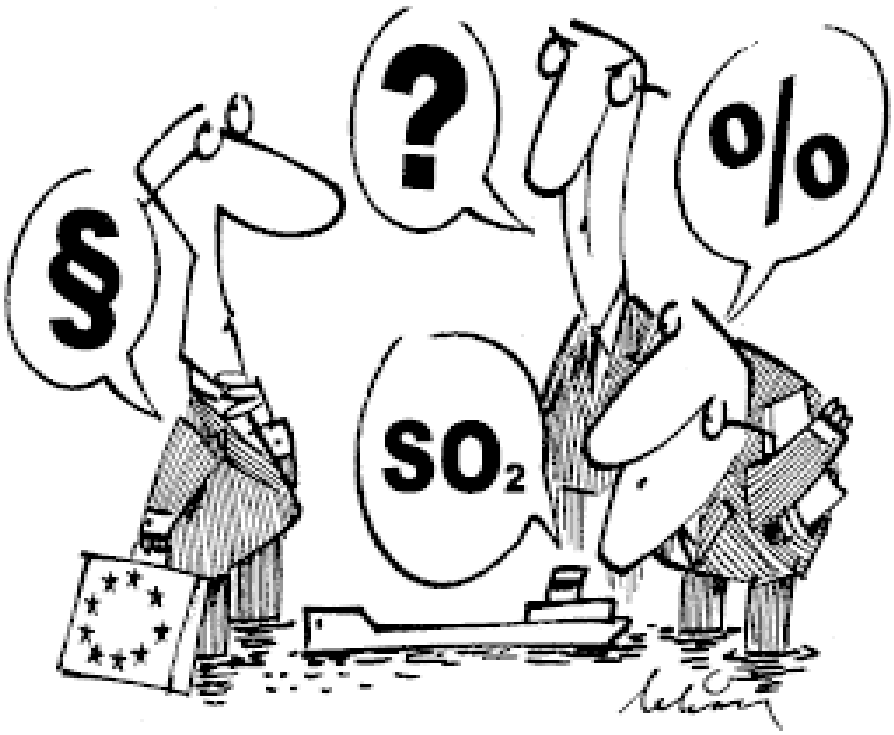
NO. 1, MARCH 2005

Acid News

In this issue:



SHIPPING EMISSIONS

Profitable to reduce sulphur in fuels

A LOWERING OF the sulphur content of marine heavy fuel oil to 0.5 per cent would reduce emissions of sulphur dioxide (SO_2) from international shipping around Europe by more than three-quarters by 2010.

The benefits of such a measure clearly outweigh the costs, according to a new study from the Swedish NGO Secretariat on Acid Rain[1]. By 2020, the annual net benefits would amount to between 6.6 and 10.4 billion euro, i.e. the benefits would be up to 7.5 times higher than the costs (see Figure, p.3).

Projections of future ship emissions were taken from the so-called baseline scenario of the Clean Air For Europe (CAFE) programme, in which the introduction of a limit value of 1.5 per cent sulphur for marine heavy fuel oil for shipping in the Baltic and the North Sea – in line with the forthcoming entry into force of MARPOL Annex VI – has been accounted for.

A lowering of the sulphur content of marine heavy fuel oil, from the current average of about 2.5–3 per cent down to 0.5 per cent, in all European sea areas would result in a fall in total SO_2 emissions from international shipping around Europe from more than 2.4 million tonnes in 2000 to less than 0.6 million tonnes in 2010, i.e. a reduction of about 76 per cent (see Table, p.3).

Because estimates of the cost of lowering the sulphur content of marine heavy fuel oil vary significantly, three different cost figures were used for the analysis. The lowest cost fig-

Continued on page 3

Acid News

A newsletter from the Swedish NGO Secretariat on Acid Rain, the primary aim of which is to provide information on air pollution and its effects on health and the environment.

Anyone interested in these matters 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 available 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, 402 31 Göteborg, Sweden

Tel: +46-31-711 45 15. Fax: +46-31-711 46 20

E-mail: info@acidrain.org

Internet: www.acidrain.org

Editor: Christer Ågren (cagren@acidrain.org)

Published by The Swedish Society for Nature Conservation.

Language consultant: Malcolm Berry, Seven G Translations, UK.

Printed by Trio Tryck AB, Örebro, Sweden.

ISSN 0281-5087.

THE SWEDISH NGO SECRETARIAT ON ACID RAIN

The Secretariat has a board consisting of 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 needed reductions in the emissions of air pollutants. The aim is to have those emissions eventually brought down to levels – the so-called critical loads – that the environment can tolerate without suffering damage.

In furtherance of these aims, the secretariat

- Keeps up observation of political trends and scientific developments.
- Acts as an information centre, primarily for European environmentalist organizations, but also for the media, authorities, and researchers.
- Produces information material.
- Supports environmentalist bodies in other countries in their work towards common ends.
- Participates in the lobbying and campaigning activities of European environmentalist organizations concerning European policy relating to air quality and climate change, as well as in meetings of the Convention on Long-range Transboundary Air Pollution and the UN Framework Convention on Climate Change.

Sulphur emissions from ships must be cut

RECENT ANALYSES for the Clean Air For Europe (CAFE) programme have estimated that air pollution by fine particles (PM) is causing some three million lost life years annually in the 25 EU member countries. This is equivalent to about 288,000 premature deaths. In addition, the morbidity effects of PM range from around 83,000 cases of hospital admissions to a much larger number of less serious effects, for example some 25 million of respiratory medication use and several hundred million days of restricted activity.

Article 152 of the EU treaty deals with public health. It states that: *"A high level of human health protection shall be ensured in the definition and implementation of all Community policies and activities."*

The CAFE programme has also looked at some of the air pollution impacts on the environment, and calculated, for example, that more than twenty per cent of the forest area in the EU25, or approximately one quarter of a million square kilometres, currently receives acid deposition above the critical loads. More than half of the ecosystems are exposed to nitrogen depositions in excess of the critical loads for eutrophication.

Article 174 of the EU treaty says that Community policy on the environment shall contribute to *"preserving, protecting and improving the quality of the environment"*, and that it shall *"be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay."*

From the above it is obvious that EU policies on air pollution have so far failed to fulfil the ambitions of the treaty. One should therefore have high expectations of the thematic strategy on air pollution that the Commission is currently preparing and will present in May. This is a clear opportunity for the Commission to take a consistent line on EU clean air initiatives and put forward concrete proposals for measures that will live up to the ambitions expressed in the treaty and in the EU's Sixth Environmental Action Programme.

However, a golden opportunity exists right now to agree on highly cost-effective measures for reducing emissions of harmful and acidifying air pollutants. I refer now to emissions of sulphur from shipping, an issue that is currently in the final phase of the EU's decision-making process (see p.4). A lowering of the sulphur content of marine heavy fuel oil to 0.5 per cent in all European sea areas, as proposed by the European Parliament, would reduce SO_2 emissions from international shipping around Europe by more than three-quarters.

Both the Commission and the Council of Ministers have so far rejected demands by the Parliament, and the main excuse they have used is that the costs and benefits of the Parliament's demands have not been reported.

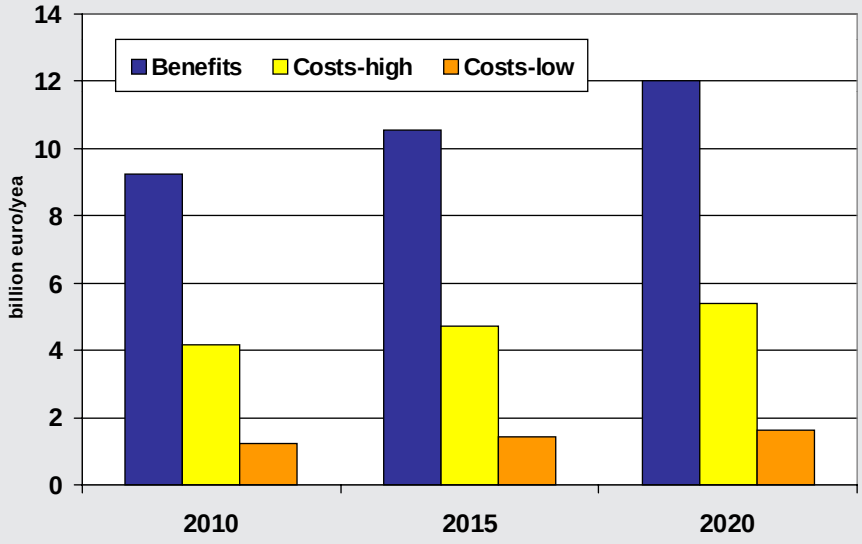
However, such an analysis now exists and was prepared using the same methods and data that the Commission itself used to motivate its original proposal (see cover story). This shows that the benefits clearly outweigh the costs. By 2020 the annual net benefits would amount to between EUR 6.6 and 10.4 billion, i.e. the benefits would be up to 7.5 times higher than the costs.

Furthermore, these benefit figures do not account for all the benefits, and in particular they do not account for the significant potential to reduce acidification damage to ecosystems, since such environmental benefits cannot be expressed in monetary terms.

The CAFE programme analysis clearly shows that the EU's jointly agreed targets for effective protection of health and the environment cannot be met without far-reaching measures to reduce emissions of air pollutants from international shipping. The Commission and the member states must therefore face their responsibilities now and support the Parliament on this critical issue.

CHRISTER ÅGREN

Comparison of benefits and costs of using 0.5% sulphur fuel in all European sea areas (billion euro/year).



Continued from front page

ure (580 euro/tonne reduction in SO_2) was taken from the International Institute for Applied Systems Analysis (IIASA). The medium figure (1,083 euro/tonne) and the high cost figure (1,938 euro/tonne) were both taken from Beicip-Franlab.

Figures on the estimated economic benefits of reducing SO_2 emissions were taken from a study prepared for the European Commission by AEA Technology. These benefit figures vary between sea areas, from 1,600 to 5,900 euro/tonne SO_2 depending primarily on the differences in population exposure resulting from the emissions. The benefit estimates include the impact on health due to fine particles and SO_2 and the effects of SO_2 and acidity on modern buildings and structures. Damage to ecosystems and cultural heritage, and impact on visibility are however not accounted for, which means that the benefits are underestimated.

A comparison of the benefits and the costs for all European sea areas combined, show that the benefits clearly outweigh the costs. For the year 2020, the annual benefits are estimated to amount to nearly 12 billion euro, while the costs are estimated to amount to between 1.6 and 5.4 billion euro per year. The resulting net benefits would be between 6.6 and 10.4 billion euro per year.

The benefit-to-cost ratio varies significantly depending on the cost figure used.

When assuming the highest cost estimate, the benefits were calculated to exceed the costs by about 2.2 times, and when assuming the lowest cost estimate, the benefits were calculated to be 7.5 times higher than the costs.

The Mediterranean shows the highest benefit-to-cost ratios, with benefits exceeding costs by up to 8.1 times, as well as the highest benefits in absolute terms. This is then followed by the Northeast Atlantic and the North Sea, showing benefit-to-cost ratios of up to 7.8 and 7.4 times, respectively. The Baltic Sea shows the lowest benefit-to-cost ratios, with at most 2.8 times, and it is the only sea area which – when assuming the highest cost figure – comes out with a negative benefit-to-cost ratio (0.8).

The fact that the benefit figures do not account for all the benefits, and particularly not for the significant potential to reduce acidification damage to ecosystems in northern Europe, helps explain why the benefit figures are relatively low for the Baltic Sea, and also underlines the fact that the benefits generally are underestimated.

This study has been produced in light of the proposal to limit the sulphur content of marine fuels that will be brought up for its second reading in the EU Parliament in March–April. The proposed amendments, put forward by rapporteur Satu Hassi, are intended to progressively reduce the maximum permissible sulphur content, initially to 1.5 per cent, and later to 0.5 per cent (see article on page 4).

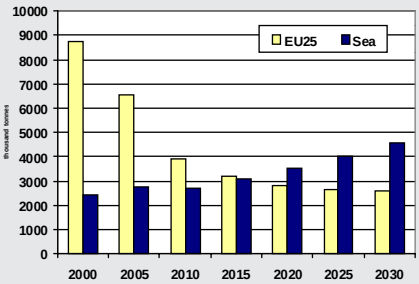
CHRISTER ÅGREN

[1]**Cost-benefit analysis of using 0.5% marine heavy fuel oil in European sea areas,** Briefing from the Swedish NGO Secretariat on Acid Rain, January 2005. Available in pdf format at www.acidrain.org

Emissions of SO_2 from international shipping 2000–2020 (kilotonnes).

	2000 2.7%	2010 2.7/1.5%	2010 0.5%	2015 2.7/1.5%	2015 0.5%	2020 2.7/1.5%	2020 0.5%
Baltic Sea	242	174	58	198	66	225	75
North Sea	459	328	109	373	124	423	141
NE Atlantic	395	509	94	578	107	656	121
Mediterranean	1232	1599	296	1823	338	2078	385
Black Sea	83	107	20	122	23	138	26
Sum	**2411**	**2717**	**577**	**3094**	**658**	**3520**	**748**

Emissions of SO_2 from land-based sources in the 25 EU countries and from international shipping in European sea areas 2000–2030 (ktonnes).



While pollutant emissions from land-based sources are gradually falling, those from shipping show a continuous increase. Even after accounting for enforcement of MARPOL Annex VI, which sets limits on the sulphur content of marine fuels for the Baltic Sea, the North Sea and the English Channel, emissions of SO_2 from international shipping are expected to increase by 45 per cent between 2000 and 2020. As a result, by 2020 the emissions from international shipping around Europe will have surpassed the total from all land-based sources in the 25 member states combined.

Parliament's rapporteur calls for stricter sulphur limits

IN THE RUN-UP to the European Parliament's second reading of the proposal to reduce emissions of sulphur dioxide from ships, its rapporteur Satu Hassi is urging much more far-reaching measures than those proposed by the Commission and agreed in the Council's common position. Whereas the Commission's proposal would reduce emissions by no more than 10 per cent from their level in 2000, the measures suggested by the rapporteur would raise that figure to about 75 per cent.

The rapporteur's proposal – which largely follows the outcome of the Parliament's first reading from June 2003 – was presented to the Parliament's environment committee on 2 February. It aims to reduce the maximum content of sulphur in marine heavy fuel oils in two stages – initially to 1.5 per cent, and later to 0.5 per cent, and to extend the sea areas where these limits would apply to cover the Northeast Atlantic and the Mediterranean too. Put briefly, this means that the rapporteur is urging the introduction of gradually tighter measures, as follows:

© PER ELVINGSON

Whereas the Commission's proposal would reduce emissions by 10 per cent from their level in 2000, the measures suggested by the rapporteur would raise that figure to about 75 per cent.

Stage 1. The introduction of the limit of 1.5 per cent sulphur in marine fuels would apply from one year after the entry into force of the directive for northern European sea areas (the Baltic and the North Sea with the inclusion of the English Channel), and this limit would also apply to ferries in all EU waters. (So far the proposal is fully in line with the Council's common position.) As from 1 January 2012, it would also apply to southern sea areas (the Mediterranean and the NE Atlantic).

Sulphur in marine fuels

Ships' emissions are now one of the largest sources of sulphur dioxide in the EU. Research recently carried out for the Commission indicates that within 10–15 years, emissions from international shipping around Europe will have surpassed the total from all land-based sources in the 25 member states combined (see fact box on p. 3).

In its present form the directive 1999/32/EC sets limits for the sulphur content of marine gas oils and marine diesel fuels used on inland waterways and in EU territorial waters up to 12 nautical miles from shore. It also sets limits on the amount of sulphur in heavy fuel oils and gas oils used in land-based plants, but none on the sulphur content of marine heavy fuel oils (bunker fuel).

Due to the lack of any limit on sulphur, the content in marine heavy fuel oils is now very high, averaging from 2.7 to 3.0 per cent, or 27,000–30,000 ppm (parts per million). By comparison, the maximum allowable sulphur content for diesel oil used in road transport is 50 ppm, and in 2009 this limit will be lowered to 10 ppm.

The Commission's proposal for revision of directive 1999/32/EC concerning the sulphur content of marine fuels was put forward in November 2002. Its main aim is to lower the extent to which ships contribute to poor air quality as well as to acidification. It is not, however, especially far-reaching, being confined in the main to securing a 1.5-per-cent limit on the sulphur content of fuel used by ships that ply the North Sea and Baltic – a limit that has in fact already been laid down in Annex VI under the IMO MARPOL Convention. The Commission's proposal does, however, include extension of the 1.5-per-cent limit to ferries in regular service to or from any Community port, and prescribes that the sulphur content of fuel used by ships travelling on inland waterways or lying at berth in port should not exceed 0.1%.

In June 2004 the EU environment ministers agreed their common position. In doing so, the Council expressed its general support for the Commission's proposal, but rejected firmly the practically unanimous call from the Parliament for stricter and more far-reaching measures.

Stage 2. Lowering the limit, from 1 January 2010, to 0.5 per cent sulphur for all ships in northern European waters and for ferries in all EU sea areas, and from 2014, in the remaining European sea areas.

With effect from January 2010, ships travelling on inland waterways or lying at berth in port would, according to the ministers' common position, have to use oil with no more than 0.1 per cent sulphur. In line with the Commission's original proposal, the rapporteur suggests bringing forward that date by two years, to January 2008. She also suggests that ships could be exempt from the in-port sulphur requirement if they connect to a shore-side electricity supply, or if they always use fuel with less than 0.5 per cent sulphur, or if they use abatement technologies that always keep their emissions below a level equivalent to that obtained using 0.5 per cent sulphur fuel.

The text of the common position provides the option to use emission abatement technologies as an alternative to using low-sulphur fuels. The rapporteur suggests that this option should be subject to the conditions that such abatement technologies achieve emission levels not exceeding 2 grams of SO_2 per kWh (which equals the emissions from using 0.5 per cent sulphur fuel), and that the ships are fitted with equipment for continuous emissions monitoring.

Another proposal by the rapporteur is that the Commission should develop and propose a new directive that sets out full specifications for marine fuels (along the lines of Directive 1998/70/EC on diesel and petrol for road vehicles).

The Environment Committee will debate and vote on the text on 15 March. Amendments adopted by the committee, as well as other proposed amendments, are scheduled to be debated and voted on in the parliamentary plenum on 13 April. The outcome will represent the Parliament's position (it will then have been its second reading).

The next step will be for the Council of Environment Ministers to arrive at their decision. Should there still remain major disagreement between the two institutions, they will be obliged to take part in conciliation negotiations, before the directive can finally be adopted.

CHRISTER ÅGREN

Truck-engined oil tanker minimizes sulphur emissions

THE FIRST OIL TANKER to be powered by truck engines will be completed this year. The 3,000 deadweight tonnes tanker has been developed by the shipping company BRP in Sweden and ordered by Stena Oil, which will use it for carrying heavy fuel oil on inland routes and in coastal service.

The new vessel has a diesel-electric drive system. Five 16-litre truck engines are used to generate electricity, which is then used to drive electric motors that power the ship's propellers. Truck engines can be run on diesel oil with a very low sulphur content, which drastically reduces sulphur dioxide emissions in comparison with common bunker oil.

Another feature that reduces energy use and emissions from the new ship is the way that the entire oil load is housed in a "thermos" structure. On a traditional tanker almost as much fuel is used to prevent the heavy oil cooling and thickening as is used to drive the ship forward. By using effective insulation it is only necessary to heat the oil now and again.

Several of the technical solutions used on the new ship have been transferred from the Ecoship concept (see AN 2/03), although the ship that is currently being built is smaller and not quite as streamlined. The Ecoship is powered by ten truck engines fitted with catalytic converters and runs on low-sulphur diesel instead of heavy fuel oil. The hull slides more easily through the water than other ships of similar size.

A full-scale Ecoship has not been built yet, but the Swedish Foundation for Strategic Environmental Research (Mistra) recently expressed interest in the technology. Ecoship Engineering – the consortium that developed the design – has been granted funds to present an application for a research programme worth almost SEK 50 million (4.4 million euro). A decision will be taken this summer.

Source: **Ny Teknik**, 20 October and 18 November 2004. Find out more about the Ecoship at www.ecoship.com.

Gas tanker powered by waste from cargo

A NEWLY DEVELOPED diesel engine that can also run on gas makes it possible to power tankers with waste from gas cargo. Gaz de France recently launched a liquefied natural gas (LNG) ship fitted with the new engines. They were developed by the Finnish company Wärtsilä and have an efficiency of 46 per cent.

The ship will be used to carry gas from Algeria to France, and can carry a cargo of 74,000 cubic metres of liquefied gas. The waste from the gas cargo is estimated at 0.18 per cent per day, which is sufficient to drive the ship. Emissions of nitrogen oxides will be one-tenth those of conventional diesel engines and carbon dioxide emissions will be halved, according to information from Gaz de France. Because the gas is almost sulphur-free, emissions of sulphur dioxide will virtually be eliminated.

Gaz de France has also placed orders for two further gas tankers with engines capable of running on both gas and diesel. They are destined to transport gas from Norway and Egypt and will be able to carry 153,000 tonnes of gas.

Source: **Ny Teknik**, 17 November 2004.

New scenarios for future emissions

The technical potential for further emission reductions is significant, but the resulting air quality in 2020 is still inadequate to protect health and the environment.

THE EU's Clean Air For Europe programme (CAFE) is progressing in its analysis for the forthcoming thematic strategy on air pollution that is to be presented by the Commission in May. As part of the programme, various scenarios for future emissions and their environmental impacts are being investigated. The Commission's consultant IIASA has recently investigated a so-called maximum technically feasible reductions (MTFR) scenario, in which full implementation of currently available technical emission control measures is assumed.

The outcomes of the MTFR scenario could be compared to those of the main baseline scenario (CLE), which includes full implementation of current EU air quality legislation, and which was presented in Acid News 4/04, pp. 10–11.

In the CLE scenario, emissions of sulphur dioxide (SO_2) in the 25 EU member countries will fall by two-thirds by 2020, as compared to the base year 2000. Emissions of nitrogen oxides (NOx), volatile organic compounds (VOCs) and fine particles ($PM_{2.5}$) will be reduced by nearly half by 2020, while those of ammonia (NH_3) are expected to remain more or less the same up to 2020.

The MTFR scenario, on the other hand, would result in a cut in SO_2 emissions of more than 80 per cent, while those of NOx, VOCs and $PM_{2.5}$ would come down by between 60 and 70 per cent, respectively. Emissions of NH_3 would be reduced by about 40 per cent (see Figure 1).

As regards emissions from international shipping, these are expected to increase significantly under the CLE scenario: SO_2 emissions would rise by 45 per cent, and NOx emissions by 67 per cent. In the MTFR scenario, shipping emissions are reduced by 63 and 14 per cent, respectively.

It should be noted that these figures for the MTFR scenario are preliminary, since the RAINS computer model is still progressing and improving. Moreover, the current draft MTFR scenario has been criticized for not properly accounting for already available opportunities to retrofit abatement equipment to existing emission sources, which means that the emission reduction potential is actually underestimated. This is true for several types of emission sources, but especially so for shipping, where the retrofitting of advanced NOx reduction technologies (such as SCR) was only partially included.

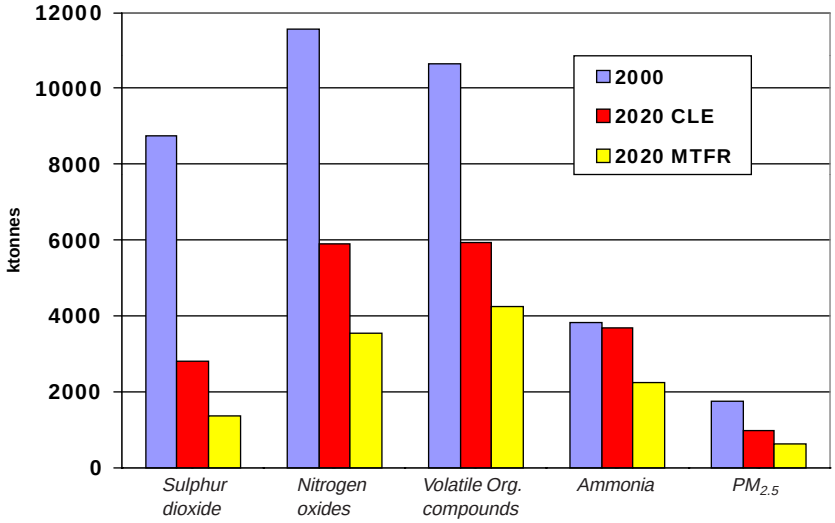


Figure 1. Emissions of air pollutants in the base year 2000 and two projections of emissions for 2020: one based on full implementation of current EU legislation (CLE), and the other on implementation of so-called maximum technically feasible reductions (MTFR).

Lower energy use and fuel switching results in lowered emissions of air pollutants

The scenarios also include preliminary estimates of some health and environmental impacts expected to result from the projected levels of future emissions. For $PM_{2.5}$ the RAINS model estimates changes in the loss of statistical life expectancy that can be attributed to changes in anthropogenic emissions. It should be noted that these calculations only refer to impact on the population over 30 years of age, thus underestimating the total impact.

Using the pollution levels for the year 2000, it is estimated that $PM_{2.5}$ results in an average shortening of life expectancy by approximately nine months in the EU25. In the CLE scenario, this figure comes down to less than six months by 2020, and in the MTFR scenario to less than three months. (See Figure 2.)

When it comes to the impact on health from ground-level ozone, the RAINS model estimates the number of premature deaths associated with levels above 35 parts per billion (ppb). The number of premature deaths estimated as above will gradually decrease up to 2020 as a result of decreased emissions of the ozone precursors NOx and VOCs.

The analysis of environmental impact includes ozone damage to vegetation, and acidification and eutrophication of various types of sensitive ecosystems.

For the year 2000, more than 20 per cent of the forest area in the EU25, or approximately one quarter of a million square kilometres, received acid deposition above the critical loads. By 2020 this is calculated to come down to about 12 per cent in the CLE scenario, and 3 per cent in the MTFR scenario. (See Figure 3.)

Continued on page 8

Figure 2. Loss in statistical life expectancy that can be attributed to anthropogenic contributions to $PM_{2.5}$ (months). For the emission levels in the year 2000 (left), and for two projected emission levels for 2020: CLE (centre) and MTFR (right).

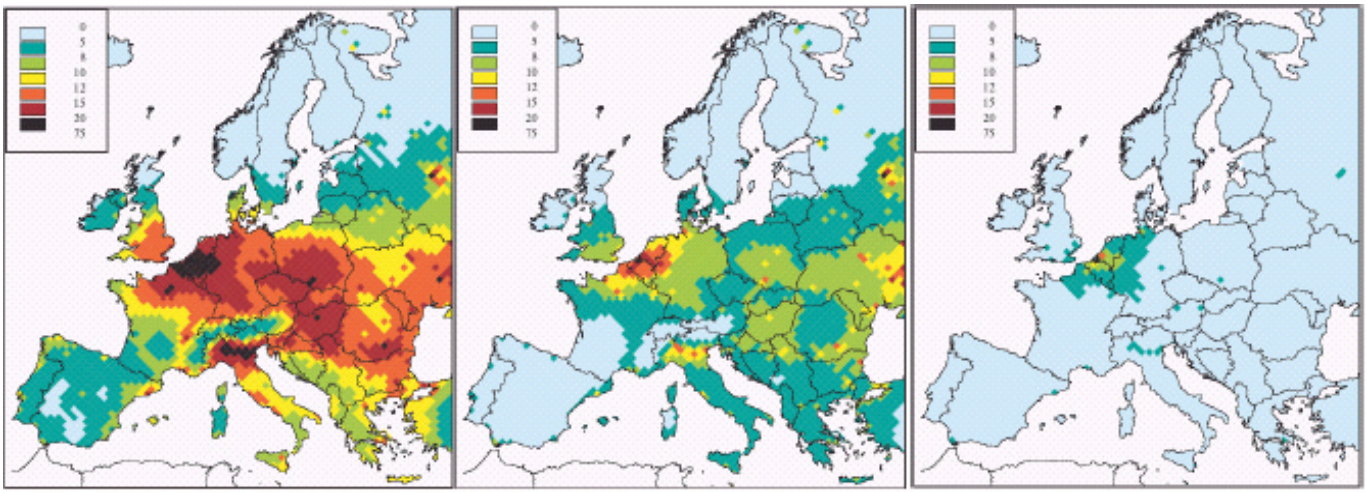


Figure 3. Percentage of forest area receiving acid deposition above the critical loads for acidification. For the emission levels in the year 2000 (left), and for two projected emission levels for 2020: CLE (centre) and MTFR (right).

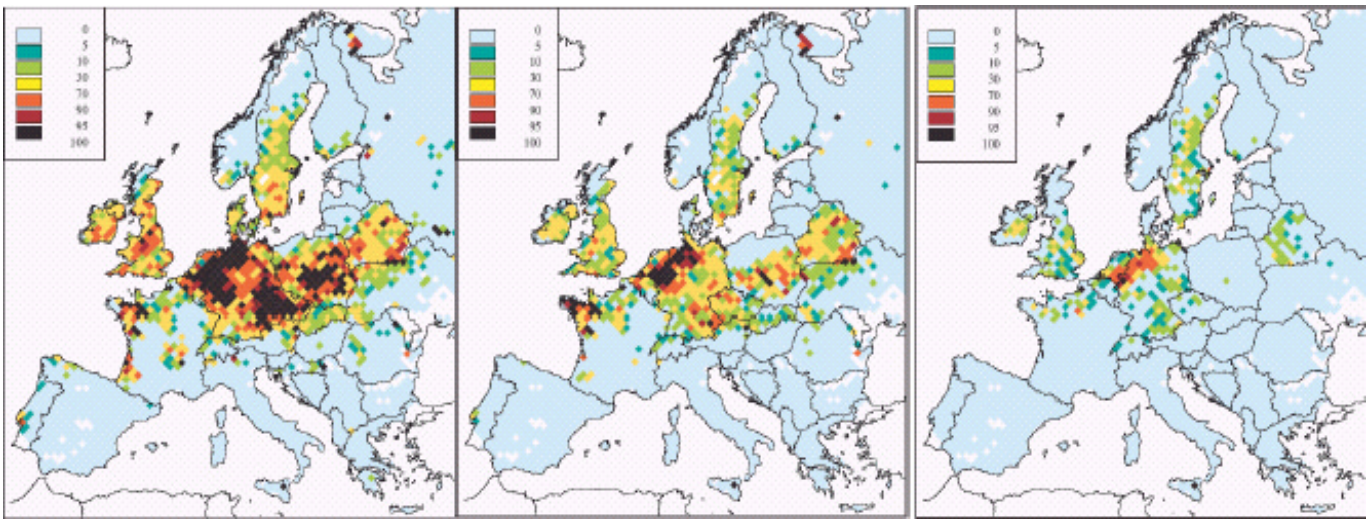
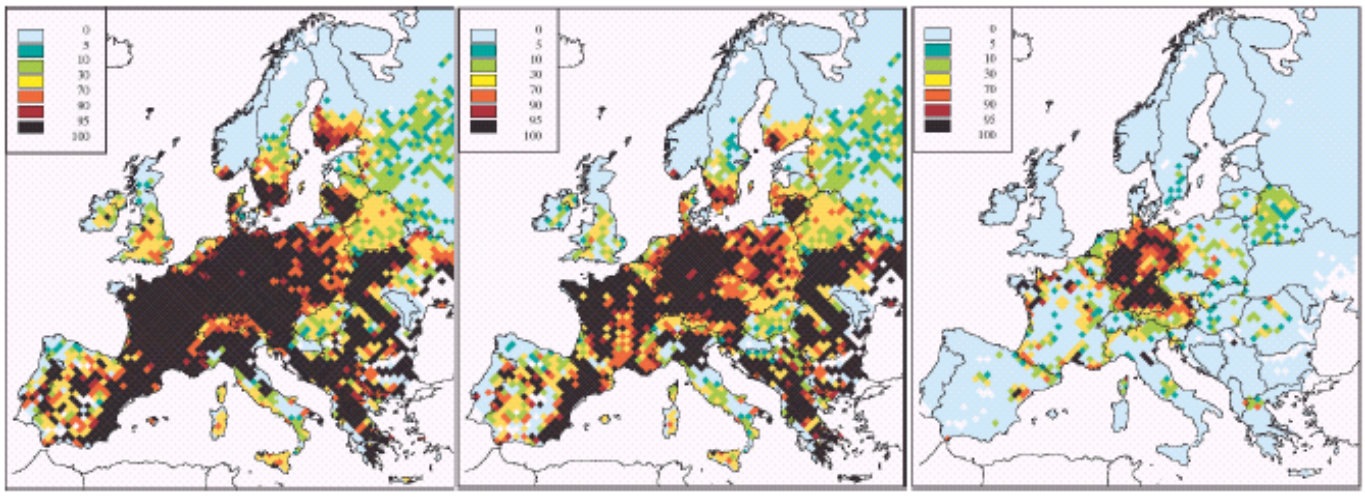


Figure 4. Percentage of total ecosystems receiving nitrogen deposition above the critical loads for eutrophication. For the emission levels in the year 2000 (left), and for two projected emission levels for 2020: CLE (centre) and MTFR (right).



Preliminary analysis shows that cleaner air brings huge benefits

Those effects that are not quantified in monetary terms are to be covered by an extended analysis.

AIR POLLUTION was responsible for some 300,000 premature deaths in the 25 member countries of the EU in 2000. Overall, the concentrations of fine particles have a much more important effect than ozone with respect to mortality. Significant reductions in concentrations and impacts are expected over the period 2000 to 2020, especially regarding fine particles. The annual health benefits of implementing current legislation up to 2020 is valued at between EUR 89 and 193 billion, for the year 2020.

These are some of the early – still preliminary – results from the cost-benefit analysis[1] carried out for the Clean Air for Europe (CAFE) programme, and presented to member states and stakeholders at a meeting of the CAFE Steering Group in Brussels on 21–22 February. As part of the analysis, the total health impacts were calculated across the EU25 due to emissions under the CAFE baseline scenario for the period 2000 to 2020.

Earlier benefit analyses have shown that improvements in health generate the largest quantified monetary benefits when air pollution is reduced. The pollutants of most concern here are fine particles (PM) and ground-level ozone. PM concentration is increased through direct emissions of so-called primary particles, as well as indirectly through the release of gaseous pollutants (especially sulphur dioxide, nitrogen oxides, and ammonia) that react in the atmosphere to form so-called secondary particles. Ground-level ozone are increased by anthropogenic emissions, particularly of volatile organic compounds (VOCs) and nitrogen oxides.

The health impacts from air pollution are dominated by PM

The quantification of health effects addresses impact related to both long-term (chronic) and short-term (acute) exposures. It deals with both mortality (i.e. deaths) and morbidity (i.e. illness). The mortality effects quantified in the benefit analysis include impacts on infants as well as adults.

The morbidity effects that can be quantified include major effects, such as hospital admissions and the development of chronic respiratory disease. They also include less serious effects, which are likely, however, to affect a greater number of people. These include changes in the frequency of use of medicine to control asthma, and days of restricted activity. When the impact and the eco-

New scenarios for future emissions

Continued from page 6

There is still a great deal of uncertainty as to how the member states will fulfil their commitments to reduce emissions of greenhouse gases. Their actions will greatly affect the extent to which fossil fuels will be used in the EU, and thus the emissions of air pollutants covered by the CAFE programme.

Consequently, various energy scenarios have been analyzed, illustrating the effects of different assumptions regarding future use of fossil fuels within the EU.

The main energy scenario used by CAFE is based on a greenhouse gas policy for the EU that is supposed to ensure compliance with the Kyoto Protocol commitments by 2010. This scenario was developed by assuming a carbon price of 12 euro per tonne of CO_2 in 2010, increasing to 20 euro/t in 2020, and would result in an EU-wide reduction in CO_2 emissions of 3.6 per cent between 1990 and 2020.

In order to illustrate the effects of more far-reaching CO_2 reductions, a more advanced climate policy energy scenario has also been produced. Here, a carbon price of 90 euro/t CO_2 in 2020 was assumed, which would result in a 20-per-cent reduction in the EU CO_2 emissions between 1990 and 2020.

The higher carbon price of 90 euro/tonne would result in an overall lowering of the energy use by about 8 per cent in 2020, as compared to the baseline scenario. It would also lead to fuel switching away from high-carbon fuels (primarily coal and lignite) to carbon-free fuels, i.e. renewables.

This combination of lower energy use and fuel switching results in lowered emissions of air pollutants, especially for SO_2 and NOx, and thus to additional benefits for health and the environment.

Following the production of the CLE and MTFR scenarios, a number of policy options for the further abatement of emissions is now being studied, for example in respect of cost-effectiveness. Some selected main scenarios will also be subjected to more detailed analyses for costs and benefits.

CHRISTER ÅGREN

The full presentations of the baseline scenarios and the estimated health and environmental impacts are available as PowerPoint files from the website of IIASA: www.iiasa.ac.at/rains/

More information on the CAFE programme can be found on the website of the Commission's environment directorate: http://europa.eu.int/comm/environment/air/cafe/index.htm

Table 1. Implementing current EU legislation: Change in health damage due to air pollution in 2000 and in 2020 in EU25. Billion euro.

	2000		2020		Difference	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
O_3 mortality	1.1	2.5	1.1	2.4	0	0.1
O_3 morbidity	6.3	6.3	4.2	4.2	2.1	2.1
PM mortality	157.7	582.3	99.7	420.1	58.0	162.2
PM morbidity	77.9	77.9	49.3	49.3	28.6	28.6
Total	**243.0**	**669.0**	**154.3**	**476.0**	**88.7**	**193.0**

Note: The results are based on 1997 meteorological data, and are comparable with the preliminary RAINS baseline scenario results. For acute mortality (O_3), two alternative values are presented, based on a range reflecting the median and mean values. For chronic mortality (PM), two alternative values are presented, based on value of life years lost (VOLY) and numbers of premature deaths, the latter using the mean value of a statistical life (VSL) value.

nomic values are combined in the analysis, the most important health-related issues relate to mortality, restricted activity days and chronic bronchitis.

Due to ozone concentrations, the annual impacts across the EU25 total some 21,000 deaths brought forward in the year 2000. However, ozone also leads to much larger numbers of annual morbidity health impacts, with tens of millions of minor restricted activity days and respiratory medication use days. While these clearly are less serious effects, they affect a much larger number of people.

Due to PM concentrations in the year 2000 some 3 million life years have been lost in the EU25. This is equivalent to about 288,000 premature deaths. There are also an additional 560 infant premature deaths from PM in the year 2000. In addition, the morbidity effects of PM range from around 83,000 serious cases of hospital or cardiac hospital admissions to much larger numbers of less serious effects, for example some 25 million respiratory medication use days and several hundred million restricted activity days.

The impacts and benefits above have been expressed in monetary terms. Strictly speaking, the methodology for cost-benefit analysis used for CAFE is only applicable for assessing the changes between scenarios, i.e. marginal policy changes. However, as an illustration of the level of economic importance, the total monetary damage from health impacts for the baseline scenario, i.e. the benefits from current policies through to 2020, has been estimated. The values are presented as an annual impact in million euro for the EU25, and summarized in Table 1.

This shows that health impacts from air pollution are dominated by PM, with mortality most important, but morbidity also significant. The most important categories (in economic terms) for PM-related morbidity arise from restricted activity days and cases of chronic bronchitis. The annual health benefits of implementing current legislation up to 2020 is valued at between EUR 89 and 193 billion, for the year 2020.

In the near future two additional types of impact will be quantified in economic terms, namely the effects of ozone on crop yield and the damage to modern buildings.

Those effects of air pollution that are not quantified in monetary terms, and thus would ordinarily be omitted from a cost-benefit analysis, are to be covered by an extended analysis. Table 2 provides an overview of such impacts. For the CAFE analysis, each impact will be given a star rating (one to three stars) to indicate their level of importance. The intention of providing information in this way is to prompt stakeholders to consider whether the impacts that have not been quantified in monetary terms are likely to be important enough to change the balance of costs and benefits.

Some preliminary conclusions from the extended analysis are that:

❑ Inclusion of impacts on forests, freshwater and other ecosystems could add significantly to the benefits quantified for emission reductions;

Table 2. Effects of air pollution that are not quantified in monetary terms.

Health

- ❑ Ozone: chronic effects on mortality and morbidity
- ❑ SO_2: chronic effects on morbidity
- ❑ Direct effects of VOCs
- ❑ Social impacts of air pollution on health
- ❑ Altruistic effects

Materials

- ❑ Effects on cultural assets

Crops

- ❑ Indirect air pollution effects on livestock
- ❑ Visible injury following ozone exposure
- ❑ Interactions between pollutants, with pests and pathogens, climate...

Forests

- ❑ Effects of O_3, acidification and eutrophication

Freshwaters

- ❑ Acidification and loss of invertebrates, fish, etc.

Other ecosystems

- ❑ Effects of O_3, acidification and eutrophication on biodiversity

Visibility

- ❑ Change in amenity

Groundwater quality and supply of drinking water

- ❑ Effects of acidification

❑ Inclusion of the effects of chronic exposure to ozone on health, social impacts of air pollution on health, altruistic effects, damage to cultural assets and some impacts on crops via interactions with pests and pathogens may be important, but there is currently inadequate evidence available to make a firm conclusion; and,

❑ The other effects listed in the table are unlikely to make a substantial difference to quantified benefits at the European level, but may be significant in some areas.

For the purpose of the forthcoming thematic strategy on air pollution, the CAFE cost-benefit analysis will be used to assess the marginal changes in costs and benefits between various emission scenarios.

CHRISTER ÅGREN

[1] **CAFE CBA Baseline Analysis 2000 to 2020 – Service contract for carrying out cost-benefit analysis of air quality related issues, in particular in the Clean Air For Europe (CAFE) programme** (January 2005). By AEA Technology, UK.

Compulsory legislation to come?

The automotive industry will not meet its promise to the European Commission to reduce emissions by one-quarter between 1995 and 2008.

IN AN AGREEMENT reached in 1998 the automotive industry promised the EU Commission that average emissions of carbon dioxide from new cars sold in the EU would not exceed 140 g/km by 2008.

The background to this undertaking was that Ritt Bjerregaard, the Commissioner for the Environment at that time, persistently called for a compulsory limit of 120 g/km to be set for 2005. By proposing a voluntary undertaking the automotive industry managed to avoid legislation.

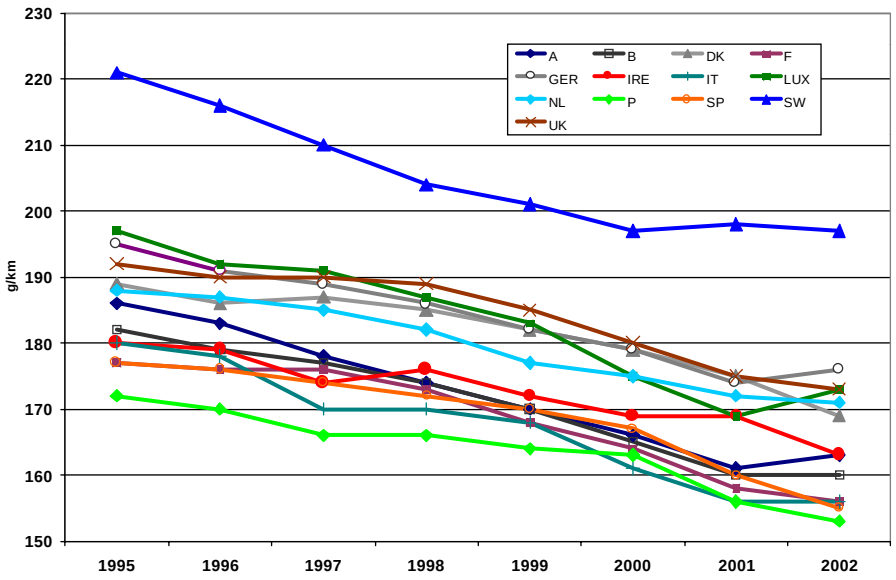
The base year for the undertaking was 1995. Since then, emissions have fallen from 186 to 164 g/km (2003). In the last two years, however, the reductions have been less than one per cent per year.

"Most signs indicate that the industry will not meet its commitment. In the best case we will see a reduction of 20 per cent by 2008," says Per Kågeson, who has analyzed developments in a report prepared on behalf of the Swedish Association of Green Motorists and the European Federation for Transport and Environment (T&E).[1]

The EU target is nevertheless still set at 120 g/km by 2010.[2] This corresponds to fuel consumptions of 5.1 and 4.6 litres/100 km for petrol and diesel cars respectively.

In discussions over a new voluntary undertaking that have now begun, the Commission has proposed a ceiling of 120 g/km by 2012, but the automotive industry has so far dismissed this figure as unrealistic and expensive.

However, Per Kågeson's analysis demonstrates that car manufacturers would not face any technical obstacles in meeting the target of 140 g/km by 2008 or 120 g/km by 2012. Technical development has been rapid. The fact is that the level of 140 g/km could have been achieved this year (2005) if the cars built since 1995 had not become heavier and more powerful, and if the number of four-wheel drive vehicles had not grown explosively.



Carbon dioxide emissions from the average new car fell significantly until 2000, but since then the decline has flattened out. Some countries – Germany, Austria and Luxembourg – are even reporting rising emissions. Sweden is by far the worst in the class.

Similarly, cars would not necessarily cost more. If manufacturers chose to reduce vehicle weight and engine power, cars could become even cheaper than today.

"The market is a good servant but a terrible master. The politicians must take command and introduce powerful incentives. A very large proportion of the car industry's income comes today from big, powerful and highly equipped cars such as sport utility vehicles. If the industry is to seriously develop and market energy-efficient cars there must be a real driving force behind it," says Per Kågeson.

The level of 140 g/km could have been achieved this year

There have recently been calls from several directions for the introduction of compulsory legislation. The EU ministers of the environment discussed the matter several times in 2004, and in January the EU Parliament presented a resolution insisting that the Commission immediately draws up a proposal for binding standards.

The Parliament suggests that the law is drafted in the same way as in California, in other words with an emission ceiling for the average car, but with freedom for car manufacturers to trade emission rights with each other. Ministers of the environment from several member states have expressed the same opinion.

A system of emission trading is also recommended as the best solution by Per Kågeson. It guarantees the fulfilment of targets, while also permitting flexibility, and hence lower overall costs than if every manufacturer were forced to meet the same level. The system would also be advantageous for European car manufacturers, since they currently build more fuel-efficient cars than their competitors.

The only real alternative to a trading system, according to Per Kågeson, is to have car registration taxes

that are differentiated on the basis of carbon dioxide emissions. To avoid making the average car more expensive, such a system could be devised so that fuel-efficient cars receive a discount at the expense of the higher tax that is paid by thirstier cars.

In order for a registration tax to have the desired effect it must however be clearly felt. Buyers of big, expensive cars are not particularly price-sensitive. Another complication is that the big car markets in the EU – France, Germany, the UK and Italy – either do not have a registration tax or just impose a notional one. Nor is it possible to force such a tax on them, since all decisions on common taxes in the EU must be reached unanimously.

Representatives of the Association of European Automobile Manufacturers (ACEA) are moderately pleased over the tougher stance. They will not admit that the target for 2008 is out of reach, but say that it will be expensive to achieve.

"Strict fuel consumption standards are being introduced now in California and China. If European industry does not stay ahead and develop fuel-efficient cars now it will face problems in the near future," comments Jos Dings, head of T&E's office in Brussels.

PER ELVINGSON

[1] **Reducing CO_2 Emissions from New Cars: A progress report on the car industry's voluntary agreement and an assessment of the need for policy instruments**. By Per Kågeson, published by the European Federation for Transport and Environment (T&E), Report 05/1. Available in pdf format at www.t-e.nu.

[2] **A Community Strategy to Reduce CO_2 Emissions From Passenger Cars and Improve Fuel Economy**. COM(95)689, approved by the Council 25 June 1995.

Californian legislation on CO_2 from cars legally challenged

IN 2002, the state of California passed a law that demands sharp reductions in the emission of greenhouse gases from cars and light duty vehicles. Based on this law, the California Air Resources Board (CARB), in September 2004, proposed that car makers should, during the first phase, be forced to reduce specific emissions from new cars and light commercial vehicles by 25 and 18 per cent respectively in 2012, and in the second phase by a total of 34 and 25 per cent in 2016.

In December 2004, car manufacturers including the BMW Group, DaimlerChrysler, Ford Motor Company, General Motors, Mazda, Mitsubishi Motors, Porsche, Toyota and Volkswagen announced a legal challenge to the legislation, since they consider that the law effectively regulates the fuel consumption of cars and that such standards should be decided at federal level (but at this level the industry has lobbied hard against stiffer standards).

Largely because of the rise of sport utility vehicles, the average fuel economy of new vehicles sold in the United States has declined since the late 1980s, driving up greenhouse gas emissions and increasing the country's oil consumption.

"It's especially disappointing to see Ford and Toyota filing suit, since they've been positioning themselves as environmentally sensitive manufacturers," said Jim Marston, attorney for Environmental Defense.

At least seven other US states – New York, Massachusetts, Maine, Vermont, Connecticut, Rhode Island, and New Jersey – are moving to adopt California's greenhouse gas emission standards. Canada also plans to adopt similar rules. The states and Canada combined would account for about 25 per cent of the North American car market.

New fuel-economy standards in China

According to a recent report by the World Resources Institute (WRI), new Chinese fuel economy standards for 2005 – to be tightened in 2008 – imply that several manufacturers will have to improve fuel efficiency in order to safeguard their position in the Chinese market. GM and DaimlerChrysler are among the manufacturers who may face problems. Toyota, Ford, and PSA appear to be better positioned to meet the standards.

Further information: http://business.wri.org/newsrelease_text.cfm?NewsReleaseID=304

GERMANY

Kilometre tax for lorries now in force

SINCE 1 January all heavy goods vehicles that use the German Autobahn network must pay a kilometre tax. The system is satellite-based and uses roadside sensors to record every kilometre that a vehicle travels.

The system, which suffered an eighteen-month delay due to technical problems, is now reported to be working. The tax is differentiated on the basis of axle load and environmental class, and averages EUR 12.6 cents per kilometre. All goods vehicles over 12 tonnes, regardless of nationality, must pay. The German state expects to earn EUR 3 billion per year in taxes.

The German environment authority, Umweltbundesamt, has already raised the question of an increase in taxation levels. It wants to see the tax doubled by the year 2010, in an effort to shift freight transport from road to rail. It has calculated that this move would create up to 28,000 jobs and cut emissions of carbon dioxide by almost 3 million tonnes a year.

Several European countries are following developments in Germany with great interest. However, an EU directive that is currently under revision (AN 4/04), means that taxes can only be charged on vehicles heavier than 12 tonnes, and then only on the motorway network. Another restriction is that the value of the tax may only reflect infrastructure costs.

Kilometre taxes have been in use in Switzerland since 2001, and in Austria since last year. In Switzerland, where the tax is four to five times higher than in Germany, it is levied on the entire road network, for all vehicles heavier than 3.5 tonnes, and also covers external traffic costs.

The Czech Republic, Slovakia and Hungary are reported to be preparing to introduce kilometre taxes in the next few years. A wider-reaching system is being prepared in the UK, but this will require changes to EU legislation before it can be introduced.

Further reading: Special Feature on Road Charging. T&E Bulletin, February 2005. Available at www.t-e.nu.

Benchmark emission standards for large combustion plants imminent

THE LARGE COMBUSTION PLANT BREF (BAT Reference Document) was adopted by the IPPC Information Exchange Forum (IEF) at its meeting in Brussels just before Christmas.

The Forum operates within the Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC), which is the key instrument of EU industrial policy relating to the environment. It covers a wide range of industrial and agricultural processes, and already applies to all new plants; existing plants have until 2007 to comply with its requirements.

The role of the Forum is to oversee the information exchange process that establishes the IPPC benchmark The information exchange is organized around a series of technical working groups, each addressing a particular industrial sector or cross-sectoral issue. BAT (Best Available Techniques) is the best standard that could be economically and technically generalized across the sector as a whole. However, IPPC does not prescribe any particular technology – rather, it is expressed as an emission value, such as mg/Nm^3 or mg/l.

The LCP BREF sets out the benchmark BAT standards for the large combustion plant sector. It has taken five years to produce and is about 600 pages long, although an Executive Summary sets out the key BAT standards in just a few pages.

The BAT standards cover a wide range of pollutants in different environmental media – air, soil and water. They also include some BAT standard procedures e.g. for the storage and handling of fuels and for environmental management systems.

It is not entirely correct to compare the IPPC standards with those set under the Large Combustion Plant (LCP) Directive because of differences in the bases of the two policy measures. The LCP Directive applies only to emissions into the air, whilst IPPC takes an integrated approach that considers the impact on all environmental media.

Further, the LCP Directive emission limit values are legally binding, whilst the BAT standards set out in the BREF are non-legally binding benchmark standards, intended to act as guidance for permit writers and industry. However, for the purposes of illustration, the tables 1–3 compare the LCP Directive emission limit values with the BREF BAT standards for emissions into the air from coal-fired plants for sulphur dioxide (SO_2), nitrogen oxides (NOx) and dust.

The benchmark BAT standards set out in the BREF represent the conclusions reached by the majority of the LCP Technical Working Group members. However, the BREF also records a number of "split views" representing the dissenting opinion of industry and a few member states. The extent to which these represent a difference of technical opinion is debatable, because a regrettable feature of the LCP BREF is that its production was subject to powerful and repeated attempts to politicize the process – something that has no place in a technical information exchange process.

The industry case is fundamentally flawed on several grounds

The dissenters argue that the BREF BAT standards represent the "best ever" standards of isolated cases, and not the full spectrum of feasible performance operating under commercial conditions at varying load factors. However, the European Environmental Bureau (EEB) has robustly dismissed this, submitting its own paper to the IEF and Commission in response to that being circulated by industry. In this, it argues that the industry case is fundamentally flawed on several grounds.

Firstly, the BREF BAT standards are not meant to represent the full spectrum of feasible performance. They are the benchmark standards, whereas a lot of feasible performance is of a relatively low or very low standard and should not be reflected in the benchmark. Neither should the benchmark reflect different loading patterns, because it is explicitly set for typical load factors; other loading patterns form part of the local factors which, under the IPPC Directive, are taken into account in setting the permit for each individual installation.

With regards to claims that the standards represent the "best ever" isolated case, a distinction has to be made between there being only a few applications and those applications being isolated cases. The EEB argues that BAT can be represented by just a few cases, or even one plant. Indeed if it couldn't, the BAT standard could never reflect new technical advances which are invariably introduced at just a few plants. However, this does not mean that they are isolated. To argue against a few plants forming the benchmark, it has to be shown that the standard of those plants could not be generalized across the sector as a whole.

The EEB's paper provides technical support for the BREF standards based on the performance of a number of plants in Germany; plants across Germany, Austria, Sweden, Finland and the Netherlands; the UK's Department of Trade and Industry and the UK Environment Agency Process Guidance Notes; guarantees that are regularly given by the manufacturers of dust and NOx abatement equipment; and even from a technical presentation given by the industry itself. There is nothing isolated about these sources and they certainly refer to commercial operation.

However, the BREF BAT standards are distinct from the legally binding BAT limits set in the individual permit for each installation. The BREF standards are a guide, but in writing permits, account also has to be taken of local environmental, technical and

Table 1. Coal-fired plants: comparison of IPPC BAT standard SO_2 emission values (EVs) with LCP Directive emission limit values (ELVs).

Sulphur dioxide		IPPC BAT EV(mg/Nm³)		LCP Directive ELV(mg/Nm³)	
Capacity (MW_{th})	Combustion technique	New plants	Existing plants	New plants	Existing plants
50-100	PC/GF	200-400	200-400	850	2000
	CFBC/PFBC	150-400	150-400		
	BFBC	150-400	150-400		
100-300	PC	100-200	100-250	200	2000-400 linear decrease
	CFBC/PFBC	100-200	100-250		
	BFBC	100-200	100-250		
300-500	PC	20-150	20-200	200	
	CFBC/PFBC	100-200	100-200		
	BFBC	20-150	20-200		
>500	PC	20-150	20-200	200	400
	CFBC/PFBC	100-200	100-200		
	BFBC	20-150	20-200		

Table 2. Coal-fired plants: comparison of IPPC BAT standard NOx emission values (EVs) with LCP Directive NOx emission limit values (ELVs).

Nitrogen oxides		IPPC BAT EV(mg/Nm³)		LCP Directive ELV(mg/Nm³)	
Capacity (MW_{th})	Combustion technique	New plants	Existing plants	New plants	Existing plants
50-100	GF	200-300	200-300	400	600
	PC	90-300	90-300		
	FBC	200-300	200-300		
100-300	PC	90-200	90-200	200	600
	FBC	100-200	100-200		
300-500	PC	90-150	90-200	200	600
	FBC	50-150	50-200		
>500	PC	90-150	90-200	200	500[1]
	FBC	50-150	50-200		

[1] 500 mg/Nm³ up to 2015; 200 mg/Nm³ as from 2016.

PC = Pulverized combustion. GF = Grate firing. FBC = Fluidized bed combustion. CFBC = Circulating fluidized bed combustion. PFBC = Pressurized fluidized bed combustion. BFBC = Bubbling bed fluidized bed combustion.

geographical conditions.

This local flexibility could be one of the strengths of IPPC, but it could also be a weakness if it is intentionally or unintentionally misused. For example, without specific guidance, permit writers are likely to differ in the weight that they give to local factors. To address this, the Commission proposes case studies of a sample of permits issued in different member states to ensure a common standard. Such studies would also show if particular member states are deliberately downgrading standards to allow more scope for emissions trading.

More problematic, though, is establishing the remaining lifespan of existing plants in order to establish the annualized costs necessary for determining BAT for the installation. Commercial considerations can make this genuinely difficult, but equally it could be open to manipulation. For example, under the UK's very similar predecessor system, the power sector evaded widespread retrofitting of FGD equipment in the late 1990s by claiming that the coal-fired plants would be closing by 2010. Within months of that successful evasion, plant operators were acknowledging that plants would stay open significantly longer.

Further retrofitting of FGD is now underway in the UK, but the underlying problem has re-emerged in relation to IPPC standards for NOx. Here, the UK Environment Agency is proposing to specify BAT in terms of the relatively unambitious overfire air technology, arguing that the LCP Directive requirement to fit the more effective but expensive selective catalytic reduction (SCR) to the largest plants after 2015 is likely to cause them to close by that date. However, if this assumption is incorrect, then a longer remaining lifespan for the plants could justify the retrofitting of SCR from 2007.

This problem could be addressed by setting benchmark standards for the lifespan of plants. With some member states closing coal-fired plants after 30 years, there appears to be little economic justification for other member states keeping plants open for 50 years. Further, in addition to removing an important uncertainty in the determination of BAT, such a standard would also hasten the attainment of the environmental advantages of new plant standards and act as a spur to further technological advance. In this way, IPPC could become a real force for environmental improvement.

LESLEY JAMES

The author is designated expert for the European Environmental Bureau (EEB) in the IPPC Technical Working Group on LCPs.

Table 3. Coal-fired plants: comparison of IPPC BAT standard dust emission values (EVs) with LCP Directive dust emission limit values (ELVs).

Dust	IPPC BAT EV(mg/Nm³)		LCP Directive ELV(mg/Nm³)	
Capacity (MW_{th})	New plants	Existing plants	New plants	Existing plants
50-100	5-20	5-30	50	100
100-300	5-20	5-25	30	100
300-500	5-10 PC 5-20 CFBC	5-20 PC 5-20 CFBC	30	100
>500	5-10 PC 5-20 CFBC	5-20 PC 5-20 CFBC	30	50

PC = Pulverized combustion. CFBC = Circulating fluidized bed combustion.

Contents of the adopted LCP BREF. Chapter one contains general information about the industry and its key environmental impacts. A second chapter sets out the general principles and processes of combustion, and looks at the concept of efficiency. It is in chapter 3 that the heavy technology starts; this looks at common processes and techniques for reducing emissions from LCPs that can be applied across a range of different fuels. BAT standards come in chapters 4–7, each of which looks at a different type of fuel. Chapter 8 addresses waste and recovered fuel. Chapter 9 makes some concluding remarks, followed by a glossary and some technical annexes.

© ANDRÉ MASLENNIKOV

Lignite policy threatens German climate strategies

LIGNITE, or brown coal, is the main domestic fuel resource in Germany. In contrast with the diminishing global reserves and increasing prices of natural gas and oil, lignite appears to offer long-term energy security. The extensive geological deposits between the Rhineland and the tri-country region of Germany, Poland and the Czech Republic are sufficient to maintain current levels of lignite power generation for more than two centuries. The deposits lie close to the surface, allowing relatively inexpensive strip mining to be employed.

However, lignite is ultimately very costly to use because of factors not reflected in market prices. According to a study by the Wuppertal Institute, released by the German environmental ministry in October 2004, the financial burdens of environmental and health detriments are estimated at a minimum of EUR 3.5 billion annually. When the comprehensive effects of climate change and a number of indirect subsidies are added, the total hidden costs of lignite use may be as high as EUR 35 billion per year.

In relation to German mining production of 180 million tons annually, these concealed costs range from EUR 25 to 200 per tonne of lignite, or up to 22 cents for each kilowatt-hour of electricity produced. Lignite is delivered to power plants for only about EUR 10 per tonne. On an all-inclusive basis, however, it is considerably more expensive than renewable energy from wind or biomass.

More than one-quarter of German electrical power is generated using lignite. The future expansion of this sector appears likely due to the lack of short-term alternatives to the country's 19 nuclear power plants, which must be shut down by law within two decades. In 2003, these reactors delivered 165 TWh (billion kWh) of electrical energy, thus satisfying 27.6 per cent of total power demand. The first plant at Stade was retired in November of that same year.

High greenhouse gas emissions

Crude lignite contains significant quantities of sulphur, inorganic impurities, and over 50 per cent residual groundwater, all of which detract from power plant efficiency. The remaining combustible portion consists largely of carbon. As a result, about one kilogram of CO_2 is released into the atmosphere for each kWh of electricity generated – nearly three times the amount produced by a combined-cycle gas turbine plant. While lignite accounts for 11 per cent of primary energy consumption in Germany, it is thus responsible for 22 per cent of the country's CO_2 emissions.

After three lignite power stations were commissioned between 1997 and 2000 in the new German states,[1] the federal government abandoned its self-imposed 25-per-cent CO_2 reduction goal for 2005 (relative to 1990). The less stringent Kyoto target of 21 per cent must now only be attained by 2012 for a mixture of six greenhouse gases.

Since 2000, German CO_2 emissions

[1] The three lignite plants at Schwarze Pumpe, Lippendorf and Boxberg were commissioned between 1997 and 2000 in Brandenburg and Saxony with a total gross capacity of 4,340 MW.

have stagnated at around 16 per cent below 1990 levels. The three major mining companies – RWE Power AG, the Swedish state corporation Vattenfall Europe AG, and the American-owned MIBRAG – intend to increase lignite production in response to nuclear phase-out and rising power consumption. In western Germany, up to 40,000 MW of ageing generating equipment – one-third of the country's entire capacity – are to be replaced by 2020. MIBRAG and Vattenfall have announced the construction of additional power plants in the east.

In a study prepared for the German lignite mining industry association DEBRIV, the Prognos AG research institute has estimated that lignite will supply 34 per cent of all electrical power by 2040. The fulfilment of these expectations would make Germany less capable of meeting future climate protection obligations. New plants will be more efficient, so that the CO_2 emissions from lignite will be lower in proportion to power generation.

However, any long-term stabilization at present emission levels would already constitute an unsustainable ecological burden. If a 70 to 80 per cent CO_2 reduction were mandated by 2050 in accordance with the scientific evidence on global warming, then nearly all of Germany's emissions would emanate from lignite. That perspective is incompatible with the anticipated fossil fuel demands of motor vehicles, space heating and industrial applications.

The German National Allocation Plan (NAP) precedent to EU emissions trading is dominated by concessions to the lignite industry. Vattenfall announced its assurance of full CO_2 emissions rights in August 2004, one month before the formal application procedure had even begun. Lignite generating plants have largely precluded the use of combined heat and power (CHP) as a resource-efficient alternative.

Destroying villages for profit

Rather than reducing lignite consumption to enhance environmental integrity, liberal operating permits have been granted to the mining companies under the Federal Mining Act. This legislation traces its origins to two historic periods in which domestic energy supplies were regarded as particularly vital to national security: the Third Reich and the international oil shortages of 1979–80. Over 300 communities have been destroyed by surface mining under its provisions.

Vattenfall devastated the traditional Sorb village of Horno near the Polish border in 2004, disregarding standards of ethnic inviolability and historic preservation that had supposedly been reinstated by German reunification. The company began pumping groundwater from beneath the nearby settlement of Lacoma in preparation for mining, even though this aquatic landscape is registered as an EU Flora-Fauna Habitat and as an Important Bird Area. MIBRAG has laid claim to the medieval village of Heuersdorf in Saxony, where lignite accounts for 85 per cent of the power consumption. In the Rhineland, RWE intends to resettle 18 communities with nearly 8,000 inhabitants for the Garzweiler II mine by 2045.

Squandered resources

Despite ecological taxes and energy-conservation incentives, power demand in Germany continues to rise by more than 1 per cent a year. With total consumption approaching 600 TWh per year, the equivalent of one additional 800 MW[2] generating plant operating 7,500 hours is required each year. Such "base-load" generation is ideally suited for lignite-fired steam boilers, which are designed for constant full-power service.

As a result, however, electricity from lignite is often sold below cost at night, at weekends and on public holidays, when production greatly exceeds demand. Lignite power may then be used as an inexpensive heat source for industrial processes. Compared with highly efficient oil or gas burners, lignite produces CO_2 emissions that are several times higher. Surplus power is also fed to hydroelectric pump storage facilities for redistribution during periods of peak consumption. Although this practice is preferable to wasteful heating, more than one quarter of the lignite is effectively lost to pumping and to grid transmission.

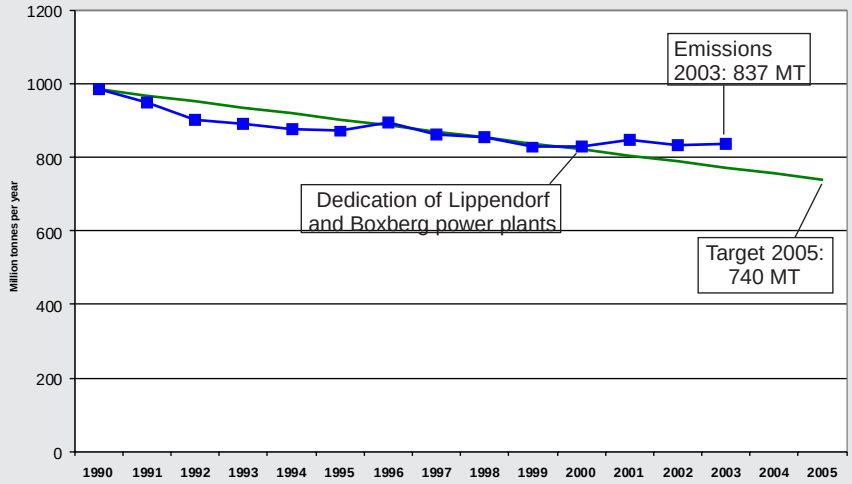
Multiple energy paths

With the present technological constraints a number of strategies could be implemented or combined to comply with future climate production mandates.

Contrary to the policy of the current Social Democrat (SPD) and Green coalition government, the opposition Christian Democrats (CDU), Christian Socialists (CSU), and Liberal Democrats (FDP) support the reinstatement of nuclear power. Corresponding legislative initiatives may be expected after the federal elections of 2006, should these parties regain a parliamentary majority.

The fossil-fuel alternative to avoiding greenhouse gases involves carbon capture and storage (CCS) using energy-intensive processes for liquefying CO_2 from power plant emissions. With sequestration in under-

Emissions of carbon dioxide in Germany. The grey line shows a linear reduction needed to cut emissions by 25 per cent in 1990–2005. Black line shows actual emissions.



[2] 800 MW expresses the effective capacity at the point of consumption. Larger steam turbines are required in practice to power emissions filters in the generating plant and to cover grid losses.

ground caverns or salt aquifers, the estimated typical cost of EUR 50 per tonne of CO_2 makes dramatic price increases for lignite power appear inevitable. Crude lignite produces about one tonne of CO_2 when burned. Sequestration would therefore raise its net market price considerably. At the same time, sequestration cannot be emulated by nations lacking the financial and/or geological resources available to Germany.

The first German CCS lignite plant may not be fully operational until around 2025, thus excluding current modernization programmes from using these technologies. The high energy expenditures required for compressing CO_2 from plant exhaust gases would necessitate the use of even more lignite. The extensive groundwater depletion inherent in mining is already contributing to the transformation of Brandenburg into a steppe landscape, a process accelerated by global warming.

Wind power could hypothetically supersede a great deal of conventional power generation. However, six times the land-based capacity of 18,000 MW expected for 2005 would be required to achieve the energy output of all nuclear plants, assuming the present average wind utilization factor of 0.17. Extensive offshore wind farms, predicted by the government to attain a rated maximum power output of 25,000 MW by 2030, could provide only one-fourth of the needed replacement power. Seasonal output fluctuations and the weak grid infrastructure of many coastal regions narrow the viability of wind generation as a nuclear substitute, which would still deliver no net reduction in CO_2 emissions even if fully implemented.

A fourth option involves the modification of existing strategies themselves. RWE and Vattenfall have depicted the construction of new lignite power plants as an international model for the coal industry. Installing the same technology worldwide, it is claimed, would prevent the annual emission of 1.4 billion tonnes of CO_2 at a cost of less than EUR 20 per tonne. However, even greater reductions could be achieved by combining a variety of techniques for enhancing the net yield of available fuel resources. In many instances, other countries have taken the lead in their implementation.

1. CO-FIRING OF LOW-CARBON OR BIOGENIC FUEL. Several coal-fired power plants in Germany, the UK, Poland and the USA already use agricultural biomass, sewage sludge, organic waste, or synthetic gas from industrial processes as a supplementary fuel. Since the proportionate net CO_2 emissions are nearly zero, the required investment costs might be compensated in the future by revenues from emissions trading.

© JEFFREY H. MICHEL

The fortified Emmaus Church in Heuersdorf, built in 1297 and the oldest in Sachsen. The entire village of Heuersdorf will be demolished if the US-owned mining company MIBRAG gets its way.

2. GASIFICATION. Lignite may be gasified to achieve an efficiency of 55 per cent, compared with 43 per cent exhibited by current best designs. In recent funding proposals submitted under the Clean Coal Power Initiative in the USA, a full 97 per cent of the projects by value involved techniques for coal or lignite gasification.

3. RANKINE CYCLE. The surplus heat of combustion, which constitutes more than half the thermal energy of most lignite plants, can be employed to vaporize a highly volatile liquid such as ammonia or propane that in turn drives an additional generating turbine. The corresponding thermodynamic process, known as the Rankine cycle, is widely used in chemical factories to achieve improvements in generating efficiency. The electricity produced by this technique already qualifies as green power in Nevada, North Dakota and South Dakota, because no additional fuel is required for generation.

4. LOAD MANAGEMENT. Automated Meter Reading (AMR) allows time-of-use rates and real-time pricing to be implemented. The tariffs are raised during periods of highest power demand to motivate a reduction in consumption. In this manner, cost benefits are realized by both the grid operator and its customers. In a recent case study by the California Public Utilities Commission, AMR was estimated to yield annual savings in administration and reliability of almost $40 per household using a meter that could cost less than $150.

5. DISTRIBUTED GENERATION. A variety of integrated approaches are available or under development for providing semi-autonomous decentralized generation and automated control. Energy supply systems employing a combination of wind, solar and biomass energy would significantly lower long-range transmission requirements.

None of these objectives has been pursued by the German power industry to the extent that modern technology would allow. It remains to be seen whether CO_2 emissions trading can provide a financial impetus sufficient for their implementation.

JEFFREY H. MICHEL

Jeffrey H. Michel is the Energy Coordinator of Heuersdorf and advisor to Friends of the Earth Europe. He is the author of the report "Status and Impacts of the German Lignite Industry", to be published by the Swedish NGO Secretariat on Acid Rain.

Green light for early introduction of filters

Several EU countries expected to set tax incentives

IN JANUARY the EU Commission gave the green light to member states that wish to give fiscal incentives for diesel passenger cars with particulate emissions lower than 5 milligrams per kilometre (mg/km). At present this limit can only be met by fitting particulate filters. Germany and Austria have already decided to introduce tax incentives, and according to the Commission there is also interest in the Netherlands, France and Sweden.

Euro 4, the emission standards that will come into effect this year in the EU, permits diesel cars to emit 25 mg/km. Particulate filters are already available for a range of diesel cars today and these can reduce emissions to below 2.5 mg/km.

It is not certain that 5 mg/km will be the particulate level imposed in the next generation of emission standards, Euro 5. A proposal is to be put forward by the Commission in 2005, and would probably take effect in 2010. It is expected that this proposal will also set stiffer limits for nitrogen oxides from diesel cars, which under Euro 4 are allowed emission levels three times as high as petrol cars.

"Five mg/km may be fine as a first step for tax incentives as of 2005, but is certainly not enough for Euro 5 in 2010," comments Karsten Krause, policy officer at the European Federation for Transport and Environment (T&E). "A maximum of 2.5 mg/km is technically feasible for particles, and we should not forget NOx, which can be reduced by 70 per cent with existing technologies."

PER ELVINGSON

Further reading: **Fiscal Incentives for Motor Vehicles in Advance of Euro 5.** Commission Staff Working Paper. SEC(2005) 43. 12.1.2005. Can be downloaded from http://europa.eu.int/comm/enterprise/automotive/index_en.htm

Less nitrogen oxides from diesel cars

The US Environmental Protection Agency and Ford are jointly testing technology developed and patented by the EPA that drastically reduces emissions of nitrogen oxides from diesel cars without treating exhaust gases.

The technology is called Clean Diesel Combustion and is a combination of several improvements in injection and combustion. It is said to be able to reduce emissions of nitrogen oxides to less than 0.07 grams per mile (approx. 0.04 g/km), which meets the requirements of the Tier 2 bin 5 emission standard.

Source: EPA news release, 28 January 2005.

German diesel filter incentives

German subsidies on particle filters for diesel cars will be introduced in 2006 and be worth a maximum of 350 euro. Old cars retrofitted with particle filters to meet the same standard will attract a EUR 250 tax break. According to earlier information the subsidies were to be introduced already this year and reach a maximum of EUR 600 per vehicle. The threshold for emissions has, however, been lowered from 8.5 to 5.0 mg/km.

The subsidy will be available for two years. Under a previous agreement the automotive industry in Germany has promised that all diesel vehicles will be equipped with particle filters by 2008. The subsidies are expected to cost EUR 1–1.5 billion over the two years, and require approval by Germany's 16 states.

Source: **Environment Daily**, 2 February 2005.

EU NEWS IN BRIEF

Sulphur-free fuels guidelines

From 2005, sulphur-free motor fuels must be available on "an appropriately balanced geographical basis" within the EU, in line with the fuel quality directive decided in 2003[1] (all petrol and diesel must be sulphur-free, i.e. contain no more than 10 ppm sulphur, from 2009). A Commission guidance published in January explains how member states could measure compliance.[2] Its main recommendations are that governments measure either the proportion of filling stations selling sulphur-free grades by region or the average distance between such filling stations. According to the Commission 28 per cent of petrol and 25 per cent of diesel sold in the EU-15 countries in 2003 was sulphur-free.

[1] 2003/17/EC. [2] Official Journal of the European Union, L 15/26. 19.1.2005.

4th daughter directive comes into effect

The fourth daughter directive passed under the 1996 air quality framework directive has entered legal force after being published in the EU official journal.[1] The directive aims at limiting air pollution by the metals arsenic, cadmium, mercury and nickel, plus polycyclic aromatic hydrocarbons (PAHs). It was agreed by the EU institutions last April (AN 2/05) and must be transposed into national law by 15 February 2007.

[1] Directive 2004/107/EC. Official Journal of the European Union, L 23/3. 26.1.2005.

Less sulphur from Maritsa, Bulgaria

Maritsa II, the Bulgarian coal-fired power plant that has the highest sulphur dioxide emissions in the whole of Europe, is to have flue-gas desulphurization equipment installed on blocks 5 and 6, following the approval of a loan for EUR 34 million by the European Bank for Reconstruction and Development (EBRD). Emissions of sulphur dioxide from the blocks in question are expected to fall by 94 per cent. EBRD has approved total loans of EUR 187 million to the Maritsa power complex, which is responsible for around 50 per cent of the country's electricity generation.

Source: **Europe Information Environment**. 10 December 2004. *Further reading*: Acid News No. 2, May 2003, No. 4, December 2004.

NEWS IN BRIEF

Spanish emissions rise

Spanish emissions of greenhouse gases rose by three percentage points last year, which means that they are now almost 45 per cent higher than in 1990. This emission increase is three times larger than the country is entitled to according to the EU's burden sharing agreement under the Kyoto Protocol (+15 per cent) up to the period 2008–12.

Source: **Environment Daily**, 2 February 2005.

EU trading update

Four EU countries – the Czech Republic, Italy, Greece and Poland – failed to get their national allocation plans for CO_2 emission allowances approved by 1 January, the date when the EU's internal trading system for CO_2 came into effect. Greece, the worst laggard, finally submitted its draft NAP only on 30 December. The original deadline for submission was 31 March. Italy received a final written warning from the Commission in mid-January for failing to submit a complete allocation plan.

Companies in those countries that do not have approved allocation plans will not be issued allowances in the emissions trading scheme. However, serious trading is not expected to begin until March, when a system for recording transactions between companies is put in place.

Further information: http://europa.eu.int/comm/environment/climat/emission.htm

Many EU countries need to do more

Existing domestic policies and measures will reduce total EU15 greenhouse gas emissions by only 1.0 per cent from base-year levels by 2010, according to a report from the European Environment Agency (EEA).[1]

Emissions in 2002 – the most recent year for which data exists – were 2.9 per cent below the level for the base year (in most cases 1990). The EU commitment under the Kyoto Protocol is a reduction of 8 per cent between the base-year level and the average for the period 2008–12.

When additional domestic policies and measures being planned by member states are taken into account, a reduction of 7.7 per cent is projected. However, this relies on several member states cutting emissions by more than is required to meet their national targets. If no over-delivery by these member states is included, the EU15 will achieve a 5.4-per-cent reduction with additional policies and measures.

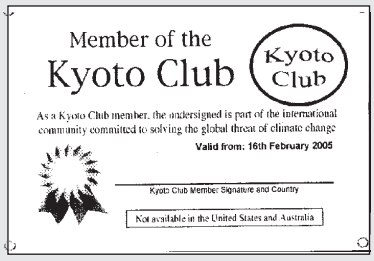
The use of the Kyoto Protocol's flexible mechanisms, which are currently being implemented by Austria, Belgium, Denmark, Ireland, Luxembourg and the Netherlands, will reduce the gap between projected emissions and the EU15 target by a further 1.1 per cent. Assuming the 7.7-per-cent reduction above, this would bring the total reduction to 8.8 per cent and thus the Kyoto target would be achieved. Without over-delivery from some countries the reduction will be 6.5 per cent.

Each of the EU15 countries has an agreed legally binding target for limiting or cutting its own emissions to ensure the overall 8-per-cent reduction is met. But the projections show that at present Denmark, Italy, Portugal and Spain are on course for above-target emissions, some by a wide margin, even with use of the Kyoto mechanisms and additional measures planned.

None of the projections takes into account the EU emissions trading scheme or plans to sequester carbon in "sinks" such as forests or agricultural land.

[1] **Greenhouse gas emission trends and projections in Europe 2004.** EEA Report No 5/2004. Available in pdf format at http://reports.eea.eu.int/eea_report_2004_5/en.

No progress at COP 10 in Buenos Aires



Member's card for the Kyoto Club. The Climate Action Network handed out member's cards and flowers to delegations from the 141 parties that ratified the Kyoto Protocol, thus bringing it into force on 16 February this year. The US and Australia were left out...

Two weeks of negotiations during the climate convention in December (COP10) served to underline the divisions that still exist over which commitments should be made when the Kyoto Protocol runs out in 2012.

The EU target at the meeting was to open immediate discussions on the next commitment period. According to the Kyoto Protocol, which came into force in February this year, negotiations on the next period should commence in 2005 and be concluded in 2007.

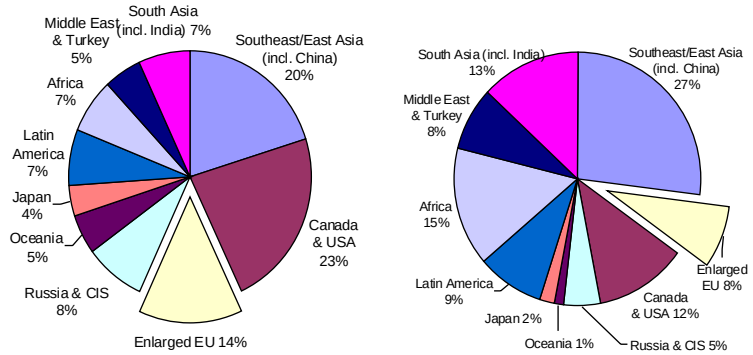
The US insisted, however, that it would be premature to begin in 2005. In a compromise, participants agreed to a UN seminar in May at which government experts will hold an "informal" exchange of information on existing and future policies. At the insistence of the US a proviso adds that the seminar "does not open any negotiations leading to new commitments".

Environmentalist organizations were, without exception, disappointed at the results of the meeting and accused the US and Saudi Arabia of obstruction. Saudi Arabia was opposed to the allocation of more money to the poorest countries to aid with adaptation unless it was promised compensation for future loss of oil revenue.

Further information: **UN framework convention on climate change**, www.unfccc.int. **Eco,** conference newsletter published by Climate Action Network, www.climatenetwork.org/eco.

No emission targets for EU after Kyoto

The Commission wants the EU to explore options for a post-2012 strategy with key partners during 2005 before deciding on the position it will take in the upcoming negotiations.



Global emissions of greenhouse gases 2000 (left) and 2050 (right). The EU share is shrinking, and broader international collaboration is therefore a top priority, says the Commission.

NEW RESEARCH shows that levels of greenhouse gases must be kept lower than was previously assumed in order to meet the EU's climate target. This is according to a Communication from the Commission that was prepared on request by the heads of government of the member countries, who are to discuss "medium and longer-term emission reductions strategies" at their meeting this spring.

The climate target that was formulated by the EU in 1996 stated that the global mean temperature should not rise more than 2°C above the pre-industrial level. This was previously assumed to correspond to an atmospheric greenhouse gas concentration of 550 ppm CO_2 equivalents.

However, the Commission now reports that the 550-ppm level offers at most a one-in-six chance of complying with the temperature target. Limiting the increase to 2°C "would very probably require greenhouse gas concentrations to be stabilized at much lower levels." This in turn "will require significant global cuts in emissions".

The main priority for the EU right now, according to the Commission, is to break the deadlock that exists in international negotiations.

"Indeed a relatively small group – EU, US, Canada, Russia, Japan, China and India – accounts for about 75 per cent of world greenhouse gas emissions", states the Commission. "It might be worthwhile to try to accelerate progress at the global level by discussing reductions among this smaller group of major emitters in a forum similar to the G8, in parallel with vigorous efforts to reach agreement in the UN context".

The communication does not propose any new climate target for the EU, on the grounds that this would be premature: "The Commission recommends that the EU explore options for a post-2012 strategy with key partners during 2005 before deciding on the position it will take in the upcoming negotiations".

The transition to a climate-friendly society offers economic opportunities for the EU

This stance has attracted criticism from many environmentalist organizations, which believe that this is the wrong tactic and represents a backward step from the EU's proactive role. The Commission stresses however that the EU will continue to play a leadership role in the multilateral approach to climate change.

In addition to extending international efforts to encompass more countries, there is also a desire that it should be widened to cover all greenhouse gases and sectors. Special mention is given to emissions from aviation and maritime transport, which are currently not covered by the Kyoto Protocol. The halting of deforestation is also identified as an important priority.

The Communication underlines that the transition to a climate-friendly society offers economic opportunities for the EU. Proposals are put forward for the development of increased energy efficiency and security of energy supply.

Many technologies for reducing greenhouse gas emissions either exist already or are at an advanced pilot stage, writes the Commission. An annex to the communication lists 15 options, which together could reduce emissions in the EU by more than 54 Gt CO_2 eq. per year by 2050.

The Commission asserts that there is increasing scientific evidence that the benefits of limiting the global average temperature increase to 2°C outweigh the costs of abatement policies. If temperatures continue to rise beyond 2°C a more rapid and unexpected perturbation in the climate becomes more likely, and irreversible catastrophic events may occur.

The Commission has also studied the possible costs of cutting world emissions consistent with stabilizing greenhouse gas concentrations in the atmosphere at 550 ppmv CO_2 eq. in the long term. Assuming gradual participation of all countries in a global effort and full international emissions trading, the study shows that reducing EU25 emissions annually by about 1.5 percentage points after 2012 would reduce GDP in 2025 by about 0.5 per cent below the level it would reach in the absence of such a policy. This is a small loss in light of the fact that GDP is expected to grow by 50 per cent by 2025.

PER ELVINGSON

The communication, **Winning the Battle Against Climate Change**, a background paper and further information are available at www.europa.eu.int/comm/environment/climat/future_action.htm

Cleaner air gives major benefits

Yet another study has shown that the costs of reducing emissions are often greatly exaggerated and that the benefits are generally underestimated.

THE TECHNICAL CONSULTANCY AEA Technology has examined the effects of emission control legislation that was introduced in the UK in the period 1990–2001 on the transport and energy supply sectors. The study was commissioned by the Department for Environment, Food and Rural Affairs (DEFRA).[1]

The report from AEA shows that emissions of sulphur dioxide, nitrogen oxides and particulates (PM_{10}) from both sectors have fallen sharply during this period. Further large improvements are expected by 2010, since several agreed standards have not yet come into full effect.

In the transport sector the reduction in emissions is due solely to air quality policy, whereas AEA calculates that 34–100 per cent of the reductions observed in the energy sector can be attributed to air pollution policy (the remaining proportion are due to other changes, including privatization and liberalization).

AEA finds that the reductions in air pollution concentrations have led to major health benefits (see factfile). These improvements have been translated into economic terms using established methods.

The economic benefits of road transport policies, as compared to the "without policies" scenario, are estimated at between £462 and 2,746 million annually by the end of the evaluation period (in 2001). By 2010, annual benefits (undiscounted) are projected to rise to £924–5,338 million.

When the benefits in the entire relevant period of the study (1990–2010) are considered, the total discounted benefits rise to an estimated £8,721–51,510 million.

The calculations of benefits do not include the improvement in air quality that the measures will give rise to after 2010. Neither do they take into account how the reductions in emissions have affected ground-level ozone formation. Similarly, they do not include transboundary effects (i.e. benefits in Europe from a reduction in UK emissions), or the benefits in the UK from reductions in European emissions from the implementation of this legislation (e.g. from Euro standards) abroad.

Economic Costs and Air Quality Benefits, relative to expected out-turn without policies for the evaluation period 1990–2001. £ Billion. Figures rounded.

	Ex Ante Cost (low to high)	Ex Post Cost (low to high)	Ex Post Air Quality Benefit (Central low to Central high)[2]
Road transport	16-23	2-4[1]	3-18
Energy sector	6-30	2	11-51

[1] Indicative only. [2] Only benefits within the UK in the period 1990–2001 are included. Some important benefits are excluded, e.g. the effects of reduced NOx emissions on ozone formation and effects in ecosystems.

The benefit figures can be compared against the costs of the policies. This is done using two sets of data: the estimated costs of policies before implementation (known as '*ex ante*' costs) and the actual costs of the policies once in place ('*ex post*' costs).

According to the report, total *ex ante* costs of policies in the transport sector were estimated at £16,109–22,807 million for the evaluation period (1990–2001), rising to £46,917–67,351 million for the entire period (1990–2010).

The total *ex post* costs are, as far as can be judged, considerably lower however. AEA calculates that the true cost could be of the order of £3,000 million for the evaluation period (1990–2001). In other words, the estimates on which the decision was based gave figures that were exaggerated by a factor of five to seven. (AEA does however state that the accuracy of the *ex post* figure is uncertain.)

A corresponding evaluation of the costs and benefits of reducing emissions in the electricity sector in line with the standards laid down in the 1994 sulphur protocol show that the

Benefits from air quality policy

The combined benefit in the UK from policies introduced in the road transport sector, plus all emission reductions seen in the electricity sector (from air quality and other policies), when compared to the 'without' policies scenario are:

- An estimated annual reduction of 4,225 deaths brought forward and 3,537 respiratory hospital admissions by the end of the evaluation period.
- An estimated annual reduction of 38,990 to 116,971 life years lost by the end of the evaluation period.

In both cases this is the benefit in the year 2001 with policies in place, compared with the predicted out-turn 'without' policies for that year.

These benefits are projected to increase significantly in future years, with an annual reduction of 6,587 deaths brought forward and a reduction of 81,601 to 244,803 life years lost each year by 2010.

These health benefits are dominated by the reduction in PM_{10} concentrations, from reductions in primary PM_{10} directly emitted, but also from secondary particulates formed from the emissions of NOx and SO_2.

benefit to cost ratios are slightly higher than for the road transport sector. Once again a number of benefits were not included, including effects on the ecosystem and transboundary effects.

It appears that the energy industry also has a clear tendency to greatly exaggerate the costs of future measures. AEA estimates that the *ex post* costs are likely to be below £2,000 million for the evaluation period. The total *ex ante* costs were estimated at £5,409–29,705 million. The costs assumed prior to acceptance of the measures were thus overestimated by a factor ranging from just over two up to a massive 15 times.

AEA concludes: "As it is the *ex post* costs that are relevant for evaluating policy, it can be seen that the benefits from the policies are likely to outweigh the costs of policy, probably by a significant amount."

The greatly overestimated *ex ante* costs mean that measures that appear to be unprofitable when subjected to a cost-benefit analysis prior to reaching a decision, can in actual fact be highly profitable.

AEA points out in its summary that a more critical and independent review of the industry's costing calculations is required. "This is particularly important, because in cost-benefit analysis, the 'typical' assumption has been that the cost estimates are far more accurate than the benefits analysis. The data in this study shows that this conclusion is rarely valid."

PER ELVINGSON

[1] **An Evaluation of the Air Quality Strategy**. By AEA Technology Environment, December 2004. Available in pdf format at www.defra.gov.uk/environment/airquality/strategy/evaluation/report-index.htm

Crying wolf

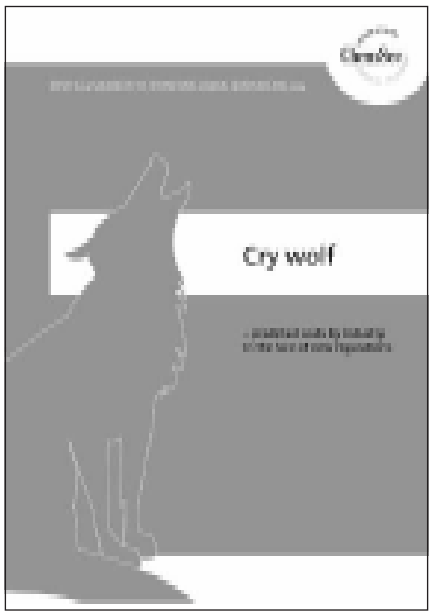
INDUSTRY HAS FOR YEARS overestimated the cost of implementing environmental legislation in order to persuade politicians to weaken or drop proposed environmental law, according to a report by the International Chemical Secretariat, sponsored by WWF.[1]

The report outlines five case studies: EU Directive on vehicle emissions standards (91/441/EEC), the EU auto-oil programme; CLRTAP protocols on acidification and the EU Directive on air emissions from large combustion plants; US Clean Air Act; and the Montreal Protocol on ozone layer depleting substances.

Each case study shows vastly overestimated costs and impacts predicted by industry during the legislative debate, and demonstrates that final results fall a very long way short of the catastrophic outcomes predicted by industry.

A further section of the report – the ABC of overestimation – offers nine examples from asbestos to vinyl chloride comparing actual costs of environmental legislation to the estimates. In all but one case the initial estimates were at least double the actual costs.

The report finds that regulators also tend to overestimate costs. It concludes: "cost estimates from specific interest groups within industry generally overestimate predicted compliance costs and underestimate innovation potential" and that "regulators tend to overestimate costs to industry, although the overestimates are not as systematic or as large as those presented by industry".



[1] **Cry Wolf – predicted costs by industry in the face of new regulations**. Published by the International Chemical Secretariat, 2004. Available at www.panda.org/downloads/europe/crywolf0404b.pdf

NEWS IN BRIEF

25 years with the LRTAP Convention

In December the Executive Body of the Convention on Long-range Transboundary Air Pollution met to celebrate the Convention's 25th anniversary. At a special event presentations were made on the work of the Convention and publications released to mark the anniversary.

The convention currently has 49 signatories and has been extended in eight protocols, the latest being the multi-effect protocol signed in Gothenburg in December 1999.

In conjunction with this special event the Executive Body also held its 22nd session. It established three new subsidiary bodies: the Expert Group on Particulate Matter, the Task Force on Heavy Metals and the Task Force on Hemispheric Transport of Air Pollution.

Further information: www.unece.org/clrtap. Se also "Recent publications" on page 23 in this issue.

Focus on reactive nitrogen

Reactive nitrogen harms people and ecosystems all over the world. It is vital to develop a comprehensive approach to optimizing nitrogen management in food production and energy use while minimizing its environmental impacts.

This is the conclusion of more than 400 environmental experts who gathered in China last October for the Third International Nitrogen Conference.

The term reactive nitrogen refers to nitrates, ammonia and nitrogen oxides; substances that are formed during the combustion of fossil fuels and through fixation in fertilizer.

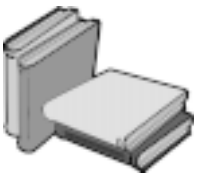
Information: Jan Willem Erisman, erisman@ecn.nl

Refineries not on track

The EU oil refining sector is not on track to meet the 2007 deadline for compliance under the IPPC directive, according to a study for the European Commission.

One area where EU-approved BAT techniques are not widely used is in the transition from fuel oil to natural gas as refinery fuel. Taking this step could cut emissions of SO_2 by up to 99 per cent, the report calculates. The study covers the EU15, with the exception of Italy, which missed the data submission deadline.

Source: **Environment Daily**, 8 February 2005. *Further information*: http://europa.eu.int/comm/environment/ippc/ippc_studies.htm. See also pp. 12-13 in this issue.



Recent publications – climate change

Extreme Weather, does nature keep up?
By R. Leemans and A. van Vliet. A listing of observed responses of species and ecosystems to changes in climate and extreme weather events, published by World Wildlife Fund (WWF) just before the 10th Conference of the Parties to the Climate Convention last December. Available at www.panda.org.

2° Is Too Much! Evidence and Implications of Dangerous Climate Change in the Arctic (2005)
Published by WWF. Available in pdf format at www.panda.org.

Air pollution and climate change policies in Europe: exploring linkages and the added value of an integrated approach (2004)
Published by European Environment Agency. EEA Technical report No. 5/2004. Available at http://reports.eea.eu.int/technical_report_2004_5/en

CO_2 Emissions from Fuel Combustion 1971-2002. 2004 Edition
Emissions data for more than 140 countries and regions by sector and by fuel.
564 pp. 150 euro. ISBN 92-64-10738-X. Published by the International Energy Agency. Can be ordered from OECD bookshop, www.oecdbookshop.org.

Up in Smoke (2004)
Published by a coalition of environmentalist and aid organizations. Says that global warming threatens to make the international targets on halving global poverty by 2015 unattainable. Available at www.neweconomics.org.

Meeting the Climate Challenge. Recommendations of the International Climate Change Taskforce.
Published in January 2005. Available in pdf format at www.tai.org.au

Greenhouse gas emissions from international aviation – Nordic perspectives
Published by the Nordic Council of Ministers, 2004. 129 pp. DKK 155. ISBN 92-893-1026-X. Available in pdf format free of charge at www.norden.org.

Export ban but no new limits for power plants

THE MAIN SOURCE of emissions of mercury is the burning of coal, both globally and in the EU. The European Commission does not however propose any further measures to reduce these emissions in the mercury strategy for the union that was presented in February.[1]

The Commission states that coal burning in plants larger than 50 MW accounts for 27 per cent of mercury emissions into the air in the EU. These plants are however covered by the IPPC and LCP directives[2]. The Commission will not take a decision on whether emission limit values for mercury are needed until the strategy comes up for review in 2010. The review will include an analysis of the co-benefit effects of sulphur emission controls at large combustion plants. Some methods for removing sulphur from flue gases can reduce mercury emissions by up to 90 per cent at the same time.

The strategy states that small combustion plants and residential coal burning are also significant sources of mercury emissions. Together they account for roughly one quarter of airborne emissions in the union (as much as from the large combustion plants). However, these small sources are not controlled under the existing EU legislation. The Commission aims to undertake a study of options to abate mercury from such sources this year, as part of a broader assessment under the CAFE programme (Clean Air For Europe).

The commission strategy also proposes a series of other actions to cut EU and global emissions and use of mercury, including phasing out EU mercury exports by 2011.

In a joint comment on the strategy, a number of environmentalist organizations have expressed their satisfaction with the proposal to stop mercury exports, but believe that stricter measures should have been proposed regarding emissions from large coal-fired combustion plants because of the significance of this emission source, both within Europe and globally.

The strategy will be presented to the Council and the European Parliament. It does not include any legislative proposals, but instead announces the Commission's intention to bring such proposals forward.

Mercury and its compounds are highly toxic to humans, ecosystems and wildlife. It travels long distances through the atmosphere.

[1] **Community Strategy Concerning Mercury.** COM(2005)20 Final. http://europa.eu.int/comm/environment/chemicals/mercury/

[2] IPPC = Integrated Pollution Prevention and Control, directive 96/61/EC. LCP = Large Combustion Plants, directive 2001/80/EC.

Focus on power plants in the US

Coal-fired power plants in the USA have been the focus of a long-debated proposal to reduce emissions of mercury. The 1,100 largest coal-fired plants emit 48 tonnes of mercury each year, which is 40 per cent of total emissions in the US.

At present these emissions are totally unregulated, but under the Bush administration's Clear Skies initiative such emissions would be reduced by 70 per cent by 2018 with the aid of emissions trading.

However, critics state that emissions could be reduced further and faster. The level for 2008 that the Environmental Protection Agency says in a report can be achieved using what is known as maximum available control technology (MACT) is 34 tonnes per year. This, according to the critics, is the amount power plants would emit if they installed no new mercury controls, but merely complied with provisions of the Clean Air Act that require pollution cuts of other emissions. The EPA has previously indicated that a MACT standard could reduce utility mercury emissions by 90 per cent – to 5.5 million tonnes – four years after a rule is finalized.

Source: **Environment News Service (ENS),** 7 February 2005.

Further publications

Health Aspects of Air Pollution (2004)
Summarizes the most recent information on the health effects of air pollution. Indicates that air pollution at current levels still poses a considerable burden on health in Europe.

24 pp. Published by WHO Europe. Available at www.euro.who.int/air/Publications/20020621_3.

Clearing the Air – 25 years of the Convention on Long-range Transboundary Air Pollution (2004)
Edited by J. Sliggers and W. Kakebekke, with contributions from people from a variety of backgrounds who have contributed to the work or monitored it closely. Also includes a description of the current situation, with glances into the past and future.

167 pp. Available free of charge from the Convention's secretariat, air.env@unece.org.

Strategies and Policies for Air Pollution Abatement (2005)
Demonstrates implementation of the Convention on Long-range Transboundary Air Pollution in summarizing policies, strategies and measures used by governments to tackle air pollution.

62 pp. Can be ordered from the Convention's secretariat, address as above.

Mission Seagull
A computer game for children on air pollution and the LRTAP Convention. Available in English, German, French, Russian and Spanish. Issued by the UNECE, Palaias des Nations, 1211 Geneva, Switzerland. www.unece.org.

How To Win Campaigns: 100 Steps to Success (2005)
By Chris Rose, consultant and former campaigner for Greenpeace and WWF. The book contains 100 campaign tools for designing and running campaigns, plus a chapter on wider issues.

160 pp. £16.99 (on-line £15.29), published by www.earthscan.co.uk. See www.campaignstrategy.org for details.

Sense and sustainability: Smart thinking to restart Europe's transport policy
A guide to the most important issues in transport and environment policy the EU will face over the next five years. By the European Federation for Transport and Environment. T&E 04/06. Available at www.t-e.nu.

Limits to growth – the 30-Year Update
By D.H. Meadows, J. Randers and D.L. Meadows. This substantially revised, expanded and updated edition follows on from the 1972-bestseller "The Limits to Growth", which raised the alarm that we have already over-shot the planet's capacity to support us.

£14.99. 368 pp. ISBN 1844071448. Published by Earthscan/James&James, 8-12 Camden High St, London NW1 0JH, UK. Internet: www.earthscan.co.uk.

EnDic2004
A dictionary presenting more than 6,000 environmental terms in nine languages: Finnish, Estonian, English, French, German, Swedish, Lithuanian, Latvian and Russian.

60 euro. ISBN 952-11-1541-6. Published by the Finnish Environmental Institute. Orders: tuula.liljander@ymparisto.fi.

Acid Rain in Story & Song (2004)
Can be ordered from T.G. Brydges, 39 Elizabeth St. South, Bampton, ON, L6Y 1R2, Canada. Send a cheque or money order by mail, $20 Canadian plus $12 for postage and handling.

Outstanding Environmental Issues, a review of the EU's environmental agenda (2004)
Gives a picture of the successes of EU environmental policy in the past 30 years, as well as the main unresolved issues in Europe, concentrating on climate change, loss of biodiversity and air pollution in urban areas.

59 pp. Published by the Dutch National Institute for Public Health and the Environment (RIVM). Can be downloaded from www.rivm.nl or requested from simone.poldermans@rivm.nl.

Earth System Analysis for Sustainability
Edited by H.J. Schellnhuber, P.J. Crutzen, W.C. Clark, M. Claussen and H. Held. Provides a panoramic view of planetary dynamics since the inception of life and identifies principles for responsible management of the global environment in the future.

352 pp. $38.00/£24.95. ISBN 0-262-19513-5. Published by The MIT Press, 2004. http://mitpress.mit.edu/.

National Policies to Promote Cycling
Brings together the experience of 21 countries and 7 municipalities in developing and implementing policies and measures to promote cycling as a means of travel.

91 pp. 16.00 euro. ISBN 92-821-2325-1. Published by the European Conference of Ministers of Transport. Can be ordered from www.oecdbookshop.org, or from Extenza-Turpin, Stratton Business Park, Pegasus Drive, Biggleswade, Bedfordshire, SG18 8QB, UK.

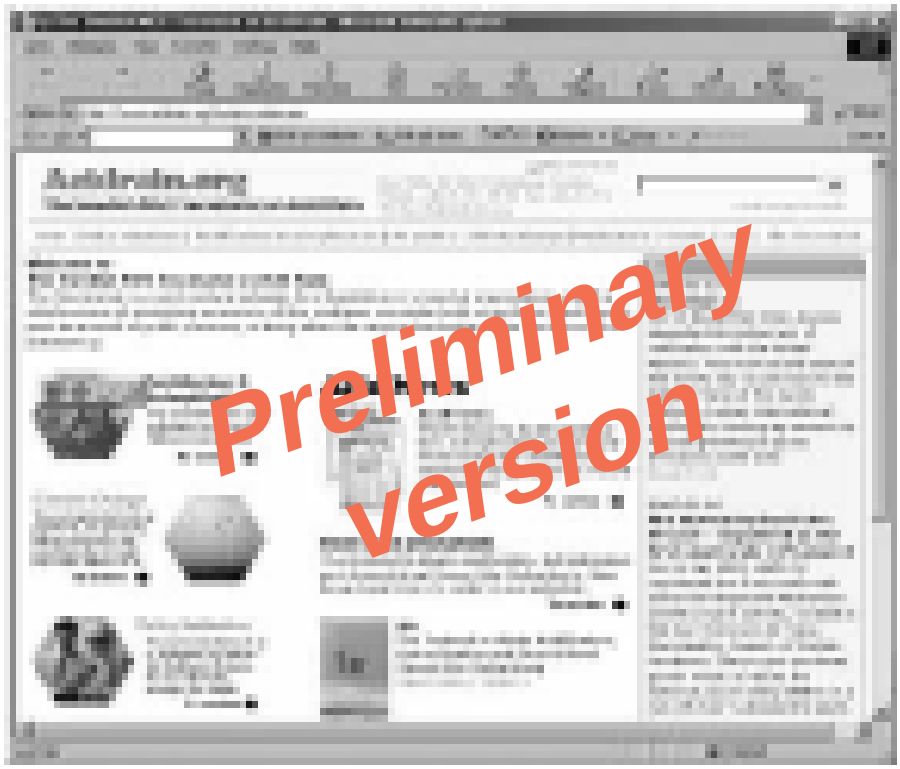
Recent publications from the secretariat

Cost-benefit analysis of using 0.5% marine heavy fuel oil in European sea areas
A lowering of the sulphur content of marine heavy fuel oil to 0.5 per cent would reduce SO_2 emissions from international shipping around Europe by more than three quarters by 2010. The benefits of such a measure clearly outweigh the costs, according to this study. By Christer Ågren, January 2005.

Atmospheric emissions from large point sources in Europe
This report identifies and lists the 200 largest emitters of sulphur dioxide and the 200 "best" fossil-fuelled power stations, in terms of SO_2 and NOx emissions per useful output. By Mark Barrett, SENCO. Published October 2004.

Air and the Environment
Which are the main air pollutants, how they arise, and what they are doing to us and our environment, as well as what can be done to counteract their spread, is described in detail in this book, which also brings out the fact that it will actually pay to cut down the emissions. By Per Elvingson and Christer Ågren, published March 2004.

HOW TO ORDER. Single copies of the above mentioned material can be obtained from the Secretariat (free of charge within Europe). Please call for quotation if more copies are required. Can also be downloaded in pdf format from www.acidrain.org



New look for www.acidrain.org

The website of the Swedish NGO Secretariat on Acid Rain now has a new graphic layout, having effectively retained the same appearance since its launch in 1998.

The most important changes are that the site now incorporate a search function and the background information on various issues is presented in greater depth. We have also added a news section on the first page that will be updated at least once a week.

As before, all the articles published in Acid News from 1996 onwards are available on the website. There is also a form for those who want to subscribe to the magazine.

The section on "Policy" covers the majority of political developments in the international air pollution arena, which is closely monitored by the Secretariat, with frequent references to relevant articles in Acid News.

The "Publications" section contains a list of fact sheets and reports published by the Secretariat. Most can be read online and/or downloaded. A trailer for the film "Sex, Sulphur and a Fishy Business" can also be seen here.

We hope that, despite the changes, the site retains the ease of navigation that we know is appreciated by many of our visitors.

Come and take a look! We welcome your comments on what you like or don't like, or perhaps what you feel is missing.

Email us at info@acidrain.org.

Electronic subscription?

Would you like to help us reduce expenses, and at the same time get Acid News sooner? We can offer electronic subscriptions free of charge.

Subscribers will receive an e-mail notifying them of publication and giving brief notices of the articles in the issue. At our website you can then either read the whole issue on-line, or download it in pdf format. If you are interested, send an e-mail with your name and e-mail address to: info@ acidrain.org. You can, if you wish, continue to receive the printed version while at the same time subscribing electronically. Just let us know if you want both.

Coming events

For the latest news and direct links, please visit www.acidrain.org.

5th International Conference on Urban Air Quality. Valencia, Spain. 29–31 March 2005. *Information*: www.urbanairquality.org

Mondial Bioenergie Conference and Exhibition. Paris, France. 31 March–3 April 2005. *Information*: www.itebe-expo.com

Transport and Climate Change. Brussels, Belgium. 1 April 2005. Half-day seminar organized by T&E, www.t-e.nu

CAFE Steering Group. Brussels, Belgium, 14 April 2005.

Greening Motorways of the Sea. Stockholm, Sweden, 21-22 April 2005. *Information*: seamotorways@t-e.nu

CAFE Steering Group. Brussels, Belgium, 10-11 May 2005.

Green Shipping World. Amsterdam, the Netherlands, 16-18 May 2005. *Information*: www.GreenShippingWorld.com

22nd session of the subsidiary bodies to the Climate Convention. Bonn, Germany, 16–27 May 2005. *Info*: www.unfccc.int

CLRTAP Task Force on Integrated Assessment Modelling. Berlin, Germany, 25–27 May 2005.

Green Week. 31 May–3 June 2005. *Information*: http://europa.eu.int/comm/environment/youth/index_en.html

ECOMM 2005. Harrogate, UK. 1–3 June 2005. European Conference on Mobility Management. *Info*: www.epomm.org

Acid Rain 2005. 7th International Conference. Prague, Czech Republic. 12–17 June 2005. *Info*: www.acidrain2005.cz.

1st International Conference on Harbours and Air Quality. Genova, Italy, 15-17 June. www.fisica.unige.it/atmosfera/HAQ.htm

IMO Marine Environment Protection Committee. 53rd session. London, UK. 18–22 July 2005. *Info*: www.imo.org

Environment Council. Luxembourg, 24 June 2005.

14th IUAPPA Regional Conference – 3rd International Sysmposium on Air Quality Management at Urban, Regional and Global Scales. Istanbul, Turkey, 26–30 September 2005. *Information*: http://web.deu.edu.tr/tuncap/aqm2005