



Reducing Light-Duty Vehicle GHG Emissions: Technologies and Policies

Presentation by
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Transportation Solutions to Climate Change
New England Governors and Eastern Canadian Premiers
Forum

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NESCAUM – Who We Are

- Northeast States For Coordinated Air Use Management formed in 1967 by the region's Governors
- Nonprofit association of air pollution control agencies in the 6 New England States, New York & New Jersey
- Provide technical assistance and policy guidance to member states on air pollution issues of regional concern

Presentation Overview



- Inventory overview
- Near-term technologies to reduce light-duty vehicle GHGs
- Advanced technologies to reduce GHGs
- Policy options to reduce GHGs
- Conclusions

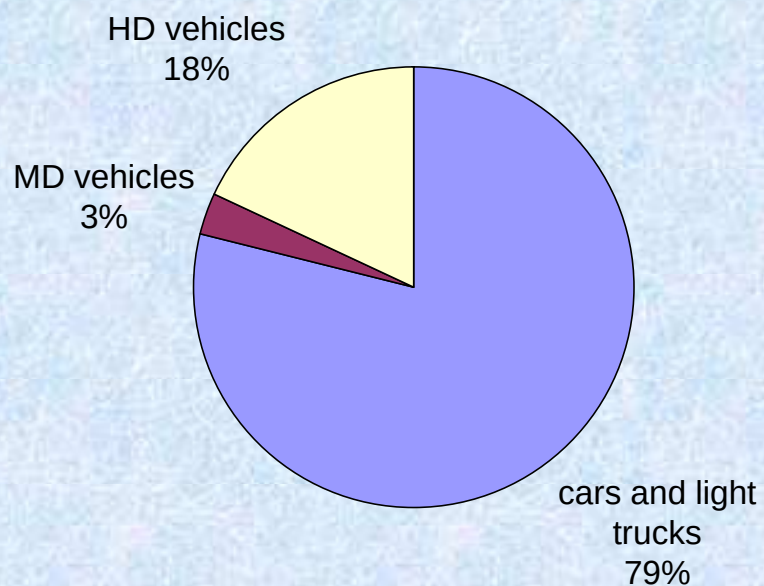


Highway Vehicle GHG Inventory

Light-Duty Contribution to Highway Vehicle Greenhouse Gas Emissions

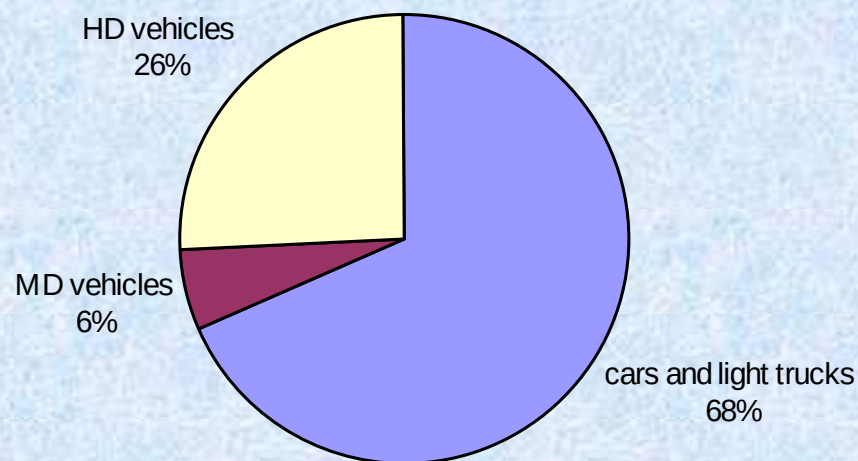


**Highway Vehicle GHGs
USA**



Source: EIA

**Highway Vehicle GHGs
Eastern Canada**



Source: Natural Resources Canada

Near Term Technologies to Reduce GHGs

Near Term Technologies

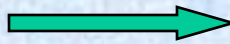


- Many technologies already in “full volume” production (500,000 units/year or more)
- Examples include: variable valve lift and timing, 6-speed automatic transmissions, electric power steering, improved air conditioning, turbocharging and downsizing, 42 volt ISG or “mild hybrids” and others
- Some technologies widely used in Europe but not yet in the U.S. – diesels, gasoline direct injection, and automated manual transmissions
- Widespread introduction could occur between 2009 and 2016

Near Term Technologies



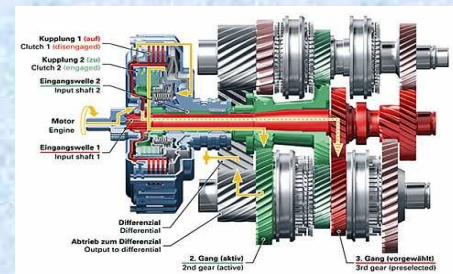
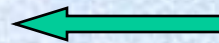
Cylinder Deactivation



2005 Chrysler 300C Hemi



**Audi TT
3.2 V6**



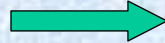
**Automated Manual Transmission
Audi TT**

Source: CARB

Near Term Technologies (continued)



Acura RSX



Variable valve timing & lift



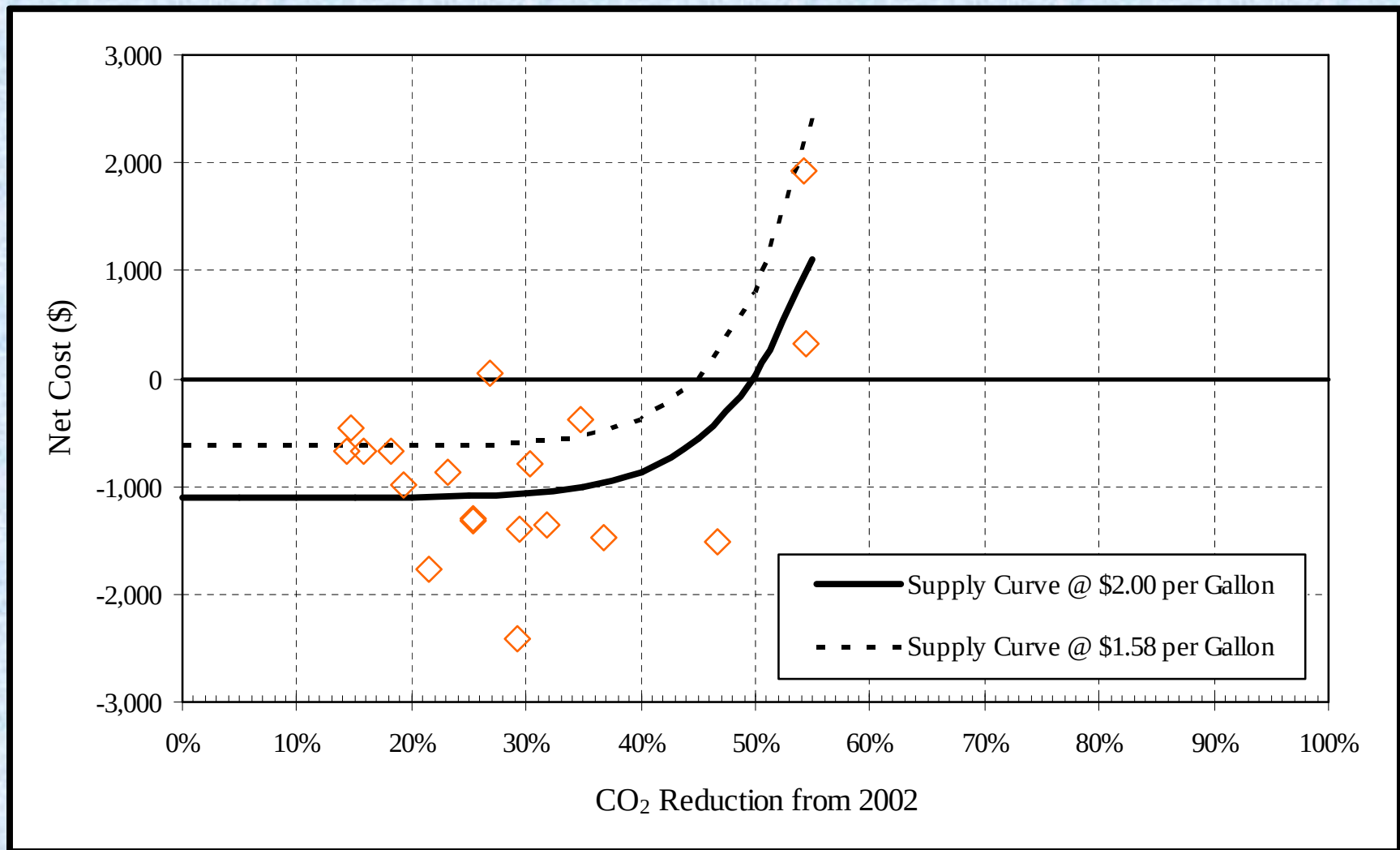
Honda Accord



Toyota Matrix

Source: CARB

Lifetime vehicle costs with reduced GHG emissions



Advanced Technology Vehicles

Advanced Technology Vehicles



- Either not yet in “full volume” production or still in development
- Full volume sales of Prius-type hybrids
- Diesel hybrids
- HCCI – homogeneous charge compression ignition engines
- Electrohydraulic camless valve actuation
- Fuel cell vehicles
- Plug-in hybrid-electric vehicles
- Electric vehicles (neighborhood and full function electrics)
- Flex fuel vehicles, flex fuel plug-in hybrids

Plug-in Hybrids



- One OEM plug-in hybrid in production – DC “sprinter”
- New York Times plug-in hybrid delivery van in New York City
- NYSERDA plans to equip 600 NYS fleet hybrids with plug-in capability - first vehicles scheduled for delivery this month
- Issues include: certification, verifying mpg, winter operation, warranty, cost



Daimler Chrysler

25 mile all-electric range

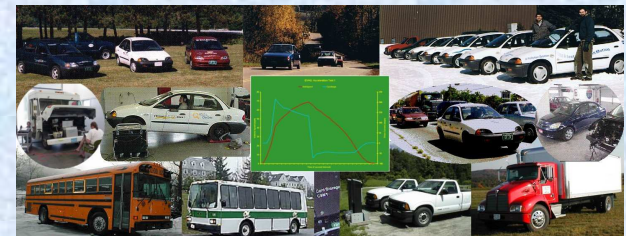
Fuel Cell and Electric Vehicles



- Fuel cell or electric vehicles required as part of the Zero Emission Vehicle requirement of LEV II
- 250 fuel cells expected to be placed in service between now and 2008 (nationwide)
- Approximately 10,000 ZEVs will be required in the Northeast (2012-2014)
- From 2014-2017, ~25,000 required
- Several fuel cell vehicles currently placed in the Northeast
- Few electric vehicles in service – but still being produced



GM Hy-wire



EVermont electric vehicles

Policies to Reduce Light-Duty GHGs

Policies to Reduce GHGs



- California Low Emission Vehicle Program (LEV II) including:
 - Zero Emission Vehicle (ZEV) requirement
 - Light-duty greenhouse gas standards
- Executive orders to reduce fuel consumption in state fleets
- Incentives for hybrids
- Feebates
- Incentives for advanced technology vehicles – carsharing and station cars

California LEV II Program

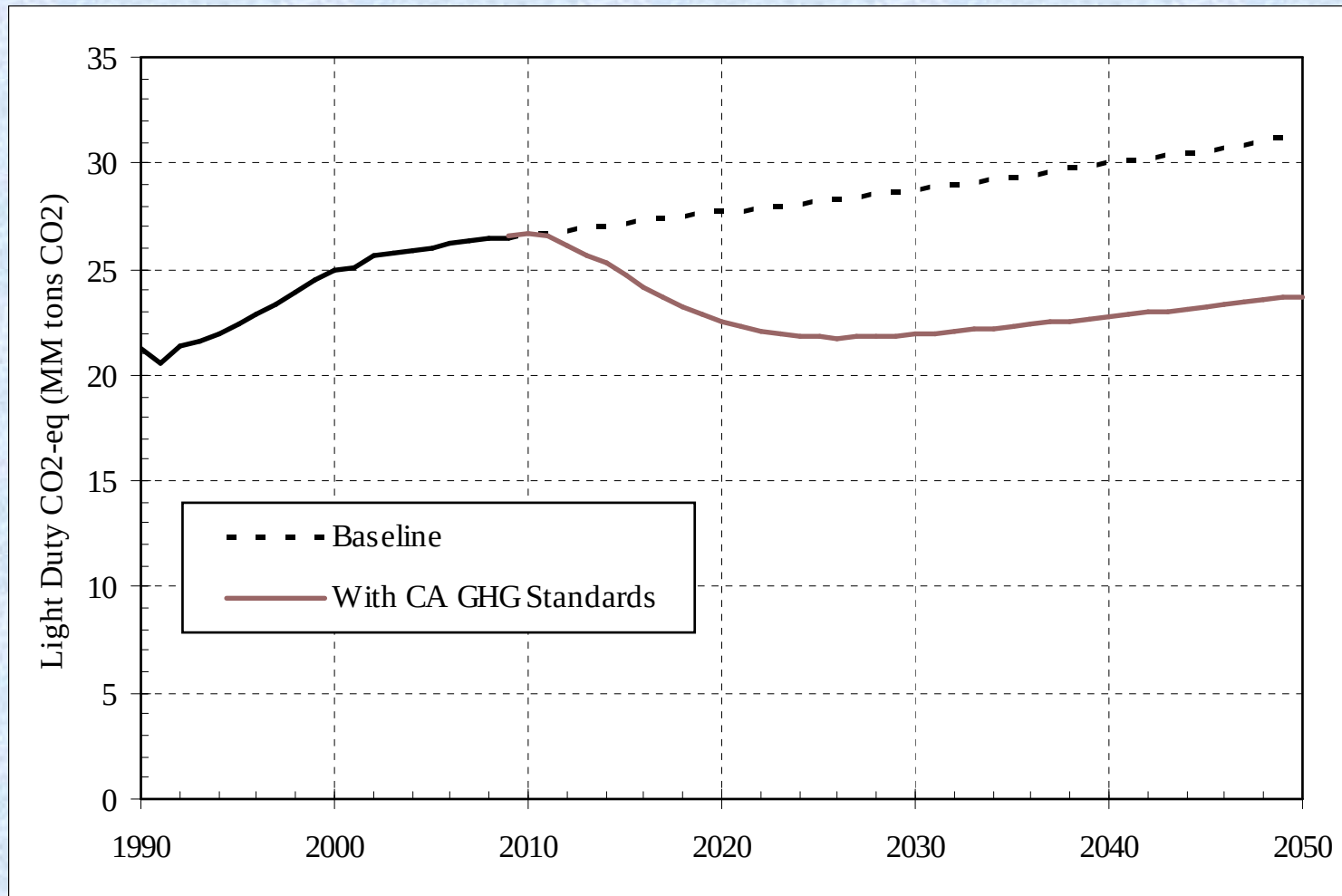


- 10 states outside of CA have adopted the program in lieu of the federal light-duty standards
- The ZEV requirements are currently phasing in
- The LEV GHG standards go into effect in 2009
- LEV GHG standards require a 22% reduction in new vehicle GHG emissions in 2012, and a 30% reduction in 2016
- NESCAUM estimates an 18% reduction in fleet GHGs in 2020 and a 24% reduction in 2030
- ZEV mandate provides a modest (2.5%) reduction

GHG Reductions Resulting from LEV II

State	Baseline GHGs (millions of tons)	With GHG regulation (millions of tons)	GHGs reduced in 2030 (millions of tons)	Percent reduction from baseline
Connecticut	18.2	13.8	4.4	24%
Maine	8.8	6.7	2.1	24%
Massachusetts	28.8	21.9	6.9	24%
Rhode Island	5.5	4.1	1.4	26%
Vermont	5.0	3.8	1.2	24%
Total	66.3	50.3	16.0	24%

LEV II GHG Reductions (MA)



LEV GHG Standards: Cost to consumers

	Near Term (2012)	Mid Term (2016)
Monthly Payment Increase	\$7	\$20
Monthly Operating Cost Savings	\$18	\$23
Monthly Net Savings	\$11	\$3

Executive Orders to Reduce Fuel Consumption in State Fleets



- New York State – EO #111 – requires introduction of greater numbers of alternative fuel and advanced technology vehicles in the state fleet. 600 hybrids are in the fleet
- Massachusetts – EO #388 – requires 10% of fleet purchases be ZEVs, and sets targets for fuel economy
- Rhode Island – sets fuel economy target for state fleets, limits purchase of SUVs, requires purchase low rolling resistance tires and improved lube oil
- Other states and jurisdictions also have requirements

Hybrid Cars and SUVs

Car type	make	model	city/hwy
Small Car	Honda	Civic	49/51
Medium Car	Honda	Accord	28/35
Medium Car	Lexus	GS 450h	25/28
Medium Car	Toyota	Camry	40/38
Medium Car	Toyota	Prius	60/51
SUV	Ford	Escape 2wd	36/31
SUV	Ford	Escape 4wd	32/29
SUV	Lexus	RX 400h 2wd	32/27
SUV	Lexus	RX 400h 4wd	31/27
SUV	Mercury	Mariner 4wd	32/29
SUV	Saturn	Vue	27/32
SUV	Toyota	Highlander 2wd	32/27
SUV	Toyota	Highlander 4wd	31/27

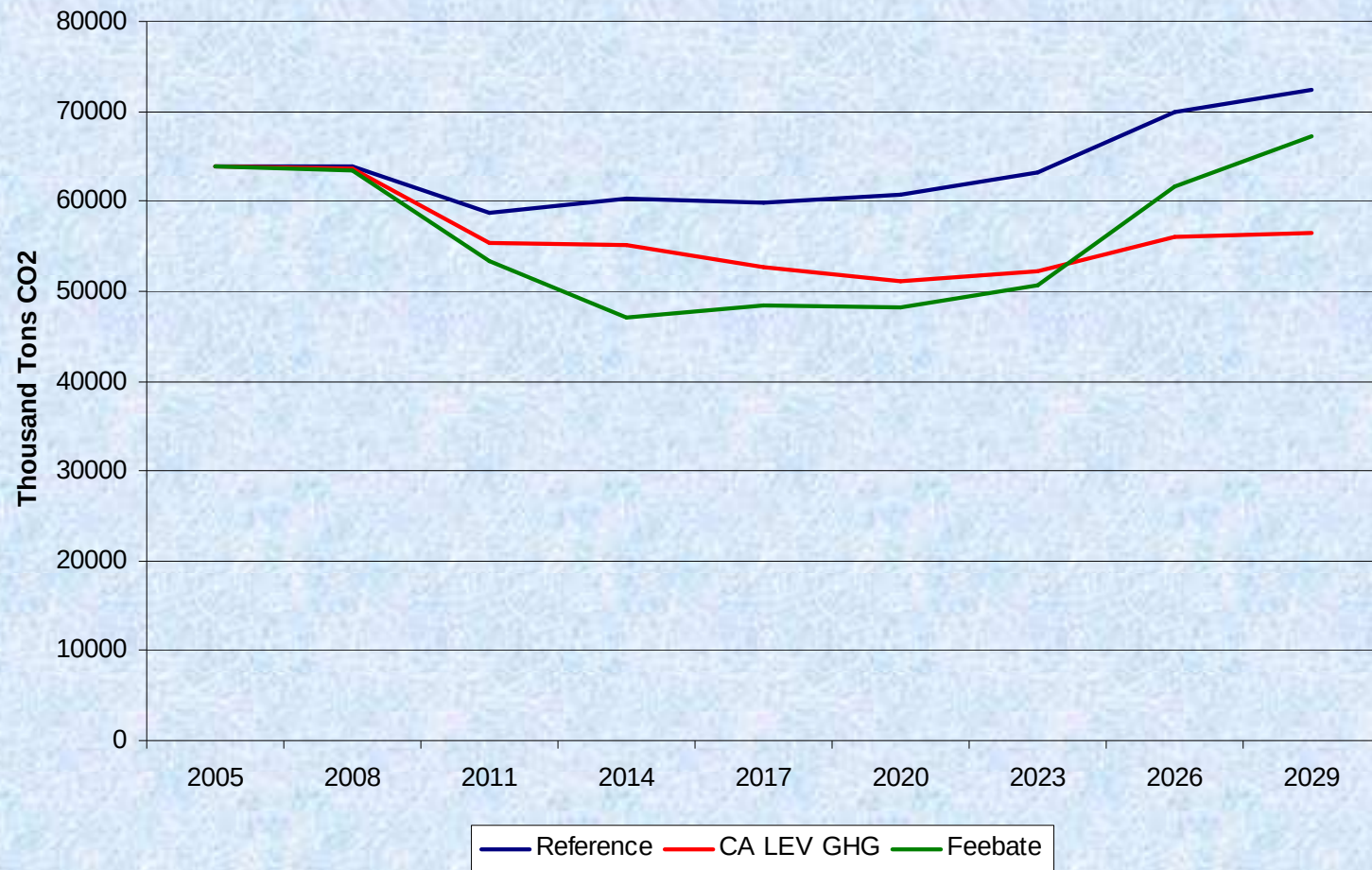
Feebate Program



- Feebate programs impose a fee on the purchase of vehicles that emit high levels of GHGs and provide a rebate to purchasers of low emitting vehicles
- Feebates promote the introduction of technologies that reduce light-duty vehicle GHGs
- Feebates have yet to be implemented in any state
- Modeling suggests that emissions can be reduced over 20% from current levels - using a model developed by Transport Canada to evaluate a feebate program

CA LEV GHG Standards with Feebate

NESCAUM



Advanced Technology Vehicles – Carsharing and Station Cars



- 30 percent of the U.S. carsharing fleet is made up of hybrids, alternative fuel vehicles, and electric vehicles (Shaheen, et al. 2003)
- CO₂ reductions from carsharing programs (studies suggest VMT reductions are realized with carsharing) can be increased with the use of advanced technology vehicles
- Evermont has a car sharing program planned for 2007 (3 electrics and one plug-in hybrid)
- Some state fleets can be switched to car sharing programs: Philadelphia has eliminated its fleet by car sharing and employees are using more fuel efficient vehicles

Conclusions



- Adopt LEV II (GHG + ZEV) in states and provinces that have not yet adopted the standards
- Consider adoption of feebate programs to encourage introduction of more efficient vehicles
- Provide incentives for hybrid electrics such as reduced tolls, HOV lane access, and preferential parking
- Shift government agency trips to car sharing programs, where possible
- Provide incentives for introduction of advanced technology station cars
- Require introduction of hybrid-electric vehicles and efficient tires in state and provincial fleets

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