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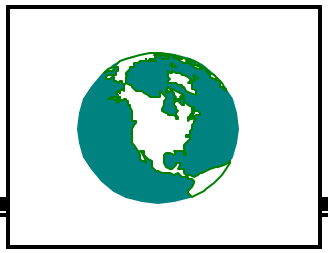
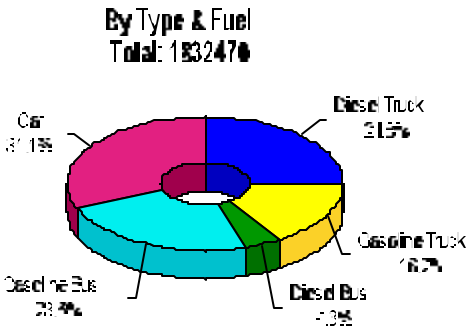
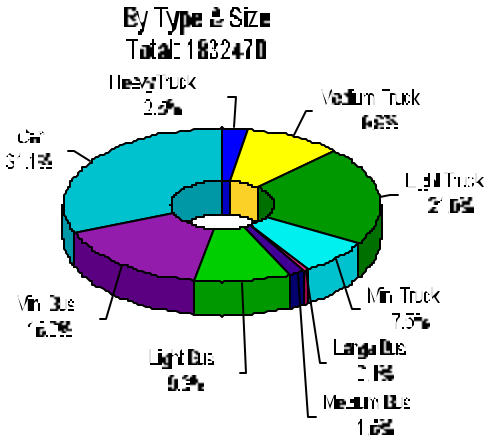


CAR LINES

Issue 2000-3 • • • • • • • • • • May 2000

China Vehicle Sales in 1999
(Excluding Motorcycles)





EUROPE

1. Czech Republic To Ban Leaded Gas in January 2001

The Czech government has approved a decree prohibiting the sale of leaded gasoline beginning January 1, 2001. The decree was initiated by the ministries of Environment and Industry and was issued November 10, 1999.

The Czech decree satisfies both domestic and international goals. A chief reason for approving the decree is to decrease auto emissions. Exhaust fumes are a problem especially in the country's big cities, whose downtown sections occasionally are closed to motor vehicles in winter months due to extreme air pollution caused by a combination of vehicle fumes and emissions from coal-fired heating facilities.

Another important purpose of the decree is to comply with EU Directive 98/70 that became effective January 1. The directive, adopted October 13, 1998, bans marketing of leaded gasoline in EU member states with few exceptions. (In December the issue became a contentious topic within the European Union when EU members Greece, Italy, and Spain asked for more time to implement an EU leaded-gas ban, which went into effect January 1, 2000. On December 20, EU Environment Commissioner Margot Wallström announced those three countries received a two-year derogation, or transition period, to implement the ban.) The Czech Republic has applied for EU membership, and harmonizing its existing laws with EU legislation is a membership prerequisite.

Also, the Czech government signed in 1998 the Convention on Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters, also known as the Aarhus Convention. At the conference held to finalize the Aarhus Convention, environment ministers also adopted a "strategy" to phase out leaded gasoline sales by January 1, 2005.

In the first nine months of 1999 a total of nearly 1.5 million tons of automotive fuels was sold in the Czech Republic; unleaded gas comprised 69.5 percent of all sales during that period.

2. Italy To Offer Incentives To Switch To Unleaded Fuel

Italian Environment Minister Edo Ronchi has announced incentives to encourage the scrapping of cars using leaded petrol by January 2002, as required by an EU directive banning the fuel from that date.

Ronchi said at a joint news conference with Transport Minister Pierluigi Bersani that the government would offer 200,000 lire (~$100) per car to pay for demolition costs of vehicles registered before 1984. Another incentive of 800,000 lire per car will encourage conversions to methane or gas of some 83,000 cars, Ronchi said. The incentives should be approved in June but the government is considering an extension through next year, he added.

Bersani said about 81 percent of cars circulating in Italy, or 21.8 million, will be able to use unleaded fuel without any changes or problems. Some 1.94 million will need minor modifications, while only 1.1 million vehicles will not be able to use the fuel.

3. London Launches Clean Taxis

A fleet of 10 "EcoCabs" has taken to London's streets as Britain launched a multi-million pound program for cleaner vehicles. The taxis look the same as the city's famous black cabs but they are environmentally safer

because they cut air pollution. An EcoCab has had its diesel engine removed and replaced with a liquefied petroleum gas (LPG) engine.

Supporters say LPG is cleaner than diesel, produces fewer emissions, gives a smoother ride, costs less and is now widely available.

If the experiment works, up to 130 more of London's 19,720 black cabs will undergo the conversion to LPG. There are also plans to extend the conversions to buses, which also run on diesel at present.

4. DaimlerChrysler Offers First Fuel Cell Vehicles

DaimlerChrysler is the first automaker worldwide to offer fuel cell vehicles for sale. The company plans to build 20 to 30 city buses with fuel cell drives during the next three years, and then offer them for sale to transport operating companies in Europe and abroad.

The first vehicles are planned for delivery by the end of 2002. They will be driven in normal traffic conditions for a period of two years. These bus operations will also mark the first time that detailed evaluations can be made on the basis of data from an entire fleet of vehicles.

EvoBus GmbH, a wholly-owned subsidiary of DaimlerChrysler, will supply the Mercedes Benz Citaro low-floor city buses with fuel cells at a price of $1.2 million (1.25 million euros) each. The price includes comprehensive technical consulting and on-the-spot maintenance by EvoBus for a period of two years. DaimlerChrysler will provide the transport operators with guidance and expertise on preparing a fuel infrastructure.

DaimlerChrysler considers fuel cells to be the alternative drive system with the greatest long term potential. They have either very low levels of emissions or none at all, and are extremely quiet and energy efficient, thereby making an important contribution to sustainable mobility. DaimlerChrysler has performed tests using methanol, hydrogen and a purer form of gasoline to power fuel cell vehicles. It is also the first automobile manufacturer to put fully functional, hydrogen and methanol driven fuel cell vehicles on the road. Hydrogen is particularly suited to fleets in public transport systems since the vehicles can regularly return to a central filling station. The emission-free, low-noise, hydrogen fuel cell buses are especially suited to city traffic.

The fuel cell driven Citaro now being offered for sale is the successor to the NEBUS (New Electric Bus). In 1997, NEBUS-a prototype based on the low- floor city bus O 405 N became the first Mercedes-Benz fuel cell driven bus to hit the streets.

The Citaro's fuel cell unit delivers more than 250 kilowatts of power. It was developed and manufactured by the DaimlerChrysler subsidiary Xcellsis, with fuel cell stack provided by Ballard Power Systems. The gas pressure bottles containing compressed hydrogen are mounted on the roof of the bus. The bus can travel up to 186 miles (300 kilometers) at a top speed of 50 miles per hour (80 km per hour) and carry around 70 passengers.

The electric motor, transmission, drive shaft and mechanical rear axle are all located at the rear of the bus. This ensures smooth low floor design and easy access during maintenance. The bus also includes three doors for optimal passenger flow.

5. European Environment Agency Says Transport Sector Falling Short of Goals

Rapidly growing transport volumes, especially for road transport and aviation, have over the past decades offset environmental gains from technology improvements. As a result, transport is contributing more and more significantly to a number of environmental and human-health problems — particularly climate change, acidification, ground-level ozone formation, local air pollution, noise, land take and habitat disruption, according to the recently released study, “Environmental Signals 2000".

a. Transport Eco-efficiency

Transport is highly reliant on the use of non-renewable fossil fuels and is therefore a major contributor to greenhouse gas emissions (particularly carbon dioxide emissions). Energy and carbon dioxide efficiency (i.e. energy use per passenger and per freight transport unit) has shown little or no improvement since the early 1970s. The increasing use of heavier and more powerful vehicles — together with decreasing occupancy rates and load factors — has outweighed increases in vehicle energy efficiency due to technological advances. As a result, growing transport volumes led to about a 14% increase in energy consumption and a 12% increase in carbon dioxide emissions between 1990 and 1996. These trends show that to reduce the sector's energy consumption and emissions, policies should now focus on demand-management measures to curb growing transport volumes together with technical efficiency improvements.

By 2010, transport is expected to be the largest single contributor to EU greenhouse gas emissions. This may jeopardize the EU's achievement of its target of an 8% reduction in greenhouse gas emissions by 2008-2012 under the Kyoto Protocol.

Limited improvements in transport eco-efficiency have occurred in EU Member States. On the positive side, emissions of non-methane volatile organic compounds and nitrogen oxides have been falling since 1990 — mainly due to the introduction of catalytic converters in vehicle exhausts. However, the decrease has been slower than expected as increasing transport demand has partly offset engine improvements. Transport continues to be a major contributor to acidification and air-quality problems. In future, a significant further reduction of road emissions is expected to be realized through the implementation of directives resulting from the Auto-Oil program.

It is estimated that over 30 % of people in the EU are exposed to high road-traffic noise levels, ± 10 % of people to high rail noise levels, and possibly a similar proportion to aircraft noise. Transport infrastructure takes land and may constitute a barrier against the movement of species. It thus has a direct influence on the occurrence and distribution of animal and plant species.

b. Trends in Transport

Passenger and freight transport have more than doubled over the past 25 years, with the strongest growth being in air and road transport. During recent decades there has been a dramatic shift towards road transport: the car increased its share of passenger transport from 65% to 74% between 1970 and 1997, and trucks now account for 45% of total freight transport compared with 30% in 1970.

Between 1970 and 1997, passenger and freight transport in the EU increased by an annual average of 2.8% and 2.6% respectively, while GDP growth over the same period was 2.5%. For road and air-passenger travel particularly, the boost in demand can be attributed to higher incomes,

a fall in transport prices in real terms and changes in travel patterns (for example as a result of urban sprawl). In turn, the demand and intensity of freight transport is closely linked to changes in the volume and structure of the economy and to infrastructure supply.

Infrastructure supply strategies (resulting in an increase in motorway length by 195% between 1970 and 1996, while rail infrastructure lengths declined slightly) have over the past decades enhanced the shift to road transport. Actions under the EU Common Transport Policy to revitalize rail and to promote inland waterways, combined transport and public transport have not yet managed to break this trend. However, some positive signs can be noted, such as better performance from short-sea shipping and more high-speed rail lines. Better coordination of transport and spatial planning (urban and regional), and the use of telecommunications would also help to increase accessibility while at the same time reducing the need for mobility.

c. Prices and taxes

Pricing is one of the key policy tools for promoting an environment-friendly balance between different forms of transport. However, current prices tend to favor private road transport over public transport. For example, rail and bus fares have increased more rapidly than gross domestic product (GDP) over the past decade, while the price of driving a private car has largely remained stable. This distribution of prices between private and public services is partly because road-transport fuel prices (the perceived marginal cost of driving a private car) have increased only slightly during the 1990s. A number of strategies to achieve fair and efficient pricing were initiated in the Common Transport Policy action plan 1995-2000.

Current transport revenues only partly cover the sector's significant external costs. The external costs caused by road and rail noise, local air pollution, climate change and accidents are estimated at around 4% of GDP; infrastructure wear and tear and congestion add to this economic loss. Costs not borne by consumers in 1991 are estimated to have been 70% of the total for road and 62% for rail.

Fuel taxes provide the biggest contribution to revenues from all environmental taxes (energy, pollution and transport taxes. Fuel prices vary substantially between Member States, with some countries showing an upward and some a downward trend. Fuel taxes are mainly used to encourage a shift towards more environment-friendly fuels. Fuel tax differentiation has, for instance, been a major factor in the phasing-out of leaded petrol in the EU. In 1998, leaded petrol was 4-17% more expensive than unleaded petrol and up to 58% more expensive than diesel. As a result, the market share of unleaded petrol reached 75% in 1997 and leaded petrol is expected to be completely phased out by 2005. Increased fuel taxes tend to stimulate energy savings through technical-efficiency improvements and thus reduce fuel demand.

Car travel is increasing throughout Europe, but over half of all car journeys are less than 6 km in length and 10 % are for local trips covering distances of less than 1 000 metres. Short car journeys are particularly bad for the environment.

Average annual car-passenger transport per capita
Unit: 1 000 passenger-km/capita

	1980	1990	1992	1993	1994	1995	1996	1997
Austria	6.3	8.1	8.8	8.5	8.5	8.5	8.2	8.3
Belgium	6.6	8.1	8.4	8.6	8.8	9.0	9.1	9.2
Denmark	7.4	10.4	10.9	11.1	11.4	11.7	12.1	12.4
Finland	7.1	10.3	10.0	9.8	9.7	9.8	9.8	10.0
France	8.4	10.3	10.8	11.0	11.2	11.4	11.6	11.7
Germany	6.6	8.6	8.9	9.0	8.9	8.9	8.9	9.0
Greece	2.9	4.8	4.9	5.2	5.4	5.6	5.9	6.1
Ireland	8.2	10.4	10.9	11.2	11.5	11.8	12.1	12.5
Italy	5.7	9.2	10.6	10.6	10.5	10.7	10.8	11.0
Luxembourg	7.4	10.5	11.0	11.3	11.4	11.5	11.3	11.5
Netherlands	7.6	9.1	9.1	9.2	9.5	9.5	9.4	9.7
Portugal	4.2	6.6	7.3	8.4	9.1	10.0	10.6	11.0
Spain	5.1	7.3	7.8	8.0	8.1	8.4	8.6	8.9
Sweden	8.0	10.5	10.6	10.4	9.6	9.9	10.5	10.6
UK	7.0	10.4	10.3	10.2	10.3	10.4	10.6	10.7
EU	6.6	9.1	9.5	9.6	9.7	9.8	9.9	10.1

6. EU Tightening Carbon Dioxide Agreements on New Cars

On Wednesday 17 May the European Parliament voted to adopt the conciliation agreement reached with Council on proposals to monitor the specific emissions of CO2 from new passenger cars registered in the EU. Member states are to be responsible for gathering, validating and forwarding the relevant data. An objective of 120 g/km has been set as an average value for CO2 emissions - to be reached by 2005 or 2010 at the latest.

It was the third reading under the co-decision procedure and after conciliation a simple majority was required for the joint text to be approved.

NORTH AMERICA

7. New York Striving To Have Cleanest Buses In The World

Governor George E. Pataki announced an unprecedented plan to ensure that the Metropolitan Transportation Authority has the cleanest bus fleet in the world by significantly stepping up the purchase of new clean-fuel buses and retrofitting existing diesel buses to dramatically reduce pollution.

The agreement calls for a revised and expanded MTA Capital Plan to include $250 million for an enhanced Clean Fuel Bus program. In addition, the Governor has also directed the Department of Environmental Conservation to work with MTA and the environmental community to develop new emissions performance standards for all MTA buses to ensure they meet or exceed those achieved by Compressed Natural Gas (CNG) buses.

The plan provides for the purchase of 550 new clean fuel buses, requires conversion of all existing diesel buses to clean technology and calls for construction of a new heavy-duty testing laboratory to fully test all developing clean fuel technologies for future implementation.

This plan, when combined with MTA's prior commitment to clean fuel vehicles, will result in more than 1,000 new clean fuel buses in service -- more than double the number anticipated in MTA's prior plan.

The retrofitting of all other buses with Traps -- devices that captures and burns pollutants before emission -- coupled with prompt conversion to the use of ultra-low sulfur fuel, will allow the entire MTA bus fleet to reduce emissions City-wide within three years, much faster than by waiting to replace these buses as they reach 12 years of age. The combination of Traps and ultra-low sulfur fuel is a promising bus emissions reduction strategy, and has proven very successful in several European countries.

Under the nine-point plan, the MTA will:

* Make a commitment to eliminate dirty diesels, and create the cleanest transit fleet in the world.

* Purchase an additional 550 clean-fuel buses. This includes 300 new CNG fueled buses to fill the available storage capacity of the three bus depots currently programmed to be CNG operational, bringing the total CNG fleet to 650 buses. It also includes 250 hybrid-electric clean fuel buses, bring the total hybrid-electric buses to 390;

* Provide input to DEC, which would work with the environmental community to establish a public process to create an emissions performance standard for new bus purchases at a level achieved by a modern bus fueled with CNG. This standard will be "vehicle based" and take into account in-use emissions of particulate matter, toxics, criteria pollutants, and deterioration rates, and will be periodically reassessed to consider new and emerging technologies;

* Accelerate the phase-out schedule for older technology two-stroke diesel buses, which have been shown to emit significantly higher emissions compared to modern buses with four-stroke engines. MTA commits to elimination of all two-stroke bus engines by December 31, 2003;

* Introduce low-sulfur fuels at all depots that continue to support diesel buses. Use of low sulfur fuel -- less than 30 ppm sulfur -- has been shown to provide immediate emission reductions from all diesel engines, as well as enable the use of after treatment technologies which can provide substantial additional reductions. DEC and MTA will support the U.S. Environmental Protection Agency's proposal to reduce sulfur levels in diesel fuel nationwide to 15 ppm in 2006. MTA will consider using such fuel prior to 2006 when it becomes commercially available;

* Equip all diesel buses in the fleet with some type of aftertreatment technology such as Traps, Catalysts, Urea Injection, or other devices, no later than December 31, 2003. Such technologies have been shown to provide substantial emission reductions, and traps are currently being evaluated by DEC on buses currently in use in New York City. New technologies will be evaluated as they emerge, as part of the DEC process described above;

* Retrofit or construct three depots to provide for CNG refueling. This will provide for a substantial fleet of CNG buses to gain practical experience with the fuel and to provide infrastructure to demonstrate future gaseous fuel technologies including fuel cells. One depot (Jackie Gleason in Brooklyn) has already been so retrofitted. The Coliseum depot is under construction and is expected to be on-line by September, 2001. Manhattanville depot is in the design phase and should be in operation by late 2003-early 2004. All three depots will receive full complements of CNG buses for a total of 650 vehicles;

* Commit that all new depot facilities constructed in the future will be "CNG-compatible." It is considerably less expensive to build a depot from the ground up to allow for use of gaseous fuels compared to retrofitting existing facilities. Such a strategy provides the option to use gaseous fuels in the future if new technologies such as fuel cells requires such fuels. If DEC determines that CNG is the superior fuel technology, MTA further commits to upgrade the three annex/depots (Staten Island, East New York, Brooklyn/Queens) to full "CNG-Ready" status, and order the appropriate number of CNG buses; and

* Provide funding towards the development of a state-of-the-art DEC Heavy-Duty Vehicle Emission Testing Laboratory. This would be the first facility of its type to be developed in the Eastern United States and will allow DEC to evaluate current and future technologies to reduce emissions from heavy-duty vehicles.

With this new initiative, New York joins with Sweden, Germany, the UK, Taiwan, South Korea, Hong Kong, California and Tokyo as areas which already have or will soon adopt strong diesel retrofit or conversion programs.

8. U.S. Seeks To Phase-out MTBE Use In Gasoline

In a bid to help farmers and ease consumer concerns about contaminated water supplies, the Clinton administration is pursuing legislation to require that at least 1.2 percent of U.S. gasoline supplies come from renewable fuels, such as ethanol. The administration's plan also includes measures to eliminate the fuel additive MTBE in gasoline. The administration also plans to eliminate a current federal requirement that clean-burning "reformulated gasoline" contain at least 2 percent oxygen by weight.

Reformulated gasoline accounts for about 30 percent of all the gasoline sold in the United States. It is required in 9 U.S. metropolitan areas with the worst air pollution, although other areas have voluntarily joined the program.

Because MTBE has shown up in groundwater in reformulated gasoline areas such as California, the administration has been under pressure to ban its use. MTBE is used in about 85 percent of reformulated gasoline

California and New England states would like Congress to eliminate the 2-percent oxygen requirement for reformulated. However, farm groups oppose that idea because they fear it would shut ethanol, which is made from corn, out of the reformulated gasoline program. EPA addresses that problem by asking Congress to set a minimum average renewable fuel content level for all gasoline. The proposed minimum would began at 1.2 percent, the current level of renewable fuel in

the gasoline, and allow for sustained growth over the coming decade.

9. Another Approach To MTBE Phase Out Emerges in Congress

As part of the federal debate over the oxygenate requirement and the phase-out of MTBE, Senators Daschle and Lugar have introduced a bill, the "Renewable Fuels Act of 2000", which would allow states to petition EPA for state authority to regulate MTBE and require EPA to establish regulations that would phase MTBE out of all gasoline by 2004. The bill also requires EPA to revise RFG performance standards to give equivalent benefits for ozone and toxics and allows any geographic area to opt-in to the RFG program.

Furthermore, the bill would require all but small refiners to provide a total volume of at least 1.3% renewable content in motor fuels beginning in 2000. The amount is to rise 0.2% each year, reaching 3.0 to 3.3% of total gasoline sold in 2010, and then remain constant. Biomass derived ethanol receives extra credit with each gallon counting as 1.5 gallons of renewable content.

The bill is intended to triple the use of ethanol over the coming decade and help replace the gasoline additive MTBE. The sponsors argue that the legislation would reduce U.S. dependence on oil imports and boost demand for corn and other plant-based materials used to manufacture ethanol.

Ethanol is made primarily from corn and competes with MTBE as a fuel additive.

For farm state lawmakers, the legislation would mean a new market for corn and new jobs as ethanol plants are expanded and opened. The legislation takes a more moderate course than other proposed bills that would retain the current oxygen requirement for reformulated gasoline, while phasing out MTBE.

Daschle said the bill would increase demand for U.S. corn by an additional 600 million bushels a year, which could boost depressed prices by as much as 50 cents a bushel.

10. US Launches 21st Century Truck Initiative

The FY 2001 budget proposed for DOE would increase funding for RD&D on advanced truck technologies by 50%, to $142 million. This budget, baseline program funding plus the increase, is being called the 21st Century Truck Initiative. Program goals include tripling the fuel economy of heavy pick-ups, vans, and buses, and doubling the fuel economy of heavy trucks. The stated emissions goal is to "exceed expected emissions requirements for 2010."

DOE also recently announced it had selected 10 truck projects for funding. Of these, 7, including 3 focused on natural gas hybrids, come under the rubric of the 21st Century Truck Initiative.

The proposal appears to have originally emerged from the Department of Defense which wants to have substantial increases in truck fuel efficiency. Unlike light duty vehicles under the PNGV program, it appears that there would be a strong market pull for introduction of highly efficient trucks if they were developed.

11. Cummins, DOE To Develop Clean, Efficient Truck Engines

The Department of Energy (DOE) has selected Cummins Engine Company to participate in a project designed to develop heavy-duty diesel engines with improved fuel

efficiency and marked emission reductions. The heavy-duty diesel engines are used in on-highway 18-wheel vehicles. The DOE will award up to $5 million to Cummins during the first year of the project. The partnership between the federal government and heavy-duty diesel engine manufacturers is expected to continue through January 2006. The proposed heavy-duty diesel engines will hopefully exhibit superior fuel economy while reducing Nitrogen Oxide (NOx) emissions and particulate matter by 90% of the stated 2002 levels. These targets are expected to be reached by improvements in engine efficiency, advances in NOx and particulate aftertreatment technology, and through the use of low sulfur fuels.

12. Efforts To Weaken Clean Air Act Moving Forward in US Senate

Senators George Voinovich (R-OH) and John Breaux (D-LA) have announced that they plan to introduce legislation to prevent the U.S. Environmental Protection Agency from setting health-based clean-air standards without a mandatory cost-benefit analysis. Further, EPA's cost benefit determination will be subject to judicial review.

Currently, the Clean Air Act requires EPA to set national health standards based solely on scientific evidence – giving Americans the right to know when the air they breath is unhealthful. Costs are then taken into consideration as EPA and the states devise programs to meet the health standards.

13. GM Leaves Global Climate Coalition

General Motors has become the third major auto manufacturer to withdraw from the Global Climate Coalition (GCC), an 11-year-old industry coalition that vigorously opposes the Kyoto protocol. GM follows Ford and Daimler Chrysler in leaving the group. Texaco and The Southern Company, a large power company, have also recently resigned from the group.

14. Massachusetts ZEV Mandate Preempted

Massachusetts cannot require automakers to sell zero emission vehicles in the state until 2003, a federal appeals court has ruled. The US Court of Appeals for the First Circuit said that contractual agreements between California and major automobile manufacturers are not official regulatory emissions standards and therefore cannot be adopted by Massachusetts.

15. Gore Pushes Efficient Cars As Key To Solving Oil Crisis

Welcoming the debut of three new fuel-efficient cars, Vice President Al Gore said the recent increase in oil prices made such vehicles a key tool in finding a long-term solution to the energy crisis.

"Energy-efficient cars will dramatically reduce our dependence on foreign oil. Right now, millions of Americans are paying higher gas prices," Gore said at a ceremony to roll out the three new fuel-efficient cars, made by Ford , General Motors and DaimlerChrysler.

The concept cars are the result of an initiative launched seven years ago by Gore called the Partnership for a New Generation of Vehicles, which was aimed at producing by 2004 a family car capable of traveling 80 miles per gallon of gasoline. That represents up to three times the fuel efficiency of conventional cars.

The partnership's timetable called for each automaker to roll out "proof of technical concept" vehicles by 2000, followed by

production prototypes by 2004. All three cars use some form of hybrid technology, combining a gasoline-or diesel powered engine with an electric motor to increase fuel economy and reduce air pollution.

Referring to OPEC's decision on Wednesday to boost oil production in an attempt to stabilize oil prices, Gore said it was essential that the United States pushed hard for a dramatic improvement in the efficiency of vehicles. The United States imports 50 percent of its oil, and its reliance on foreign oil is expected to grow to 60 percent by 2010, Gore said, adding that producing more efficient cars could be a long-term solution to the gas crisis.

He urged Congress to help make the new cars affordable to the American public by approving the Clinton administration's proposed tax credit, worth up to $4,000 to anyone who buys such a car.

He also announced expansion of the partnership's research to include technologies for greater fuel economy in gas-guzzling sport utility vehicles, minivans and other light-duty trucks.

The partnership program brings together the three car makers, federal agencies and research bodies, and universities to create more efficient cars without sacrificing safety, affordability or compliance with emission standards.

GM's Vice Chairman Harry Pearce said his company's Precept car, a hybrid electric car, incorporated 130 innovations, including a more aerodynamic body and low-energy lights. Side mirrors have been replaced with interior cameras, and the wheels are the "lightest in the industry," he said.

"The proof of the pudding will be getting these cars into high-volume production," Pearce said.

Ford Group Vice President John Rintamaki said his company would build a mass-production hybrid electric vehicle beginning in 2003.

Ford is also making good progress in developing a hydrogen-fueled car that would be ready for production by 2004. The vehicle's only emission would be clean, hot water - which drivers could use to make a cup of tea, Rintamaki quipped.

DaimlerChrysler President James Holden said consumers wanted moonshot technology at down-to-earth prices and the promised tax credit would help lower the prices of these cars.

16. Ford Escape to Have Hybrid-Electric Powertrain in 2003

A hybrid-electric powered Ford Escape is being designed to be the cleanest, most fuel-efficient sport utility when it debuts in 2003. Ford is the first automaker to announce production plans for a hybrid-electric powered sport utility vehicle.

The Ford Escape HEV will feature an electric drivetrain to augment its fuel-efficient four-cylinder gasoline engine. With regenerative braking and nearly instantaneous start-stop capability, the Escape HEV will be especially fuel efficient in city traffic, delivering about 40 mpg in urban driving. Yet Escape HEV will deliver acceleration performance similar to an Escape equipped with the V-6 engine. The hybrid Escape will be capable of being driven more than 500 miles on a single tank of gasoline.

It will also feature an advanced regenerative braking system which recaptures energy in

the form of electricity when the vehicle is being braked; the electrical energy is stored in the battery for future use. A sophisticated motor-generator saves fuel by shutting down the engine when the vehicle is coasting or stopped, restarting it almost instantaneously when the driver steps on the accelerator pedal. These and other related technologies have been developed and proven out in Ford's P2000 research program.

The Escape HEV is being designed to operate more cleanly than government regulations require. In fact, it will qualify as a Super Ultra Low Emission Vehicle (SULEV) under California standards. It also will meet Stage IV emissions requirements in Europe (where it will be marketed as the Maverick) before they become mandatory in the 2005 model year.

Ford indicated that it will charge a premium of about $3000 for the HEV.

17. Ballard Says First Fuel Cell Bus Field Tests A Success

Ballard Power Systems wrapped up its first field test program for fuel cell-powered buses and said it remains confident sales of the green technology to mass transit systems can begin in two years. Ballard called the collaboration between its XCELLSIS Fuel Cell Engines Inc. subsidiary and the Chicago Transit Authority for the past two years "very successful," with the three buses involved logging more than 5,000 hours of revenue service.

The company has received extensive media attention for its efforts to develop a fuel cell engine for cars, but Ballard officials believe the technology will actually hit the road first in mass transit vehicles.

The issue of what fuels should be used to supply the hydrogen is still being debated by the auto, energy and fuel cell industries. Sales to mass transit systems are less price sensitive and centralized bus fleets do not require the same fueling infrastructure that will have to be in place before private car sales can be successful. The initial buses, expected to be available for commercial production in 2002, will cost about C$500,000 - about the same as electric-powered trolleys - with the cost dropping as production levels increase.

Diesel-powered buses are likely to remain less expensive than their fuel cell rivals but Ballard does not believe that will not be a problem because of increasing environmental restrictions.

Field tests on fuel cell-powered buses are also being conducted in California and Vancouver. XCELLSIS is a engine development unit owned by Ballard, Ford Motor Co. and DaimlerChrysler.

18. US EPA Proposes Groundbreaking Heavy Duty Emissions & Fuels Package

On May 17th, EPA announced its long awaited proposal to substantially reduce emissions from heavy duty vehicles and engines and to reduce the sulfur content in diesel fuel. EPA has proposed a comprehensive national control program that would regulate the heavy-duty vehicle and its fuel as a single system. New emission standards would begin to take effect in 2007, and would apply to heavy-duty highway engines and vehicles. These proposed standards are based on the use of high-efficiency catalytic exhaust emission control devices or comparably effective advanced technologies. Because these devices are damaged by sulfur, EPA has also proposed to reduce the level of sulfur in highway diesel fuel significantly by the

middle of 2006.

Highlights of the proposal include the following:

a. Proposed Standards

EPA is proposing a particulate matter (soot) emission standard for new heavy-duty engines of 0.01 grams per brake - horsepower - hour (g/bhp-hr), to take full effect in the 2007 model year. The current soot standard is 0.1 g/bhp-hr.

EPA is also proposing standards for nitrogen oxides (NOx) and hydrocarbons (HC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. The current standard for NOx is 4 g/bhp-hr and the HC standard is 1.3 g/bhp-hr. These standards will be phased-in for diesel vehicles between 2007 and 2010. Gasoline vehicles would have to meet these standards in 2007.

The sulfur content of diesel fuel, used in highway vehicles, would be limited to a cap of 15 parts per million (ppm) beginning June 1, 2006. The current standard is a cap of 500 ppm.

b. Costs of Proposal

The cost of reducing the sulfur content of diesel fuel would result in an estimated increase of approximately three to four cents per gallon.

EPA estimates that vehicle costs would increase from $1,000 to $1,600 depending on the size of the vehicle. To put this in perspective, new heavy-duty trucks can cost as much as $150,000 and buses can cost $250,000.

c. Environmental Impacts

If this program is implemented as proposed, diesel trucks and buses will have dramatically reduced emission levels. It will bring heavy-duty diesel emissions on par with new cars and would, for the first time, result in the widespread introduction of exhaust emission control devices on diesel engines.

By 2007, EPA estimates that heavy-duty trucks and buses will account for as much as 30 percent of nitrogen oxides emissions from transportation sources and 14 percent of particulate matter emissions. In some urban areas, the contribution will be even greater. The proposed program would result in particulate matter and oxides of nitrogen emission levels that are 90% and 95% below current standards levels, respectively. In order to meet these more stringent standards for diesel engines, the proposal calls for a 97% reduction in the sulfur content of diesel fuel. EPA is also proposing more stringent standards for heavy-duty gasoline vehicles.

The clean air impact of this program would be dramatic when fully implemented. By 2030, this program would reduce annual emissions of nitrogen oxides, nonmethane hydrocarbons, and particulate matter by a projected 2.8 million, 305,000 and 110,000 tons, respectively.

A more detailed summary of the proposal is attached as a special report at the end of this document.

19. New HEI Studies Reenforce Concerns Regarding Particulate

At its annual conference in Atlanta, Georgia, the Health Effects Institute (HEI) released the results of two major studies that are central to the debate over EPA's fine particle air quality standards. The first report is a re-analysis of two long-term community health studies: the Harvard Six Cities Study (1993), and the American Cancer Society Study (1995). The

second, called the National Morbidity, Mortality, and Air Pollution Study (NMMAPS), is original research on hospitalization and deaths associated with air pollution in major U.S. cities.

a. The Particle Epidemiology Reanalysis Project

The Harvard Six City Study and the American Cancer Society study examined the long-term effects of exposure to particulate air pollution on mortality. The Harvard Six-Cities Study by Dr. Douglas Dockery of the Harvard School of Public Health, and others, was published in December 1993 in the New England Journal of Medicine. Researchers followed the health of more than 8,000 people in six small cities that fell along a gradient of air pollution concentrations for a period of 14 to 16 years. As particle concentrations increased, there was an almost directly proportional increase in the death rate in the residents studied. Residents of the most polluted city in the study, Steubenville, Ohio, had a 26 percent increased risk of premature mortality, compared to the residents of the cleanest city studied, Portage, Wisconsin. According to study authors, this translates into a shortened life expectancy of one to two years for residents of Steubenville compared to residents of Portage.

The March 1995 American Cancer Society study, by Dr. Arden Pope of Brigham Young University, and others, found an association between chronic exposure to fine particle air pollution and premature death in a study group of over half a million people in 151 cities. Sulfate pollution was also associated with early death. The study reported strong associations between sulfates and fine particles and death by cardio-pulmonary causes.

These original studies used statistical techniques to adjust for age, and to control for the effects of smoking, diet, and occupational exposure.

Dr. Daniel Krewski of the University of Ottawa and his associates conducted the newly released reanalysis of these two studies for the Health Effects Institute. First, the HEI - funded researchers undertook a reanalysis of the original studies and a quality audit of the underlying data. Second, researchers performed an extensive sensitivity analysis using alternative statistical methods, and considering the role of 20 potential confounders such as other pollutants, climate, and socio-economic factors on study results.

The reanalysis by independent investigators validates the original studies.

b. The National Morbidity, Mortality and Air Pollution Study (NMMAPS)

The Health Effects Institute commissioned an original nationwide study of the short-term effects of air pollution on human health in the 90 largest American cities. A team of investigators led by Dr. Jonathan Samet and Dr. Scott Zeger of the Johns Hopkins University School of Hygiene and Public Health examined short-term increases in mortality rates caused by short-term elevations in particulate air pollution. Harvard School of Public Health researchers Dr. Douglas Dockery and Dr. Joel Schwartz studied effects on hospitalization in a subset of these cities. NMMAPS developed a new standardized methodology for examining pollution effects across many cities. Investigators developed state-of-the-art statistical techniques to examine the effects of multiple pollutants and the extent of life-shortening.

Some critics have argued that short-term increases in the death rate are unimportant because the individuals affected are very frail and near death, even in the absence of air pollution. NMMAPS dispels this "harvesting" notion. NMAPPS investigators report that life is not shortened by a matter of days, but that life shortening is on the order of months or more.

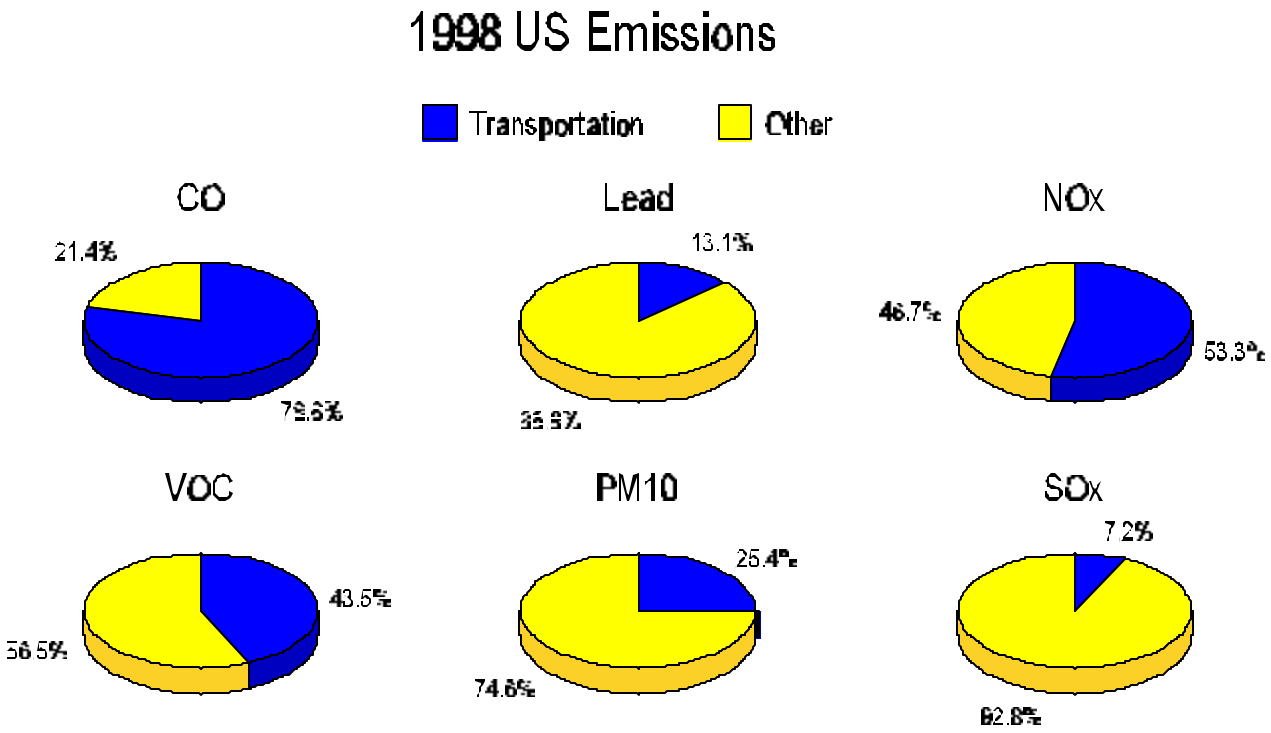
Critics have also argued that other pollutants may be responsible for observed health effects. NMMAPS found strong evidence linking daily increases in particulate pollution to increases in death, in the twenty largest U.S. cities. The association between particulate matter and mortality persisted even when other pollutants were included in the analysis.

In addition, NMMAPS found stable and robust associations between particulate pollution and increased hospital admissions for cardiovascular disease, pneumonia, and chronic obstructive pulmonary disease.

In an abstract prepared for the HEI Annual Conference, investigators concluded "these complementary analyses of mortality and morbidity provide new and strong evidence linking particulate air pollution at current levels to adverse health effects."

20. EPA's Annual Air Quality Trends Report Shows Continued Improvement

EPA's just-released *National Air Quality and Emissions Trends Report, 1998* reports that air pollution levels continued to decrease over the ten-year period 1989-1998. During that period, the ambient concentrations of carbon monoxide decreased by 39%, lead by 56%, nitrogen dioxide by 14%, ozone by 4%, particulate matter (PM10) by 35% and sulfur dioxide by 39%. In 1990, 274 areas were designated as non-attainment for at least one of the ambient air quality standards; as of September 1999, the number of non-attainment areas was 121.



21. Section 202L Mobile Source Toxics Process

As the result of an Earth Justice suit and subsequent consent decree, EPA is required to promulgate a final rule addressing toxics from mobile sources by the end of this year. EPA's heavy work load with Tier 2 and now heavy duty vehicles and engines has made it difficult to carry out a quality analysis. However, the issuance of a quick and dirty rule concluding that there is no serious problem beyond diesel particulate would seriously undercut the potential for future action. Therefore, EPA will likely issue a proposal soon, laying out the issues and proposing a plan of action which would result in a more substantive rule in 2003.

ASIA PACIFIC

22. Hong Kong Experiences Severe Smog Episode

Thick, choking smog enveloped Hong Kong for several days over the past month, and the government came under renewed pressure from environmentalists, the business community and politicians to rein in the worsening air pollution problem. Air pollution in central business district reached 174 on the air pollution index (API), the highest ever recorded since measurements began in 1995.

API is the conversion of the ambient respirable suspended particulate (RSP),

sulphur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and nitrogen dioxide (NO_2) concentrations measured throughout the air quality monitoring network to a scale of 0 to 500. An index of 100 corresponds to the short-term Hong Kong Air Quality Objectives (HKAQO) established under the Air Pollution Control Ordinance. Real time air quality data from each monitoring station are transferred via telephone line to the air quality data processing center for calculation of the API.

Before dawn on the first day of the episode, almost all of Hong Kong was registering more than 100 on the index - levels regarded as "very high" - triggering warnings from the government. "When the general index lies between 101 and 200, persons with existing heart or respiratory illnesses are advised to reduce physical exertion and outdoor activities," the government said in a statement.

This problem has invited increasing criticism even from the business sector, which has now formed a lobby group to press the government into faster and more effective action. Hong Kong's worsening air pollution is usually blamed on its large fleets of diesel-powered vehicles, such as taxis, trucks and light buses, and smog from factories and power stations in other parts of southern China.

Wearing white surgical masks and carrying banners, about 12 activists from Friends of the Earth took to streets in Central and Causeway Bay in protest, urging the government to act. They also passed pamphlets to taxi drivers and motorists, urging them not to keep the engines of their idle cars running.

Legislator Christine Loh said in a statement: "We don't want just less-bad pollution. We demand real improvements." Loh called for quick imports of diesel fuel with lower sulphur content, and for fines on smoky vehicles to be raised immediately to HK$5,000 (US$641) from the paltry HK$450 currently.

Secretary for the Environment Lily Yam renewed the government's anti-pollution pledge after it emerged that a European organization had called off a business conference in Hong Kong because of the poor air. ``I certainly regard clean air as my top priority...and the government is fully behind me in this effort,'' Yam told a gathering of the Australian Chamber of Commerce in Hong Kong. Yam said the government was promoting the wider use of ultra-low sulfur diesel. ``The government vehicle fleet will try out this diesel in July and franchised bus companies are also in support of using cleaner fuel,'' she said. ``...I would not rule out the possibility of banning the use of other forms of diesel at some future time.'' Yam said the government also supported other initiatives to develop clean fuel and related technology, including trolley buses, hybrid vehicles and the use of natural gas.

Hong Kong Chief Executive Tung Chee-hwa announced in his policy speech last October a program to convert 18,000 taxis from diesel to liquefied petroleum gas, and to convert 6,000 minibuses to LPG or electricity.

23. GM Says Demand For Cars in China Still Strong, Despite Sales Drop

General Motors China believes that underlying demand for cars in mainland China is still very strong, despite a 30% on-year decline in the company's China sales during the first quarter of this year.

Analysts have been saying for some time that once China joins the WTO and import tariffs drop, car companies with manufacturing

operations in the mainland will be hit hard as vehicle prices plummet in the face of competition from cheap imports. Despite repeated government pledges to protect the domestic industry, sources say the ambitious joint-venture auto manufacturers will force dealers to reduce prices as capacity outweighs demand.

However, GM said that this is both an exaggeration and distortion of the truth about how the auto market will be affected by China's entry to the WTO: that change will come gradually, which will enable domestic automakers to adapt over time to the new conditions and competitive atmosphere.

"As China becomes more competitive in all areas--manufacturing, more models, both domestically built and imported, and so on, prices will come down, and tariffs are scheduled to drop from 80-100% (to 25%) by 2006. But these changes will not be immediate. We have not been able to get that message across so far, nor has the Chinese government despite numerous attempts," emphasized GM's spokesperson.

In spite of the drop in car sales registered in the first quarter, GM is increasing production this year, showing confidence in the market of the world's most populous country. GM's key production facility in Shanghai intends to more than double its output this year compared with 1999 to around 50,000 vehicles. The Shanghai plant's capacity is 100,000 vehicles and 180,000 engines and transmissions.

Shanghai GM is a joint venture between Shanghai Automotive Industry Corp. and General Motors, representing a US $1.5 billion investment, borne jointly by the 2 companies. It was established in 1997 and employs over 2,000 workers in its 160,000-square-meter production facility. Shanghai GM currently markets 3 sedan models in China--the GL, the GLX and the New Century. It will launch the new GL8 Wagon model in June.

And GM China's plans for expansion in the mainland don't stop in Shanghai. The group's second facility, Jinbei GM, will be upgraded this year to begin production of Chevrolet Blazer sport-utility vehicles and Chevrolet S-10 crew cab pickup trucks in December. Next year, Jinbei GM will become a full-capacity production facility. Jinbei GM is a joint-venture between General Motors and FAW-Jinbei Au Ltd. It represented an investment of $230 million and was established in 1998. The future employment of the plant, once it reaches full production, is estimated at 1,500.

The Jinbei GM management is on schedule in hiring and training a workforce. It is now renovating a 340,000 square meter manufacturing facility. The expected local parts content at the facility could exceed 50 percent; Chinese law requires a joint venture vehicle facility plant to have at least 40 percent local content to receive its regular operating license.

In addition to the Chevrolet Blazer sport-utility vehicle, Jinbei GM will also manufacture the Chevrolet S-10 crew cab pickup.

24. China Auto Group Questions Price Cuts After WTO

Price cuts in China's auto industry are out of the question following the country's accession to the World Trade Organization, an official at China's leading producer of sedans, Shanghai Automotive Industry Sales Corp. (SAISC) has stated. He was refuting a report carried by China Online that said Shanghai auto makers would cut prices 5%, saying instead they planned to reduce production costs--not prices--by 5% this year.

Government officials, fearing a sharp downturn in sales as potential buyers stay sidelined waiting for a WTO-related price drop, from last year have repeatedly guaranteed price stability and ruled out the possibility of market-driven price fluctuations.

China Online, citing an article in the Chinese-language Financial News, said that SAISC had decided to cut prices by 5%, introduce new models and launch on-line sales initiatives.

Analysts have already forecast market-wide price slashing in China's auto industry, which will need to take drastic steps to remain competitive in the face of post-WTO foreign competition.

The sedan market will likely face the largest price cuts as import tariffs are highest on such models, an auto industry analyst at ABN-AMRO said.

Despite repeated government pledges to protect the domestic industry, sources have said that ambitious joint-venture auto manufacturers will force dealers to reduce prices as capacity outweighs demand.

The Sino-US trade agreement signed last November stipulated that China must phase in tariff reductions, bringing the rate down from the current 80-100% to 25% by 2006.

25. South Korea To Tighten Vehicle Standards

The Ministry of Environment (MOE) is in process of establishing new emission standards for 2002-2004. Euro3 standards will be applied to heavy duty diesel trucks and buses, and LEV standards for gasoline passenger cars. Standards will be fixed by the middle of this year.

According to the Ministry of the Environment, about 3.24 million diesel fueled vehicles are currently in use in South Korea, accounting for 29 percent of all motor vehicles but 64% of all air pollutants generated by road engines in the country.

In addition, the natural gas vehicle program is actively underway. In this year(2000), 1500 CNG city buses and 30 refueling stations are scheduled. A budget of $45.8 million is approved for this year. By 2002, 5000 CNG buses and 100 stations are planned; by 2007, 20,000 CNG buses and 400 stations are planned.

26. Philippines Accelerates Phase-out of Leaded Gas

Philippine oil companies have signed a memorandum of agreement with the government to stop the sale of leaded gasoline in heavily polluted Manila by April, earlier than the originally scheduled January 2001.

The agreement was signed by Energy Secretary Mario Tiaoqui and 21 oil firms.

The country's three oil refiners said in September they were ready to shift production to unleaded gas early this year.

The refiners are Petron Corp , Pilipinas Shell Petroleum Corp and Caltex (Philippines) Inc. Pilipinas Shell is the local unit of the Royal Dutch/Shell group, while Caltex is a unit of the joint venture between Chevron Corp and Texaco Inc

Unleaded gasoline was first sold in the Philippines in February 1994.

The energy department said motorists were initially reluctant to shift to unleaded gasoline due to the erroneous perception that it had

less power. To overcome this bias, Congress reduced the price of unleaded gas by lowering its excise tax. Pump prices for unleaded gasoline are now around 50 centavos per liter cheaper than leaded gasoline. Demand for unleaded gasoline has since picked up, now accounting for 45 percent of total gasoline sales in the country, the energy department said.

The government said local oil firms would need to invest $2 billion to refine and distribute oil products to conform with the requirements of the law.

The law also stipulated that by 2003 all gasoline sold in the Philippines must contain no more than 35 percent aromatics content and two percent benzene. Lower aromatics and benzene mean reduced airborne pollution.

27. Honda To Introduce Fuel Cell Car by 2003

Honda Motor Company has announced that it plans to debut a fuel cell powered car in Japan in 2003

28. Toyota Gets Approval To Make Cars in China

Toyota has received government approval for a joint production project in China making it the third Japanese automaker to get the OK. Toyota and Tianjin Automotive will establish a joint venture pending final authorization from the Ministry of Foreign Trade and Economic Cooperation. Toyota follows Suzuki and Honda into the China market and hopes to begin production by 2002. The new company will have an initial capacity of 30,000 units per year. It will produce compact cars based on Toyota's 1300 cc engine.

29. Tokyo Continues Push Toward Clean Diesels

The Tokyo workshop on DPF in March was very successful with 570 people in attendance. Local officials concluded that there were many good technologies; the companies are now busy responding to potential customers. The next goal is to use DPF on an experimental trial and the local officials are now negotiating with oil companies to get low sulfur fuel.

Further, new vehicle and low sulfur fuel requirements which had been planned for 2007 will now go into effect in 2005. The Japanese Automobile Manufacturers Association also said that starting in 2003-2004 it will start introducing new types of vehicles equipped with particulate filters.

30. India Developments

A high court appointed panel on vehicular pollution has recommended a wide ranging series of measures for Mumbai. Among the proposed measures are the following:

A halt to new registration of diesel taxis and autorickshaws by May 2000

An additional tax of 20,000 Rs on private diesel vehicles registered after October

Only 4-stroke two and three wheelers can be registered after October 2000

Only CNG public transport buses can be registered after May 2000

Sulfur in diesel must be reduced to 0.05% and benzene in petrol to 1% by October 2000

Adulteration of fuel is a criminal offense

31. **New Toyota Earth Charter Sets Tone for 21st Century**

Toyota Motor Corporation (TMC), as part of its continuing efforts to set the tone for the 21st century, has made comprehensive revisions to the Toyota Earth Charter, which outlines TMC's basic policies, action guidelines and organizational structure for environmental preservation. To back its words up with actions, TMC has adopted the Third Environmental Action Plan for the years 2001 to 2005.

The Third Environmental Action Plan will be carried out to help develop solutions to the world's increasingly serious and complex environmental problems and to contribute to the sustainable development of a prosperous society in the new era. TMC realizes that to achieve these goals a determined effort-one greater than ever-must be made.

The revision of the Toyota Earth Charter is the first since the charter was adopted eight years ago in January 1992 on the basis of TMC's Guiding Principles. The revisions incorporate new perspectives including a "quest for zero emissions" and participation in the "creation of a recycling society" to respond to rapidly growing environmental issues.

As with the original charter, the revised Toyota Earth Charter will apply to all TMC consolidated Japanese and overseas companies as a common set of environmental guidelines. TMC calls on each company to formulate its own policies and action plans on the basis of the new charter to contribute to the environmental management effort of the entire Toyota group.

The first Toyota Environmental Action Plan was adopted in February 1993 and revised in April 1996 as the second plan, under which TMC is on track to complete all its environmental objectives by the end of 2000.

The Third Action Plan was developed for the years 2001 to 2005 to promote the attainment of environmental management goals, which include the development and provision of products (automobiles) with some of the world's best environmental performance in fuel efficiency and emissions, the realization of production activities that generate no waste, and response to recycling issues.

Some specific elements of the Action Plan are highlighted below:

Meeting at an early stage Japan's new fuel efficiency standards (by 2005 for diesel engines; by 2010 for gasoline engines)

Further reducing emissions in gasoline vehicles (through gradual introduction of low-emission vehicles with 1/4 the emissions levels of Japan's 2000 regulation figures)

Developing and introducing clean diesel vehicles

Improving the Toyota Hybrid System and expanding the hybrid model line-up

Accelerating development and introduction of fuel cell hybrid vehicles (FCHVs)

Reducing the total volume of CO2 emissions by 5% of FY1990 levels by the end of 2005, and by 10% by the end of FY2010

32. Taiwan Releases 1999 Air Quality Analysis

The Taiwan EPA's air quality monitoring

report for 1999 confirms that air quality in Taiwan is steadily improving. Although in 1999 the number of days with poor air quality was 4.87%, slightly higher than 4.61% in 1998, air quality has still been steadily improved from 5.23% in 1997 and 6.83% in 1994. In this time frame, overall air quality has been improved by 30%.

In addition, to present an even more rational assessment of air quality trends, the EPA has begun keeping "moving average" statistics. Results show that the average percentage of poor air quality days has gradually fallen from 6.2% thru 1994-1996, to 4.9% thru 1997-1999. The rate of progressive improvement has been steadily maintained around 7%, and the overall range of change has reached 21%. These numbers are sufficient to demonstrate that air quality has definitely improved.

Looking at the average concentrations of various pollutants, there is also a general trend towards improvement. In six years, greatest gains have been made in concentrations of sulfur dioxide. In 1999 the average concentration was 4.7 ppb, an improvement of 7% compared with 5.1 ppb in 1998, and 42% compared with 8.1 ppb in 1994. Carbon monoxide concentrations dropped 8% to 0.67 ppm last year, from 0.7 ppm in 1998, and a total of 19% from 0.86 ppm in 1994. Nitrogen dioxide concentrations also slightly dropped to 22.3 ppb, from concentrations of 22.5 ppb in 1998, and a total of 9% from 24.4 ppb in 1994. Concentrations of suspended particulates (PM_{10}) slightly increased from 57.6 ：g/m^3 in 1998 to 59.8 ：g/m^3 in 1999, however still a 20% improvement from 74.2 ：g/m^3 in 1994. Only concentrations of ozone showed steady signs of worsening, increasing to 23.6 ppb from 21.6 ppb in 1998, a yearly increase of about 1.6%, and a total increase of 11% from 21.2 ppb in 1994.

The EPA pointed out that the number of rainy days and amount of rainfall in 1999 decreased noticeably from past years, especially in the first and fourth quarters, which are times of high suspended particulate pollution. Rainfall in Taiwan's various regions decreased anywhere from 50 to 90%. This is the main reason air quality in 1999 was found to be slightly below that in 1998. The EPA explained that unusual weather conditions in 1999 were especially disadvantageous for pollution dispersion. However, that the number of poor quality air days was maintained at relatively low levels even under such adverse conditions is proof of the effectiveness of the efforts put into air pollution control.

The EPA noted that although traditional air pollutants have been effectively controlled, Taiwan is experiencing the same problem currently faced by developed nations. Particularly, the increase of ozone, secondary aerosols and other derivative pollutants. For this reason the EPA is working actively to research the local mechanisms for ozone generation and set national reduction strategies for ozone precursors. In addition, the EPA will push forward with the building of total quantity controls and regional air quality improvement plans. And, the EPA will make efforts to better understand the pollution characteristics for each district and develop local control strategies.

The EPA further pointed out that future air quality management measures will more fully take into account the influence time and location play on air pollution. For instance, the EPA will consider setting differential air pollution fees or initiating reduction negotiations with large air pollution sources for districts and seasons of relatively low air quality. The EPA will also work to create support for the use of low pollution vehicles; develop appropriate economic incentives;

effectively raise public willingness to use low pollution transportation methods; and accelerate elimination of old vehicles. The EPA will also strengthen the compilation and use of scientific techniques and data, and improve air quality forecasting techniques to improve air pollution warnings and response measures.

33. Management Guidelines for I/M Stations Promulgated in Taiwan

As part of its efforts to implement large-scale remote sensing of vehicle emissions, the EPA has asked vehicle inspection and maintenance companies to set up on-site emissions inspection stations. In the future, vehicles identified through remote sensing as not being in compliance with emissions standards can go to certified inspection stations to receive free inspection.

In order to locate high polluting vehicles, the EPA has begun heavily promoting the use of remote sensing technologies. Vehicles identified through remote sensing as being out of compliance with emissions standards are notified by environmental agencies that they must have their emissions analyzed. This policy has created the dire need for the establishment of vehicle testing stations. To set the necessary legal bases, the EPA recently announced the *Management Guidelines Concerning the Establishment of Vehicle Emissions Inspection Stations*.

In the past, all vehicle emissions inspection occurred through periodic testing performed by either motor vehicle departments or by contracted testing firms. Since the EPA began implementing remote sensing, however, follow up testing at approved inspection stations has been required for a large number of vehicles. This trend has necessitated the strengthening of the oversight of such inspection stations.

According to the recently announced guidelines, regular inspection facilities, class A and B repair shops, maintenance shops, and service stations can all provide emissions testing services if they receive approval from the EPA. Inspection stations must not only employ certified personnel, every inspection line must also utilize emissions analysis equipment.

EPA officials emphasized that testing shall be provided free of charge. When vehicle owners take their vehicles in for inspection, the relevant inspection station shall perform the testing in accordance with required procedures. Inspection stations shall also be required to enter inspection results on the proper forms and submit them to the EPA on a monthly basis.

CENTRAL AMERICA

34. Central America Has Become A Junkyard for Used US cars

Impoverished Central America has become a huge junk yard for used American cars, helping bring the regional environment to the brink of collapse. Marco Gonzalez, head of environment for a regional integration body known as SICA, said the polluting, gas-guzzling vehicles were responsible for high levels of carbon monoxide and other contaminants that afflict Honduras, Guatemala, Nicaragua, El Salvador and Costa Rica.

Because used cars are far cheaper than new ones, old vehicles from the United States are imported by many Central American countries in large numbers and used not just by private owners but also for public transport.

35. Jamaica Eliminates Leaded Gasoline

In early April, sales of leaded gasoline on the Caribbean Island of Jamaica came to an end.

AFRICA & MIDDLE EAST

36. Leaded Gasoline Still Rules In The Gulf

Regional governments have imposed a target of no later than 2002 to fully market unleaded gasoline. The Gulf states face a daunting task given realities on the ground - there are virtually no public awareness campaigns on television or radio stations in the Gulf.

The UAE, a major OPEC producer, introduced unleaded gasoline in 1992. But the country's gasoline stations are hard pressed to find customers for unleaded petrol.

Marketing unleaded gas in GCC states - Saudi Arabia, Kuwait, UAE, Qatar, Oman and Bahrain - will be expensive, making the task ahead even more staggering. The countries, which once overflowed with petrodollars, are tightening spending after an oil price crisis. They will need to do major upgrades on refineries across the region to produce unleaded gasoline.

Qatar plans to phase out the production and distribution of leaded petrol in the domestic market within three years. That means its state oil company will spend $850 million on a project to modernize a plant to convert to unleaded gasoline.

Saudi Arabia - the world's biggest oil producer and consumer - is a leading supplier to the huge market in the United States, where only unleaded gasoline is sold. But at home, it is hoping to reduce the lead content in its domestic market and plans to modernize its refineries to produce unleaded gasoline by 2001.

At the same time, there are few incentives to buy unleaded gasoline. In the emirate of Dubai, for example, the unleaded Ultima brand costs 4.20 dirhams ($1.15) a liter compared to leaded Mumtaz at 3.95 dirhams.

OCEANIA

37. BP Seeks Australian Clean Fuel Tax Break

BP Amoco PLC has asked the Australian government for a tax break on a high quality gasoline it will produce from August, but which will only be required in Australia from 2006. BP Amoco's Australasian president, Greg Bourne, said he had suggested to the government last week that it could speed up the shift to cleaner gasoline by making the tax on the new fuel two cents per liter less than on other petrol.

Unlike its three local refining competitors, BP Amoco will produce the cleaner Euro Four petrol in Australia from August 2000 at its Brisbane refinery, where it is spending more than A$200 million. An early shift to the Euro Four grade would improve fuel efficiency, lower greenhouse gas emissions, and shift Australia's cars to a fuel used in other parts of the world, BP said in a letter to the government. "The proposal also provides for an incentive for refiners to invest early and consumers to change quickly," he said in prepared remarks for an oil and auto industry conference.

The company suggested refiners should not have to pass the tax break on to consumers, giving refiners an incentive to invest and produce the cleaner fuel earlier than required. However, some retailers might pass on part of the tax advantage in order to undercut their rivals. Bourne said making higher quality fuels was the only way to make Australia's refineries viable because they could not

compete on volume against the much bigger refineries in Asia.

While most oil industry experts expect Australia's eight refineries to dwindle to about six in the near term because their margins are so small, Bourne predicted the number would fall to three or four. "Assuming we get the number right - in my mind it's probably three, or at most four - we then have the opportunity to focus our attention on that smaller number and really make them work," he said.

Australia's other refiner marketers are units of Exxon Mobil Corp , Royal Dutch/Shell , and Caltex Australia Ltd , which is half-owned by a joint venture of Chevron Corp and Texaco Inc.

38. GM To Launch Lead Acid Battery Hybrid Car in Australia

US car maker General Motors will launch the first hybrid car using a lead acid battery in Australia this week, David Rand, group manager of novel battery technologies at Australia's CSIRO Energy Technology told a conference in Nice recently.

The launch of the car, which will be driven only in Australia, is important because it is the first time a major car maker will have used a lead acid and not a nickel metal hydride battery in a hybrid car, he said at the fifth Advanced Lead-Acid Battery Consortium (ALABC) Conference. Hybrid cars, which produce around 50 percent fewer emissions than traditional cars, are powered by electricity and an internal combustion engine.

The Japanese models currently available use nickel metal hydride batteries, which cost around $12,000 each, instead of lead acid ones which cost around $750, because they are longer-lasting and more efficient. The ALABC is an industry consortium formed in 1992 to encourage improvement in lead acid battery technology, and speakers at the conference said they were confident car manufacturers would have to use lead batteries in the future because of cost considerations.

Fritz Kallhammer, an advisor to the California Air Resources Board, said the latest lead acid batteries were the most likely ones to be able to hit car manufacturers' requirements on price and performance for hybrid electric vehicles. He said the only question remaining was whether or not they would be able to meet manufacturers' recharging requirements, meaning they would have to be recharged several thousand times in a life of around five years. "While other battery technologies such as lithium ion and nickel metal hydride look certain to met manufacturers requirements they still exceed cost targets by a substantial figure," he said.

The ALABC has 60 members, including 20 lead acid battery manufacturers representing more than 85 percent of the world's global lead acid battery production.

GENERAL

39. Second Big Iceberg Breaks Off from Antarctica

A second giant iceberg has broken off from Antarctica and is bumping into a huge iceberg that broke off the Ross Ice Shelf earlier.

Matthew Lazzara of the University of Wisconsin's Antarctic Meteorological Research Center found the latest iceberg, which will be named B-17, while scanning images taken from a satellite orbiting the poles. He said the new iceberg lies to the north and east of Roosevelt Island and is 80 miles by 12 miles (130 km by 20 km). The

larger iceberg is 183 miles by 23 miles (295 km by 37 km), roughly the size of Jamaica.

The images show the two giant icebergs, and a third, smaller one known as B-16, jostling one another just off the island. The researchers said it was not yet clear if the icebergs would pose a threat to shipping.

Researchers say large chunks are breaking off of Antarctica for several reasons, some due to global warming. They say, for example, that the West Antarctic Ice Sheet has been steadily melting since the end of the last ice age. But they also stress that human-induced global warming can speed the process.

Much of Antarctica consists of ice sheets with no ground underneath. If it shrinks, the process could not only help raise ocean levels but could help shift ocean circulation and weather patterns, bringing drought, severe storms and the wider spread of tropical diseases.

The largest iceberg ever reported was seen in 1956 and was 60 miles wide and 208 miles long (95.6 km by 335 km), or 12,000 square miles (48,564 sq km) in area, more than twice the size of the state of Connecticut.

40. NASA, EU Report Massive Arctic Ozone Loss

A long, cold arctic winter spawned one of the most massive ozone losses on record, but ultimately, human-made pollution is to blame, scientists from NASA and the European Union have reported. Measurements taken by researchers aboard NASA's high-flying ER-2 plane show ozone in the arctic region decreasing by about 60 percent between January and mid-March. Other data collected by satellites back this up.

There is no "ozone hole" in the arctic as there sometimes is in the antarctic, but the arctic ozone depletion reported this year shows that chlorine compounds contained in some pollution are lingering in the far north.

Certain chlorine compounds can help destroy the protective ozone layer in Earth's stratosphere, but only if they are present when it is extremely cold and a bit sunny, as it was this winter. The chlorine contained in some chlorine-bearing pollutants remains in a benign form until it connects with extreme cold and sunlight.

These two conditions are unusual in the arctic winter. And the production of these pollutants is now limited, so the amount of chlorine in the stratosphere is not increasing, but there will be no full recovery of arctic ozone for decades.

Another reason the ozone loss was so severe this winter could be the lack of weather disturbances on the Earth's surface, which tend to warm the arctic. This lack may have been caused by the warming greenhouse effect, which tends to weaken such disturbances, according to the researchers.

The drop in the ozone over the arctic has caused a slight depletion of ozone in the northern hemisphere, stretching through northern Europe and the northern United States.

41. Worldwide Movement Toward Low Sulfur Diesel Fuel Continuing

There continues to be a clear worldwide trend toward lower and lower levels of sulfur in diesel fuel. Mandatory limits have been adopted in some regions and countries (e.g, EU and expected US) and tax incentives have been used in other countries as summarized below.

Tax incentives for 50 ppm sulphur diesel were introduced from 30th June 1999 in Denmark. The Ministry of Tax introduced a tax incentive of 0.18 DKK/liter. The result was a nearly 100% penetration of 50 ppm sulphur diesel on the Danish market from the 1st July 1999.

In Australia, sulphur levels in diesel are currently on average 1300 parts per million (ppm). The earliest date at which *any* significant domestic production of diesel at 50ppm will occur is later this year, at which time the BP refinery in Brisbane will commence production. It is unlikely to be able to produce more than one eighth of Australian demand. It is considered unlikely that other significant domestic capacity to produce 50ppm diesel could be available before 2003. While the earliest feasible introduction of Ultra Low Sulphur Diesel (ULSD) is the aim, there will be advantages in the earlier introduction of an intermediate level product. For example, reduction of sulphur levels to 500 ppm is necessary to enable the introduction of Euro 2 standards for light diesel vehicles. This can occur progressively, initially focusing on urban areas, and with sufficient capacity being available to supply the whole Australian market by the end of 2002.

Speeding the introduction and use of low sulphur diesel fuel in Australia will be encouraged by:

1. Negotiation with the oil majors of the early voluntary introduction of diesel at 500ppm in urban areas in 2000, on a best endeavors basis.

2. Diesel fuel standard set at 500ppm by the end of 2002 for road transport fuel.

3. An increase in the diesel excise tax for high sulphur fuel above 50ppm so that the relevant effective diesel excise payable increases by

1 cent per liter from 1 January 2003

2 cents per liter from 1 January 2004.

It is then planned to introduce a mandatory fuel standard of 50ppm in 2006. This would facilitate the introduction of the following diesel vehicle emission standards:

1. Euro 2 2002/3 all new diesel vehicles

2. Euro 3 2002/3 new medium and heavy diesel vehicles

3. Euro 4 2006/7 all new diesel vehicles.

Germany wishes to increase the duty on fuels with a sulfur content over 50 PPM by 3 pfennigs/liter from 1 November 2001 and from 1 January 2003 the higher tax would apply to fuels over 10 PPM sulfur. The Commission has agreed to the first part of the request but has requested more time to examine the technological and environmental benefits of fiscal incentives for 10 PPM sulfur fuels. The Commission is reported to be in support but the member states' ECOFIN council will rule on the request.

The Netherlands and UK are both considering the implications of following the German Move. Following a tax differential of 3 pence/loiter introduced in March 1999, the UK has switched to 50 PPM maximum sulfur diesel fuel.

Recognizing that tax policy on fuels is changing frequently, the Table below summarizes the tax incentives for ULSD in various countries at the time this note was

drafted.

Worldwide ULSD Tax Incentive	
Country	Tax Incentive (US$/L)
UK	0.048
German (start from Nov 2001)	0.015
Sweden	0.085
Finland	0.045
Denmark (start from June 1999)	0.023
Australia (start from Jan 2003)	0.006
Australia (start from Jan 2004)	0.012
Norway	0.031

42. Special Report: US EPA Proposal On Heavy Duty Emissions and Diesel Fuel

On May 17, 2000, the US EPA proposed a comprehensive package of measures to reduce emissions from heavy duty vehicle. Key elements of the proposal are summarized below.

a. Heavy-Duty Engine Emission Standards

EPA is proposing a PM emissions standard for new heavy-duty engines of 0.01 grams per brake-horsepower-hour (g/bhp-hr), to take full effect in the 2007 HDE model year. They are also proposing standards for NOx and NMHC of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively, to be phased in together between 2007 and 2010, for diesel engines. The phase-in would be on a percent-of-sales basis: 25 percent in 2007, 50 percent in 2008, 75 percent in 2009, and 100 percent in 2010. Because of the more advanced state of gasoline engine emissions control technology, gasoline engines would be fully subject to these standards in the 2007 model year. In addition, EPA is proposing a formaldehyde (HCHO) emissions standard of 0.016 g/bhp-hr for all heavy-duty engines, to be phased in with the NOx and NMHC standards, and the inclusion of turbocharged diesels in the existing crankcase emissions prohibition, effective in 2007.

The emission standards for heavy-duty engines are summarized below.

Proposed Full Useful Life Heavy-Duty Engine Emission Standards and Phase-Ins

		Standard (g/bhp-hr)	Phase-In by Model Year			
			2007	2008	2009	2010
Diesel	NOx	0.2	25%	50%	75%	100%
	NMHC	0.14				
	HCHO	0.016				
Gasoline	NOx	0.2	100%			
	NMHC	0.14				
	HCHO	0.016				
Diesel & Gasoline	PM	0.01	100%			

The proposed PM standard of 0.01 g/bhp-hr is projected to require the addition of a highly efficient PM trap to diesel engines, including urban buses; it is not expected to require the addition of any new hardware for gasoline engines.

Like the PM standard, the proposed NOx standard is projected to require the addition of highly efficient NOx aftertreatment to diesel engines. For gasoline engines, the standard proposed in the 2004 heavy-duty rule is 1.0 g/bhp-hr NMHC+NOx. Therefore, for gasoline engines, the standards proposed would represent roughly an additional 70 percent reduction.

With respect to formaldehyde, the standards are comparable in stringency to the formaldehyde standards recently finalized in the Tier 2 rule for passenger vehicles; they are also consistent with the CARB LEV II formaldehyde standards. These standards would be especially important for methanol-fueled engines because formaldehyde is chemically similar to methanol and is one of the primary byproducts of incomplete combustion of methanol. Formaldehyde is also emitted by engines using petroleum fuels (i.e., gasoline or diesel fuel), but to a lesser degree than is typically emitted by methanol-fueled engines. Based upon the analysis of similar standards recently finalized for passenger vehicles, EPA believes that formaldehyde emissions from petroleum-fueled engines when complying with the PM, NMHC, and NOx standards should be as much as 90 percent below the standards. Thus, to reduce testing costs, EPA is proposing a provision that would permit manufacturers of petroleum-fueled engines to demonstrate compliance with the formaldehyde standards based on engineering analysis. This provision would require manufacturers to make a demonstration in their certification application that engines having similar size and emission control technology have been shown to exhibit compliance with the applicable formaldehyde standard for their full useful life. This demonstration would be similar to that recently finalized for light-duty vehicles to demonstrate compliance with the Tier 2 formaldehyde standards.

Because the NOx exhaust emission control technology EPA expects would be required to meet the proposed NOx standard is at an early stage of development, EPA believes a phase-in of the NOx standard is appropriate. With a phase-in, manufacturers are able to introduce the new technology on a limited number of engines, thereby gaining valuable experience with the technology prior to implementing it on their entire fleet. Also, EPA is proposing that the NOx, HCHO, and NMHC standards be phased-in together for diesel engines, i.e, engines would be expected to meet each of these proposed new standards, not just one or the other. EPA proposes this because the standard as proposed in the 2004 heavy-duty rule would be a combined NMHC+NOx standard. Separating the phase-ins for NMHC and NOx would create a problem because it would not be clear to what NMHC standard an engine would certify were it to certify to the proposed NOx standard independent of certifying to the proposed NMHC standard (and vice versa for engines certifying to the proposed NMHC standard independent of the proposed NOx standard).[1] EPA is not proposing a phase-in for gasoline engines because it wants to maintain consistency with the proposed heavy-duty gasoline vehicle standards which are not phased-in.

b. Not-to-Exceed and Supplemental Steady-State Test

To help ensure that heavy-duty engine emissions are controlled over the full range of speed and load combinations commonly experienced in use, EPA has previously proposed to apply Not-To-Exceed (NTE) limits to heavy-duty diesel engines. As proposed, the NTE approach establishes an area (the "NTE zone") under the torque curve of an engine where emissions must not exceed a specified value for any of the regulated pollutants. As proposed, the specified value under which emissions must remain is 1.25 times the FTP standards. The NTE standard would apply under any conditions that could reasonably be expected to be seen by that engine in normal vehicle operation and use. In addition, EPA has proposed that the whole range of real ambient conditions be included in NTE testing.

Similarly, to help ensure that heavy-duty engine emissions are controlled during steady-state type driving (such as a line-haul truck operating on a freeway), EPA has previously proposed a new supplemental steady-state test consisting of 13 steady-state modes, each weighted according to the amount of time that might be expected at each mode during typical real world conditions. As proposed, the supplemental steady-state test has emission limits of 1.0 times the FTP standards.

EPA's notice proposes to apply the heavy-duty diesel NTE and supplemental steady-state test provisions intended to be finalized as part of the 2004 standards rulemaking. The October 29, 1999, proposal for that rule contained the description of these provisions. EPA expects that a number of modifications will be made to those provisions in the FRM for that rule based on feedback received during the comment period. While the details of the final provisions are not yet available,

[1] Note that, despite the concurrent phase-in of NOx and NMHC standards for diesel engines, the NMHC standards should be easily met through use of a PM trap. Since the PM standards would be implemented on 100 percent of new engines in the 2007 model year, all new engines would have a PM trap and would, therefore, control NMHC emissions to levels below the proposed standards. Therefore, while the NMHC standard is phased-in with NOx due to the 2004 combining of the NOx and NMHC standards, the proposed NMHC standards would be met by all new engines in the 2007 model year.

EPA will provide the necessary information in the docket for this rule as soon as it becomes available in order to allow for comment.

EPA has not proposed that the NTE requirements, or the supplemental steady-state test, apply to heavy-duty gasoline engines. However, it is working with several industry members to pursue a proposal in a separate action with the intention of having NTE requirements in place for heavy-duty gasoline engines beginning in the 2004 model year. EPA's proposal intends that those provisions, when developed, would apply to the gasoline engines subject to EPA's proposed standards as well. EPA currently have no intention of pursuing supplemental steady-state test requirements for heavy-duty gasoline engines.

c. Crankcase Emissions Control

Crankcase emissions are the pollutants that are emitted in the gases that are vented from an engine's crankcase. These gases are also referred to as "blowby gases" because they result from engine exhaust from the combustion chamber "blowing by" the piston rings into the crankcase. These gases are vented to prevent high pressures from occurring in the crankcase. The existing emission standards prohibit crankcase emissions from all highway engines except turbocharged heavy-duty diesel engines. EPA made the exception for turbocharged heavy-duty diesel engines because of concerns in the past about fouling that could occur by routing the diesel particulates (including engine oil) into the turbocharger and aftercooler. These concerns are now alleviated by newly developed closed crankcase filtration systems, specifically designed for turbocharged heavy-duty diesel engines. These new systems are already required for new on-highway diesel engines under the EURO III emission standards.

EPA is proposing to eliminate the exception for turbocharged heavy-duty diesel engines starting in the 2007 model year. This is an environmentally significant proposal since most heavy-duty diesel trucks use turbocharged engines, and a single engine can emit over 100 pounds of NOx, NMHC, and PM from the crankcase over the lifetime of the engine.

d. Heavy-Duty Vehicle Exhaust Standards

The emission standards being proposed for heavy-duty vehicles are summarized in the Table below. EPA has already proposed that all complete heavy-duty gasoline vehicles, whether for transporting passengers or for work, be chassis certified. Current federal regulations do not require that complete diesel vehicles over 8,500 pounds be chassis certified, instead requiring certification of their engines. EPA's proposal does not make changes to those requirements.

The Tier 2 final rule created a new vehicle category called "medium-duty passenger vehicles".[2] These vehicles, both gasoline and diesel, are required to meet requirements of the Tier 2 program, which carries with it a chassis certification requirement. As a result, applicable complete diesel vehicles must certify using the chassis certification test procedure. EPA's proposed chassis standards for 2007 and later model year

[2] Medium-duty passenger vehicles are defined as any complete vehicle between 8,500 and 10,000 pounds GVWR designed primarily for the transportation of persons. The definition specifically excludes any vehicle that (1) has a capacity of more than 12 persons total or, (2) is designed to accommodate more than 9 persons in seating rearward of the driver's seat or, (3) has a cargo box (e.g., pick-up box or bed) of six feet or more in interior length.

heavy-duty gasoline vehicles would apply to the remaining (work-oriented) complete gasoline vehicles under 14,000 pounds.

These NOx standards represent a 78 percent reduction and a 60 percent reduction from the standards for 8,500-10,000 pound and 10,000-14,000 pound vehicles, respectively, proposed in the 2004 heavy-duty rule. The 2004 heavy-duty rule would require such vehicles to meet the California LEV-I NOx standards of 0.9 g/mi and 1.0 g/mi, respectively. The proposed NOx standards shown in the Table are consistent with the CARB LEV-II NOx standard for low emission vehicles (LEVs). EPA has proposed, and CARB has put into place in their LEV-II program, a slightly higher NOx standard for 10,000 to 14,000 pound vehicles because these vehicles are tested at a heavier payload. The increased weight results in using more fuel per mile than vehicles tested at lighter payloads; therefore, they tend to emit slightly more grams per mile than lighter vehicles.[3]

The NMHC standards represent a 30 percent reduction from the proposed 2004 standards for 8500-10,000 and 10,000-14,000 pound vehicles. The 2004 heavy-duty rule would require such vehicles to meet NMHC standard levels of 0.28 g/mi and 0.33 g/mi, respectively (equal to the California LEV-I nonmethane organic gases (NMOG) standard levels). The proposed NMHC standards are consistent with the CARB LEV-II NMOG standards for LEVs in each respective weight class. The NMHC standard for 10,000-14,000 pound vehicles is higher than for 8,500-10,000 pound vehicles for the same reason as stated above for the higher NOx standard for such vehicles.

[3] Engine standards, in contrast, are stated in terms of grams per unit power rather than grams per mile. Therefore, engine emission standards need not increase with weight because heavier engines do not necessarily emit more per horsepower even though they tend to emit more per mile.

Proposed 2007+ Full Useful Life Heavy-Duty Vehicle Exhaust Emission Standards for Complete Gasoline Vehicles* (grams/mile)

Weight Range (GVWR)	NOx	NMHC	HCHO	PM
8500 to 10,000 lbs	0.2	0.195	0.016	0.02
10,000 to 14,000 lbs	0.4	0.23	0.021	0.02

* does not include medium-duty passenger vehicles

The formaldehyde standards are comparable in stringency to the formaldehyde standards recently finalized in the Tier 2 rule for passenger vehicles; they are also consistent with the proposed engine standards and the CARB LEV II formaldehyde standards.

The PM standard represents over an 80 percent reduction from the CARB LEV-II LEV category PM standard of 0.12 g/mi. Note that the PM standard shown in the Table represents not only a stringent PM level, but a new standard for federal HDVs where none existed before. The California LEV-II program for heavy-duty vehicles, and the federal Tier 2 standards for over 8,500 pound vehicles designed for transporting passengers, both contain PM standards. The PM standard proposed is consistent with the Tier 2 bin 8 level of 0.02 g/mi.

EPA believes that the vehicle standards proposed are comparable in stringency to the proposed diesel and gasoline engine standards.

EPA is not proposing a phase-in for the HDV standards. As proposed, the HDV standards would apply only to complete gasoline vehicles, consistent with current regulations. EPA believes that emission control technology for gasoline engines is in an advanced enough state to justify a simple implementation requirement in the 2007 model year.

Consistent with current regulations, EPA is not proposing to allow complete heavy-duty diesel vehicles to certify to the heavy-duty vehicle standards. Instead, manufacturers would be required to certify the engines intended for such vehicles to the engine standards.

e. Supplemental Federal Test Procedure For Heavy Duty Vehicles

EPA is not proposing new supplemental FTP (SFTP) standards for heavy-duty vehicles. The SFTP standards control off-cycle emissions in a manner analogous to the NTE requirements for engines. EPA believes that the SFTP standards are an important part of the light-duty program just as it believes the NTE requirements will be an important part of the heavy-duty diesel engine program. Although they are not proposing SFTP standards for heavy-duty vehicles, they intend to do so via a separate rulemaking.

f. Heavy-Duty Evaporative Emission Standards

EPA is also proposing new evaporative

emission standards for heavy-duty vehicles and engines. The proposed standards are shown in the Table below. These standards would apply to heavy-duty gasoline-fueled vehicles and engines, and methanol-fueled heavy-duty vehicles and engines. Consistent with existing standards, only the standard for the three day diurnal test sequence would apply to liquid petroleum gas (LPG) fueled and natural gas fueled HDVs.

Proposed Heavy-Duty Evaporative Emission Standards*
(grams per test)

Category	3 Day Diurnal + Hot Soak	Supplemental 2 Day Diurnal + Hot Soak**
8,500 - 14,000 lbs	1.4	1.75
>14,000 lbs	1.9	2.3

* Proposed to be implemented on the same schedule as the proposed gasoline engine and vehicle exhaust emission standards. These proposed standards would not apply to medium-duty passenger vehicles, and would not apply to diesel fueled vehicles.
** Does not apply to LPG or natural gas fueled HDVs.

These proposed standards represent more than a 50 percent reduction in the numerical standards as they exist today. The 2004 heavy-duty rule proposed no changes to the numerical value of the standard, but it did propose new evaporative emission test procedures for heavy-duty complete gasoline vehicles.[4] Those test procedures would effectively increase the stringency of the standards, even though the numerical value was not proposed to change. For establishing evaporative emission levels from complete heavy-duty vehicles, the standards presume the test procedures proposed in the 2004 heavy-duty rule.

The proposed standards for 8,500 to 14,000 pound vehicles are consistent with the Tier 2 standards for medium-duty passenger vehicles (MDPV). MDPVs are of consistent size and have essentially identical evaporative emission control systems as the remaining work-oriented HDVs in the 8,500 to 10,000 pound weight range. Therefore, the evaporative emission standards should be equivalent. EPA is proposing those same standards for the 10,000 to 14,000 pound HDVs because, historically, the evaporative emission standards have been consistent

[4] The proposed test procedure changes sought to codify a commonly approved waiver allowing heavy-duty gasoline vehicles to use the light-duty driving cycle for demonstrating evaporative emission compliance. The urban dynamometer driving schedule (UDDS) used for heavy-duty vehicles is somewhat shorter than that used for light-duty vehicles, both in terms of mileage covered and minutes driven. This results in considerably less time for canister purge under the heavy-duty procedure than under the light-duty procedure. EPA recognizes this discrepancy and have routinely provided waivers under the enhanced evaporative program that allow the use of the light-duty procedures for heavy-duty certification testing. They do not believe that this approach impacts the stringency of the standards. Further, it is consistent with CARB's treatment of equivalent vehicles.

throughout the 8,500 to 14,000 pound weight range. EPA believes that the HDVs in the 10,000 to 14,000 pound range are essentially equivalent in evaporative emission control system design as the lighter HDVs; therefore, continuing this historical approach is appropriate.

EPA is proposing slightly higher evaporative emission standards for the over 14,000 pound HDVs because of their slightly larger fuel tanks and vehicle sizes. This is consistent with past evaporative emission standards. The levels chosen for the over 14,000 pound HDVs maintains the same ratio relative to the 8,500 to 14,000 pound HDVs as exists with current evaporative standards. To clarify, the current standards for the 3 day diurnal test are 3 and 4 grams/test for the 8,500 to 14,000 and the over 14,000 pound categories, respectively. The ratio of 3:4 is maintained for the proposed 2007 standards, 1.4:1.9.

The proposed standards levels are slightly higher than the California LEV-II standards levels. The California standards levels are 1.0 and 1.25 for the 3-day and the 2-day tests, respectively. EPA believes that its standards are appropriate for federal vehicles certified on the higher-volatility federal test fuel.

EPA is proposing that the evaporative emission standards be implemented on the same schedule as the proposed gasoline engine and vehicle exhaust standards. Also, they are proposing the revised durability provisions finalized in the Tier 2 rulemaking, which require durability demonstration using fuel containing at least 10 percent alcohol. Alcohol can break down the materials used in evaporative emission control systems. Therefore, a worst case durability demonstration would include a worst case alcohol level in the fuel (10 percent) as some areas of the country use alcohol fuels to improve their air quality.

g. Diesel Fuel Sulfur Standards

EPA is proposing to require that all highway diesel fuel produced or imported by refiners and importers be subject to a maximum sulfur level of 15 ppm by weight. There are five key factors which, when taken together, lead EPA to propose that a diesel fuel sulfur cap of 15 ppm is both necessary to enable the NOx and PM exhaust emission control technology (and thereby allow the proposed emission standards to be met), and appropriate, taking into consideration the challenges involved in providing low-sulfur fuel. These factors are the implications that sulfur levels in excess of 15 ppm would have for the efficiency, reliability, and fuel economy impacts of the exhaust emission control systems, and the feasibility and costs of producing low-sulfur diesel fuel.

The efficiency of emission control technologies at reducing harmful pollutants is directly impacted by sulfur in diesel fuel. Initial and long term conversion efficiencies for NOx, NMHC, CO and diesel PM emissions are significantly reduced by catalyst poisoning and catalyst inhibition due to sulfur. NOx conversion efficiencies with the NOx adsorber technology in particular are dramatically reduced in a very short time due to sulfur poisoning of the NOx storage bed. In addition total PM control efficiency is negatively impacted by the formation of sulfate PM. The formation of sulfate PM is likely to be in excess of the total PM standard proposed , unless diesel fuel sulfur levels are below 15 ppm.

The reliability of the emission control technologies to continue to function as required under all operating conditions for the life of the vehicle is also directly impacted by sulfur in diesel fuel. Sulfur in diesel fuel can prevent proper operation and regeneration of

both NOx and PM control technologies leading to permanent loss in emission control effectiveness and even catastrophic failure of the systems. EPA believes that diesel fuel with sulfur levels less than 15 ppm will be required to provide a level of reliability for these technologies to allow their introduction into the marketplace.

The sulfur content of diesel fuel will also affect the fuel economy of vehicles equipped with NOx and PM exhaust emission control technologies. NOx adsorbers are expected to consume diesel fuel in order to cleanse themselves of stored sulfates and maintain efficiency. The larger the amount of sulfur in diesel fuel, the greater this impact on fuel economy. As sulfur levels increase above 15 ppm the fuel economy impact transitions from merely noticeable to levels most diesel vehicle operators would consider unacceptable. Likewise PM trap regeneration is inhibited by sulfur in diesel fuel. This leads to increased PM loading in the diesel particulate filter, increased exhaust backpressure, and poorer fuel economy. Thus for both NOx and PM technologies the lower the fuel sulfur level the better the fuel economy of the vehicle.

As a result of these factors, EPA believes that 15 ppm represents an upper threshold of diesel fuel sulfur levels that would make these technologies viable, and is therefore proposing to cap in-use sulfur levels there. However, EPA has analyzed the impacts on technology enablement, costs, and benefits from controlling fuel sulfur to a 15 ppm average level with a 25 ppm cap, as well as from capping fuel sulfur at 5 ppm and 50 ppm. These levels have been put forward by various stakeholders as either necessary (in the case of a 5 ppm cap) or adequate (in the case of a 50 ppm cap) for enabling high-efficiency diesel exhaust emission controls.

h. Timing of New Diesel Sulfur Standard

Since the need for low-sulfur diesel is dictated by the implementation of new engine standards, the proposed sulfur standard would become effective commensurate with the introduction of the first heavy-duty engines meeting the proposed standards. The phase-in of the engine standards is proposed to begin with the 2007 model year. Since light-heavy-duty trucks might be introduced as early as January 2 of the previous calendar year but are often introduced beginning about July 1, EPA is proposing that all highway diesel fuel sold at retail stations and wholesale purchaser - consumers meet the proposed sulfur standard by June 1, 2006. EPA believes that this one month lead time will be sufficient to provide confidence that the fuel available for purchase on July 1 will comply with the proposed sulfur cap. EPA is also proposing that highway diesel fuel at the terminal level be required to meet the proposed sulfur standard as of May 1, 2006, and that highway diesel fuel produced by refiners (and imported) meet the proposed sulfur standard by April 1, 2006. EPA believes these earlier compliance requirements at terminals and refineries would be necessary to provide an orderly transition to low-sulfur fuel and to avoid the market disruptions that occurred when the sulfur level of diesel fuel was lowered to 500 ppm in 1993 with only a retail compliance date. The three months between April and July should allow sufficient time for fuel to move through the distribution system, for existing tankage to transition down to the lower sulfur level that would be required. It would also ensure that all fuel is complying with the proposed sulfur standard and is available for use in heavy-duty engines when 2007 model year engines are introduced to the market. EPA requests comment on this proposed approach.

i. Need For & Benefits of Proposal

Emissions from heavy-duty vehicles contribute greatly to the health and welfare effects of ozone, PM, NOx, SOx, and volatile organic compounds (VOCs), including toxic compounds such as formaldehyde. These adverse effects include premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days), changes in lung function and increased respiratory symptoms, changes to lung tissues and structures, altered respiratory defense mechanisms, chronic bronchitis, and decreased lung function. Ozone also causes crop and forestry losses, while PM also causes damage to materials, and soiling. Second, both NOx and PM contribute to substantial visibility impairment in many parts of the U.S. Third, NOx emissions from heavy-duty trucks contribute to the acidification, nitrification and eutrophication of water bodies.

Millions of Americans live in areas with unhealthful air quality that currently endangers public health and welfare. Without emission reductions from the proposed standards for heavy-duty vehicles, there is a significant risk that an appreciable number of areas across the country will violate the 1-hour ozone national ambient air quality standard (NAAQS) during the period when these standards will take effect. Furthermore, EPA's analysis shows that PM_{10} concentrations in 10 areas with a combined population of 27 million people face a significant risk of exceeding the PM_{10} NAAQS without significant additional controls in 2007 or thereafter.

Urban areas, which include many poorer neighborhoods, can be disproportionately impacted by HDV emissions, and these neighborhoods would thus receive a relatively larger portion of the benefits expected from new HDV emissions controls. Over time, the relative contribution of diesel engines to air quality problems will go even higher if diesel-equipped light-duty vehicles become more popular, as is expected by some automobile manufacturers.

In addition to its contribution to PM inventories, diesel exhaust PM is of special concern because it has been implicated in an increased risk of lung cancer and respiratory disease in human studies. The EPA draft Health Assessment Document for Diesel Emissions is currently being revised based on comments received from the Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board. The current EPA position is that diesel exhaust is a likely human carcinogen and that this cancer hazard applies to environmental levels of exposure.[5] In the draft Health Assessment Document for Diesel Emissions, EPA provided a qualitative perspective that the upper bounds on environmental cancer risks may exceed 10^{-6} and could be as high as 10^{-3}. Several other agencies and governing bodies have designated diesel exhaust or diesel PM as a "potential" or "probable" human carcinogen. In addition, diesel PM poses nonmalignant respiratory hazards to humans, not unlike, in some respects, hazards from exposure to ambient $PM_{2.5}$, to which diesel PM contributes.

i. NOx Emissions

Heavy-duty vehicles are important contributors to the national inventories of NOx

[5] Environmental Protection Agency (1999) Health Assessment Document for Diesel Emissions: SAB Review Draft. EPA/600/8-90/057D Office of Research and Development, Washington, D.C. The document is available electronically at www.epa.gov/ncea/diesel.htm

emissions, and they contribute moderately to national VOC pollution. HDVs are expected to contribute approximately 15 percent of annual NOx emissions in 2007.

The contribution of heavy-duty vehicles to NOx inventories in many MSAs is significantly greater than that reflected in the national average. For example, HDV contributions to NOx in Albuquerque, Atlanta, San Francisco, Spokane, Seattle, and Dallas are projected to be 22 to 25 percent of the MSA-specific inventories in 2007, which is significantly higher than the national average.

The Agency expects substantial NOx reductions on both a percentage and a tonnage basis from this proposal. As illustrated in the following graph, the air quality benefit expected from this proposal is a reduction in NOx emissions from HDVs of 2.0 million tons in 2020.[6] The Figure shows EPA's national projections of total NOx emissions with and without the proposed engine controls. The proposed standards should result in about a 90 percent reduction in NOx from new engines.[7]

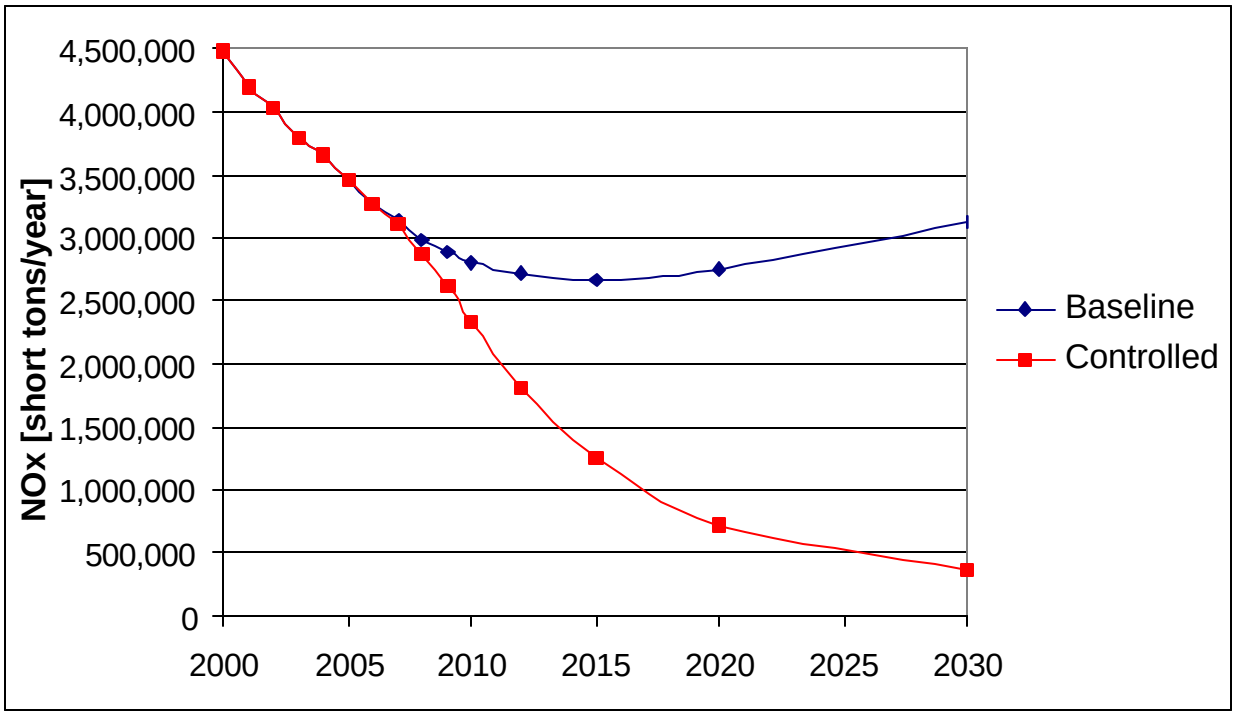
[6] The baseline used for this calculation is the 2004 HDV standards. These reductions are in addition to the NOx emissions reductions projected to result from the 2004 HDV standards.

[7] EPA includes in the NOx projections excess emissions that were emitted from many model year 1988-98 diesel engines.

2007 Heavy-Duty Vehicle Contribution to Urban NOx Inventories

Metropolitan Statistical Area	Portion of Total NOx	Portion of Mobile Source NOx
National	*15%*	*29%*
Albuquerque	25%	38%
Atlanta	23%	36%
San Francisco	23%	29%
Spokane	23%	29%
Seattle	22%	26%
Dallas	22%	28%
Charlotte	21%	34%
Washington	20%	37%
Los Angeles	20%	26%
San Antonio	20%	31%
New York	19%	30%
Miami	18%	23%
Phoenix	18%	28%
Philadelphia	18%	30%
Cleveland	17%	30%
St. Louis	16%	34%

Figure II.D-1: Projected Nationwide Heavy-Duty Vehicle NOx Emissions



ii. PM Emissions

Nationally, EPA estimates primary emissions of PM_{10} to be about 33.2 million tons/year in 2007. Fugitive dust, other miscellaneous sources and crustal material (wind erosion) comprise approximately 90 percent of the 2007 PM_{10} inventory. However, there is evidence from ambient studies that emissions of these materials may be overestimated and/or that once emitted they have less of an influence on monitored PM concentration than this inventory share would suggest. Mobile sources account for 24 percent of the PM_{10} inventory (excluding the contribution of miscellaneous and natural sources) and highway heavy-duty engines account for 14 percent of the mobile source portion of national PM_{10} emissions.

The contribution of heavy-duty vehicle emissions to total PM emissions in some metropolitan areas is substantially higher than the national average. This is not surprising, given the high density of these engines operating in these areas. For example, in Albuquerque, Pittsburgh, St. Louis, and Atlanta, the estimated 2007 highway heavy-duty vehicle contribution to mobile source PM_{10} ranges from 16 to 21 percent, and the national percent contribution to mobile sources for 2007 is projected to be about 14 percent. As illustrated below, heavy-duty vehicles operated Washington, Fairbanks, Billings, and Detroit also account for a slightly higher portion of the mobile source PM inventory than the national average. Importantly, these estimates do not include the contribution from secondary PM which is an important component of diesel PM.

2007 Heavy-Duty Vehicle Contribution to Urban Mobile Source PM Inventories

Metropolitan Statistical Area	PM_{10} Contribution from HDVs
National	*14%*
Albuquerque	21%
Pittsburgh	18%
St. Louis	17%
Atlanta	16%
Washington	15%
Fairbanks	15%
Billings	15%
Detroit	15%

In addition to the national inventories, investigations have been conducted in certain urban areas which provide information about the contribution of HD diesel vehicles and engines to ambient $PM_{2.5}$ concentrations. This is particularly relevant as diesel PM, for the most part, is composed of fine particles under 2.5 microns.

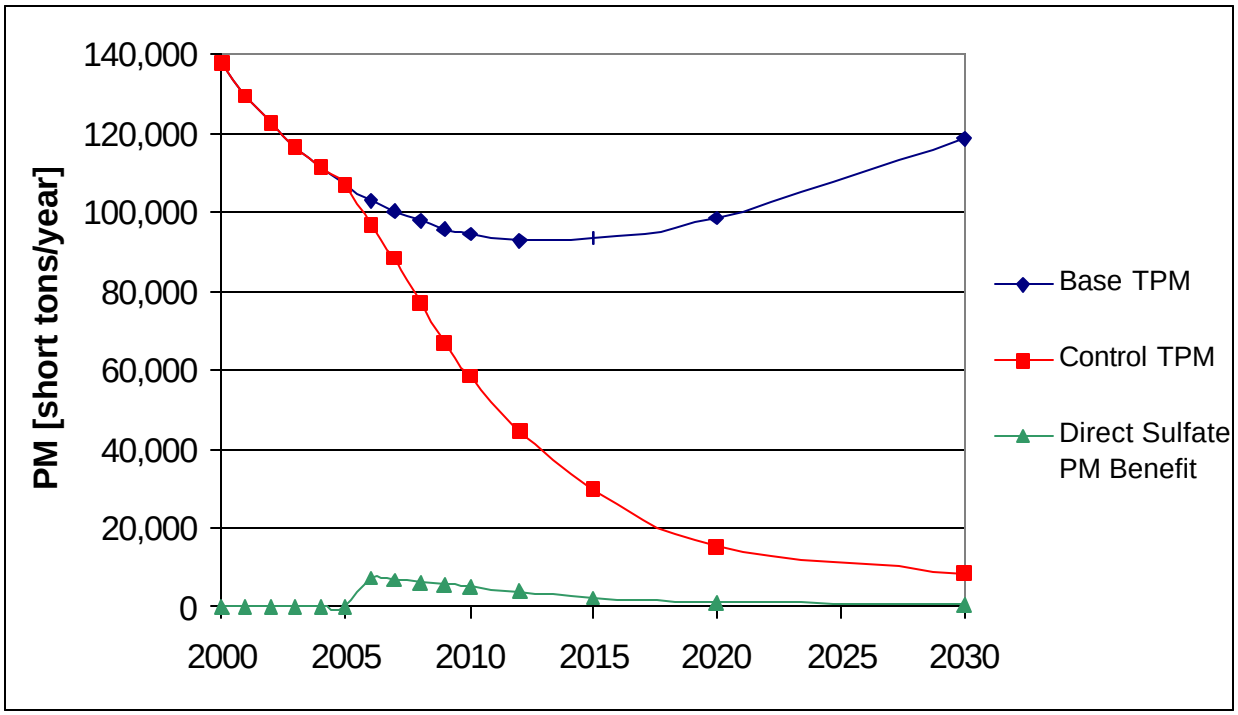
The city-specific emission inventory analysis and independent investigations of ambient $PM_{2.5}$ summarized here indicate that the contribution of diesel engines to PM inventories in several urban areas around the U.S. is much higher than indicated by the national PM emission inventories only. One possible explanation for this is the concentrated use of diesel engines in certain local or regional areas which is not well represented by the national, yearly average presented in national PM emission inventories. Another reason may be underestimation of the in-use diesel PM emission rates. EPA's current modeling incorporates deterioration only as would be experienced in properly maintained, untampered vehicles.

Moreover, heavy-duty vehicles will have a more important contributing role in ambient $PM_{2.5}$ concentrations than in ambient PM_{10} concentrations. In addition, the absolute contribution from heavy-duty vehicles is larger in relationship to the numerically lower $PM_{2.5}$ standard, making them more important to attainment and maintenance.

The Figure below shows EPA's national projections of total HDV PM emissions with and without the proposed engine controls. This figure includes crankcase emissions and the direct sulfate PM benefits due to the use of low sulfur fuel by the existing fleet. These direct sulfate PM benefits from the existing fleet are also graphed separately. The proposed standards should result in about a 90 percent reduction in total PM from new engines. The proposed low sulfur fuel should result in about a 95 percent reduction in direct sulfate PM from pre-2007 engines. Due to complexities of the conversion and removal processes of sulfur dioxide, EPA does not attempt to quantify the indirect sulfate reductions that would be derived from this rulemaking. Nevertheless, the Agency believes that these indirect sulfate PM reductions are likely to contribute significant additional benefits to public health and welfare. The air quality benefit of the new PM standards and low sulfur diesel fuel as

presented in the Figure indicate an 83,000 ton direct PM reduction in 2020.

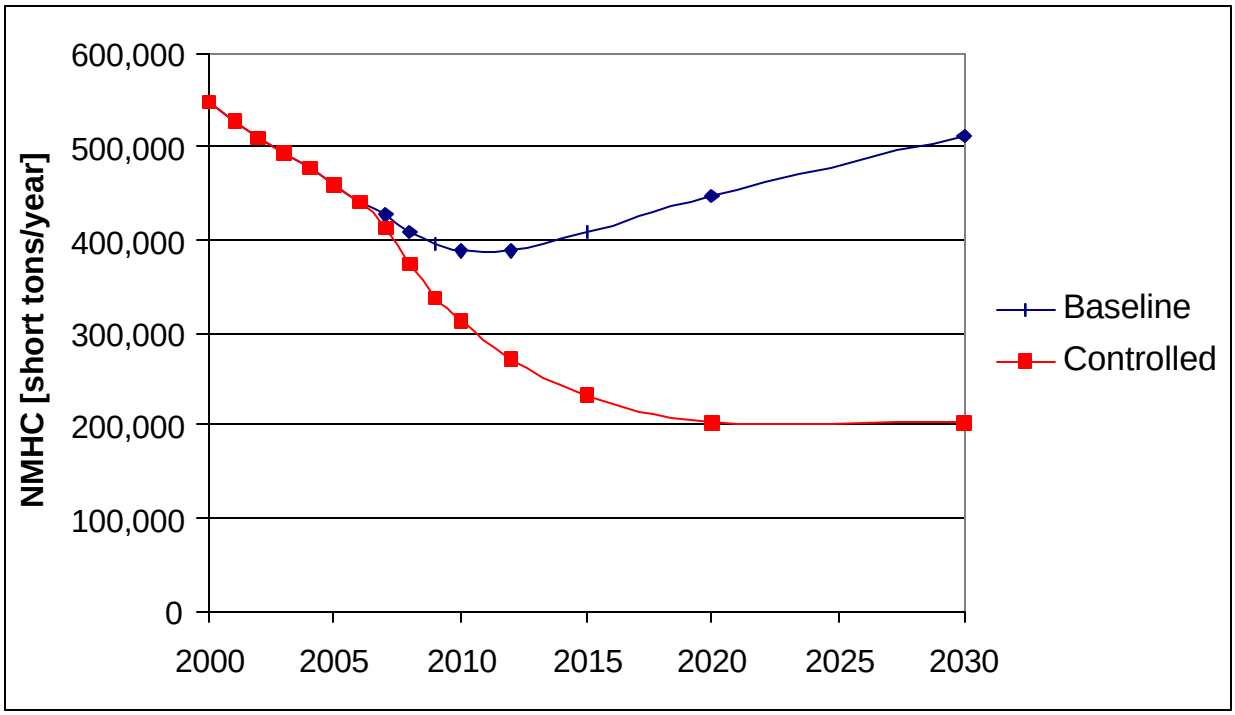
Figure II.D-2: Projected Nationwide Heavy-Duty Vehicle PM Emissions and Direct Sulfate Emission Reductions



iii. NMHC Reductions

The Figure below shows EPA's national projections of total NMHC emissions with and without the proposed engine controls. This includes both exhaust emissions and evaporative emissions. As presented in the Figure, the Agency projects a reduction of 230,000 tons of NMHC in 2020 due to the proposed standards.

Figure II.D-3: Projected Nationwide Heavy-Duty Vehicle NMHC Emissions



iv. Additional Emissions Benefits

The Table below presents the projected reductions in CO emissions from HDVs.

(1) CO Reductions

Estimated Reductions in CO

Calendar Year	CO Benefit [thousand short tons]
2007	71
2010	405
2015	911
2020	1250
2030	1640

(2) SOx Reductions

SOx reductions resulting from the proposed low sulfur fuel.

The Table below presents EPA's estimates of

Estimated Reductions In SOx Due To Low Sulfur Fuel

Calendar Year	SOx Benefit [thousand short tons]
2007	101
2010	106
2015	115
2020	124
2030	139

v. Air Toxics Reductions

The proposal establishes new hydrocarbon and formaldehyde standards for heavy-duty vehicles. Hydrocarbons are a broad class of chemical compounds containing carbon and hydrogen. Many forms of hydrocarbons, such as formaldehyde, are directly hazardous and contribute to what are collectively called "air toxics." Air toxics are pollutants known to

cause or suspected of causing cancer or other serious human health effects or ecosystem damage. The Agency has identified as least 20 compounds emitted from on-road gasoline vehicles that have toxicological potential, 19 of which are emitted by diesel vehicles as well as an additional 20 compounds which have been listed as toxic air contaminants by California ARB.[8,9] This proposal also seeks to reduce emissions of diesel exhaust and diesel particulate matter.

EPA's assessment of heavy-duty vehicle (gasoline and diesel) air toxics focuses on the following compounds with cancer potency estimates that have significant emissions from heavy-duty vehicles: benzene, formaldehyde, acetaldehyde, and 1,3-butadiene. These compounds are an important, but limited, subset of the total number of air toxics that exist in exhaust and evaporative emissions from heavy-duty vehicles. The reductions in air toxics quantified in this section represent only a fraction of the total number and amount of air toxics reductions expected from the proposed new hydrocarbon standards.

For this analysis, EPA estimates that air toxic emissions are a constant fraction of hydrocarbon exhaust emissions. Because air toxics are a subset of hydrocarbons, and new emission controls are not expected to preferentially control one type of air toxic over another, the selected air toxics chosen for this analysis are expected to decline by the same percentage amount as hydrocarbon exhaust emissions. The Table below shows the estimated air toxics reductions associated with the anticipated reductions in hydrocarbons.

[8] National Air Quality and Emissions Trends Report, 1997, (EPA 1998), p. 74.

[9] California Environmental Protection Agency (1998) Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant. Appendix III, Part A: Exposure Assessment. April 1998.

Estimated Reductions In Air Toxics (short tons)

Calendar Year	Benzene	Formaldehyde	Acetaldehyde	1,3-Butadiene
2007	153	831	318	65
2010	932	4750	1870	382
2015	2080	11400	4460	909
2020	2780	15800	6120	1250
2030	3510	20500	7850	1600

j. Heavy Duty Control Technology

Several exhaust emission control devices have been developed to control harmful diesel PM constituents -- the diesel oxidation catalyst (DOC), and the many forms of particulate filters, or traps. DOCs have been shown to be durable in use, but they control only a relatively small fraction of the total PM and, consequently, do not address EPA'S PM concerns sufficiently. Uncatalyzed diesel particulate traps demonstrated high efficiencies many years ago, but the level of the PM standard was such that it could be met through less costly "in-cylinder" control techniques. Catalyzed diesel particulate traps have the potential to provide major reductions in diesel PM emissions and provide the durability and dependability required for diesel applications. Therefore, at this time EPA believes the catalyzed PM trap will be the control technology of choice for future control of diesel PM emissions. However, EPA believes that catalyzed PM traps cannot be brought to market on diesel applications unless low-sulfur diesel fuel is available.

Diesel NOx control is arguably at an earlier stage of development than is diesel PM control. Even so, several exhaust emission control technologies are being developed to control NOx emissions, and the industry seems focused on a couple of these as the most promising technologies for enabling lower NOx emission standards. Diesel selective catalytic reduction, or SCR, has been developed to the point of nearing market introduction in Europe. SCR has significant NOx control potential, but it also has many roadblocks to marketability in this country. These roadblocks include infrastructure issues that EPA believes would prove exceedingly difficult and potentially costly to overcome. Because of that, EPA believes that the NOx adsorber is the best technology for delivering significant diesel NOx reductions while also providing market and operating characteristics necessary for the U.S. market.[10] However, the NOx adsorber, like the catalyzed PM trap, cannot be brought to market on diesel applications unless low-sulfur diesel fuel is available.

Improvements have also been made to gasoline emission control technology during the past few years, even the past 12 months. Such improvements include those to catalyst designs in the form of improved washcoats and improved precious metal dispersion.

[10] The NOx adsorber was originally developed for stationary source emission control and was subsequently developed for use in the lean operating environment of gasoline direct injection engines.

Much effort has also been put into improved cold start strategies that allow for more rapid catalyst light-off. This can be done by retarding the spark timing to increase the temperature of the exhaust gases, and by using air-gap manifolds, exhaust pipes, and catalytic converter shells to decrease heat loss from the system.

These improvements to gasoline emission control have been made in response to the California LEV-II standards and the federal Tier 2 standards. Some of this development work was contributed by EPA in a very short time frame and with very limited resources in support of its Tier 2 program. These improvements should transfer well to the heavy-duty gasoline segment of the fleet. With such migration of light-duty technology to heavy-duty vehicles and engines, EPA believes that considerable improvements to heavy-duty emissions can be realized, thus enabling much more stringent standards.

k. Emission Control Systems for 2007 and Net Fuel Economy Impacts

EPA anticipates that, in order to meet the stringent NOx and PM emission standards proposed , the manufacturers would integrate engine-based emission control technologies and post-combustion emission control technologies into a single systems-based approach that would fundamentally shift historic trade-offs between emissions control and fuel economy. Individual components in this system would introduce new constraints and opportunities for improvements in fuel efficient control of emissions. Having considered the many opportunities to fundamentally improve these relationships, EPA believes that it is unlikely that fuel economy will be lower than today's levels and, in fact, may improve through the application of these new technologies and this new systems approach. Therefore, for its analysis of economic impacts, no penalty or benefit for changes to fuel economy are considered.

l. Future Reassessment of Diesel NOx Control Technology

EPA is considering conducting a future reassessment of diesel NOx control technologies and associated fuel sulfur requirements. Given the relative state of development of NOx emission control technology versus PM and NMHC control technologies, EPA would expect to focus the control technology reassessment solely on NOx control technologies. They believe that the clear intent of this proposal to provide low-sulfur diesel fuel will allow the development of this technology to progress rapidly, and will result in systems capable of achieving the proposed standards. However, they acknowledge that the proposed NOx standard represents an ambitious target for this technology, and that the degree of uncertainty surrounding the feasibility of high-efficiency NOx control technology would be higher if fuel sulfur levels higher than the proposed level were adopted. They also recognize that technology evolution may affect the sulfur level at which these technologies are enabled.

Therefore, they are evaluating whether or not the proposed program could benefit from a future reassessment of the control effectiveness of diesel NOx exhaust emission control technologies and associated fuel sulfur requirements. They would expect to conduct such a reassessment in the 2003 time frame. They also welcome comment on the extent to which a review of NOx control technology should also include a review of the appropriate diesel fuel sulfur level for enabling the NOx control technology, including consideration of impacts that a revised fuel requirement would have on PM control

technology. Another possible area for consideration during the reassessment could be non-conformance penalties (NCPs) and the role they might play in this program. NCPs would allow engine manufacturers to produce and sell noncomplying engines under limited circumstances in exchange for paying a penalty to the government.

m. Encouraging Innovative Technologies

EPA also encourages comments on approaches that could provide increased incentives for the development and introduction of clean advanced engine technologies. Some such approaches have been suggested by stakeholders or have been a part of other EPA rules. One of these would be to develop a program for providing a special designation for engines or vehicles that are significantly below the standards or use specific innovative propulsion technologies. EPA finalized such a designation, the "Blue Sky Series Engine" program, as a part of the 1998 nonroad diesel standards final rule. Incorporating such a designation could be very valuable for use in programs developed by states, municipalities, or corporations to highlight or reward the purchase and use of especially clean or innovative vehicles and engines. EPA requests comment on how it might structure a program like the "Blue Sky Series" program in the context of EPA's proposal, including what criteria they should use to qualify an engine or vehicles for such a designation.