather than supporting alternative transportation of freight. The following organizations opposed the measure: ENE, PSR, NRCM, and CSE. All others present supported it.

TLU 5.0 INTERCITY TRAVEL
[not discussed]

TLU 7.0 OFF-ROAD VEHICLES
[not discussed]

TLU 7.1 Public Education
[not discussed]

Separate Workgroup

Black Carbon

TLU 8.0 Clean Diesel Technologies to reduce Black Carbon

(See Environment Northeast memo in Appendix 3 of the CCAP technical document for more details)

- Gather statewide data on heavy duty mobile diesel engines and emissions
- Establish working group to analyze: data, fuel issues, emission control technologies, costs, benefits, opportunities, case studies and pilot projects
- Develop recommendations for a Maine Clean Diesel Program
- Develop definition of Best Available Control Technology (BACT) by vehicle type, vintage, duty cycle to promote appropriate use of fuels and new or retrofitted engines

- Consider appropriate mix of measures, including:

    - Procurement – Specify use of BACT in state funded construction contracts, state and municipal fleets (e.g., highway maintenance vehicles, snow plows, and transit)

    - Develop an incentive program for retrofits of emission controls on in-use engines, and early retirement of older engines.

    - Support capital expenditures to reduce truck, locomotive and marine engine idling through electrification or the use of clean auxiliary engines.

    - Incentives could include reduced sales tax, enhanced tax deductions, rebates, and preferential bidding treatment. Incentives could be paid from a dedicated fund, using the Carl Moyer Program model or the Texas Emission Reduction Program model. Sources of funding could include bond funds, taxes, fees, federal appropriations and the like.

    - Regulatory Support

    - Propose legislation directing DEP to establish phased-in emission standards requiring BACT for particulates, black carbon and NOx for in-state, in-use diesel engines: (trucks (garbage, snow removal, dump, tanker), buses (school, transit, intercity), and construction equipment.

    - Establish anti-idling rules to eliminate unnecessary idling for all on-road, off-road, locomotive and marine engines.

    - Regional initiatives – Recommend to the NEG-ECP that black carbon emissions be studied and considered for inclusion in the GHG inventories and baselines.

- Federal initiatives – Work with its federal delegation and EPA to raise increase funding for diesel retrofit programs, with particular focus on transboundary diesel sources (marine, interstate trucking).

Favoring the option "as is" were SPO, NRCM, DEP, MCC, PSR, MCSC Senator Hall, DEP, ENE, MDOT, CSE.

Several organizations noted their opposition to any reductions in fuel taxes, which are deemed inadequate as they are.

There was **consensus** to approve the option if it was modified to include only the following bullets:

- Gather statewide data on heavy duty mobile diesel engines and emissions
- Establish working group to analyze: data, fuel issues, emission control technologies, costs, benefits, opportunities, case studies, pilot projects
- Develop recommendations for a Maine Clean Diesel Program
- Regional initiatives – Recommend to the NEG-ECP that binational black carbon emissions be studied and considered for inclusion in the GHG inventories and baselines.
- Federal initiatives – Work with its federal delegation and EPA to raise increase funding for diesel retrofit programs, with particular focus on transboundary and international diesel sources (marine, interstate trucking).

    - On this modified measure, there was considerable debate about the use of the GHG reduction numbers in the document, since they were based on assumptions about implementation of specific initiatives, which was not supported since this measure calls for study and analysis only. The WG concluded these numbers were illustrative only and were not part of the consensus decision to approve the modified measure above.

Maine Greenhouse Gas Action Plan Development Process

Transportation and Land Use Greenhouse Gas Reduction Options

Center for Clean Air Policy

June 9, 2004

Table of Contents

SECTOR BASELINE

Key Baseline Assumptions

- Historic GHG emissions (1990 – 2000)
    - Source: NESCAUM inventory

    Discussion: CCAP examined whether or not there is a discrepancy between trends in state data on fuel sales and fuel consumption (derived from VMT), which is often the case in other states. This discrepancy can manifest as an apparent increase or decrease in fuel economy due for example, to out-of-state travel, or data inconsistencies. CCAP found only minor differences in Maine. Our attempt to address the discrepancy made only a 4-7% change in historic transportation GHG emissions, which is within the likely uncertainty of the calculation. Therefore we do not recommend any adjustment. More thorough examination of individual fuels might lead to improved data, but is beyond the scope of this process

- GHG Emissions Forecast (2000-2020)
    - Used ME DOT VMT forecast to calculate gasoline and diesel use and GHGs
        - = 18.8% growth (2000 – 2020)

    Discussion: ME DOT has noted that the Travel Demand model under-predicted VMT growth from 1995-2001 by about 9%. They noted that this may be due to inadequate estimate of number of trips or trip lengths, or growth in socioeconomic variables (population, households, jobs) may have outpaced model inputs. ME DOT plans to update the VMT forecast late 2004 at which point the sector baseline could be revisited as appropriate.

    CCAP looked at the U.S. DOE VMT forecast for New England (2000 – 2020), which forecasted higher VMT growth rates: Gasoline Vehicles: +37.7%, Diesel Vehicles: +46.4% (assuming population growth of 9% and 79% GDP growth). Historically Maine VMT growth has been similar to New England VMT growth: from 1990-2001 Maine VMT increased +21.6%, while New England New England VMT increased +19.4%.

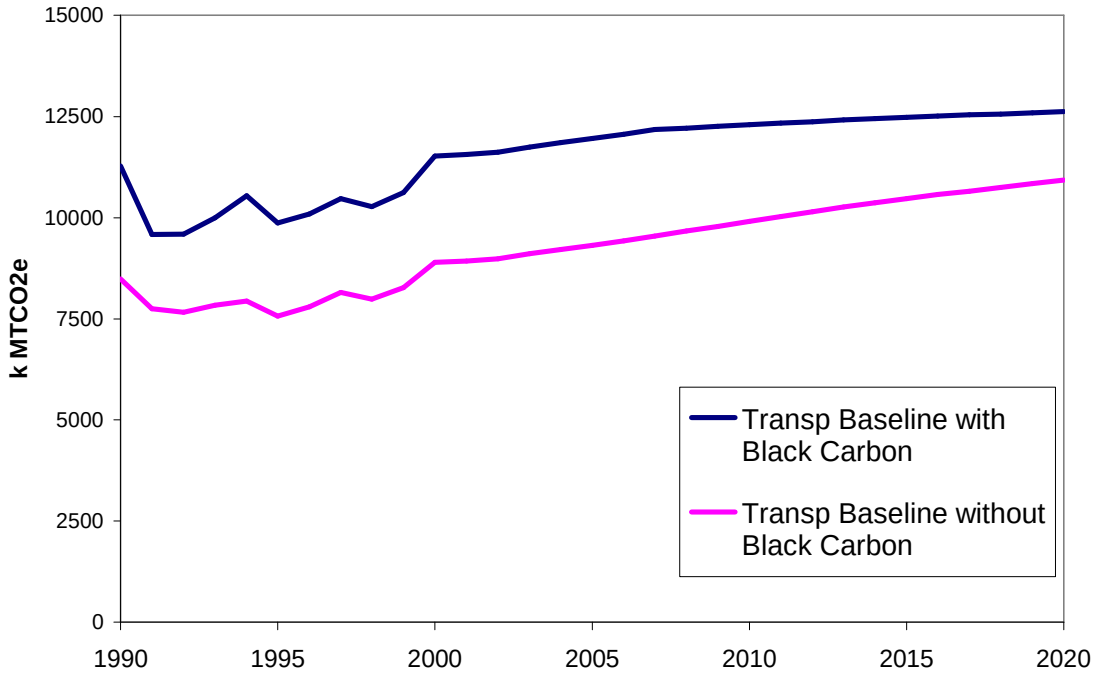
    Working group members decided it was best to use ME DOT data, and that the baseline should be updated when the new VMT forecast is completed.

    - For other fuels (≈ 11% of total) we used USDOE regional growth rates for lack of Maine-specific data.
    - Non-CO_2 GHG emission factors from USEPA
    - Black Carbon (for more detail see the Black Carbon memo in Appendix 3)
        - Used emissions factors developed by Energy and Environmental Analysis: 0.0090349 metric tons of BC per 1000 gallons of diesel
        - Calculated CO_2 equivalence based on the findings of Prof. Mark Jacobson of Stanford University: ratio of fossil fuel black carbon plus organic matter to CO2-C cooling of 220:1 (low-end of range)
        - Assumed VMT (and fuel consumption) for existing engines stays static, and that new VMT is picked up by new (cleaner) engines

- Assumed that all new engines are compliant with federal standards for new engines that are in place for on-road (for MY 2007) and non-road (phased in for MY 2008-2014).

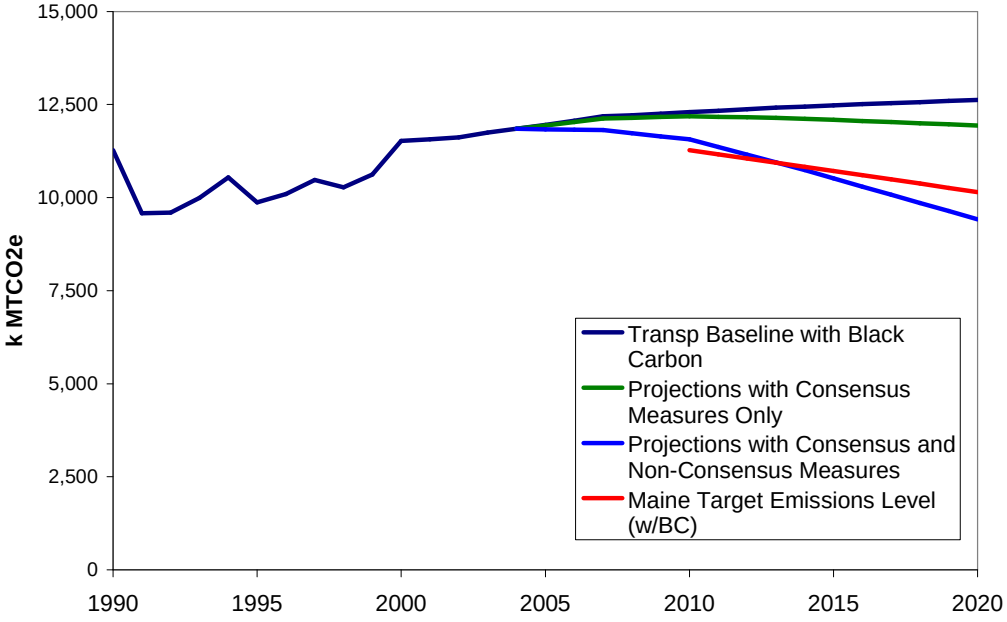
- Assumed that in-use engines are phased out at the end of the median expected life – 30 years – and that 1/30th of the existing fleet is phased out each year. Thus, in 2010, about 13% of the existing fleet is retired, and 87% remains. In 2020, 47% of the pre-2007 fleet is retired, and 53% remains.[1]

Maine Transportation Baseline With and Without Black Carbon



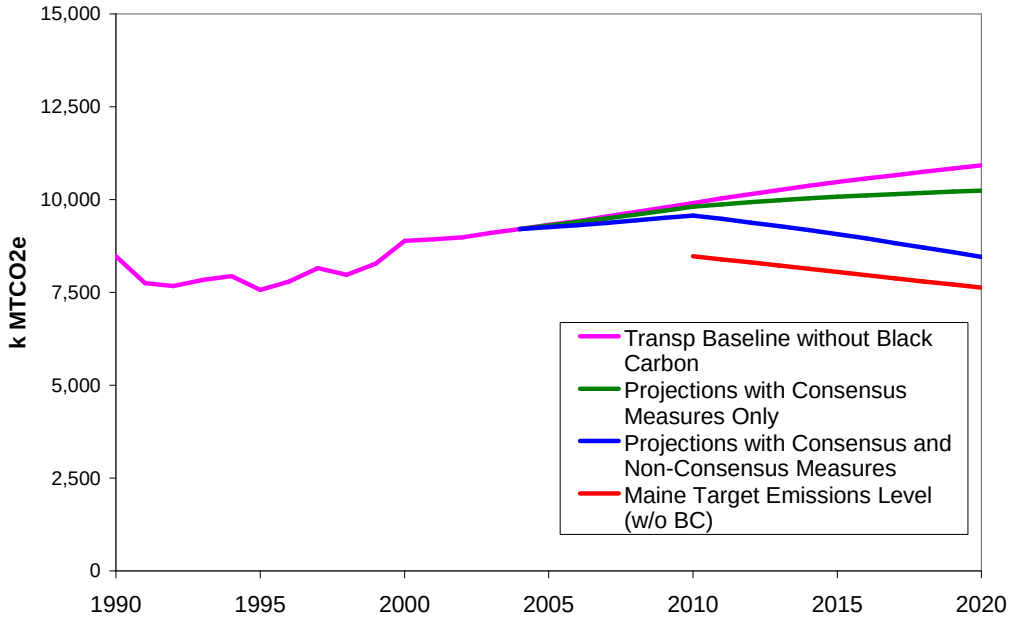
[1] The supporting documents for the new EPA non-road likely includes information that could inform or improve this analysis; reviewing that information is beyond the scope of this process.

Maine Transportation Baseline <u>With</u> Black Carbon



Cumulative GHG Reductions

Maine Transportation Baseline (Without Black Carbon)



GHG Savings & Cost Estimates for Priority Measures

	Measure (Transportation Sector)	2010 thousand MTCO2 (Total)	2020 thousand MTCO2 (Total)	Cost Effectiveness $/MTCO2
TLU 1.0	**Passenger Vehicle GHG Emission Rates**	**141.3**	**952.4**	
TLU 1.1	**Vehicle Technology**			
a	Implement Tailpipe GHG Emissions Standards	137.5	933.6	**($48)**
b	Add ZEV Mandate to LEV II Standards	-	-	
TLU 1.3	**Incentives and Disincentives**			
b	GHG Feebates (state or regional)	3.8	18.8	Can be revenue-neutral
TLU 2.0	**Slowing VMT Growth**	**102.2**	**681.2**	
TLU 2.1	**Develop Policy Packages to Slow VMT Growth** (includes savings from TLU 2.2, TLU 2.3, and unquantified measures in TLU 2.4)			
TLU 2.2	**Land Use & Location Efficiency:** a) Review and amend state/local policies that encourage sprawl b) Target Infrastructure Funding and development incentives to efficient locations c) Infill, Brownfield Re-development d) Transit-Oriented Development e) Support Smart Growth Planning & Modeling f) Target Open Space Protection to complement smart growth and infill.	87.5	286.4	Some policies offer savings (e.g., higher use of existing transit), others may require significant investments (e.g., new transit infrastructure)
TLU 2.3	**Increase Low GHG Travel Options** a) Increase/Redirect Transportation Funding for Efficient Modes b) Improve Transit Service (coverage, frequency, convenience, quality) c) Expand Transit Infrastructure (rail, bus, BRT) d) Bike and Pedestrian Infrastructure g) Initiate a Fix-it-First policy			
TLU 2.4	**Incentives and Disincentives**			
a	Commuter Choice	7.8	15.7	
d	Pay as You Drive Insurance (assumes 50% penetration in 2020, 10% savings)	6.9	379.0	
f	Location Efficient Mortgage (LEM)	-	-	
k	Benefits for Low-GHG Vehicles (parking, HOV, etc)	-	-	
TLU 3.0	**Fuel Measures**	**83.1**	**799.1**	
TLU 3.1	Set a Low GHG Fuel Standard	63.5	639.5	**$34**
TLU 3.2	Low-GHG Fuel for State Fleets	19.1	157.5	**$10**
TLU 3.3	Low-GHG Fuel Infrastructure (CNG, LPG)	0.4	2.0	**$1,482**
TLU 3.4	Hydrogen Infrastructure	-	-	
TLU 4.0	**Freight (subtotal excludes Black Carbon)**	**12.0**	**29.7**	
TLU 4.2	**Vehicle Operation (Freight)**			
d	Encourage Anti-Idling Measures	12.0	29.7	
TLU 7.0	**Cross-cutting Issues**	**0.0**	**0.0**	
TLU 7.2	Improve GHG Data Collection	-	-	
TLU 8.0	**Reduce Black Carbon from Diesels**	**383.8**	**740.0**	
TLU 8.1	Clean Diesel/Black Carbon	383.8	740.0	**$ 6 - 14**
	Total Savings (thousand MTCO2e)	**339**	**2,462**	
	Baseline Emissions	9,910	10,925	
	Baseline minus Reductions	9,572	8,462	
	% above/below 1990	**12.9%**	**-0.2%**	
	NEG/ECP Goal (1990 in 2010, 10% below in 2020)**	8,477	7,629	
	Additional reductions needed to reach NEG/ECP	**1,095**	**833**	
	Total Savings with Black Carbon (thousand MTCO2e)	**722**	**3,202**	
	Baseline Emissions with Black Carbon	12,293	12,622	
	Baseline minus Reductions	11,570	9,420	
	% above/below 1990	**2.6%**	**-16.5%**	
	NEG/ECP Goal (1990 in 2010, 10% below in 2020)**	11,278	10,150	
	Additional reductions needed to reach NEG/ECP	**292**	**-730**	

** NEG/ECP does not necessarily assume proportional goals for specific states or sectors

TRANSPORTATION & LAND USE ASSUMPTIONS

TLU 1. VEHICLE TECHNOLOGY

Measure: TLU 1.1a Implement Tailpipe GHG Emission Standards

Sector: **Transportation**

Policy Description: Adopt California GHG tailpipe standards for passenger vehicles.

California is developing regulations to reduce motor vehicle emissions of GHGs (including tailpipe emissions and emissions from air conditioners). By January 1, 2006, the California Air Resources Board (CARB) is to develop and adopt regulations that achieve "the maximum feasible and cost-effective reduction of GHG emissions" from passenger vehicles and light-duty trucks whose primary use is noncommercial personal transportation.[2]

- January 2005: CARB submits standard to the Legislature and Governor
- January 2006: the regulations will go into effect
- Regulations apply to motor vehicles manufactured in model year 2009 and thereafter.

Criteria to be used in determining "maximum feasible and cost-effective" include ability to be accomplished within the time provided, considering environmental, economic, social, and technological factors, and economy to vehicle owners and operators, considering full life-cycle costs of a vehicle. CARB is required to:

- consider the technical feasibility of the regulations
- consider their impact on the State's economy, including jobs, new and existing businesses, competitiveness, communities significantly affected by air contaminants, and automobile workers, and related businesses in the State
- provide flexibility, to the maximum extent feasible, in the means by which people subject to the regulations may comply and,
- ensure that any alternative methods for compliance achieve equivalent or greater reduction in GHGs.

BAU Policy/Program: Maine adopted CA LEVII for criteria pollutant emissions (without ZEV).

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- Technology Baseline: vehicle technology assumptions from US DOE AEO 2003
- VMT Forecast: based on Maine's State DOT VMT growth estimate of 18.8% (minus VMT savings from transit and smart growth)
- **CO_2 Emission Rate (g/mi) reduction for cars and light trucks**
  - 2009: 14% (CARB, low estimate)
  - 2015: 24% (CARB, mid-range)
  - 2020: 30% (CARB, low estimate)
- Other data
  - 2002 new vehicle registration data comes from 2003 "Ward's Motor Vehicle Facts and Figures"
  - We assumed that 49.2% of the new vehicles are cars and 50.8% are light duty trucks (LDTs).
  - Mileage for new vehicles starts at 16,000 miles and decreases at a rate of 4% per year (ORNL)
  - Scrappage rates based on ORNL

[2] AB 1493, signed August 13, 2002 (www.arb.ca.gov/cc/ab1493.pdf).

Incremental Costs

- 2009: $400/vehicle (CARB, mid-range, consistent with UCS)
- 2015: $1,000/vehicle (CARB, mid/high range, higher than UCS)
- 2020: $1,600/vehicle (CARB, mid/high range, higher than UCS)
- Average payback rates: 2.2 to 4.5 years (consistent with CARB, UCS)
- (Gasoline price assumed to be $1.75/gallon)

Potential Barriers/Issues: California GHG tailpipe standards are likely to face legal challenge from automakers on the basis that vehicle CO_2 regulation is preempted by federal fuel economy regulation. Maine could propose amending Chapter 127 to include the new CARB regulation.

New York, Massachusetts and Connecticut have all made commitments to implementing the California motor vehicle GHG standards once finalized.

Measure:	**TLU 1.1b Adopt Advanced Technology Component (formerly ZEV) of LEV II Standards**
Sector:	**Transportation**
Policy Description:	Adopt Advanced Technology Component (formerly "Zero Emission Vehicle") component of California LEV II Standards
BAU Policy/Program:	Maine adopted CA LEVII for criteria pollutant emissions (without ZEV).

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- Adoption of the Advanced Technology Vehicles could reduce GHGs in Maine.
- Savings not quantified by working group

Advanced Technology Requirements of the LEV II Emissions Program, 2005–2008

Category	Vehicle Type	Examples	% of Total Fleet	% of Total Alternative Compliance
Gold	Pure ZEVs	Electric vehicles and fuel cells	2	250 total fuel cell vehicles by 2008
Silver	Advanced technology PZEVs	Hybrid Electric and Compressed Natural Gas vehicles	2	3
Bronze	PZEVs	Super Ultra Low Emissions Vehicle or SULEV (internal combustion)	6	6

For more information see memos in Appendix 3 from the Natural Resources Council of Maine and the Alliance of Automobile Manufacturers.

Measure:	TLU 1.1c Fund R&D on Low-GHG Vehicle Technology

Sector: **Transportation**

Policy Description: Increase funding and support for R&D efforts including emphasis on deployment strategies, incentives and federal matching funds

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured in GHG tailpipe standards or GHG feebates (cited above).**

Data Needs:
- Vehicle types (passenger, heavy duty)
- GHG savings (% basis)
- Penetration rate of technology and fuels
- Total cost of annual R&D program (capital and operating outlays)

Potential Barriers/Issues: Cost of program, conflict with federal fleet requirements (i.e., HEVs do not count towards EPACT)

TLU 1.3 Incentives and Disincentives

Measure:	TLU 1.3b GHG Feebates (state or regional)

Sector: **Transportation**

Policy Description: Under a GHG feebate system, consumers would be charged a fee on purchases of relatively high-emitting vehicles and would receive a rebate on the purchase of relatively low-emitting vehicles.
- Market tool to influence consumer purchasing decisions
- Regional application could achieve economies of scale

BAU Policy/Program: The **Cleaner Cars for Maine Program** is a consumer-labeling program that enables individuals seeking to purchase an automobile to easily identify the cleanest vehicles on dealer lots.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:
- GHG reductions depend on level of feebate, program scale and structure (state, regional, or national program)
- **Savings scaled from the CT & NY GHG analyses, which were based on a California Energy Commission (CEC) study**
  - The CEC study is the only to do a bottom-up calculation of a feebate at a state level (albeit a large state).
- **Savings could be significantly higher in multi-state or national program**
  - The CEC study showed much smaller impacts for a one state feebate than for a national feebate
- Need to consider potential double-counting of savings with tailpipe GHG emissions regulation
- Costs and savings schedule shown below (Table 1.3.b) is a **sample** feebate schedule. Savings based on \$40/MMTCO$_2$.
- **A Brown University tool can help calculate potential revenue impacts of different feebate schedules**

Table 1.3.b

Sample Feebate Schedules

Lifecycle CO_2e Emissions (lb/mi)	Lifetime CO_2e Emissions (tons CO_2e)	$28/ton CO_2 Pivot A	$40/ton CO_2 Pivot B	Sample Vehicles
0.30	33	($1,470)	($2,700)	
0.35	37	($1,365)	($2,550)	
0.40	41	($1,260)	($2,400)	
0.45	44	($1,155)	($2,250)	Insight (man.)
0.50	48	($1,050)	($2,100)	'04 Prius
0.55	52	($945)	($1,950)	'03 Prius
0.60	56	($840)	($1,800)	Jetta diesel
0.65	59	($735)	($1,650)	
0.70	63	($630)	($1,500)	Civic HX
0.75	67	($525)	($1,350)	Civic (man.)
0.80	71	($420)	($1,200)	Geo Prizm
0.85	74	($315)	($1,050)	Mini Cooper
0.90	78	($210)	($900)	Sentra
0.95	82	($105)	($750)	Ford Focus
1.00	86	$0	($600)	Camry
1.05	89	$105	($450)	Lancer
1.10	93	$210	($300)	Grand Am
1.15	97	$315	($150)	Malibu
1.20	101	$420	$0	Intrepid
1.25	104	$525	$150	Aztec FWD
1.30	108	$630	$300	Mustang
1.35	112	$735	$450	Odyssey
1.40	116	$840	$600	Highlander
1.45	119	$945	$750	Town Car
1.50	123	$1,050	$900	Dakota
1.60	131	$1,260	$1,200	Trailblazer
1.70	138	$1,470	$1,500	Explorer 4x4
1.80	146	$1,680	$1,800	
1.90	153	$1,890	$2,100	
2.00	161	$2,100	$2,400	Escalade
2.10	168	$2,310	$2,700	Navigator
2.20	176	$2,520	$3,000	
2.30	183	$2,730	$3,300	
2.40	191	$2,940	$3,600	Ferrari 456
2.50	198	$3,150	$3,900	
2.75	217	$3,675	$4,650	Hummer H1

Note: CO_2-equivalent emissions include estimated in-use emissions for gasoline and diesel vehicle (calculated using EIA data), average manufacturing emissions estimated at 10.6 tons CO_2-equivalent (based on ACEEE Green Book methodology, 2002), and fuel-cycle emissions of CO_2 and other GHGs (based on DeLucchi, 1997, using revised GWP estimates from IPCC). Gasoline and diesel vehicle CO_2 burdens were calculated separately, but they result in similar numbers, so a single number was used to estimate both, for simplicity. Sample vehicles are based on model year 2002 carbon emission estimates, except where otherwise noted. Estimates assume lifetime mileage of 150,000 miles, with no discounting of future emissions.

For more information see memo in Appendix 3 from the Natural Resources Council of Maine.

Measure: **TLU 1.3d Provide Tax Credits for low-GHG Vehicles**

Sector: **Transportation**

Policy Description: Provide a tax incentive to encourage acquisition of low-GHG vehicles.

BAU Policy/Program: There are existing state and federal tax credits for alternative fuel vehicles but unclear if these have significant GHG benefits (i.e., IRS $2000 tax credit for hybrid vehicles.)
Title 36 Section 1779 allows for partial sales tax exemption for clean fuel vehicles. Effective until 1/1/06.

Maine Clean Cities & COG programs may also offer additional tax credits, however an initial review of these programs shows that they are not specifically oriented towards low-GHG vehicles. Stakeholder input is needed to understand the full scope of Maine-specific tax credits and how to orient them (if appropriate per stakeholder guidance) toward towards low-GHG vehicle purchases.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured in GHG feebates (above)**
- If Maine adopts a GHG-feebate program (cited above) this measure might be redundant
- Performance based or target specific technologies?

Data Need	Assumption	Source
Current tax credits		For a full list see, http://www.gpcog.org/trnsprttn/cln_cts/tx_ncntv.htm
Potential revenue to be devoted to credits		

TLU 2.0 SLOWING VMT GROWTH

Measure:	**TLU 2.1 Develop Policy Packages to Slow VMT Growth** **TLU 2.2 Land Use & Location Efficiency** **TLU 2.3 Increase Low-GHG Travel Options**

Sector: **Transportation**

Policy Description: Develop policy packages to slow vehicle miles traveled (VMT) growth and increase the availability of low-GHG travel choices, such as transit (rail and bus), vanpools, walking, and biking. *Included in the packages are a number of complementary land-use polices and transit-based incentives to improve the attractiveness of low-GHG travel choices:*

2.1 Develop packages to slow VMT growth/reduce VMT - Increase availability of travel choices, such as transit (rail and bus), vanpools, walking and biking and provide complementary land use polices and incentives to improve the attractiveness of low-GHG travel choices.

2.2 Land Use and Location Efficiency

a) Review and amend state/local policies that encourage sprawl (e.g., funding, econ. development, property taxes, zoning)
b) Target Infrastructure Funding (transportation, utilities, schools) and development incentives to efficient locations
c) Infill, Brownfield Re-development.
(No state policies or incentives but some municipalities offer tax increment financing (TIF) on the redevelopment of brownfields.)
d) Transit-Oriented Development (TOD)
e) Support Smart Growth Planning & Modeling
f) Target Open Space Protection to complement smart growth, infill, etc.

2.3 Increase Low-GHG Travel Options

a) Increase/Redirect Transportation Funding for Efficient Modes
b) Improve Transit Service (coverage, frequency, convenience, quality)
c) Expand Transit Infrastructure (rail, bus, BRT)
d) Bike and Pedestrian Infrastructure
g) Initiate a Fix-it-First policy – Earmark transportation funds toward the repair of existing transportation network before funding new transportation infrastructure

For more information see memos in Appendix 3 on:

- Removing Subsidies for Sprawl (2.2a) -- Maine State Planning Office
- Transit Oriented Development (2.2d) -- Greater Portland Council of Governments
- Transportation and Open Space (2.2f) – The Nature Conservancy
- Commuter Choice (2.4a) – Greater Portland Council of Governments
- Pay as You Drive Insurance (2.4d) – Natural Resources Council of Maine
- Preferential Parking (2.4k) – Natural Resources Council of Maine

BAU Policy/Program: Executive Order 11, 3/17/04 calls for reduction in VMT by State employees, promotion of carpools, vanpools, teleconferencing, and study of telecommuting.

In 1991 Maine, established the Sensible Transportation Policy Act (STPA), which required any transportation system planning, including decisions relating to major capital expenditures, must reduce the State's reliance on foreign oil and promote reliance on energy-efficient forms of transportation. Complementing the STPA, Maine has focused on increasing transportation efficiency and providing alternatives to road building. Examples include Initiatives to promote transportation efficiency include ridesharing/park and ride and the Transit Bonus Program.

- The **Transit Bonus Program** reimburses municipalities on a dollar for dollar basis for increased municipal financial contributions to the operating costs of transit. This reimbursement is made through the Urban-Rural Initiative Program (URIP) which provides revenue sharing to municipalities out of the State Highway Fund. The Transit Bonus Program began July 1, 2003. Total distributions cannot exceed 2.5 percent of annual URIP funding and must be prorated if entitlements exceed appropriations. In its first year, the Transit Bonus Program is oversubscribed.[3]

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

Description of Assumption:

- **Given the interactive natural of land use and transportation measures it is difficult to estimate impacts of many of these policies on their own.**
- For incentives and disincentives we can make estimates for some measures (see 2.4 below)
- Lacking Maine specific smart growth studies, we refer to smart growth studies from other parts of the country (Table 2.0.a).
- As seen in Table 2.0.a below, MPO smart growth studies across the country show potential regional and statewide VMT reductions ranging from around 3-10 percent (below business-as-usual projections). The VMT savings are a result of a combination of transit improvements, land use modifications (TOD, infill, etc.) and complementary policies such as open space protection and Travel Demand Management.
- **VMT reduction from the package of measures assumed to be 1.3% in 2010 and 3.8% in 2020**
  - Based on county-by-county VMT reductions (below the baseline forecast)

Cumberland	6.5%
York	6.5%
Androscoggin	4.0%
Kennebec	3.0%
Penobscot	3.0%
Other	1.5%

  - Reductions are from baseline VMT forecast
  - Assume 1 mile driven ~ 0.97 lbs of CO_2 (based on recent US DOE and FHWA data)

- Additional DOT modeling would be useful to test these assumptions.

[3] Source: Maine Energy Policy Overview and Opportunities for Improvement (page 20-22)

Table 2.0.a: Regional VMT Reductions (based on MPO Smart Growth Studies) [4]

Study Location	VMT Reduction	Time Frame
Albany	7 - 14%	2000 - 2015
Portland, OR	6 - 8%	1995 - 2010
Puget Sound (Seattle)	10 - 20%	2000 - 2030
Sacramento	6.5%	2001 - 2015
Salt Lake City	3%	2000 - 2020
California (state-wide reduction)	2.6 - 10.3%	2000 - 2020

Note: These studies do not necessarily capture the impacts of pedestrian and bike trips. (i.e., microscale land use policies and intra-zonal trips)

- To get a location-specific sense of VMT reduction from TOD and other specific land use and smart growth policies it is also important to look at some large scale TOD efforts. The Table 2.0.b below shows that at the project level, you can achieve a 20-50% reduction in VMT from smart growth and infill projects.

Table 2.0.b **Infill VMT Reductions: Project-Based VMT Benefits**[5]

Location	Description of TOD / infill site	VMT Reduction
Atlanta, GA	138-acre brownfield, mixed-use development project	14 - 52%
Baltimore, MD	400 households and 800 jobs on waterfront infill development	55%
Dallas, TX	400 housing units and 1500 jobs located 0.1 miles from the Dallas Area Rapid Transit (DART)	38%
Montgomery County, MD	Infill site near major transit center	42%
San Diego, CA	Infill development project	52%
West Palm Beach, FL	Auto-dependent infill project	39%

- It would be ideal to model alternative transportation and land use scenarios for key regions in Maine. However, while an integrated approach is preferable one can get a sense of the potential scope of reductions by doing discrete analyses.
- For example ConnDOT conducted the following analyses as part of their GHG stakeholder process:
  - Calculated the impacts of doubled transit ridership in the state
  - Modeled the VMT and GHG impacts of shifting 25% of new population & employment growth away from suburban areas and towards central areas
- Could Maine DOT conduct similar analyses?

Costs:

- Need Maine-specific cost figures. Costs vary widely depending on the existing transit capacity (and current load factors) vs. the need for new capacity (rail and bus capital costs)

[4] Capital District Transportation Committee, *New Visions 2021*, Draft approved October 2000. Cambridge Systematics, Inc. and Parsons, Brinckerhoff, Quade & Douglas. *Making the Land Use Transportation Air Quality Connection: Analysis of Alternatives*. Vol. 5. Prepared for Thousand Friends of Oregon. May, 1996. Parsons Brinckerhoff, for the California Energy Commission. California MPO Smart Growth Energy Savings MPO Survey Findings. September, 2001. Apogee/ Hagler Bailly, for the US EPA, *The Effects of Urban Form on Travel and Emissions: A Review and Synthesis of the Literature*. April 1998.

[5] Data from: U.S. EPA. *Comparing Methodologies to Assess Transit and Air Quality Impacts of Transit Oriented Development, Review of Literature and Case Studies.* August, 2001.

- In addition, VMT savings yield the following quantifiable benefits and costs savings: economic (avoided infrastructure, fuel), environmental (air, water), health

TLU 2.4 incentives & Disincentives

Measure: **TLU 2.4a Commuter Choice**

Sector: **Transportation**

Policy Description: Promoting employer-based commuter incentives for transit and carpooling (includes transit benefits, parking cash-out, telecommuting, vanpools, preferential parking)

BAU Policy/Program:

- Executive Order drafted for state to evaluate telecommuting and other commuter choice incentives.
- Maine adopted a policy of promoting energy efficiency in transportation in 1991. The Sensible Transportation Policy Act (STPA), enacted in response to the Maine Turnpike Authority's proposal to widen the Maine Turnpike between Ogunquit and Portland, requires that due consideration be given to reasonable alternatives (such as demand management) in planning major road transportation network projects.
- Dating from 1981, Maine's ridesharing program, previously administered by DECD, provided matching funds to eligible entities for up to **50 percent of the cost** of measures such as "van pool financing and formation assistance, ride share promotion, creation of area ride share task forces, provisions of community ride share incentives, such as park and pool lots, preferential or reduced fare parking for pools on an area-wide basis." Eligible entities included "individuals, individual groups, private employers, ride share businesses or programs, civic, service, municipal, county or regional organizations, neighborhood cooperatives, nonprofit corporations and other similar entities." **While the authority for the DECD program remains on the books, it has not been funded for several years.**[6]

- Current federal incentive: Employers offer pre tax and/or subsidized transit passes or vanpool benefits of up to $100 a month pre-tax (IRS 132(f)).
- Taxable cash is offered to employees in lieu of parking benefits. Firms in California and Minnesota offer a $2 a day incentive instead of free parking.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- Currently 550 registered car- and van-poolers (plus perhaps up to 50% more that aren't registered?)
- 2020: Assume 1,000 new vanpoolers, 60 miles each way
- 2020: Assume 1,000 new carpoolers, 25 miles each way

- Note: GHG savings can also be calculated using EPA's Commuter Model
  - Parameters: rideshare, preferential parking, PCO, free transit passes, etc.

Next Steps, Data Needs:

- Is it worthwhile for Maine DOT to use the Commuter Model to estimate savings?
- List of employer-based commute programs in the state
- Is the Maine State government participating?

For more information see memo in Appendix 3 from Greater Portland Council of Governments.

[6] Source: Maine Energy Policy Overview and Opportunities for Improvement (page 21)

Measure: **TLU 2.4b VMT Tax**

Sector: **Transportation**

Policy Description: Tax on the number of miles driven per year per vehicle with revenues targeted towards low-GHG travel alternatives

BAU Policy/Program: None.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured with VMT reduction packages (above)**
- May be more effective at raising revenues for low-GHG alternatives than at modifying behavior

Data Needs:
- Current VMT in Maine
- Annual vehicle registrations – one method of applying the tax would be at the point of registration

Measure: **TLU 2.4c Fuel Tax with targeted use of revenues**

Sector: **Transportation**

Policy Description: A fuel targeted to a low-GHG option such as funding transit, hybrid vehicles, etc with revenues targeted towards low-GHG travel alternatives.

BAU Policy/Program: Current Maine taxes are 24.6 cents per gallon for gasoline, and 25.7 cents per gallon for diesel. Both will increase again this July due to inflation.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured with VMT reduction packages (above)**
- May be more effective at raising revenues for low-GHG alternatives than at modifying behavior
- Legal implications: May need state constitutional amendment
- Tax could be phased over time

Measure: **TLU 2.4d Pay As You Drive Insurance**

Sector: **Transportation**

Policy Description: Pay-As-You-Drive Insurance (also called Distance-Based Vehicle Insurance, Mileage-Based Insurance, Per-Mile Premiums and Insurance Variabilization) means that a vehicle's insurance premiums are based directly on how much it is driven.

BAU Policy/Program: (Insurers typically reduce a premium for low-mileage customers, but a pay-as-you drive scheme ties the premium to actual, measured VMT, either through odometer readings or GPS.)

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Working Group assumed per-vehicle VMT reduction: 10%**
  - VMT reductions range between 2-10% VMT, for more in information see, http://www.vtpi.org/tdm/tdm79.htm or http://www.environmentaldefense.org/article.cfm?ContentID=2205&Page=3

- **Penetration rate: 1% of Maine vehicles in 2010 (pilot program)and 50% in 2020**

- **Note: DOT should determine if savings depend upon or overlap with GHG savings from transit and smart growth measures.**

For more information see memo in Appendix 3 from Natural Resources Council of Maine.

Measure: **TLU 2.4f Location Efficient Mortgage**

Sector: Transportation

Policy Description: Location-Efficient Mortgages (LEM) – is a discounted mortgage that recognizes the savings available to people who live in location efficient communities, mixed-use communities near public transportation.

BAU Policy/Program: ?

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

Per capita automobile travel is often 20-50% lower in Location Efficient Mortgages than in automobile-dependent, urban fringe locations. Table 2.0.b (above) summarizes the projected VMT reduction impacts of various LEM and infill efforts.

Key Data Needs & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured with VMT reduction packages (above)**
- Need to define size and scope of pilot program (e.g., number of households participating)
- Actual travel impacts may vary depending on household preferences and demographics, neighborhood conditions, and travel choices. See http://www.vtpi.org/tdm/tdm22.htm and http://www.nhi.org/online/issues/103/lem.html

Measure: **TLU 2.4j VMT Offset Requirements from large developments**

Sector: Transportation

Policy Description: Require developer to offset automobile emissions attributed to their development (e.g., through transportation infrastructure changes, incentives for low-GHG modes, building efficiency improvements, tree planting, purchases of emission credits, etc.)

BAU Policy/Program: ?

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG-savings assumed to be captured with VMT reduction packages (above)**

Data Needs:
- What level of offset should be required?
- How should the threshold be set (based on generated GHG emissions?)
- Travel characteristics (trips generated, trip length, mode, etc.)

TLU 3.0 FUEL MEASURES

For more information, see memo in Appendix 3 from the fuels sub-group.

Measure:	**TLU 3.1 Set a Low-GHG Fuel Standard**

Sector: **Transportation**

Policy Description: Require minimum low-GHG fuel content in all fuel sold in the state

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- 2020: 100% of gasoline sold in Maine is E-10 (10% ethanol)
- 2020: 100% of diesel sold in Maine is B-5 (5% biodiesel)
- E-10 GHG Savings: 2.6% (corn, 2010), 9.2% (wood, 2020) (from GREET)
- B-5 GHG Savings: 3.9% (from GREET)

Heat Content: Btu/gal (net) (based on US DOE)

- Gasoline: **115,400**
- E-10: **111,427**
- Diesel: **128,700**
- B-5: **128,120**

Costs (from fuels sub-committee):

- B-5: $0.05/gallon premium
- E-10: $0.02/gallon premium

Measure:	**TLU 3.2 Low GHG Fuel for State Fleets**

Sector: **Transportation**

Policy Description: Provide non-petroleum, renewable fuel or other low GHG-fuels for State Fleets

BAU Policy/Program:

In 2003 the 121st Maine Legislature passed a Resolve requesting the Maine Department of Environmental Protection and the Maine Department of Transportation to conduct a comprehensive study of the costs and benefits of various alternative energy sources for state government actions (S.P. 388 - L.D. 1184).

Executive Order 11, 3/17/04 calls for improvements in the fuel economy of the State fleet, and use of cleaner and renewable fuels.

1992 EPACT requires states to increase use of non-petroleum state fleet vehicles. Maine is meeting its EPACT compliance goals (as of October 2003)[7]. *Note: The GHG impacts of this policy are uncertain.*

- DOT purchased 8,400 gallons of biodiesel to date for their Freeport facility.
- Question: Does Executive Order 2003 impact-low GHG fuels?

[7] Source: Maine Energy Policy Overview and Opportunities for Improvement (page 21)

- The Department of Administrative and Financial Services (DAFS) is charged with developing recommendations for fuel efficiency and emissions standards for heavier duty vehicles by January 1, 2004, and agencies are directed to promote the procurement of dedicated alternative fuel vehicles, dual-fuel vehicles and fueling infrastructures to support such vehicles. DAFS was also given until January 15, 2003 to ensure that these policies are reflected in the procurement policies of the State.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- 2020: 50,000 FFVs running on E-85
- 2020: 1.5% of heavy duty vehicles run on B-20 (state, local, private fleets)
- E-85 GHG Savings: 24% (corn, 2010), 70% (wood, 2020) (GREET)
- B-20 GHG Savings: 26% (GREET)

Heat Content: Btu/gal (net) (based on US DOE)

- Gasoline: **115,400**
- E-85: **81,630**
- Diesel: **128,700**
- B-20: **126,379**

- Total state motor fuel usage for fiscal year 2003 was 6.57 million gallons.
- State vehicles consume ~ 1% of the total highway transportation fuel used in Maine.
- Large fleets include the DOT, general fleet (Bureau of General Services) and the State Police.
- Passenger fleet vehicles by type (e.g., petroleum, CNG, LPG, E85, etc)

Costs (from fuels sub-committee)**:**

- E-85: $0.20/gallon premium
- B-20: $0.20/gallon premium
- E-85 Infrastructure: 100 new tanks at $10,000 = $1 million*
- B-20 Infrastructure: 100 new tanks at $10,000 = $1 million*

* Costs could be lower if these are replacement tanks

There are currently 951 chambers that hold diesel, and 2605 chambers that hold one of the various gasoline products. Data are not available for aboveground tanks.

Measure: **TLU 3.3 Low-GHG Fuel Infrastructure (CNG, LPG)**

Sector: **Transportation**

Policy Description: Expand infrastructure for compressed natural gas and propane.

BAU Policy/Program: Limited infrastructure at present

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

New Vehicles

Light Duty	**2010**	**2020**
CNG	34	165
Propane	41	197

Heavy Duty	**2010**	**2020**

CNG	48	230
Propane	226	1086

- Lifecycle GHG Savings: 28.5% for CNG and propane (CARB)

- Heat Content: Btu/gal (net) (based on US DOE)
- Gasoline: **115,400**
- Propane: **84,500**
- Assume gasoline displaced (introduces slight error)

Costs (from fuels sub-committee)**:**
- CNG: assume no premium compared to gasoline
- LPG: $0.30/gallon premium

Vehicle Incremental Costs (thousand)

	2010	2020
LDV	$4	$2
CNG HDV	$25	$12.5
LPG HDV	$12	$6

- CNG Infrastructure: ≈$2.8 M*
- CNG maintenance & storage: ≈$3.2M*
- LPG Infrastructure: ≈$0.3M.*

* Some costs could be absorbed by private sector as market penetration increases

Measure: **TLU 3.4 Hydrogen Infrastructure**

Sector: **Transportation**

Policy Description: Support research on low-GHG hydrogen vehicle technology and infrastructure. This could include such components as: fuel cells, how best to facilitate the development of alternative fuel infrastructure and refueling networks, pilot projects and R&D and /or incentives.

BAU Policy/Program: ?

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Emissions reductions by 2020 unlikely**
- Automakers and oil companies expect commercialization of H_2 fuel cell vehicles to be 10-40 years away.
- Current H_2 fuel cell vehicle costs range from $500,000 to $1,000,000
- Filling stations cost $300,000 to $2,000,000 (would need H_2 at about 25% gas stations)
- Many technical challenges (H_2 storage, vehicle range, low temperature operation)
- Efficiency potential similar to hybrid-electric vehicles
- GHG savings dependent on affordable, low-GHG sources of H_2 (renewable, fossil with carbon capture and sequestration or nuclear)

Future Technology Discussion

Hydrogen has been touted as the transportation fuel of the future. Since the product of utilizing hydrogen for energy is only water, it is seen as one of the few choices of vehicle fuels with low GHG emissions, and it has the potential to achieve significant GHG reductions by reducing oil consumption. The technology is not yet commercially viable; the most optimistic assessment is that it will not become cost-effective and feasible until 2020 at the earliest. Barriers to the development of hydrogen as a significant transportation fuel include problems related to cost, durability, and fuel supply. Mobile fuel cell costs are currently prohibitively expensive: the U.S. Department of Energy (DOE) estimates that costs would have to fall by a factor of 100 and the durability of the technology would have to rise fourfold to make the technology commercially viable. The storage and delivery of hydrogen presents additional challenges and costs. Widespread use of hydrogen would require the development and installation of a completely new (and untried) fuel transmission and delivery infrastructure, at an estimated cost of $600 billion nationally.

Even if the cost and technical problems were resolved successfully, the potential of hydrogen as a GHG mitigation measure would remain uncertain, because the net environmental benefits (or costs) will depend upon the method used to produce the hydrogen. At present, this process requires electricity generated from power plants, which are a significant source of GHG emissions in their own right. On average, in a fuel cell car the use of hydrogen produced with electricity purchased from a typical grid in the United States will produce more net GHGs, NO_x, and other pollutants than the low-emission gasoline-electric hybrid Toyota Prius. Hydrogen can also be produced with natural gas, but in terms of energy output the combustion of natural gas has been shown to be far more efficient in combined cycle or combined heat and power applications, technologies that can achieve emission reductions in the electric power industry. It thus appears that hydrogen would have to be produced from electricity generated from sources with zero GHG emissions (e.g., wind and other renewables, nuclear power) or new hydrogen production methods would have to be developed if hydrogen fuel cells are to become a useful measure for mitigating GHG emissions from transportation in Maine and elsewhere.

TLU 4.0 FREIGHT
TLU 4.2 Freight Vehicle Operatoin

Measure:	**TLU 4.2d Encourage Anti-Idling Measures**

Sector: **Transportation**

Policy Description: Support programs to fund infrastructure or develop incentives to reduce truck, locomotive, and marine engine idling through electrification and other technologies, enforcement, and congestion management.

BAU Policy/Program: Maine DOT Intelligent Transportation System Commercial Vehicle Operation work group is working on a system for pre-clearance at scale houses.

- "A prominent state policy shift relating to the conservation of mobility occurred in the late 1990s in the area of access management. In an effort to conserve highway capacity and in keeping with the spirit of the STPA, the State became focused on the number and placement of driveways on arterials. Driveways add turning movements which in turn impede through traffic, reduce highway capacity and ultimately, with enough driveways on an arterial, lead to congestion and the inefficient use of energy for transportation. *The historic solution has been to build another road and go through this same cycle one more time. Building a new road has further negative energy implications. The State's change in policy seeks at a minimum to slow this cycle down and preferably end it."*[8] (italics added)

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Penetration Rate: 25% of diesel use in 2010 & 2020**
  - Diesel carbon baseline adjusted for AEO + Maine diesel VMT
- Assumed efficiency gains: **2.5% reduction in MMTCO2 per truck in 2010, increasing to 5.9% reduction per truck in 2020** (conservatively based on anti-idling technologies cited below)
- Potential for anti-idling technologies[9] (% fuel savings per truck):
  - Reduction (Direct-Fire Heater) 3.4%
  - Idling Reduction (APU) 8.9%
  - Idling Reduction (Automatic Engine Idle) 5.9%

Data Needs:

- Freight and HDV vehicle inventories, characteristics (truck and rail)
- Congestion management system approaches in Maine (beyond road expansion measures cited above)
- Potential for Truck Stop Electrification (~30% GHG emissions reductions) and list of freight rail commodities in Maine that could be shifting to TSE (refrigerated goods, etc) (Argonne National Lab)

Key Data Sources:
1) Guidance Document: "Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity" (EPA420-B-04-001, January 2004)

[8] Source: Maine Energy Policy Overview and Opportunities for Improvement (page 21)
[9] Jeffrey Ang-Olson and Will Schroeer, ICF Consulting. "Energy Efficiency Strategies for Freight Trucking: Potential Impact on Fuel Use and GHG Emissions." *2001 Annual Transportation Research Board Meeting*.

2) Guidance Document: "Guidance for Quantifying and Using Long Duration Switch Yard Locomotive Idling Emission Reductions in State Implementation Plans" (EPA420-B-04-002, January 2004) www.epa.gov/smartway/

3) Argonne National Laboratory Idling study (forthcoming)

Measure:	**TLU 4.2e Maintenance and Driver Training (Freight)**

Sector: **Transportation**

Policy Description: To encourage more energy efficient driving habits

BAU Policy/Program: NA

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Penetration rate: Based on 25% of diesel CO_2 emissions in 2010 & 2020**
- **Efficiency improvement 3.8% reduction in diesel use (per truck)**
- **This would result in savings of 19.1 thousand $MTCO_2$ in 2020 (not included in summary table).**
  - ICF paper cited above indicates 3.8% fuel efficiency savings (per truck) from driver maintenance and training

For more information, see memo in Appendix 3 from Natural Resources Council of Maine.

TLU 4.3 Intermodal Freight Initiatives

Measure:	**TLU 4.3a Develop and fund a long-term regional infrastructure plan for rail and marine**

Sector: **Transportation**

Policy Description: Develop infrastructure plan for providing alternatives to freight trucks, including enhanced freight rail infrastructure and intermodal transfer facilities (rail-to-truck and rail-to-barge). Such alternatives use less energy than freight trucks and thus offer a low-GHG alternative for goods delivery.

BAU Policy/Program: Funded since the latter 1990's through Transportation Bond Issues, the **Industrial Rail Access Program (IRAP)** is designed to provide 50 percent matching grants to the private sector for projects that will connect, reconnect or expand rail service for industrial uses, build rail market share and consequently improve the financial viability of rail freight service.

The Maine Department of Transportation has produced the Maine Integrated Freight Plan, which emphasizes the use and expansion of rail and marine.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Penetration: 1% shift to rail or marine in 2010, 10% shift in 2020**
    - **Truck traffic in New England is expected to increase by more than 50% by 2025, this assumes a fraction of the growth occurs in other modes**
- **Energy Savings: 75% energy savings vs. trucks**
- **This would result in savings of 123 thousand $MTCO_2$ in 2020 (not included in summary table).**

- Requires regional coordination on infrastructure planning and development

Data Needs:
- Freight vehicle inventories (truck and rail)
- Freight load factors for Maine (truck and rail)
- Vehicle load factors for Maine (truck and rail), Off-road vehicles by type
- Cost savings from delays for freight (initial data provided by MEDOT)

Sources:
- Reconnecting America, www.reconnectingamerica.org
- AASHTO's Freight-Rail Bottom Line Report, http://freight.transportation.org/doc/FreightRailReport.pdf
- TRB's Freight Capacity for the 21st Century http://books.nap.edu/html/SR271/SR271.pdf
- Mineta Institute's Trucks, Traffic, and Timely Transport, http://transweb.sjsu.edu/publications/mti_02_04.htm
- I-95 Corridor Coalition's Mid-Atlantic Rail Operations Study, http://www.i95coalition.org

Measure: **TLU 4.3b Remove Obstacles to Freight Rail**

Sector: **Transportation**

Policy Description: A program to categorize, rank and remove obstacles to freight rail

BAU Policy/Program: ?

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Savings included in 4.3a**
- **Question:** Is Maine's rail property tax system comparable to surrounding states?
- Understand where the need exists to raise bridges and tunnels to better accommodate freight rail

Measure: **TLU 4.3c Develop Intermodal Transfer Facilities**

Sector: **Transportation**

Policy Description: Develop and support intermodal networks

BAU Policy/Program: The **Industrial Rail Access Program (IRAP)** is designed to provide 50 percent matching grants to the private sector for projects that will connect, reconnect or expand rail service for industrial uses, build rail market share and consequently improve the financial viability of rail freight service.

Waterville Intermodal Freight Facility & the Maine Integrated Freight Plan, which emphasize the use of rail and marine.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:
- **Savings included in 4.3a**
- How much barge shipping is done in Maine

- How has the Waterville Facility benefited the state in terms of cost savings and emissions reductions?
- There is also a role for the Congestion Mitigation Air Quality Program first established under TEA-21. This offers federal matching funds from freight rail project which have a measurable and quantifiable impact on air quality

TLU 4.4 Freight Incentives & Disincentives

Measure: **TLU 4.4a Procurement of low-GHG Fleet Vehicles (Freight)**

Sector: **Transportation**

Policy Description: Establish incentives and initiatives to encourage acquisition of low-GHG vehicles in public, private, and State fleets.

BAU Policy/Program: The Department of Administrative and Financial Services (DAFS) is charged with developing recommendations for fuel efficiency and emissions standards for heavier duty vehicles by January 1, 2004, and agencies are directed to promote the procurement of dedicated alternative fuel vehicles, dual-fuel vehicles and fueling infrastructures to support such vehicles. DAFS was also given until January 15, 2003 to ensure that these policies are reflected in the procurement policies of the State.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG savings not estimated.**

Data Needs:

- Heavy duty fleet inventories, characteristics

TLU 5.0 INTERCITY TRAVEL

Measure:	**TLU 5.1 Develop and fund high-speed passenger rail** **TLU 5.2 Integrated Aviation, Rail, Bus Networks**

Sector: **Transportation**

Policy Description: High-speed rail (HSR) service can reduce passenger-car VMT and short-haul air travel, both of which can lead to reductions in GHG emissions in the region. Integrated HSR, bus and airport networks can foster optimal travel mode choice. Intercity travel networks need to be examined on a regional basis (i.e., Northeastern US and Eastern Canada).

BAU Policy/Program: The **Downeaster/Amtrak passenger rail service** was inaugurated in December of 2001 and has since nearly hit its long-term ridership projections. Current plans to extend service to Brunswick and Auburn will expand access to a broader base of Maine's population. Connections with Freeport, Maine's largest destination attraction, will enhance overall service viability.[10]

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **Short-haul flights are approximately 50% of all flights**
- **Penetration rate: 1% of short haul flights in 2010, 10% in 2020 would result in GHG savings of 1.7 kMTCO2 in 2020**
- **High speed rail and intercity buses use 75% less energy than short-haul flights** (FRA, DOE)

Data Need:

- Need Maine-specific data

Sources:

Reconnecting America, www.reconnectingamerica.org
FRA, "High Speed Ground Transportation for America", 1997
FRA data on high speed rail energy intensity
DOE data on intercity bus energy use

[10] Source: Maine Energy Policy Overview and Opportunities for Improvement (page 20-22)

TLU 6.0 OFF-ROAD VEHICLES

Measure:	**TLU 6.1 Incentives for Purchase of Efficient Vehicles/Equipment**

Sector: **Transportation**

Policy Description: Provide incentives for purchase of efficient vehicles/equipment.

BAU Policy/Program: The Department of Administrative and Financial Services (DAFS) is charged with developing recommendations for fuel efficiency and emissions standards for heavier duty vehicles by January 1, 2004, and agencies are directed to promote the procurement of dedicated alternative fuel vehicles, dual-fuel vehicles and fueling infrastructures to support such vehicles. DAFS was also given until January 15, 2003 to ensure that these policies are reflected in the procurement policies of the State.

- Clean Marine Initiative, marine engine retailers pledged to accelerate the sale of low emission marine outboard motors. The target for accelerated sales of the 2006 compliant engines is as follows:
    - 2002: 75% or more
        - **Total 2002 sales were 223 low polluting engines** (≈ 95% of total)
    - 2003: 80% or more
    - 2004-2005: 95 % or more

- Bond Amendment prohibits states to regulate emissions of nonroad engines under 50 hp. [
    - (other incentives are not prohibited)

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- **GHG savings not estimated.**
- According to EPA, the 2006 marine outboard 4-stroke or 2-stroke direct fuel injection engines burn 35-50% less gas, use up to 50% less oil and reduce air emissions by 75% or more.

Data needs:

- Average engine energy use
- Projected sales

TLU 8.0 REDUCE BLACK CARBON FROM DIESELS

Measure: TLU 8.1. Clean Diesel Technologies to reduce Black Carbon

Sector: **Transportation**

Policy Description: Scientists have identified BC, a component of diesel particulate matter (PM), as having a large and fast-acting warming impact on the atmosphere.[11, 12] While there is still significant uncertainty on the exact climate impacts of black carbon emissions, the Working Group decided that the issue is worth serious consideration given the magnitude of the potential impact. Diesel engines emit roughly half of the BC in the United States. This program would provide incentives to accelerate the use of lower sulfur diesel and to accelerate adoption of engine improvements and tailpipe control technology to reduce emissions of BC.

BAU Policy/Program: Clean School Bus USA Grant is funding diesel oxidation catalysts retrofits for 266 Maine school buses.

The Maine School Bus Retrofit program includes two contractors:

- Donaldson Company will supply approximately 200 buses with a DOC muffler plus Spiracle crankcase filter system which removes all crankcase emissions. Total emission reductions from the tailpipe and crankcase are <40% PM reduction, 40% CO reduction and 50% HC reduction.
- Clean Diesel Technologies will supply a fuel borne catalyst (fuel additive) and DOC, Platinum Plus Purifier System, to three school districts as a pilot demonstration program. (Approximately 75 buses) CDT claim by using the FBC the districts can save an annual fuel consumption of 7%. Thereby a reduction of CO_2 as well. The FBC alone in diesel fuel (500 ppm) has consistently shown to reduce 15-25% of the PM emitted from the engine which is predominantly the elemental carbon (black carbon) portion while the DOC element of the system reduces the soluble organic fraction of the particulate.

Data Needs, Sources & Assumptions for Preliminary GHG Savings and Cost Estimates:

- See baseline discussion on BC emissions estimation
- For more information see black carbon memos from Environment Northeast in Appendix 3.

Table 8.1 Clean Diesel Technology (data needs)

Data Need	Assumption	Source
Diesel fuel used in Maine	194 M gallons in 2002	ME DOT
Diesel vehicle inventory, projections	Registered in-state: 11,720 (>26,000 GVW) Farm – 1,030 School Bus – 2845 (> 15 passenger) Commercial Bus – 746 (>15 passenger) Construction? Railroad locomotive? Vessel?	ME DOT
State diesel use	State heavy vehicle use in 2002 was 1,951,394 gallons [1% of total].	ME DOT
Performance of BC reduction technologies (% BC reduced)	• Diesel Particulate Filter: 90% • High-performance Diesel-oxidation	Environment Northeast (ENE)

[11] James Hansen and Larissa Nazarenko, "Soot climate forcing via snow and ice albedos," *Proceedings of the National Academy of Sciences*, vol. 101, no. 2, 423-428, January 2004.

[12] Mark Z. Jacobson, "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming," *Journal of Geophysical Research*, Vol.107, No.D19, p. ACH 16, 1-22, 2002.

Table 8.1 Clean Diesel Technology (data needs)		
Data Need	**Assumption**	**Source**
	catalysts (DOC): 25% • Early Retirement: 99% • Standard DOC: 0% • Crank Case Emissions	
Current cost of BC reduction technologies	DPF: $4,500 - $9,000 DPF (large construction): $12,000 High-performance DOC: $3,500 Vehicle retirement (partial): $10,000 - $50,000	ENE
Cost per ton of BC reduction	$6 -14 per $MTCO_2$ (7% discount rate, over 17 years)	CCAP based on ENE
BC Emission Factor	0.0090349 metric tons of BC per 1000 gallons of diesel	Energy &Environmental Analysis, Inc.
BC :: Carbon equivalence ratio	220 – 550 (220 used for calculations)	Jacobson
Technology Mix and Weighted Savings	Tech Penetration x Savings Filters: 50% x 90% = 45% Super DOCs: 25% x 25% = 6% Retirements: 25% x 99% = 25% Weighted Av. Savings 76% Without Retirements **50% (used for savings calculation)**	ENE
Penetration Rate	2010: 33% 2020: 100%	ENE
GHG Savings	2010: 17% 2020: 50%	ENE
Air Quality improvements	• ULSD + filters: 90% reductions in, PM, toxics, CO and hydrocarbons • High-performance DOCs: 50-60% reductions in PM, and cut about 70% CO and hydrocarbons. • Use of ULSD: reduce PM by up to 20% in certain types of vehicles. • Other environmental benefits: improved visibility in state and federal parks.	ENE
Health Benefits	• Mitigation of diesel PM delivers avoided: - health costs typically associated with fine particulates, including: asthma attacks, heart attacks, emergency room visits, lost school and work days, premature death - cancer risk associated with extended exposure to diesel toxic emissions - Relief of acute exposures for children riding school buses, elderly riding transit buses, and occupational exposures for construction workers, truckers, other drivers.	ENE

APPENDIX 1: Potential Transportation and Land Use GHG Reduction Opportunities

The following notation was used in the table below:

- *Options that were popular choices in other states, potentially high Maine GHG reduction options, or both (originally denoted by CCAP, reviewed by Stakeholders)
- *? For *'d options to which at least one member of the Stakeholder Advisory Group expressed uncertainty about it being important in Maine
- *! For options not previously marked with a *, which at least one member of the Stakeholder Advisory Group thought should be a priority
- Some additional comments from stakeholders are highlighted in the list

Status Legend:

NI: **Not Identified** for pursuit by Working Group or Stakeholder Advisory Group, but included in CCAP's original list of GHG mitigation options

D: **Dropped**. Originally selected for evaluation and consideration by Stakeholder Group or Working Group, but dropped by the Working Group.

C: **Combined** with another option (list which option)

R: **Referred** to another working group (name working group)

F: **Future** technology. Technology not commercially viable at present, but flagged for monitoring and possible future pursuit.

WG: Working Group proposing this option

NC: No consensus

ND: Not discussed by WG

	Transportation and Land Use Sector GHG Reduction Opportunities	
1	**Passenger Vehicle GHG Emission Rates**	**Status**
1.1	***Vehicle Technology***	
1.1.a	***Implement Tailpipe GHG Emission Standards** - Implement policies to reduce GHG tailpipe emission rates (grams CO_2 -equivalent per mile), such as regulatory standards or an alternative approach. –Avoiding 3rd car problem	NC
1.1.b	**Adopt Advanced Technology Component (formerly ZEV) of LEV II Standards ADOPTED LEVII but not ZEV mandate**	NC
1.1.c	*!**Fund R&D on Low-GHG Vehicle Technology** (e.g., fuel cell, hybrid electric vehicles)-low hanging fruit	ND
1.1.d	**Encourage the use of add-on technologies** (e.g., Low Friction Oil, Low Resistance Tires)	NI

1.2	***Vehicle Operation***	
1.2.a	**Enforce Speed Limits** (thereby reducing fuel use)	NI
1.2.b	**Vehicle Maintenance, Driver Training** – To encourage more energy efficient driving habits	NI
1.2.c	**Transportation System Management** – The use of technology, signage and other measures to mitigate traffic congestion –need to look at regional/local system enhancements	NI
1.3	***Incentives & Disincentives***	
1.3.a	**Procurement of Low-GHG Fleet Vehicles** - Establish incentives and initiatives to encourage acquisition of low-GHG vehicles in public, private and state fleets.	C 3.2
1.3.b	*__Feebates (state or regional)__ - Under a feebate system, purchasers of high CO_2 emitting vehicles would pay a fee, while purchasers of low CO_2 emitting vehicles would receive a rebate. Can be designed to be revenue neutral and regional.	NC
1.3.c	**Implement CO_2-based registration fees**	NI
1.3.d	*__Provide Tax Credits for Low-GHG Vehicles__ – An incentive for car buyers to purchase a low-GHG emitting vehicle	C 1.3b
2	**Slowing VMT Growth**	
2.1	*__Develop packages to slow VMT growth/reduce VMT__ - Increase availability of low-GHG travel choices, such as transit (rail and bus), vanpools, walking and biking. Provide complementary land use polices and incentives to improve the attractiveness of low-GHG travel choices.	WG
2.2	***Land Use and Location Efficiency***	
2.2 a	*__Review and amend state/local policies that encourage sprawl__ (e.g., funding, econ. development, property taxes, zoning)	WG
2.2.b	*__Target Infrastructure Funding (transportation, utilities, schools) and development incentives to efficient locations__	WG
2.2.c	**Infill, Brownfield Re-development*	WG
2.2.d	**Transit-Oriented Development*	WG
2.2.e	**Support Smart Growth Planning & Modeling*	WG
2.2.f	*__Target Open Space Protection to complement smart growth, infill, etc.__	WG
2.3	***Increase Low-GHG Travel Options***	
2.3.a	**Increase/Redirect Transportation Funding for Efficient Modes*	WG
2.3.b	*__Improve Transit Service__ (coverage, frequency, convenience, quality)	WG
2.3.c	*__Expand Transit Infrastructure__ (rail, bus, BRT)	WG
2.3.d	*__Bike and Pedestrian Infrastructure__	WG
2.3.e	**Transit Marketing and Promotion**	NI
2.3.f	**HOV lanes**	NI
2.3.g	*__Initiate a Fix-it-First policy__ – Earmark transportation funds toward the repair of	ND

	existing transportation network before funding new transportation infrastructure	
2.3.h	**Transit Prioritization (signal prioritization, HOV lanes)**	NI
2.3.i	**Encourage Telecommute and Live-Near-Your-Work Programs**	C 2.4a
2.3.j	**Encourage car sharing initiatives**	NI
2.4	***Incentives & Disincentives*** - Establish incentives and initiatives to encourage low-GHG travel behavior including:	WG
2.4.a	**Commuter Choice** – Promoting employer-based commuter incentives for transit and carpooling	WG
2.4.b	**VMT Tax** – Tax on the number of miles driven per year per vehicle with revenues targeted towards low-GHG travel alternatives	ND
2.4.c	**Increased Fuel Tax with Targeted Use of Revenues** – A fuel targeted to a low-GHG option such as funding transit, hybrid vehicles, etc with revenues targeted towards low-GHG travel alternatives. May need constitutional change to implement	ND
2.4.d	**Pay As You Drive Insurance (PAYD)** - Automobile insurance, in which premiums for a vehicle are based on how much it is driven – May already be in place in ME	NC
2.4.e	**Road Pricing (or tolls) with Targeted Use of Revenues** – Use tolls or congestion pricing to fund alternatives to the single occupant vehicle	C 2.4b
2.4.f	**Location-Efficient Mortgages (LEM)** – is a discounted mortgage that recognizes the savings available to people who live in location efficient communities, mixed-use communities near public transportation.	R: Bldgs WG
2.4.g	**Parking Pricing or Supply Restrictions** – Limit or assess a premium for parking in areas where transit is convenient and highly accessible (e.g., in downtown core, near universities, etc.)	NI
2.4.h	**Transit Repositioning** – Strategies to make transit more competitive in the marketplace	NI
2.4.i	**Transit Pricing Incentives** - To promote transit use (e.g., fare cards, discounts)	NI
2.4.j	**VMT/GHG Offset Requirements for Large Developments** – Require developer to offset automobile emissions attributed to their development (e.g., through tree planting, open space preservation, purchasing emission credits, etc.)	ND
2.4.k	**Benefits for Low GHG Vehicles** (preferential parking, use of HOV lanes)	WG
3	**Fuel Measures**	
3.1	**Set a Low-GHG Fuel Standard** (e.g., biodiesel, ethanol)	NC
3.2	**Low-GHG Fuel for State Fleets (**e.g., biodiesel)	NC
3.3	Low-GHG Fuel Infrastructure (CNG, LPG)	NC
3.4	**Low-GHG Fuel Infrastructure Development (e.g., hydrogen)** - Assess how best to facilitate the development of alternative fuel infrastructure and refueling networks through measures such as pilot projects, research and development, and incentives.	F
4	**Freight**	
4.1	***Vehicle Technology***	
4.1.a	**Vehicle Technology Improvements** (e.g., aerodynamics)	NI
4.1.b	**Fund R&D on Low-GHG Vehicle Technology**	NI
4.1.c	**Clean Diesel technologies to reduce Black Carbon** -- Provide incentives to accelerate	Moved

	use of lower sulfur diesel, and to accelerate adoption of engine improvements and tailpipe control technology (e.g., particulate traps) to reduce emissions of black carbon (BC).	to 8.1
4.2	***Vehicle Operation***	
4.2.a	**Improve Freight Logistics e.g., through the use of GIS**	NI
4.2.b	**Enforce Speed Limits** (thereby reducing fuel use)	NI
4.2.c	**Improve load efficiency** (e.g., reduce empty back-hauls, etc.)	NI
4.2.d	*?**Encourage Anti-Idling Measures** (e.g., Truck Stop Electrification, pre-clearance at scale houses, enforcement)	WG
4.2 e	*!**Maintenance and Driver Training** - To encourage more energy efficient driving habits sugg–Make it easier to fill tires with air	ND
4.3	***Intermodal Freight Initiatives***	
4.3.a	**Develop and fund a long-term regional infrastructure plan for rail and marine*	ND
4.3.b	*?**Remove obstacles to freight rail** (e.g., raise bridges, etc.) **(Would like to see analysis of air quality benefits)**	ND
4.3.c	**Develop intermodal transfer facilities** (rail-truck, rail-barge, etc.)	ND
4.3 d	**Review and remove policies that disadvantage freight rail** (e.g., taxes)	NI
4.4	***Incentives & Disincentives***	
4.4.a	**Procurement of low-GHG Fleet Vehicles** - Establish incentives and initiatives to encourage acquisition of low-GHG vehicles in public, private and state fleets.	ND
4.4.b	*!*Incentives to retire or improve older, more polluting Vehicles—ME has high proportion of older vehichles*	ND
4.4.c	**Increased Truck Tolls or Highway User Fees and target revenues to GHG reduction policies**	NI
	Increase Truck Weight on Interstate from Falmouth north?	NC
5	**Intercity Travel: Aviation, High Speed Rail, Bus**	
5.1	**Develop and fund high-speed passenger rail** (as part of a long term regional transportation plan)	ND
5.2	**Integrated Aviation, Rail, Bus Networks**	ND
5.3	**Aircraft emissions** – more efficient operation of the aircraft and runway management	NI
5.4	**Airport Ground Equipment** (cleaner fuels, i.e., electric, natural gas, etc.)	NI
6	**Off-Road Vehicles (construction equipment, out-board motors, ATVs, etc)**	
6.1	*!*Incentives for Purchase of Efficient Vehicles/Equipment –Big opportunity*	ND
6.2	**Improved Operations, Operator Training** - To encourage more energy efficient operating habits	NI
6.3	**Maintenance Improvements** – To ensure the vehicles run at peak efficiency	NI
6.4	**Increased Use of low-GHG vehicles**	NI
7	**Cross Cutting Issues**	
7.1	**Education** - Raise public awareness about the benefits of low-GHG travel options (e.g., hybrids, transit), including available incentives (e.g., tax credits, LEMs).	ND
7.2	**Improve GHG Data Collection**	WG
7.3	**Air Quality Benefits from GHG Plans** (e.g., State Implementation Plan (SIP) credit)	NI

7.4	**GHG Registry & Emissions Trading**	ND
8	**Clean Diesel Technologies to reduce Black Carbon**	
8.1	*__Clean Diesel technologies to reduce Black Carbon__ -- Provide incentives to accelerate use of lower sulfur diesel, and to accelerate adoption of engine improvements and tailpipe control technology (e.g., particulate traps) to reduce emissions of black carbon (BC).	WG
9	**Other**	
9.1	**Provide incentives to promote local agriculture** (reduce long-haul freight)	ND

APPENDIX 2: Proposed Criteria for Assessing and Prioritizing GHG Measures

PRIMARY CRITERIA	**Indicators that would be assessed by CCAP to the extent possible using the best available data for each option.**
GHG Impact	Total annual GHG's reduced in relevant target years in carbon equivalents. This is typically expressed as an average annual level of projected MMTCE reduction in a given year beyond baseline emissions. GHG impacts must be quantified in order to aggregate measures toward a numerical target.
Cost-Effectiveness	Direct net cost divided by the GHG impact (expressed in dollars per metric ton of carbon equivalent) and is typically expressed in a given year as an average annual value over the life of the action. Costs may be expressed as a range.
SECONDARY CRITERIA	**Indicators that would be assessed by CCAP, the Working Groups, or both when relevant for a particular option using best available data. These impacts may not be readily quantifiable.**
Ancillary Environmental Impacts	Environmental impacts other than GHG emissions reductions, including public health and ecosystem impacts from changes in air quality or other environmental indicators. These impacts may not be readily quantifiable.
Ancillary Economic Impacts	Economic impacts other than direct costs or benefits of GHG reduction actions (e.g. economic development, cost savings for other actions). These impacts may not be readily quantifiable.
Equity Effects	Measure disproportionately affects a population, sector or a region of the state or affects the state's competitive position relative to other states. These impacts may not be readily quantifiable.
Public and Political Support/Concern	Expected support and or concern from the general public and from policymakers. These impacts may not be readily quantifiable.
Feasibility	Ease of implementation and administration by implementing parties. These impacts may not be readily quantifiable.
Compatibility	Measure reinforces or enhances the effectiveness of other policy programs, or is required for other measures to work. These impacts may not be readily quantifiable.
Transferability to Other States/Nationally	Ease of duplication of measure in other states and or national and international policies. These impacts may not be readily quantifiable.

APPENDIX 3: Working Group Sub-Committee Memos

Zero Emissions Vehicle Program (1.1 b) – Natural Resources Council of Maine

DRAFT FOR WORKING GROUP

Zero Emissions Vehicle Program

Submitted by Natural Resources Council of Maine

Recommendation

Adopt legislation requiring an alignment of the Maine LEVII program with California and other Northeastern state programs by incorporating a Zero Emission Vehicle (ZEV) requirement.

Description

In April 2003, the California Air Resources Board (CARB) finalized its changes to the Zero Emission Vehicle (ZEV) program, making it even easier for automakers to comply. The modified program establishes a new "alternative compliance path" that allows automakers to comply by producing for sale a modest number of fuel cell vehicles and significant numbers of hybrids and other "clean" vehicles with advanced technologies in lieu of actual zero-emission vehicles.

Under the alternative compliance path, automakers would need to produce vehicles in three broad categories to satisfy the program constraints:

- *Partial Zero Emission Vehicles (PZEVs)* – These vehicles have extremely low tailpipe emissions of NOx and hydrocarbons, and essentially zero evaporative emissions, but do not necessarily provide a greenhouse gas benefit. There are already over a dozen models offered; these are essentially "cleaner" versions of regular cars.

- *Advanced Technology PZEVs such as hybrids* – These vehicles have all of the pollution-reducing benefits of PZEVs but also employ advanced technologies that reduce CO_2 emissions.

- *Fuel Cell Vehicles* – These vehicles use a fuel cell instead of an internal combustion engine to power the vehicle. They may be fueled by hydrogen. Under the current ZEV program, automakers would not be required to introduce fuel cell vehicles in Maine until 2012-2014.

Implementation in Maine

The ZEV program requires manufacturers to produce for sale in participating states a certain number of vehicles, calculated using a crediting system developed by the California Air Resources Board as part of its regulations. The number of credits must sum to a number that is determined as a fraction of the overall fleet. Generally speaking, more technologically advanced vehicles receive more credits. The overall targets are contained in the table below.

Regulatory Phases (assuming use of alternative compliance path)

Model Years	Minimum ZEV Requirement (credits from each category must equal this percentage of the total fleet)		
	PZEVs	**AT-PZEVs**	**Fuel Cell Vehicles (ZEVs)**
***2005*-2008**	6%	**4%**	**0**
2009-2011	6%	**5%**	**0**
2012-2014	6%	**6% ***	**~750****
2015-2017	6%	**8%***	**~1500****
2018 through subsequent years	6%	**5%**	**5%*****

*less credits for fuel cell vehicles (likely worth 3 ZEV credits each) sold in these years
**Fuel cell vehicle requirement is an estimate of the number of vehicles to be sold during the three year period. This estimate assumes all manufacturers choose the alternative compliance path.
***The alternative compliance path expires in 2017. This is the percentage of ZEVs (including fuel cell vehicles) that must be sold each year after 2017.

PZEVs would typically receive 0.2 ZEV credits for each vehicle; gasoline-electric hybrids would receive credits based on technology employed. The 2004 Toyota Prius and Ford Escape would receive 0.7 ZEV credits; the Honda Civic receives 0.6.

The number of advanced technology vehicles sold in Maine would depend on company compliance strategies and use of credits. California, New York, and Massachusetts have allowed companies to bank credits earned during previous years, and so many companies will be able to use those credits to offset some of their annual compliance obligations. However, a rough estimate suggests that if no banked credits were used, the following numbers of vehicles might be sold in Maine under this program (based on the table above):

	2010	**2015**
Fuel Cell Vehicles	0	500
Hybrids	5,000	7,500

California has a history of revising its program to reflect the state of technological progress, so program requirements could change in the future.

GHG Reduction
TBD

Benefits:

In addition to offering GHG reductions, the ZEV program will require automakers to make and sell cars and light trucks that emit fewer toxic and criteria pollutants (such as those that cause smog).

Who Else Has Done This?

New York and Massachusetts followed California's lead in implementing a ZEV program in 2002. Vermont has adopted LEVII and is currently writing rules for its ZEV program. In January 2004, New Jersey adopted legislation requiring the state to implement LEVII and ZEV standards. This spring, Connecticut and Rhode Island adopted legislation requiring each state to adopt LEVII and ZEV standards.

ZEV Analysis in Connecticut (1.1b) – Alliance of Automobile Manufacturers

Submitted by Greg Dana, Alliance of Automobile Manufacturers

MEMORANDUM

air
Hyper Anemo™

To: Greg Dana, Alliance of Automobile Manufacturers

From: Jeremy G. Heiken

Date: November 17, 2003

Subject: Greenhouse gas emissions from light-duty vehicles in Connecticut

Executive Summary

The memorandum summarizes an evaluation of the total lifecycle greenhouse gas (GHG) emissions from light-duty on-highway vehicles operating in Connecticut.

The evaluation of lifecycle GHG emissions covers two regulatory scenarios, the Federal Tier II program and the California LEV II program for light-duty vehicles. Currently, vehicles sold in Connecticut are subject to Federal standards. In the emission inventory results presented, the two regulatory paths are 1) a continuation of Federal standards, including Tier II and 2) a change from Federal to California standards beginning with the 2007 model year. Connecticut light-duty vehicle GHG emission inventories are estimated for the years 2010, 2015, 2020 and 2025.

The estimated difference in GHG emissions under the two regulatory programs results from a subset of vehicles needed to fulfill the ZEV Mandate portion of California's LEV II regulation. The ZEV Mandate includes requirements for two categories of vehicles, "zero emission vehicles" (ZEVs) and "advanced-technology partial zero emission vehicles" (AT-PZEVs). At this time, the current consensus of industry and government stakeholders is that automobile manufacturers will use fuel-cell electric vehicles (FCEVs) and hybrid electric vehicles (HEVs) to meet ZEV and AT-PZEV requirements, respectively.[1] Estimated lifecycle GHG emissions for FCEVs and HEVs, which make up a small fraction of the light-duty fleet under California's LEV II, differ from the remaining "conventional" vehicles.

Before presenting the results, two key assumptions of this evaluation need to be stated up front. This analysis assumes compliance to the letter of the each regulation, and the regulations are mutually exclusive. Therefore, this analysis assumes that HEVs and FCEV would only be present in Connecticut under the California LEV II program. Conversely, this means that the analysis assumes that there would be no HEVs and FCEVs under the

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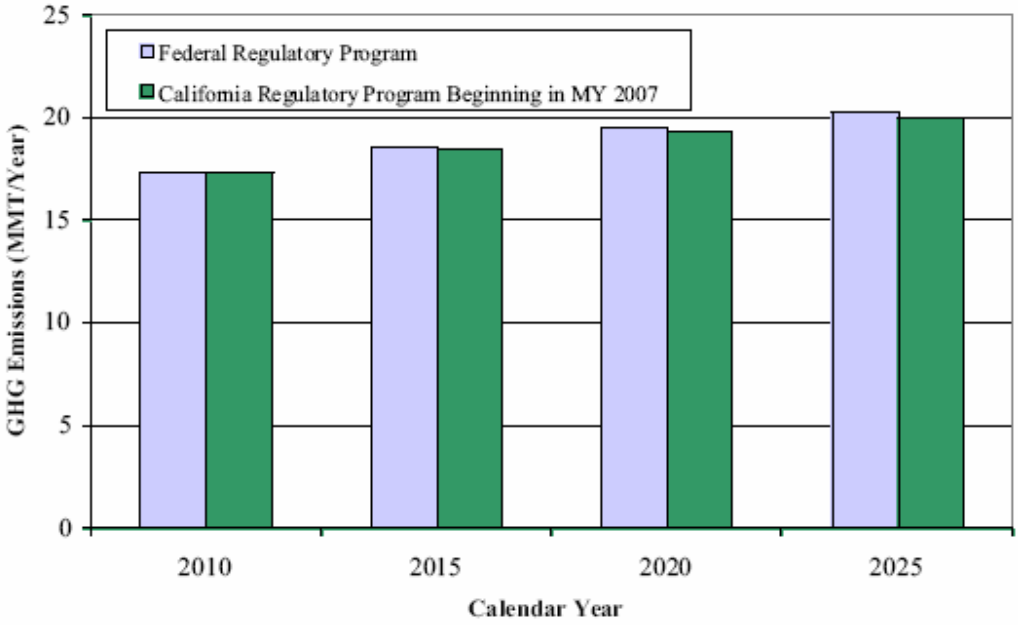
[1] California ARB rulemaking and regulatory models assume the sale of FCEVs and HEVs to meet the ZEV Mandate requirements.

Federal Tier II regulation. Practically speaking, HEVs and FCEVs will be present in Connecticut under both the California and Federal programs. Indeed, the first two vehicles currently certified as AT-PZEVs under the California regulations are also available for sale in Connecticut without any regulatory requirement to do so.[2] For this reason, the GHG analysis of this memo represents an upper bound estimate of the differences between Tier II and LEV II.

With these assumptions understood, the estimated lifecycle light-duty GHG inventories in Connecticut are summarized in Figure 1. The difference between the Federal and California programs does not reach 1 percent until 13 years after implementation, in calendar year 2020. In this year, lifecycle GHG inventories under Federal and California programs are estimated to equal 19.5 and 19.3 million metric tons (MMT) per year, respectively. Thereby, the estimated GHG benefit of the California program in 2020 is 0.2 MMT per year.

The remainder of this memorandum presents additional documentation of the evaluation of lifecycle GHG emissions in Connecticut from light-duty vehicles.

Figure 1.
Connecticut Lifecycle GHG Emissions
Light-Duty On-Highway Vehicles



[2] In automotive manufacturing, it is common that economics of scale and distribution result in a 50-state product line with no difference between California and Federally certified vehicles.

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Analytical Method

The latest available data were compiled for this evaluation of lifecycle GHG emissions. The inventory evaluation includes all light-duty on-highway vehicles under 8,500 lb gross vehicle weight rating (GVRW). GHG emissions reported in this evaluation include the species carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) which are expressed in summation as total CO_2 equivalents.[3] And lifecycle emissions include all components from fuel extraction to vehicle tailpipe exhaust. Note that "lifecycle" emissions are also commonly referred to as "well-to-wheel" emissions.

The following summarizes both assumptions and data sources used.

1. Vehicle Miles Traveled (VMT) - Total statewide VMT data are those provided by Connecticut Department of Transportation. Data were provided for calendar years 2000, 2002, 2007, 2010, 2015 and 2020. Linear interpolation or extrapolation was used to estimate VMT for years not provided. The VMT data used are shown in Table 1.

2. Lifecycle Emission Factors - The lifecycle emission factors are those currently being developed for the next release of the GREET model and are summarized in Table 2.[4] These data are based on a General Motors Study *Well-to-Wheels Analysis of Advanced Fuel/Vehicle Systems* being completed with Argonne National Laboratory.

3. Fuel Economy - Fuel economy data by vehicle class are those developed by the US EPA for MOBILE6.2, which include in-use adjustments for typical on-highway operation. These data are shown in Table 3.

4. FCEVs & HEVs Implementation - The proportions of FCEVs and HEVs under the California LEV II program are those from the latest California Air Resources Board (ARB) ZEV Mandate rulemaking completed in April 2003. The model year sales percentages estimated by the ARB are shown in Table 4 and taking into account the complicated credits scheme developed in the latest rulemaking

5. Fleet Characteristics – MOBILE6.2 was used for age distribution data and for the fleet mix (proportions of model year VMT by vehicle class).

The lifecycle GHG inventory was estimated combining all these data sources into a spreadsheet model. Under the Federal program, it is assumed that there would be only conventional vehicles operating. For this regulatory case, the VMT data were converted to in-use gasoline consumption (in gallons) using MOBILE6.2 fleet characteristics and EPA's in-use fuel economy. The in-use GHG inventory was then estimated by multiplying the gram-per-gallon GHG emission factor (shown in Table 2 for conventional vehicles) times the total gasoline consumption.

[3] Expressing emissions in terms of CO_2 equivalents also takes into consideration the warming potential of each species relative to that of CO_2.

[4] The GREET model is the current state of the science for modeling lifecycle emissions in the U.S. This model is maintained by the Department of Energy's Argonne National Laboratory.

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Table 1. Connecticut On-Highway VMT Estimates, Connecticut Department of Transportation	
Calendar Year	Vehicle Miles Traveled (Million Miles per Year)
2002	31,058
2003	31,384
2004	31,709
2005	32,035
2006	32,361
2007	32,686
2008	33,061
2009	33,436
2010	33,812
2011	34,153
2012	34,494
2013	34,835
2014	35,176
2015	35,516
2016	35,806
2017	36,095
2018	36,385
2019	36,674
2020	36,963
2021	37,253
2022	37,542
2023	37,831
2024	38,121
2025	38,410

Table 2. MOBILE6.2 In-Use Fuel Economy (Miles per Gallon).					
Model Year	Automobile	LDT1	LDT2	LDT3	LDT4
1985	22.9	18.7	18.7	14.4	14.4
1986	23.7	19.6	19.6	15.0	15.0
1987	23.8	19.7	19.7	15.2	15.2
1988	24.3	19.3	19.3	14.8	14.8
1989	23.9	19.1	19.1	14.7	14.7
1990	23.6	18.9	18.9	14.6	14.6
1991	23.8	19.4	19.4	14.9	14.9
1992	23.5	19.0	19.0	14.6	14.6
1993	24.0	19.1	19.1	14.7	14.7
1994	23.9	18.9	18.9	14.6	14.6
1995	24.1	18.7	18.7	14.4	14.4
1996	24.1	19.0	19.0	14.6	14.6
1997	24.2	18.8	18.8	14.5	14.5
1998	24.3	19.0	19.0	14.6	14.6
1999	24.0	18.7	18.7	14.4	14.4
2000-2020	24.1	18.7	18.7	14.4	14.4

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Table 3. Lifecycle GHG Emission Factors Under the Light-Duty FTP Driving Cycle.			
Vehicle Type	Technology Assumption	GHG Emission Factor (g/mi)	GHG Emission Factor (g/gal)
Conventional	Conventional drive spark-ignited engine operating on Federal reformulated gasoline	540	11,600
AT-PZEV	Spark-ignited hybrid electric vehicle (parallel hybrid) operating on Federal reformulated gasoline	440	11,600
ZEV	Fuel cell electric vehicle operating on hydrogen produced by a centralized reformer using natural gas as feed fuel.[5]	252	n/a

Table 4. California ARB Estimated Percent Sales of AT-PZEVs and ZEVs Under the April 2003 ZEV Mandate.[6]

Model Year	Automobiles, LDT1		LDT2, LDT3, LDT4	
	AT-PZEVs	ZEVs	AT-PZEVs	ZEVs
2007	4.61%	0.01%	0.00%	0.00%
2008	6.66%	0.01%	0.00%	0.00%
2009	9.39%	0.07%	0.00%	0.00%
2010	9.99%	0.06%	0.00%	0.00%
2011	10.91%	0.06%	0.00%	0.00%
2012	11.66%	0.65%	0.00%	0.00%
2013	11.56%	0.64%	0.00%	0.00%
2014	11.42%	0.63%	0.00%	0.00%
2015	15.01%	1.25%	0.00%	0.00%
2016	15.07%	1.26%	0.00%	0.00%
2017	14.78%	1.23%	0.00%	0.00%
2018	14.52%	2.15%	0.00%	0.00%
2019	14.30%	2.12%	0.00%	0.00%
2020-2025	14.06%	2.08%	0.00%	0.00%

Under the California regulatory case, the AT-PZEV and ZEV sales percentages are assumed to occur in Connecticut beginning with the 2007 model year, and for these two vehicle technologies, the lifecycle GHG reductions assumed (over a comparable conventional vehicle) are 19 and 53 percent for AT-PZEVs and ZEVs, respectively. These reductions in GHG emissions, derived from the data shown in Table 3, were applied to the GHG inventory estimated under the Federal program to calculate the GHG inventory under the California program.

[5] There is uncertainty as to the future source of hydrogen needed to power FCEVs, and the source of hydrogen has a significant impact on the lifecycle GHG emission factor. Hydrogen from electrolysis, for instance, has an estimated GHG emission factor of 653 g/mi. The selected hydrogen source, a centrally located hydrogen refueling station which derives the hydrogen from a natural gas reformer, was selected as the most probably source of hydrogen.

[6] The ZEV Mandate applies to all vehicle classes shown (autos, LDT1 through LDT4); however, the ARB makes the assumption that manufacturers will derive all the required AT-PZEVs and ZEVs credits by implementing these technologies in the lightest vehicle classes (autos and LDT1 only).

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The resulting lifecycle GHG inventories under both regulatory paths are shown in Table 5. The estimated difference between programs is small, less than a one percent difference in GHG emissions until 2020. By 2025, the difference is 1.3 percent.

Table 5. Estimated Lifecycle GHG Inventory, Connecticut Light-Duty, On-Highway Vehicles (MMT per Year).

Year	Federal Regulatory Program	California Regulatory Program Beginning in MY 2007	Benefit of California Regulation
2010	17.40	17.36	0.04
2015	18.60	18.48	0.11
2020	19.51	19.31	0.20
2025	20.28	20.03	0.26

The assumptions used in this study were biased towards overestimating the differences between the two programs. Therefore, the differences recorded in Table 5 should be considered an upper bound. Assumptions that support this assertion are as follows.

1. The analysis assumes that there will be no HEVs or FCEVs sold under the Federal program. This is already demonstrated as a poor assumption. The only HEVs currently being sold in the U.S. are being distributed to all 50 states independent of the regulatory context. Upcoming releases of HEVs (e.g., the Ford Escape) will also be a 50-state product line.

2. The percent reduction in GHG emissions for HEVs, shown in Table 3, is based on the light-duty FTP. The improvement in efficiency of the HEV (resulting in lower GHG emissions) is amplified in this stop-and-go type driving cycle. The percent benefit of HEVs on highway type driving will be less.

3. The analysis assumes that FCEVs will be driven exactly like a conventional gasoline vehicle. For the foreseeable future, this is an optimistic assumption. Range limitations of FCEVs will limit the ability of these vehicles to fully replace gasoline vehicle VMT resulting in a reduced GHG emissions benefit.

4. The source of hydrogen needed to power FCEVs is an uncertainty. The source selected in this study (centralized natural gas reformer) also corresponds to the source with the lowest lifecycle GHG emissions. Hydrogen from on-board reformers and hydrogen from electrolysis have significantly higher lifecycle GHG emissions. Under some fuel pathways, lifecycle GHG emissions from FCEVs can be higher than conventional vehicles.

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Feebates (1.3 b) – Natural Resources Council of Maine

DRAFT FOR WORKING GROUP

GHG Febates

Submitted by Natural Resources Council of Maine

Recommendation:

Establish a single-tier, revenue-neutral, GHG-based feebate program for all new passenger vehicles sold in Maine beginning in 2005. This feebate would provide a continuing incentive for the fleet to improve its GHG emissions as technology develops. While Maine should take the lead on this issue and implement a feebate program unilaterally, we suggest that Maine should also seek cooperation with the other Northeastern states in order to implement feebates across the region.

Description

- Establish a sliding scale of fees and rebates applied to the purchase/registration of <u>new</u> vehicles in Maine.
- The feebate schedule consists of a *rate* (pegged to an amount per ton of CO_2-equivalent) and a *pivot point* established to meet revenue goals (e.g., revenue neutrality).
- Program could be designed to generate only enough revenue to pay administrative expenses.
- Pivot/zero-point adjusted periodically to meet annual revenue goals (e.g., raise small amount of revenue to cover program expenses).
- Provide for waiver/reduced fee upon application and showing of legitimate work-related need?
- Encourage regional implementation

Implementation in Maine

- The feebate could be assessed at point of sale as an adder or refundable rebate to state sales tax or at BMV or town offices as a separate fee/rebate.
- If the feebate is assessed at dealerships, provision will need to be made to assure that it applies only to Maine residents, and that Maine residents cannot avoid the feebate by purchasing their vehicle out of state. This could be accomplished by folding feebate collection/distribution into the sales tax collection process.
- The state will need to provide a written or electronic schedule to auto dealers and/or town offices to facilitate calculation of feebates.
- A decision to exempt/reduce fees to work vehicles based on "legitimate need" will need to consider implementation issues associated with such an approach. If this approach is chosen, it may best be handled as a deduction against state income, as that would provide an opportunity for verification of work-related use.
- To insure against fluctuations of revenue associated with shifts in consumer preferences, Maine could dedicate revenue to a permanent administrative fund that would balance out net revenue over time.

GHG Reduction:
To be determined.

Benefits and Cost Savings
Each new car purchased commits Maine to future energy use and emissions. The average new passenger vehicle commits Maine to roughly 100 tons of CO_2-equivalent emissions. While the target of the feebate program is not fuel consumption *per se*, it is likely that some manufacturers will respond to consumer demand for lower CO_2 emitting vehicles by producing vehicles with lower lifetime fuel consumption. This will benefit consumers in both the new and used car markets, by providing them a greater range of choices and more cost-effective products. Many low-GHG vehicles also have lower emissions of NOx and hydrocarbons.

Cost of Implementing
The cost of implementing this program should be relatively modest, particularly if it is implemented on a regional basis. The feebate schedule would be designed to cover program implementation costs.

Sample Feebate Schedules with Approximate Revenue

Lifecycle CO2e emissions (lb/mi)	*Lifetime CO2e emissions (tons CO_2e)*	*\$15/ton CO_2 Pivot A*	*\$40/ton CO_2 Pivot B*	*Sample Vehicles*
0.30	***33***	($1,136)	($3,150)	
0.35	***37***	($1,080)	($3,000)	
0.40	***41***	($1,024)	($2,850)	
0.45	***44***	($968)	($2,700)	Insight (man.)
0.50	***48***	($911)	($2,550)	
0.55	***52***	($855)	($2,400)	Prius
0.60	***56***	($799)	($2,250)	Jetta diesel
0.65	***59***	($743)	($2,100)	
0.70	***63***	($686)	($1,950)	Civic HX
0.75	***67***	($630)	($1,800)	Civic (man.)
0.80	***71***	($574)	($1,650)	Geo Prizm
0.85	***74***	($518)	($1,500)	Mini Cooper
0.90	***78***	($461)	($1,350)	Sentra
0.95	***82***	($405)	($1,200)	Ford Focus
1.00	***86***	($349)	($1,050)	Camry
1.05	***89***	($293)	($900)	Lancer
1.10	***93***	($236)	($750)	Grand Am
1.15	***97***	($180)	($600)	Malibu
1.20	***101***	($124)	($450)	Intrepid
1.25	***104***	($68)	($300)	Aztec FWD
1.30	***108***	($11)	($150)	Mustang
1.35	***112***	$45	$0	Odyssey
1.40	***116***	$101	$150	Highlander
1.45	***119***	$158	$300	Town Car
1.50	***123***	$214	$450	Dakota
1.60	***131***	$326	$750	Trailblazer
1.70	***138***	$439	$1,050	Explorer 4x4
1.80	***146***	$551	$1,350	Hummer H2?
1.90	***153***	$664	$1,650	
2.00	***161***	$776	$1,950	Escalade
2.10	***168***	$889	$2,250	Navigator
2.20	***176***	$1,001	$2,550	
2.30	***183***	$1,114	$2,850	
2.40	***191***	$1,226	$3,150	Ferrari 456
2.50	***198***	$1,339	$3,450	
2.75	***217***	$1,620	$4,200	Hummer H1
Estimated Net Revenue		***+$1M***	***Approximately neutral***	

Notes: Revenue estimated based on national sales data from 2002, and ME share of national sales in 2000; actual revenue may vary substantially. It may be desirable to set a pivot point at a lower emissions level to avoid revenue shortfall due to changes in consumer choice in response to the feebate policy. CO_2-equivalent emissions includes estimated in-use emissions for gasoline & diesel vehicle (calculated using EIA data), average mfg emissions estimated at 10.6 tons CO_2-equivalent (based on ACEEE Green Book Methodology, 2002), and fuel cycle emissions of CO_2 and other GHGs (based on DeLucchi, 1997, using revised GWP estimates from IPCC).

Sample vehicles are based on MY 2002 carbon emission estimates, except where otherwise noted.
Estimates assume lifetime mileage = 150,000 miles, with no discounting of future emissions.

DRAFT FOR WORKING GROUP

Removing Subsidies for Sprawl

Prepared by Paula Thompon, Maine State Planning Office

The table two pages below is a list of state funded programs that shows whether or not they incentivise smart growth -- usually through preference points given for adopted consistent comprehensive plans (last column). More in-depth info on state smart growth related accomplishments and needs can be found in the 2/03 evaluation of the growth management program on our website at http://www.state.me.us/spo/landuse/docs/evaluation2003/index.php (see especially pp. 52-59). It's a year old, but still a good gauge of what's been done and what could be done.

This 'top ten list' identifies some areas in state policy that we need to work on to help combat sprawl.

Sprawl Buster's Top Ten Areas in State Government That May Be Subsidizing Sprawl

(10/23/03)

10. Culture and practice of developing single purpose regulation without regard for unintended impacts (and secondary and tertiary impacts) on other state goals and lack of integrated state policy.

9. Environmental policies that make it more expensive and time consuming to build in service centers and growth areas (or their surrogates[13]) than in green fields.

8. General purpose school aid formulas that penalize service centers because the formula is so significantly influenced by valuation, rather than tax burden, particularly when schools in centers should be neighborhood based (at least the elementary schools) and generally viewed by homeowners as the "best" in the region.

7. Sewer and other utility extensions outside of service centers and designated growth areas (or their surrogates).

6. Housing subsidies outside of service centers and designated growth areas (or their surrogates).

5. Lack of integrated, coordinated state spending, particularly for capital investments and discretionary grants.[14]

[13] Surrogates for designated growth areas, as defined in statute, are sewered areas, census-designated places, and areas within MDOT urban compact areas.

[14] Massachusetts has created a Super Commissioner to oversee their equivalent of DEP, DOT, Dept of Energy, and DECD, thereby helping to ensure coordinated spending, instead of spending at cross purposes. Doug Foy, the former Director of CLF, is that Super Commissioner and claims it will make a huge difference not only in development patterns, affordable housing, etc, but its also spending money much more wisely.

4. Cumulative tax policies that place higher burdens on Regional Service Centers than surrounding towns.

3. Dedication of school construction funds for suburbanizing areas to meet shifts in school enrollment from centers. In addition, some of the specific school construction regulations themselves.

2. Funding roadway construction and improvements that makes it easier (i.e., faster) for folks to live in suburbanizing areas and to commute to job centers.

1. Funding economic development projects, Pine Tree Zones, BETR Program, etc. outside of service centers and designated growth areas (or their surrogates).

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

AGENCY & GRANT PROGRAM NAME STAFF CONTACT AND PHONE NUMBER (web address if available)	BRIEF DESCRIPTION OF WHAT IS FUNDED TOTAL ANNUAL FUNDING; MAX GRANT AWARD	WHO IS ELIGIBLE TO APPLY?	DOES THE PROGRAM FUND A "GROWTH RELATED CAPITAL INVESTMENT" [1]? YES/NO Are program funds EXEMPT from LOCATION PREFERENCES [2] ?	PREFERENCES/ENHANCEMENTS FOR ELIGIBILITY (consistent comp plan, consistent zoning ordinance, certified program?) (not necessarily inclusive – see grant program materials for additional information)	NOTES
ALL AGENCIES					
With some waiver provisions, Title 30-A MRSA § 4352 6. requires that a state agency shall comply with a zoning ordinance consistent with a comprehensive plan that is consistent with the Growth Management Act when seeking to develop any building, parking facility or other publicly owned structure.					
Department of Agriculture, Food and Rural Resources					
Agricultural Development Grant Fund *John Harker, 287-7620* http://www.mainefoodandfarms.com/marketprod/	Market, research, market promotion and new technology demonstration projects to encourage innovative efforts by farmers, aquaculturists and food processors to expand markets, promote their products and test new innovative equipment and processes. $250,000/year $30,000/grant	Any person or organization in the business of growing or harvesting of plants, raising of animals, growing or obtaining plant or animal by-products, aquaculture or engaged in the producing, processing, storing, packaging or marketing of a product derived from such a business	*NO or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #2*	No current preferences for consistent comprehensive plans	
Agricultural Marketing Loan Fund *John Harker, 287-7620* http://www.mainefoodandfarms.com/marketprod/	Low interest loans (5-8%) for up to 55% of capital costs for design, construction or improvement of commodity and storage buildings and packing and marketing facilities, or for the construction, renovation or acquisition of land, buildings, equipment, docks, wharves, piers, or vessels, located in the State of Maine and used in connection with an agricultural enterprise Maximum AMLF Loan is $250,000	Any person or organization in the business of growing or harvesting of plants, raising of animals, growing or obtaining plant or animal by-products, aquaculture or engaged in the producing, processing, storing, packaging or marketing of a product derived from such a business	*NO or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #2*	No current preferences for consistent comprehensive plans	

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Nutrient Management Grant Program *Paryse Turgeon, 287-5941*	Assistance to farm operations for construction of new or retrofitted manure and/or milk waste storage and handling facilities $2.5 million - total allotment lesser of $100,000 or 75% or project costs/grant	Owner/operator of livestock operation or of an operation that imports >100 tons of manure/year	*NO or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	No current preferences for consistent comprehensive plans	
Nutrient Management Loan Program *Nutrient Management Program Coordinator 287-1132* http://www.famemaine.com/biz/index.html	Loans to finance the construction or improvement of livestock manure and milk room waste containment and handling facilities, their associated design and engineering costs, related equipment that meets goals of State's Nutrient Management Plan; effective interest rate of 4% the first year and 3% each year thereafter for up to 20 years.	Any business or individual identified by the State of Maine Department of Agriculture, Food & Rural Resources as required by law to upgrade manure and milk room waste containment and handling facilities.	*NO or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	No current preferences for consistent comprehensive plans	
Department of Conservation					
Land and Water Conservation Fund *Mike Gallagher, 287-2163* http://www.state.me.us/doc/parks/programs/community/lwgrants.html	LWCF grants can provide up to 50% of the allowable costs for the acquisition and/or development of public outdoor recreation facilities	State and municipal public agencies. (special purpose agencies such as Water Districts are not eligible)		No current preferences for consistent comprehensive plans. Applicants with adopted comprehensive plans (or recreation plans) that prioritize the proposed project receive a higher score in the Needs Assessment portion of the evaluation.	

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Project Canopy, Maine Forest Service *Jan Ames, 623-2371* http://www.state.me.us/doc/mfs/projectcanopy/index.htm	This cooperative effort between the Maine Forest Service and the Pine Tree State Aboretum. The project selects "Model Towns" which are provided with technical assistance and expertise for community forestry projects. No grant funding associated with the program.	Municipalities		No current preferences for consistent comprehensive plans	
Shore and Harbor Management and Planning Improvements Grant Program *Dan Prichard, 287-4919*	Supports shore and harbor planning and improvement activities adjacent to publicly owned submerged lands, including tidal waters, ponds greater than 10 acres, and the Maine's three international boundary rivers. Eligible projects include management planning and ordinance development, public access facilities, and land acquisition. Individual matching grants up to $18,500 may be awarded. Total available funds are $75,000. The Department anticipates that 4 to 6 grants will be awarded.	Municipalities	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #2 or 5*	Program guidelines being developed	
Snowmobiling/ATV trails *Scott Ramsay, 287-4956*	Grants to develop and maintain safe, environmentally sound trails ~$1.8 million/year	Municipalities; snowmobile and ATV clubs	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	No current preferences for consistent comprehensive plans	

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	$2,250-2,500/grant				
Recreational Trails Program *Cindy Bastey, 287-4963*	Development and/or maintenance of non-motorized, motorized or combined use recreation trails ~$700,000/year $30,000/grant	Municipalities and non profit trail organizations	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	No current preferences for consistent comprehensive plans	
Urban and Community Forestry Grants *Tish Carr, 287-5024* http://www.communityforest.org	Technical assistance to community's on tree care and management. Technical fact sheets, program publications, and direct service to help create or enhance a comprehensive community forestry program $50,000/year $10,000/grant	Municipalities, non-profit organizations, educational institutions	*YES (Footnote 1 – D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	Preferences given to towns with consistent comprehensive plans but if funds are targeted toward developing a consistent comprehensive plan, also eligible. Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Volunteer Fire Assistance Program *Tom Parent, 287-4991*	Purchase of equipment for forest fire control or to provide forest fire training $15,500/year $1,000/grant	Municipalities and Fire Departments in towns with <10,000 population	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	No current preferences for consistent comprehensive plans	
Department of Economic and Community Development - Community Development Block Grant (CDBG)					

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all CDBG programs *Orman Whitomb, 287-8476*		Units of local government except entitlement communities; counties on behalf of unorganized territory; also see program statement		Communities with certified growth management programs (as determined by the State Planning Office), as of 30 days prior to application deadline, will receive preference in the award of CDBG grants in the following situation: In the event of a tie between communities receiving the lowest funded application score in any particular program, the grant will be awarded to the certified community, except where the tie is between a certified community and a community that never received an offer of financial assistance to develop a growth management program.	
Community Planning *Orman Whitomb, 287-8476*	Studies, analysis, data gathering, preparation of plans and maps and identification of actions that will implement plans. $158,000/year $10,000/grant	See all programs above	*Not Applicable (Town-wide Plan)*	There are no location sensitive preferences for this program	
Development Fund *Orman Whitomb, 287-8476*	Grants to units of local gov't to provide gap financing for businesses in acquisition, relocation, demolition, clearance, construction, reconstruction, installation, rehabilitation and working capital. $500,000/year the lesser of $200,000 or 40% of total project cost	See all programs above	*NO*	There are no location sensitive preferences for this program	
Downtown Revitalization Grants *Orman Whitomb, 287-8476*	All activities eligible under the Public Facilities, Public Infrastructure, Public Service, Housing Assistance, Micro Loan or Business Assistance programs as relevant to the revitalization of a downtown district.	See all programs above	*YES (Footnote 1 – A, B,C,D)*	Project must be located in a Downtown as defined in 30-A MRSA §4301 sub-§5-A, as enacted in PL 776 by the 119th Legislature.	

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	$1,200,000/year $400,000/grant				
Economic Development Programs: Economic Development Infrastructure Program Business Assistance Program Regional Assistance Fund *Orman Whitomb, 287-8476*	Acquisition, relocation, demolition, clearance, construction, reconstructions, installation, and rehabilitation associated with public infrastructure projects eg sewer and water facilities, parking, sidewalks, public buildings which are necessary to create or retain jobs in the non-retail sector for low and moderate income persons. $5,000,000/year $400,000/grant or no more than 50% of total project costs	See all programs above	*YES if public infrastructure; or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1,2,3, 4, 5 or 6 or NO if direct to private entity*	Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Housing Assessment Planning *Orman Whitomb 287-8476*	Comprehensive studies of housing planning issues for the community. Egs. Include number and age of units, condition , energy considerations, affordability, occupancy, elderly, etc. $150,000/year $15,000/grant	See all programs above	*N/A*	There are no location sensitive preferences for this program	

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Housing Assistance Grants *Orman Whitomb, 287-8476*	new or rehab housing $2,400,000/year $300,000/grant	See all programs above	*YES for new housing or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 6* *EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 6*	Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Micro Loan Program *Orman Whitomb, 287-8476*	The establishment of a local commercial loan program for the purposes of assisting businesses. $150,000/year $15,000-$25,000/loan	See all programs above	*NO*	There are no location sensitive preferences for this program	
Phase II Project Development Planning *Orman Whitomb 287-8476*	Planning activities necessary to complete Phase II requirements $75,000/year $2,500/grant	Communities invited into Phase II of the Housing Assistance, Public Facilities/Infrastructure, Public Service, Econ. Devel. Infrastructure, Micro-Loan and Downtown Revitalization programs	*YES (Footnote 1 – A, B,C,D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1,2,3, 4, 5 or 6*	There are no location sensitive preferences for this program	
Public Infrastructure Grants *Orman Whitomb, 287-8476*	Construction, acquisition, reconstruction, installation, rehabilitation, site clearance, historic preservation, relocation assistance associated with public projects, and infrastructure for new housing construction. Egs. Water systems, storm drainage $3,600,000/year $50,000-$400,000/ grant	See all programs above	*YES (Footnote 1 – B,C,D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 6*	Service Centers and Specialized Centers are given priority for these grants. Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

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Public Facilities Grants *Orman Whitomb, 287-8476*	Construction, acquisition, reconstruction, installation, rehabilitation, site clearance, historic preservation, relocation assistance associated with public projects, and infrastructure for new housing construction egs. fire stations, handicap accessibility, etc $1,500,000/year $50,000-$250,000/grant	See all programs above	*YES (Footnote 1 – A, D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 6*	Service Centers and Specialized Centers are given priority for these grants. Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Public Service Grants *Orman Whitomb, 287-8476*	Operating and program material expenses for child care, health care, job training, recreation programs, educations programs, public safety services, fair housing activities, senior citizen services, homeless services, drug abuse counseling and treatment, and energy conservation counseling and testing. $200,000/year $50,000/grant	See all programs above	*NO*	There are no location sensitive preferences for this program	
Urgent Needs Grants *Orman Whitomb, 287-8476*	threats to public health $200,000/year $100,00/grant	See all programs above	*NO*	There are no location sensitive preferences for this program	
Department of Environmental Protection					

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319(h) Non Point Source Pollution Grants *Norm Marcotte, 287-7727* http://janus.state.me.us/dep/blwq/grants.htm	4 types: Watershed Survey project; Watershed Management Plan, Implement Watershed management Plan; Non Point Source Implementation Project $5,000- $120,000/grant	Municipalities, Soil and Water Conservation Districts, watershed districts, river and watershed groups	*YES (Footnote 1 – D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 4*	Preference given to: Polluted waters (Section 303(d) TMDL), DEP priority watersheds, and Communities with consistent comp plans Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	A consistent comp plan is awarded 5/100 points. This is such a small portion, it cannot be considered to "make the difference" unless two grants come out exactly equally otherwise.
Combined Sewer Overflow Program *Stephen McLaughlin, 287-7768* *Ben Viola 287-3782* http://janus.state.me.us/dep/blwq/docgrant/csoinf.htm	1990 state bond issue for $2.4 million; Grants are awarded for 25% of eligible CSO studies (planning and monitoring). No maximum/project	Municipalities	*YES (CSO's located in growth areas by definition) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 4*	No current preferences for consistent comprehensive plans Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1. Design and construction costs associated with CSO remediation may be funded by the State Revolving Loan Fund or, depending on municipal financial capability and grant availability	
Municipal Land fill closure funds *Paula Clark, 287-7718*	Closing non-compliant municipal landfills	Municipalities	*Not applicable*	No current preferences for consistent comprehensive plans	

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Overboard Discharge Grant Program *David P. Achorn, 287-7766* http://janus.state.me.us/dep/blwq/docgrant/obdpara.htm	Grants for replacement systems that would eliminate licensed overboard discharges in certain areas. The State share of funding comes from State bond issues. Bond issues vary from year to year No limit/grant	Municipalities, Quasi-Municipal Corporations, County Commissioners and Individual Persons	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	High priority is given to shellfish areas that could be opened for harvesting if the licensed overboard discharges were eliminated. High priority is also given to great ponds and small rivers and streams with drainage areas of less than 10 square miles where the licensed overboard discharge creates a public nuisance condition. The Program Administrator develops a priority list based on information from the Department of Marine Resources, DEP staff, local officials, shellfish committees, and other interest groups. No current preferences for consistent comprehensive plans.	
"Patient" Sewer Extension Revolving Loan Program *Bill Brown, 287-7804*	Sewer extensions into undeveloped growth areas; loan repayment can be made as new hook-ups occur and are therefore "patient" Program materials under development Total funding $3,000,000 Max grant: no cap Continuous availability of funds	Municipalities with consistent comprehensive plans	*YES (Footnote 1 – C)*	Only applied in growth areas as designated in local comp plans; must be reviewed by SPO	
Small Community Grant Program *Richard Green, 287-7765* http://janus.state.me.us/dep/blwq/docgrant/scgpara2.htm	Grants to help replace malfunctioning septic systems that are polluting a waterbody or causing a public nuisance; 25% to 100% of design and construction costs, depending upon the income of the owners of the property, and the property's use Bonded funds of ~$1,000,000.00/year $100,000/project	Municipalities. Individual families if federal taxable income for previous year was $40,000 or less. Commercial uses if gross profit for the previous year was $40,000 or less.	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	Actual pollution problem must be documented in order to qualify for funding; Grant applications must be submitted by the municipality in which the property owner resides and are not available to provide septic systems for new homes.; Highest priority is given to problems which are polluting a public drinking water supply or a shellfishing area; No current preferences for consistent comprehensive plans	

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State Revolving Loan Fund (SRF) *Bill Brown, 287-7804* http://janus.state.me.us/dep/blwq/docgrant/srfparag.htm *and* http://www.mainebondbank.com/wwsrf.html	Low interest loans for municipal wastewater treatment plants, and other sewage improvements to ensure compliance with Clean Water Act; State participation limited to 80% of the project costs for wastewater treatment facilities, interceptor systems and outfalls. Does not include costs relating to land acquisition or debt service, unless allowed under federal statutes and regulations. Commissioner also authorized to grant no more than 25% for preliminary planning or design of a pollution abatement program; $55,000,000/year	Municipalities and quasi-municipal corporations such as sanitary districts	*YES (Footnote 1 – C,D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 4*	State law also gives the DEP flexibility, through the related Construction Grant Program, to use bond issue funds with other sources of funding to provide affordable financing of municipal and quasi-municipal wastewater facilities. The Board of Environmental Protection has established a goal for residential users of 2% of the Medium Household Income (MHI). The DEP attempts to reach this goal by combining grant funds, SRF loan funds, and other sources of funds such as Community Development Block Grants, Rural Development loans and grants, and grants or loans from the Economic Development Administration. Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Department of Human Services					
Maine Municipal Bond Bank State Revolving Loan Fund *David Breau, 287-5685*	Land acquisition; Low interest (2% below market) loans and principle forgiveness; Forgiveness is only available for disadvantaged communities for drinking water infrastructure projects	Community water systems (public, private and non-profit; municipalities)	*YES (Footnote 1 –C) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEMS #1 or 4*	address serious risk to human health necessary to ensure compliance with the Safe Drinking Water Act to assist public water systems in need. No current preferences for consistent comprehensive plans Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	

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Source Water Protection Planning Grant Program *Joy Nadeau, 287-5681* http://www.state.me.us/dhs/eng/water/Source%20Protection.htm	plan or implement projects designed to protect a well or surface water supply from contamination $75,000/year up to $2,500/grant	community public water suppliers eg. Water utilities, mobile home parks, apartment buildings, and nursing homes	*YES (Footnote 1 –C) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	demonstrated need; build on previous source protection work; involve other municipal or volunteer partners. No current preferences for consistent comprehensive plans. Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Department of Transportation					
Community Gateways Grant Program *Kent P. Cooper, 287-5735* http://www.state.me.us/mdot/oes/gateways/gatehomepage.htm	enhance Community Gateways, or community landscapes along Maine transportation corridors; $100,000 for grants in the 2-year BTIP Period program designed to reimburse municipalities for purchase of materials only, up to a total of $5000	town or municipality endorsed project (one) may be submitted for review per application period.	*NO or EXEMPT AS LISTED IN FOOTNOTE 2, ITEM #5*	No preferences for consistent comprehensive plans; Program under review and preferences for consistent comprehensive plans will likely be including in future cycles.	
Dredging Recommendations to the US Army Corps of Engineers *Brian Nutter, 624-3564* *Todd Burrowes (207) 287-1496 (SPO)*	This is a federally funded program, run by the Army Corps of Engineers.			SPO and DEP team to prioritize the towns applying for funding for Navigation Projects to assess the need for dredging (from a navigation point of view), the environmental impact/permitability (DEP), and the potential benefits of dredging (socio-economic ranking tool developed by Beth that doesn't take into effect permit-ability).	A formal ranking hasn't been done in a while (since '98 or so).

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Major Projects *Duane Scott, 287-5735*	Because major MDOT projects involve federal funds, they trigger the National Environmental Policy Act (NEPA). NEPA requires that community impacts be considered, especially for projects that might involve significant environmental or cultural resources.	N/A	*NO*	Comprehensive plans do not affect project selection, but rather shape project location and design. MDOT often reviews municipal comprehensive plans to determine whether community impacts from transportation projects are consistent with comprehensive plans.	
Municipal Sand/Salt Storage Funding *Pete Coughlan, 287-2152* http://www.state.me.us/mdot/planning/csd/csd.htm	State cost-sharing to build municipal sand/salt storage facilities where existing storage creates environmental risks.	Municipalities or Counties.	*NO*	No preferences for consistent comprehensive plans. Selection criteria described in statute based on environmental risks.	
Scenic Byways Program *Bret Poi 287-8739*	Scenic Byways are eligible for Federal and State $$'s to…protect…scenic, recreational, cultural, natural, historic and archeological resources. Most funding decisions made by federal gov't. $1.5 million/year depending on competitive federal grants	State designated Scenic Byway with a Corridor Management Plan in place	*NO or EXEMPT AS LISTED IN FOOTNOTE 2, ITEM #5*	No preferences for consistent comprehensive plans. Required corridor management plans often overlap with comprehensive plans and ordinances. Strong municipal planning predicts successful federal grant applications.	

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Small Harbor Improvement Program *Kevin Rousseau, 287-2841*	Grants to coastal municipalities for improvements to coastal marine infrastructure such as boat ramps, piers, floats, shore stabilization. $3 million proposed to 120th Legislature for FY2002-03 Maximum Grant Amount (if applicable): $250,000	Promote economic development. Preserves existing coastal infrastructure. Ensures public access. Well thought out plan with cost estimates, time schedule, etc.	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	Plans that are consistent with the GMA and contain sections relevant to the proposal are awarded a maximum of 5/60 points.	5/02 - All applicants from the last round were funded; consistency made no effective difference. Work in the future to ensure that proposals include the relevant sections of the plan, certified by the town clerk.
Surface Water Quality Protection Program *Susan Breau, 287-3363* http://www.state.me.us/dep/blwq/doclake/mdot.htm	Permitting, development and construction of a project that eliminates runoff into surface waters from an eligible highway ~$300,000.00/year $35,000.00 (average project)	Organizations don't receive funds; sites can be nominated by any interested party; funds are allocated as DOT projects. Municipal support a requirement.	*NO*	preference given to projects that: · are actively supported by local groups (lake associations, Cons.Comm., soil and water conservation districts) · consistent Comprehensive Plans · are on DEP lists – Lakes most at risk for development; Priority Watersheds; Priority Water bodies; Atlantic Salmon River Watershed; Non-point source priority coastal watersheds - listed at: http://www.state.me.us/dep/blwq/docwatershed/prilist5.pdf	
Traffic Permit *Steve Landry, 287-3775*	23 MRSA Section 704-A requires that developments which generate more than 100 vehicle trips per hour -- such as large schools, retail stores, or industrial facilities -- correct off-site	Developers, including municipal industrial parks and schools.	*NO*	Relaxed mitigation standards in growth areas of towns with consistent comprehensive plans.	

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

AGENCY & GRANT PROGRAM NAME STAFF CONTACT AND PHONE NUMBER (web address if available)	BRIEF DESCRIPTION OF WHAT IS FUNDED TOTAL ANNUAL FUNDING; MAX GRANT AWARD	WHO IS ELIGIBLE TO APPLY?	DOES THE PROGRAM FUND A "GROWTH RELATED CAPITAL INVESTMENT" [1]? YES/NO Are program funds EXEMPT from LOCATION PREFERENCES [2] ?	PREFERENCES/ENHANCEMENTS FOR ELIGIBILITY (consistent comp plan, consistent zoning ordinance, certified program?) (not necessarily inclusive – see grant program materials for additional information)	NOTES
	traffic problems prior to construction.				
Transportation Enhancements Duane Scott, 287-5735	12 designated activities related to surface transportation. Eg Pedestrian & Bicycle Facilities, Rehabilitation and Operation of Historic Transportation Buildings, Structures, or Facilities, Mitigation of Highway Runoff and Provision of Wildlife Undercrossings $ 3+ M per FFY	Any party may apply or nominate projects	*YES (Footnote 1 – D) or NO or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5 depending on activity*	Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1. Beginning in the Summer '02 grant round, three questions ask about whether or not there is a plan, if the plan is consistent with the GMA, and if the plan refers to the proposed project. The number of points for these questions is unclear.	
State Planning Office					
Comprehensive Plan Grants http://www.state.me.us/spo/cpip/cpinvest.htm	development of comprehensive plans pursuant to the Planning and Land Use Regulation Act (30-A M.R.S.A. §4301 et seq). ~$100,000/year $13,500-$18,000/grant	Municipalities who have not previously received a Comprehensive Planning Grant	*Not Applicable (Town-wide Plan)*		
Comprehensive Plan Update Grants http://www.state.me.us/spo/cpip/cpinvest.htm	update of comprehensive plans by municipalities pursuant to the Planning and Land Use Regulation Act (30-A M.R.S.A. §4301 et seq). ~$150,000/year $10,000/grant	Municipalities that received a Comprehensive Planning Grant prior to January 1, 1995.	*Not Applicable (Town-wide Plan)*	Communities that have shown a strong commitment to effective planning and zoning by adoption of plans and implementation measures consistent with the Planning and Land Use Regulation Act; Service center communities	

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

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Implementation Grants http://www.state.me.us/spo/cpip/cpinvest.htm	development of implementation programs by municipalities pursuant to the Planning and Land Use Regulation Act (30-A M.R.S.A. §4301 et seq). ~$50,000/year $9,375/grant	Municipalities with consistent comp plans	*YES if growth related Or Not Applicable (eg. Town-wide Ordinance)*	Consistent Comprehensive Plan is not just a preference, it is a threshold requirement Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
Land for Maine's Future *Tim Glidden, 287-1487* http://www.state.me.us/spo/lmf/index1.htm	Land and easement acquisition 1999: $50,000,000.00 bond issue to be expended over 5 year period Fair market value based on appraisal	Municipalities, Land Trusts, State Agencies	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	Consistent comp plans are evaluated as an "additional factor"	
Maine Outdoor Heritage Fund *Collin Therrien, 287-5619 (SPO)* *Jo D. Saffeir, 688-4191 (MOHF)* www.state.me.us/ifw/outdoorheritage/homepage.htm	maintaining, improving and expanding state and local natural resource conservation programs and associated compatible public uses	"Any entity," including an individual, organization, municipality or other entity, but they must apply through one of 16 designated state Natural Resource Agencies.	*EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #5*	No current preferences for consistent comprehensive	
Municipal Brownfields Site Assessment Grant (partner with DEP) *Liz Rettenmaier, 287-6417 (SPO)* *Nick Hodgkins 287-4854 (DEP)*	Phase I and Phase II Site Assessment consulting services $120,000 total available; $60,000 max per grant	Municipalities, other governmental entities	*YES (Footnote 1- D) or EXEMPT AS NOTED IN FOOTNOTE 2, ITEM #1*	Last round held July, 2000; funds still available (07/17/02) on first come first served basis; (call to inquire) . Preference for municipalities with consistent comprehensive plans.	

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

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Smart Growth Challenge Grants http://www.state.me.us/spo/cpip/cpinvest.htm	pilot implementation grant program to fund local and regional projects that promote smart growth solutions ~$150,000/year up to $50,000/grant	For local projects: municipalities with an adopted consistent comprehensive plan. For regional projects: regional councils, counties and quasi-governmental organizations, provided that (1) the project activity is centered in one or more municipalities with adopted, consistent comprehensive plans, and (2) the project involves and has the support of two or more municipalities.	*YES if growth related Or Not Applicable (eg. Town-wide Ordinance)*	Consistent Comprehensive Plan is a threshold requirement and scoring advantages are then given to communities that have shown a strong commitment to effective planning and zoning by adoption of plans and implementation measures consistent with the Planning and Land Use Regulation Act; Designated Growth Areas in consistent comprehensive plans are one of four priority areas where capital investments are directed. Other 3 priority areas are noted in Footnote 2 on page 1.	
[1] 30-A MRSA §4301, sub-§§ 5-A defines "Growth-related capital investment" to mean investment by the State in only the following projects, whether using state, federal or other public funds and whether in the form					
of a purchase, lease, grant, loan, loan guarantee, credit, tax credit or other financial assistance: (The YES projects)					
A. Construction or acquisition of newly constructed multifamily rental housing;					
B. Development of industrial or business parks;					
C. Construction or extension of sewer, water and other utility lines;					
D. Grants and loans for public service infrastructure, public facilities and community buildings; and					
E. Construction or expansion of state office buildings, state courts and other state civic buildings that serve public clients and customers.					
"Growth-related capital investment" does not include **(The NO projects)** investment in the following: the operation or maintenance of a governmental or quasi-governmental facility or program; the renovation of a governmental facility that does not					
significantly expand the facility's capacity; general purpose aid for education; school construction or renovation projects; highway or bridge projects; programs that provide direct financial assistance to individual businesses;					
community revenue sharing; or public health programs.					

State Investment, Grant, & Technical Assistance Programs: Municipal Eligibility Requirements

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[2] 30-A 4349-A directs growth related capital investments to "growth areas" which are locally designated in a Comprehensive Plan that is consistent with the Growth Management Act. In communities with no "growth area"					
designated in a consistent Comprehensive Plan "priority areas" include a) an area with adequate existing public sewer service; b) an area that the Census lists as a "census-designated place",					
or; c) a "compact area" as defined by 23 MRSA §754. Exemptions to these location preferences include (The EXEMPT projects)					
1) Project certified to the Land and Water Resources Council (LWRC) as necessary to remedy a threat to public health or safety or to comply with environmental cleanup laws.					
2) Project related to a commercial or industrial activity, that due to operational or physical characteristics, typically is located away from other development, such as an activity that relies on a particular natural resource for its operation.					
3) An airport, port or railroad or industry that must be proximate to an airport, a port or a railroad line or terminal.					
4) A pollution control facility.					
5) Project that maintains, expands or promotes a tourist or cultural facility that is required to be proximate to a specific historic, natural or cultural resource or a building or improvement that is related to and required to be proximate to land					
acquired for a park, conservation, open space or public access or to an agricultural, conservation or historic easement.					
6) Housing projects serving the following: individuals with mental illness, mental retardation, developmental disabilities, physical disabilities, brain injuries, substance abuse problems or a human immunodeficiency virus, homeless individuals,					
victims of domestic violence, foster children, or children or adults in the custody of the state.					
7) Project certified by the head of a state agency to the Land and Water Resources Council (LWRC) as having no feasible location within the four municipal geographic categories, if by majority vote of all members, the LWRC finds that					
	extraordinary circumstances or the unique needs of the agency require state funds for the project.				

Transit Oriented Development (2.2d) – Greater Portland Council of Governments

DRAFT FOR WORKING GROUP

Transit Oriented Development

Prepared by Steve Linnell, Greater Portland Council of Governments

Definition of Transit Oriented Development, from Victoria Transport Policy Institute (http://www.vtpi.org/tdm/tdm45.htm)

Transit Oriented Development (TOD) refers to residential and commercial areas designed to maximize access by Transit and Nonmotorized transportation, and with other features to Encourage Transit Ridership. A TOD neighborhood has a center with a rail or bus station, surrounded by relatively high-density development, with progressively lower-density spreading outwards. For example, the neighborhood center may have a transit stations and a few multi-story commercial and residential buildings, surrounded by several blocks of townhouses and small-lot single-family residential, and larger-lot single-family housing farther away. TOD neighborhoods typically have a diameter of one-quarter to one-half mile (stations spaced half to 1 mile apart), which represents pedestrian scale distances. It includes these design features (Morris, 1996):

- The neighborhood is designed for Cycling and Walking, with adequate facilities and attractive street conditions.
- Streets have Traffic Calming features to control vehicle traffic speeds.
- Mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighborhood.
- Parking Management to reduce the amount of land devoted to parking compared with conventional development, and to take advantage of the parking cost savings associated with reduced automobile use.

Transit Oriented Development generally requires about 7 residential units per acre in residential areas and 25 employees per acre in commercial centers, and about twice that for premium quality transit, such as rail service (Ewing, 1999). These densities create adequate transit ridership to justify frequent service, and help create active street life and commercial activities, such as grocery stores and coffee shops, within convenient walking distance of homes and worksites. However, other factors are also important beside simple density. Transit ridership is also affected by factors such as employment density and Clustering, demographic mix (students, seniors and lower-income people tend to be heavy transit users), transit pricing and rider subsidies, Parking Pricing and Road Tolls, the quality of transit service, the effectiveness of transit Marketing, walkability, and street design. A particular density may be inadequate to support transit service by itself, but becomes adequate if implemented with a variety of Transit Encouragement and

Smart Growth strategies. The assumption that transit cannot be effective except in large cities with high population densities can be a self-fulfilling prophecy, because it results in transport and land use decisions that favor automobile travel over transit.

The PACTS Arterial Land Use Policy

"Any arterial corridor roadway project, that by itself or as part of a program of improvements will reduce commuter travel times between an urbanized and non-urbanized area, must be accompanied by a land use plan that preserves the arterial's capacity, protects its mobility and the public investment, and that minimizes sprawl."

Key Concepts & Principles

* Compact/Transportation Efficient/ Pedestrian-Scaled Land Use
* Job and Residential Densities to Support Transit
* Mix of Land Uses:
* Residential, Commercial and Public
* Corridors are the Appropriate Scale for this Type of Planning
* Plan Should Address Multiple Geographic Scales

Land Use Concepts

* Density / Intensity
* Diversity / Mix of Uses
* Design / Scale
* Accessibility
* Vehicle
* Transit
* Bicycle
* Pedestrian

Four levels of compact planning areas: Urban, Village, Hamlet and Suburban, each with a core (more intensive) and secondary (less intensive) zone that mixes commercial, residential and public space appropriate to the setting that also supports public transit.

Transportation and Open Space (2.2f) – The Nature Conservancy

DRAFT FOR WORKING GROUP

Recommendations for bolstering Transportation and land use planning efforts in Maine
Submitted by Kate Dempsey, The Nature Conservancy

In Maine there are new efforts underway to coordinate land use decisions with transportation planning and or municipal comprehensive planning. Most of these are voluntary efforts, lack significant funding and are in their early stages. (some of these were described by Kathy Fuller at the Transportation sub meeting):

- The **Beginning with Habitat** (BwH) program was created in 2000 with the goal of providing municipalities with the data and tools to prevent poorly planned development that leads to the loss, degradation, and fragmentation of habitat for the native plants, animals and natural communities of Maine. Every 10 years, the State requires all municipalities to write comprehensive plans that include sections on natural resources and land use planning. BwH provides municipalities and land trusts on a voluntary basis access to comprehensive natural resource data and provides hands-on assistance in interpreting and using data for planning purposes. To date, more than 100 towns have received this data. BwH represents a dynamic approach to disseminating natural resource data to local planners. The program brings together the expertise and resources of the Maine Department of Inland Fisheries and Wildlife, the Maine Department of Conservation, the US Fish and Wildlife Service, The Nature Conservancy, the Maine State Planning Office, Maine Audubon, and Maine's 13 Regional Planning Commissions. The BwH program is now having initial coordination meetings with MaineDOT. The Beginning with Habitat program signifies a dramatic change in the manner in which the State provides Maine's natural heritage information to towns, land trusts, watershed groups and other organizations. This program is funded primarily through small grants. Its funding is not guaranteed for this year.

  Recommendation: While the focus on the program is on habitat protection, it can serve as a guide for other planning, including transportation and other land use for the purpose of Green House Gas reductions. Support program funding.

- **Gateway One** is a long-term land use and transportation planning projects developed by MaineDOT and coordinated with Route 1 towns from Brunswick to Prospect. Gateway 1 will ultimately give MaineDOT and the towns a long-term, regional plan for growth around the Rte. 1 Corridor, incorporating each town's land use and transportation needs. This is an opportunity to proactively plan for growth along the Corridor as a region. The Gateway 1 process will allow communities and the MaineDOT to evaluate where they want to be in 20-30 years and build land use policies and transportation infrastructure in support of these goals. Gateway 1 will be funded through a mix of federal and state dollars. MaineDOT is funding phase one, which is expected to cost $300,000 for preliminary outreach and data collection over the first nine months.

  Recommendation: Support additional funding of this pilot project and determine where else in Maine such increased coordination would be useful.

- The revision of **The Sensible Transportation Act (rule expected next session)** could provide an opportunity to make an explicit connection between municipal comprehensive plans and the reduction of GHG emissions.

Recommendation: Provide incentives (priority order etc) through Maine DOT to encourage compact mixed-use development and cross municipal planning.

- **Land for Maine's Future** is a program designed to support opens space (open space, working forest, farms, water access) conservation at a local and state-wide level. Funding has run out.

Recommendation: Support a substantial land bond to be placed on November ballot

Commuter Choice (2.4a) – Greater Portland Council of Governments

DRAFT FOR WORKING GROUP

COMMUTER CHOICE

Prepared by Steve Linnell, Greater Portland Council of Governments

Recommendation:
Provide incentives for Maine commuters to use public transit, carpool and vanpool, walk, bike and other options to get to work.

Specific Recommendations

- Implement *Commuter Choice* tax incentives for vanpool and transit riders allowing them to pay up to $100 per month using pre-tax dollars.
- Additional regular funding for expanded vanpool program. *Could use 15 new vans today*
- Preferred parking for carpools/vanpools/alternative fuel vehicles (including hybrids) *MaineDOT is launching a pilot program using colored tags*
- Dedicated fund for cooperative marketing of transit and GO MAINE program directed at commuters
- Broaden Executive Order # 11 to include municipalities and employers
- Encourage integration of alternative modes into new employee benefits info
    - Regular updated notices to all employees on commuter options
- Provide seed money and/or subsidies, matching money to employers to start van pools
- Encourage employers to meet the criteria of EPA's Best Workplaces for Commuters http://www.bestworkplacesforcommuters.gov/

Description

- Employers offer pre tax and/or subsidized transit passes or vanpool benefits of up to $100 a month (IRS 132(f)).
- Taxable cash is offered to employees in lieu of parking benefits. Firms in California and Minnesota offer a $2 a day incentive instead of free parking.

Implementation in Maine
Implementation could involve a combination of the following:

- State Tax Credits- The cost of Commuter Choice benefits to the employer is relatively small and can easily be incorporated into the ordinary benefits package offered by most employers. Benefits to the employer include less FICA and FUDA. State tax credits can further reduce this cost.
- New Fares- Municipalities can be encouraged to establish new transit fare products such as discounted rates for bulk purchases of mass transit tickets.
- Marketing- Aggressive marketing of the Commuter Choice benefits to employers and employees will be necessary to encourage adoption of the program.

- Financial incentives- Provide financial incentives for employers and employees to adopt Commuter Choice benefits. These incentives should be adjusted annually in order to meet target compliance rates.

GHG Reduction:
- *To be determined*

Benefits:
- The implementation of Commuter Choice benefits in California, Minnesota and DC resulted in approximately 11% of employees switching from driving to using other means (such as mass transit) to get to work. In the DC region this took approximately 12,500 cars off the road.
- Fewer commuter auto trips reduce air pollution, help alleviate congestion, and ensure a reliable supply of parking for those who choose to drive.
- A complete Commuter Choice program with targets, timetables and funding commitments can be included the State Implementation Plan.

Cost savings:
The savings for the employee provided by a Commuter Choice plan are substantial. Allowing employee-paid pre-tax transit benefits can save transit-using employees up to $400 a year (Arthur Andersen). The Commuter Choice benefit may also result in savings for the employer by avoiding the cost of building, leasing or maintaining parking spaces. Capital cost and operating cost savings to the employer can be significant, up to thousands of dollars per avoided space. Such savings are often more than enough to pay for Commuter Choice benefit.

Pay as You Drive Insurance (2.4 d) – Natural Resources Council of Maine

DRAFT FOR WORKING GROUP

Pay as You Drive (PAYD) Insurance Program

Submitted by Natural Resources Council of Maine

Recommendation

- Provide incentives for Maine car insurance companies to experiment with PAYD pricing programs.

Description

- **Establish distance-based insurance premiums instead of the current term-based system. A distance-based, or Pay As You Drive, system allows motorists who drive less to pay less on their insurance premiums.**
- **Determine insurance premiums using 'odometer audits' to provide accurate mileage data.**

Implementation in Maine
Implementation could involve a combination of the following:

- Pass Legislation – Maine most likely will need to pass legislation specifically allowing PAYD insurance pricing (as with Texas' HB45, adopted in 2001).
- Tax credits – Maine can provide tax credits to auto insurance companies as an incentive to offer PAYD insurance (as with Oregon HB 2043, adopted in 2003).
- **Funding or technical assistance for pilot programs – The potential cost of determining odometer-based premiums (GPS technologies or odometer readings) is a large concern for insurance companies. Funding to help pay for technology would reduce this barrier.**

GHG Reduction
Estimates suggest that full adoption of a PAYD program could reduce vehicle miles traveled by approximately 10%. This translates into an estimated 1,500 million miles in 2004, or a greenhouse gas reduction of approximately 0.9 million metric tons of CO_2.

Benefits

The reduction of VMT provided by the PAYD program will lead to reduction in traffic congestion, air pollution, toxic runoff from roads and climate impacts. PAYD is also expected to reduce accidents: a 10% reduction in driving is estimated to result in a 17% decrease in crashes.

Cost savings
A cost benefit analysis showed that the benefits provided by a PAYD program out weighted the costs 50:1. (Litman, 2003) Pilot programs show that, on average, PAYD reduces insurance premiums by 25% thereby making insurance more affordable. This will help reduce the large

number of uninsured drivers. In addition, PAYD can reduce infrastructure costs. The Federal Highway Administration estimated savings on infrastructure improvements is 3-5¢ for every mile not driven; this would save Maine between $45 and $75 million a year. The reduced accident and road costs provided by PAYD will more than pay for a tax credit or other incentive program.

Cost of implementing

PAYD requires odometer auditing to collect accurate vehicle-mileage data. Odometer audits are estimated to cost $5-10 on average per vehicle-year.

Who else has done this?

- Texas adopted legislation allowing insurers to offer mileage based programs (HB45 in 2001).
- Oregon adopted legislation allowing tax credits for corporations that provide mile-based insurance plans (HB 2043 in 2003). The tax credit is $100 per vehicle for the first year an eligible policy is issued. The credit is capped at $1 million. Maryland has recently introduced similar legislation.
- Washington and Pennsylvania are also pursuing PAYD programs.
- Progressive Insurance and Norwich Union(UK) are offering usage-based insurance pilot programs.

Preferential Parking (2.4 k) – Natural Resources Council of Maine

DRAFT FOR WORKING GROUP

Preferential Parking

Submitted by Natural Resources Council of Maine

DRAFT FOR WORKING GROUP
PREFERENTIAL PARKING

Recommendation

Provide preferential parking for drivers of low (GHG) emissions vehicles.

Description

- Reserving choice parking spaces and providing reduced parking rates provides incentives for renting or purchasing low emissions vehicles.
- Parking spaces: Parking spaces in ideal locations (close to key buildings) could be reserved for low emission vehicles. These vehicles must have visible certification of their low emissions status.
- Parking lots/garages: Entire lots or sections of lots (e.g., covered spaces) could be set aside for low emission vehicles. In addition, parking rates for these vehicles could be reduced.

Implementation in Maine

Implementation could involve a combination of the following:

- Pass Legislation- Maine can pass legislation permitting, encouraging, or requiring towns and cities to offer preferential parking for low emissions vehicles (cf. Massachusetts SB 1150 introduced in 2003).
- Financial assistance- Maine could provide financial assistance to allow for reduced parking rates.

GHG Reduction

To be determined.

Benefits

Encouraging residents and tourists to drive low emissions vehicles will reduce greenhouse gas emissions. To the extent that many low-GHG vehicles are broadly less polluting, this will improve air quality and public health.

Cost of implementing

Implementation costs should be minimal as vehicles will be required to have visible certification of their low emissions status.

Who else has done this?

Massachusetts has introduced a bill permitting towns and cities to offer preferential parking for low emissions vehicles.

MAINE GREENHOUSE GAS STAKEHOLDER ADVISORY GROUP

TRANSPORTATION AND LAND USE WORKING GROUP

Fuels Sub-group recommendation report

Prepared by John Wathen, MEDEP

This report is intended to summarize the recommendations of the sub-group for measures that would yield GHG savings. The emphasis of the report is on measures that can be effected in the short term. Measures with potential for the medium and long term are discussed later in the report.

Measure TLU 3.2: Low-GHG Fuel for State fleets.

The motor vehicle fleet of the State of Maine consists of two primary groups of vehicles: medium and heavy vehicles operated by the Department of Transportation (MaineDOT), and medium and light vehicles used by the agencies and maintained by Central Fleet Management (CFM), as well as certain agencies such as the Department of Public Safety.

MaineDOT
Green house emission reductions from the use of biodiesel are generally analyzed on a life-cycle basis. In contrast to tailpipe emissions, life cycle emissions incorporate the net quantity of emissions generated during the following: 1) those emissions saved during the growth of plants used for making biodiesel; 2) those emissions saved during production of the fuel and; 3) those emissions generated during fuel combustion. If lifecycle emissions are not taken into account, and only the tailpipe emissions are measured and compared to those tailpipe emissions from conventional diesel, the use of B20 results in a 1% increase in CO_2 emissions.

It should be noted that CO_2 tailpipe emissions created with the combustion of biodiesel are emissions that have already existed in the atmosphere that were recently sequestered by the growth of the crop. Biodiesel does not introduce new CO_2 emissions into the atmosphere, but rather recycles existing CO_2 emissions within the atmosphere. This contrasts with the use of fossil fuels that re-release CO_2 emissions that been removed from the earth's atmosphere and stored in the form of oil for thousands of years. Without the mining and combustion of conventional fuel, these CO_2 emissions would remain stored in the earth and would not be released into the atmosphere.

The primary CO_2 reductions for the use of biodiesel occur during the growth of the soybeans (or any crop used to produce biodiesel) and during the production of the fuel. However, the actual benefit derived from the sequestration of CO_2 will occur primarily in the Midwest, where crops for biodiesel are grown and where the majority of biodiesel is manufactured. Maine will not directly benefit from a reduction in CO_2 emissions because the State does not grow or manufacture biodiesel.

Because the reduction of green house gases is seen as a global issue, lifecycle emissions are used to determine the net benefit associated with the use of biodiesel. Using biodiesel in the State of Maine will reduce CO_2 emissions on a global scale but will not reduce CO_2 emissions on regional scale.

Most of the MaineDOT fleet, at least the heavy vehicles such as plow trucks, consists of diesel-powered trucks, whereas their patrol trucks are gasoline powered. Trucks based at the MaineDOT maintenance garage in Freeport have been operating on 20% biodiesel (B20) on a trial basis. B20 is usually viewed as a reasonable compromise between the incremental cost of biodiesel and the benefits obtained from the reduction emissions.

When taking lifecycle emissions into account, the use of B20 results in approximately a 15% reduction in CO_2. Other benefits of biodiesel include reductions of particulate matter (PM), hydrocarbons (HC), carbon monoxide (CO) and sulfates (SOx) that are also associated with the use of biodiesel. This practice has the potential to achieve substantial reductions in the GHG emissions of the State heavy vehicle fleet, and could also extend to construction equipment operated by MaineDOT. Replacement of gasoline-powered patrol vehicles with diesel powered trucks would provide an opportunity for greater use of biodiesel and would achieve reductions in GHG emissions from the increased mileage efficiency of diesel engines. Specifying the use of B20 in construction contracts bid by the Department would further leverage the benefits of B20 at minimal cost to the State. Although the Maine Turnpike Authority (MTA) is an independent entity, the use of B20 in their fleet vehicles would yield the same benefits.

Although not part of the State fleet, there are numerous other heavy vehicles owned and operated by public entities in the State. These include municipally-operated school buses and public works trucks. Operation of these vehicles on B20 would yield benefits comparable to State operated vehicles. Measures to encourage the use of B20 in these fleets should be considered as part of a State package to achieve GHG reductions.

Other fuels available to reduce GHG emissions in heavy and medium duty vehicles include compressed natural gas (CNG) and liquefied petroleum gas (LPG) also known as propane. CNG will be available in the near future at the Greater Portland METRO and will power transit busses, some school busses and various other vehicles from a variety of fleets. Conversion of fleets in the Portland Metro Area to CNG would, like the use of biodiesel, yield a three-fold benefit: reduction of GHG emissions, reduction of priority pollutant air emissions for health benefits, and reduction of black carbon emissions as an additional anti-global warming component. Maine's other larger metropolitan areas, L-A and Bangor, would also constitute potential venues for the establishment of CNG fueling, maintenance, and vehicular infrastructure.

There is also a "dual-fuel" technology specific to heavy-duty diesel vehicles that uses the high energy content of diesel to start the engine but runs almost entirely on CNG. This technology could be used by Maine DOT and Turnpike Authority vehicles, especially snow-plows.

Examples of propane vehicle use exist around the state as well. Most notable is the Island Explorer fleet of buses in Acadia National Park using 19 propane-powered buses. At least two private sector fleets are known to use dedicated propane vehicles. Schwan's Frozen Food delivery service operates more than 70 medium duty propane trucks throughout the state, while a

taxi company in Bangor has a fleet of propane cabs. Public infrastructure has been built in Portland and Augusta. Propane fueling stations are much less expensive than CNG facilities, and propane, being heavier than air, does not require the modifications to service facilities associated with CNG.

Recommendations (Heavy vehicles):

⇒ Increase the use of B20 in MaineDOT maintenance fleet;

⇒ Use B20 in existing diesel powered off-road vehicles;

⇒ Include B20 and/or other alternative fuel use in contract specifications for firms doing business with the State;

⇒ Urge MTA to use B20 and/or other alternative fuel in its fleet.

⇒ Encourage/incent the use of B20 and/or other alternative fuel in municipal fleets

⇒ Expand CNG capable fleets in Portland

⇒ Establish CNG infrastructure in other metropolitan areas and along the Maine Turnpike

⇒ Take advantage of existing propane fueling infrastructure

Light Duty vehicles

The opportunities for reducing GHG emissions in light duty vehicles are currently limited by fuel availability and regulation. CFM has been and continues to purchase high mileage conventional drive train vehicles and hybrid vehicles for inclusion in the State fleet. Honda Civic hybrids are currently being acquired due to back orders on 2004 Priuses. Continued purchase of these vehicles will increase fuel efficiency of the fleet and will result in reduced operational GHG emissions.

Another resource in the CFM stable that is currently not being used to reduce GHG emissions is represented by the 34 flexfuel vehicles (FFV)owned by the State. Flexfuel vehicles can run on straight gasoline or blends of up to 85% ethanol. As is the case in many areas, these FFVs have never experienced E85 or even E10. A concerted and coordinated program of continued purchase of FFVs combined with an infrastructure and supply investment in ethanol-containing fuel would represent a reasonable and cost- effective measure available to the State for achieving GHG emission reduction goals. The FFVs are indeed flexible and can accommodate any blend of ethanol with gasoline up to E85, eliminating strandings and giving them to the ability to benefit from whatever percentage of ethanol the State coffers were capable or providing.

The use of light diesel vehicles represents another means of reducing GHG emissions. Such vehicles often achieve 40-50% better mileage than their gasoline powered counterparts and are capable of operating on renewable biodiesel fuels. Currently available models have not been able to meet 2004 California Air Resources Board (CARB) emissions standards for light vehicles for NO_x emissions and are therefore not available in Maine. Versions of these models that will be designed for use with ultra-low sulfur diesel when it becomes mandatory in 2006 may make this

option available in the future. When consistent with air quality regulation, incorporation of these vehicles in the CFM fleet would represent a cost-effective option for reducing GHG emissions.

Recommendations (Light vehicles):

⇒ Continue/increase the purchase of high mileage and hybrid vehicles;

⇒ Continue/increase the purchase of FFVs by CFM;

⇒ Provide fueling infrastructure and ethanol-blend fuels for use by State and other vehicles;

⇒ Purchase diesel light vehicles when consistent with air quality regulation.

⇒ Purchase CNG and LPG bifuel light vehicles where practicable and available.

Measure TLU 3.3: Low-GHG Fuel Infrastructure

The consideration of measures for reducing GHG emissions through changes in the mix of motor fuels used in Maine and providing infrastructure for alternative fuels involves many of the same elements discussed in TLU 3.2 with respect to State fleet vehicles. The range of available fuels is limited, the types of vehicles that are reasonably available are limited, and lack of infrastructure that would facilitate the use of low GHG/renewable fuels represent major impediments to the reduction of GHG emissions by these means.

Fuels cannot be considered in a meaningful way separate from their cost and the economic context of the conditions that have caused the increase of CO_2 in the earth's atmosphere. The use of fossil energy sources has transformed every aspect of human activity and society. Fossil energy has dominated our economic growth and industrialization because of its low price and the fact that mankind has accepted the externalized costs that we now know have been associated with its use. Knowing what is required to reduce GHG emissions now does nothing to decrease the strength of the economic forces that have brought us to this point. Reducing GHG emissions is going to cost money and is going to run counter to our instinct and inclination not to pay more than we have to for anything.

According to the U.S. Department of Energy (DOE), however, savings in CO_2 emissions that result from the use of the fuels cited herein are substantial. In terms of current cycle vs. fossil carbon, the combustion of biodiesel (B100) results in a 78% reduction of CO_2 relative to petrodiesel, or a 15% reduction for B20. Although the energy/GHG benefits of grain derived ethanol are controversial, most investigators cite a 120%-130% energy (and therefore GHG) benefit, relative to energy inputs, from the combustion of ethanol. The GHG reduction benefit of cellulosic ethanol is greater and is less controversial. The reduction of CO_2 associated with the use of natural gas vs. liquid petroleum fuels is 30%-40%. Propane, although it produces lower reductions in GHG than CNG, results in lower emissions of soot and other pollutants than petroleum, and is the most accessible alternative fuel.

The role of government in addressing the gap between the low price of fossil/petroleum energy and more expensive but less harmful means of meeting our energy requirements is an issue that is currently being addressed in many forums, including this one. Scarce budgetary resources, relatively high taxes, and a generally high cost of doing business in Maine do nothing to facilitate the task. Although it can be postulated that as more renewable fuels (renewable fuels of some kind are really the ultimate answer to reducing GHG emissions) are produced, their costs will decline, the fact is that there is and likely will continue to be a substantial cost differential between renewable fuels and petroleum until such time as the latter gets scarce. And, of course, because of the nature of markets, renewable fuels will never be cheaper than petroleum.

A major component of the cost of low-GHG fuels in the Northeast is transportation. E85 and biodiesel both are currently priced at $1.60-$1.70/gallon in the midwest in locations proximate to production facilities, which in turn are located in growing areas. Terminal prices of biodiesel in New England run in the $1.90-$2.00/gallon range. Encouraging the use of low-GHG/renewable fuels as a means of attracting production to the State, eliminating or reducing the transportation differential in price, certainly would represent a measure that the State could undertake to reduce the cost differential attributable to transportation over time. To the extent that locally produced biodiesel would likely be made from yellow grease (waste fry oil) and an economically viable ethanol would be derived from wood products/waste, local use would certainly provide a boost to the economics of local production, which would in turn lead to more prevalent use.

A second potential opportunity for low GHG diesel fuel exists for Maine. Synthetic diesel fuel derived from biomass is a reality on a pilot basis. At present, syn-diesel from biomass is cost-competitive only in high-tax environments where its additional cost can be absorbed by fuel tax structure modifications. This would not be applicable in Maine or for public fleets, but should be noted for its GHG reduction potential, again as production cost fall with advancing process technology.

These discussions relate to infrastructure in that means of production is certainly an element of infrastructure. The petroleum infrastructure is huge and complex and operates relatively flawlessly with little attention from us as we pull up to the pump. Beyond the realm of production, the two categories of infrastructure that are required for the use of low-GHG fuels relate to distribution and dispensing, and to the vehicle fleets that will employ them. As stated above, many of those elements are similar to those considered in TLU 3.2, but the twist in providing fuels and vehicles for use by the public varies somewhat from what it would take for greater use by the State.

Distribution and dispensing infrastructure

Getting the right vehicles to an appropriate fueling location can be a challenge for some alternative fuels with GHG reducing potential- CNG and propane are good examples. Propane light vehicle availability in the short-term and intermediate future does not appear favorable though conversions are expected to fill the void. Effective use of CNG and LPG fueling facilities is limited to vehicles that garage at or near to those facilities or that can count on fuel at either end of a longer run. Bi-fuel CNG and LPG options exist that allow the vehicles to run on

gasoline when the alternative fuel is unavailable. Unlike propane, availability of CNG vehicles of all sizes is much more robust. Fueling infrastructure is the critical limiting factor for CNG.

One opportunity on the horizon is the potential for an LNG port on the Maine coast. When LNG is reverted to natural gas there exists an opportunity to compress it on site. Depending on the ultimate location, this could prove beneficial for businesses and/or a municipality for marine as well as road use..

Ethanol, biodiesel, and other liquid low-GHG petroleum extenders are free of infrastructure limitations in that vehicles that can use either can also use their respective petroleum equivalents interchangeably. This eliminates the potential for a problem related to stranding of a dedicated vehicle that uses low GHG fuels away from its fueling infrastructure. An E85 FFV can just fill up with gasoline, apologize to its low GHG ethic, and return to an area where an ethanol blend is available for the next fill-up.

Not all gasoline vehicles, however, can use ethanol blends at levels higher than E10 (which all gasoline vehicles can tolerate). Therefore, in order to provide for high ethanol blends, additional tanks and dispensers will be required. For retailers that currently sell no E85 or E10 for that matter, the prospects for demand would be uncertain at best, and the assurance of getting an adequate return on the investment would be absent. Separate tanks for any ethanol or any other liquid low-GHG fuel constitute an essential element of infrastructure that will be required for the use of such fuels in Maine. This applies as much to biodiesel as it does to ethanol in that some potential users of a BXX fuel may not wish to pay the incremental cost associated with its use.

One approach to avoiding the tank and dispenser infrastructure that is available to the State would be to adopt a renewable fuel standard (RFS) analogous to a RPS for electricity. Under this scenario all diesel fuel sold would have low renewable content requirement (e.g. B2 or B5). Similarly gasoline with a low ethanol content (<10%) would be sold statewide, achieving a substantial impact in terms of aggregate use. It can be argued that absent such a mechanism, low-GHG fuels will continue to occupy niche markets only. An additional result of an RFS is that air quality benefits for a given volume of oxygenated fuel are greater when that fuel is mixed with a larger volume of conventional fuel, rather than a smaller volume of high percentage low-GHG fuel.

Vehicle infrastructure

As with the State fleet, the commercial fleet of diesel trucks constitutes a major potential element of infrastructure for the use of low-GHG fuels. Diesel vehicles of any type can use biodiesel or biomass-based synthetic diesel in substantial concentration (up to 40%, depending on the season) to advantage with no vehicle modification. By any measure, the diesel fleet represents a major, continuing opportunity for the use of low-GHG fuels.
Additionally, air quality problems associated with diesels are greatly mitigated by the qualities of renewable diesel substitutes, which are low in sulfur and aromatic compounds, and which, like biodiesel, are oxygenated.

Also comparable to the State fleet in numbers and potential, there are approximately 25,000 FFV vehicles registered in Maine that could use up to E85 but which currently use only gasoline for fuel. Competitively-priced high-ethanol blends would most certainly attract users among owners of these vehicles and would have the potential for very large per vehicle reductions in fossil CO_2 emissions. Availability of fuels would work synergistically with the continued availability of FFVs to increase low-GHG fuel usage and result in net CO_2 reductions. Measures that would increase the purchase of FFVs within the context of incented availability of ethanol blends, such as their inclusion in a Feebate structure, would fuel this synergy. Combining the need for dispensing infrastructure for ethanol blends for State vehicles with providing commercial availability of these fuels to the public could be accomplished through a public/private partnership structure to avoid redundancy of effort and investment.

Heavy vehicles that operate on CNG in modes that involve long hours, high mileages, and which return to a central facility each day have the potential for reducing their GHG emissions relative to conventionally-fueled vehicles. Although limited in scope and potential area of operation, the use of such vehicles can result in substantial savings in CO_2 emissions as well as producing air quality benefits.

Recommendations:

⇒ Provide incentives for in-State production of biofuels

⇒ Provide incentives for investments in alternative fuel infrastructure;

⇒ Adopt a Renewable Fuel Standard (RFS) appropriate to Maine;

⇒ Use the potential of diesels to employ low-GHG fuels;

⇒ Provide incentives for the sale of low-GHG fuels;

⇒ Provide incentives for the purchase of E85 vehicles.

⇒ Provide incentives for CNG vehicles and CNG fueling infrastructure for urban fleets.

The Future

The ultimate future that we work back from towards today likely involves hydrogen fuel with no GHG emissions save water. This fuel would be derived from sources with very low associated life-cycle CO_2 emissions. The fuels would be the result of the production of hydrogen from renewable electricity or derived from cellulosic materials. With respect to both of the infrastructure elements discussed above, hydrogen is a long way off. Hydrogen requires a more advanced fueling infrastructure than does CNG, costs of fuel cells are very high, and challenges with storing sufficient hydrogen for normal patterns of operation pose themselves as obstacles to the coming hydrogen economy. The first uses of hydrogen to replace fossil fuels will likely come in fixed installations rather than in transportation.

In the less distant future, the prospect of low-cost cellulosic ethanol holds great promise in terms of the use of low-GHG/renewable fuel for the State of Maine. Similarly, “bio-oil” and other

diesel-like derivatives of wood and woodwaste have the potential to provide for a substantial portion of the fuels needs of the State and greatly reduce GHG emissions. This generation of useful renewable fuels that is just over the horizon will represent a major step up from the crop-based biofuels that are available to us today.

The combustion of a unit of biodiesel, considering all energy used in its production, results in a 78% reduction in the emission of fossil CO_2 relative to a unit of petrodiesel. Apart from the practical and economic considerations of having fuel crops compete for land and other inputs with food crops, however, there is uncertainty at the margins as to the net life-cycle implications of large-scale production of crop-based fuels over the long term. These considerations relate to both net CO_2 impacts of crop cultivation and land use as well as to CO_2 equivalents of other GH gasses. These second-tier considerations are characterized by a high degree of uncertainty and beg both original research and further concerted efforts towards life-cycle analysis. In the short term, encouraging the use of currently available low-GHG fuels- ethanol, biodiesel, propane and CNG- is essential in developing patterns of fuel use, encouraging local production of renewable fuels, increasing fueling infrastructure, and maximizing the attributes of both State and privately-owned vehicles for the increased use of renewable fuels over time.

Truck Stop Electrification (4.2 d) – Natural Resources Council of Maine

DRAFT FOR WORKING GROUP

Truck Stop Electrification

Submitted by Natural Resources Council of Maine

Recommendation

Establish a Truck Stop Electrification program in Maine.

Description of TSE

- Truck Stop Electrification provides power to run truck HVAC systems, therefore eliminating the need for them to idle overnight and resulting in a significant reduction in greenhouse gas emissions.
- Long-haul truck drivers idle to provide power for onboard appliances (such as air conditioner/heater, microwave) and to maintain engine warmth during cold weather. On average, a single truck idles 1,830 hours annually and produces approximately 0.2 tons of CO, 0.4 tons of NOx, and 22 tons of CO_2.
- Truck stop electrification allows truck drivers to obtain power for overnight use from an electric "grid" instead of by idling their motors.
- Either an off-board or on-board truck stop electrification program can be implemented.
    - Off-board TSE: Auxiliary HVAC units are provided for each truck to power on-board appliances. Off-board TSE does not require any truck modifications. Existing systems charge drivers $1.25-$1.50 per hour, slightly less than the typical fuel cost associated with idling. Off-board infrastructure requires an initial capital investment that may be a barrier to some truck stops without state assistance.
    - On-board TSE: Electric HVAC units are installed onboard the truck and connected to electrical outlets at parking spaces. Such a retrofit could cost from several hundred dollars up to $4000 per truck, depending on the extent of the retrofit. Installing electrical infrastructure at parking spaces could cost $1000-$4000 per parking space.

Implementation in Maine

- Of Maine's 16 major truck stops, the US EPA has identified at least 8 that would be suitable for TSE. These truck stops are on the I-95 corridor and have at least 50 parking spaces for trucks.
- The approximate capital cost for installing an off-board TSE system is $10,000 per space or $0.5 million per truck stop. Maine could facilitate TSE installation through a voluntary partnership or provide assistance with capital financing through low interest rate loans, tax incentives, or grants.
- More widespread long-term reductions could be achieved by providing incentives for fleet owners to install on-board systems in their trucks. These would facilitate idle reduction in cold temperatures at locations with access to electric power.

GHG Reduction

Installation of off-board TSE systems at the 8 truck stops identified by EPA could save approximately 1.2 million gallons of fuel each year, and reduce CO_2 emissions by 12,000 metric tons of CO_2 per year less indirect emissions from electricity. Expanded use of off-board systems would provide further reductions.

Benefits

TSE will reduce emissions of greenhouse gases, improve air quality, and decrease fuel consumption. In addition, driver health and quality of rest will be improved as a result of TSE systems. Many TSE systems also provide additional amenities, such as internet access and access to first-run movies.

Cost savings
Each year truck idling consumes $2400 of fuel and adds $250 in maintenance fees for a typical long-haul truck. TSE systems will reduce or eliminate these costs, replacing them with lower electricity/service charges.

Who else has done this?
New York State currently has two TSE demonstration sites on I-90 and is installing an onboard TSE system on I-87. The demonstration sites provide access to electrical power outlets and HVAC units for 45 parking spots at each truck stop.

Memo

TO: **Transportation Working Group, Maine GHG Initiative**
FROM: **Environment Northeast**
SUBJ: **Diesel Black Carbon Background**
DATE: **DRAFT – 29 March 2004**

A. Background

Black carbon (BC)

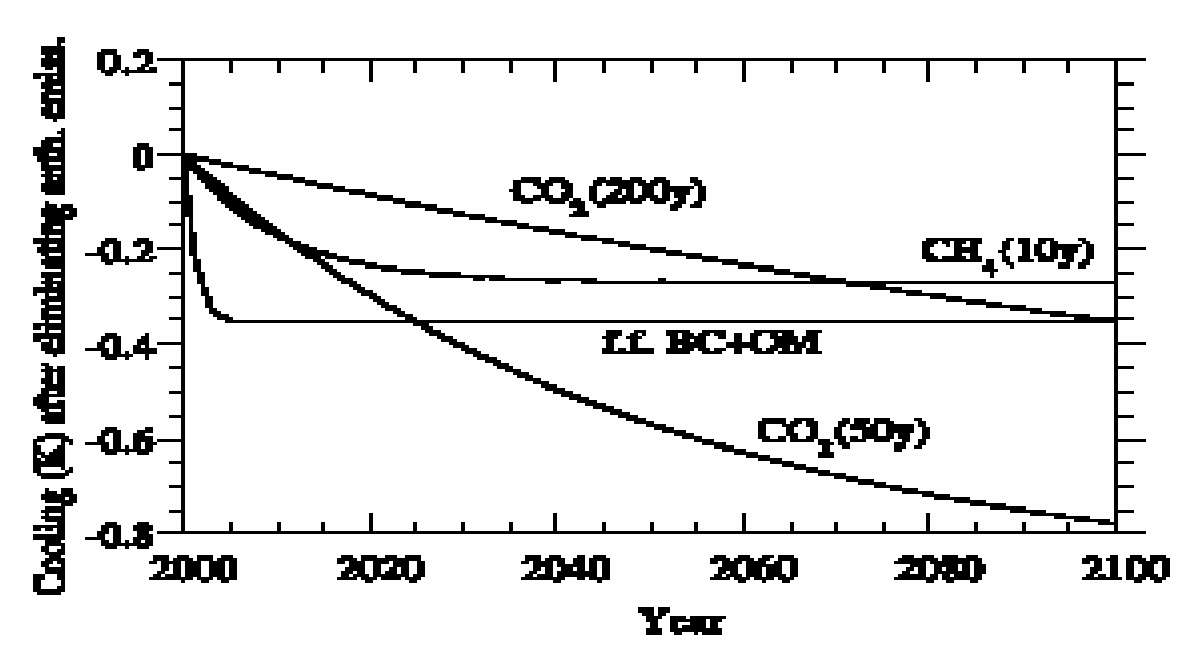
- Definition -- As used here, BC is defined as the absorbing component of carbonaceous aerosols (fine particles in the air) in soot, which results from the incomplete combustion of a carbon-based material (mainly fossil fuels and biomass). (Hansen). BC remains in the atmosphere for about a week. (Ogren, Bond).
- National Inventory
  - Total US emissions of BC are in the range of 400,000-500,000 metric tons.
  - About 50% (220,000-230,000 metric tons) comes from transportation (Streets, Bond)
    - 195,000-205,000 metric tons from diesel (on road, off road, marine, aviation)
    - 25,000 metric tons from gasoline vehicles
  - Between 60,000-110,000 metric tons comes from biomass
- Maine BC Inventory – Estimate
  - In 2002, there were about 1,745.6 metric tons of BC from mobile diesel engines in Maine.
  - 194.2 million gallons of diesel fuel were sold in Maine in 2002. (EIA – Tables 16 including on-highway, off-highway, railroad, farm, vessel)

End User Category	Gallons
on-highway	167.6 million
off-highway	9.9 million
vessels	8.6 million
farm	7.5 million
TOTAL	194.2 million

    - an additional 36.7 million gallons of residual fuel oil are sold for vessel bunkering, and were not factored into these calculations.
    - no estimate is made for combustion of 398 million gallons of fuel oil (e.g., for heating systems or industrial use) since there is no emissions factor estimate.
  - Blended emissions factor of 0.0090349 metric tons of BC per 1000 gallons (Energy and Environmental Analysis, Inc.) combines:
    - US EPA Part5 emission factor model for PM emissions of on-road vehicles
    - US EPA AP-42 emissions factors for PM from all other mobile diesel uses.
    - Other assumptions -- The emissions factors are for “elemental carbon,” assumed to be a proxy for “black carbon”, by factoring out the soluble organic

fraction of carbon-based PM. Indirect PM emissions and sulfate emissions are not counted.

- o CO2 equivalence, global warming potential
  - 1,745.6 metric tons of BC has a CO2 equivalence in the range of 2.8 – 6.4 million metric tons. To err on the more conservative side, we will work with the low estimate of 2.8 MMTCO2e. There continues to be significant uncertainty in these calculations.
  - The global temperature reduction curves modeled by Dr. Mark Jacobson at Stanford Univ. found that the ratio of fossil fuel black carbon plus organic matter to CO2-C cooling is somewhere between 220:1 and 500:1. By this method, cutting a ton of BC today has the same cooling effect, over 100 year time period, as cutting between 220 and 500 tons of carbon (taking the form of CO2).



Source: Mark Z. Jacobson, "*Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming,*" Journal of Geophysical Research, Vol. 107, No. D19, p. ACH 16-1 to 16-22, 2002. "f.f. BC+OM" is fossil fuel black carbon and organic matter.

- Global Warming Impact – The IPCC initially estimated the warming impact from fossil fuel BC as 0.2 Watts/meter^2. Since then some studies have concluded that the direct warming from all BC is closer to 0.5 W/m^2 (Jacobson), and when combined with reduced reflectivity of snow and ice and other indirect effects, drives warming by about 0.8 W/m^2 (+/- 50%). (Hansen). These studies estimate that BC is responsible for about ¼ of all human-made global warming over the last century. Some are now calling control of fossil-fuel BC "possibly the most effective method of slowing global warming." (Jacobson).

Reducing Black Carbon – Options, Measures

- Retrofits to existing or "in-use" diesel engines
  - 90% Solution -- New catalyzed filters reduce tailpipe particulate matter (PM) emissions of a diesel engine by about 90% compared to current engines. We assume that 90% of BC

in this PM is also reduced. Such filters can be integrated into new engines or retrofit onto existing engines. These filters require the use of ultra low sulfur diesel (ULSD) fuel and for commercial on-road applications, only work on MY 1994 and newer engines in duty cycles that achieve certain minimum temperatures. We assume that they are not currently available for use on locomotives or marine engines.

- 25% Solution – New high performance diesel oxidation catalysts can cut more than 50% of the tailpipe PM emissions from a diesel engine. The amount of BC captured in this PM depends on several factors, including the vintage of the engine, but for the sake of argument is assumed to be half of the PM captured, or 25% of the total from the uncontrolled emissions. These filters do not require use of ULSD, but work best on need low-sulfur (500 ppm or less). They also can work on engines of any age, and do not require the same high temperatures as the filters. They are currently commercially available, and are awaiting EPA verification.
- Standard diesel oxidation catalysts (DOCs) – DOCs typically cut 20-25% of the PM from the tailpile emissions of a diesel engine, but are only effective on the soluable organic fraction (SOF) of total PM. They do not reduce any significant amount of BC.
- Crank case – Between 25-70% of total PM emissions from a diesel engine can occur in the venting of the crank case, before the emissions ever reach tailpipe controls. The amount is a function of the engine vintage and whether it is under load or at idle. New technologies can cut nearly 100% of this PM.

- Early Retirement -- For engines too old to warrant the expense of retrofits or those that cannot be retrofitted, one options is to accelerate early retirement and replacement with new low-emission engines (which in the case of a new on-road truck could deliver over 99% reductions of PM and BC).
- Reduced Idling – BC emissions can also be cut by eliminating unnecessary idling of diesel engines. This can be achieved through a combination of anti-idling programs (regulation or education), electrification, and use of clean auxiliary power units. Estimates indicate that roughly 0.5% of diesel fuel consumption could be avoided through anti-idling measures at half of the state truckstops.

<u>Legal Framework for Reductions</u>

- Starting in MY2007, all new on-road heavy duty diesel engines will comply with the EPA PM standard of 0.1g/bhp, that is generally 90% cleaner than previous model years. Starting in MY2008 and phasing in to 2014, similar EPA standards are expected to apply to purchases of new non-road diesel engines.
- States have jurisdiction to regulate emissions from “in-use” (i.e., existing, not new) engines in both the on-road and non-road categories. In some cases, states can also regulate fuels.

<u>Analysis – Technical and Achievable Reductions</u>

- If we assume that:
  - VMT (and fuel consumption) for existing engines stays static, and that new VMT is picked up by new engines;
  - In-use engines are phased out at the end of the median expeccted life -- 30 years -- and that 1/30th of the existing fleet is phased out each year. Thus, in 2010, about 13% of the existing fleet is retired, and 87% remains. In 2020, 47% of the pre-2007 fleet is retired, and 53% remains;
  - All new engines are compliant with federal standards for new engines that are in place for on-road (for MY 2007) and non-road (phased in for MY 2008-2014);

    - By 2010, we have retrofit or early-retired 1/3 of in-use engines; by 2020 we have retrofit or early retired 100% of in-use engines.
    - For the 2010 and 2020 penetration rates (1/3 and 100%), the reduction in black carbon from a combination of retrofits and early retired replacements is between 50-75% compared to Business As Usual. This range is arrived at by assuming the following distribution of mitigation measures:
        - ½ fleet x filters (90% Solution) + ¼ fleet x high performance DOCs (25% Solution) + ¼ fleet x early retirement (99% cleaner new engines), or
        - ½ fleet x filters (90% Solution) + ½ fleet high performance DOCs
- In 2010, of the 2.32 MMTCO2e of BC available, the suite of mitigation measures reaching 1/3 of the "in-use" fleet could reduce between 0.39 – 0.58 MMTCO2e.
- In 2020, of the 1.48 MMTCO2e of BC available, the suite of mitigation measures reaching 100% of the "in-use" fleet could reduce between 0.74 – 1.1 MMTCO2e.

Memo

To: Maine GHG – Transpo Work Group
From: Michael Stoddard
Re: Diesel Black Carbon Mitigation Measures
Date: DRAFT - 30 March 2004

Policy Description: Establish Comprehensive Maine Clean Diesel Program.

Implementation Description:

1. Data and Analysis

- Gather statewide data on heavy duty mobile diesel engines and emissions
- Establish working group to analyze: data, fuel issues, emission control technologies, costs, benefits, opportunities, case studies, pilot projects

2. Emission Reduction Program

- Develop recommendations for a Maine Clean Diesel Program
- Develop definition of Best Available Control Technology (BACT) by vehicle type, vintage, duty cycle to promote appropriate use of fuels and new or retrofitted engines
- Consider appropriate mix of measures, including:
  - Procurement – For state funded construction contracts, requests for bids can include criteria specifying certain engines use BACT. Municipalities can be encouraged to do the same. For state funded fleets, state policy can promote or require the use of BACT for in-use engines. Potential fleets include: highway maintenance vehicles, snow plows, and transit fleets.
  - Incentives – The state could incentivize use of ultra low sulfur diesel fuel (ULSD) by offering to cut sales tax for the period prior to federally required use of ULSD. ULSD is a prerequisite to the use of filters that achieve 90% PM (and BC) reductions. The state could also develop a 15 year program to incentivize retrofits of emission controls on in-use engines, and the early retirement of older engines being replaced with engines complying with new federal rules. The state could also support capital expenditures to reduce truck, locomotive and marine engine idling through electrification or the use of clean auxilliary engines. Incentives could include reduced sales tax, enhanced tax deductions, rebates, and preferrential bidding treatment. Incentives could be paid from a dedicated fund, using the Carl Moyer Program model or the Texas Emission Reduction Program model. Sources of funding could include bond funds, taxes, fees, federal appropriations and the like.
  - Regulatory Support -- Legislation could be proposed directing DEP to establish phased-in emission standards requiring BACT for particulates, black carbon and NOx, as verified by acceptable authorities (e.g., US EPA, Cal. Air Resources Board, Environment Canada) for in-state, in-use diesel engines: (1) trucks (garbage, snow removal, dump, tanker); (2) school buses; (3) transit and intercity buses; (4) construction equipment. The state, municipal and port authorities could establish anti-

idling rules to eliminate unnecessary idling for all on-road, off-road, locomotive and marine engines.

3. Coordination

- Regional initiatives – Maine should recommend to the NEG-ECP that black carbon emissions be studied and considered for inclusion in the GHG inventories and baselines. On September 9, 2003, the NEG-ECP passed Resolution 28-7 (Resolution Concerning Environmental Projects and Issues) which includes in pertinent part:

  > Whereas, diesel engines are a source of several pollutants of concern that adversely impact the environment and public health; …
  >
  > Therefore, be it resolved that …the Conference of [NEG-ECP] supports reducing emissions in heavy duty diesel vehicles to protect the public health …. The Conference directs its Committee on the Environment to:
  > - pursue appropriate options to reduce diesel emissions;
  > - encourage the early introduction of cleaner diesel fuels in the region;
  > - promote anti-idling initiatives; and
  > - enhance education for the public on the benefits of diesel clean-up programs.

- Federal initiatives – Maine should work with its federal delegation and EPA to raise increase funding for diesel retrofit programs, with particular focus on transboundary diesel sources (marine, interstate trucking).

Analysis

1. Costs

- Starting in 2006, federal rules effectively mandate that all on-road diesel fuel meet the standard for "ultra low sulfur diesel fuel" (ULSD)(S<30 ppm). Until that time, ULSD will cost anywhere from 5 – 25 cents/gallon more than standard on-road diesel fuel (S<500). ULSD is a prerequisite for proper operation of most diesel particulate filter systems. Existing facilities can be used. However, use of ULSD requires dedicated shipping and storage facilities so that it is not contaminated by higher sulfur fuels.
- Diesel particulate filter retrofit packages work on MY94 or later engines with relatively high operating temperatures. The filters cut PM and BC by 90%, and cost between $5,000 - $9,000 per unit for a truck or bus, including a backpressure monitor. They should last the life of the vehicle. Transit buses would be on the lower end of this scale. For large construction engines like a front end loader, these filters can cost as much as $12,000. The cost varies depending on the size of the engine and the volume of the purchase. Annual cleaning is $250/unit if outsourced, less if done by in-house.
- High-performance diesel oxidation catalysts (DOCs) cut BC by 25% on average, and PM by 50-60%. Costs vary by size of the engine, and for a standard transit bus would be between $3,000 – 3,500 each. These units do not require the use of ULSD and can operate on older engines.
- Standard DOCs do not reduce BC but can make important contributions to reducing harmful PM, cutting levels by 20-25%.
- Early retirement/replacement with new federal rule-compliant engine costs ____.
- Auxiliary Power Units for freight locomotives cost _____.

2. Climate Benefits

- In 2010, the suite of mitigation measures could reach 1/3 of the “in-use” fleet to reduce an amount of BC equivalent to between 0.39 – 0.58 MMTCO2e.
- In 2020, the suite of mitigation measures could reach 100% of the “in-use” fleet to reduce an amount of BC equivalent to between 0.74 – 1.1 MMTCO2e.

3. Other Co-Benefits

- The combination of ULSD and filters typically achieves 90% reductions in emissions of BC, PM, toxics, carbon monoxide and hydrocarbons for each unit retrofitted.
- High-performance DOCs achieve 25% reductions in BC and 50-60% PM, and cut about 70% carbon monoxide and hydrocarbons.
- Use of ULSD instead of regular diesel can reduce emissions of particulate matter by up to 20% in certain types of vehicles.
- Health and climate objectives are advanced with immediate effect. Mitigation of diesel PM delivers avoided:
    - health costs typically associated with fine particulates, including: asthma attacks, heart attacks, emergency room visits, lost school and work days, premature death
    - cancer risk associated with extended exposure to diesel toxic emissions
- Relief of acute exposures for children riding school buses, elderly riding transit buses, and occupational exposures for construction workers, truckers, other drivers.
- Other environmental benefits associated with reduced PM emissions are gained, such as improved visibility in state and federal parks.