

Acid News

Britain's refusal to ratify the 1985 sulphur protocol earned it the epithet of "the dirty man of Europe." In the event however it met the requirements of that protocol with some margin.



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GREAT BRITAIN

Break in the clouds

DURING MOST OF the eighties Great Britain was the great hanger-back among nations aiming to curb emissions of air pollutants – refusing both to sign the sulphur protocol under the Convention on Long Range Transboundary Air Pollution in 1985 and scrounging advantages under the EC directive on large combustion plants three years later. Now however HM Inspectorate of Pollution has announced emission limits for power plants that go well beyond the requirements of these international agreements.

Under the EC Directive on Large Combustion Plants of 1988, Great Britain was to reduce its emissions of sulphur dioxide from plants with a capacity of 50 MW_{th} or more by 40 per cent in 1998 and 60 per cent by 2003, from the levels of 1980. By signing a later protocol under the Convention on Long Range Transboundary Air Pollution, in 1994, it

undertook to lower the emissions of sulphur by 50 per cent by 2000, 70 per cent by 2005, and 80 per cent by 2010, again from the 1980 baseline. See AN 4/94, pp. 10-11.

Following accession to the EC directive, a national plan was evolved to indicate how compliance was to take place. It was expected that it would require equipment of flue-gas desulphurization to be installed on 12 GW of the country's coal-fired capacity. But the only plants so fitted have been Drax, 4 GW, and Ratcliffe, 2 GW.

The new requirements set by HMIP are traceable to the Environmental Protection Act of 1990, which led to the large power plants being brought under IPC, integrated pollution control. Subsequent discussions between HMIP and the two big power generators in England and Wales, National Power and PowerGen, have resulted in a package of reductions

for existing plants. The outcome of the long-drawn-out negotiations has proved unexpectedly favourable from the point of view of the environment.

Each plant has been set two annual limits for SO₂ emissions, which in most cases become successively stricter in 1999 and 2001. The "A limits," which may not be exceeded, have been set with regard to the local effects on the environment, and are tougher for plants such as Fiddlers Ferry that are contributing relatively greatly to the exceeding of the critical loads for acid depositions in their neighbourhood.

The "B limits" are stricter than the A limits and may be exceeded in the case of individual plants, but the companies may not exceed the sum of their B limits. It is expected that similar demands will be made of generators in Scotland and Northern Ireland, since it is hardly likely that the

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Acid News

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

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

In order to fulfill 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:

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THE SECRETARIAT

The Swedish NGO Secretariat on Acid Rain was formed in 1982 with a board now comprising one representative from each of the following organizations: Friends of the Earth Sweden, the Swedish Anglers' National Association, the Swedish Society for Nature Conservation, the Swedish Youth Association for Environmental Studies and Conservation, and the World Wide Fund for Nature Sweden.

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

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

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

EDITORIAL

Need to act quickly

BELETEDLY, the European Commission has just put before the member states its first draft for a revision of the directive for controlling the emissions of sulphur and nitrogen oxides from large combustion plants. An account of the Commission's proposals is given in an article on page 6 of this issue. It is now highly important, in view of the continuing effects of air pollution, to arrive at a new directive with all speed.

Still more important, however, is that it should set emission limits that will really bring about reductions. The requirements for new plants should moreover be such as will hasten forward technical im-

provements, in the same manner as the Californian standards for vehicle emissions. The tendency in Europe has in effect been to freeze developments, by opting for emission limits that merely reflect existing techniques – thereby fixing them as standard for many years to come. The currently applicable LCP directive is a prime example of this tendency, having set requirements that are actually lower than those that had been adopted in Germany already at the beginning of the eighties. In other words, it calls for the available technology that was "best" fifteen years ago.

The requirements should instead progress in two or three stages, becoming gradually stricter during a period of ten years or so. The emission limits prescribed under Stage 1 should correspond to the results that can be obtained through use of the best technology that is now commercially available. Examples can be found in the Secretariat's publication, *Large Combustion Plants – Revision of the 1988 EC directive*.

The requirements should then be made successively stricter in the following stages, and meeting them will probably call either for new technical developments, or, in some cases, a

switching of fuel from coal and oil to natural gas and biofuels.

To encourage a more efficient use of energy and conservation of resources the limits should be expressed as grams of pollutant per unit of output of useful energy. Since the aim of the directive is moreover to put a stop to

the damage caused by emissions, the requirements should not vary from one type of fuel to another, thus giving artificial support to the environmentally worse types of fuel. It is likewise highly debatable whether the requirements should vary according to plant size.

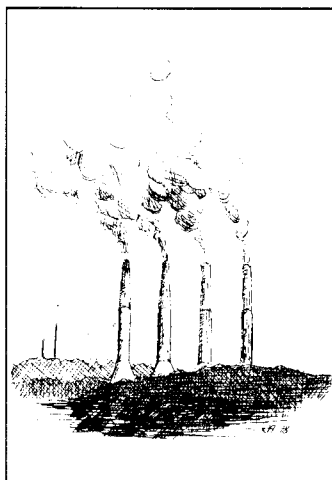
To bring about appreciable reductions in the short term it will now be necessary to

turn attention to existing plants. The proposal for national ceilings covering existing as well as new plants, which has now been put forward, is admirable and should be adopted. Although it is difficult to indicate the exact levels for the different countries' emission ceilings, there is some guidance to be had from the critical-load limits that have been worked out under the Convention on Long Range Transboundary Air Pollution. It would be reasonable to expect the energy sector to accept liability at least for its own activities, in line with other sectors.

In general there is an obvious need to make the emission limits apply to existing plants as well as to new ones. In the draft for the new directive it is proposed to introduce emission requirements for existing plants by 2007. While time for conversion will doubtless be needed, five or six years should however suffice.

A combination of command-and-control with economic instruments, such as charges or taxes on emissions, will probably be the best solution if the needed reductions are to be achieved in a cost-effective manner and within a reasonable time.

PER ELVINGSON



Continued from front page

owners of plants in England and Wales will accept discrimination.

Reduction of the sulphur dioxide emissions will now go far beyond what is required under the LCP directive. At worst, if other generators, including those in Scotland and Northern Ireland, should merely keep emissions within their quotas under the National Plan, the UK will still have met the required 60-per cent reduction in 1999, four years ahead of schedule. By 2003, its LCP emissions will have fallen by at least 78 per cent from their 1980 level.

The prospects are good, too, in respect of the sulphur protocol of 1994. The curbs on National Power and PowerGen alone will enable the 2000 target to be met, and that of 2005 very nearly, even if the emissions from other than LCP sources should remain at the 1993 level.

The authorization terms should bring noticeable improvements to the environment. HMIP expects the peak annual mean concentration of SO₂ to fall from 60-70 µg/m³ to below 10 µg/m³ over most of the UK as a result of the new requirements and "likely" reductions from other sources.

Moreover the area of the country where critical loads are being exceeded should fall by 43,000 sq kilometres, or 43 per cent. If reductions from other sources were also taken into account, including those from the continent, the area would shrink by 68 per cent.

Subsequent improvements would, according to HMIP, have to depend on measures taken on the continent – implying an entirely new situation for Great Britain, where until quite recently 80 per cent of the deposition of sulphur came from the country's own emissions.

The new, much stricter, requirements must be seen in relation to a general retreat from coal. The two big generators were already getting well below their emissions quotas under the National Plan (which was started to meet the requirements of the EC directive of 1988). The reasons are to be found partly in the improved performance of nuclear plants, partly in the introduction of combined-cycle gas turbines.

In future the power generators will probably operate their coal and oil-fired plants mostly to relieve peak loads during short periods of time, and gradually phase them out in

favour of new, gas-fired plants. More low-sulphur coal may also be imported. But unless there is a marked increase in the price of natural gas, or nuclear plants have to be suddenly decommissioned, there are not likely to be any further installations for flue-gas desulphurization.

The authorizations for National Power and PowerGen also include requirements for other pollutants. Annual limits have been set for the emissions of NO_x from individual plants in 1999, based on what is assumed to be possible of achievement with low-NO_x burners – with stricter limits for 2001 to meet "relevant air quality standards." No ceilings have however been set for the generators' total emissions of this pollutant, so that the overall reduction will depend on how they choose to deal with sulphur dioxide. HMIP estimates that NO_x emissions from the power industry as a whole will have fallen by 35 to 47 per cent by 2001-2005.

Further reductions may be expected for plants that are likely to retain a relatively high load factor. It may be noted here that several EU member countries have much stricter requirements in regard to NO_x emissions from large combustion plants than are now being introduced in Britain, meaning that they must have catalytic cleaning of the flue gases (which can reduce emissions by as much as 80-90 per cent).

As regards particulates, HMIP has required both companies to submit proposals for reduction of their emissions to below 50 mg/m³ by 2001. This should, according to HMIP, result in a halving of the overall emissions of particulates from power stations.

The generators must, in addition, by October this year produce a review of each plant's effect on local air quality. By 1997 they will also be expected to implement procedures to reduce their plants' contributions to poor air quality under adverse meteorological conditions.

Andrew Farmer, English Nature's expert on acidification, welcomes the new authorizations as a "very significant step beyond previous policy constraints," adding however that the improvement will not be as great for Sites of Special Scientific Interest as for the country as a whole.

PER ELVINGSON

Source: ENDS Report 254. March 1996.

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Standards shown to be too easily met

What it costs

Acidification is costing Norwegians 300 million kroner (£30m) a year in damage to buildings and motor vehicles alone. The damage is worst, according to *Statens Forurensningstilsyn*, the pollution watchdog, in the larger towns. Emissions from oil burning account for almost half of the estimated damage. The agency says the charge on sulphur emissions ought to be quadrupled if oil firing is to be made to pay its actual cost to the community.

Natur&Miljø Bulletin. April 19, 1996

Mussel shells

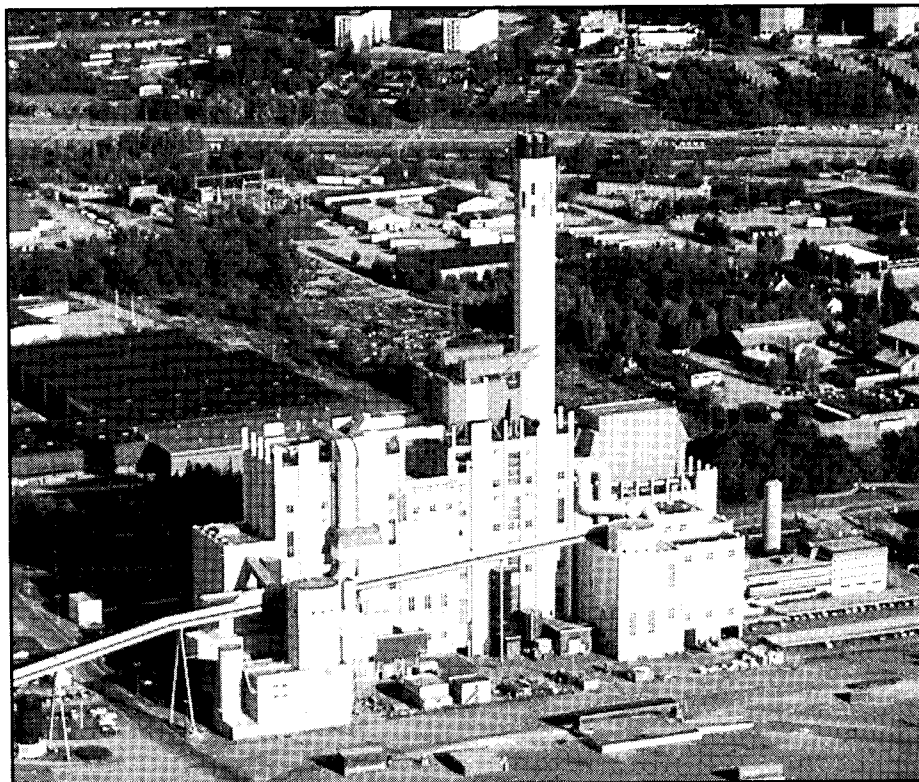
To counteract the effects of acid fallout, thousands of tons of limestone are dropped every year onto thousands of lakes in Sweden – most of it coming from quarries in southern Sweden. Now however the authorities have started to work with a canning company, ABBA, which accumulates 12,000 tons of mussel shells a year as waste. Ground mussel shells have been spread by way of trial over a number of river and lake systems with unexpectedly good results. "Apart from the positive aspects of mussel shells, their lime content and spreading and dissolving qualities, this solution is attractive in that it makes use of something that otherwise find its way onto rubbish tips, and may obviate the need to dig up more ground around the limestone quarries," says one official. So long as acid depositions continue as at present, however, mussel shells can only meet a small part of the need for liming.

Svenska Dagbladet. March 6, 1996.

Moving slowly forward

"It is the right of every individual to breathe the air that is not detrimental to health." So reads the opening sentence of a bill on air quality standards that was presented by the French government in April. The wording, which in itself was a triumph for Corinne Lepage, the environment minister, was passed despite the protests of prominent lawyers who feared an avalanche of environmental lawsuits. As regards concrete measures, however, little remains of Lepage's original bill, apart from a requirement that all French towns shall have installed equipment for measuring air quality before the year 2000. The authorities will have the right to stop all non-vital traffic on days when the air is exceptionally polluted. There is also an obligation for all the larger municipalities to see over their traffic arrangements. Some tax reliefs are imminent too – for electric or gas-driven vehicles, and perhaps for all mass transportation.

Ny Teknik. No. 16, 1996.



The combined heat-and-power plant at Västerås. With wet-dry flue-gas desulphurization, a low-NOx burner, and selective catalytic reduction for reducing the emissions of nitrogen oxides, its No. 4 unit comes out best in either way of ranking.

WHAT ARE the emission levels that can be achieved with a fairly efficient large combustion plant of the conventional type? It is pertinent to put the question, because the plants for the generation of electricity and heat are responsible for a large part of the emissions of sulphur dioxide and nitrogen oxides in Europe, and a revision of the limits to the emissions from new as well as existing plants is now under way within the European Union.

A study* that has recently been commissioned by the Secretariat shows that there are already plants in operation that easily meet both the present and proposed EU requirements. The data for the study was selectively collected from countries where the best plants (from the environmental point of view) were likely to be found – i.e. those with the toughest national legislation. Since the aim was simply to reveal some of the best plants the findings must

not be taken to be representative of a majority of the European plants.

Plants for combined heat and power were included as well as plants for the production of electricity only. The sizes varied, from about 100 to 2000 megawatt, as did the types of fuel. Although most of the plants were coal-fired, using lignite as well as hard coal, there were also some burning oil, natural gas, and biofuels.

Emissions were measured only in respect to air pollutants, and to enable comparisons to be made they have been assessed as sulphur and nitrogen oxides in relation to the energy content of the fuel on the one hand and the output of useful energy on the other. Although somewhat unusual, the latter type of assessment is better from the point of view of effects on the environment because it gives extra points to plants that use energy most effectively.

Figures for the ten best of the thirty plants in the study, expressed as the

Emissions in relation to energy input.

Plant	Type ¹	Fuel	Country	mg (SO ₂ +NO ₂)/MJ energy input
1. Västerås 4. Västerås Stads Kraftvärmeverk	CHP	Coal	Sweden	32
2. Gersteinwerke B/C, F/G/H/I. VEW	P	Natural gas	Germany	35
3. Ingolstadt 3. Bayernwerk	P	Oil	Germany	41
3. Korneuburg 2. Verbundkraft	P	Natural gas	Austria	41
5. Eemshaven, EC-3/4/5. EPON	P	Natural gas	Netherlands	45
6. Västerås 1-2. Västerås Stads Kraftvärmeverk	CHP	Coal	Sweden	46
7. Ingolstadt 4. Bayernwerk	P	Oil	Germany	50
7. Händelöverket P13. Norrköpings Energi AB	CHP	Biofuel	Sweden	50
9. Mellach. STEWAG	CHP	Coal	Austria	64
10. Idbäckverket. Nyköpings Energi AB	CHP	Biofuel	Sweden	66

¹ P = Power plant. CHP = Combined heat-and-power.

Emissions in relation to output of useful energy.

Plant	Type ¹	Fuel	Country	mg (SO ₂ +NO ₂)/MJ useful energy ²
1. Västerås 4. Västerås Stads Kraftvärmeverk	CHP	Coal	Sweden	36
2. Västerås 1-2. Västerås Stads Kraftvärmeverk	CHP	Coal	Sweden	53
3. Händelöverket P13. Norrköpings Energi AB	CHP	Biofuel	Sweden	57
4. Korneuburg, Block 2. Verbundkraft	P	Natural gas	Austria	69
5. Idbäckverket. Nyköpings Energi AB	CHP	Biofuel	Sweden	72
6. PFBC, Värtaverket. Stockholm Energi AB	CHP	Coal	Sweden	80
7. Eemshaven, EC-3/4/5. EPON	P	Natural gas	Netherlands	81
8. Gersteinwerke B/C, F/G/H/I. VEW	P	Natural gas	Germany	92
9. Ingolstadt, 3. Bayernwerk	P	Oil	Germany	117
10. Mellach. STEWAG	CHP	Coal	Austria	119

¹ P = Power plant. CHP = Combined heat-and-power.

² Useful energy is the sum of the net electricity output and heat for district heating.

sum of the sulphur dioxide and nitrogen oxides, range from 36 to 119 milligrams per megajoule (mg/MJ) of energy output, or putting it alternatively, from 32 to 66 mg/MJ of fuel input.

In the EU directive as well as in many countries' legislation the emissions are expressed as milligrams of pollutant per cubic metre of air (mg/m³) in the flue gases. Put in that way the figures for the ten best plants would be 85-175 mg(SO₂+ NO_x)/m³. That is several times lower than the limits in the present EU directive, and also considerably lower (less than half) than those proposed for a revised directive.

The new limits are supposed to apply for new plants as from 1999. It should however be noted that in the legislation the limits for SO₂ and NO_x apply separately, making attainment more difficult than if they are lumped together, so comparison is not altogether fair.

The study lists plant and emissions data from altogether thirty units in five countries. The plants are ranked in order of their emissions as calculated above, and the ten best ones according to their emissions in relation both to fuel input and output of useful energy. It is perhaps worthy of note that the same plant came out best on both counts, and it is one burning coal.

That plant is a combined heat-and-power unit with conventional firing – fitted for wet-dry flue-gas desulphurization, and with a low-NO_x burner and selective catalytic reduction for reducing the emissions of nitrogen oxides. The main driving force behind these very low emissions is said to have been the tax on sulphur emissions and the charge on NO_x that have now been in force in Sweden for several years.

In a word, the study shows it to be quite possible, by using only conventional technology, to achieve emission

levels that are considerably lower than required by the EU standards or most countries' national legislation.

CHRISTER ÅGREN

***Doing more than required. Plants that are showing the way.** By A-K Hjalmarsson, ÅF-Energikonsult Stockholm AB. No. 6 in the Secretariat's Air Pollution and Climate Series. Available from the publisher.

Conversion factors

	Fuel	Factor
mg S/MJ _{fuel}	Coal	5.4 mg SO ₂ /Nm ³ ¹⁾
	Oil	7.1 mg SO ₂ /Nm ³ ²⁾
	Natural gas	7.4 mg SO ₂ /Nm ³ ²⁾
	Biofuels	5.3 mg SO ₂ /Nm ³ ¹⁾
mg NO ₂ /MJ _{fuel}	Coal	2.7 mg NO ₂ /Nm ³ ¹⁾
	Oil	3.6 mg NO ₂ /Nm ³ ²⁾
	Natural gas	3.7 mg NO ₂ /Nm ³ ²⁾
	Biofuels	2.6 mg NO ₂ /Nm ³ ¹⁾

¹⁾ 6 % O₂ dry gas at normal temperature and pressure.

²⁾ 3 % O₂ dry gas at normal temperature and pressure.

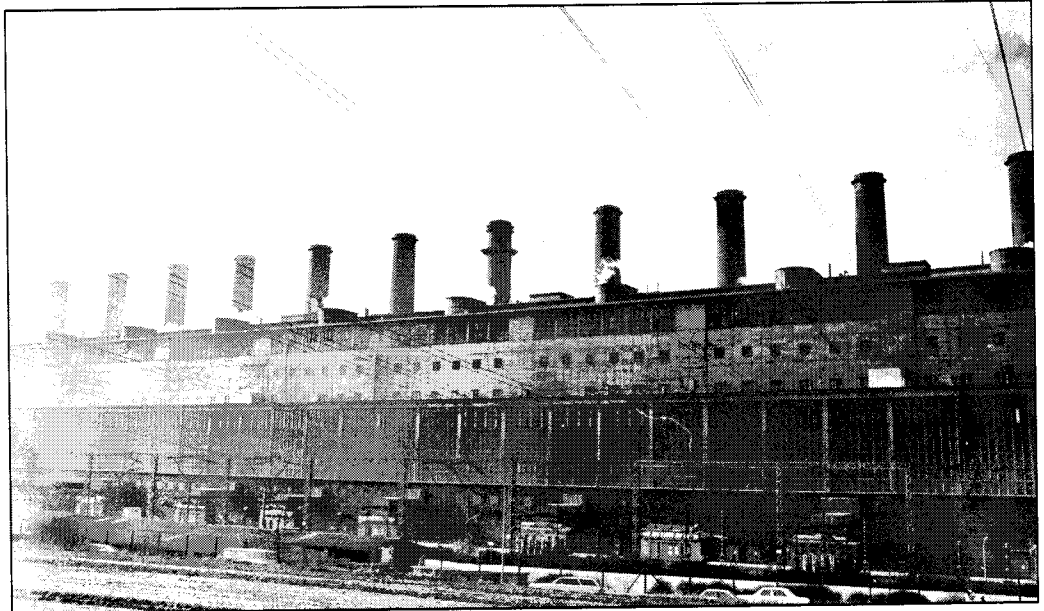
Revision now under way

IN APRIL the European Commission presented a first draft – much delayed – for revision of the 1988 directive for controlling emissions from large combustion plants.* It should have made a report to the Council as long ago as 1994, “accompanied where necessary by proposals for a revision of the national reduction targets for emissions from existing plants.” It should also have submitted proposals for a revision of emission limits for new plants at the latest by July 1995.

The 1988 directive applies to combustion plants with a thermal input of 50 MW (MW_{th}) or more, irrespective of the type of fuel used. It consists of two main parts, the one aiming at a gradual reduction of the emissions of pollutants from existing plants (pre-1987), and the other prescribing limit values for emissions from new ones. The emissions of sulphur dioxide from existing plants were to be reduced by about 57 per cent by 2003, and those of nitrogen oxides by 30 per cent by 1998 (average for the member countries), from the levels of 1980.

A key phrase running through the subsequent discussions has been Best Available Technique, or BAT – for the simple reason that it must be decided what the best available technique is, before emission limits can be set for new plants. The levels at which these limits are set will be of even greater importance in the new directive than they were before, since it is likely that as a result of the awaited IPPC directive (Integrated Pollution Prevention and Control) they will be indicative of the limits starting in 2007 for existing plants.

The limits discussed in April varied, as in the 1988 directive, according both to the size of plant and the type of fuel. Somewhat oversimplified, this means that the larger the plant the stricter would be the requirements (the limits lower), and that the limit values would be lowest (the requirements most stringent) for gas but higher for oil and highest for coal.



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Some examples. In the present directive the figure for a coal-fired plant of more than 500 MW_{th} is 400 milligrams of sulphur dioxide per cubic metre ($mg\ SO_2/m^3$) of flue gas, and 2000 mg/m^3 for one between 50 and 100 MW_{th} . In the range from 100 to 500 MW_{th} the limits go from 2000 to 400 mg/m^3 in linear descent. (A more

*Proposed limits are
neither especially stringent
nor in line with BAT*

detailed description of the directive will be found in one of the Secretariat's publications.**)

The April draft called for toughening of the requirements. The limits for coal-fired plants were for instance to be 200 $mg\ SO_2/m^3$ and 200 $mg\ NO_x/m^3$ for plants larger than 300 MW_{th} , and 200 to 600 $mg\ SO_2/m^3$ (linear rise) for those between 300 and 100 MW_{th} , and 400 $mg\ NO_x/m^3$. For plants from 100 down to 50 MW_{th} the limits would be 600 $mg\ SO_2/m^3$ and 400 $mg\ NO_x/m^3$.

It is obvious that these limits are neither especially stringent nor in line with the best available technique – no matter whether they are for coal, oil, or gas-fired plants. With

modern flue-gas-cleaning and firing techniques, markedly lower emission values can be obtained. From a limited survey that the Secretariat has had made of some of the better European combustion plants (see pp. 4-5), it has turned out that at least ten of the existing plants are already attaining emission levels that are less than half of those proposed for new plants as from 1999.

Once again a number of exceptions are proposed. The emission requirements should for instance be more lenient for plants that are mainly intended for relieving peak loads, which would mean such as are operated for less than 2200 hours a year. Spain would be granted a temporary exemption for some of its large new plants, and plants burning indigenous lignite could also expect favourable treatment.

Proposals for national ceilings on emissions are also to be found in the draft, but differing from those in the 1988 directive in that they are intended to apply for new as well as existing plants. It is proposed, too, to make 1990 the base year instead of 1980. While eleven of the member states would have to reduce their emissions of sulphur dioxide by 30 per cent by 2005 and 60 per cent by 2010, compared with 1990, Greece, Spain, Portugal, and Ireland would be allowed to make lower reductions.

The proposed reductions for nitrogen oxides would, in the case of most countries, be 20 per cent by 2005 and 40 per cent by 2010, but here again less for the four countries that would be let off lightly in respect of sulphur dioxide.

Screwing down the ceilings equally for most countries, while at the same time making 1990 the base year, is considered highly controversial, since it would punish those countries that had made reductions in the eighties and favour others that had not been so diligent. The countries that had made advances include, besides the Scandinavian, Austria, Belgium, the Netherlands, and France. The less diligent ones have been Great Britain, Spain, and Greece.

A new item in the draft is a proposal to impose minimum requirements for energy efficiency in future plants, the primary aim being to curb emissions of carbon dioxide. As in the case of emission limits, the requirements would be more stringent for large plants than for smaller ones.

Some of the member countries have maintained that revision of the directive should be postponed until after the Commission has completed its proposal for an overall strategy to deal with acidification, supposedly in the first half of 1997. Others reply that the revision has already been so much delayed that any further lagging would be unacceptable, not least in view of what is happening to the environment.

It is expected that the Commission will be arranging a new meeting with the member countries early in September to continue the discussions.

PER ELVINGSON

* Council Directive of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants (88/609/EEC).

** Lundberg, F. & Ågren, C. (1995). **Large combustion plants – Revision of the 1988 EC directive.** Air Pollution and Climate Series No. 5. The Swedish NGO Secretariat on Acid Rain.

A quiet start

In Taipei, the capital of Taiwan, the government has set a requirement that by 1998, 5 per cent of motorcycles offered for sale must be electric. To spur demand, it is coupling the mandate with a tax rebate. Of all vehicles in the city more than 75 per cent are motorcycles.

Tomorrow Magazine, Spring 1996

ROAD CONSTRUCTION

Gives no boost to the economy

GREAT BRITAIN and Sweden are among the countries whose governments have of late been cutting back on expensive road building programs. This has been partly for budgetary reasons, but also because of a growing realization that the circumstances for infrastructural development have now significantly changed.

A strong belief in the beneficent effects of road building still persists however within the European Union. Assertions that it will help to invigorate economic growth and increase employment can still be found in documents such as the *Guidelines for the Trans-European Networks (TENs)* and the *White Paper on Growth, Competitiveness and Employment*. Even as late as last April the EU transport commissioner, Neil Kinnock, was telling the ministers of transport that the TENs program would generate jobs and aid European competitiveness.

But economists are now more and more throwing doubt on the supposed effects of road building on economic growth. At a seminar in Brussels, organized last December by the European Federation for Transport and Environment (T&E) and the Centre for Energy Conservation and Environmental Technology, four independent economists were asked to give their views on the matter, and a number of professionals in the field of European policy were invited to respond.

From the report* on the seminar, issued on April 23, it appears that there was a remarkable degree of unanimity behind the following conclusions:

Calls for a general increase in road investments to achieve economic goals cannot be justified on scientific grounds.

A blanket assumption that road building generates long-term employment cannot be justified on the basis of available evidence.

There is severe doubt about the effectiveness of road building as an instrument to improve cohesion.

The report was published just one day before so-called conciliation nego-

tiations started between the European Parliament and the Council of Ministers in regard to trans-European transport measures. In a joint statement the T&E and the World Wide Fund for Nature urged the Parliament "not to sacrifice environmental provision to faulty economic logic," adding that the environmental conditions for the TENs that Parliament has inserted in the guidelines should ensure a corridor analysis being made for each road project, in order to find the least-damaging route, as well as providing for a strategic environmental assessment for the whole TEN system.

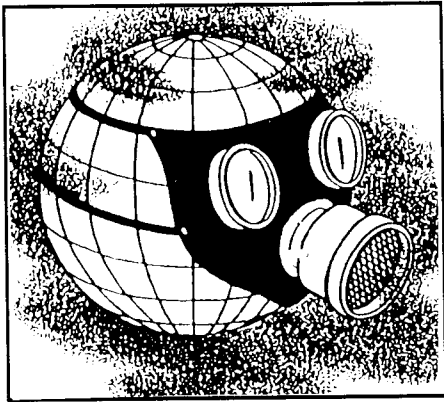
The environmentalist organizations insist that each road project should be judged on its own merits, there being no ground for the assumption that all road building will be good for the economy. A proper evaluation should also note what road users would have to pay if account were taken of all the costs, environmental and social, to which the project would give rise.

"We fear that the Council is racing ahead and spending money from the Cohesion and the Structural Funds on roads, but with the scantiest economic justification," said Tony Long, director of WWF's European Policy Office. Most of the 3300 million ecus that the EU spent on road building between 1990 and 1995 came from these funds – which are primarily intended for stimulating development in relatively poor regions.

"If decision-makers really want to create growth and employment they should check all the available options. This is the very least they can do to ensure that European taxpayers' money is being well spent and the environment is not being damaged in vain," added Tony Long.

PER ELVINGSON

***Roads and Economy.** T&E Publication 96/1. 52 pp. BEf500. A six-page summary (T&E 96/6) can be had free of charge. Both are available from T&E, Rue de la Victoire 26, 1060 Brussels, Belgium. Fax. +32 2 537 7394.



Mortality and London air

A FIVE-YEAR STUDY in London has found that more people die when the levels of ozone and particulates in air are high. The strong link already established between those air pollutants and adverse health effects is thus further confirmed.

The study, led by Professor Ross Anderson of St George's Hospital, looked for correlations between daily mortality and daily measures of air pollution between 1987 and 1992. The levels of ozone, particulates (as black smoke), nitrogen dioxide, and sulphur dioxide were compared with total mortality, and mortality from cardiovascular and respiratory diseases.

The study found a positive correlation between daily mortality and higher levels of ozone and black smoke. As regards ozone, the effect was most pronounced in spring and summer. An increase in eight-hour ozone levels from 4 to 36 parts per billion (8 to 72 $\mu\text{g}/\text{m}^3$) resulted in an increase in total mortality of 3.5 per cent. For cardiovascular and respiratory mortality the increases were 3.6 and 5.4 per cent, respectively.

Black smoke was associated with an increase in total mortality throughout the year, but in contrast to the findings of some studies in the United States, links with cardiovascular and respiratory mortality were not found to be significant. Nevertheless, the size of the effect was similar to that seen in America – an increase of 10 $\mu\text{g}/\text{m}^3$ in black smoke being associated with a 1.1 per cent increase in mortality.

Source: **ENDS Report 254**, March 1996. The study appears in *BMJ*, Vol. 312, pp. 665-669.

SWEDEN

The "greenest" cars

BUYING A CAR means investing a lot of money. While car makers offer a profusion of facts about performance, comfort, options, etc., they remain largely silent as to the environmental aspects. *Gröna Bilister*, a Swedish branch of T&E, the European Federation for Transport and Environment, has therefore now ranked the new 1996 models on sale in Sweden in accordance with their environmental qualities, and proposed "best buys" in four size classes.

Only models certified as Class 1 or 2 in the Swedish environmental classification system were admissible for the test. In other words, the functioning and durability of their exhaust-cleaning systems for instance had to be guaranteed. The emissions of nitrogen oxides and volatile organic

compounds were then compounded with the consumption of fuel to form an index. The top-ranking cars were as follows:

Small cars

Hyundai Accent LS/GS/GLS
Volkswagen Polo 1.4i

Small medium size

Mazda 323 1.5
Volkswagen Golf 1.4i

Large medium size

Mazda 626 2.0i
Volkswagen Passat CL 1.8i

Large cars

Opel Omega 2.0i
Volvo 850 GLT2.5

For more information, please apply: *Gröna Bilister*, Högalidsgatan 36B, 117 30 Stockholm, Sweden. Tel/Fax +46-8-8441 19.

ISRAEL

Solar energy at an acceptable price

A NEW TECHNOLOGY for solar energy has been developed at the Weizmann Institute in Israel. It involves using the sun's radiation to heat up air to a very high temperature. The hot air then drives a turbine to produce electricity. The high temperatures that are needed are attained by using mirrors in a funnel-shaped device to greatly concentrate the radiation, which is then sent through a quartz window to heat ceramic pins around which the air flows. The array of pins absorbs the solar energy and transfers heat to the surrounding air very efficiently. The air is made to pass over the pins in a carefully controlled stream before going on to drive the turbine.

According to one of the institute's scientists, Israel's peak-hour electricity demand of 6000 megawatts could be provided by solar power stations collecting sunlight from an area of 2000 hectares – which is considerably less than that now taken up by the country's fossil-fueled plants.

The price of the electricity so generated should also be acceptable. Uri Fischer, head of the Ormat technol-

ogy consultancy, who participated in the development of the new system, estimates the cost of production to be 7 cents (US) per kilowatt-hour, although some improvements still remain to be made.

Electricity from plants burning fossil fuels normally costs between 5 and 6 cents/kWh, but in many places may be much higher. The new solar technology has yet to be tested in full scale, but Fischer hopes to see it on the market within three or four years.

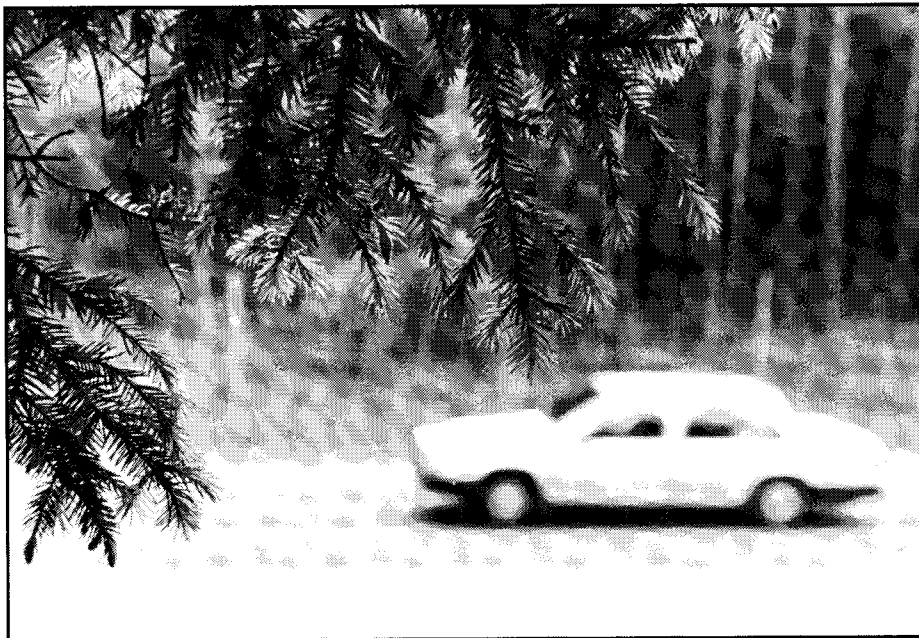
Source: **New Scientist**, May 11, 1996.

Competitive on Hawaii

Research and development are bringing about ever more efficient and cheaper solar cells. The largest American solar power plant, with an extreme capacity of 4 MW, is going to be built on Hawaii in 1997, using solar cells made by Solarex. It is estimated that the total cost will run to \$7 million, of which the U.S. Department of Energy will contribute \$1 million. Commercial operation of a solar plant is made possible by the high price of electricity on the islands, where it averages 15-18 cents per kilowatt-hour.

Sveriges Tekniska Attachéer, January 1996.

Squeezed from two sides



© DAN RAPP

IN EXPECTATION of a proposal from the European Commission for new vehicle emission limits and fuel quality standards at the end of June, a group of environmentalist bodies called a conference in Brussels early in May. The Commission had been expected first to propose standards for fuel qualities and emission limits for light vehicles, and to present further requirements for heavy vehicles, and for vehicle inspection and maintenance, later. The intention has been to make all of them applicable as from the year 2000.

At the NGO conference Patrick Murphy from the Commission's environmental directorate said that the full package, together with other measures already taken or planned, would lead to reductions of 70 per cent, between 1990 and 2010, in the total emissions of nitrogen oxides and volatile organic compounds from vehicles, and at the same time a drop of 65 per cent in vehicles' total emissions of particulates.

A draft for a fuel-quality directive that was leaked in May contained a proposal to prohibit leaded petrol from January 1, 2000. In many other respects however this draft was weaker than the one presented to the member states in December 1995 (see AN 1/96, p.6). For one thing the limit for the sulphur content of petrol had become 0.02 per cent as against 0.01

per cent in the December draft, and for another the allowance for aromatic hydrocarbons was proposed to be 45 per cent (which would be higher than the present EU average). The limit for benzene, which is a carcinogenic substance, was to be 2 per cent, only slightly lower than the current market average of around 2.5 per cent.

Since the intention of the directive is to act for European harmonization, those countries that wish to use fiscal means to encourage the use of cleaner fuels still further may do so, but may not introduce stricter limits than those set in the directive.

At the Brussels conference a Commission officer explained that the reason the fuel-quality requirements had been made more lenient was the poor financial state of the oil companies and their consequent inability to shoulder the necessary investments.

As regards passenger cars, the matter most discussed has been the emission-limit value for NOx from diesel-engined vehicles. It seems the Commission has accepted the car makers' argument that it would be impossible to get down to the level of 0.37 g NOx/km, as proposed in the December draft, by the year 2000. It is not clear however whether it intends to stick to the alternative figure of 0.45 g/km that it then proposed as a compromise, or give way to the car

makers' protests and soften the limit to 0.50 g/km.

The draft directive, which really should have been presented in December 1994, is the outcome of an extensive three-year study carried out jointly by the Commission and the trade associations for car and oil industries. The aim of the study had been to try and identify the most cost-effective measures to achieve the future EU air quality standards by 2010.

The study, or Auto-Oil Programme as it was called, has been heavily criticized by environmentalist NGOs, none of which have been allowed to participate. Among the aspects especially attacked have been the cost-benefit analyses, which are considered to have systematically underestimated the cost of the deleterious effects of air pollution on health and environment, while at the same time heavily overestimating the costs to industry of rectification.

It is generally believed that what will now follow will be lengthy and complicated discussions both within the council of ministers, and between the council and the European parliament. A spokesman from the Commission has said that he did not expect any of the proposed legislation to be passed into law before mid-1998.

PER ELVINGSON

Sources: *Environment Watch: W. Europe*. May 17, 1996. *T&E Bulletin*. May 1996.

Risky oversight

Up to 95 per cent of all the emissions from cars may be laid to cold starts and heavy loading. Neither of these forms part however of the present test cycle, and the European Federation for Transport and Environment warns that unless the European Commission takes cold starts and heavy loading into account in its proposal for vehicle emission limits, its estimates for the reductions that are aimed at may turn out to be widely over-optimistic.

Emissions from 36 car models. Test results from cars subjected to heavy loads and a supplementary test cycle. By Per Kågeson. T&E Report 96/4. Available from T&E, Rue de la Victoire 26, 1060 Brussels, Belgium.

Getting better

Air quality in the United States has improved over the last ten years, asserts the Environmental Protection Agency in its latest report entitled *Air Quality Trends*, covering the period from 1985 to 1994. But even in 1994 90 million Americans were still having to breathe air that was not up to federal health standards. The number in 1990, though, was 140 million (the total population is 245 million). Of the thirty-three areas where the federal health standards for smog were still not being met in 1994, only Los Angeles fell into the "extreme" category. In ten areas the situation is classed as "severe."

The EPA estimate that 90 million people are subject to smog levels above the National Ambient Air Quality Standard for ozone is being questioned by the American Lung Association, which issued a report in November saying that 161 million people were potentially at risk from dangerous levels of ozone. The difference in the two estimates can be explained by the fact that the ALA expresses the acceptable limit for exposure to ozone differently from the EPA (0.07 ppm over an eight-hour period instead of 0.12 ppm as a one-hour average), arguing that recent research shows that people can be harmed by being exposed to low levels of ozone over periods longer than one hour.

Car Lines, M.P. Walsh. January 1996.

Dusty air

The emissions of particles from London traffic would have to be reduced by at least two-thirds – and up to 80 per cent in places where traffic is thickest – if the limit recommended last year by the Expert Panel on Air Quality Standards is not to be exceeded. This can be read in a report presented in May by the government Quality of Urban Air review group. It found that 86 per cent of the PM₁₀ – particles with a diameter of less than 10 micrometres – in the London air comes from road traffic.

New Scientist. May 18, 1996.

Cleaner shipping

All four main engines and all the auxiliary engines on the ferry *Stena Jutlandica* have been fitted with catalyzers – making it the first ferry in the world to have exhaust-gas cleaning on all its engines. This has reduced the emissions of nitrogen oxides by 90 per cent and those of volatile organic compounds and particulates by 80 and 30 per cent respectively. The managing director of the Stena group, opining that this improvement in respect of the environment will pay in the long, calls it an investment for the future.

Ny Teknik. No. 11, 1996.

Guide values need to be revised

OZONE IS MORE dangerous than previously believed. The Swedish Institute of Environmental Medicine (IMM), which has been studying the effects of ground-level ozone on human health on behalf of the national Environmental Protection Agency, is urging in consequence a marked lowering of the present guide and limit values.

The agency's guide value for ozone is now 150 µg/m³ air as an hourly average, which the IMM proposes should be almost halved to 80 µg/m³. This would mean bringing it down even further in relation to the EU guide values.

"There is quite sufficient evidence to show that concentrations even of 160 µg/m³ can give rise to acute effects, such as deterioration of lung function. Still higher concentrations can cause sensitive individuals to be hospitalized or actually die. We have seen this from a Belgian study," says Katarina Victorin, project leader for the Swedish one. Her institute, IMM, is internationally prominent in this field of research, and it was she who directed the revision of the WHO guidelines for air quality which have just been adopted and will shortly be published.

Victorin defends the tightening that is recommended for Sweden on the grounds that a margin of safety is needed in order to protect groups such as the elderly, children, and allergics.

Because of uncertain scientific evidence, the IMM is not proposing any guide level for long-time exposure. The proposed hourly value does however, says Victorin, provide some protection against too high long-time exposure.

According to the Environmental Protection Agency, practically the whole Swedish population is exposed to concentrations in excess of both the current and proposed guide values. By far the greater part of the ozone in the Swedish atmosphere stems however from sources outside the country. Ground-level ozone in high concentrations is a problem that is

plaguing almost the whole of Europe, and the new findings will be used by Sweden to press the European Union to take stronger measures against the emissions of nitrogen oxides and volatile organic compounds, both substances leading to the formation of ground-level ozone.

It may be noted, by way of comparison, that the British government's Expert Panel on Air Quality Standards proposed a couple of years ago that 50 ppb (which would be 100 µg/m³) should be the standard for any eight-hour period. The panel thought it could detect a threshold at about that level, noting that higher concentrations led to significant increases in mortality rates.

The British expert panel estimated that compliance would require either cutting the present emissions of VOCs by 75-80 per cent or a reduction of NOx emissions by 95 per cent, or some compromise between the two. But attainment of the proposed IMM guide level, with a one-hour value at a lower figure, would require a much greater reduction of emissions.

PER ELVINGSON

Note. A report on the IMM study will be published in the *Scandinavian Journal of Work, Environment and Health*. A Swedish summary can be obtained from IMM, entitled: *Ozon – hälsoriskbedömning och förslag till riktvärden* (IMM rapport 1/96).

Correction

There was an error in the article on the mapping of critical loads in the last issue (pp. 14-15). The caption to the two top charts should read "The extent to which *depositions* need to be reduced ..." (not *emissions*).

The mapping program does not cover requirements for emission reductions. That requires knowledge of emission reduction costs and other matters treated in integrated models under the Convention on Long Range Transboundary Air Pollution. The mapping program investigates critical load excess and *deposition reductions needed* to meet critical loads.

Future pollution projected

RAPID ECONOMIC GROWTH in parts of southeast Asia is expected to considerably worsen the problems connected with air pollution in that region. According to official sources the use of energy, and with it the emissions of sulphur dioxide, will treble during the next 20-30 years.

This was the reason for starting the RAINS Asia program 1992, financed by the World Bank. RAINS (Regional Acidification Information and Simulation) is a computer model developed by IIASA, the International Institute for Applied Systems Analysis, in Vienna. It has had great practical importance in Europe in the negotiations for reducing the emissions of sulphur dioxide (see for instance AN 2/96, pp. 5-6), and it is hoped that through RAINS Asia, policy makers there will also use the RAINS model as a means of reducing emissions of air pollutants.

Bringing together scientists from Europe, North America, and Asia has enabled the model to be adapted to Asian circumstances – which compared with those in Europe are much more complicated. The area to be covered is three times as great, and both weather and ecosystems are more complex. Nor has the geographical distribution of the emissions, or the sensitivity of the various ecosystems to acid deposition yet been mapped with any exactness.

The model makes it possible to foresee the likely emissions of sulphur under various assumptions, where deposition will occur, and what the effects will be on the environment – now and in future. It also covers the cost aspect, showing what the reduction of emissions will cost, country by country.

The greatest fallout of sulphur resulting from present emissions is shown by the model to occur around Chongqing, a town in the Chinese province of Sichuan. As in Europe the pollution gets carried across national borders. While in

China's case only 3 per cent of the country's emissions lands elsewhere (83 per cent stays at home, 14 per cent falls in the sea), that small fraction has a marked effect in the neighbouring countries. In North

tion in those countries comes from China.

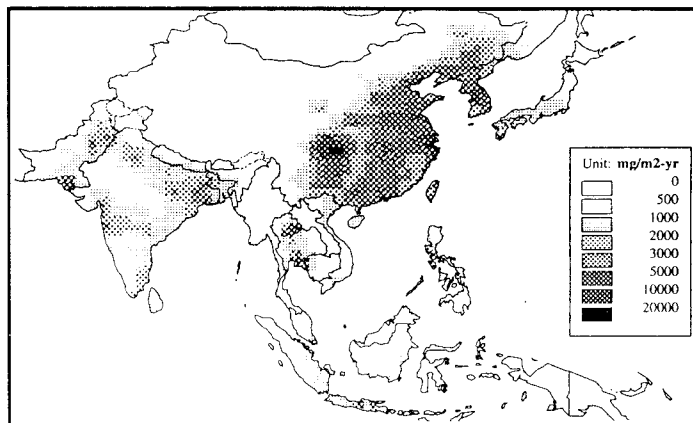
It also appears from the model that in large areas of China and Korea the atmospheric concentrations of sulphur dioxide are exceeding the limits above which damage can occur to woodlands and field crops. (The limit is 20-30 $\mu\text{g}/\text{m}^3$ as a yearly average.)

The reference scenario used for the calculations assumes a trebling of energy use in the region between 1990 and 2020, and no measures to control the emissions of sulphur dioxide (beyond those already decided upon in Japan and Taiwan). The consequence

of this official so-called energy pathway would likewise be an overall trebling of the emissions of sulphur dioxide, although with considerable variations from country to country – from a 32-per-cent increase in Japan to a twelvefold increase in Pakistan (see Table 1). It is estimated that in 2020, 75 per cent of the sulphur will come from the burning of coal, and 20 per cent from oil. The sector expected to be most responsible for the increase in emissions would be power generation.

Depositions will naturally also increase. Over large areas they will be two to three times greater in 2020 than they are today, while in certain cases – such as in parts of India, Korea, and Thailand – they will, according to the model, be five times greater or even more.

Throughout eastern China and Korea, and in parts of India, the depositions of sulphur will amount to 20 to 50 kilograms per hectare per year. By far the highest figures will be seen in China, where they may run locally to 260 kg/ha per year. See Map 1. It may be noted by way of comparison that in the "black triangle" of Central Europe – where eastern Germany, the

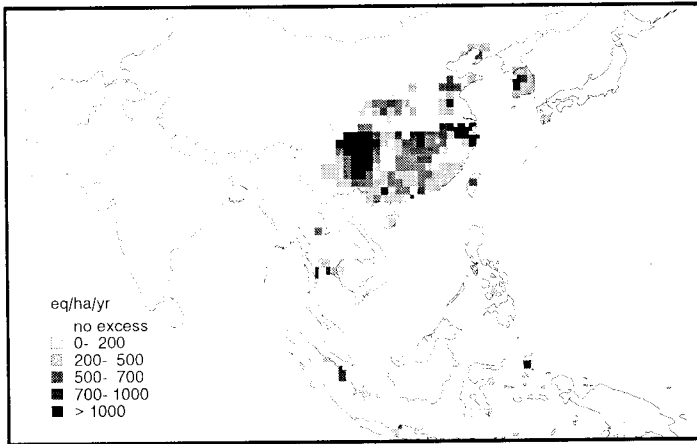


Map 1. Sulphur deposition in 2020 according to the reference scenario (base-case energy pathway, assuming no further measures beyond current legislation).

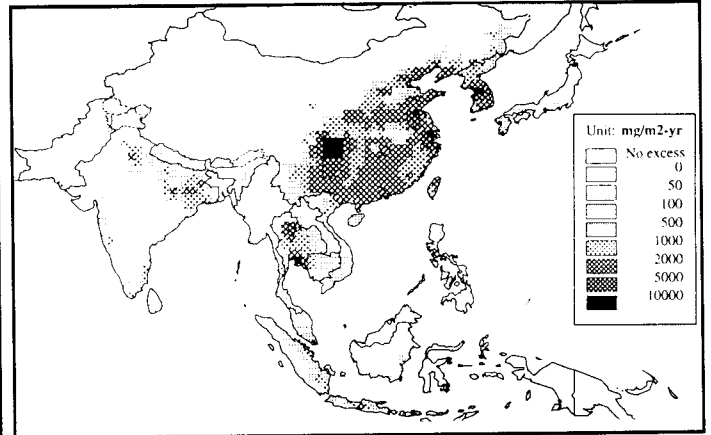
Korea and Vietnam, where 0.8 and 0.4 per cent of China's emissions fall, 35 and 22 per cent of the deposi-

Table 1. Emissions of sulphur dioxide in 1990 and as forecast for 2020 in the reference scenario. (Unit: 1000 tons of SO_2).

	1990	2020	Increase
Bangladesh	118	524	344%
Bhutan	2	12	500%
Brunei	6	18	200%
Cambodia	22	147	568%
China	21908	60687	177%
Hong Kong	140	378	170%
India	4471	18549	315%
Indonesia	630	3162	402%
Japan	835	1120	34%
Korea, north	343	1345	292%
Korea, south	1640	5537	238%
Laos	3	12	300%
Malaysia	205	409	100%
Mongolia	78	168	115%
Myanmar	18	40	122%
Nepal	122	247	102%
Pakistan	614	7527	1126%
Philippines	390	2037	422%
Singapore	191	1033	441%
Sri Lanka	42	239	469%
Taiwan	500	1478	196%
Thailand	1038	4637	347%
Vietnam	113	654	479%
Sea lanes	243	511	110%
Total	33,674	110,477	228%



Map 2. Computed exceeding of the critical loads for acidity from sulphur deposition in 1990 (25%il).



Map 3. Excess deposition above critical loads (25%il, all ecosystems) in 2020 according to the reference scenario.

Czech Republic, and Poland converge – they have never been more than 150 kg/ha per year.

As in Europe, the assessment of the ecological effects of sulphur deposition has been based on the critical loads concept. The sensitivity of the soil to acid deposition has been determined by noting weathering capacity and other factors. Map 2 shows where the critical loads would have been exceeded, given the emissions levels of 1990. Since there is a relatively large margin of uncertainty in the statistics, in making the maps the most sensitive quarter of the ecosystems in each square (the so-called 25 percentile) has been excluded. This means that if the critical loads are not exceeded, at least 75 per cent of the ecosystems in the square will be safe from acidification. (In Europe it is usually 5 per cent that are excluded.)

The extent to which the critical loads would be exceeded if emissions in 2020 were in accordance with the reference scenario can be seen in Map 3. Although the present scientific knowledge does not allow any conclusions to be drawn as to the environmental damage that might ensue from the assumed deposition, the fact that the sulphur falling on large areas is likely to be ten times more than the critical load should give reason, it is said, for serious concern. The high concentrations of sulphur dioxide in the air that might be expected according to this scenario would also affect human health, not only in towns but also in great parts of the countryside.

There are therefore obvious reasons for reducing emissions. The question is just how, and at what cost, and RAINS Asia gives answers.

The most expensive way would be to apply the best available technology (BAT) to all emission sources. In the model set-up that would mean equipping *all* large point sources, both new and existing, for flue-gas desulphurization, and in other cases using only low-sulphur fuels. This would halve emissions in 2020, compared with today's figures, despite a

*Most expensive to apply
best available technology
to all emission sources*

trebling in energy use. The greatest reductions would be of emissions from large combustion plants. Whereas in China, the Philippines, and Thailand emissions would drop by 60-70 per cent, in India they would increase by 30 per cent, all compared with 1990.

Under this BAT scenario, depositions would be kept under the critical loads in most places – as can be seen from Map 4, which again excludes 25 per cent of the most sensitive ecosystems. There would still be trouble in

parts of China, particularly in Hunan and Jiangxi provinces, which suffer from a combination of sensitive ecosystems with high economic activity (and consequently high emissions). Critical loads would also be exceeded around certain "hot spots" in India, Thailand, and Korea.

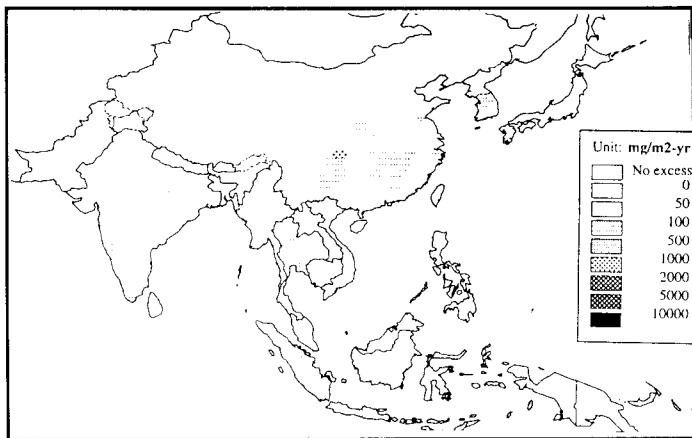
The trouble with that scenario is the cost. By 2020 it would have amounted to US\$90 billion a year, corresponding to 0.59 per cent of the GDP in the region, also assuming the expected economic growth. The heaviest burden would fall on China, where the cost would come to 1.7 per cent of the GDP. By comparison, the commitments of the European countries under the 1994 sulphur protocol are estimated to cost them on an average 0.21 per cent of the gross domestic product.

Since the constraining factor will be money, the aim has been to unearth strategies that will yield the greatest environmental gain at the least possible cost.

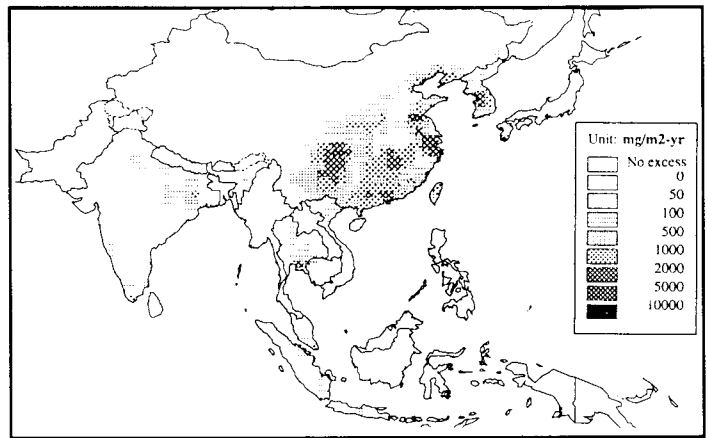
A solution may lie in a scenario called ACT, Advanced Emission Control Technology, where flue-gas desulphurization would be installed only at *new* large point sources and low-sulphur fuels used in other cases.

Table 2. Comparison of emissions and emission-control costs for the base-case energy pathway and the energy-efficiency pathway.

	Emissions (million tons SO ₂)		Costs (billion US\$/year)	
	Base case	Efficiency	Base case	Efficiency
Reference scenario (no further control)	110.5	80.1	3.9	2.0
Best Available Technology (BAT)	16.3	12.4	90.4	65.6
Advanced Control Technology (ACT)	50.4	39.1	38.8	25.5



Map 4. Excess deposition above critical loads in 2020 according to the BAT scenario (25%il).



Map 5. Excess deposition in 2020 if the ACT strategy were applied (25%il).

While sulphur emissions would then be 50 per cent higher in 2020 than in 1990, they would nevertheless only be half of what they would have been under the reference scenario. The cost would be markedly less than that for the BAT scenario – US\$39 instead of US\$90 billion in 2020. That would correspond to 0.25 per cent of the likely GDP, bringing the cost of reduction down to the current European level.

The increase of 50 per cent in emissions would mean an exceeding of the critical loads to a greater extent than today (Map 5). Serious consequences from acidification might therefore be expected in Korea and most of China.

Both the BAT and the ACT scenarios require industrial technique, know-how, and investment capital, all of which tend to be in short supply in developing countries. Hitherto preference has often been given to technology that has already been available and in use, but it has been shown by modelling that if for instance simple limestone injection were used instead of the more advanced flue-gas desulphurization method, the installation cost would be lower but the total cost will be higher on account of the higher cost of operation. Since there will be a lower cleaning effect, too, the emissions of pollutants would be distinctly higher.

A third way out that has been examined is the local application of advanced technologies (LACT). Advanced technology would be applied in ecologically sensitive areas, and less demanding measures elsewhere. Although the ecosystems would not be so well protected as under ACT,

the total cost with this procedure would be markedly less.

All the scenarios so far described assume a trebling of energy use, with a similar rise in sulphur emissions. It turns out however that measures aimed at bringing about a more efficient use of energy would be definitely more cost-effective than in-

*Efficient use of energy
more cost-effective
than flue-gas cleaning*

stalling flue-gas cleaning. Emissions would be much lower with a more efficient use of energy – and so ecosystems would be better protected – and the cost, compared to the base scenarios, would be 30 per cent lower. See Table 2.

In each of the pathways illustrated in the table there would be the same growth in GDP, but under the energy

efficiency scenario energy use would no more than double between 1990 and 2020. This scenario assumes sharp increases in energy prices, general improvements in technology, and increased use of renewable sources.

Since the RAINS Asia report contains no assessment of the cost of emissions to society, it gives no help in balancing benefits against the cost of various scenarios.

In their address to the World Bank the project group points out that the model is preliminary and still has certain deficiencies. Cost assessments based on European and North American experience are for instance not always applicable to Asian circumstances. In order to better estimate future trends a renewed check should be made of the actual size of present emissions. It would also be desirable to include nitrogen oxides in the model, and so the traffic sector. Nitrogen oxides are not only acidifying, but also contribute to the eutrophication.

Continued on page 14

Worse than feared

Acid rain in China is far more severe and widespread than originally feared, says the report on a three-year research project that was published last December. The study, conducted by the Chinese Research Academy of Environmental Sciences, revealed that 40 per cent of the nation's land mass is now affected by acid rain. Beijing's National Environmental Protection Agency had previously reported that the extent of acid rain was limited to 29 per cent of the territory.

Officials from the National Environmental Protection Agency estimate acid rain in southern China to be responsible for US\$1.6 billion worth of damage to crops, forests, and property each year,

and that all but five or six of the nation's major cities fail to meet international standards for environmental quality. While energy planners have been announcing the need for a greatly increased use of coal to meet the demand for energy during the next few years, EPA officials have pledged that special projects to curb the most severe cases of air pollution will be carried out in nine cities next year, with financing from an \$880 million loan approved by the Overseas Economic Cooperation Fund of Japan. China also intends to spend a total of \$18.7 billion on environmental cleanup over the next five years under the state's "Cross-Century Green Project."

Source: *Car Lines*, M.P. Walsh, March 1996.

Transit traffic causes Swiss controversy

A BIG ROW has broken out in Switzerland after government representatives had told the European Union that Switzerland was prepared to lift its maximum limit of 28 tons for trucks.

A parliamentary working group had recommended that Switzerland should allow 40-ton trucks into the country's hinterland from 2001 if they paid a performance-related charge for heavy goods. This has however met with serious opposition from Swiss environmental groups and leading experts, who say the charges will not bring in as much revenue as expected and will lead to more goods going by road.

One reason for proposing to admit 40-ton trucks if they pay a special charge may be the need to finance the two new tunnels through the Alps that are intended to move freight transiting onto the railways.

Most of the Swiss environmental groups have threatened to call a referendum if the proposal to abolish the 28-ton limit should turn out to be serious.

Source: **T&E Bulletin**. April 1996.

RAINS Asia

Continued from page 13.

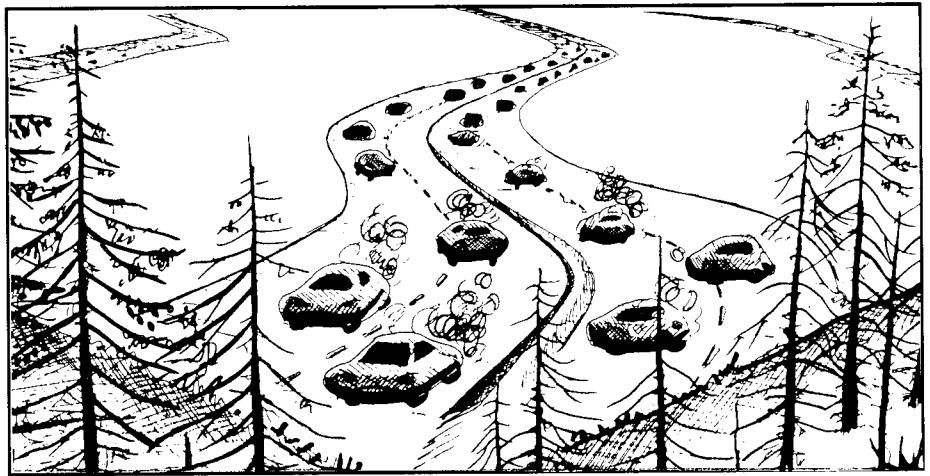
cation of ecosystems, and the formation of ground-level ozone. A long-term aim should be to achieve a comprehensive approach to the various problems that would also take into account the different effects of air pollutants on the environment and health.

PER ELVINGSON

RAINS Asia: An assessment model for air pollution in Asia. Edited by W. Foell, M. Amann, G. Carmichael, M. Chadwick, J-P Hettelingh, L. Hordijk, and Z. Dianwu. Final report to the World Bank, December 1995.

Further reading on the project can be found in *Water, Air, and Soil Pollution* Vol. 85 (1995), pp. 2277-2294, 2565-2570.

Information can also be had from the project's contact person at the World Bank, Dr J. Shah of the Environment and Social Affairs Division, 1818 H Street NW, Washington, D.C., 20433, USA.



US SPEED LIMITS

Effects of lifting them

NOW THAT President Clinton has signed into law a bill that includes a provision eliminating speed limits of 55-65 mph as a prerequisite for federal highway funding, many states are considering raising their limits.

The speed limit on highways in the United States has since the oil crisis in 1974 in practice been 55 mph (barely 90 km/h), although an increase to 65 mph (105 km/h) on rural interstate freeways became allowed through a modification of the law in 1987. Raising the limit generally from 55 to 65 mph will, according to the EPA's computer model, result in the following increase in the emissions from an average petrol-driven car in America:

	Emissions (g/mile)		Change %
	55 mph	65 mph	
NOx	2.19	2.40	+10
VOCs	0.59	0.92	+56
CO	7.60	19.24	+153

The Environmental Protection Agency estimates that a general increase to 65 mph will result in an increase of 5 per cent in the total emissions of NOx in the United States. In some parts of the country the increase will approach 10 per cent. But there is a reason to believe that many of the states will raise the limit to more than 65 mph, and several have in fact already done so, to 70 and 75 mph. For lack of data, however, the EPA is unable to assess the effects of these increases above 65 mph.

The increase in emissions resulting from driving at higher speeds will make it difficult to come up to

National Ambient Air Quality Standards in places where they are still not being attained. It seems the standards for emissions from other sources will have to be tightened to compensate for the increased emissions from road traffic.

As vehicle speeds increase, fuel economy decreases – and markedly so at speeds above something like 50 mph. On the national level, raising the speed limits will result in a significant increase in fuel consumption – thus making it more difficult to meet the reduction targets for greenhouse gases. From the EPA analysis it appears that carbon emissions will increase by 6-15 million tons per year – which is about 6-15 per cent of the amount needed to return US emissions to their 1990 level the year 2000.

Faster driving will also have effects that are likely to accentuate the direct increase in emissions. Higher speeds will reduce travel times, thus making it even more attractive to use the car rather than other modes of transport. While travel times will probably not be appreciably reduced in congested areas, there will be an increase in car travel in areas that are not affected by congestion. Reduced travel times will also encourage low-density suburban developments.

The EPA will now be gathering and analysing data on emissions from vehicles moving at high speeds. A fresh statement of the effects of eliminating the national speed limit can then be expected.

Source: **Car Lines**. March 1996.

Risk of an increase

THERE APPEARS to be every probability that the European Union will fail to freeze its emissions of carbon dioxide at 1990 levels by the year 2000, to judge by a report from the Commission (COM(96)91). If the national programs for energy saving do not succeed, emissions may have risen by as much as 5 per cent by 2000.

The report reveals that the emissions of carbon dioxide from the fifteen member countries amounted in 1990 to 3285 million tons. Germany alone was responsible for almost a third of that total.

Since 1990 the German emissions have however fallen – largely on account of what has happened in eastern Germany, where the emissions were halved between 1987 and 1993. Otherwise it was only in Great Britain and Austria that energy-related emissions of carbon dioxide declined between 1990 and 1993. The result for the EU as a whole was a reduction from such sources of 2.2 per cent during that time.

The emission figures in the table, from the EU statistical office, Eurostat, were published some time after the Commission's report had come out. They show a continued fall in the energy-related emissions of CO₂, bringing the reduction of the EU total to 2.7 per cent between 1990 and 1994. As can also be seen, three more countries – France, Italy, and Luxembourg – reported reductions.

One sector where emissions have continued to increase is transportation, with an increase of 7.6 per cent between 1990 and 1994. The most rapid rise was for aviation, which increased its emissions 13.3 per cent. Transportation now accounts altogether for 26 per cent of the CO₂ emissions in the EU.

There is a warning in the Commission's report against entertaining false hopes regarding the Union's possibility of achieving a freeze by 2000. The drop so far in emissions is due largely, it says, to the economic recession, less burning of lignite in eastern Germany, and a switch from coal to gas in Great Britain. If economic growth takes off again, as the Commission hopes and believes it

will, there will be a risk of an increase in emissions too. The International Energy Agency (IEA) estimates, on the basis of the member countries' own forecasts, that the Union emissions of CO₂ from the energy sector will show an increase of 6 per cent between 1990 and 2000.

The members' estimates do not however tell quite the same story. Five of them are counting on reducing their total emissions of carbon dioxide during the period, four expect to freeze them, and six think theirs will increase. The overall result would be a reduction of 1 per cent.

But the Commission remains unimpressed. In six cases the figures given presuppose the imposition of an EU tax on energy and/or carbon dioxide – which hardly seems imminent. "It cannot be excluded," it says, "that Community emissions will increase within the range of 0 to 5 per cent by 2000 over 1990 levels."

The environment commissioner Ritt Bjerregaard comments that it would be absurd if "with present efforts, we shall only meet our CO₂ target if the growth rate turns out to be lower than we hope and expect it to be." If only less energy is wasted, she says, reduced emissions need not to be incompatible with economic growth.

Source: ENDS Report 255. April 1996.

Emissions of carbon dioxide from burning of fossil fuels. Million tons.

	1990	1994	Change
Austria	58	57	-2%
Belgium	111	117	+6%
Denmark	53	63	+19%
Finland	53	61	+14%
France	368	349	-5%
Germany	992	897	-10%
Greece	73	78	+7%
Ireland	31	32	+3%
Italy	402	393	-2%
Luxembourg	12	12	-3%
Netherlands	157	164	+5%
Portugal	40	45	+14%
Spain	209	229	+10%
Sweden	52	56	+8%
UK	579	550	-5%
EU total	3,188	3,103	-2.7%

Source: Eurostat.

Profitable to tax pollution

A more than doubling of the country's tax on carbon dioxide, from 160 to 360 kroner per ton of CO₂, combined with a lowering of 2.5 per cent in the employment charge, would, according to a study released by the Norwegian Department of Finance, in time increase the country's GDP by 0.5 per cent and employment by 0.75 per cent. The sectors that would be hardest hit are metal alloys and the fish-oil and fish-meal industries. Aluminium production, petrochemicals, and pulp making would on the other hand come out relatively unscathed.

Dagens Nyheter. April 23, 1996.

Voluntary commitment

German industry has tightened its voluntary commitment to reduce emissions of carbon dioxide. The original agreement, presented last year, called for a reduction of CO₂ emissions by "up to 20 per cent" by 2005 from 1987 levels. The new commitment moves the base year up to 1990 and sets 20 per cent as the definitive target. This translates into a cut of 120 million tons of CO₂ in the manufacturing, electricity generating, and decentralized heat sectors. An additional reduction of 50 million tons will come from gas and water supply. German industry has also agreed to have an independent body monitoring the emissions. For its part, the government has announced it has no plans to introduce a national CO₂/energy tax and would exempt those parts of the industry that adhere to the voluntary commitment from any EU-wide tax.

Environment Watch: Western Europe. April 5, 1996.

Not succeeding

Austria is hardly likely to meet its reduction targets for nitrogen oxides, volatile organic compounds, and carbon dioxide, according to the latest monitoring report from the *Umweltbundesamt*. Existing legislation calls for a 40-per-cent reduction, from 1985, for NO_x, and from 1988 for VOCs – both by the end of 1996. There were to be further cuts to 60 per cent by the end of 2001, and to 70 per cent by the end of 2006.

The emissions of carbon dioxide were to be reduced by 20 per cent between 1988 and 2005, but according to the report, by 1994 they had risen by 8 per cent, so that attainment of the target will require a 30-per-cent reduction in the nine remaining years.

Environment Watch: Western Europe. March 1, 1996.

New energy policy evolving

RUSSIA IS STILL SUFFERING from the aftermath of the centrally planned Soviet economy, and not least in the energy sector. But changes are now in many respects imminent.

The Chernobyl disaster not only hastened the process of democratization but also gave impetus to the environmentalist movement and the development of a new energy policy. After the disintegration of the Soviet Union, bringing a new geopolitical situation and the beginnings of a market economy in the CIS, it became clear that the preservation of the *status quo* in the energy sector would cause the whole Russian economy to remain uncompetitive in the world market.

This realization led to a review of the country's energy policy, instigated by the federal government, which culminated in the publication in 1995 of a comprehensive document, *New Energy Policy in Russia*.

The basic aim of Russia's energy policy will now be to create the necessary conditions for the efficient use of the country's energy resources and its whole energy industry. It will also be necessary to improve the quality of the energy services, through greater reliability for instance in the supply of energy and heat, and better qualities of motor fuel. There needs further to be an increased use of gas, especially in rural areas.

The new policy is expected to lead to an amelioration of the effects of the energy system on the environment, to help Russia's integration with the world economy and to bring improvement to the country's economy through exports of energy. It will be important however to control exports, so as to avoid a shortfall in the internal market.

The highest priority is to be given to measures for the conservation and efficient use of energy. Energy conservation should not only ensure a more rational use of natural resources, but also lead to gains for the environment – reducing the emis-



sions of greenhouse and toxic gases, for instance, by 15-20 per cent.

At present there are three main factors hindering energy conservation:

- Lack of legislation to promote the conservation and efficient use of energy.

Highest priority to measures for conservation and efficient use

- Uncompleted privatization. Because of the way it was introduced in Russia, privatization did not lead to any real ownership of property, hence there is no incentive to save energy and use it more efficiently.
- The continued subsidizing of inefficient facilities.

The suggested means of forwarding energy conservation include the creation of conservation funds, the introduction of construction standards, and appliance certification. It will also be important to develop programs for educating the public as well as employees in the energy sector.

The following developments are envisaged for the next 10-15 years on the supply side:

- Increased use of natural gas, especially in environmentally sensitive as well as rural areas generally.
- Increased production of electricity from hydro, conventional, and nuclear installations wherever it is economically and environmentally worthwhile.
- Increased use of renewables.
- Modernization of the technologies for the mining and use of coal.
- More intensive use of local resources – hydropower, peat, small oil and gas fields, and renewables.

Given the present state of the economy, it is likely that the emphasis will tend to be rather on the reconstruction of existing plants, energy saving, and the development of new technologies than on building new plants of high capacity, which require large investments of capital.

The merging of regional systems for the production and distribution of electricity and gas into national ones will mean that they will have to stay under state control. Gas is expected to remain the prime source of energy during the foreseeable future. It constitutes more than half of

Russia's energy resources, and 35 per cent of all gas exports from the CIS come from Russia. An increase in domestic consumption and exports will however require renovation of the distribution network and the exploitation of new gas finds.

Oil and coal are also important energy sources, but in both cases the industry is in need of modernization. While the existing nuclear power plants will be modernized and technically improved during the next five years, it is unlikely that any new plants will be built before 2000. But if the public's attitude to nuclear power should become more favourable, work might be resumed on the construction of some moth-balled reactors.

After 2000, nuclear plants may be built in central and western Russia, and also in the far east, provided reactors of new design and improved safety are available. In that case they will be producing electricity for export as well as for domestic use. Small reactors of the type used in submarines may be installed in the far north, and even in the western part of the country and underground.

Considerable use of hydroelectric power is envisaged for some regions, in particular Siberia, the far east, North Caucasus, and Kamchatka – the idea being to build many small plants.

De-monopolization is said to be among the first-rank aims of the

new energy policy. It is hoped to attract investment from private Russian businesses as well as foreign firms and the regional and federal Russian governments.

Regional energy policies had no place in the Soviet planned economy. In a market economy however federal and regional policies must be in consonance if resources are to be

Opportunity for NGOs to become involved in regional energy programs

used rationally. Federal policy should take into account the special interests of the regions, with their strong desire for independence, while yet ensuring a properly functioning distribution system for the whole country.

In pursuance of this policy the federal government should allow the regions a larger share in the ownership of the means of production and a greater influence in planning and management – thus providing a more tangible incentive for energy conservation and efficiency in its use, for maintaining reliable supplies and restricting the emissions of pollutants.

In the oblasts of Tula and Kaliningrad regional specialists are already cooperating with others in

federal academic and state institutions for the development of regional energy policies. The regional governments are notably inclined to prefer investments in projects that can be carried out rather quickly, which explains why energy conservation is often chosen.

The specific legislation needed for implementation of the new energy policy is now being worked out by the federal government. It will lay down the rights and responsibilities of the federal and regional governments and institutions in respect of strategy and the market for energy, and management of the installations.

There is nothing in the New Energy Policy document about public participation in the formulating of energy strategy. The federal law "On Tariffs," which gives energy commissions authority to develop regional policies, requires public hearings to be held, and lays down that the commissions shall include at least two members representing public organizations. This provides an opportunity for NGOs to become more deeply involved in the development of regional energy programs, allows for wider public participation in discussions on energy policy, and public influence in economic matters generally.

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As it is now

TODAY'S Russian energy system is characterized by enormous ineffectiveness. Almost 40 per cent of the fuel and electricity is being used inefficiently, due to direct losses in the distribution network and unnecessarily high consumption in end use. The energy intensity in Russian industry is 2.5-3 times higher than in western countries. Under the Soviet regime the country's energy production had been steadily increasing, so that by 1988 it had reached 13 per cent of the world total, although the population constitutes less than 3 per cent. After the collapse of the Soviet Union the demand for energy declined, but to a less extent than industrial output, which by 1993 had fallen off by a third since 1990.

The whole energy complex is now in a very poor state. More than half of the

coal-mining machinery, and 30 per cent of the gas-pumping equipment, has passed the limit of its design age. Within the next five years all of the country's power plants will also have reached that stage. And none of the nuclear power plants of Soviet design can approach world safety standards.

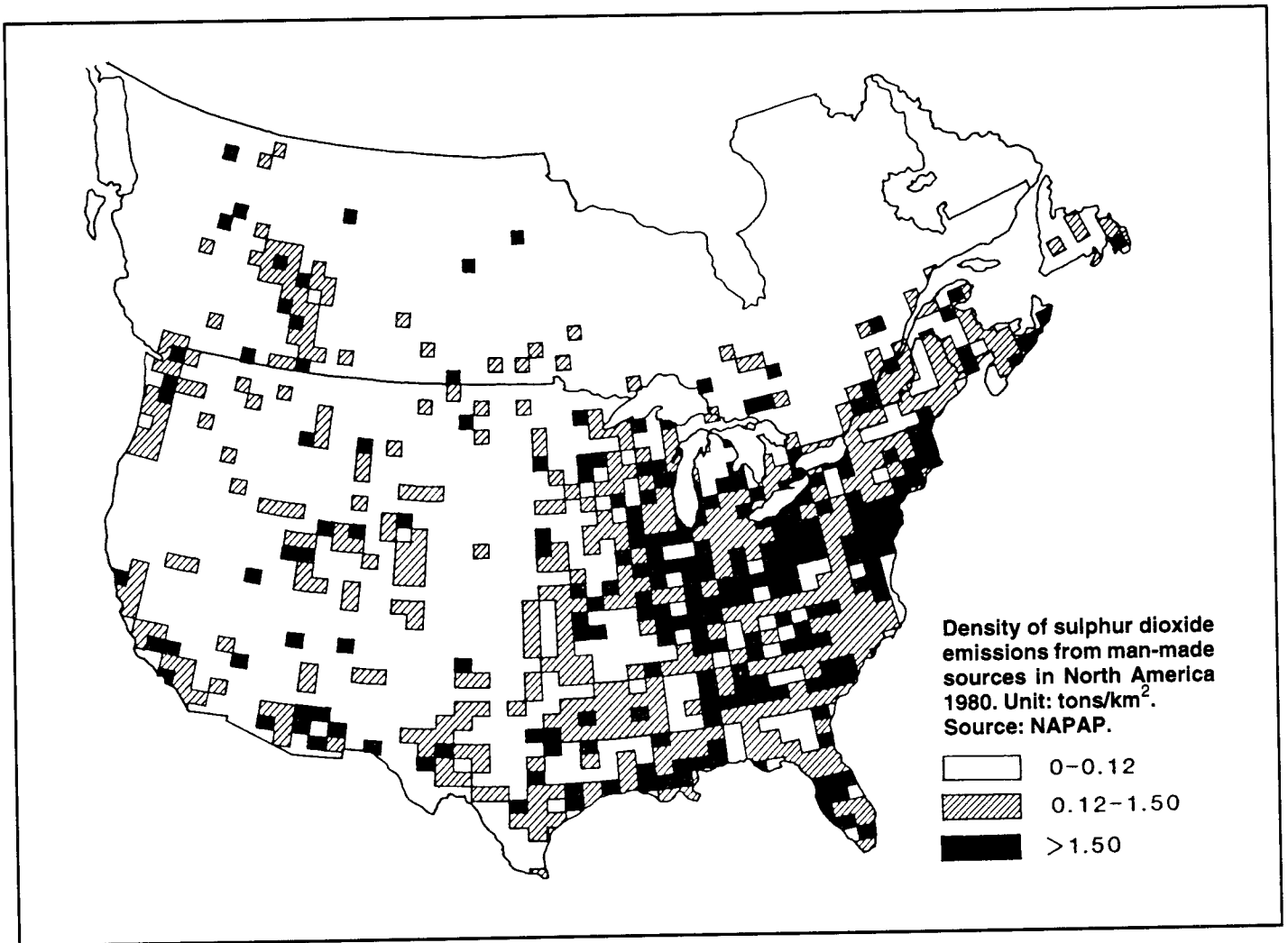
At present the most serious problem for the whole system lies in non-payment for deliveries of fuel and electricity, which is holding up the much needed investments. But low energy prices are also a problem. Although they grew faster in 1993-94 than those for industrial products as a whole, oil and gas at least were being paid for at prices far below world levels.

Also making the situation almost critical in the energy sector is the absence of legislation and proper regula-

tion, combined with poor management and the lack of incentives to save energy and use it more efficiently. The tax system is moreover ineffective both for the economy as a whole and the energy-fuel complex in particular.

In 1994, 67 per cent of the electricity was being generated in power plants fired with fossil fuels, and 11 per cent in nuclear plants. In European Russia hydropower answered for 14 per cent of the electricity output, but as much as 40 per cent in the eastern regions. The environmental burden of the energy sector consists primarily of emissions of air pollutants and radioactive substances from power plants and nuclear fuel production. There are also the problems of widespread destruction of soil and the contamination of water.

Source: **New Energy Policy in Russia**



US PROGRAM

More details now reported

APPRAISALS of the American system of allowance trading to control emissions of air pollutants continue to appear. One of the most recent comes from Bernd Schärer of the *Umweltbundesamt*, Berlin, which contains more detail than has previously come to the attention of Acid News.

After describing the antecedents of the system, and its emergence under the Clean Air Act of 1990, Schärer goes on to outline its known workings, namely: Certificates are issued to the affected power plants, each entitling to the emission of one ton of sulphur dioxide per annum – to a total, Schärer says, corresponding to the “historical fuel consumption and specific emission factors” of the plant. At the end of each year plants must be able to show allowance certificates to an amount equal to their emissions quota or face penalties. Since the allowances are tradeable, utilities can make up any deficiency

by buying either from other utilities or in the now established market. Contrariwise those that have been more successful in keeping down emissions, can sell their excess allowances. Companies that fail to

Effects are clear from the trend of emissions

produce the necessary number of allowances have to pay a penalty of \$2000 per excess ton emitted – which, in view of the average traded price for an allowance of \$200 per ton, Schärer calls drastic.

Strangely, he omits to say that the EPA aims, through the system, to have halved emissions by 2010, compared with 1980, as the director of

its Acid Rain Division emphasized in the letter printed in Acid News 5/95, by issuing allowances only equal to about half the emissions of that base year. He adds on the other hand a number of details that did not appear there.

The 110 utilities involved in Phase I of the Acid Rain Program, starting in 1995, comprise 263 mainly coal-fired blocks in the twenty-one eastern and middle-western states where most of the coal is mined. There the sulphur content of the coal is usually more than 3 per cent, but with the emission factor used for the allowances it would be equivalent to 1.6 per cent. Most of the coal used for power generation in Germany, Schärer notes, has a sulphur content of 1 to 1.5 per cent.

Phase II, from the year 2000, will bring both a tightening of the requirements and extension of the coverage to 700 utilities with a total

of 2100 power blocks, so that the program will then apply to all plants of more than 25 MW capacity. The emission factor will be 1.2 lb/mill. Btu, corresponding to a sulphur content in the fuel of 0.8 per cent.

Schärer also notes that the primary aim of the Clean Air Act is to reduce the emissions of sulphur dioxide by 10 million tons a year from the 1980 level, so that on completion of the acid rain program in 2010 the aggregate of SO₂ from power plants will be 8.95 million tons a year, and from other sources 5.6 million tons. The target for NO_x emissions, for which there is no allowance trading, will be 2 million tons per annum.

Schärer reports that even prior to 1995 more than twenty direct deals had been made between utilities, with a total value of \$20 million. At the first of two auctions at the Chicago Board of Trade, in 1993, more than 150,000 allowances were sold at prices ranging from \$122 to \$450, and at the second in 1994 176,000 allowances exchanged owners at \$140-400 each. He compares this with the reduction cost of DM2300 per ton of SO₂ under GFAVO, the German regulation program for large combustion plants.

To promote energy efficiency and the use of renewable fuels, the EPA is keeping a number of allowances in reserve. Utilities that carry out efficiency measures or go over to using renewable fuels before the time limit are given bonus allowances corresponding to the extent to which they have cut back emissions of SO₂. These allowances can be banked or traded just like any others, and some have already been conferred.

Sulphur success

Power companies in the United States reduced their output of sulphur dioxide by 5.6 million tons in 1995, far exceeding the cuts demanded by the federal government, according to the Environmental Protection Agency. In the first phase of the program 445 power plants halved their annual emissions of sulphur dioxide, from 10.9 to 5.3 million tons, 39 per cent more than the reduction required by the EPA. In the next phase, which begins year 2000, another 700 utilities will be required to start reducing their emissions. According to the EPA the industry is well on the way towards reducing its emissions of sulphur dioxide by 10 million tons a year by the year 2010.

New Scientist. April 6, 1996.

A comparison of the emission factors for SO₂ in the Acid Rain Program with the corresponding limit values in the German regulation for large combustion plants depends on differences of expression (US: lb SO₂/mill. Btu. Germany: mg SO₂/m³). But what is important is the implied stringency. The emission factor in the American Phase I corresponds to a sulphur content in the coal of 1.6 per cent. Only after Phase II comes into force in 2000 will a concentration equivalent to 1400 mg SO₂/m³ be attained. Hardly impressive, Schärer comments, when compared with the current German limits of 400 mg/m³ for large plants and 800 mg/m³ for medium sized.

The effects of the regulations are clear from the trend of emissions. Whereas in the period from the start of GFAVO in 1983, to the completion of the program in the eastern Germany in 2000, a total reduction of 90 per cent in SO₂ emissions can be expected, the reduction under the Clean Air Act between 1980 and 2010 will be barely 50 per cent.

The relative strictness of the requirements explains why the American utilities can achieve cost-effective reductions for about \$400 per ton of SO₂ – way under the average of DM2300 under the German desulphurization program for large combustion plants. The greater flexibility that the Americans are allowed, through the trading system, will, according to EPA estimates, save in the end \$1-2 billion a year or up to 50 per cent of the total cost of reduction.

It must nevertheless be kept in mind, says Schärer, that with increasing strictness of the requirements and their adjustment to technical improvements, there will be less leeway for the utilities to practice inexpensive measures and economic balancing.

A remarkable aspect of the Acid Rain Program, as Schärer in conclusion points out, is however the fact that 8.95 million tons represents a final target for 2010, to which all utilities must adhere – meaning that newcomers will have to buy their way into the system before they can start operation.

G. HOWARD SMITH

Schärer's report appeared in *Gefahrstoffe – Reinhaltung der Luft* 56 (1996) 3-4. See also AN 5/93, 5/94, 3/95, 5/95.

Recent publications



Control of Hazardous Air Pollutants in OECD Countries (1996)

This report outlines an overall control strategy for dealing with hazardous air pollutants, and puts forward recommendations on the setting of priorities. It draws heavily on detailed case studies in France, the Netherlands, Germany, Sweden, Switzerland, the United States, and Japan.

236 pp. Obtainable from OECD, 2, rue Andre-Pascal, 75775 Paris Cedex 16, France. Fax +33-1 45 24 80 03.

Memorandum on transport and environment to the Council of Ministers and the Italian and Irish Presidencies (1996)

Covers most of the issues concerning transport and environment policy which are, or according to the T&E (European Federation for Transport and Environment) should be on the Council's agenda in 1996.

24 pp. Free of charge. T&E Publication 2/96. Obtainable from the T&E, Rue de la Victoire 26, 1060 Brussels, Belgium. Fax. +32-2-537 7394.

Response to the Commission's Green Paper "Towards Fair and Efficient Pricing in Transport" (1996)

8 pp. Free of charge. T&E Publication 96/3. Published by T&E, address as above.

The global climate is changing (1996)

A discussion of the options for continuance of the negotiations under the Climate Convention. Various principles are discussed for the shaping of a protocol in respect of efficiency, equity, feasibility and the consequences for Sweden.

30 pp. Available from the Swedish Environmental Protection Agency, S-106 48 Stockholm, Sweden.

Smog Alert – Managing Urban Air Quality (1996)

By D. Elsom. Examines the causes and scale of urban air pollution, identifying those who are most at risk, and which particular health risks various pollutants give rise to. It also considers the design of an effective framework for air quality management. Detailed case studies illustrate the severity and breadth of the problems.

220 pp. £13.95. Published by Earthscan, 120 Pentonville Road, London, England N1 9JN. Fax +44-171-278 1142.

World cleanest

From June 1 all the petrol sold in California must have been reformulated so as to meet the most stringent environmental requirements that have so far been applied anywhere. "The effect of the ruling will be to reduce the emissions of substances that cause the formation of ozone and smog by 15 per cent. It will be as if we were to clear the roads of 3.5 million cars," says Allan Hirsch, speaking for the California Air Resources Board, the authority policing air quality in the state.

Petrol must now have lower contents of toxic substances such as sulphur, benzene, and aromatics, lower internal pressure to reduce evaporation, and a standardized oxygen content to improve combustion. To meet these new requirements the oil companies have been forced to invest \$4 billion. The extra cost of production is estimated to add 3 cents to every litre sold, but because of the intense competition between the oil companies, it is thought that the rise will actually be less.

Ny Teknik No. 11, 1996.

On the march

Whereas some years ago the construction cost of wind power was about 10,000 kronor per kilowatt of capacity, it is now down to 7000 kronor, which means that wind power will often be able to compete in price with electricity generated in new coal-fired and nuclear plants. This came out at the European Union Wind Energy Conference, which drew more than 500 participants to Göteborg for a week in May. The expansion of wind power in Europe during the last three years – from 1000 to 2500 MW installed capacity – has been greater than expected. Wind turbines now generate some 5 TWh of electricity per annum in Europe, but there is a theoretical potential of 350 TWh/yr.

Ny Teknik No. 21, 1996.

Stopping Ku Klux Klan

Air quality legislation is being used in California to stop the Ku Klux Klan's cross burning, which has been used to terrorize blacks and other minority groups. Cross burning has not been illegal, provided it has been started by the owner of the property on which it takes place and is not intended to intimidate.

The authorities in the San Joaquin Valley have now however taken action, referring to the effects on air quality. "This is not about anyone's political motivations. The regulations are strict because the valley traps pollution. If everyone burnt crosses the result would be disastrous," says one of their spokesmen.

New Scientist. March 9, 1996.



Small is ugly

As from last August all small petrol engines sold in California have had to meet high emission standards – which will become even stricter in 1999. There are however still some 1.7 million old lawn movers, leaf blowers, chain saws, and other garden power tools in use around Los Angeles alone. This ageing fleet is estimated to belch out more than 22 tons of smog-forming chemicals a day. In order to get rid of these machines as quickly as possible, firms can now buy up second-hand garden equipment and by scrap-

ping it obtain a clean-air credit. They can either use such credits to offset any of their own excess emissions or sell them to other firms.

New Scientist. May 25, 1996.

Recovering the cost

Given Swedish climatic conditions, normal solar panels for heating water will make up for the energy it takes to build them within a year. The time taken to recover the energy cost will depend mainly on the quantity of aluminium in the construction. Solar collectors that are integral with the roof of a building, which contain less aluminium than others and moreover replace the ordinary roofing, repay the energy used in their production within three to six months.

The most reliable solar panels for generating electricity, composed of crystalline silicon cells, consume a lot of energy in their production. Calculations of the time needed to recover the cost in terms of electricity vary from 4-5 to just over two years, depending on various assumptions. For amorphous silicon cells the time is 2-3 to just one year.

Silicon cells are thought to have a life of 20-30 years. Cells of the thin-layer type need less energy for their production than silicon cells, but contain metals that are either rare or harmful to the environment (or both) such as cadmium and indium.

Solsverige Part 6, 1995. Yearbook of the Svenska Solenergiföreningen.

Coming events

IMO Marine Environmental Protection Committee, 38 session. London, England, July 1-10, 1996.

Second Conference of the Parties to the Framework Convention on Climate Change. Geneva, Switzerland, July 8-19, 1996.

Working Group on Strategies of the Convention on Long Range Transboundary Air Pollution. August 26-30, 1996

EuroSun '96. 10th International Solar Forum. Freiburg, Germany, September 16-19, 1996.

Inquiries: Deutsche Gesellschaft für Sonneenergie, Augustenstrasse 79, 80333 München, Germany. Fax +49-8952 1668.

World Congress on Air Pollution in Developing Countries. San José, Costa Rica, October 21-26, 1996.

Inquiries: ProEco, Apdo 3959 Tegucigalpa, Honduras. Fax +504 31 33 41.

Executive Body for the Convention on Long Range Transboundary Air Pollution (CLRTAP). Geneva, Switzerland, November 25-29, 1996.