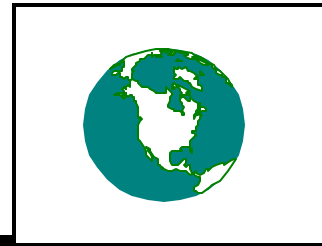


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CAR LINES

Issue 2000-2



March 2000

ATTENTION: Anyone Interested in Receiving Car Lines in Adobe Format by E-mail rather than Snail Mail, Please send me an e mail to that effect.

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EUROPE

1. Another Report Supports Low Sulfur Fuel

FEV Aachen under contract of VDA and German IG Metall (labor union of metal workers) has prepared a report which supports the rapid reduction of sulfur levels in both gasoline and diesel fuel.. Major conclusions are summarized below.

a. Diesel

* Sulphur-free fuel (S < 10 ppm) very clearly reduces the contribution of road traffic to sulphur emissions. Moreover, sulphur-free fuel not only has a beneficial effect on particulate, HC, NOx and CO emissions but also indirectly reduces the CO2 emissions of road traffic compared to the use of current commercially available fuel.

* For NOx - Adsorber Catalysts, a fuel sulphur content of less than 10 ppm is necessary in order to guarantee stable, high-efficiency emission control and optimal fuel consumption over the service life of the vehicle.

* A reduction of the sulphur content to values less than 10 ppm increases the capability of the oxidation catalyst, SCR catalyst and particulate filter. The results are reduced sulphate (particulate) emissions in the oxidation catalyst and improved fuel consumption for particulate filter systems.

b. Otto

* The lean burn gasoline engine with direct fuel injection is already available on the market and is capable of achieving reductions of up to 15% in fuel consumption compared to conventional gasoline engines. However, in order to comply with strict future emission legislation, the use of an NOx - Adsorber Catalyst in combination with close-coupled

3-way catalysts will be necessary.

* A reduction in sulphur content from 50 ppm to less than 10 ppm leads to an improvement in the long-term stability of emission-related components, in particular with ultra-low emission concepts.

* For NOx - Adsorber Catalysts, "sulphur-free" fuels with sulphur contents less than 10 ppm are needed in order to guarantee the high-efficiency emission control and optimal fuel consumption required to meet the strict emission limits over the full useful life of the vehicle.

2. EU Parliament Backs Recycling Law

The European Parliament has voted to force car makers to bear the cost of recycling old cars in the 15-nation European Union. The move was hailed by environmental groups and politicians who had opposed suggestions that consumers should share part of the burden of recycling through government-imposed levies on new car purchases. But the German car association VDA, whose members account for around a third of European auto sales, pinned their hopes on parts of the text which say "producers meet all, or a significant part of, the costs".

Ministers from EU governments and Parliament are set to iron out their differences and final details of the new law later this year in the EU's "conciliation" procedure.

The so-called End of Life Vehicles Directive is part of a broader drive to keep hazardous waste materials out of European landfills. It is seen setting the trend for similar measures concerning other durable consumer goods such as refrigerators and television sets.

Once the law is finalized, national capitals will have 18 months to translate the rules into law.

This was a small concession compared with the originally proposed deadline of January 2001.

But the most contentious point for the industry - and endorsed by parliament - remains that from 2006 manufacturers would be forced to take back and recycle all cars made even before the legislation takes effect. Manufacturers have estimated the industry will have to take significant charges against future earnings - of up to 10 billion euros (\$9.74 billion) - to meet this "producer pays" regulation.

In one of the few concessions made to industry, the EU assembly excluded "cherished" cars, defined as classic cars of value to collectors, from the draft rules. It also accepted an amendment allowing manufacturers to continue using heavy metals such as lead, mercury or cadmium, in new models approved before 2005. EU Environment Commissioner Margot Wallstrom said this amendment posed problems because it could delay phasing out the use of these toxic substances "by as much as 10 years", but she hailed the overall result as "very satisfying".

The Netherlands has a levy on new car sales to finance recycling. The draft EU rules do not mean such national measures are outlawed, only that they are optional.

Recyclers were also critical of the measure, saying that it is misguided because it fails to find markets for some waste products and is too prescriptive about methods. The recyclers argue that the EU, insisting on extraction from cars and the recycling of plastics, polymers and glass that is now dumped, should first find markets for these items rather than put all the burden on car makers and ultimately car buyers.

The EU also specifies techniques for extracting them which are uneconomic and over-prescriptive, requiring slow dismantling when the job could be done fast by large shredders, they say.

Others say recyclers worry that if car makers are made financially responsible for recycling they may muscle in on the actual business, possibly forcing some scrap businesses out.

Another issue is that dismantlers currently take out the more valuable items from old cars which then go to shredders who sell ferrous scrap and earn extra from non-ferrous content. A concern is that if EU rules on how glass and plastics are extracted forced meticulous dismantling, dismantlers might cherry-pick more non-ferrous scrap, depriving the shredders.

3. Italians Ban Cars For A Day

Traveling by bus, bicycle or on foot, millions of Italians reclaimed the traffic-plagued streets of their historic city centers on a recent Sunday as cars were banned for the day in a fight against pollution. Some 150 cities and small towns joined an initiative by the Environment Ministry worried about the levels of car exhaust pollution which have exceeded healthy limits in many urban areas.

In an atmosphere that recalled 1973, when record oil prices led to Sunday car bans across Italy, usually fume-filled, traffic-jammed streets were peacefully silent of car horns and mopeds.

Italians moved around by bicycle, tricycle, roller blades and electricity-powered vehicles. In some cities like Rome and Catanzaro, public transport was free of charge.

In Rome, all museums run by the city council were free of charge and hiring electricity-powered mopeds for two hours

cost the same as an ice-cream. The "Sundays on foot" project will be restaged again for one Sunday in March, April and May.

In September last year, 150 cities in France, Italy and Switzerland joined a similar car-free day.

4. EU Takes Steps To Reduce Global Warming

The European Commission has taken steps to meet internationally agreed targets on greenhouse gas emissions, warning the latest data showed carbon dioxide pollution was on the increase. The steps - a European Climate Change Program and a consultation paper on emissions trading - aim to prepare the European Union for the ratification of the Kyoto Protocol under which the 15-nation bloc agreed to reduce greenhouse gas emissions by eight percent from 1990 levels between 2008 and 2012.

"The latest data show that CO₂ (carbon dioxide) emissions are increasing rather than decreasing, and that the eight percent reduction objective will not be met if no additional measures are taken," the Commission said in a statement.

The emissions trading plan is one of three flexible mechanisms agreed at a December 1997 conference in Kyoto, Japan, to meet the targets for cutting emissions of CO₂ and other gases believed to be responsible for global warming. The idea is to allow companies having difficulties or finding it too costly to cut emission levels to increase their pollution permits by buying credits from other companies that exceed their own emission reduction targets.

The European Commission proposes allowing companies with problems meeting reduction targets for greenhouse gas

emissions to purchase pollution credits from other companies more successful in protecting the environment. If agreed by European Union governments, the so-called emissions trading system would come into force in 2005 ahead of its implementation worldwide in 2008 as a mechanism to ease the cost of cutting pollution from carbon dioxide and other damaging greenhouse gases.

Anglo-Dutch oil major Royal/Dutch Shell Group launched a similar internal trading system earlier this month to meet gas emission reduction targets.

The system will allow businesses involved in chemicals refining, exploration and production in different countries to trade permits worth 100 tonnes of carbon dioxide or methane equivalent over an internal web site.

There will be a ceiling so that companies would not be able to escape emission cuts altogether and that trading would initially be limited to more easily quantifiable CO₂ emissions.

Environmental groups, industry and governments were given six months to comment on the Commission's emission trading plans and to suggest practical measures, after which the EU executive plans to make legislative proposals from next year.

The European program and accompanying strategies did not replace a deadlocked plan for an EU-wide energy tax but was rendered all the more necessary by the bloc's inability to reach agreement on the tax issue.

The EU is expected to ratify the Kyoto protocol after the sixth conference of the parties to the United Nations climate change convention in November in The Hague, the Netherlands.

5. EU To Monitor Carbon Dioxide Emissions From Cars

The European Union has agreed to a scheme to monitor car manufacturers' pledges to reduce carbon dioxide (CO₂) emissions. This will be the first monitoring scheme for CO₂ emissions in the 15-nation bloc. It will be used to check compliance with voluntary commitments given by the car industry and to replace them by legally binding rules if need be, the EU said in a statement after a meeting of the so-called conciliation committee.

The committee brings together members on the European Parliament and representatives of EU governments on issues where they share decision-making powers and is the last step of the legislative process. The text is expected to be ratified by a majority in Parliament and the Council of Ministers in the coming weeks.

Passenger cars account for about half of total CO₂ emissions in the transport sector and make up around 12 percent of total emissions of the same gas in the EU.

6. UK To Exceed Targeted Greenhouse Gas Cuts

Britain will unveil policies aimed at more than meeting its target of cutting greenhouse gas emissions, environment minister Michael Meacher has announced. Britain agreed in December 1997 at a United Nations global warming conference in Kyoto, Japan to reduce its emissions of the greenhouse gases thought to contribute to global warming by 12.5 percent from 1990 levels by 2008-2012. Britain also maintains a further goal of cutting carbon dioxide (CO₂) emissions by 20 percent over the same time frame. The UK contributes around 2.5 percent of global emissions of CO₂ from fuel combustion.

The new measures include a climate change levy, negotiated agreements with energy-intensive sectors, a voluntary agreement already secured with European car manufacturers to reduce carbon dioxide by a quarter in new cars, and an obligation on electricity suppliers to deliver 10 percent of supplies from renewable sources of energy.

Industry, transport and domestic usage cuts would be expected to shoulder about a third each of the reductions. From 2002 gas and electricity companies would have to provide help to consumers to reduce their fuel use. Particular help would be targeted at pensioners and low income groups. Increased domestic energy efficiency would cut fuel bills by \$37 a year for low income groups from 2005, the government estimated.

Under the new Utilities Bill, power companies would also have to find 10 percent of output from renewable energy sources by 2010. The government will invest 43 million in the next three years on a renewables research program.

The carbon trading program between UK industrial companies, which will provide the backbone of industry's contribution to reductions, was still under negotiation.

NORTH AMERICA

7. EPA and HEI Host Toxics Workshop

On February 8th, the US EPA and the Health Effects Institute hosted an all day workshop to review the status of EPA's impending proposal on motor vehicle toxics emissions. The presentations, especially those from the State and Local experts made clear that at the present time, toxic emissions from motor vehicles and ambient toxics levels represent a serious health hazard. In fact, comparisons

of actual measured levels in ambient air tend to exceed those levels predicted by the EPA models.

The new emissions control programs recently adopted by the US EPA, especially the Tier 2 standards and low sulfur gasoline, and the expected future programs such as stringent heavy duty engine standards combined with low sulfur diesel fuel, should substantially reduce the motor vehicle related toxics risk. However, whether these reductions will be sufficient to eliminate the residual toxics risk is highly uncertain. One reason for this uncertainty is the lack of reliable toxics emissions factors. In some cases, the factors used by EPA seem fundamentally flawed in a systematic way. This concern applies to particulate emissions factors which essentially assume no deterioration in use, an assumption which seems to inherently understate future emissions. Similarly, the assumption of zero deterioration in emissions of all pollutants (including hydrocarbons) from heavy duty vehicles and engines inherently understates the problems.

Other emissions factors from gasoline fueled cars meeting Tier 2 standards are difficult to estimate because the cars are not yet in existence in other than the prototype stage. However, in carrying out a sensitivity analysis to determine the residual risk it seems prudent to carry out a worst case assessment along with the best judgement. Estimating twice the deterioration doesn't seem to truly reflect worst case. Emission factors for off road vehicles and engines should get a similar worst case assessment. Ultimately the precautionary principle should apply.

Another problem that was raised is the utility of CO as a surrogate for vehicle emissions since CO doesn't necessarily correlate well with evaporative hydrocarbons, account for

reactivity and the secondary transformation of toxics. CO is also an inadequate surrogate for diesel particulate both directly emitted and its physical persistence in the urban environment. Therefore difficult as it may be, it seems worthwhile to at least explore alternative methodologies.

Finally micro environments such as residential garages and within vehicles seem to be important sources of exposure to toxics and deserve greater attention.

Areas which seem especially ripe in terms of future control efforts include both fuels and off road vehicles and engines. Fuel controls have the special advantage of having an immediate impact as soon as implemented compared to vehicle controls which take many years to have their full impact. Retrofit strategies can have similar benefits.

The bottom line recommendation is that EPA should not in its April 28th proposal or December 22nd final rules preclude future actions which may turn out to be appropriate as the available data and methodologies improve.

8. Comparison of the Tier 2 and LEV 2 Programs

A previous study¹ of the California and Federal programs for cleaning up light duty vehicles, concluded among other things the following:

Both the California LEV II and EPA Tier 2 programs will substantially lower emissions from light and medium duty vehicles in future years.

¹"California's Low Emissions Vehicle Program Compared to US EPA's Tier 2 Program", Walsh, January 20, 2000

Especially significant is the decision in both programs to set fuel neutral standards and to require all vehicles used primarily for personal transportation to meet the same limits.

The maximum average NMOG and NOx emissions standards under the LEV II and Tier 2 programs after complete phase in are down dramatically from current levels with LEV II levels marginally lower than Tier 2 because of the ZEV mandate and the need to introduce SULEV vehicles to meet the NMOG corporate average standard. However, it is important to note that since the Tier 2 program includes the ZEV and SULEV bins, manufacturers may opt to sell more of these vehicles than mandated and could achieve similar levels as under LEV II.

After full implementation, average lifetime emissions from vehicles between 8,500 and 10,000 lbs. GVW are substantially lower for this class of vehicles than is presently allowed. However, Tier 2 vehicles are marginally cleaner since they must comply on average with the same 0.07 grams/mile NOx standard as passenger cars.

One of the especially innovative approaches of the Tier 2 package is the introduction of stringent interim standards for light duty trucks. The NOx emission standards for LDT2s, LDT3s and LDT4s, which comprise about 40 percent of the fleet, are more stringent than the corresponding standards in the NLEV and CAL LEV I programs.

Subsequently, the State of Texas carried out an analysis² which concluded the following:

The trend for NOx indicates only small differences between the two programs. In 2007 there is a slight benefit (between 1.5 and 2.0 tons per day) with remaining with the Federal Tier II program. This benefit decreases over time and is essentially equivalent to the California LEV II program by about 2018. By 2020, the California LEV II program surpasses the Federal Tier II program for NOx reductions by about 0.5 tons per day.

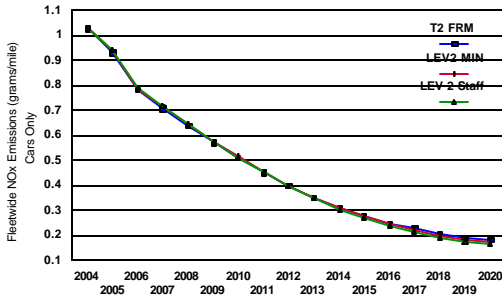
The trend for VOC reductions indicates slight benefits (less than 2 tons per day) for the California LEV II program in 2007. This trend continues so that by 2020 there is an approximate 8.5 to 10 ton per day benefit in VOCs with the California LEV II program.

In view of these conclusions, an additional analysis was carried out which examined the three different categories of light duty vehicles separately - light duty vehicles, light duty trucks 1 and 2, and light duty trucks 3 and 4. The results are presented in the attached figures. These results indicate that if a state were to adopt the California Car standards without adopting the California light truck standards, the NOx crossover would occur about 5 years earlier, in about 2013 instead of 2018. If NOx control is considered more important than VOC and Toxics control, a viable option for a state might therefore be to only adopt the California car program, at least until the final California light truck standards kick in. Alternatively, California might consider

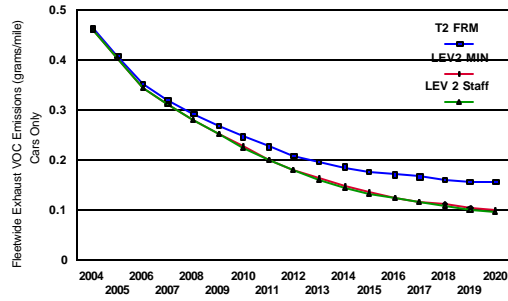
²"Analysis of the California LEV II and Federal Tier II Programs", TNRCC

tightening its interim light truck standards to match the Federal program.

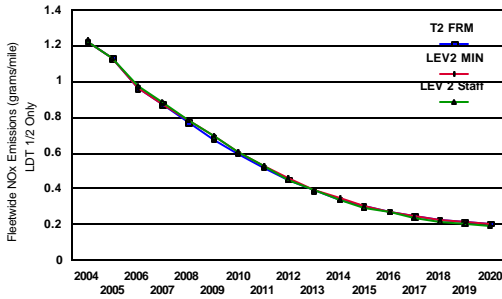
In Use Emissions Under Different Standards



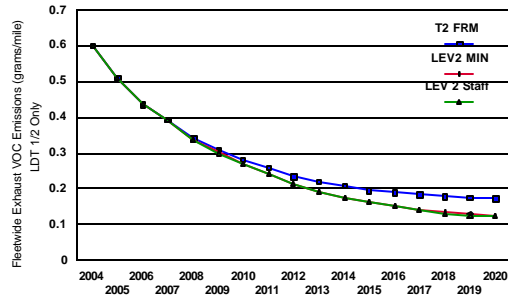
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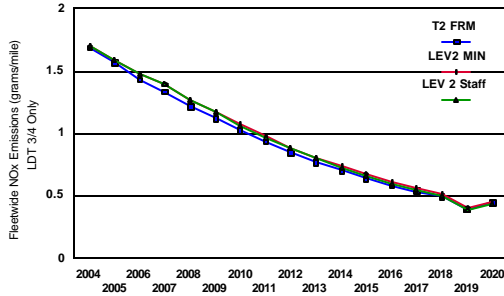
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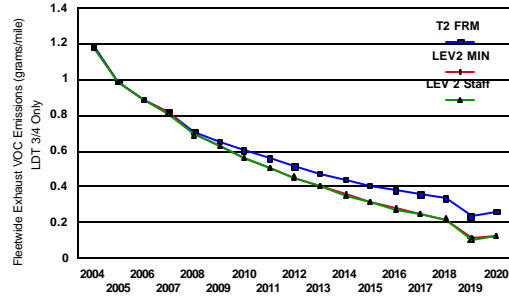
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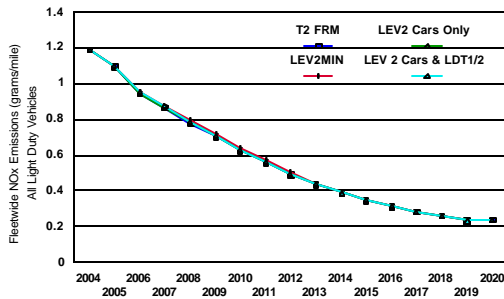
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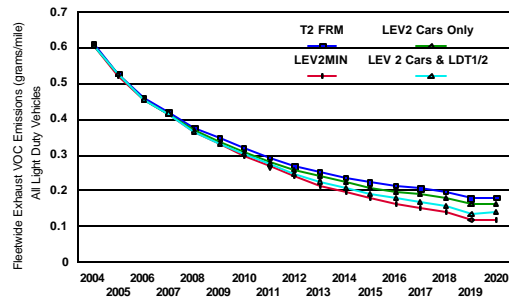
In Use Emissions Under Different Standards



In Use Emissions Under Different Standards



In Use Emissions Under Different Standards



9. US Energy Department To Fund Clean Fuel Research

U.S. Energy Secretary Bill Richardson has announced that his department would provide \$75 million in research grants to develop clean fuels and better pollution control devices for cars and trucks. The research money is part of the Clinton administration's efforts to cut sulphur levels in gasoline.

In December, the administration adopted new regulations requiring the nation's refineries to reduce sulphur levels in gasoline to an average 30 parts per million by 2005, down

from current levels of over 300 parts per million. New regulations for lower sulphur levels in diesel fuel are expected by the end of the year.

The goal of the research grants is to ensure fuel processing technologies can meet the tougher fuel standards. Richardson said the initiative would help U.S. refiners develop new technologies to process crude oil into clean-burning fuels. The department is asking for proposals in three areas:

* Projects which produce clean fuel from different energy sources - crude oil, petroleum

coke, refinery wastes, natural gas or coal.

* Projects which develop innovative emission control systems and verify their performance in engine tests.

* Projects which could lead to new fuel making processes or technologies that refineries and automakers could use in future fuel, engine and emission control systems.

Up to \$15 million could be awarded for each project, which could last for five years. The department will make the funding available this year through 2005, and will require participants in the research to share from 35 to 50 percent of the cost of each project. The department will evaluate project proposals over two time periods, those received by June 1 and proposals received by Dec. 1.

10. GAO Report Says U.S. Won't Reach Alternative Fuels Goal

The United States will be unable to significantly cut its use of gasoline because alternative fuels are too expensive and not widely available, according to a report from the General Accounting Office.

The Energy Policy Act passed by Congress in 1992 set a goal to reduce the nation's use of petroleum fuels by 10 percent this year and by 30 percent in 2010. However, the GAO said drivers find alternative fuels such as ethanol and natural gas too costly and difficult to find.

The Energy Department estimates that alternative fuels replaced about 100.7 million barrels of gasoline in 1998, which represents just 3.6 percent of all the gasoline consumed that year. A barrel holds 42 gallons. Each day, vehicles in the United States consume about 10 million barrels of petroleum fuels, mostly gasoline and diesel.

About one million alternative fuel vehicles were on the road last year, accounting for 0.4

percent of the 212 millions vehicles in the United States, according to the department. Vehicles that run on natural gas generally cost \$3,000 to \$5,000 more than gasoline vehicles, while the price for an electric car is in the low-\$30,000 to the mid-\$40,000 range. The agency said consumers would purchase alternative fuel vehicles only if gasoline became very expensive.

While gasoline prices are at record highs, the GAO said that even if crude oil prices reached \$40 a barrel, alternative fuels' share of the market for transportation fuels would not increase. Oil, from which gasoline is refined, is currently around \$30 a barrel.

Another problem with alternative fuels is the lack of service stations nationwide selling the product. About 69,300 alternative refueling stations would be needed to reach the Act's 30 percent goal by 2010, more than ten times the number of stations currently operating. The cost for building those stations would range from \$2.7 billion to \$10.5 billion, depending on the fuels used, the GAO said.

11. Mexico City Experiences Smog Emergency

Mexico City schoolchildren were kept indoors and out of playgrounds earlier this month while brick factories remained shut and factories were forced to cut output after air pollution hit record levels. One of the largest metropolitan areas in the world, with around 3.5 million vehicles, Mexico City declares environmental emergencies when the Imeca reaches 250 points. A high of 385 points triggered the emergency declaration based mainly on all-time high levels of suspended particles.

Last year, the World Resources Institute, funded by the World Health Organization, named the city the most dangerous in the

world for children in terms of air pollution, with high levels of sulphur dioxide, nitrogen dioxide and total suspended particulates (TSPs). Authorities nevertheless declared 1999 the best year in the last decade for pollution. The respite for the metropolitan area's 20 million inhabitants was short-lived, however.

Factories in the southeastern part of the city were ordered to cut back operations by 30 to 60 percent and some 154 brickyards around the capital were shut down.

Residents complained to local newspapers of headaches and respiratory problems and many also suffered sore eyes and throats.

12. Latest Green Car Guide Issued

The "greenest" vehicles in the United States tend to be low volume, possibly electric and small, while those deemed the "meanest" to the environment are popular, gas guzzling sport utility vehicles, according to the latest issue of the green car guide.

Vehicles like General Motors Corp.'s EV1, or Nissan Motor Co. Ltd.'s Altra electric cars are sold on a limited basis, but scored the highest among 2000 model vehicles in the annual study conducted by the American Council for an Energy-Efficient Economy.

The "meanest", or most damaging to the environment, among 2000 model vehicles included popular monster SUVs like GM's Chevy Suburban, equipped with a 6 liter, 8 cylinder engine, or Ford Motor Co.'s new Excursion, with a 5.4 liter, 8 cylinder engine, the nonprofit group said.

"Our larger objective is to encourage green automobiles and greener buying, but our other objective is simply as an information provider to put greenness out there as one of the things people can trade off with other features

when they car shop," said John DeCicco, a senior associate with the research group.

Consumers can access the information at the American Council's Web site at "www.greenercars.com."

Other vehicles on the "greenest" list include Honda's gas-powered Civic GX and Insight hybrid car, Toyota Motor Corp.'s RAV4 electric small SUV and gas-powered Camry sedan and Ford's Ranger electric compact pickup truck. Other gas-powered vehicles on the list are small cars.

The American Council ranked the vehicles by fuel economy and emissions, estimating pollution from vehicle manufacturing, production and distribution of fuel and vehicle tailpipes. It also counts air pollution, greenhouse gases and the powerplant pollution generated by electric vehicles.

The vehicles were ranked on a 1-100 scale, with 100 being the highest. The EV1 ranked highest this year with a score of 52, while the average was 22 and worst gas guzzlers score below 10, the group said.

Suburban, Excursion, DaimlerChrysler AG's Dodge Ram 2500 pickup, GM's Chevrolet Silverado and GMC Sierra full-size pickups, and the Ferrari 550 Maranello sports car tied for the lowest score at 9, the group said. Other vehicles on the "meanest" list include Toyota's Land Cruiser and Lexus LX470, BMW's Land Rover Range Rover SUV, GM's Cadillac Escalade, Chevrolet Tahoe and GMC Yukon SUVs, and the Dodge B2500 Van or Wagon.

The group also listed the best gasoline-powered vehicles by segment. Among those cited were the Toyota Echo (compacts), GM's Saturn LS (mid-sized cars), Toyota Avalon (large cars), Dodge

Caravan (minivans), Toyota Tacoma (compact pickups), Ford F-150 (full-size pickups), Toyota RAV4 (small SUVs) and DaimlerChrysler's Jeep Cherokee (medium SUVs).

13. ARB Cuts Emissions from Transit Buses

The California Air Resources Board (ARB) has adopted a regulation that will further reduce air pollution from the state's transit buses, and require some fleet operators to start using zero-emission buses (ZEBs) in three years. The regulation, which in 2002 starts its phase-in, affects about 8,500 buses at approximately 75 California transit agencies. It moves forward in several steps over the next ten years, requiring cleaner engines, cleaner diesel fuel, retrofits to reduce exhaust particulate matter (PM) emissions from older diesel buses, use of ZEBs and reduced exhaust PM and nitrogen oxides (NOx) from new diesel engines.

The regulation allows transit agencies the flexibility of choosing between either a diesel or alternative fuel path to lower air emissions. They may choose to use alternative fuels such as compressed or liquefied natural gas, propane, methanol, electricity, fuel cells or other advanced technology. Continued use of diesel brings with it a requirement to use low-sulfur (15 parts-per-million) diesel fuel beginning July 1, 2002, and cut emissions from new diesel buses by another 75 percent beginning in 2004. An even lower NOx standard applies to both diesel and alternative fuel bus engines sold to California transit agencies starting in 2007.

In addition, for both diesel and alternative fuel paths, a NOx fleet average of 4.8 begins in 2002, which will require some transit agencies to retire their oldest, highest polluting buses. A requirement to retrofit

existing buses with traps or other devices to reduce PM starts in 2003.

Large transit agencies with 200 or more buses that continue to purchase primarily diesel vehicles are required to begin demonstrating the use of at least three ZEBs by 2003. ZEBs powered by electricity or hydrogen fuel cells are already being used by some transit agencies.

From model year 2008 through 2015, large transit agencies using diesel will be required to make ZEBs 15 percent of their new bus purchases/leases. For large transit agencies using primarily alternative fuels, the 15 percent ZEB rule runs from model year 2010 through 2015.

ARB staff calculates that the new transit bus rules, combined with normal fleet turnover, will bring statewide reductions of seven-tons-per-day of NOx and 12 tons-per-year of PM by 2020.

14. EPA Wins Major Court Decision

The U.S. Environmental Protection Agency has won a court decision upholding the agency's plan to enforce tighter anti-smog rules and cut nitrogen oxide (NOx) emissions, which contribute to the interstate transportation of ozone.

The federal D.C. Circuit Court of Appeals ruled in favor of EPA's approach for reducing state-to-state transport of air pollution, rejecting claims by Midwestern states that the new rules were arbitrary and insufficiently researched.

Most of the reductions in NOx emissions were expected to come from power plants.

EPA in October of 1998 told 23 states, most of them west of the Mississippi River, to

revise their so-called state-implementation plans (SIPS) for reducing pollution which travels from their states by wind to the Eastern Seaboard. After the decision, the EPA said the plan would allow it to move forward with protecting clean air for more than 138 million people living in the eastern half of the country.

Environmentalists said the court ruling was a big win for the agency, which has been involved in a number of lawsuits with states and power companies concerning efforts to cut pollution.

15. US Maintains Legal Pressure For Utility Cleanup

The U.S. government expanded an ongoing legal battle to enforce a controversial portion of the Clean Air Act, adding 12 facilities to a lawsuit against industry majors American Electric Power, Cinergy and Southern Co. The action by the Justice Department, acting for the Environmental Protection Agency, raises the stakes in a government effort to curb emissions from coal-fired power plants partially exempted from the Clean Air Act. The move also comes just one day after the EPA and Justice Department announced what they called a landmark \$1 billion settlement with Florida's TECO Energy (see below) over the same type of pollution violations originally alleged last November against TECO, AEP, Cinergy, Southern Co and three other firms.

The power plants targeted include five owned by AEP in Ohio, West Virginia and Virginia, two owned by Cinergy in Indiana and five operated by Southern Co affiliates in Mississippi, Georgia, Florida and Alabama.

In November, 1999, the U.S. charged the utilities with making major modifications at 12 of their power plants without installing equipment required to control smog, acid rain

and soot. At the time of the lawsuit, additional plants were given notices that they would be added to the suit, resulting in the action just announced.

The dispute between utilities and the government concerns the "new source review" language in the Clean Air Act. "New source" rules govern how emissions producing facilities built before 1977 can make plant alterations without violating the act. Older plants are exempted from having to install up-to-date pollution controls until "major" modifications are made to the plants. When changes are made, facilities must install new emissions technology, since their lifespan will likely be extended from the improvements. Utilities said improvements were not illegal and should not trigger the enforcement action undertaken by EPA. The U.S. has said it will seek civil penalties of up to \$25,000 for each day of violation at each power plant prior to Jan. 30, 1997, and \$27,500 for each day thereafter.

TECO agreed to pay a \$3.5 million civil fine as part of the deal just announced. In addition to TECO, AEP, Cinergy and Southern Co, the other utilities covered under the pending lawsuits are FirstEnergy Corp, Illinova Corp, Southern Indiana Gas and Electric Co. The total number of plants now included in the lawsuits number 27.

EPA said utility plants account for nearly 70 percent of sulphur dioxide emissions each year and 30 percent of nitrogen oxides emissions, endangering the health of asthma sufferers, the elderly and children.

16. EPA and TECO Reach Settlement

Following are details from the U.S. Environmental Protection Agency on a settlement with TECO Energy for improving pollution controls at power plants owned by

the Florida utility. The settlement decrees that TECO - the Tampa Electric Co - do the following:

- * Starting in 2003, burn natural gas at the Gannon facility near Tampa, and install appropriate pollution controls for such gas-fired electricity generation;
- * Starting in 2008, either install first-class pollution control equipment at its Big Bend station regardless of the fuel TECO ultimately decides to use to make electricity at that location;
- * Carry out interim pollution control measures at Big Bend while final, permanent controls are selected, designed and installed. The steps are to start as soon as possible to improve the use and operation of "scrubbers" so they trap more of the sulphur dioxide released from burning coal before it can escape into the environment; starting in 2002 install \$3 million worth of "combustion controls" that will begin to reduce nitrogen oxides created by Big Bend; and by next year optimize the operation and maintenance of existing electrostatic precipitators which will keep more particulate matter, soot, from reaching the environment;
- * Continue to meet stringent emission limits for key pollutants, like sulphur dioxide, not only during the life of the consent decree but also after its termination;
- * Starting in 2005, never burn coal at Gannon, and never burn coal at any Big Bend electric generation system that TECO either shuts down or changes over to natural gas under the settlement;
- * Surrender significant amounts of allocation "credits" which otherwise could be used by TECO or others to emit additional pollution;
- * Carry out at least \$5 million worth of

EPA-approved projects to demonstrate innovative means for reducing emissions of nitrogen oxides;

- * Carry out or finance up to \$2 million in research and pollutant measurement work in the Tampa Bay estuary;
- * Pay a penalty of \$3.5 million in light of the past violations of law alleged in the complaint filed by the Department of Justice on behalf of EPA.

17. Texaco Leaves Global Climate Coalition

In the first such defection by a major U.S. oil company, Texaco Inc. has announced it is leaving the Global Climate Coalition, a business group which opposes the Kyoto treaty's approach to fighting global warming. Texaco said it was not leaving the group because of any fundamental differences of opinion but because it wanted to speak for itself and through other broader-based organizations on the issue of greenhouse gas emissions and global warming.

Texaco's exit follows hard on the heels of Ford Motor Co. and Daimler Chrysler AG which also recently quit the group but said they remained opposed to the mandatory curbs in greenhouse gas emissions set out in the Kyoto treaty.

Among other major oil companies, the European-based Royal Dutch/Shell Group and BP Amoco PLC left the group in 1997 and 1998 respectively.

18. EPA Tightens Standards For Small Engines; Planning on Tighter Controls on Large Off Road Engines

The U.S. Environmental Protection Agency has ordered major pollution cuts for

lawnmowers, weed trimmers, chainsaws and other small engine-powered equipment used by homeowners, saying the new standards will slice smog emissions by 70 percent by 2007. The 20 million small engine devices bought by Americans annually contribute a relatively small amount of hydrocarbon emissions but rank as the largest single contributor to so-called "non-road" emissions, EPA said.

The cuts, to be phased in over the next seven years, will reduce the emissions by 350,000 tons each year from 2007 while increasing fuel efficiency by 30 percent.

EPA said the equipment covered under its final rule are mainly used in hot summer months, the time of year when ground-level ozone is the highest and the biggest threat to asthmatics and people with respiratory conditions.

EPA's thinking on nonroad heavy duty diesel engines seems to be as follows:

- 1) a tier 3, 0.1 PM standard for the 2005/6 timeframe (50 - 750 hp engines) and no new NOx requirements
- 2) a composite supplemental transient cycle to be met in addition to the steady state cycle, and an NTE requirement. The transient cycle is being developed from engine cycle data and is weighted evenly for 5 types of engines (wheeled loaders, arc welders, skid steer loaders, excavators, bulldozers)
- 3) 500 ppm fuel for 2005/6
- 4) tier 4 standards that are the same as the 2007 highway heavy-duty standards in the 2010 time frame
- 5) nonroad fuel that is the same as highway fuel in 2010.

19. Refiners Challenge EPA Low

Sulfur Diesel Proposal

Oil refiners and other industry groups called for the Clinton administration to reconsider a pending proposal from the Environmental Protection Agency to drastically cut sulphur levels in diesel fuel, saying the plan is unworkable and dangerous. Officials from the National Petrochemical Refiners Association (NPRA) and Petroleum Marketers Association of America said they were committed to reducing diesel engine emissions, but were concerned about maintaining a stable and reasonably priced supply of diesel and other middle distillates like home heating oil.

"EPA's proposal for diesel sulphur is likely to reduce the supply of diesel fuel as well as heating oil and even gasoline," said a letter from oil refiners to EPA Administrator Carol Browner.

"It is our understanding that the EPA proposal calls for a reduction of the onroad diesel sulphur cap from 500 parts per million (ppm) to 15 ppm in 2006. The proposed cap and timeframe are in excess of what is feasible or advisable from either an energy supply or environmental standpoint."

Industry officials said the nation was losing its flexibility in meeting emergencies, noting refiners were running plants tighter and tighter to enhance dwindling rates of return on their operations.

Even lowering the sulphur rates to 50 ppm, a position supported by refiners, will cost the industry \$5-6 billion and raise diesel prices by around 5 cents a gallon. To get to 15 ppm, the costs would double, according to the officials.

EPA has not yet announced the new diesel rules, but is expected to do so by the end of April at the latest.

20. Engine Manufacturers Challenging Not To Exceed Provision in Consent Agreement, Proposed Rule

The heavy duty industry is pushing EPA very hard to relax the Not to Exceed (NTE) provision of the Consent Agreement and the proposed heavy duty regulations. This provision is extremely critical to the overall success of the heavy duty program as it is the key to in use enforcement and to the prevention of defeat devices in the future. (NTE means that EPA is not required to run a full compliance test on an engine to determine if it meets standards but rather can test emissions anyplace on the full engine map and the emissions cannot exceed 1.25 times the standard.) Under the Consent Agreement reached with most of the heavy duty diesel industry about a year ago, manufacturers agreed to this provision. However, they have now come back to EPA and argued that under certain conditions it can't be done. Unfortunately, the conditions under which it can't be done apparently differ significantly between manufacturers as they have all followed different approaches to complying; some of them made bad decisions and are now paying the price. If EPA were to hold tight, there would be a major shake up in the industry as some manufacturers would be placed at a big competitive disadvantage in both cost and performance.

It appears that there is a genuine problem and that some adjustment is appropriate - especially at high altitude, high temperature, high BMEP. Under these conditions, one proposal is for a relaxation from 1.25 times the standard to 2 or even 3.

The issue must be resolved soon if the 2004 and 2007 rules are to be finalized this year. On the other hand, if agreement is not reached, much of the industry will be bound

by the consent agreement which goes into effect in 2002.

21. STAPPA/ALAPCO Issues Report On Cancer Risk from Diesel Particulate

Last fall, the South Coast Air Quality Management District (SCAQMD) in Los Angeles, California released a draft final report, the *Multiple Air Toxics Exposure Study in the South Coast Air Basin* (MATES-II), which included an analysis of the cancer risk in the region from exposure to diesel particulate. Based on this analysis - which estimated diesel particulate levels by using elemental carbon as a surrogate and applied a cancer potency factor determined by the state of California - SCAQMD concluded not only that mobile sources were responsible for approximately 90 percent of the cancer risk in the area, but that 70 percent of the total cancer risk was attributable to diesel particulate.

Alarmed by these findings, the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) sought to extend the evaluation of cancer risk from diesel particulate to other cities across the country and to estimate how many cancers nationwide are the result of exposure to diesel particulate. STAPPA and ALAPCO's findings are no less frightening: the soot spewed by diesel engines is responsible for a shocking 125,000 cancers in the United States.

The U.S. Environmental Protection Agency (EPA) is currently preparing a proposal, for release this spring, for more stringent emission standards for on road heavy-duty diesel vehicles and substantial cuts in levels of sulfur in diesel fuel used in on road applications. In addition, the agency is

contemplating its course of action for emission and fuel quality standards for nonroad heavy-duty diesel engines, such as construction and agricultural equipment. The magnitude of the cancer threat from diesel particulate seals the overwhelmingly compelling case for aggressive and timely action by EPA for on road and nonroad diesel engines and their fuels. To this end, STAPPA and ALAPCO strongly urged that EPA:

Set more stringent nitrogen oxide (NO_x) and particulate matter (PM) emission standards for on road heavy-duty engines – NO_x standards no less stringent than 0.2 grams per brake-horsepower hour (g/bhp-hr) and PM standards no less stringent than 0.01 g/bhp-hr, based on the most advanced technologies possible. Both of these standards should apply to 100 percent of the fleet in the 2007 model year;

Set more stringent emission standards for nonroad heavy-duty diesel engines, equivalent to those for

on road heavy-duty diesels and in the same time frame;

Sharply reduce sulfur in diesel fuel used in on road and nonroad diesel engines to ultra-low levels, to take effect in mid-2006, with an interim nationwide sulfur cap of no higher than 30 ppm, to take effect by 2004; and

Ensure that all heavy-duty diesel engines – on road and nonroad – operate as cleanly in-use as they are supposed to.

In STAPPA/ALAPCO’s view, tens of thousands of cancers, not to mention a host of other public health and environmental hazards, can be avoided if EPA implements these recommendations. Because states and localities have limited authority under the Clean Air Act to tackle this perilous source of air pollution, it is entirely up to EPA to exercise federal leadership to address this critical national issue.

Cancer Risk from Diesel Particulate
National Totals

	<u>Estimated Cancers</u>
Metropolitan Areas	119,570
Non-metropolitan Areas	5,540
United States Total	125,110

Cancer Risk from Diesel
Particulate:

**Estimates for 50 Largest Metropolitan
Areas**

<u>Metropolitan Area</u>	<u>Cancers</u>
<u>Atlanta</u>	<u>1,930</u>
<u>Austin</u>	<u>570</u>
<u>Boston</u>	<u>2,900</u>
<u>Buffalo</u>	<u>595</u>
<u>Charlotte</u>	<u>710</u>
<u>Chicago</u>	<u>4,535</u>
<u>Cincinnati</u>	<u>1,005</u>
<u>Cleveland</u>	<u>1,500</u>
<u>Columbus</u>	<u>755</u>
<u>Dallas/Fort Worth</u>	<u>2,470</u>
<u>Denver</u>	<u>1,220</u>
<u>Detroit</u>	<u>2,810</u>
<u>Grand Rapids</u>	<u>535</u>
<u>Greensboro/Winston-Salem</u>	<u>600</u>
<u>Hartford</u>	<u>590</u>
<u>Houston</u>	<u>2,270</u>
<u>Indianapolis</u>	<u>780</u>
<u>Jacksonville, FL</u>	<u>540</u>
<u>Kansas City</u>	<u>895</u>
<u>Las Vegas</u>	<u>680</u>
<u>Los Angeles</u>	<u>16,250</u>
<u>Louisville</u>	<u>515</u>
<u>Memphis</u>	<u>565</u>
<u>Miami/Fort Lauderdale</u>	<u>1,880</u>
<u>Milwaukee</u>	<u>845</u>
<u>Minneapolis</u>	<u>1,460</u>
<u>Nashville</u>	<u>595</u>
<u>New Orleans</u>	<u>675</u>
<u>New York</u>	<u>10,360</u>
<u>Norfolk</u>	<u>795</u>
<u>Oklahoma City</u>	<u>535</u>
<u>Orlando</u>	<u>775</u>
<u>Philadelphia</u>	<u>3,085</u>
<u>Phoenix</u>	<u>1,510</u>
<u>Pittsburgh</u>	<u>1,210</u>
<u>Portland, OR</u>	<u>1,105</u>
<u>Providence</u>	<u>580</u>
<u>Raleigh</u>	<u>555</u>
<u>Richmond</u>	<u>495</u>
<u>Rochester</u>	<u>555</u>
<u>Sacramento</u>	<u>870</u>
<u>Salt Lake City</u>	<u>655</u>

<u>San Antonio</u>	<u>790</u>
<u>San Diego</u>	<u>1,430</u>
<u>San Francisco</u>	<u>3,510</u>
<u>Seattle</u>	<u>1,765</u>
<u>St. Louis</u>	<u>1,320</u>
<u>Tampa</u>	<u>1,160</u>
<u>Washington/Baltimore</u>	<u>3,750</u>
<u>West Palm Beach</u>	<u>530</u>

22. New Study Links High-traffic Streets to Childhood Leukemia, Other Cancers

The results of a new study conducted in the rapidly expanding Denver metropolitan area indicates children living near heavily traveled streets or highways are at significantly greater risk of developing cancer, including childhood leukemia.

The researchers found a correlation between high volumes of traffic on streets or highways near homes where incidences of childhood cancer previously had been documented. The study was authored by Robert Pearson of Denver's Radian International, University of Colorado at Boulder electrical engineering Professor Howard Wachtel and Kristie Ebi of the Electric Power Research Institute in Palo Alto. The study was published in the February 2000 issue of the Journal of the Air and Waste Management Association. The research was funded by EPRI.

The new study showed that homes adjacent to street corridors carrying 20,000 or more vehicles per day had roughly a six-fold increase in risk for children contracting cancer, including childhood leukemia. Motor vehicles are a significant source of air-pollution emissions, including benzene and other organic compounds. Occupational exposure to elevated concentrations of benzene is a known cause of leukemia in adults.

23. U.S. Records Warmest Winter On Record

The winter of 1999-2000 was the warmest winter in the United States since the government began keeping records 105 years ago, the National Oceanic and Atmospheric Administration has announced. This marked the third year in a row that record warmth was recorded in the United States during the winter months. Since 1980 more than two-thirds of U.S. winters have been warmer than average, NOAA said.

The average U.S. temperature from December to February was 38.4 degrees Fahrenheit, six-tenths of a degree warmer than the previous record set last year.

"During the past winter, every state in the continental United States was warmer than its long-term average, with 21 states from California to the Midwest ranked as much above average," NOAA said in a statement.

It was also the 16th driest on record, NOAA said.

The government blamed the warmer temperatures and lack of moisture on the La Nina weather phenomenon. During a La Nina period, sea surface temperatures are cooled, leading to lower rainfall in parts of the world, including in the United States. La Nina also shifts the location of the jet stream, raising temperatures across the United States. The latest La Nina period began in mid-1998 and

scientists predict it will continue well into 2000.

NOAA also said global warming, which most scientists believe is caused by human activities such as the burning of fossil fuels like coal and gas, was partly to blame for the temperature spike.

24. Houston Is New Smog City

Houston, which likes to promote itself as the world's energy capital and home of the U.S. manned spaceflight program, is eager to lose a less flattering title it has recently acquired: Smog City, USA. The Texas metropolis grabbed the nation's smog crown last year by chalking up 52 days when ozone, smog's main component, exceeded the federal health limit, abruptly ending the long reign of Los Angeles, which had 42 such days in 1999.

Houston's smog woes and similar problems in other Texas cities are cited by environmentalists and political opponents of Gov. George W. Bush, including Vice President Al Gore, who say he puts business interests above the environment. Republican Bush rejects the charge and says Texas has in fact become cleaner under his administration.

Houston is the fourth-largest U.S. city and one of its biggest oil refining and petrochemical centers. Its smog is classed as "severe," a term surpassed only by "extreme" in the lexicon of the U.S. Environmental Protection Agency (EPA).

Like other cities across the country, Houston has to comply with 1990 amendments to the U.S. Clean Air Act by 2007 or risk losing federal highway dollars and becoming synonymous with poor air quality and associated ailments such as asthma.

The Texas Natural Resource Conservation Commission, working with Houston area authorities, has until the end of this year to submit a plan to the EPA that shows the eight-county area can comply with the Clean Air Act by the end of 2007. That means slashing emissions of ozone-forming nitrogen oxides from a projected 1,052 tons a day to 230 tons, even though Houston's population and its economy are expected to continue their rapid expansion of recent years.

The commission has proposed measures that would require industrial plants, which produce 54 percent of the nitrogen oxides in the air, to cut their emissions by some 90 percent.

But cars and trucks, good for 25 percent of emissions, will also be targeted. Tentative proposals have been published to reduce the maximum speed limit from 70 miles per hour to 55 and cut the use of cars and trucks by 25 percent.

Talk of restrictions on car use has led to angry rumblings among Houston residents who love their cars as passionately as other Americans and who have only a rudimentary public transit system compared to many other cities.

25. CARB About To Initiate Process To Review ZEV Mandate

A biennial review of the Air Resources Board's Zero Emission Vehicle (ZEV) program is scheduled for September 2000. The purpose of the biennial review is to update the Board on progress being made towards meeting the ZEV program requirements. Staff to the Board will be holding two workshops to present information related to the review, and receive public comment. Staff will also be holding a separate workshop to discuss how multi-manufacturer

joint ownership arrangements may affect ZEV obligations.

a. **Background Information for the September 2000 Biennial Review**

At the first workshop, staff will present preliminary information regarding the biennial review process, manufacturer status, current vehicle technology, and compliance with the Memoranda of Agreement. Staff will seek comment on the content of the preliminary staff assessment, and will also invite comment on the experience of current EV drivers, and advances in ZEV drive trains and other components. The workshop agenda and a preliminary staff assessment will be made available prior to the workshop on the ARB web site.

At a follow-up workshop, staff will present the draft Staff Report and Technical Support Document for the September Board meeting, with updated information on the topics referenced above, plus a discussion of costs, emissions benefits, and the EV market.

Staff also will present findings from an assessment of battery technology and manufacturing cost, currently being conducted by an external review panel. The workshop agenda and related documents will be made available prior to the workshop on the ARB web site.

b. **ZEV Regulatory Status of Multi-Manufacturer Ownership Arrangements**

In recent years, there have been many new multi-manufacturer arrangements, which have made it difficult to delineate individual companies. Through this workshop, ARB will work with automobile manufacturers and other interested parties to clarify the ZEV-

related emission compliance liabilities of companies in multi-manufacturer arrangements. Appropriate lead-time would be provided before any changes become effective.

For the first time, the ARB's CAP 2000 regulations incorporate U.S. EPA's sales aggregation provisions as part of the durability demonstration requirements for small volume manufacturers in the certification and test procedures. In applying the durability demonstration requirements for the 2001 and subsequent model years and for 2000 model year vehicles certified under CAP 2000, sales from different firms are now aggregated in the following situations:

Vehicles produced by two or more firms, one of which is 10 percent or greater part owned by another,

Vehicles produced by any two or more firms if a third party has equity ownership of 10 percent or more in each of the firms,

Vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies,

Vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

In an upcoming rulemaking planned for 2001, ARB intends to propose amendments that would apply these sales aggregation provisions to the following instances in which a small volume manufacturer receives different treatment under the ARB program: (i) the fleet average requirements for passenger cars and light -duty trucks and the required

mix of emissions categories for medium-duty vehicles, and (ii) application of the percentage phase-in requirements for the LEV II exhaust standards, the LEV II evaporative emissions standards, and the SFTP standards. Appropriate lead time would be provided.

In this current workshop, ARB seeks comment on how best to determine when sales volumes must be combined for purposes of compliance with the ZEV requirement. Specifically, ARB solicits input on the following issues:

How various multi-manufacturer arrangements are established,

Clarification of terms such as “partnership,” “joint venture,” “partial ownership,” etc.,

Application of the “operationally independent” principle in 100 percent ownership situations,

Whether or not ARB should amend its

regulations to use the CAP 2000 sales aggregation provisions to determine whether a manufacturer is a small volume manufacturer exempt from the ZEV requirement, or an intermediate volume manufacturer exempt from the 60 percent limit on the use of credits from partial ZEV allowance vehicles, and

Suggested alternate methods for determining how the ZEV requirement should apply in multi-manufacturer arrangements.

MIDDLE EAST

26. Serious Pollution Problems Identified in Jerusalem

Following are the results of ozone monitoring in Jerusalem in 1998 based on measurements performed in the upgraded Safra station, a general monitoring station which began to operate in April of 1998.

Annual Summary of Ozone (in : g/m³)

Annual Average	Maximum ½ hour Value	Maximum 8-hour Value	No. of Exceedances of ½ hour standard	No. of Exceedances of 8-hour standard
82.5	328	169	49	8

While the presence of high ozone concentrations in Jerusalem is most likely the result of transport from coastal areas, not all the problems are the result of pollutants generated elsewhere. A new monitoring station on Jaffa Road in downtown Jerusalem has revealed major exceedances of the NOx standards. These are attributed to pollutant emissions from diesel powered vehicles such as buses, trucks and taxis.

27. Status of Motor Vehicle Pollution Control In Singapore

The Environmental Pollution Control Act (EPCA), which came into operation on 1 Apr. 1999 consolidates the previous separate laws on air, water and noise pollution and hazardous substances control. The EPCA therefore provides a comprehensive legislative framework for the control of environmental pollution.

ASIA - PACIFIC REGION

Motor vehicles are also a major source of air pollution. To control the emission of lead from motor vehicles, lead in petrol had been progressively reduced from 0.84 g/l to 0.15 g/l since 1 June 1987. In January 1991, unleaded petrol was introduced in Singapore and leaded petrol was phased out by 1 July 1998. To further reduce smoke emission from diesel vehicles, the permissible level of sulphur in diesel had been reduced from 0.3% by weight to 0.05% by weight from 1 March 1999.

With effect from 1 July 1994, all petrol-driven vehicles are required to comply with the exhaust emission standard as specified in either the European Directive 91/441/EEC or Article 31 of the Japanese Safety Regulations for Road Vehicles. To comply with these emission standards, all petrol-driven vehicles are fitted with catalytic converters.

With effect from 1 July 98, all diesel-driven vehicles must comply with the exhaust emission standard as specified in the European Directive 93/59/EEC for light duty vehicles with maximum laden weight (MLW) of 3,500 kg or less and 91/542/EEC Stage I for heavy vehicles with MLW of more than 3,500 kg before these vehicles can be registered for use in Singapore.

With effect from 1 October 1991, all motorcycles/scooters must comply with the US 40 CFR 86.410-80 Emission Standard before they can be registered in Singapore.

With effect from 1 Aug. 2000, all off-road diesel engines would be required to comply with either Japan, US or EU off-road diesel exhaust emission standards. Any equipment or machinery that is equipped with diesel engines as the main or auxiliary prime mover and not registered with the LTA for use on public roads requires to have a permit prior to the import of such equipment.

With effect from 1 Jan 2001, all petrol & diesel-driven vehicles must comply with the exhaust emission standard as specified in the European Directive 96/69/EC for light duty vehicles with maximum laden weight (MLW) of 3,500 kg or less and 91/542/EEC Stage II for heavy vehicles with MLW of more than 3,500 kg before these vehicles can be registered for use in Singapore.

In addition, all vehicles are subject to mandatory inspections periodically. During such inspections, emission of the vehicles is tested to ensure that they comply with the prescribed standard. Enforcement against smoky vehicles is also conducted.

28. India Continues To Move Forward On Vehicle Pollution Control

a. Lead Phase Out

The Indian oil industry has announced that only unleaded gasoline will be sold throughout the country from February 1, 2000. Though this announcement has taken many by surprise, people close to the industry had an indication of this. Oil industry representatives have been making informal announcements stating that all the refineries had started producing only unleaded gasoline from as early as October last year.

The phase out has been formally announced after it has been ensured that there are no remaining stocks of leaded gasoline in the pipelines, storage tanks etc. Presently, only one refinery of the Indian Oil Corporation in the North East is unable to produce unleaded gasoline and it will not produce any for the next few months till the necessary changes in the process are put into place.

Beginning with the first supply of unleaded gasoline only in the four metro cities from April 1995, the complete lead phase out has been

accomplished rather speedily.

b. Low Sulfur Diesel Fuel

The automotive industry has been insisting with the government to make diesel fuel with 0.05 percent sulphur widely available to enable them to meet the Euro II emission standards. According to the announcement, the National Capital Territory of Delhi is currently being supplied with 0.05 percent sulphur diesel. It is also being supplied in a region called the "Taj Trapezium", which is an area surrounding the famous monument "Taj Mahal" situated in the city of Agra. The rest of the country is supplied with a diesel fuel with 0.25 percent sulphur from 1st January 2000. The oil industry is likely to target the other metro cities, viz., Mumbai, Calcutta and Chennai for the supply of low sulphur diesel. Authorities in these cities are also in the process of enforcing the Euro II standards.

c. Two Stroke Engines

The Environment Pollution (Prevention and Control) Authority for Delhi, referred to as EPCA, which was constituted by the Central Government under an order by the Supreme Court, has made a recommendation that the Court may issue an order disallowing the registration of two wheelers powered by two-stroke engines in the city of Delhi. Their view is that even though these vehicles are fitted with catalytic converters and meet the stringent emission norms applicable from April 2000, [2.0 g/km of CO and 2.0 g/km of HC+NOx] are not as good as the four-stroke engine powered vehicles on account of the fact that the catalytic converters have a low durability. This contention has been strongly contested by the vehicle manufacturers who claim that, at the very low levels of permitted emissions, both the four-stroke and the two-stroke engines with catalytic converters are on par. They also say that some of the

four-stroke engines would be employing catalytic converters. Regarding durability, the industry claims that the catalytic converters on their vehicles will keep the emissions within limits up to 30,000 km. The corresponding figure for passenger cars is 80,000 km. Considering the lower average running of two wheelers compared to that of passenger cars, the industry claims that the durability, in terms of number of years, is comparable in both the cases. Both passenger cars and two wheelers will need catalyst replacement in about 5 to 6 years.

Though the EPCA had also suggested that the two-stroke engines may be permitted provided the manufacturers offered an emission warranty, they were not strongly in favor of this due to the weaknesses in the current laws and their enforcement for controlling emissions of in-use vehicles. They have indicated that implementing sound systems for I&M, surveillance and recall may take a long time, and, until these are in place, the two-stroke engines must not be allowed. The industry shares the view that there is a need for strong laws for in-use vehicles, they think that it is a requirement common to all types of vehicles, such as passenger cars which have been using catalytic converters for many years, and that it is unfair to single out the two-stroke engines on this ground.

In an effort to save the two-stroke engine from being banished, and to demonstrate their confidence in the catalyst technology to be used by them, the industry has offered an emission warranty for 30,000 km for all two-stroke engines fitted with catalytic converters. Details of how exactly the system will work and the terms and conditions etc are yet to be worked out. The offer has been made formally to the Delhi Government and to the Supreme Court. The Delhi Government, which has been seriously considering a move to ban the two-stroke engines, has decided to

await the decision of the Supreme Court before taking a final decision. The Supreme Court is yet to take up the case for a hearing which is due any time now.

29. Japan Continues Aggressive Push To Clean Up Diesels

a. The Kobe District Court Ruling

On January 31, the Kobe District Court ordered the government and Hanshin Expressway Public Corporation to pay for the health damages to the plaintiffs who were residents in the roadside area of National Highway No. 43 and Hanshin Expressway. In the finding, the Court acknowledged the relationship between asthma of the plaintiffs and suspended particulate matter (SPM), especially diesel exhaust particulate (DEP). The Court also ruled that the government and Hanshin Expressway shall keep the SPM concentration level lower than 0.15mg/m³ within 50m from the roadside of both roads. The defendants appealed against the decision to the High Court.

b. The Tokyo Metropolitan Government Proposes Regulations

The Tokyo Metropolitan Government announced on 18 February the draft regulations for the mandatory installment of Diesel Particulate Filters (DPF) for all diesel vehicles that run in Tokyo area. The government proposed to amend its anti pollution law by the end of 2000 to require particulate retrofitting of all existing diesel engines. The new regulation will be effective on April 1, 2001. There will be a 2 year's preparation time for retrofit, so the first group under the regulation is required to be equipped with diesel particulate filters (DPFs)

after April 2003. The requirements will be phased in on a step by step basis but 100% of the vehicles are to be equipped with DPF by April of 2006.

Approximately 190,000 diesel passenger cars and 460,000 commercial vehicles are registered in Tokyo. In addition to those, about 240,000 diesel vehicles come into Tokyo from other areas each day.

The actual performance standard which the DPF device must meet has not yet been set. A symposium on this issue will be held in late March in Tokyo. An important purpose of this program is to promote the replacement of diesels by lower emitting fuels such as LPG, gasoline and so forth.

Officials at the Environment Agency and the Transport Ministry, both of which had Tokyo Governor Ishihara as their head during his days as a Diet member, have taken opposing positions. The agency, not surprisingly, favors the policy, while the ministry has lambasted it, citing problems in both technological and financial areas.

Yasuhiko Okada, secretarial vice minister at the Environment Agency, said at a press conference that the agency supported Ishihara's policy. "Tokyo's policy is an extension of what we have been doing up until now," said Okada, referring to the agency's previous cooperation with the metropolitan government on DPF studies. " We intend to conduct an evaluation of DPFs and have results by the end of the summer to make Ishihara's idea a practical and relevant policy," Okada said.

The Environmental Agency conducted tests on buses that run on public roads not only in Tokyo, but also in other major cities, including Yokohama, Kawasaki, Sendai and Nagoya in fiscal 1997 and 1998. The agency concluded

that although problems remained regarding the equipment's durability and price, the DPF removed small particles contained in exhaust efficiently.

c. The Request from the Director-General of Environment Agency

On 22 February, the Director-General of Environment Agency, Ms. Shimizu, made a request to chairmen of Petroleum Associations of Japan (PAJ) and JAMA (Japan Automotive Manufacturers Associations) concerning the emission from diesel fuel vehicles. Ms. Shimizu requested to the chairman of PAJ that technological development for lowering the sulfur content should be promoted, whilst she asked the chairman of JAMA for the promotion for technological development of abating the exhaust emission from diesel fuel vehicles. In the request, she mentioned that Environment Agency asked the Central Environment Council to consider the earlier introduction of so-called New long-term regulations that had been planned to be introduced around 2007. She also stated that based upon the risk assessment of PM that will begin soon, NOX oriented Japanese regulation might be changed and more importance might be attached for strengthening of PM regulations.

d. Investigation Committee for DPF technology

After the Tokyo Metropolitan Government announced its proposals for mandatory installment of DPF, the Environment Agency and the Ministry of Transport established the Investigation Committee for DPF technology on 3 March. The Committee will consider the following items about conventional DPF and Continuously Regenerating Traps:

Durability

Type of vehicles that can be installed
Amount of supply and demand
Cost etc.

The committee will issue an interim report around this summer and a final report by March 2001.

e. Responses From JAMA and PAJ

On March 16th, JAMA and the Petroleum Association of Japan (PAJ) announced their measures to cope with lower emissions from diesel vehicles, in particular PM. They will jointly deal with this issue. Soon after the announcement, Governor Ishihara commented that this is a very favorable reaction to the city's campaign backed by the public. He will call on the further effort of national government, JAMA, and PAC .

i. JAMA's Response

- 1 Regarding new cars,
 - Promote development of vehicles which pass new restrictions on diesel exhaust emission (scheduled for 2007)
 - Provide diesel vehicles with re-generating DPF or any other PM reducing technology in 2003-2004
- 2 Regarding in-use cars,
 - Develop technology for reducing PM considering user needs. In particular, in large cities, deal with the installation of DPFs, substitution to gasoline fuel or LPG, CNG fuel vehicles.
- 3 Japan Clean Air Program(JCAP)
 - Regarding JCAP, joint research with PAJ, JAMA will promote and accelerate its project. In particular, for in-use-car,

JAMA will assess technologies including DPF.

ii. PAJ's Response

- 1 With regard to the 2007 regulation, PAJ progressively provide low sulfur diesel fuel. Also, for vehicles with regenerating DPF, PAJ will provide a grade of low sulfur diesel fuel earlier than 2007.
- 2 Promote and accelerate JCAP

The Tokyo Municipal government announced it will push the petroleum industry to provide low sulfur fuel for city buses from 2001.

30. Australia To Phase Out Leaded Petrol by January 2002

Australia will phase out leaded petrol nation-wide by January 1, 2002, which would significantly improve the country's air pollution levels, Environment Minister Robert Hill has announced.

"The emissions from motor vehicles contribute about 90 percent of airborne lead in urban areas. The government is therefore committed to phasing out leaded petrol to reduce ambient lead concentrations as much as possible," Hill said in a statement.

There are around 2.5 million cars built before 1986 that are designed to run on leaded petrol in Australia, but Hill said the government had negotiated with oil companies for the national introduction of lead replacement petrol (LRP). LRP will have the same octane rating as leaded petrol, with the anti valve seat recession (AVSR) additive providing the lubricating properties of lead. Western Australia has already introduced LRP and prices are similar to those for leaded petrol.

The Australian Institute of Petroleum (AIP)

said the oil industry supported the decision and oil companies would introduce lead replacement petrol progressively in each state to meet the phase-out date.

31. Public Hearing on Stage-Three Standards for Light Diesel Vehicles to be Held in Taiwan

As part of its bid to enter the World Trade Organization, Taiwan has pledged to allow imports of diesel-powered automobiles and small trucks. In anticipation of this move, the EPA has begun drafting revisions to the island diesel vehicle emissions standards. According to the draft put forth by the EPA, if Taiwan entry into WTO goes smoothly, then the existing three-phase emissions standards for gasoline-powered vehicles will be used as the basis for revising the diesel emissions standards. If WTO entry is delayed, however, the EPA will directly implement standards that parallel US federal emissions standards.

In order to prevent air pollution generated by diesel oil emissions, Taiwan had previously banned the import of diesel-powered light vehicles. In discussions with the European Union regarding the island WTO entry, however, the EU where diesel vehicles are used most extensively insisted that Taiwan open its markets to diesel-powered light vehicles. Because WTO entry is of primary importance, the Ministry of Transportation and Communications in conjunction with the EPA have promised that within two years following WTO entry imports of diesel vehicles will be allowed.

As Taiwan moves closer to joining the world trade body, the EPA has begun taking measures to bring light vehicle diesel emissions under regulatory control. It recently contracted the Vehicle Research and Testing Center (VRTC) to draft Stage-Three emissions standards for diesel emissions

from light vehicles. To discuss these developments with concerned parties, the EPA met with vehicle industry representatives on November 30 of last year.

At this meeting, VRTC personnel stated that in the US light vehicle and commercial vehicle emissions standards are divided into Tier 1 and Tier 2 stages. The former standards were implemented in stages between 1994 and 1997, while the latter will come into effect after 2004. Tier 2 standards will be divided into seven different classifications according to the degree of pollution. Vehicle manufacturers must select an appropriate emissions standards classification based on car model, and must also ensure that nitrogen oxides (NO_x) emission for every car sold from their factory do not exceed an average of 0.07 g/km.

In Europe, light vehicle diesel emissions standards are being gradually tightened through a five-stage process. Of these, the Euro II-DI standards were implemented in 1999, and Euro III and Euro IV standards will come into effect in 2000 and 2005, respectively. In Japan, light vehicle diesel emissions standards were put in place in 1997 and have since been gradually tightened. The Japanese Central Environment Committee recently decided to implement even stricter control limits in 2002.

Liberalization of the Taiwan diesel vehicle market will occur two years after the island accedes to WTO. After comparing regulations in different countries, the VRTC presented two scenarios that depend on the speed of Taiwan WTO entry. The VRTC has suggested that if WTO entry goes smoothly later this year, then Taiwan existing Stage-Three standards for gasoline-powered vehicle emissions will be used as the model for diesel emissions standards. This approach will not only allow urban areas to gain better control of

NO_x pollution, it will also avoid placing too heavy a burden on existing domestic vehicle manufacturers.

However, if Taiwan WTO accession is delayed, the VRTC recommends that a different approach be taken. Because liberalization will not occur until two years after entry, this time line should coincide with the implementation of new diesel emissions standards in the US and Europe. In this circumstance, Taiwan should strive to protect urban air quality by directly adopting standards that closely parallel the US Tier 2 standards.

Industry representatives at the November 30 meeting did not have many opinions in response to the VRTC recommendations. They did point out, however, that the US Tier 2 standards will not go into effect until 2004, and even then implementation may not occur according to schedule. Because the engines of vehicles made in Taiwan are all imported, the implementation date of diesel emissions standards must be later than those in Europe and the US.

The EPA agreed with industry viewpoint and further emphasized that the date of WTO entry is the most crucial element in deciding when to announce new standards in Taiwan.

32. Taiwan EPA Urges Local Governments to Get Electric Bikes on the Road

The EPA has set sales targets of electric motorbikes (e-bikes) for various county and city governments, and estimates that by the end of the year sales of e-bikes will reach 7,600. Five local governments have already reached goals for this FY, and 5,261 e-bikes have already been registered. A number of local governments have also offered independent subsidies in hopes of meeting

targets.

In the last few years the EPA has decided to promote electric motorbikes (e-bikes) as an important way to improve urban air quality. Besides providing a generous subsidy to consumers purchasing e-bikes, the EPA has requested that beginning January of this year 2000 sale of e-bikes must make up over 2% of total sales volume by motorbike vendors.

To continue getting e-bikes on the streets, during the past fiscal year (FY) the EPA asked all environmental protection bureaus (EPBs) to come up with a budget for promoting e-bikes. The budgets are determined based on factors such as population and size of the local air pollution fund. In cities or counties with large numbers of motorbikes, such as Taipei and Kaohsiung Cities, the EPA set a quota of 500 e-bikes, and in areas with fewer motorbikes, such as Hsinchu and Miaoli Counties, the target was set at 200.

According to EPA plans for the second half of 1999, an additional 7,600 e-bikes should be put on the road by the end of the year. On top of the 5,000 already out there, by the end of 1999 e-bikes should have broken the target mark of 10,000. To ensure that local governments meet their year end targets, the Bureau of Air Quality Protection and Noise Control recently invited local EPBs to report on their current progress.

According to EPA statistics for the second half of 1999, as of the end of October, Taipei, Kaohsiung, and Hsinchu Cities, and Taoyuan and Tainan Counties had already exceeded their set quotas for the number of registered e-bikes. After only four months, an additional 5,261 e-bikes had been registered, closing fast on the 6 month target of 7,600. Officials from the Air Bureau were optimistic in predicting that there would be no problems in meeting progress goals for this year.

The EPA is also urging cities and counties falling behind their targets to pick up the pace of their efforts. In order to support the e-bike initiative, besides the original EPA subsidies for e-bikes, Taoyuan, Hsinchu, Pingtung, I-Lan, and Taitung counties have already proposed their own subsidy measures for e-bikes purchased during this fiscal year. The subsidies range between five and ten thousand NTD. Expenditures by local governments in promoting the e-bike initiative this year came close to 180 million NTD.

From the public's perspective, the most frequent complaint against e-bikes is the inconvenience of recharging them. For this reason in addition to the sale of e-bikes themselves, city and county governments are also promoting the installation of recharge stations. Estimates are that by the end of the year a total of 2,135 recharge stations will be installed for the use of e-bike owners.

33. Installation of Gas Vapor Recovery Equipment to be Strictly Enforced in Taiwan

Volatile organic compound (VOC) emissions from Taiwan's 1,800 gas stations comprise 6% of total stationary source VOC emissions island wide. Recently, the EPA has been financially assisting gas station operators to install VOC recovery equipment. This assistance will end in March of this year, however, and the EPA has already drafted regulations requiring the installation of such equipment. The EPA will steadfastly enforce compliance on this issue.

Taiwan has a total of 1,800 gas stations. Annual fugitive volatile organic compound (VOC) emissions from these facilities exceed 28,000 tons. This is more than nine times the amount of VOCs emitted by Taiwan's semiconductor industry and seven times the amount emitted by all dry cleaners across the

island. Six percent of all stationary source VOC emissions in Taiwan originate from gas stations. To address this problem, the EPA in March 1997 began a three year program to assist gas station operators to install vapor recovery equipment. To date, more than 600 million NTD has been provided in subsidies. Following expiration of this program in March of this year, installation of such equipment will be strictly enforced.

To test gas station VOC emissions, the EPA contracted the Center for Industrial Safety and Health Technology (CISH) of the Industrial Technology Research Institute to sample vapor emissions from 52 gas stations. The testing showed that ambient air in and around gas stations that have not installed vapor recovery equipment contains benzene at average concentrations of 0.45 parts per million (ppm). These levels clearly exceed the International Workplace Health and Safety Association standards of 0.1 ppm. Gas stations that have installed vapor recovery equipment, on the other hand, have benzene levels about ten times lower – 0.05 ppm – in surrounding air. The aforementioned study also looked at worker exposure levels and found that vapor recovery equipment reduced such exposure by more than 80%.

Gas station VOC emissions contain a range of substances harmful to human health such as benzene, toluene, xylene, and styrene. Of these, benzene is the most toxic and has been proven to be carcinogenic. It also leads to high blood toxicity, system toxicity, and gene toxicity, and can cause leukemia and damage human chromosomes. To reduce exposure on the part of the workers and neighboring communities, public health experts and environmental groups are urging the government to require gas stations to install vapor recovery equipment.

Since 1993, the EPA has been pushing gas

stations to install vapor recovery units on fuel nozzles, and on March 13, 1997 the EPA began providing subsidies to gas stations to do so. For station operators that voluntarily installed vapor recovery systems, the EPA made available annual subsidies. These, however, will stop on March 12 of this year. To enforce compliance with equipment requirements, the EPA recently completed draft regulations. These controls will target gas stations with higher sales volumes and will be phased in over several years.

The EPA stated that 773 gas stations have already installed nozzle vapor recovery equipment and that VOC emissions have therefore been reduced by 12,200 tons. This amount comprises about 55% of total gas station VOC emissions. Only a few private gas station operators have maintained an attitude of resistance and chosen to violate the rights of their workers and neighboring communities to breath clean air.

Because environmental awareness of the general public has been growing rapidly, the EPA has been cautiously urging gas stations that have not installed vapor recovery equipment to face the truth. The public may soon protest such stations or even demand compensation from them. The EPA's job is to ensure environmental quality and the health of the people and will, therefore, resolutely enforce vapor recovery equipment requirements. The EPA has made it clear that it will not back down on this point.

34. First Privately Run LPG Station in Greater Taipei Opens

The difficulty in setting up liquid petroleum gas (LPG) fill stations has created a bottleneck in getting LPG cars on the road. In response, the EPA has worked with the Ministry of Economic Affairs and other agencies to loosen up regulations that increase the

willingness of businesses to apply to set up LPG fill up stations.

Greater Taipei's first privately run liquid petroleum gas (LPG) fill up station began service for taxicabs on December 23. The EPA noted that promoting LPG as a fuel for motor vehicles is an important policy for the agency. To speed up the process, on July 13, 1995 the EPA announced administrative guidelines for subsidizing the upgrade or substitution of regular cabs for LPG ones. The guidelines use economic incentives from the Air Pollution Fund to encourage cabs to switch to LPG.

The EPA points out that from the opening of subsidies up until November of 1999, subsidies have been given to help a total of 24,539 cabs switching over to LPG. Of these, 14,238 were in the Greater Taipei area, 8,655 in Taipei City, and 5,583 in Taipei County.

However, because the number of LPG refill stations has not grown apace of the number of LPG cars, promotion of LPG vehicles has hit a bottleneck. The EPA has actively offered suggestions to the Energy Commission of the Ministry of Economic Affairs (MOEA) on how to break through the current impasse. These suggestions have been aimed at revision of unreasonably strict regulations that would help out LPG taxis with no place to refill. After a number of meetings and negotiations between various departments, the regulations governing set up of gas stations and LPG stations have been revised. Now, gas stations and LPG stations can be set up together and the total required area reduced significantly. Furthermore, the installation of private LPG storage facilities has been permitted so that shipping and construction industries, factories or other organizations can install such facilities with central government approval.

The EPA noted that the regulatory revisions

have significantly raised businesses willingness to set up LPG stations. Currently, three model LPG stations have been set up and commissioned by the China Petroleum Corp. (CPC) in Taipei City, Taichung City, and Kaohsiung, as well as one station in Chiuching (Tainan County). The LPG station on Binchiang Road in Taipei, which began operations on December 23, 1999 is the first privately run LPG station in the Greater Taipei area, and can service over 1,600 gas powered vehicles per day.

35. Taiwan EPA Phases Out Leaded Gas Vehicles

In light of the prohibition on the sale of leaded gasoline in Taiwan, in October of 1999 the China Petroleum Corporation made available a lead-substitute fuel additive. However, the EPA is urging owners to replace vehicles that require leaded gasoline as soon as possible due to their higher emissions levels.

On January 1, island wide controls came into force banning the sale of leaded gasoline, and the EPA has again reminded owners of vehicles burning leaded gasoline to quickly upgrade to vehicles that use unleaded gasoline.

Lead has been proven to cause nerve-muscle disorders, anemia, kidney disease, and high blood pressure, as well as to slow brain development in children. After the major source of lead emissions was identified as tetraethyl lead-containing gasoline, many countries throughout the world implemented bans on leaded fuel.

In Taiwan, unleaded fuel first became available in 1986. By April 1987, a policy to completely replace leaded with unleaded fuel entered its initial phase. As part of this policy, the EPA informed automobile manufacturers that they should perform advance hardening

treatment on all engine valves in preparation. On July 1, 1990 all new cars sold in Taiwan were required to run on unleaded fuel, and on January 1, 2000 a complete ban on leaded gasoline came into effect. Commenting on this policy, the EPA indicated that this ten year lead time should have been enough time for vehicle owners to upgrade to unleaded fuel cars.

As for leaded fuel vehicles still on the streets, the EPA has stated that most of these can directly use unleaded fuel. Cars and motorcycles produced after January 1, 1988 should all have received engine valve treatment. Only about 70,000 cars that cannot burn unleaded fuel remain on the road today, and although the number for motorcycles older than 11 years is not known, it is likely not very large. Moreover, two-stroke motorbikes lack valves and should therefore not suffer from engine valve problems.

People that do not desire to replace their vehicles can continue to drive their cars provided they take certain measures. For example, they can have their engine valves hardened so that they can then burn unleaded fuel without damaging their engines. Also, the China Petroleum Corporation (CPC) made available a lead substitute additive in October of last year. This additive prevents engine valves from becoming worn.

In addition to the lead emissions problem, leaded fuel vehicles are also more likely to lack catalytic converters. These cars and motorcycles can only comply with first phase emissions standards. Even if they were maintained in top condition, they could still not comply with the second and third stage, hydrocarbon, and nitrogen oxide emissions levels. For the sake of clean air, therefore, the EPA hopes that all car owners will seek to comply with the new regulations by phasing out use of their older vehicles.

36. Hybrid-Electric Busses Hit the Streets in Taiwan

In an effort to improve air quality, the EPA has been implementing a " hybrid-electric bus program." On January 21, the first of these busses rolled onto the streets of Taipei as part of the demonstration phase of the program. Depending on the reaction of commuters and the city government, full-scale use of the busses should proceed in the near future.

To improve urban air quality, the EPA has been formally promoting a "Hybrid-Electric Bus Program," and on January 21 of this year, the first busses hit the streets. To encourage public participation in the roll out of this program, and to provide a taste of this form of transportation, the EPA has implemented a web-based promotional program whereby the public can participate in a drawing for a free bus pass (the deadline for registering was January 17). Winners can ride for free on the new electric busses until the end of April this year.

Current city busses are all powered by diesel fuel, the emissions from which pollute the air and threaten public health. In the past, electric busses could only travel a limited number of miles before requiring a battery charge. The newest busses, imported from California, utilize hybrid-electric technology. Unlike diesel busses, when started up or near bus stops, the hybrids will not emit a large, polluting burst of exhaust. To supplement electric power, the busses utilize a 40 kilowatt diesel powered engine to drive an electric generator that charges the onboard batteries. Moreover, when braking, momentum is used to return a partial charge to the batteries. This energy can then be used for acceleration and maintaining forward momentum of the bus.

The EPA is currently undertaking a

demonstration project with the Taipei City Public Transportation Bureau. Initially, the new busses will be used on the city's Number 20 route; busses on this route stop at major points of interest in the city such as the World Trade Center, the Chiang-Kai Shek Memorial Hall, the Sun Yat-Sen Memorial Hall, and the Presidential Building. The EPA is also undertaking a commuter awareness campaign to encourage public participation. The public can log onto the EPA's website and apply to win a pass for riding the electric busses free of charge between January 21 and the end of April.

The EPA's Bureau of Air Quality Protection and Noise Control recently stated that due to the large price tag of the hybrid-electric busses, only two can be put on the road for demonstration purposes. Bringing more into use will depend on the reaction of the public and the budget of local governments.

GENERAL

37. Twentieth Century Hottest In 500 Years

The 20th century was the hottest for more than 500 years according to a study just published in the journal, NATURE. The earth's temperature has increased by about one degree Centigrade (1.8 degrees Fahrenheit) since the 1500s; in the Northern Hemisphere it was even faster: 1.1C (2F) in the last 500 years and 0.6 C (1.1F) in the 20th century alone.

"The 20th century was the warmest for the last five, and the one which was most rapidly changing," Henry Pollack, of the University of Michigan, said in a statement.

Pollack and his colleague Shaopeng Huang and Po-Yu Shen of the University of Western Ontario reconstructed past trends in climate

change by using data on sub-surface temperature gathered from holes drilled into the ground at 616 sites on every continent except Antarctica. Highly sensitive thermometers in the holes show just how much temperature has changed over the years because signals from surface temperature travel below the earth and are preserved in rock and soil. Temperatures of the past 1,000 years are recorded to a depth of 500 meters (yards) down.

"So the upper 500 meters is an archive - a historical record of temperature changes that have occurred in the last thousand years," said Pollack. "Like any historical archive, there are of course missing pages, and the ink has run in a few places. But in principle, if you drill a borehole anywhere on a continent, you can observe a temperature profile and reconstruct what has happened at that location," he added. By averaging the temperatures taken from the boreholes, the researchers reconstructed a picture of past climates. Pollack and his team had previously examined data from 358 borehole sites around the globe.

Their findings are consistent with other ways of estimating past temperature such as studying ice cores, lake sediment and coral growth. "All the methods generally show a very unusual 20th century, and ours does, too," Pollack added.

38. Another New Study Reports Heating In Last Twenty Years

The Earth's surface has heated up appreciably over the past 20 years, according to a new study in "Science" magazine. This study supports a National Academy of Sciences panel that concluded that strong evidence showed an "undoubtedly real" warming of the Earth's surface.

One of the authors of the study, research meteorologist Dian Gaffen, said the contention that the Earth's surface had warmed up appreciably over the past 20 years was proven in their research. The Earth's surface was warming up at 0.05 to 0.08 degrees Celsius per decade, said Gaffen of the National Oceanic and Atmospheric Administration in Maryland.

The study tries to resolve a major discrepancy in global climate - that measurements at the Earth's surface suggest a temperature rise but that satellite measurements indicate the lower troposphere shows little or no signs of warmup. This discrepancy in temperature trends cast doubt about how the Earth's surface could be warming up if the air directly above it had not, raising questions over whether man-made Greenhouse gases had contributed to global warming.

Gaffen's group studied data from a series of weather balloons sent aloft in the Tropics to measure the temperature of the Earth's surface as well as in the troposphere, the area just above Earth.

"Our results support the contention that the surface has been warming appreciably in the last 20 years versus the troposphere which does not show as much warming," she said. Gaffen's study focused on the tropical belt, the region on the Earth where the difference between measurements taken by satellites and ground station measurements is greatest.

Some scientists had argued that data from both satellite and ground measurements were so different that they could only be wrong, changing how meteorologists looked at climate change in the decades to come.

"The most important thing is that there has

been a debate among policy circles that satellite data did not show warming and so the surface could not be warming either," Gaffen said.

Gaffen wrote that both calculations were correct and the discrepancy arose from variations in how atmospheric temperature decreased with altitude.

Ben Santer of Lawrence Livermore National Laboratory in California, who wrote an accompanying paper in "Science", said there were good "physical reasons" why the Earth's surface was warmer than the troposphere above the surface. He cited external factors such as increases in Greenhouse gases, the number of particles in the air due to combustion, depletion of the Ozone layer or natural events such as the eruption of Mount Pinatubo in 1991. Santer said he hoped the study would clarify that the discrepancies could not be reduced to "sound bytes".

"The bottom line is that the discrepancy between the surface of the Earth and the lower troposphere seems to be real. Also there are plausible reasons to explain how we have these different temperatures," said Santer.

39. Shell & Daimler Chrysler See Gasoline/Fuel Cell Car Advance

Oil and auto titans Royal Dutch/ Shell and DaimlerChrysler have unveiled a research advance they said brought closer the prospect of gasoline-powered fuel cell cars.

Shell subsidiary Shell Hydrogen and DaimlerChrysler unit dbb Fuel Cell Engines GmbH said they had made a prototype gasoline reformer to make hydrogen for fuel cell applications in cars. A joint statement said the development would allow the use of existing filling stations.

The companies will seek ways to commercialize the research, which successfully produced a 50kW multi-fuel system with a compact design for mobile and stationary use of fuel cells.

Ferdinand Panik, head of DaimlerChrysler's fuel cell project, said that despite the advance his first priority was to try to develop methanol as a fuel for fuel cells. DaimlerChrysler plans to roll out an economically viable car powered by a fuel cell engine, which works by converting hydrogen into electricity, by 2004.

40. Shell Sees Major Challenges In Renewable Energy

Royal Dutch Shell said it saw great opportunities for renewables to help reduce greenhouse emissions but that large-scale production of "green" energy remained a tough challenge. Evolutionary progress to deal with greenhouse emissions from fossil fuels, rather than knee jerk responses bringing abrupt changes, appeared to be the way forward, said group chairman Mark Moody-Stuart.

"We see great opportunities for renewables. But the scale of the industry required should never be underestimated nor the problems to be overcome," he told an industry conference.

He said customer pressure had changed the mix of energy sources, bringing about progressive decarbonization.

Extending the use of gas for power generation was the most effective immediate way of reducing emissions, but longer-term, renewables offered the potential for carbon-free energy.

But problems and challenges persisted. Resources appeared adequate although "storage is a major problem."

Moody-Stuart estimated energy demand could grow by 60 percent in 2020, but renewable energy would require large scale sites to produce a fraction of fossil fuel energy.

"A solar industry supplying just two percent of primary energy by 2025 would probably be producing some 4,000 square kilometers of photo-voltaic panels a year - six times current European production of plate glass," said Moody-Stuart.

"How would large-scale production of bio-fuels square with growing concerns about intensive agriculture? Where should we site large scale wind production?" he said.

Shell, however, was committed to commercial renewable energy development. The company earlier this month announced plans to construct, as part of a consortium, the UK's first offshore wind project in the North Sea.

It was also involved in rural solar electrification projects in Bolivia and South Africa, its first commercial biomass scheme in Norway and a third solar factory in Germany.

Hydrogen fuel cells, seen by many as a long-term answer, could be produced from emission-free solar or wind power, but developing sufficient capacity would be a huge undertaking.

Using surplus off-peak nuclear electricity could be done easily though less acceptably, Moody-Stuart added.

Output of hydrogen from fossil fuels using existing infrastructure would make it easier to penetrate the market and substantially reduce emissions, he said.

Shell Hydrogen and Siemens Westinghouse are developing gas-fueled power plants to

deliver emission-free electricity.