NO. 4, DECEMBER 1998

Acid News

ILLUSTRATION - IN PRINTED VERSION ONLY

© SVEN ÅNGERMARK

EMISSION CEILINGS

Four pollutants targeted

EARLY IN the new year the EU Commission will be presenting a proposal for a directive setting national emission ceilings for four air pollutants that cause acidification and the formation of ground-level ozone. These are sulphur dioxide, nitrogen oxides, volatile organic compounds, and ammonia. It will be the most important piece of legislation for attainment of the environmental targets for 2010, which are designed to reduce the damage from these two causes.

The concept for this new directive first surfaced in 1997, when the Commission put forward its strategy for dealing with acidification. There it confirmed that the long-term aim for the EU, in regard to acidification, as already laid down in the fifth EU plan of action for the environment of 1993, was that there should be ”no exceeding ever of critical loads and levels.” The aim for air quality was said to be that ”all people should be effectively protected against recognized health risks from air pollution.”

Since 1996 the Commission has been working on a similar strategy for reducing the concentrations of ground-level ozone, to be combined with a daughter directive for air quality standards involving this pollutant.

Since it turned out, after analyses had been made of the problems of acidification and ozone that would arise in both strategies, that the long-term aims would not be realizable without some delay, the Commission decided on a stepwise plan. What it called interim targets, to be achieved by 2010, were set in both cases – the intention being to revert to the matter with further, deepened analyses in connection with the review of these strategies which is scheduled for 2004. The Commission will then also be evaluating the progress made by member countries in reducing emissions, as well as considering the need for further reductions. It may well make proposals at the same time for new targets, and for any revisions of its directives that might lead to reducing emissions still more.

As reported in Acid News 3/98 (pp.4-5), negotiations are now going

Continued on page 3

Acid News

is a newsletter from the Swedish NGO Secretariat on Acid Rain, whose primary aim is to provide information on the subjects of acid rain and the acidification of the environment.

Anyone interested in these problems is invited to contact the secretariat. All requests for information or material will be dealt with to the best of our ability. Acid News is distributed free of charge.

In order to fullfill the purpose of Acid News, we need information from everywhere – so if you have read or heard about something that might be of general interest, please write or send a copy to:

The Swedish NGO Secretariat on Acid Rain
Box 7005, S-402 31 Göteborg, Sweden

Tel: +46-31-10 55 90. Fax: +46-31-711 46 20

E-mail: info@acidrain.org

Internet: www.acidrain.org

Editor: Christer Ågren

Published by: The Swedish Society for Nature Conservation

Printed at Grafiska Punkten, Växjö, on paper not bleached with chlorine.

ISSN 0281-5087

THE SECRETARIAT

The Secretariat has a board comprising one representative from each of the following organizations: Friends of the Earth Sweden, the Swedish Anglers' National Association, the Swedish Society for Nature Conservation, the Swedish Youth Association for Environmental Studies and Conservation, and the World Wide Fund for Nature Sweden.

The essential aim of the secretariat is to promote awareness of the problems associated with air pollution, and thus, in part as a result of public pressure, to bring about the required reduction of the emissions of air pollutants. The eventual aim is to have those emissions brought down to levels – the so-called critical loads – that the environment can tolerate without suffering damage.

In furtherance of these aims, the secretariat operates as follows, by

- Keeping under observation political trends and scientific developments.
- Acting as an information centre, primarily for European environmentalist organizations, but also for the media, authorities, and researchers.
- Producing information material.
- Supporting environmentalist bodies in other countries in their work towards common ends.
- Acting as coordinator of the international activities, including lobbying, of European environmentalist organizations, as for instance in connection with the meetings of the Convention on Long Range Transboundary Air Pollution and policy initiatives in the European Union.
- Acting as an observer at the proceedings involving international agreements for reducing the emissions of greenhouse gases.

EDITORIAL

Not only new ones!

NEXT YEAR the EU Commission will be putting forward a proposal for a directive setting national ceilings for the emissions of four air pollutants causing acidification and the formation of ozone. Certain interests are now trying to make this an excuse either for delaying or at least watering down the plans for other measures to reduce emissions. One such is EURELECTRIC, an umbrella organization for electricity generators, which is pursuing the line that measures to lessen the emissions of air pollutants from existing plants should not be included in the discussions on a revision of the LCP directive.

Here one should note the essential difference between measures that are already in place and those that may be introduced in future. About the existing ones, represented for instance by the LCP directive, there seems to be fairly general agreement, even if views as to their environmental effects may differ a great deal. There tends to be more confusion, on the other hand, over what is likely to come, such as the NEC directive (see pp. 1-5). There is uncertainty as to whether or when it will definitely be adopted in legislation, what exactly its legal obligations will be, and how well it is likely to be observed.

In the case of the LCP directive, which in its original form has had legal force since 1988, there is some passable recording of how it has been followed in practice, even if the supply of information from the member countries has not been all that it might have been. From what they have thus seen, the Commission and several of the member countries have come to the conclusion that the directive needs revising – as indeed was foreseen at the time of its adoption. This directive relies mainly on the "best available techniques" for reducing emissions and their effects. Since techniques will however undergo development, and the knowledge of effects will improve in the course of time, it must be evident that a directive of this type will have to be revised at intervals, say, after five or ten years.

There are a number of reasons why steps should be taken to control emissions from existing plants. In the first place, those emissions will constitute far and away the greatest part of the total during the next ten or twenty years. They will definitely have to be reduced, if the aim of better air quality and reduced acidification is to be realized. Then, as an analysis made for the Commission has shown, it would actually be cost-effective – for at least thirteen of the fifteen member countries – to cut emissions from these existing plants. There can in fact be no doubt, even if the EU should sooner or later adopt the NEC directive, that it would still be necessary as well as cost-effective to do just that.

A revised LCP directive may also have the advantage that it could cause emissions to decline more rapidly than the NEC directive would, no matter whether the latter is adopted sooner or later. Damage to the environment and health would also fall away earlier, making in turn less cost for the community as well as bringing other gains, both in the short and the long term.

The form of the LCP directive, including as it does technical requirements – not to mention the demand for greatly improved reporting that the Commission's proposal will bring – will make monitoring easier and so make it possible to see how well the requirements of the directive are being followed. It could soon be discovered whether the directive was adequate for it purpose or not. This would not be the case with the NEC directive, which would only reveal the facts when it would be too late – one or two years after the target date, 2010.

It should however be held in mind that a revised LCP directive will only cover a limited proportion of the reductions that will be needed for achievement of the national ceilings that are now announced – very little indeed if the changes should be limited to new plants, but somewhat more if requirements for existing plants should also be included. The revision should therefore be regarded as one of several complementary measures – intended to ensure that the emission ceilings will actually be adhered to, and that cost-effective technical measures to reduce emissions will be taken by the European Union.

CHRISTER ÅGREN

ILLUSTRATION - IN PRINTED VERSION ONLY

Continued from front page

on for a multi-effect and multi-pollutant protocol under the Convention on Long Range Transboundary Air Pollution. The basis here will be the critical-loads approach, and to ensure compatibility between this work and that of the Commission, close links have been established between the two bodies. They will be using the same methodology, and as far as possible the same data, and the same consultants for the computer modelling.

As a part of the procedure of working out a directive on emission ceilings for the four pollutants, the Commission has investigated, through IIASA, various targets and emission scenarios. These have been gone over by experts from the member countries, representatives of industry, and environmentalist organizations, and are included in a report.[1] The last time consultation took place was in Brussels on October 19 this year, when the Commission informed of the preliminary conclusions it had reached in regard to the overall aims it favoured, and what they would mean by way of emission reductions for the member countries.

Improvements everywhere

In essence the Commission's aims are intended to bring about an equal relative improvement everywhere in the EU, while at the same time ensuring extraordinary improvements in the worst affected areas. The aim of the general relative improvement is expressed in the form of gap closure towards the long-term target where there will be no exceeding of critical loads. The extraordinary improvements are to be achieved by adding absolute limits for exposure to pollutants to the gap-closure procedure.

So as not to let some lesser areas take on undue importance in the modelling work, a so-called compensation mechanism has been employed. This allows the gap-closure aim to be violated in some sub-areas, provided the resulting "loss" is balanced by extra improvements in other parts of the same country. The compensation mechanism has been applied in the cases both of acidification and ozone.

Environmental targets

Following a careful analysis of various scenarios, the Commission has put forward the main aims it wishes to see achieved by 2010:

❒ Acidification. The target is to be at least a 50-per-cent reduction in areas that are not protected against acidification, as from 1990. (Although the method for calculating gap closure in respect of acidification has been altered since the advent of the acidification strategy, the general target remains unchanged.)

❒ Health-affecting ozone. The target for gap closure is to bring down the exceeding of AOT60 by at least 67 per cent, again as from 1990. (AOT60 is used as a surrogate indicator for excess health-related exposure to ozone.) Furthermore there is to be an absolute ceiling for AOT60 of 2.9 ppm hours, which is to apply everywhere.

❒ Vegetation-affecting ozone. The gap-closure target is at least a 33-per-cent reduction of the amount

Continued on page 4

ON THE FOLLOWING PAGES

Continued from page 3

by which the critical level for crops is exceeded (that level is an AOT40 of 3 ppm hours). The baseline is still 1990. There will also be an absolute ceiling of 10.0 ppm hours for AOT40.

Least-cost solution

The International Institute for Applied Systems Analysis, IIASA, which has been the Commission's consultant, has used its RAINS model to carry out a so-called joint optimization to find the most cost-effective way, for EU as a whole, for achieving these environmental aims. The emission reductions that will be required of individual member countries are set forth in Table 1, where they are called the NEC scenario. These can be compared with the changes that are already likely both as a result of current national and international commitments and of existing and impending EU legislation (according to REF, the reference scenario).

Costs overestimated

Table 2 shows the extra costs for the member countries of going over from the REF to the NEC scenario (taking the four pollutants in question as a bunch). These are estimates coming from the RAINS computer model, where only technical means for reducing emissions have been taken into account.

It is estimated that the total extra cost of reducing emissions in line with the NEC scenario will be 9.1 billion ecus a year in 2010. Background papers, presented by the Commission at the October meeting, indicate however that this is an overestimate – a view that is also supported by the IIASA report. The reason is partly that only technical changes have been considered, no account having been taken of structural measures such as switching fuels from coal to gas, increasing energy efficiency, greater use of alternative energy sources, and changes in the transportation and agricultural sectors. Emissions could be reduced at much lower cost through some of these structural changes than by relying solely on technical "end-of-pipe" solutions.

Furthermore, a highly doubtful energy scenario has been used in the computer modelling. This would imply an increase in the EU emissions of carbon dioxide by about 8 per cent by 2010, in absolute disregard of the commitments made by the EU and its member countries under the Kyoto protocol, involving a reduction of 8 per cent in EU emissions of greenhouse gases (of which carbon dioxide is the most important). A computer run simulating a low-CO_2 scenario that would roughly accord with the Kyoto agreement brought the extra cost down by more than 40 per cent.

Reducing acidification

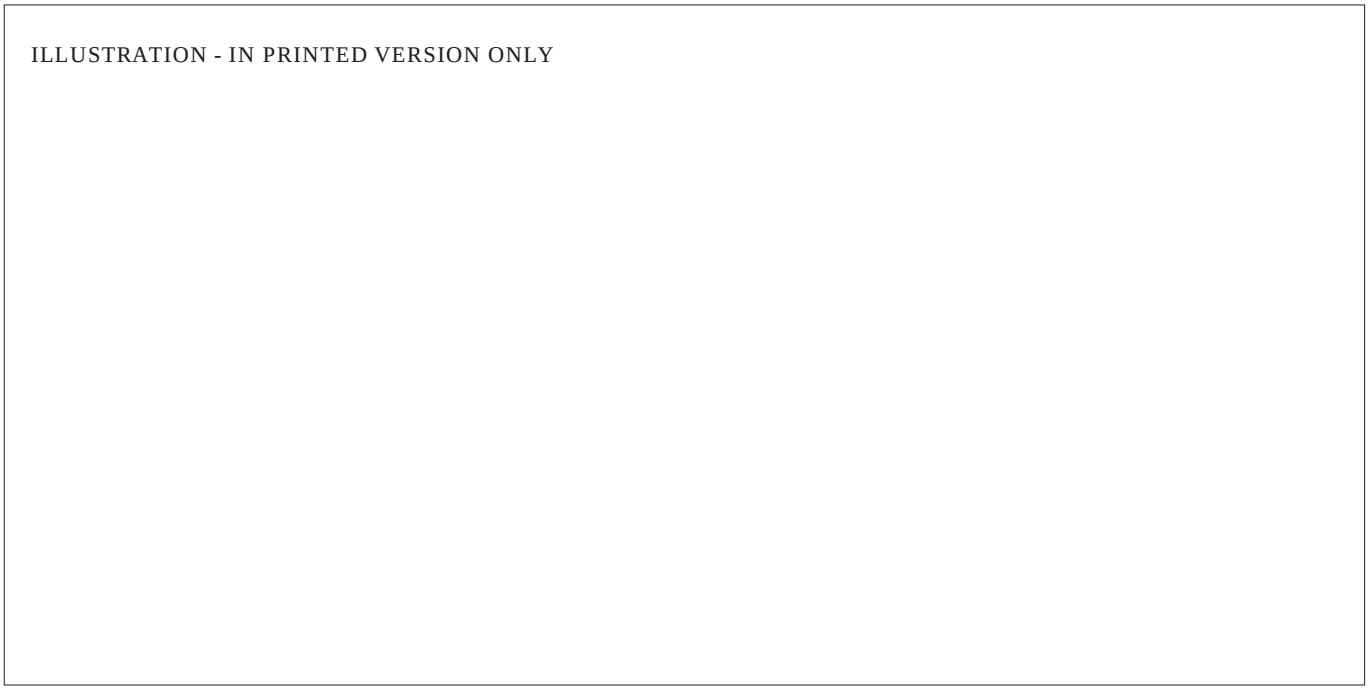
The area of ecosystems where the depositions of acidifying air pollutants exceed the critical loads will be greatly diminished as a result of the Commission's proposals. As can be seen from Table 3, altogether 37 million hectares, or a quarter of the sensitive EU ecosystems, were being subjected to excess loading in 1990. Under the REF scenario the area would drop to 6.6 million hectares by 2010, and would shrink still more, to 4.3 million hectares, under NEC. That is for the EU as a whole. In the Netherlands almost a quarter of the country's ecosystem area would still be affected. Otherwise the countries with the greatest remaining overloaded areas would be Sweden, Finland, Germany, and Great Britain.

Less ozone damage

Notable improvements for ozone, too, would accrue under the NEC scenario. The exposure estimates for population and vegetation that have been used by IIASA indicate that for population the excess exposure to ozone would be 76 per cent less than in was in 1990, and 40 per cent less than in the REF scenario. The exposure of vegetation in excess of the critical levels would be less than half of what it was in 1990, and almost 25 per cent less than it would be under the REF scenario. The number of days in which the 8-hour value of 60 ppb is exceeded in the worst affected parts of the EU, in Italy and northern France, would be more than halved – from 50-60 days in 1990 to 20-25 in 2010 according to

Table 1. Emissions (in ktons) under the reference (REF) and NEC scenarios.
Percentage changes (in paranthesis) from the base year 1990.

	Sulphur dioxide			Nitrogen oxides (as NO_2)			Ammonia			Volatile Organic Compounds		
	1990	**REF 2010**	**NEC 2010**	**1990**	**REF 2010**	**NEC 2010**	**1990**	**REF 2010**	**NEC 2010**	**1990**	**REF 2010**	**NEC 2010**
Austria	93	42 (-55)	42 (-55)	192	113 (-41)	94 (-51)	77	67 (-13)	67 (-13)	352	208 (-41)	133 (-62)
Belgium	336	208 (-38)	64 (-81)	351	207 (-41)	111 (-68)	97	96 (-1)	60 (-38)	398	212 (-47)	103 (-74)
Denmark	185	90 (-51)	48 (-74)	274	136 (-50)	136 (-50)	77	72 (-6)	70 (-9)	162	86 (-47)	86 (-47)
Finland	232	116 (-50)	116 (-50)	276	162 (-41)	162 (-41)	40	31 (-23)	31 (-23)	213	112 (-47)	112 (-47)
France	1250	489 (-61)	256 (-80)	1867	1044 (-44)	757 (-59)	805	798 (-1)	727 (-10)	2399	1242 (-48)	866 (-64)
Germany	5280	608 (-88)	453 (-91)	2662	1263 (-53)	1062 (-60)	757	571 (-25)	396 (-48)	3066	1137 (-63)	947 (-69)
Greece	504	562 (+12)	562 (+12)	345	344 (0)	338 (-2)	80	74 (-8)	74 (-8)	336	205 (-39)	202 (-40)
Ireland	178	70 (-61)	32 (-82)	113	81 (-28)	66 (-42)	127	126 (-1)	122 (-4)	111	46 (-59)	46 (-59)
Italy	1679	593 (-65)	593 (-65)	2037	1186 (-42)	879 (-57)	462	416 (-10)	416 (-10)	2053	1176 (-43)	935 (-54)
Luxemb.	14	4 (-71)	4 (-71)	22	10 (-55)	5 (-77)	7	7 (0)	7 (0)	19	8 (-58)	5 (-74)
Netherl.	201	74 (-63)	53 (-74)	542	312 (-42)	261 (-52)	233	136 (-42)	106 (-55)	490	241 (-51)	154 (-69)
Portugal	284	146 (-49)	146 (-49)	208	197 (-5)	112 (-46)	71	67 (-6)	67 (-6)	217	144 (-34)	127 (-41)
Spain	2189	793 (-64)	759 (-65)	1162	892 (-23)	822 (-29)	352	353 (0)	353 (0)	1048	669 (-36)	669 (-36)
Sweden	119	67 (-44)	67 (-44)	338	200 (-41)	181 (-46)	61	48 (-21)	48 (-21)	492	287 (-42)	235 (-52)
UK	3805	980 (-74)	537 (-86)	2839	1186 (-58)	1186 (-58)	329	297 (-10)	264 (-20)	2663	1351 (-49)	1032 (-61)
EU15	**16348**	**4842 (-70)**	**3731 (-77)**	**13226**	**7333 (-45)**	**6171 (-53)**	**3576**	**3159 (-12)**	**2807 (-22)**	**14017**	**7123 (-49)**	**5651 (-60)**



the NEC scenario. (The 8-hour value of 60 ppb serves as an indicator of deleterious effects on human health.)

Although no targets have been set for stopping eutrophication, improvements can nevertheless be expected as result of lower emissions of nitrogen oxides and ammonia. The area of sensitive ecosystems where critical loads are being exceeded is estimated to drop from 67 million hectares or 55 per cent of the total in 1990 to 41 million hectare (34 per cent) in 2010, if emissions of those pollutants should be cut in accordance with NEC scenario.

Benefits outweigh costs

The Commission also engaged another consultant, AEA Technology, to make an analysis of the quantifiable gains from reducing emissions in terms of money. Account was taken chiefly of the effects on human health (morbidity and mortality), on farm crops and modern buildings and materials. As reported in Acid News 2/98 (pp.16-17), there is still considerable uncertainty as to how to evaluate mortality. The problem lies in the division between acute and chronic effects, and also the value to be assigned to a lost life. Some prefer to consider the value of a statistical life (VOSL), others a valuation of life-years lost (VOLY). To be on the safe side, the consultants have done both.

Their calculations show quantifiable gains under the NEC scenario to amount to about 22 billion ecus a year in 2010, using VOLY, or 43 billion by VOSL. It should however be noted that a number of gains have not been included, such as less acidification of soil and water, less eutrophication, fewer effects on biological diversity, less long-term effect on forest productivity, and less damage to historical monuments.

Proposal coming soon

During the next few months the directive on ceilings for emissions will be a matter for internal negotiation within the Commission. A communication is expected by February or March next year. This will include three proposals, one being for the directive for ceilings on national emissions of SO_2, NOx, VOCs, and NH_3, another the strategy for ozone reduction, and the third a daughter directive giving air-quality standards for ozone. The next step will be for the European Parliament of make itself heard in these matters, followed by negotiations between the member countries in the Council of Ministers. The whole procedure is expected to take one or two years before a final directive can be adopted by the Council, depending on whether any great differences of opinion should arise.

CHRISTER ÅGREN

[1] *Sixth Interim Report to the Commission on Cost-effective control of acidification and ground-level ozone*. IIASA 1998. In three parts, all available on Internet: www.iiasa.ac.at/~rains/. The titles are: Part A, Methodology and databases. Part B: Emission control scenarios. Part C: Economic evaluation of proposals for emission ceilings for atmospheric pollutants.

Table 2. Costs of emission control under the NEC scenario For 2010, in million ecus per year.

Austria	137
Belgium	1361
Denmark	22
Finland	0
France	1453
Germany	3181
Greece	19
Ireland	77
Italy	640
Luxembourg	46
Netherlands	944
Portugal	284
Spain	30
Sweden	40
UK	904
EU15	9139

Table 3. Acidification. Unprotected ecosystem areas: with acid deposition greater than the critical loads.
1000 hectres and per cent (in parenthesis).

	1990		REF		NEC	
Austria	2373	(47.5)	189	(3.8)	94	(1.9)
Belgium	410	(58.3)	162	(23.1)	53	(7.6)
Denmark	54	(13.9)	9	(2.3)	5	(1.3)
Finland	4722	(17.3)	1166	(4.3)	1130	(4.1)
France	8191	(25.8)	226	(0.7)	90	(0.3)
Germany	8156	(79.5)	1750	(17.1)	691	(6.7)
Greece	0	(0.0)	0	(0.0)	0	(0.0)
Ireland	97	(10.7)	12	(1.4)	9	(1.0)
Italy	2064	(19.5)	87	(0.8)	58	(0.6)
Luxembourg	58	(66.7)	6	(6.7)	1	(0.9)
Netherlands	285	(89.3)	198	(61.9)	76	(23.7)
Portugal	1	(0.0)	1	(0.0)	1	(0.0)
Spain	78	(0.9)	18	(0.2)	17	(0.2)
Sweden	6344	(16.4)	1599	(4.1)	1356	(3.5)
UK	4117	(43.0)	1200	(12.5)	680	(7.1)
EU 15	36950	(24.7)	6623	(4.4)	4260	(2.9)

Bringing about improvements

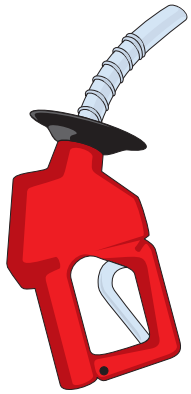
Through tax differentials, better fuels have come rapidly onto the market

SWEDEN AND FINLAND have led the way with less-polluting motor fuels. They have done this by using tax differentials – with a complete transformation of the market for petrol and diesel fuel as a result. Legislation has now been passed in the EU, too, making stricter specifications mandatory for these fuels (see AN 3/98, pp. 8-9). And for an analysis of the results obtained in Sweden and Finland from improving motor fuels, the governments of the two countries commissioned a report[1] from the consultants Arthur D. Little.

The reason for wanting to improve the quality of motor fuels was of course to reduce those exhaust emissions that have an adverse effect on human health and the environment in general. Sulphur in petrol, for instance, affects the performance of three-way catalyzers, so that less sulphur in the fuel will result in lower emissions of nitrogen oxides, volatile organic compounds, and carbon monoxide. With lower concentrations of sulphur and aromatics in diesel fuel there will be decreased emissions of particulate matter and carcinogenic substances. Moreover, secondary treatment of the exhaust gases from diesel engines is only possible if the sulphur content is kept below about 50 ppm (parts per million). In Sweden, the maximum content for Class 1 diesel fuel is 10 ppm.

Environmentally classified diesel qualities began to be marketed in Sweden in 1991, and those for petrol in 1994. In Finland reformulated grades both for petrol and diesel had appeared in 1993. It was feared, when these moves were being planned, that consumers would not switch to cleaner fuels if they were more expensive, and so refiners would not invest more in the necessary plant than they were legally obliged to do. To provide incentives, the taxes were differentiated, making them higher for the more-polluting fuels than for the cleaner ones.

The tax differentials were large enough to induce the industry to invest in plant, yet without having to increase consumer prices for the improved fuels. It is worth noting, however, that in most cases the tax differential was only a fraction of the normal annual price fluctuations due to movements in world markets. Whereas in 1996, for example, the consumer price variation for petrol in Sweden was 0.07 ecu per litre, the tax differential between environmentally classified petrol and the standard quality was 0.007 ecu.



The refineries responded by investing approximately 543 million ecus in the period between 1990 and 1996. Of this total, 178 million ecus was for producing improved petrol, and 365 million ecus for improved diesel fuel. Whereas in 1991 the refinery configurations in Sweden and Finland were in general similar to those in the rest of the EU, by 1996 they had become very different. Capacity for desulphurization and de-aromatization had increased, as had the use of oxygenates. Benzene precursors from reformers had also been removed.

The consultants have estimated the cumulative value of the tax differentials due to the use of improved fuels to have been about 741 million ecus for the two countries up to 1996. This may be compared with the estimated cost to the industry of 709 million ecus for investments, increased operating costs, and "sulphur premia" for low-sulphur fuels.

Some of the benefits – or reduced environmental costs – resulting from the decreased emissions were also estimated, being put at 170 to 230 million ecus for the period between 1992 and 1996. The consultants stress however that these types of estimate for benefits are subject to much debate, and should therefore only be regarded as indicative. Swedish national estimates, for instance, give significantly higher figures for reduced environmental costs. Moreover the methodology that was used did not take into account reductions in the emissions of polyaromatic hydrocarbons (PAHs) or benzene.

The conclusion of the study was that differentiating taxes is a quick and effective method for changing market conditions so as to enable improved fuel qualities to gain a dominant share. If consumers should be unwilling to pay a higher price for less-polluting fuels, the tax differentials need to be large enough to induce refiners to produce the improved fuels, by providing cover both for the necessary investments and the increased operating costs. After the investments have been made, and the new fuels have come onto the market, a new steady state will have been achieved, and the tax differentials can then be altered to reflect changing market conditions.

As used in Sweden and Finland, tax differentials brought improved fuels rapidly onto the market. Besides giving the country's refiners an incentive to make the investments, they also seem to have had a positive effect on their operations. Exactly how much the environmental costs have been reduced is uncertain. Since such costs are largely associated with human health, however, it may be assumed that even greater benefits than those noted in Sweden and Finland would result from the introduction of improved fuels in more densely populated areas of Europe.

CHRISTER ÅGREN

[1] *Case Study – The introduction of improved transport fuel qualities in Finland and Sweden*. By Arthur D. Little AB, Box 70434, S-107 25 Stockholm, Sweden.

ILLUSTRATION - IN PRINTED VERSION ONLY

PHOTO: VCS/ATE

TRANSALPINE ROAD TRAFFIC

End to deadlock

IN A REFERENDUM in September the Swiss voted for big rises in charges on heavy trucks. Besides helping to switch freight to the railways, this should put an end to the differences between Switzerland and the EU over transit traffic through the Alps.

Instead of the present charge for transit trucks of 25 francs per time, there will be one fixed according to the weight of the truck and the distance to be travelled within Switzerland. To begin with, in 2001, the charge will be 0.016 franc per tonkilometre, but will rise to 0.026 franc in 2005. Thus a typical movement with a truck of the present permitted size (28 tons and 300 kilometres) would cost 134 francs in 2001 and 220 francs in 2005. But the allowable truck weight is to be increased to 34 tons in 2001, and to 40 tons (EU maximum) in 2005.

The income from the charges is estimated to be 750 million francs in 2001 and about twice that amount in 2005. About 65 per cent will be paid by Swiss truckers – transit traffic accounting for about 35 per cent of the truck movements in Switzerland.

Half of the money is intended to be used for financing two new railway tunnels, a huge expansion of the railway network, and noise-screening arrangements along the transit routes. These plans must however first have been agreed in another referendum, on November 29. The higher charges on road transport, together with improvements in the railway infrastructure, are expected to lead to more of the freight through the Alps being carried by rail.

An interesting aspect of the deal is that the amounts of the charges have not only been set so as to pay for investments in the infrastructure, but also to internalize some of the costs that heavy road transports do not now incur, such as environmental damage. According to Swiss government sources, the external costs of heavy road traffic now run to 1.5 billion francs a year.

The charge schedule that the Swiss electorate has now approved had already been agreed by the EU transport commissioner, Neil Kinnock, earlier this year, thus making it possible to break the four-year deadlock in the negotiations between Switzerland and the European Union concerning traffic through the Alps. The matter will be taken up by the transport ministers of the EU countries when they meet on November 30.

It is hoped that settlement of the Swiss transit problem will ease the way to a general solution for charging heavy road traffic in the whole of EU, as proposed in the Eurovignette directive (COM(96)331). See AN 4/96, p.5 and 2/97, p.5).

Sources: *Environment Watch: Western Europe*. October 2, 1998. *T&E Bulletin*, October 1998. David Asseo, Verkehrsclub Schweiz/Association transports et environnement, Switzerland. E-mail: d.asseo@vcs-ate.ch.

EU NEWS DIGEST

Agreeing

As expected, both the Parliament and the Council of Ministers accepted the compromise solutions for passenger cars and light commercial vehicles, and also for the quality standards for liquid fuels, which had come about through conciliation this summer. The directives that have now been agreed upon, with specific requirements for the years 2000 and 2005, constitute part of the auto-oil package (see AN 3/98, pp. 8-9).

Not yet

Soon after Parliament and the Council had agreed on the above matters, the former started calling for action on emissions from heavy vehicles. Its main contention is that emission standards for 2005 should be set without delay. The proposal put forward by the Commission in December last year only included requirements for the year 2000 (see AN 1/98). The Commission, however, wants to await the possible findings of further research before making any definite proposals for 2005, and most of the EU countries seem to agree that this would be reasonable.

Now for tractors

Tractors used in agriculture and forestry should have to comply with the same emission standards as other heavy non-road equipment, says the Commission in a proposal for a directive that it presented in September. The directive for other non-road equipment, which was finally adopted in the autumn of 1997 (see AN 1/98, p.8 and 4/96, p.7), contains only mild requirements, at least compared with those for the engines of heavy road-using vehicles. Since however all such equipment had previously been unregulated, the gains will nevertheless be considerable. When fully applied, the new rules are expected to result in reductions in the emissions of particles, hydrocarbons, and nitrogen oxides by 67, 29, and 42 per cent, compared with what could otherwise have been expected from this type of engine.

Motorbikes

Stricter emission requirements for motorcycles are awaited next year. If accepted, they will apply either from 2003 or 2005. The Commission has also announced rules for cutting the noise from two- and three-wheelers, which would be a matter for a separate directive.

Environment Watch: Western Europe. October 2, 1998.

Old plants are the problem

By concentrating on new plants, the Commission's proposal will have little effect

THE EU COMMISSION has recently had the IIASA make a forecast[1] of the likely emissions of air pollutants from large combustion plants in 2010, so as to be able to judge the effect of its proposals for a revision of its directive of 1988 concerning such plants. Although it appears from a preliminary outcome of the IIASA study that the Commission's proposed limit values would certainly result in a distinct reduction of emissions from new plants, the overall reduction would be very small. To really reduce the emissions of sulphur and nitrogen oxides within the next ten years, measures will therefore have to be taken for control at existing plants as well as new ones.

ILLUSTRATION - IN PRINTED VERSION ONLY

For its analysis the IIASA first set up a data base with details of the various plants (such as the type of fuel burnt, their capacity and age) in all fifteen member countries. Since the target was the year 2010, it was necessary to make assumptions as to the use of energy in that year, and the scenario chosen for this was the Conventional Wisdom one from the Commission's energy directorate (DGXVII). That scenario does not however take into account the commitments made by the EU to bring down emissions of greenhouse gases in accordance with the Kyoto protocol. Instead it figures increased emissions of carbon dioxide, the main greenhouse gas.

Other important factors that had to be taken into account were a) the shape of plants yet to be built, their capacity and the type of fuel they will use, b) load factors, the extent to which capacity would be used during the year, and c) how long existing plants would be kept going. Although some information could be obtained from the member countries and various trade associations, in many cases the IIASA had to make assumptions about these things. For operational lifetime a technical age of 30 years is assumed for boilers in manufacturing industry, and 40 years for those in power plants.

After having compared the official emission requirements with the reports of actual emissions, the IIASA consultants concluded that plants were usually being operated in such a way that the long-term average emissions were well below the legal requirements. The reasons were that

❒ Plant operators were wont to aim at having a margin of safety up to the ELVs (emission limit values), so as to avoid interruptions in the production of electricity and heat from unexpected events. The margin was usually between 20 and 40 per cent.

❒ In some countries emission charges can make it financially worthwhile to use the potential for emissions abatement to the outmost in order to minimize charges.

❒ Because the extra operating cost of more-efficient emission control is often small, some operators choose to improve the environmental performance of their plants as a means of bettering or at least retaining a good public image for their company.

❒ It is usually good engineering practice to operate existing technical equipment at the best possible mode.

Consequently the IIASA has estimated emissions for 2010 in two ways – one under the assumption that emissions would be in exact correspondence with the legal emission limit values, the other by taking a more realistic empirical approach and sticking to the fact that most plants can show emissions that are below the legal requirements.

The consultants also split the plants in three categories, according to their date of licensing – before 1987, between 1987 and 1999, and after January 1, 2000. It is of course only plants in this last category that are covered by the Commission's proposal for revision of the LCP directive.

The proposed ELVs for the post-2000 plants would, taking the empirical approach, lead to a reduction of the emissions of SO_2 from such plants from about 156,000 to 78,000 tons a year, or a halving by 2010. The emissions of NOx that year would be lower than they would otherwise have been, dropping by about a quarter, from 108,000 to 80,000 tons a year.

© CHRISTER ÅGREN

Estimated emissions of SO_2 and NOx from LCPs in the EU in 2010 (ktons).

	— Age class —			Total emissions
SO_2	pre-1987	1987-1999	post-2000	from LCPs
Current legislation	1918	266	156	2239
1998 revision	1918	266	78	2261 (-3%)
Full penetration	324	121	78	523 (-78%)
NOx				
Current legislation	627	168	108	903
1998 revision	627	168	80	875 (-3%)
Full penetration	343	129	80	551 (-40%)

Again taking the empirical approach, the IIASA has made estimates of the total emissions of SO_2 and NOx from all large combustion plants in the fifteen EU countries in three different cases.

❒ Under current legislation, giving the likely emissions in 2010 without taking into consideration the effects of the Commission's proposals for new ELVs for post-2000 plants.

❒ With the 1998 revision, showing the expected effects of the proposed ELVs for the post-2000 plants.

❒ A hypothetical "full penetration" case, with the revised ELVs applied to all large combustion plants, irrespective of their age. (To provide a rough idea of the situation in the distant future, when all the boilers installed before 2000 will have been phased out, and all the remaining ones subject to the new ELVs. Future changes in the energy structure were ignored.)

The results of these various calculations can be seen in the table. With the likelihood of few new plants being built between 2000 and 2010, the proposed ELVs can only be expected to produce a limited reduction of emissions by 2010. The emissions from LCPs, both of SO_2 and NOx, would be about 3 per cent less. Considering the total of emissions from all sectors, the falloff would be only 1 per cent for SO_2 and one-half per cent for NOx.

It is worth noting that the use of fossil fuels will have to be lower than has been assumed in the energy scenario used by IIASA, if the EU is to honour its commitments under the Kyoto protocol. The IIASA figures for the emission reductions resulting from application of the EU Commission's proposals most therefore be overestimates rather than underestimates.

In any case the Commission's proposals will only result in modest reductions, the reason being that far and away the greater part of the emissions from LCPs, both now and in 2010, will come from existing plants. According to the IIASA estimates, in 2010 85 per cent of the emissions of SO_2, and 70 per cent of those of NOx, will come from plants built before 1987.

CHRISTER ÅGREN

[1] *Impacts of revised emission limit values for large combustion plants on EU15 emissions in 2010.* Draft final report to the European Commission, DGXI. Contract No. M5-9000/97/00636/MAR/E1. By the International Institute for Applied Systems Analysis, Austria.

CALL FROM ENVIRONMENTALISTS

For putting requirements on existing plants

THE EU Commission's proposal for a revision of its directive on large combustion plants has now been openly criticized in a document issued by three European environmentalist organizations,[1] who maintain that it will fail to protect either the environment or people's health, and that the requirements set down in it in no way correspond to the possibilities of the engineering techniques that are now available. The three organizations are therefore calling for a further tightening of the proposed emission limits for new plants, and for requirements to be put on existing ones.

In the preliminaries, its so-called explanatory memorandum, the Commission claimed that the proposed amendments to the directive would support implementation of its acidification strategy as well as its measures for reducing ground-level ozone. While agreeing that this what they ought to do, the environmentalists consider that the Commission's proposals will do little or nothing to further the stated aims.

The environmentalist organizations base their criticism in part on an analysis made for the Commission (see previous page) showing that the amendments will have done very little to reduce emissions by 2010, the year when the interim targets of the acidification strategy were to be attained. If there is to be any marked reduction of emissions from large combustion plants within the coming ten years, say the NGOs, further requirements will have to be placed on existing plants, not only on the new ones. Not only will this be necessary, it will also be cost-effective.

After 2000 the LCPs will be split into three categories, each subject to different requirements: those licensed before July 1, 1987; between that date and January 1, 2000; and after January 1, 2000. In other words, pre-1987, post-1987, and post-2000. It is only for those in this last category that the proposed new emission limit values are to be mandatory.

Since they consider the new ELVs fail to match the best available techniques, the environmentalist NGOs are proposing stricter standards, as shown in Table 1.

It is the lack of measures to curb emissions from existing plants that causes the severest criticism. The NGOs are therefore putting forward an alternative proposal, namely to have emission limits set, from January 1, 2004, for all existing plants covered by the directive. In other words, the pre-1987 as well as the post-1987 ones. The consider that five years should give the plant operators ample time for readjusting. The requirements that the NGOs are now pushing are essentially the same as those that have been

Continued on next page

Table 1. NGO proposals for post-2000 plants. Emission limit values expressed as milligrams per cubic metre (mg/m^3). Plant sizes in megawatts thermal input (MW_{th}).

	Sulphur dioxide			Nitrogen oxides		
Plant size →	*50-100*	*100-300*	*>300*	*50-100*	*100-300*	*>300*
Solid fuels	200	100	100	200	150	150
Liquid fuels	200	100	100	200	150	150
Biomass	200	100	100	200	150	150
Natural gas[1]	10	10	10	100	75	75

[1] For gas turbines using natural gas, the limit value should be 50 mg NOx/m^3.

Table 2. NGO proposals for existing plants. Emission limit values to become mandatory as from January 1, 2004. The underlined figures are the same as those that have applied to new plants from 1987, according to the LCP directive of 1988. Units as above.

	Sulphur dioxide			Nitrogen oxides		
Plant size →	*50-100*	*100-500*	*>500*	*50-100*	*100-500*	*>500*
Solid fuels	850	850-400[1]	400	650	650	300
Liquid fuels	850	850-400[1]	400	450	450	300
Gaseous fuels	35	35	35	350	350	200

[1] Linear decrease.

Continued from page 9

applicable for new plants since 1987. See Table 2. In the former West Germany even stricter requirements had been in force since the early eighties.

Since the proposed ELVs are far below the levels that can already be attained by current techniques, certain adjustments are urged – involving somewhat stricter requirements for sulphur emissions from small and medium-sized plants (up to 500 MW_{th}), as well as a tightening of the requirements for NOx emissions from the largest plants (with capacities greater than 500 MW_{th}).

To prove that their proposals for harder emission limit values are both technically and economically sound, the environmentalist NGOs have appended to their criticism of the Commission's proposals a list with data from more than fifteen plants now in operation in four of the EU member countries. These plants are of various age and size, and fired by a variety of fuels. Common for them all is that they easily surmount the requirements proposed by the NGOs for existing plants, as set forth in Table 2. Several of them can record emission levels that are already considerably lower than the limit values proposed by the Commission for plants coming into operation after 2000.

The environmentalists propose moreover that the Commission should be advised to prepare schemes for the use of economic instruments, such as taxes or charges, to be applied within the EU as means of bringing down emissions still further. They would also like to see the exceptions for some emission sources and certain types of fuel, which are still included in the Commission's proposals for a revised directive, cut out. And they urge that it should be required of the EU member countries to publish emission data for all the plants concerned.

CHRISTER ÅGREN

[1] *The large combustion plants directive: Comments to the Commission's proposed revision*. By The European Environmental Bureau, The European Federation for Transport and Environment, and the Swedish NGO Secretariat on Acid Rain. Available from the EEB, 34 Bd de Waterloo, 1000 Brussels. Tel. +32 2 2891090. Fax. +32 2 2891099. Can also be downloaded from the secretariat's website under "News" at: www.acidrain.org.

NITROGEN

Dutch hold first international conference

REALIZING that the pivotal function of nitrogen and its complex mutations needed to be elucidated, the Dutch Ministry of Housing, Spatial Planning and the Environment and the National Institute of Public Health and the Environment took upon themselves to arrange the First International Nitrogen Conference. This was held last March at Nordwijkerhout and attended by some 200 delegates. About a hundred verbal presentations were given, and a like number of poster presentations.

Here are some of the highlights of the statement adopted by the delegates at the conference:

❒ An integrated approach is strongly recommended for the abatement of nitrogen pollution. This will enable targets for acidification, eutrophication, health, and global warming to be met simultaneously.

❒ The region where human perturbation of the nitrogen cycle is highest is Asia. Unless drastic measures are taken, the problems of nitrogen will remain greatest here.

❒ One way of bringing about a reduction of nitrogen in the environment would be to attach the environmental costs to the prices of raw materials or of products.

❒ A high potential for the reduction of emissions lies in social changes, such as an increased use of bicycles, a greater turning to vegetarian diet, etc. There will need to be an increase in education, communication, and public awareness. The time needed to bring about the necessary changes could be greatly reduced by using financial incentives.

❒ The most effective way of reducing the emissions of ammonia will often be to lower the number of animals in food production. There are also technical methods for using ammonia much more efficiently in agriculture, although they will require more mixed farming in place of today's specialization.

This first nitrogen conference was held under the auspices of the Convention on Long Range Transboundary Air Pollution, and a second one is planned to take place in the United States in 2001.

A summary statement from the Nordwijkerhout conference can be obtained from Stan Smeulders, Ministry of Housing, Spatial Planning and the Environment, P.O. Box 30945, 2500 GX Den Haag, The Netherlands. E-mail: s.m.smeulders@dle.dgm.minvrom.nl.

About a hundred of the addresses and papers presented at the conference will appear in a special issue of the journal *Environmental Pollution* late in 1998. They will also be available in book form from Elsevier Science (ISBN 008 0432018). For information, please turn to nlinfo-f@elsevier.nl.

Effects of various forms of nitrogen

Nitrogen oxides are known to conduce to respiratory diseases in humans, either through direct exposure or indirectly by partaking in the formation of ground-level ozone and other photochemical oxidants, as well as fine particulate aerosols.

Crops, forest trees, and entire ecosystems can also be damaged by ozone.

Nitrogen oxides and ammonia add to acidification, which not only affects natural ecosystems but also helps to intensify corrosion and in some cases has even spoilt drinking water.

Both of these pollutants contribute to eutrophication, which hits biological diversity on land and in water, and affects groundwater.

Depositions of nitrogen oxides and ammonia – as well as the addition of nitrogen to arable land through the spreading of manure and artificial fertilizer – result in increased formation of nitrous oxide by microorganisms in the soil. Nitrous oxide, N_2O, is a powerful greenhouse gas.

Emissions of nitrogen oxides from aircraft cruising at great heights help to break down the ozone layer. At lower heights the nitrogen oxides contribute to ozone formation, probably with a significant effect on climate.

Nitrogen oxides make for reduced visibility at places of scenic interest and also at airports.

One single nitrogen atom can give rise to a veritable cascade of effects, such as by first contributing to the formation of urban smog, then either to acidification or eutrophication, or both, and finally to the greenhouse effect by conversion to nitrous oxide.

ILLUSTRATION - IN PRINTED VERSION ONLY

© CALLE BERGIL

NITROGEN

Affecting the flora in South Sweden

THE NUMBER of species of vascular plants has become almost halved of late in nutrient-poor fens in southern Sweden. The species most affected has been few-flowered sedge (*Carex pauciflora*), which has declined by 97 per cent, although closely followed by brown beak-sedge (*Rhyncospora fusca*) and dioecious sedge (*Carex dioica*), both of which have fallen away by 95 per cent. But many species associated with nutrient-rich fens, natural pasturage, raised bogs, and waters poor in nutrients have often gone into sharp decline too. There has on the other hand been little change in species growing on forest land. Altogether forty-six species have declined by more than 75 per cent.

These facts were revealed by the botanist Torbjörn Tyler when he compared the present situation with the results of inventories made in the period from 1938 to 1971. He maintains that the changes on rich fens and unfertilized grasslands are mainly ascribable to changes in land use, but that other explanations must be found for what has happened on unfarmed land, such as nutrient-poor fenland and raised bogs. One explanation might be the extensive fallouts of nitrogen. For several decades depositions in southernmost Sweden have amounted to 10-30 kilograms per hectare a year. It can be seen from statistical analysis that species favoured by nitrogen have increased most in every kind of environment, while species that are known to be at a disadvantage on nitrogen-rich soils have declined.

It seems in any case clear that nitrogen is having a greater effect on flora than acidification. Tyler notes, too, that the findings from South Sweden correspond closely with those from similar counts in the Netherlands and eastern Germany.

The effects of nitrogen on the composition of the flora are confirmed by Tyler's list of species that have increased most between the two periods surveyed. Several species favoured by nitrogen, including spear-leaved orache (*Atriplex prostrata*), many-seeded goosefoot (*Chenopodium polyspermum*), and dewberry (*Rubus caesius*), have all become two or three times more common in the region.

PER ELVINGSON

Tyler T. & Olsson, K.A. 1997: *Förändringar i Skånes flora under perioden 1938-1996 – statistisk analys av resultat från två inventeringar*. Svensk Botanisk Tidskrift 91:143-185. In Swedish, but with an English summary.

EU NEWS DIGEST

Exposing polluters

A list of the largest point sources for emissions of a number of substances, published by the EU Commission, is due to appear in 2001, as a result of the directive on integrated pollution prevention and control that will come into effect in October next year (see AN 2/98, pp.11-14). The directive lays down uniquivocally that such a list, giving the principal emissions and their sources, is to be issued every third year. Although some of the key provisions of the directive will not affect existing installations until October 2007, the Pollution Emissions Register avoids this restriction. From the start, too, it will include emissions from existing plants as well as new ones, assures Peter Wicks at the Commission.

Environment Watch: W. Europe. October 2, 1998.

Benzene in air

The Commission's environment directorate wants to set a limit value for benzene of 5 micrograms per cubic metre of air, yearly average, to be achieved by 2010 at the latest. No exceeding of the limit would be tolerated. The proposal for this was put forward at a meeting with the Commission's advisory group on air quality in October.

The average background level of benzene in the air of European cities is often twice as high as the proposed limit. In streets it may be three to four times higher again, according to the Commission. Since petrol-driven vehicles are the main source, acceptance of the proposal will mean that measures to curb traffic will be necessary in many places. Some improvement may however be expected before 2010, since it has already been decided to limit the benzene content of petrol to 1 per cent from the year 2000, and there will be sharpened requirements for the exhaust emissions from new cars in 2000 and further in 2005 (see AN 3/98, pp. 8-9).

Infrastructure spending

More money needs investing in European transport infrastructures, is the Commission's view after an evaluation of the progress of Trans European Networks, TENs. The Commission's attitude is that roads and railways help to promote development of the common market, to boost GDP, and create new jobs. It thinks the member countries had performed badly in this respect, and urges the need on the one hand for other forms of investment, and a doubling of the EU budget for this purpose on the other.

Press release from the Commission, October 28, 1998.

NEWS DIGEST

CO_2 from cars

As expected, the EU environment ministers gave their approval to the agreement on emissions of carbon dioxide from cars that had been reached between the Commission and ACEA, the automobile industry's trade association, this summer (see AN 3/98, p.7). The ministers were however careful to emphasize that the target set in 1996 – to bring down the emissions of carbon dioxide from the average new car to 120 g/km by 2005, or at latest by 2010 – still applied. The agreement with the ACEA will result in its being 140 g/km in 2008. Among the further measures needed to achieve the ministers' target, special taxes and tax incentives have been mentioned, as well as a fuel-economy labelling scheme for the whole EU.

Environment Watch: Western Europe. October 16, 1998.

More for railways

Among the various forms of transport infrastructure, roads have so far got the most out of the EU cohesion fund. In 1997, however, almost a third of the outpayments went to railways, according to an October report from the Commission. This was also the first year in which more was paid out for environmental projects than for transportation. The fund disburses 2.7 billion ecus a year for infrastructure projects for transport and environment, and in the poorer EU countries, which now means Spain, Portugal, Greece, and Ireland, the Commission intends to continue as at present, but also wants to set up a special fund for paying 1 billion ecus a year for transport and environmental projects in the candidate countries, to help bring their environmental standards into line with EU laws.

French hybrid

Saxo Dynavolt it the name of a prototype that Citroën unveiled at the Paris Motor Show. Basically it is an electric car, supplemented by a Peugeot scooter engine mounted under the back seat. Before starting off, the driver taps in the proposed route length and the car then works out how much the petrol engine will be needed. For distances up to 80 kilometres the car can run on electricity alone, after which the batteries can be charged from an ordinary electric outlet. With a full 15-litre tank, and the batteries fully charged, the driving distance can however be extended to 340 kilometres, according to the car maker. No decision has yet been made for mass production.

Ny Teknik. No. 42, October 15, 1998.

ILLUSTRATION - IN PRINTED VERSION ONLY

GAS DRILLING, YAMAL PENINSULA © V. LARIN

RUSSIA

Problems of burning fossil fuels efficiently

IN RUSSIA, as in most other countries, coal is becoming less and less used for power production. Natural gas is already the most widely used source of energy, and its share is growing – a trend that is expected to continue at least until the year 2010. This is all to the good, since the harmful emissions are less than from coal and oil.

Both coal and oil from domestic sources in Russia are for the most part of low quality, with high contents of sulphur. Coal mining has however been steadily declining since 1990, from 387 million tons to 255 million (in 1996, the last year for which figures are available).

Figures for emissions of air pollutants are difficult to obtain in Russia, and even official data is often put in question. The reason is chiefly that monitoring is mainly a matter for the individual generators. Impartial measuring of the emissions by the regional offices within GosComPrirodi – the State Committee of the Russian Federation for Protection of the Environment – is still not common. Emissions of air pollutants from power generating do nevertheless show a downward trend (see table).

Standards do exist for limiting the emissions of air pollutants from Russian power plants. The last, which were promulgated in 1995, set rules for plants built both before and after 2000, and are comparable with EU standards. But poor administration coupled with Russia's present financial state means that checks on compliance are seldom carried out, and so enforcement is often lacking.

Despite the hard times for Russian industry, engineers are busily designing more efficient and less polluting systems for burning coal and other fossil fuels, and several are already being tested in old thermal power stations. Equipment is also being tested for removing 99 per cent of the sulphur from flue gases.

In the aftermath of communism, Russia's economy is in a state of limbo, and it may be some time before the difficulties of the transition period can be overcome, and full attention given to the problems of burning fossil fuels efficiently, so that environmental standards can really be attained.

VLADISLAV LARIN

The writer is senior expert at the Moscow ECOPRESSCENTER, st. Rogova, 12 - 46, Moscow 123479, Russia. Tel. (7-095)-947- 19-09. E-mail: larin@glasnet.ru

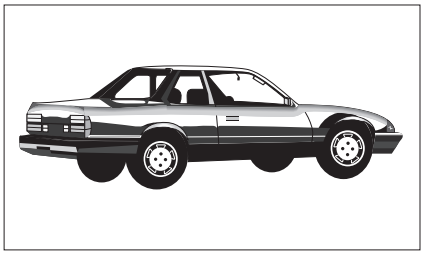
Emissions of harmful pollutants from Russian thermal power stations (million tons).

	1991	1992	1993	1994	1995
SO_2	3.1	2.7	2.4	2.2	2.1
NOx	1.6	1.5	1.4	1.2	1.2

AMMONIA

Surprisingly great emissions from cars

SINCE 1993 all new cars in the EU have had to be equipped with catalytic converters, which greatly reduce the emissions of air pollutants such as nitrogen oxides, volatile organic compounds, and carbon monoxide. But it is evidently less known that catalyzers actually increase the emissions of ammonia, a pollutant that adds to eutrophication as well as acidification. According to a study[1] that has just been published in Sweden, the emissions of ammonia from cars with catalyzers may be much greater than has previously been believed, especially when cars are being driven hard. In terms of nitrogen equivalents, the amounts of ammonia may even be greater than those of nitrogen oxides.



The causes have been known for some time, both to researchers and the car manufacturers, and there are accepted computer models for calculating the emissions. An example is that used in CORINAIR, a program for assembling European emissions data that is run by the official European Environmental Agency. The EU member countries nevertheless give greatly varying figures for emissions of ammonia from road traffic. Some, such as Britain and Finland, have not reported any ammonia at all from that source for the latest CORINAIR statistics.

For the purposes of the Swedish study, four new cars were tested, with engine volumes from 1.6 to 2.8 litres. The results showed the emissions of ammonia to be relatively low during normal driving, but to be very much higher when the engine was being driven under high load, as for instance at very high speeds.

By using CORINAIR emission factors, the Swedish Environmental Protection Agency has figured that in 1996 those of the country's cars that were equipped with catalyzers emitted some 3100 tons of ammonia. Such cars accounted for a good 60 per cent of the country's total mileage for petrol-driven types. Older cars, without catalyzers, which made up the remaining 40 per cent of the mileage, only emitted 50 tons, according to the calculations.

In comparison, the emissions of nitrogen oxides for catalyzer cars in that year were put at 14,000 tons, as against 59,000 tons for those that were not so equipped (the emissions in each case expressed as NO_2). Calculated as pure nitrogen, the emissions from catalyzer cars would have been 4300 tons in the form of nitrogen oxides and 2600 tons in the form of ammonia.

It would appear from the Swedish study that the officially reported emissions of ammonia from catalyzer cars may be underestimates. If so, the emission factors that are now being used will have to be revised. More tests, with many more cars, will however be needed before any safe conclusions can be reached.

If it should turn out that the emissions have in fact been underestimated, and that there are ways of reducing ammonia without increasing the emissions of other pollutants, then there would be every reason to regulate the emissions of ammonia too through legislation. The very fact that the emissions of some pollutants apparently show a marked increase when the engine is being driven hard also suggests a need to consider a revision of the test cycle, which now includes no running at high load. Another conclusion that may be drawn from the study is that all countries should check over their emission statistics, so as to make their reporting as correct and comparable as possible.

CHRISTER ÅGREN

[1] *Ammonia emissions from cars with three-way catalytic converters*. June 1998. By J. Färnlund and P. Kågeson. Published by Rototest AB, Salemsvägen 20, 141 44 Rönninge, Sweden. Internet: www.rototest.com.

EMISSIONS TRADING

Curbing emissions of NOx in USA

ON SEPTEMBER 24 the Environmental Protection Agency unveiled its final plans for reducing emissions of nitrogen oxides, the aim being to improve air quality in those parts of the United States where the standards that had been set last year still remain unmet. The EPA estimates that when the new plan has been implemented, 31 million of the 138 million people living in those states will be able to breathe, for the first time, air that meets the health standard for ozone concentrations.

The plan, which is based on recommendations from thirty-seven states represented in the Ozone Transport Assessment Group as well as on extensive comment from the public, calls on twenty-two states and the District of Columbia to reduce their emissions of nitrogen oxides by a total of 28 per cent, or 1.1 million tons, by 2007. An emission ceiling has been set for each state, and each must have clean-air plans ready by September next year and the necessary controls by 2003.

While the states will have maximum flexibility in deciding how the reductions are to be achieved, the EPA suggests it can be done most cost-effectively by focusing on emissions from power plants. To try and ensure the greatest possible cost effectiveness, the EPA will in any case be working with the states to promote a market-based emissions-trading system for utilities.

The result should be an improvement in air quality not only in the affected parts of the United States but also in Canada (see AN 3/98, pp. 16-17). And not only will less ozone be formed: reduced emissions of nitrogen oxides will also mean less acidification and less eutrophication, lower concentrations of harmful airborne particles, and better visibility.

Source: EPA press release, September 24, 1998. Extensive information can be downloaded from the EPA Office of Air and Radiation website under "Recent actions" at: http://www.epa.gov/ttn/oarpg/.

ILLUSTRATION - IN PRINTED VERSION ONLY

© CHRISTER ÅGREN

EUROPEAN FORESTS

Damage has steadily increased

NOT MUCH IS HEARD nowadays about the state of the European forests. But as can be seen from the result of the continuous surveys, the situation is now much worse than it was when the alarm bells rang loudest in the mid-eighties.

In the summer of 1997 some 635,000 trees were examined in the national surveys carried out by thirty-two countries, and the results, from altogether 130 million hectares of forest land, can be seen from the table. Some 124,000 trees of the total covered in the national surveys, spread over about 5700 sample plots, were used for a Europe-wide assessment which revealed that 25.1 per cent of the trees were damaged. This means that at the time of sampling they had lost at least 25 per cent of their leaves or needles, judged by reference trees of the same species. The proportion was about the same as the year before, and about the same both for conifers and deciduous trees.

Still, conclusions are best not drawn from any single year – it is better to consider developments over a series of years. What makes this possible is a number of so-called common sample trees that have been examined every year. Between 1988 and 1997 it was about 30,000 a year, and from 1992 onwards 68,000 trees.

In the ten-year series the proportion of damaged trees had steadily increased, from 13 per cent in 1988 to 23 per cent in 1997. But because these common sample trees are not evenly spread over the continent, the survey puts more weight on what is happening in the Mediterranean region and along the Atlantic seaboard than in the rest of Europe.

The geographic spread was better in the 1992-97 series. But although the general trend was similar, a slight improvement could be seen in central and eastern Europe, where the proportion of damaged trees had dropped from 37.5 per cent in 1992 to 35 per cent in 1997.

Little has been added of late to what is known about the connection between air pollution and forest decline, although it is evident enough in places where the concentrations of air pollutants are very high. The critical concentrations for ozone, for instance, are frequently being exceeded in many parts of Europe. It is likely that air pollutants will tend to stress the trees even in low concentrations, making them more susceptible to damage from drought, frost, and insect attack, and continued acidification of the soil may be assumed to have a similar effect.

Long drought periods are considered to be a notable cause of forest damage in many countries. Air pollution is however reported to be a predisposing, accompanying, or locally triggering factor in a third of the countries. Combinations of natural factors, or interaction between natural and anthropogenic factors, may also be involved, although it is difficult to identify them.

Other surveys are also being made as part of the European effort to get a better understanding of cause and effect in forest changes (see for instance AN 4-5/97, p. 14). As it will be some years however before any results are available, in the meantime the annual surveys will be all that we have to go on.

PER ELVINGSON

Results from national forest-damage surveys 1995-97.
Percentage of trees in Classes 2-4 (defoliation >25 per cent).

	1995	1996	1997
Austria	7	8	7
Belarus	38	40	36
Belgium	24	21	17
Bulgaria	38	39	50
Croatia	40	30	33
Czech Rep.	58	72	69
Denmark	37	28	21
Estonia	14	14	11
Finland	13	13	12
France	12	18	25
Germany	22	20	20
Greece[1]	25	24	24
Hungary	20	19	19
Ireland[2]	26	13	14
Italy	19	30	36
Latvia	20	21	19
Lithuania	25	13	14
Luxembourg	38	38	30
Moldova	40	41	–
Netherlands	32	34	35
Norway	29	29	31
Poland	53	40	37
Portugal	9	7	8
Romania	21	17	16
Russia[3]	12	–	–
Slovak Rep.	43	34	31
Slovenia	25	19	26
Spain	24	19	14
Sweden	14	17	15
Switzerland	25	21	17
Ukraine	30	46	31
U.K.	14	14	19
Yugoslavia	–	4	8

[1] Excluding maquis. [2] Conifers only. [3] Data only from Kaliningrad and Leningrad regions.

Forest Condition in Europe. Results of the 1997 crown condition survey. 1998 Technical Report. 118 pp. + annexes. There is also a summary in *Forest Condition in Europe. 1998 Executive Report*. 48 pp. Both reports are available from the Programme Coordinating Centre of IPC Forests, c/o Federal Research Centre for Forestry and Forest Products (BFH), Leuschnerstr. 91, D-21031 Hamburg, Germany. Fax. +49 40 739 62 480. Internet: www.dainet.de/bfh/icpfor/icpfor.htm.

Country-by-country data for the period 1988-1996 can be found in Acid News 4-5/97.

Reduced tree growth at today's concentrations

The forest trees of northern Europe become more damaged by ground-level ozone than those in the south of the continent, despite the concentrations of ozone being lower in the north.

Ozone, a strong oxidant, is poisonous both to plants and animals. The greater sensitivity of northern forests can be explained by the relatively damp climate and the long hours of daylight in the summer. In consequence the stomata – the small "breathing holes" in leaves and needles – remain open for an exceptionally long time, enabling ozone to enter and cause damage. The chlorophyll content of leaves and needles drops, and they become prematurely aged, which means that the trees' ability to utilize solar energy diminishes.

By growing spruce in open-top chambers scientists have been able to determine how the ozone in the air affects growth. By transposing the results of the field tests to mathematical models they were able to calculate that with the ozone concentrations that are now common over southern Sweden, the growth in volume of a spruce tree during its whole lifetime could be reduced by 3-10 per cent compared with what it would have been in preindustrial times.

The average concentrations are now reckoned to be two to four times higher than they were then. It is however of more interest from the point of view of effects that plants' exposure to harmful concentrations of ozone (more than 30-40 ppb) has increased still more. It may therefore be reasonable to conclude that the present concentrations are causing forest owners considerable economic loss.

Note. The research on the effects of ozone on spruce has been carried out in collaboration between the Botanical Institution at Gothenburg University and the Swedish Environmental Research Institute (IVL). The findings are set forth in IVL Report B1306, which can be obtained from IVL, Box 47086, 402 58 Göteborg, Sweden. Internet: www.ivl.se.

ILLUSTRATION - IN PRINTED VERSION ONLY

Young spruce are cultivated in a kind of greenhouse equipped with a large fan, enabling ozone concentrations to be kept steadily within realistic climate conditions. (© IVL)

BRIEFS

Carfree day

On September 22 the central parts of 35 French cities were closed to all wheeled traffic except bicycles, public transportation, and electric or gas-driven vehicles. This was done voluntarily, although some of the closed-off areas were admittedly small or little more than symbolic. The car-free day was an idea of the environment minister, Dominique Voynet. It was intended to "regain space for pedestrians and cyclists in city centres, develop public transport, and reacquaint people with good-quality of air."

Of those subsequently polled, 85 per cent thought it was a good idea. Only 19 per cent of the car owners said however that they would be willing to leave the car at home on days of high pollution.

Environment Watch: Western Europe, October 2, 1998.

Oil companies cut CO_2 emissions

The multinational concern British Petroleum, BP, has declared its intention of reducing its emissions of carbon dioxide by 10 per cent between 1990 and 2010. According to BP's own figures, in 1990 it was letting out 40 million or so tons of CO_2 worldwide. Part of the proposed reduction will come about through emission trading among BP's twelve companies around the world.

Notice of a 10-per-cent reduction of greenhouse-gas emissions has also been given by Shell, but in this case by 2002. It expects to be able to achieve this by a general increase in efficiency and reduced venting and flaring of natural gas both in exploration and production, as well as by concentrating more altogether on natural gas.

These two oil companies are thus promising more than a majority of the industrialized countries have been willing to do in the international negotiations to save the climate.

Source: **ENDS Daily**. September 21, 1998. **FLT** October 16, 1998.

Climate Action on internet

Climate Action Network, the international umbrella organization for environmentalists on climate matters, is now accessible on internet:

www.climatenetwork.org

Under the subsection Climate Network Europe you can find the Network newsletter named "Hotspot," as well as a directory with a long list of environmentalist organizations, and factsheets discussing the climate problem from a variety of aspects.

Transformations and depositions

THE DOWNWARD TREND has continued for Europe's emissions of acidifying air pollutants. According to the latest report from the EMEP, the European Monitoring and Evaluation Programme, in 1996 the manmade emissions of sulphur dioxide were 56 per cent lower than they had been in 1980, the latest figures showing them to have been 24.9 million tons. Nitrogen oxides also continue to show a slow decline from their peak in the late eighties, to 20.5 million tons, which is 11 per cent less than in 1980. The emissions of ammonia are estimated to have declined by nearly 18 per cent since 1980, to about 6.8 million tons. In contrast to those for sulphur and nitrogen oxides, the data for ammonia is however highly uncertain.

The EMEP operates under the Convention on Long Range Transboundary Air Pollution, using data supplied by each country adhering to the convention. But besides the national figures for manmade pollutants, its report includes estimates of the natural emissions of sulphur from the seas (dimethyl sulphide produced by phytoplankton) and from volcanoes.

Although the estimates of emissions from shipping in international trade in the North Sea and the northeastern Atlantic have recently been updated, the figures still only refer to 1990. Moreover the data for the Baltic only covers vessels moving in and out of that sea, and the emissions from shipping in the Mediterranean and the Black Sea, never having been properly investigated, must be greatly underestimated.

In combination with meteorological data, the emissions figures form the basis for calculations in a computer model to describe the transformation and deposition of pollutants as they move about over Europe. Field checks of concentrations and fallout are made in order to verify the results of the modelling.

Depositions that cannot be traced to any particular country are grouped under indeterminate sources (IND). About two-thirds are thought to emanate from within Europe, the rest from North America and Asia.

The latest figures on exports and imports of sulphur and oxidized as well as reduced nitrogen compounds appear in Tables 2, 3, and 4. Since the transports of pollutants may be affected in varying extent by the weather and air currents, the values are given as annual averages for the three-year period from 1994 to 1996.

The EMEP data is important in providing a check on the way the signatories to the Convention's protocols are living up to their com-

Table 1. Emissions of sulphur, nitrogen oxides, and ammonia (1000 tons a year).

		Sulphur dioxide		Nitrogen oxides (as NO_2)		Ammonia	
		1990	1996	1990	1996	1990	1996
Albania	AL	[72]	[72]	[24]	[24]	[31]	[31]
Austria	AT	93	60*	196	175*	85	87
Belarus	BY	637	275*	285	195*	[219]	[219]
Belgium	BE	322	240	343	334	104	97
Bosnia & Herz.	BA	480	[480]	[80]	[80]	[31]	[31]
Bulgaria	BG	2020	1420	376	259	144	83
Croatia	HR	180	58	83	57	44	30
Czech Rep.	CS	1876	1091*	742	412*	105	86
Denmark	DK	182	186	282	288	122	99
Estonia	EE	239	110*	93	50*	[29]	29
Finland	FI	260	96*	300	259*	35	31*
France	FR	1300	1031	1590	1641	700	668
Georgia[2]		[162]	[162]	[188]	[188]	[97]	[97]
Germany[1]	DE	5263	1851	2654	1858	769	651
Greece	GR	510	[556]	[392]	[357]	[78]	[78]
Hungary	HU	1010	670	238	189	164	117
Iceland	IS	24	24*	20	23*	[3]	[3]
Ireland	IE	178	143	115	115	126	128
Italy	IT	1678	[1437]	2047	[2157]	416	[389]
Kazakstan[2]		[140]	[140]	[76]	[76]	[18]	[18]
Latvia	LV	57	38*	90	29*	44	17*
Lithuania	LT	222	107*	158	67*	84	44*
Luxembourg	LU	14	8*	23	20*	7	8*
FYR Maced.	FYM	[106]	[106]	[39]	[39]	[17]	[17]
Moldova	MD	231	59*	39	25*	[47]	[47]
Netherlands	NL	202	136	596	505	232	150
Norway	NO	53	35*	227	222*	23	25*
Poland	PL	3210	2337*	1279	1120*	508	380*
Portugal	PT	283	272*	221	254*	93	92*
Romania	RO	1311	912*	546	319*	300	221*
Russian Fed.[2]	RU	4460	2635	2675	1798	1191	650*
Slovak Rep.	SK	543	227	225	130	62	50
Slovenia	SI	194	110	62	70	24	22*
Spain	ES	2266	[2061]	1188	[1227]	353	[345]
Sweden	SE	136	94*	411	362*	61	61*
Switzerland	CH	43	30	165	130	72	71
Turkey[2]	TR	[354]	[354]	497	692	[415]	[415]
Ukraine	UA	2782	1293	1097	467	[729]	[729]
United Kingdom	GB	3764	2028	2850	2136	320	320*
Yugoslavia[3]	YU	508	434	66	57	[90]	[90]
Baltic Sea	BAS	[72]	[72]	[80]	[80]	[0]	[0]
North Sea	NOS	[475]	[475]	[710]	[710]	[0]	[0]
Rem. NE Atl.	ATL	[891]	[891]	[1275]	[1275]	[0]	[0]
Mediterr. Sea[2]	MED	[12]	[12]	[13]	[13]	[0]	[0]
Nat. oceanic	NAT	[724]	[724]	[0]	[0]	[0]	[0]
Volcanic[4]		1645	[2235]	[0]	[0]	[0]	[0]
Sum		41,751	28,345	24,777	20,606	8,048	6,782

The table shows national official data received at the ECE secretariat. Data estimated by MSC-W/CCC are given in square brackets. * 1995 figures. [1] Including East Germany in 1990 figures. [2] Part within the EMEP area of calculation. Emissions from Georgia and Kazakstan are considered as REM in the tables 2-4 [3] The Federal Republic of Yugoslavia. [4] Natural emissions reported by Italy.

mitments, and in showing the general effect of these protocols.

CHRISTER ÅGREN

Transboundary acidifying air pollution in Europe. EMEP/MSC-W Report 1/98. Available from the publisher: MSC-W, Norwegian Meteorological Institute, Box 43, Blindern, N-0313 Oslo, Norway.

Explanation of the tables

For country/area codes, see opposite table. To find the contribution from other countries to a certain country, follow the horizontal row starting from the relevant country code on the far left. To find the contributions from a certain country to other countries, follow the vertical column starting from the relevant country code at the top. REM signifies contribution to and from the part of the domain for deposition calculations which is not covered by European countries, as well as volcanic emissions.

Table 2. Provisional sulphur budget for Europe. Average for 1996-97. Total deposition of sulphur. 100 tons per year.

	AL	AT	BE	BG	DK	FI	FR	DE	GR	HU	IS	IE	IT	LU	NL	NO	PL	PT	RO	ES	SE	CH	TR	GB	BY	UA	MD
AL	44	0	0	16	0	0	2	2	41	4	0	0	26	0	0	0	4	0	4	2	0	0	0	0	0	2	0
AT	0	58	4	3	2	0	18	120	1	48	0	0	105	0	2	0	61	0	10	4	0	6	0	7	0	4	0
BE	0	0	151	0	2	0	98	68	0	2	0	1	4	1	20	0	8	0	0	11	0	0	0	56	0	0	0
BG	8	1	0	1110	0	0	1	11	34	28	0	0	10	0	0	0	34	0	170	0	0	0	7	0	2	34	4
DK	0	0	7	0	88	0	12	60	0	2	0	1	2	0	4	1	39	0	0	2	4	0	0	39	1	1	0
FI	0	0	2	0	10	112	4	31	0	4	0	0	1	0	1	4	51	0	2	2	20	0	0	18	12	10	0
FR	0	4	116	2	5	0	1357	221	0	12	0	8	154	6	30	0	41	8	4	492	0	14	0	233	0	2	0
DE	0	18	142	4	42	1	290	2498	0	42	0	5	97	8	67	2	391	1	14	44	5	18	0	218	4	8	0
GR	20	0	0	339	0	0	1	4	289	10	0	0	24	0	0	0	12	0	28	3	0	0	18	0	0	13	2
HU	3	12	1	31	1	0	6	46	6	641	0	0	38	0	0	0	148	0	86	2	0	1	1	2	2	16	0
IS	0	0	0	0	0	0	0	2	0	0	16	1	0	0	0	0	1	0	0	0	0	0	0	8	0	0	0
IE	0	0	4	0	0	0	12	12	0	1	0	112	0	0	2	0	5	0	1	6	0	0	0	107	0	0	0
IT	4	12	4	20	1	0	84	50	13	38	0	0	1406	0	1	0	44	2	13	56	0	14	2	6	0	5	0
LU	0	0	3	0	0	0	12	6	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	2	0	0	0
NL	0	0	55	0	2	0	48	120	0	2	0	1	2	0	85	0	20	0	0	6	0	0	0	84	0	0	0
NO	0	0	6	0	18	3	10	39	0	2	0	2	0	0	4	38	31	0	1	2	15	0	0	78	3	1	0
PL	2	12	14	26	32	2	36	830	3	186	0	1	36	1	8	2	3508	0	70	8	8	2	0	51	31	78	2
PT	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	186	0	102	0	0	0	0	0	0	0
RO	7	4	2	318	2	0	4	40	18	178	0	0	32	0	0	0	177	0	1226	1	0	0	8	3	6	143	20
ES	0	0	4	0	0	0	66	12	0	2	0	1	18	0	2	0	4	86	0	2268	0	1	0	15	0	0	0
SE	0	1	10	0	78	18	18	101	0	9	0	2	2	0	6	17	118	0	3	6	100	0	0	64	8	6	0
CH	0	2	3	0	0	0	43	19	0	2	0	0	108	0	1	0	3	0	0	10	0	38	0	6	0	0	0
TR	4	0	0	249	0	0	1	8	82	11	0	0	12	0	0	0	20	0	46	2	0	0	497	0	4	56	4
GB	0	0	36	1	6	0	98	98	0	4	0	43	5	1	23	0	34	2	2	34	2	1	0	2197	1	1	0
BY	0	2	3	24	7	4	9	90	3	45	0	0	13	0	2	0	380	0	52	2	4	1	2	13	330	134	6
UA	4	4	4	212	7	4	10	128	16	178	0	0	32	0	2	1	624	0	379	2	3	0	22	15	96	2036	60
MD	0	0	0	22	0	0	0	5	1	8	0	0	2	0	0	0	22	0	56	0	0	0	2	0	2	50	30
RU	2	4	10	138	26	88	21	216	10	91	0	0	26	0	6	6	636	0	152	4	26	1	36	43	343	1056	18
EE	0	0	2	0	4	10	3	18	0	3	0	0	2	0	1	0	38	0	2	0	4	0	0	5	8	6	0
LV	0	0	2	2	6	4	4	35	0	7	0	0	3	0	1	0	82	0	5	0	3	0	0	8	22	12	0
LT	0	1	2	4	5	2	4	48	0	10	0	0	4	0	1	0	144	0	8	1	0	0	0	10	21	15	0
SI	0	7	0	3	0	0	3	11	0	12	0	0	48	0	0	0	10	0	3	2	0	0	0	0	0	1	0
HR	2	6	0	12	0	0	5	20	4	67	0	0	72	0	0	0	37	0	12	4	0	0	0	2	0	4	0
BA	3	2	0	10	0	0	4	18	6	46	0	0	43	0	0	0	28	0	11	2	0	0	0	2	0	3	0
YU	18	2	0	86	0	0	4	22	22	104	0	0	38	0	0	0	56	0	66	2	0	0	2	2	1	10	1
FYM	12	0	0	47	0	0	0	2	28	4	0	0	7	0	0	0	4	0	6	0	0	0	1	0	0	2	0
CS	0	14	6	6	4	0	18	434	0	48	0	0	27	0	3	0	292	0	11	4	1	2	0	12	2	6	0
SK	0	8	13	13	1	0	4	42	2	184	0	0	16	0	0	0	212	0	26	1	0	0	0	2	2	10	0
REM	3	1	70	70	1	0	20	10	56	12	0	0	64	0	0	0	32	4	22	92	1	1	54	3	11	130	2
BAS	0	2	2	2	166	64	41	368	0	31	0	2	10	1	14	8	515	0	14	10	90	1	0	101	30	24	1
NOS	0	4	186	2	152	4	406	724	0	28	1	50	20	2	176	23	418	2	12	74	24	2	0	2908	18	18	0
ATL	0	4	108	1	44	20	528	438	0	25	50	336	18	3	58	30	237	194	7	1542	24	3	0	2028	18	14	0
MED	70	22	14	835	4	0	424	142	862	170	0	2	1920	1	5	0	230	26	158	1152	2	16	305	37	6	94	8
BLS	6	2	0	729	2	1	2	27	42	46	0	0	12	0	0	0	102	0	236	0	1	0	144	2	16	452	28

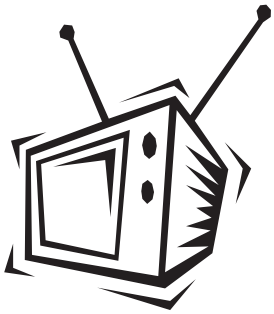
	RU	EE	LV	LT	SI	HR	BA	YU	FYM	CS	SK	REM	BAS	NOS	ATL	MED	NAT	IND	SUM
AL	0	0	0	0	0	0	18	14	16	2	1	66	0	0	0	0	1	66	332
AT	1	0	0	0	52	6	8	10	0	134	18	8	0	2	0	0	0	212	912
BE	0	0	0	0	0	0	0	0	0	16	0	0	0	24	2	0	2	42	510
BG	4	0	0	0	0	1	28	64	34	14	8	21	0	0	0	0	1	207	1838
DK	3	1	0	1	0	0	1	0	0	18	1	0	6	22	2	0	4	46	369
FI	220	37	5	8	0	0	1	0	0	14	2	0	12	6	2	0	5	333	930
FR	0	0	0	0	6	2	6	4	0	69	4	64	1	106	52	0	20	819	3866
DE	8	1	0	3	10	2	4	6	0	816	20	6	12	90	8	0	10	580	5499
GR	2	0	0	0	0	1	20	20	26	6	2	92	0	0	0	0	3	228	1167
HU	2	0	0	1	13	14	72	74	4	78	86	14	0	1	0	0	0	170	1574
IS	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	12	49	97
IE	0	0	0	0	0	0	0	0	0	6	0	0	0	8	15	0	11	48	353
IT	0	0	0	0	40	15	62	24	4	44	10	1337	0	2	2	0	6	572	3898
LU	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	5	34
NL	0	0	0	0	0	0	0	0	0	28	1	0	0	38	2	0	3	41	547
NO	57	2	1	4	0	0	1	1	0	14	1	0	4	33	11	0	18	364	766
PL	44	4	4	26	10	4	25	32	3	615	105	11	14	20	2	0	4	591	6456
PT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	28	0	4	66	390
RO	16	0	0	2	4	5	78	156	16	54	44	33	0	1	0	0	2	482	3086
ES	0	0	0	0	0	0	1	0	0	4	0	24	0	4	50	2	9	403	2982
SE	67	11	5	11	1	0	2	3	0	34	4	0	22	35	6	0	12	409	1194
CH	0	0	0	0	1	0	1	1	0	6	0	3	0	2	1	0	0	96	348
TR	15	0	0	0	0	0	12	16	6	9	4	109	0	0	0	0	6	2176	3370
GB	2	0	0	0	0	0	0	0	0	34	2	2	1	119	41	0	28	197	3018
BY	88	8	8	38	3	1	8	12	2	68	21	8	4	4	0	0	2	412	1811
UA	246	6	4	18	6	4	46	59	8	132	70	33	4	4	0	0	4	1256	5740
MD	4	0	0	0	0	0	4	4	1	6	2	1	0	0	0	0	0	60	284
RU	5558	192	35	73	4	2	23	30	4	148	42	244	24	16	6	0	18	6727	16113
EE	27	68	2	8	0	0	1	1	0	10	2	2	7	2	0	0	1	86	330
LV	26	10	28	30	0	0	2	2	0	18	3	2	6	4	0	0	2	110	439
LT	24	3	8	94	1	0	2	2	0	32	4	1	4	3	0	0	1	112	477
SI	0	0	0	0	82	6	7	6	0	14	3	8	0	0	0	0	0	46	274
HR	0	0	0	0	16	38	97	26	2	32	13	30	0	0	0	0	0	110	566
BA	0	0	0	0	4	10	422	40	3	22	10	40	0	0	0	0	1	118	851
YU	2	0	0	0	3	6	245	457	38	32	20	60	0	0	0	0	1	214	1516
FYM	0	0	0	0	0	0	12	16	60	2	1	18	0	0	0	0	0	52	275
CS	2	0	0	2	7	2	6	6	0	868	34	2	1	5	0	0	1	164	1993
SK	2	0	0	1	5	3	18	21	2	87	176	5	0	1	0	0	0	100	948
REM	264	2	0	2	2	2	16	10	4	11	4	1282	0	1	3	0	14	3110	5347
BAS	116	58	24	41	2	1	6	6	0	132	15	2	112	54	4	0	20	556	2674
NOS	32	5	3	11	2	0	3	4	0	274	15	5	21	824	76	0	150	854	7536
ATL	652	12	4	9	2	0	2	2	0	182	12	8	12	282	1562	0	1558	4854	14885
MED	15	0	0	2	52	59	260	166	58	158	46	5398	2	12	20	2	145	3586	16653
BLS	92	2	1	4	1	2	28	46	12	33	13	66	1	0	0	0	18	988	3163

Table 3. Provisional oxidized-nitrogen budget for Europe. Average for 1996-97. Total deposition of nitrogen. 100 tons per year.

	AL	AT	BE	BG	DK	FI	FR	DE	GR	HU	IS	IE	IT	LU	NL	NO	PL	PT	RO	ES	SE	CH	TR	GB	BY	UA	MD
AL	4	1	0	2	0	0	3	2	12	1	0	0	30	0	0	0	1	0	1	1	0	0	2	1	0	0	0
AT	0	44	6	2	2	0	29	103	0	8	0	0	108	1	6	0	20	0	3	2	1	16	0	9	0	2	0
BE	0	1	40	0	2	0	55	44	0	0	0	1	4	1	27	0	2	0	0	5	0	1	0	44	0	0	0
BG	2	2	1	74	1	0	2	9	20	6	0	0	14	0	0	0	14	0	38	0	0	0	9	1	1	10	2
DK	0	1	8	0	28	1	13	40	0	0	0	1	3	0	14	3	12	0	0	1	7	0	0	36	0	0	0
FI	0	1	4	0	18	101	9	24	0	2	0	1	2	0	8	25	28	0	0	2	54	0	0	28	8	4	0
FR	0	7	90	0	6	0	921	213	0	3	0	6	170	8	64	2	16	12	1	222	3	34	0	218	0	0	0
DE	0	28	122	0	36	3	286	993	0	7	0	5	113	10	166	7	99	2	4	18	16	44	0	216	4	2	0
GR	4	1	0	28	0	0	3	3	69	2	0	0	29	0	0	0	5	0	8	2	0	0	22	0	0	5	0
HU	0	21	2	6	1	0	10	40	4	54	0	0	52	0	2	0	56	0	18	1	1	4	2	4	1	5	0
IS	0	0	0	0	2	0	2	2	0	0	6	1	0	0	2	1	1	0	0	0	1	0	0	11	0	0	0
IE	0	0	4	0	1	0	15	11	0	0	0	22	1	0	6	0	2	1	0	4	0	0	0	71	0	0	0
IT	1	24	5	4	1	0	121	59	8	8	0	0	888	0	4	0	16	2	4	34	1	36	3	9	0	2	0
LU	0	0	2	0	0	0	6	5	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	2	0	0	0
NL	0	1	24	0	2	0	32	61	0	0	0	1	2	1	53	1	5	0	0	2	1	1	0	62	0	0	0
NO	0	0	8	0	25	8	16	30	0	1	0	2	2	0	16	88	18	0	0	2	38	0	0	92	2	0	0
PL	0	22	19	4	34	7	49	298	2	32	0	1	50	1	31	8	541	0	16	4	28	8	0	56	23	18	0
PT	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	61	0	52	0	0	0	2	0	0	0
RO	2	9	2	46	2	1	7	39	12	32	0	0	43	0	3	0	64	0	159	1	2	2	11	4	4	34	4
ES	0	0	5	0	0	0	82	17	0	1	0	1	22	0	5	0	2	72	0	640	0	2	0	18	0	0	0
SE	0	2	12	0	62	38	24	87	0	2	0	2	6	0	24	62	56	0	1	2	124	2	0	80	6	2	0
CH	0	2	4	0	0	0	54	24	0	0	0	0	72	0	4	0	1	0	0	5	0	34	0	6	0	0	0
TR	1	2	0	26	0	0	2	8	41	3	0	0	16	0	0	0	10	0	12	2	0	0	448	0	2	19	2
GB	0	2	29	0	8	0	90	71	0	1	0	24	8	1	48	3	4	2	0	17	4	2	0	728	0	0	0
BY	0	4	6	4	12	8	15	83	2	10	0	0	15	0	9	4	127	0	14	2	13	2	2	20	71	40	2
UA	1	10	6	34	12	8	18	119	12	33	0	0	42	0	10	4	263	0	84	1	12	4	36	19	46	293	13
MD	0	0	0	3	0	0	0	4	1	2	0	0	2	0	0	0	8	0	10	0	0	0	2	0	1	10	3
RU	1	12	16	22	52	190	38	226	8	22	0	1	36	0	32	42	288	0	46	2	100	4	58	72	147	282	6
EE	0	0	2	0	7	11	6	16	0	1	0	0	4	0	4	3	17	0	1	0	10	1	0	8	5	2	0
LV	0	1	4	0	8	6	6	28	0	2	0	0	4	0	5	3	30	0	2	0	11	1	0	12	8	4	0
LT	0	2	4	1	8	4	7	32	0	2	0	0	5	0	5	2	45	0	2	0	9	1	0	12	10	4	0
SI	0	8	0	0	0	0	5	10	0	2	0	0	44	0	0	0	4	0	1	1	0	2	0	0	0	0	0
HR	0	12	1	2	0	0	9	20	2	11	0	0	80	0	1	0	14	0	3	2	0	2	0	2	0	1	0
BA	0	6	1	2	0	0	8	16	4	8	0	0	68	0	0	0	12	0	3	2	0	2	0	2	0	1	0
YU	3	6	2	14	0	0	6	19	12	20	0	0	53	0	2	0	26	0	16	2	0	1	3	2	0	3	0
FYM	2	0	0	6	0	0	1	1	12	1	0	0	10	0	0	0	2	0	2	0	0	0	2	0	0	0	0
CS	0	18	9	0	5	0	26	148	0	8	0	0	35	1	12	1	63	0	4	2	4	7	0	16	1	2	0
SK	0	12	2	2	1	0	8	26	2	24	0	0	22	0	2	0	58	0	7	1	1	2	0	2	1	3	0
REM	1	3	2	12	2	2	38	15	32	4	0	0	95	0	2	0	18	4	8	55	2	4	83	5	6	38	1
BAS	0	6	26	0	90	58	48	207	0	7	0	2	20	1	46	32	144	0	4	5	114	3	0	108	18	8	0
NOS	0	8	126	0	108	10	298	413	0	6	1	37	31	4	250	46	135	3	4	34	54	8	0	1372	12	7	0
ATL	0	12	140	0	91	50	606	480	0	8	27	144	32	6	227	129	137	103	3	380	86	12	0	1710	16	8	0
MED	12	46	19	87	5	1	452	123	260	34	0	1	1510	2	18	1	84	22	41	451	4	52	288	42	4	31	2
BLS	2	4	1	56	4	2	4	28	22	10	0	0	17	0	2	1	40	0	47	0	4	1	147	2	8	98	6

	RU	EE	LV	LT	SI	HR	BA	YU	FYM	CS	SK	REM	BAS	NOS	ATL	MED	IND	SUM
AL	0	0	0	0	0	1	2	2	2	1	0	0	0	0	0	0	20	88
AT	0	0	0	0	14	4	2	1	0	31	6	0	0	4	0	0	73	494
BE	0	0	0	0	0	0	0	0	0	4	0	0	0	18	4	0	20	278
BG	4	0	0	0	0	1	2	6	5	5	4	1	0	0	0	0	56	288
DK	0	0	0	0	0	0	0	0	0	4	0	0	2	18	2	0	20	218
FI	36	10	4	4	0	0	0	0	0	6	2	0	10	14	4	0	113	527
FR	0	0	0	0	2	1	1	0	0	18	2	2	1	92	72	0	324	2540
DE	4	0	0	2	6	2	0	0	0	120	7	0	7	94	16	0	238	2678
GR	2	0	0	0	0	1	2	2	4	2	1	1	0	0	0	0	63	263
HU	2	0	0	0	6	8	8	6	2	25	26	0	0	2	0	0	57	425
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	32	70
IE	0	0	0	0	0	0	0	0	0	2	0	0	0	11	20	0	24	199
IT	0	0	0	0	14	9	10	2	2	14	4	4	0	4	3	0	200	1504
LU	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	24
NL	0	0	0	0	0	0	0	0	0	4	0	0	0	24	4	0	18	308
NO	7	1	1	2	0	0	0	0	0	4	0	0	5	38	12	0	126	558
PL	22	2	2	10	6	4	3	3	1	122	32	0	10	28	4	0	201	1676
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	45	194
RO	12	0	0	1	2	4	8	11	6	18	19	1	0	2	0	0	128	690
ES	0	0	0	0	0	0	0	0	0	2	0	2	0	7	56	2	187	1128
SE	20	5	3	6	0	0	0	0	0	12	2	0	15	44	9	0	146	862
CH	0	0	0	0	1	0	0	0	0	2	0	0	0	2	1	0	32	250
TR	22	0	0	0	0	0	2	2	2	4	2	22	0	0	0	0	543	1203
GB	0	0	0	0	0	0	0	0	0	8	0	0	1	90	58	0	90	1305
BY	56	2	4	13	0	1	1	1	0	23	10	1	4	8	2	0	116	685
UA	166	2	2	8	3	4	5	6	3	44	28	13	4	9	1	0	339	1630
MD	4	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	16	72
RU	2036	38	21	40	2	2	2	3	2	52	20	146	26	38	12	0	2044	6190
EE	10	6	2	3	0	0	0	0	0	4	1	0	4	5	0	0	28	164
LV	12	3	4	7	0	0	0	0	0	6	2	0	4	6	0	0	36	217
LT	10	1	2	12	1	0	0	0	0	8	2	0	2	5	0	0	36	236
SI	0	0	0	0	10	2	2	0	0	4	2	0	0	0	0	0	16	115
HR	0	0	0	0	6	10	10	2	1	10	5	0	0	0	0	0	37	246
BA	0	0	0	0	2	6	16	4	1	8	4	0	0	0	0	0	37	214
YU	2	0	0	0	2	4	13	18	11	12	9	0	0	0	0	0	60	319
FYM	0	0	0	0	0	0	1	2	4	0	0	0	0	0	0	0	14	60
CS	2	0	0	0	4	2	1	0	0	98	8	0	1	7	1	0	64	547
SK	2	0	0	0	3	2	2	2	0	22	22	0	0	2	0	0	34	266
REM	180	0	0	2	2	2	2	2	2	6	2	221	1	2	5	0	1190	2051
BAS	42	12	7	14	2	1	1	0	0	34	6	0	30	57	8	0	178	1345
NOS	20	2	2	5	1	0	0	0	0	59	6	0	15	344	92	0	341	3906
ATL	92	5	3	6	2	0	0	0	0	70	8	0	16	390	1024	0	2582	8670
MED	16	0	0	1	22	25	42	17	15	48	18	58	2	22	28	2	1232	5160
BLS	104	0	0	2	0	2	3	4	2	10	6	26	1	2	0	0	231	887

Table 4 overleaf →



Shut them off!

A billion dollars a year – or 40 billion kilowatt hours – is the cost of leaving electronic apparatus in standby mode in US homes. The standby electricity consumption of equipment that is infrequently used, such as video recorders, may well exceed the consumption while actually turned on. Researchers at Lawrence Livermore National Laboratory in Berkley, California, who have been investigating the matter, consider bad design to be mainly responsible. The standby consumption of similar CD players made by different manufacturers may be anything from 2 to 28 watts. They think it could be brought down to less than 1 watt for most apparatuses.

New Scientist. August 29, 1998.

Hybrid buses in use

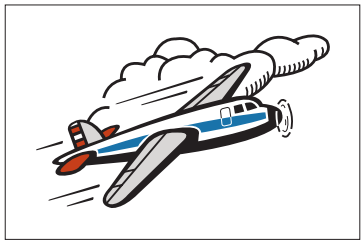
Since October, two Volvo hybrid buses, driven by a combination of gas turbine and electric motor, have been running in regular traffic in Göteborg, W. Sweden. They are estimated to emit 90 per cent less NOx than an ordinary bus, and about a third of other noxious substances.

Ny Teknik No. 40/98, October 1, 1998.

CIVIL AVIATION

Little inclination to do anything

LITTLE TO THE ADVANTAGE of the environment came out of the meeting of the general assembly of the International Civil Aviation Organization at the end of September and the beginning of October.



❒ There are to be new emission standards for nitrogen oxides, applying from 2004. Although this will amount to a tightening of the requirements by 16 per cent, in effect it is meaningless, since modern aircraft engines already meet the standard, and those now in use need no modification.

❒ The European Union as well as some individual European countries wanted the ICAO to prepare a framework decision for the introduction of emissions-related levies before the next general assembly in 2001. Although the proposal was rejected, it was nevertheless agreed that a study should be made of the effects of environmental charges and taxes on airline operation.

❒ Due to the lack of agreement as to how the emissions from international aviation should be apportioned out among the nations, they are not regulated in the Kyoto protocol under the climate convention. The EU countries were therefore urging the ICAO to set to work on the matter, but as the idea was unattractive to a majority of the 185 countries represented in the general assembly, all that emerged was a vague agreement to the effect that the ICAO should in future place a "strong emphasis" on addressing emissions of greenhouse gases.

❒ The general assembly also issued a rebuke to the EU because it had introduced rules for limiting noise from aircraft, in a resolution urging ICAO members to "refrain from unilateral environmental measures that would be harmful to the development of international civil aviation."

For more information, apply ICAO, 999 University Street, Montreal, Quebec H3C 5H7, Canada. Fax: +1 514 954 6376. Web site: www.icao.org.

Table 4. Provisional reduced-nitrogen budget for Europe. Average for 1996-97. Total deposition of N. 100 tons per year.

	AL	AT	BE	BG	DK	FI	FR	DE	GR	HU	IS	IE	IT	LU	NL	NO	PL	PT	RO	ES	SE	CH	TR	GB	BY	UA	MD	RU	EE	LV	LT	SI	HR	BA	YUFYM	CS	SK	REM	IND	SUM
AL	110	0	0	1	0	0	1	0	6	1	0	0	6	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	3	0	0	0	22	162
AT	0	393	2	0	1	0	10	135	0	16	0	0	50	0	2	0	10	0	2	1	0	22	0	1	0	4	0	0	0	0	0	22	2	1	2	0	27	10	0	72	788
BE	0	0	332	0	0	0	64	30	0	0	0	1	1	3	43	0	0	0	0	2	0	1	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	506
BG	4	1	0	322	0	0	0	2	16	6	0	0	2	0	0	0	4	0	60	0	0	0	6	0	1	24	4	2	0	0	0	0	1	2	24	6	1	2	0	66	560
DK	0	1	3	0	346	0	6	45	0	1	0	1	0	0	8	0	9	0	0	0	5	0	0	6	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	14	452
FI	0	0	1	0	6	142	3	13	0	0	0	0	0	0	2	3	14	0	0	0	12	0	0	4	11	7	0	22	12	2	4	0	0	0	0	0	2	0	0	102	368
FR	0	4	82	0	2	0	3368	113	0	2	0	8	64	10	34	0	4	4	0	120	0	45	0	42	0	1	0	0	0	0	0	1	1	0	0	0	4	1	2	270	4193
DE	0	42	80	0	32	0	164	3280	0	6	0	4	30	12	204	1	64	0	2	6	6	64	0	35	4	6	0	2	0	0	2	2	1	0	2	0	46	4	0	198	4302
GR	13	0	0	16	0	0	0	0	277	2	0	0	4	0	0	0	2	0	7	0	0	0	12	0	0	8	1	1	0	0	0	0	0	1	6	8	0	0	0	68	430
HU	1	24	0	4	0	0	2	14	1	542	0	0	12	0	1	0	22	0	30	0	0	2	0	0	2	16	1	1	0	0	0	6	12	6	19	0	11	31	0	54	728
IS	0	0	0	0	0	0	1	0	0	0	12	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	40
IE	0	0	2	0	0	0	12	6	0	0	0	574	0	0	2	0	0	0	0	1	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	650
IT	2	20	1	2	0	0	42	50	2	8	0	0	1723	0	1	0	6	1	3	12	0	61	0	1	0	3	0	0	0	0	0	8	8	5	6	1	4	2	3	178	2152
LU	0	0	3	0	0	0	6	4	0	0	0	0	0	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	40
NL	0	1	36	0	2	0	24	72	0	0	0	1	0	0	516	0	2	0	0	1	0	1	0	14	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	14	688
NO	0	0	2	0	16	2	7	20	0	0	0	2	0	0	6	120	10	0	0	0	13	0	0	16	3	2	0	3	1	0	2	0	0	0	0	0	1	0	0	120	352
PL	0	18	4	3	21	1	14	162	1	27	0	1	11	0	12	1	1788	0	19	1	10	4	0	8	59	84	2	16	2	2	14	2	2	2	6	0	60	30	0	196	2586
PT	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	337	0	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	406
RO	3	4	0	44	0	0	2	10	6	55	0	0	8	0	0	0	26	0	1008	0	0	0	5	0	6	142	34	8	0	0	1	1	4	4	32	2	6	10	0	162	1588
ES	0	0	2	0	0	0	69	4	0	0	0	1	5	0	2	0	1	70	0	1537	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	101	1800
SE	0	1	4	0	48	8	8	49	0	2	0	1	1	0	9	16	30	0	1	1	260	0	0	10	8	6	0	10	4	2	6	0	0	0	1	0	3	1	0	123	616
CH	0	4	2	0	0	0	44	41	0	0	0	0	42	0	1	0	0	0	0	2	0	323	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	494
TR	2	0	0	14	0	0	0	2	12	2	0	0	2	0	0	0	3	0	12	0	0	0	2376	0	3	38	3	14	0	0	0	0	0	0	4	1	1	0	34	726	3253
GB	0	1	18	0	4	0	82	40	0	0	0	82	2	1	22	0	4	0	0	6	1	2	0	1432	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	59	1763
BY	0	4	2	2	4	2	4	25	1	10	0	0	4	0	3	0	100	0	16	0	3	1	0	3	1042	181	6	46	4	8	30	1	1	0	3	0	7	6	0	141	1662
UA	2	6	2	18	4	1	6	32	4	36	0	0	10	0	4	0	136	0	138	0	3	2	18	3	149	3818	78	154	2	2	9	2	3	3	14	1	13	18	7	424	5122
MD	0	0	0	2	0	0	0	1	0	1	0	0	0	0	0	0	4	0	24	0	0	0	1	0	2	70	159	2	0	0	0	0	0	0	1	0	0	0	0	20	290
RU	0	8	5	12	16	38	13	70	3	18	0	1	10	0	10	5	154	0	54	0	18	2	70	10	261	574	16	4650	38	21	38	1	2	2	8	1	16	11	142	2210	8516
EE	0	0	0	0	2	2	2	8	0	0	0	0	0	0	2	0	11	0	1	0	3	0	0	1	8	6	0	8	108	6	5	0	0	0	0	0	1	0	0	27	208
LV	0	1	1	0	3	1	2	10	0	2	0	0	1	0	2	0	20	0	2	0	4	0	0	2	26	10	0	11	12	63	23	0	0	0	0	0	2	1	0	33	234
LT	0	2	1	0	3	0	2	12	0	2	0	0	2	0	2	0	42	0	2	0	3	0	0	2	42	14	0	8	2	6	176	0	0	0	0	0	3	1	0	34	368
SI	0	16	0	0	0	0	1	6	0	4	0	0	18	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	78	4	1	1	0	2	1	0	14	152
HR	0	11	0	1	0	0	2	6	0	22	0	0	26	0	0	0	5	0	2	1	0	1	0	0	0	2	0	0	0	0	0	8	107	14	6	0	4	4	0	34	261
BA	2	4	0	1	0	0	2	4	2	12	0	0	17	0	0	0	4	0	2	0	0	0	0	0	0	2	0	0	0	0	0	2	16	120	14	0	2	3	0	39	251
YU	11	3	0	12	0	0	1	5	5	29	0	0	10	0	0	0	8	0	18	0	0	0	1	0	0	8	1	0	0	0	0	1	6	15	378	9	4	6	0	68	602
FYM	10	0	0	4	0	0	0	0	10	1	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	11	59	0	0	0	16	120
CS	0	42	2	0	3	0	10	134	0	9	0	0	10	0	4	0	48	0	2	0	1	6	0	2	2	5	0	0	0	0	0	2	2	0	1	0	356	11	0	55	711
SK	0	14	0	2	0		2	10	0	36	0	0	6	0	1	0	38	0	8	0	0	1	0	0	2	16	0	0	0	0	0	2	2	2	4	0	14	179	0	33	378
REM	2	2	0	4	0	0	12	3	6	2	0	0	18	0	0	0	6	2	6	18	0	2	155	0	6	46	2	202	0	0	0	0	1	2	3	1	1	1	800	944	2248
BAS	0	4	19	0	100	20	18	168	0	5	0	2	4	1	22	5	132	0	4	2	72	2	0	15	31	21	1	26	30	12	22	1	1	0	2	0	10	4	0	161	904
NOS	0	7	96	0	132	2	339	344	0	4	0	49	6	2	179	17	86	1	4	10	23	4	0	466	18	17	0	8	2	2	4	1	0	0	0	0	19	4	0	252	2103
ATL	0	7	54	0	28	8	591	199	0	4	8	359	6	4	78	31	54	89	2	172	14	7	0	507	15	14	0	35	3	2	4	0	0	0	0	0	16	4	0	1555	3871
MED	34	24	6	37	2	0	204	44	104	30	0	1	510	0	6	0	26	8	34	216	1	30	170	4	4	50	5	8	0	0	1	11	27	27	44	9	13	10	64	1018	2783
BLS	2	2	0	30	1	0	1	7	8	8	0	0	4	0	0	0	15	0	66	0	0	0	208	0	12	338	23	95	0	0	2	0	1	2	8	2	4	3	26	285	1157

Egalitarianism and sustainability

And for any normal needs, using a car from a pool can be a real bargain

CAR SHARING is an idea that is now gaining foothold in Europe. The largest operation of this kind is that run by Mobility CarSharing Schweiz, with a pool of 1000 vehicles and 20,000 members. Studies have shown that car sharing not only makes the car available to more people, but also cuts the total number of kilometres driven.

Two factors in particular have contributed to the success of Mobility CarSharing in Switzerland. One is that people can purchase a yearly ticket for travel on all public transportation, another is that there is a central booking office for all the cars in the Mobility scheme – or so says Matthias Zimmermann of Verkehrsclub Schweiz, a motorists' association with environmentalist leanings. Zimmermann himself is also chairman of the T&E, European Federation for Transport and Environment. He refers to studies showing that the possibility of using the commuter ticket for unlimited travel on public transportation, yet having access to a car when needed, has caused many people to give up private car ownership.

More than 200,000 people are now using the ticket, the *Generalabonnement*, as against 18,000 in 1985 (the Swiss population is 7 million). Although the ticket has been available in some form since the beginning of the century, the great surge in its popularity came in the eighties, when it was made valid for unlimited travel on all the private railways in Switzerland, all public transportation in Swiss towns, and on the rural bus routes run by the Swiss Post Services. The ticket costs 2500 francs (about 1400 ecus) for the first family member, with big reductions for further members of the family.

The Mobility scheme is smooth-working and reliable, without any bureaucratic hindrances. The large number of cars at disposal, together with the central booking system, makes it possible to reserve a vehicle at any time and almost everywhere in the country. The cost of hiring a medium-size car is 2.35 francs per hour plus 0.5 francs per kilometre. The point of economic break-even is estimated to lie around 11,000 kilometres a year. If one drives more than that, it pays to have one's own car, but for anyone driving less – as about 600,000 Swiss car owners do – car sharing is a bargain.

ILLUSTRATION
- IN PRINTED VERSION ONLY

Car sharing is also showing rapid growth in the Netherlands and Germany. According to Verkehrsclub Deutschland some 200,000 Germans are engaged in it and the total number in the Netherlands is estimated to be 24,000. Through the European Car Sharing e.V. network the system has now been extended internationally, enabling members of the associated organizations to rent a car on favourable terms abroad as well.

That car sharing not only gives more people access to a car but also benefits the environment has been demonstrated by Mikael Klintman, who has examined car sharing from the points of view both of ecological and social sustainability. He says that more than half of the members in the car-sharing groups that were studied had previously had no car of their own. "Car sharing thus helps promote egalitarianism and so can be said to support social sustainability."

From studies from the Netherlands reported by Klintman it appears that members of these car pools who had not had a car of their own increased their car travel by 30 kilometres a week. Former car owners, on the other hand, travelled 190 kilometres less than before. Since the latter constituted more than 40 per cent of the total membership, this meant a reduction of the average weekly travel distances by 42-46 per cent.

Apart from reducing the distances travelled, car sharing appears to result in other environmental gains as well. The cars used in the system tend to be new and "best" from the point of view of the environment and safety. It is also possible to choose the size of car suited to the occasion. There will be less need for parking space, and increased passenger volume for public transportation.

Public transportation companies should therefore have a distinct interest in the growth of car sharing. Matthias Zimmermann believes that the chief brake on car sharing as a means of reducing dependence on the car lies in the unwillingness of the organizations which run public transport to agree on nationwide *Generalabonnements*. "Maybe that will only come," he says, "with privatization."

PER ELVINGSON

Between the Private and the Public. Formal Carsharing as a Part of a Sustainable Traffic System – an Exploratory Study. By Mikael Klintman, Department of Sociology, Lund University. Research Report 1998:3. Can be ordered from the Department of Sociology, Lund University, Box 114, 221 00 Lund, Sweden. Fax +46-(0)46222 4794.

More information, as well as links to a number of national car-sharing organizations, may be found on the internet addresses **www.carsharing.org** (European Car Sharing e.V.) and **www.mobility.ch** (Mobility CarSharing Schweiz).

B FÖRENINGS-
BREV

Int. Försurningssekretariatet
Box 7005
402 31 Göteborg

Porto betalt
Port payé

Diesel vs. petrol

Diesels are slightly better than petrol-driven vehicles as regards effects on the climate, but much worse in the way of emissions of NOx, particulates, and carcinogenic substances .

"Although diesel vehicles have become very much better during the last ten years, petrol-driven types have surpassed them in respect of exhaust-gas cleaning," affirms Reino Abrahamsson of the Environmental Protection Agency. The agency had been commissioned by the Swedish government to look into the matter, after changes in taxation had led to a marked increase in the sales of diesel-driven cars.

While diesels consume 20-25 per cent less fuel than petrol-driven types, burning a litre of diesel fuel gives rise to 15 per cent more carbon dioxide than burning of a litre of petrol does. The emissions of this greenhouse gas are thus only marginally better from diesels. An increase from 1 to 20 per cent in the proportion of diesels among the new cars sold would mean an overall reduction of no more than 1-2 per cent in the emissions of carbon dioxide from such vehicles. The emissions of nitrogen oxides and particulates would on the other hand be two and two-and-a-half times greater.

In comparison with a diesel, a modern petrol-driven vehicle poses far less danger as regards the cancer risk, effects on the respiratory system, and the possibility of causing acute illness. The emissions from modern diesel vehicles are estimated to be 3-4 time more carcinogenic than those from the petrol-driven type. The emissions of particulates are also 10-15 times greater even from modern diesels – although, as the EPA report admits, the new diesels are very much better than the old.

But as Reino Abrahamsson says: "Everyone thinking of buying a new car should go for a fuel-efficient petrol-driven one rather than a diesel."

Further information from Naturvårdsverket, 106 48 Stockholm, Sweden. E-mail: reino.abrahamsson@environ.se.

USA

Heavy penalties for deceit

Under a recent settlement with the Environmental Protection Agency, seven manufacturers of heavy-duty diesel engines are to pay $83 million in civil penalties (fines) and in addition spend more than ten times that amount on improving their engines so as to make them less polluting.

It had been found that the companies were selling diesel engines equipped with "defeat devices" so as to give maximum fuel efficiency in highway driving. They did this at the cost of greatly increased emissions of nitrogen oxides – up to three times the legal emission limit. The consequent excess emissions are estimated to have been 1.3 million tons in 1998 alone. The deceit had remained undetected because the defeat devices allow engines to meet the EPA emission standards during testing.

Besides paying the civil penalties, the engine makers will have to spend more than $850 million to introduce cleaner new engines, rebuild older engines to cleaner levels, recall pickup trucks with defeat devices, and conduct new emissions testing. They will also be bound to spend $109.5 million on a number of projects for lowering NOx emissions, such as research and development for low-emitting engines that use new technologies and cleaner fuels.This is the largest environmental enforcement in US history.

Source: EPA October 22, 1998. See also EPA's website on Internet: www.epa.org.

Coming events

EU Council of Environment Ministers. Brussels, Belgium, December 21, 1998.

Working Group on Strategies under the Convention on Long Range Transboundary Air Pollution. Geneva, Switzerland. January 25-29, 1999.

Health Effects of Vehicle Emissions. London, England. Febraury 16-17, 1999. *Information*: Energy Logistics International Ltd, 70-72 St Marks Road, Maidenhead, Berks. SL6 6DW, England. E-mail: enquiries@energylogistics.co.uk.

Sustainable Transport Solutions in the Baltic Region. Stockholm, Sweden. March 5-6, 1999. International NGO seminar. *Information*: The Swedish Society for Nature Conservation in Stockholm, Högbergsg. 30A, 11620 Stockholm, Sweden. E-mail: susanne.ortmanns@stockholm.snf.se.

Working Group on Strategies under the Convention on Long Range Transboundary Air Pollution. Geneva, Switzerland. March 22-26, 1999.

The Automotive Industry and the Environment. Stuttgart, Germany. April 21-22, 1999. *Information*: Energy Logistics International Ltd, address as above.

Air Quality in Europe: Challenges for the 2000s. Venice, Italy, May 19-21. *Information*: Dr. Vincenzo Cocheo, Fondazione Salvatore Maugeri-IRCCS, via Svizzera, 16, I-35127 Padova, Italy. Fax. +39 0498064555. E-mail: fsmpd@tin.it. Internet: www.fsm.it.

Working Group on Strategies under the Convention on Long Range Transboundary Air Pollution. Geneva, Switzerland. May 31-June 4, 1999.

Third Ministerial Conference on Environment & Health. London, England, June 16-18, 1999. Ministerial Conference organized by World Health Organization. *Information*: WHO Regional Office for Europe: www.who.dk/london99/.

Working Group on Strategies under the Convention on Long Range Transboundary Air Pollution. Geneva, Switzerland. August 30-September 3, 1999.

New website items:

Acid News, some factsheets and special reports, can now be downloaded in pdf format.

www.acidrain.org