

# Acid News



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NORTH BOHEMIA

## After five years

TEPLICE is a charming town, with lingering traces of 18th century splendour from the time when it was one of Europe's more fashionable spas. But on November 20, 1989, when I first visited Teplice, and the "Velvet Revolution" has just started in Prague, demonstrations has been going on for two weeks. Suffering under a impenetrable layer of smog, the inhabitants of Teplice had, in anger and desperation, taken to the streets.

Now, five years later, there is evidence of improvement. As explained by Rene Pisinger, from the local section of the Czech ministry of environment, the bad quality of the air in the North Bohemian basin is due to an enormous concentration of plants burning brown coal in the area, combined with unfavourable climatic conditions for dispersion of

the pollutants. The measures that are now being employed to attack the problem are primarily the substitution of other fuels, and especially natural gas, for brown coal, but also cleaning of the flue gases and an overall cutting down on electricity production.

For the moment, on account of industrial recession, the demand for electricity has in any case diminished, and Rene Pisinger sees little likelihood of any immediate rise, since many of the big energy-consuming plants have been closed down.

According to Dr František Kotěšovec, former chief health officer of Teplice county, air pollution has decreased for three reasons: industrial output has dropped as a result of restructuring, the weather in the last few years has been favourable, but above all measures have been

taken to deal with the small local sources of pollution as well as the general big ones.

In many cases domestic boilers and stoves burning coal have been replaced by central heating (water-borne), gas firing, and electricity. Although brown coal may still be used for producing both heat and electricity, such conversions still aid the local environment, especially in city centres. They are subsidized, although inadequately, from the national budget. Electric heating is especially used in places where pipe laying for hot water or gas would be too expensive, as for instance in the Ore mountains (see below).

One of the difficulties in persuading people to change their mode of heating is that many are employed in mines and get their coal free. Also

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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: The Environmental Federation, 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 United Nations Convention on Long Range Transboundary Air Pollution.
- Acting as an observer at the proceedings involving international agreements for reducing the emissions of greenhouse gases.

# Assessing the cost

DEPOSITIONS OF SULPHUR in 1991 cost Sweden at least 2.5 billion kronor, or US\$333 million, according to an official estimate that has just been published. The figure appears in a pilot study commissioned by the government, covering the effects on forests, farmland, freshwaters, and urban areas.

The biggest item was found to be corrosion, included under the urban heading, and answering for almost three-quarters of all the nation's costs traceable to sulphur. This hardly came as a surprise, since the best dose-response data is precisely that for corrosion, and the damage occurs mostly to buildings with a high market value.

Since there is less certainty about the effects on the natural environment, the estimates for them are more cautious. Forest damage from acidification has been regarded as the loss of income due to forest owners being unable to maintain extraction sustainably at the level that would otherwise have been possible. The cost in this case is calculated to amount to about one fifth of the country's total. Assumed future emissions and depositions of sulphur were also considered in regard to their effects on forestry.

In the case of freshwaters and agriculture, the estimates are based solely on the amount that is at present being paid out for liming to counteract that part of the acidification that is ascribable to sulphur.

It is evident that acidification is costing the nation enormous sums every year. Corresponding studies in other industrialized countries would almost certainly reveal even higher costs, since the concentrations of sulphur dioxide in the air over Sweden are low compared with those elsewhere, and thus Sweden's damage from corrosion must also be relatively low.

The costs for Sweden must however in reality be much greater than is revealed in the present study, since no attempt has been made to estimate some of the less traceable effects of sulphur – among which are for instance its influence on biological diversity and the possibilities for

recreation. Nor have the effects on human health been taken into consideration – since the concentrations of sulphur dioxide in urban surroundings were considered so low that such effects could be regarded as negligible.

Chiefly two things are necessary if estimates of the cost of damage are to be carried out. One is that a connection can be seen between the cause (emissions) and the damage (from acidification), the other that a price can be put on the objects damaged. These preconditions are usually at hand, although not always (see AN 3/94, editorial).

For creditability, *all* the damage and *all* the effects of air pollution should be set forth, even if it should not be possible at present to express them in monetary terms.

Of late, both the United Nations and the European Union have made it an aim to get their member countries to do environmental accounting, and some are actually starting off on such a course. An intention here is to show how various economic activities affect the environment and natural resources – and also how changes in environment and resources affect economic activity. Estimating the cost of damage from air pollution can be considered as *one* part of these efforts.

At a meeting of the Executive Body of the UN ECE Convention on Long Range Transboundary Air Pollution last December, it was decided that the Task Force on Economic Aspects of Abatement Strategies should be told to give priority to evaluating the costs of the damage.

When debating limits on the sulphur content of fuel oils, the European Commission used evaluations of such costs in order to be able to set the cost of any measures for abatement against the gains that might accrue from a reduction of sulphur in the atmosphere (see AN 4/94, p. 13). That is an excellent initiative, of a kind that we shall certainly see more of in future, both at the national and international level.

CHRISTER ÅGREN

Continued from front page

the costs of gas and electricity are rising. In some cases (although not in Teplice) the authorities are resorting to compulsion by banning the use of coal in certain areas, such as city centres. But then they are faced by objections from people who live in those areas but still want to go on using brown coal – saying that any restriction would be in violation of their civil rights. Nevertheless, according to Rene Pisinger, during the last year the heating systems of some 16,000 households have been modernized – even to the extent, in some cases, of being made over to district heating. The amount of brown coal burnt annually in Teplice alone has thereby been reduced by 80,000 tons.

Although pollution in the area generally has decreased by at least 50 per cent, and some local authorities believe that the pollution from domestic heating will have been entirely eliminated by the end of 1995, the smog problem is, in Pisinger's view, nevertheless likely to persist.

Emissions of sulphur are however expected to start decreasing in 1998, when the Clean Air Act will be coming fully into force, causing polluters to maintain strict emission limits if they are to avoid paying high penalties. In order to be able to comply, some enterprises, such as the Glavunion glassworks in Teplice, have already started to use gas instead of brown coal.

The CEZ utility, which is the dominant producer of electricity in the Czech Republic, is planning to shut down some of its plants in the North Bohemian basin and to equip the remainder for desulphurization. After completion of Temelín nuclear facility, the country will have a power surplus, but because of a popular aversion to the exporting of electricity, still more of the less efficient plants in the basin will probably have to be closed down.

Since 80 per cent of the Czech voters are in favour of starting up the Temelín plant, it will almost certainly take place in spite of the protests of environmentalist NGOs.



Parts of the generating capacity have already been decommissioned. Of the CEZ total in the North Bohemian basin of 4882 MW, ten blocs with a capacity of 1160 MW have for instance been withdrawn from operation – a reduction of 24 per cent. This will increase to 40 per cent after the closing down of seven more blocs by the end of 1996.

New fly-ash separators have been installed in all but four blocs. All the twenty-one blocs that will still be in operation after 2000 are to be equipped for desulphurization – an expensive undertaking, since each installation will cost at least US\$54 million. Two blocs at the Pocerady power station had already been fitted out with such installations last November. Between 1989 and 1993 CEZ cut down the amount of brown coal it was burning from 24.5 to 18.7 million tons. At the same time SO<sub>2</sub> emissions dropped from 650,000 to 475,000 tons, and now it seems well prepared in general to meet the requirements of the Clean Air Act. It will also be able to afford it; having al-

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Still further growth is expected as a result of price cuts following more efficient cells and lower-cost manufacturing.

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After a steady increase, concentrations are now high enough in Europe to affect health, structural materials, and vegetation, and add to global warming.

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Airborne salt has been found in Norway to increase and compound acidification effects on already acidified soils, and to spread fishkills.

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In Sweden a commission has proposed a giant increase in liming to counteract the damage due to steady acidification of forest soils.

### Less expensive 16

At times of low demand for electricity, British power generators have found they can shut off FGD units and still remain within their emission quotas.



## Green jobs

The environment-related market can still create several thousand jobs, over and above a million green ones already available in Europe, according to *Green jobs? The employment implications of environmental policy* published by the World Wide Fund for Nature. This shows that the European market for environmental protection is growing at an annual rate of 6 per cent and could be worth 80 billion ecus by the year 2000. The countries with most jobs in the environmental sector are those with the strongest environmental legislation, notes the author of the study, Michael Jacobs of CAG Consultants.

**Europe Environment**, December 6, 1994. The report is available from M. Hiller, WWF European Policy Office, Brussels, fax. +32-2-347 43 66.

## Asthma increasing

Nine per cent of the children in Oslo, the Norwegian capital, had to visit a doctor in 1994 on account of asthma. That is three times as many as in 1980. Motor vehicles are suspected of being a principal cause, since emissions of nitrogen oxides and particles add to susceptibility to respiratory disease.

**Natur & Miljö Bulletin**, November 25, 1994.

## Worth it, if possible

According to an estimate of the Norwegian Central Bureau of Statistics, introducing the California 1995 standards for cars would cost 34 million kroner. Emissions would be lower by 60 per cent than they are under the country's present standards, and the additional cost for a new car would be a mere 500 kroner. The measure, if fully carried out, would reduce the cost to the nation of damage to health and the environment by 75 million kroner. Because of the EEA treaty, however, Norway could not adopt any stricter regulations unless the European Union does so too.

**Natur & Miljö Bulletin**, November 25, 1994.

## Another alert

The Center for Disease Control in Atlanta, USA, reports that the frequency of asthma attacks and deaths from asthma is steadily rising. In 1991, the most recent year for which statistics are available, 18.8 people out of every million died of asthma, up from 13.4 per million in 1982, an increase by 40 per cent.

The CDC says worsening air pollution is probably one cause of the increase, and points out that in 1991 63 per cent of Americans who had asthma lived in areas that failed federal air-quality standards. The drive to make buildings more airtight may also explain part of the increase.

**New Scientist**, January 14, 1995.

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most a monopoly, it can pass on any increase in costs to its customers.

Smaller companies, such as those operating district heating plants, are in a worse position. In the interests of social justice, the prices they are allowed to charge to households are strictly controlled, and they do not have the money for technical improvements. By 1998 the government will have the alternative either of letting people freeze, or of allowing pollution to continue by postponing application of the Clean Air Act. Some of these small companies would like arrange a temporary solution by changing over to hard coal with a much lower sulphur content than brown coal, while the more enterprising ones are trying to find finance for improving the combustion process in their plants.

In some industries there is on the other hand no great eagerness to meet the requirements of the act. This is the case, for instance, with the Chemopetrol Litvínov chemical company, one of the big polluters. Such companies are often engaged in a change of technology, which although it will eventually lead to a decrease in emissions, has the primary aim of improving competitiveness. In the meantime they do not want to divert money to installing end-of-pipe technologies.

Unfortunately, because of insufficient financial resources, the new process technologies will not be in place before 1998, so they will not affect emissions till after that date.

A representative of the Czech environment management centre fears the effect of the Clean Air Act will be to conserve obsolescent process technologies for many years to come, since end-of-pipe applications will first have to be amortized. He thinks economic incentives would be much more effective, instancing Chemopetrol's process line for unleaded petrol. While incidentally contributing to environmental improvement, its main attraction for the company lies in improved profitability.

Rene Pisinger is aware that strong lobbying can be expected from businesses that are not making sufficient preparation for meeting the requirements of the act. But, he says, the situation is complicated, and the only way out may be to make it more profitable to invest in im-

proving the environment than to pay the penalties for non-fulfillment.

Because all types of energy are becoming more and more expensive, almost all companies are trying to cut down on their use.

Although the people of North Bohemia may complain that changes are taking place too slowly, the situation is undoubtedly improving as regards the concentrations of sulphur dioxide and dust in the atmosphere. Between 1989 and 1992 the amounts of SO<sub>2</sub> decreased from 89 to 57 micrograms per cubic metre, and of dust from 97 to 61 µg/m<sup>3</sup>. In Prague, by way of comparison, the concentrations of both of these pollutants have remained constant.

"There used to be so much pollution in North Bohemia that we were unable to measure it," recalls Dr Kotěšovec from his days at the health department. "The measuring instrument for SO<sub>2</sub> only went as far as 1500 µg/m<sup>3</sup> – the manufacturer evidently having been unable to believe that concentrations could go higher. When they were 3000 µg/m<sup>3</sup>, we could only say that the average 24-hour concentration was more than 1500 micrograms." He adds however that the pollution is definitely decreasing.

Clear evidence of improvement can be seen in the Ore mountains, where even as recently as ten years ago there was thousands upon thousands of dead spruce trees littering the tops. Now, if anyone wants to feel depressed at a sight of devastation, he should visit the Krkonoše national park. In the Ore mountains, instead of spruce monocultures there are quite nice forests of birch, rowan, and larch, with pines here and there as well as a special species of spruce that is more resistant to air pollution.

It may be expected that as a result of the measures that are being or are about to be taken, by 1998 the emissions of SO<sub>2</sub> will have fallen to one-tenth of the present levels. The cost is being met almost entirely by the nation and Czech business. All the talk and worry over the Black Triangle notwithstanding, aid from abroad has so far been practically negligible.

"At first," says Rene Pisinger, "we thought that once a study had been completed, action would follow. But it always stopped at a study, based on information supplied by our-

selves. We were told that power stations needed to be equipped for desulphurization, but the problem was not what to do, but where to get the money to do it."

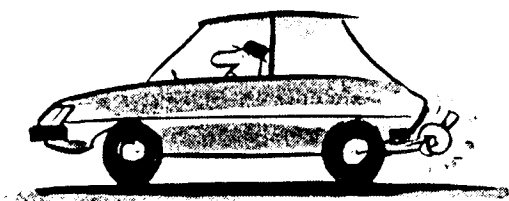
As regards the health situation in North Bohemia, certain peculiarities have come to light. Life expectancy in the basin is much lower than the average in the Czech Republic, and pollution might seem to be the one cause. But how then does one explain the much higher life expectancy in Prague, where the pollution is hardly less.

The aim of a project called the Teplice program has been to monitor the environment, especially as

regards air quality, to investigate the relation between environment and health, and propose measures for improving health generally in the area. Its findings have come as a shock to many of the inhabitants of the basin: the bad state of affairs was due not only in the environment, but also in people's unhealthy habits, with smoking as an important factor. Further research will now try to determine the relative responsibility of "environment" and "bad habits."

JANA PLAMÍNKOVÁ

The writer is a freelance journalist based in Prague.



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## PARTICULATES

# A health risk

RESEARCH IS INCREASINGLY showing PM<sub>10</sub> – airborne particles less than 10 micrometres in diameter – to be a serious threat to health.

According to Douglas Dockery of the Harvard School of Public Health, a series of epidemiological studies in the United States and elsewhere has confirmed a "remarkably consistent and coherent" link between short-term increases in levels of PM<sub>10</sub> and respiratory mortality and other effects on health. At a conference at University College London in September, Dr Dockery said that these studies showed an increase of 0.7-1.5 per cent in total mortality, and some 3.4 per cent in respiratory mortality, for every increase of 10 µg/m<sup>3</sup> in five-day mean concentrations of PM<sub>10</sub>.

A key question is whether short-term increases in mortality represent a significant shortening of life expectancy, or merely advance the death of critically ill patients. Dr Dockery referred to a study made in six American cities, which suggests that higher exposures to PM<sub>10</sub> may reduce life expectancy by two to three

years. The finding is supported by a study in the Utah Valley, where the only significant source of PM<sub>10</sub> is a large steel mill. In the course of a lengthy strike in 1986-87, PM<sub>10</sub> levels dropped by 30 µg/m<sup>3</sup>. During the same period total mortality fell by 3 per cent and there was a "massive drop in hospital admissions for children with bronchitis, asthma, pneumonia, and pleurisy."

The biological effects of exposure to PM<sub>10</sub> have recently been confirmed, too, by Japanese scientists, who have shown that when exposed to particulate matter, cultures of nasal epithelial cells produce large quantities of inflammation mediators that are implicated in the onset of bronchial asthma and allergic responses. Particulates from diesel exhaust were found to be particularly potent in provoking a response. Work at St Bartholomew's Hospital in London has also confirmed that PM<sub>10</sub> has these effects in cultures of lung cells.

Source: **ENDS Report**, No 237, October 1994.

## Recent publications

### Greening Urban Transport

"Greening Urban Transport" is a project undertaken by T&E to seek out and make known successful solutions to traffic problems. The selected examples have been arranged under eight headings, and are presented both as full reports in English and in a four-page factsheet with English, German, and French text. The subject headings are: pedestrian and cycling policy, parking policy, public transport, environmentally improved grades of petrol and diesel, environmentally improved buses, urban road pricing, and planning of land use.

The reports, costing Bfrs 400 each (factsheets free of charge) can be obtained from Transport & Environment, Rue de la Victoire 26, 1060 Brussels, Belgium.

### The economics of climate change (1994)

The proceedings of an OECD/IEA conference held in 1993. Contains presentations and summaries of discussions on topics such as the economic costs and benefits of strategies for greenhouse-gas mitigation, the potential role of carbon taxes and other economic instruments, and joint action between industrialized and developing countries for bringing about abatement.

320 pp. Obtainable from OECD, Publications service, 2 rue André-Pascal, 75775 Paris Cedex 16, France.

### Environmental indicators (1994)

Presents the OECD's core set of environmental indicators – one of the tools for evaluating the environmental performance of different countries and tracking their course towards sustainable development. Arranged according to issues, such as climate change, acidification, biodiversity etc.

160 pp. Combined English/French edition. Published by OECD, address as above.

### Managing the environment with rapid industrialization – lessons from the East Asian experience (1994)

By David O'Connor. Takes a comparative look at experience of environmental management in five high economic performers in Asia – Japan, Korea, Taiwan, Thailand, and Indonesia. Rapid economic growth has placed heavy strains on their environments, and high clean-up costs point up the need for placing greater emphasis on prevention and taking advantage of new, lower-cost abatement options.

218 pp. Available from OECD, address as above.



## Less NOx with new catalyzers

THE EMISSIONS of nitrogen oxides from diesel engines could be markedly reduced by injecting a solution of water and ammonia into the exhaust gases. Known as SCR, selective catalytic reduction, the method is essentially the same as that used for stationary power plants. Swedish researchers are now trying to adapt it for use in trucks and buses, with great variations in the flow and temperature of the gases.

The emissions of NO<sub>x</sub>, carbon monoxide, and hydrocarbons from ordinary combustion engines can be reduced by using three-way catalyzers, with noble metals as catalyst to bring about oxidation of the carbon monoxide and hydrocarbons with the oxygen of the nitrogen oxides. The technique is however unusable in diesel engines, which operate with an excess of oxygen. But the nitrogen oxides can be reduced (have oxygen removed) by injecting ammonia. The reaction takes place with a catalyzer containing either metal oxides or ion-exchanged zeolites.

In tests under realistic driving conditions the emissions of nitrogen oxides have been reduced by 67 per cent, and those of hydrocarbons by 70 per cent. Carbon monoxide emissions on the other hand increased, although still remaining on low levels.

Source: **Selektiv katalytisk reduktion av NO<sub>x</sub> i dieselfordonstillämpningar.** Pär Gabrielsson, Lunds Tekniska Högskola, 1994.

## ...and no soot

IN WEST SWEDEN a garbage vehicle and ten buses are now operating with exhaust cleaners consisting of an oxidizing catalyzer and a dust filter – causing both hydrocarbons and soot particles to be burnt up.

The filters that had previously been tried for catching the particulate matter had to be cleaned at regular intervals, which the new type obviates – the soot becoming burnt up even at normal exhaust-gas temperatures. If the trials prove successful, the new filters should be on the market this spring.

Ny Teknik, November 10, 1994.

## CARS

# The greenest models

HEADING THE LIST of cars that are best from the environmental point of view – in a ranking compiled by Gröna Bilister in collaboration with T&E, the European Federation for Transport and Environment – is the Suzuki Swift 1.3.

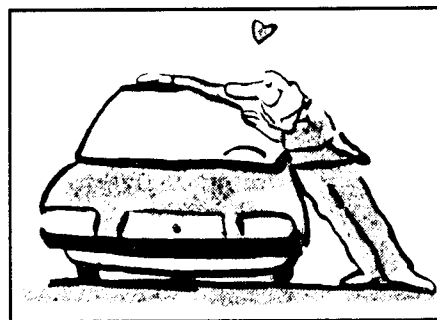
Several attempts have been made to grade cars according to their environmental effects, and in the latest issue of Acid News there was a report on two studies, a German and a British, which were based largely on fuel consumption. Coming out top in each case was a small car, the Fiat Cinquecento. The new Swedish study does not only take into account fuel consumption, but also emissions of the pollutants nitrogen oxides, hydrocarbons, and carbon monoxide.

The official certification test, with standing vehicles, does not, in the view of Gröna Bilister, give an adequate picture of the polluting effects, and it has therefore in its rankings incorporated figures from cars on the road. These have been taken from tests in Sweden and the Netherlands, as well as from the group's own test, using a driving cycle that includes more acceleration and higher engine loadings than in the official test. From this emerged the five best cars in each of four size groups.

Gröna Bilister urges some caution in drawing conclusions from the rankings, since there are further car models that come close to being eligible for inclusion in the lists. Some car makers on the other hand have no models at all that might be included, among them being Ford, Renault, Subaru, Daihatsu, and Lada.

"Our principle has been to pick out the good cars and keep quiet about the bad ones – although with one exception," says the Gröna Bilister chairman, Per Kågeson. "It is quite clear, from the results both of our study and the official tests, that environmentally minded motorists should avoid buying any cars made by Ford."

The aim in publishing the rankings is to provide incitement for technical improvements – there being great differences at present between the best and the worst cars. It is



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hoped eventually to take into account further characteristics, such as noisiness, the materials used, and the possibilities of recycling when the cars are scrapped.

Since Gröna Bilister is urging people to buy small cars with a low fuel consumption, the matter of safety arises. As far as it can be done from the available information, some indication is therefore given of the relative safeness of the listed cars. There can be a considerable variation in this respect between cars of same size.

PER ELVINGSON

Gröna Bilister is an organization recently formed in Sweden for environmentally minded motorists.

### Small cars

1. Suzuki Swift 1.3
2. Mazda 121 1.3i-16
3. Fiat Punto 55S
4. Peugeot 106 XR
5. Opel Corsa Swing 1.4i

### Small medium-size cars

1. Honda Civic 1.5 VEI
2. Volkswagen Golf 1.8\*
3. Seat Toledo 1.8
4. Peugeot 306 XR 1.4
5. Opel Astra 1.6
5. Toyota Corolla 1.3

\*Also valid for Golf Variant.

### Large medium-size cars

1. Mazda 626 1.8i/2.0i
2. Volkswagen Vento 1.8i
3. Volkswagen Passat 1.8
4. Saab 900 SE 2.0 Turbo
5. Audi 80 2.0E

### Large cars

1. BMW 518i
2. Opel Omega 2.0i
3. Saab 9000 2.3 T
4. Citroen XM 2.0
5. Volvo 850

# Blocked by oil interests

ONCE AGAIN the oil companies have managed to obstruct efforts to reduce the emissions of air pollutants from shipping.

Negotiations to that end have been going on within IMO, the International Maritime Organization, a United Nations body, since 1987. Mostly discussed in the sub-committee appointed to produce a draft annex to the MARPOL Convention has been sulphur. When it came to making a decision last October, a majority of the nations voted for a limit of 5 per cent sulphur in bunker oil – the worst possible choice from the point of view of the environment.

A group of twelve countries tried to get the limit set at 3.5 per cent, but the majority of twenty-two stuck to the higher figure, which is judged to have no effect at all. Hardly any oil with a sulphur content of more than 5 per cent is sold today. Nor would a 3.5 per cent limit have any special effect – the average level at present being just under 3 per cent.

Swedish and Norwegian observers regard the IMO as tied to the oil companies' apron strings and being in danger of losing creditability. "The oil companies are not only acting as persistent observers at all levels, they have even managed to get themselves included as regular members in several national delegations," notes Erik Stenmark, head of the Swedish Shipping Administration's inspectorate. Prominent among the IMO members that are opposing environmental measures are particularly the Bahamas, Liberia, Singapore, and Panama – with Belgium and the United States in silent agreement.

The oil companies are resisting because they feel their interests are threatened. Stricter requirements for

emissions from land have meant that shipping is the only remaining market for high-sulphur oil.

Among those pressing the IMO for stricter limits at sea are Norway and the countries around the Baltic Sea. For several years the latter have been trying, while attempts to work out an air pollution annex were going on, to get the Baltic classified as a so-called Special Area, with its

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## *Observers regard IMO as tied to oil companies' apron strings*

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own emission requirements – in part because acidification in those parts is of particular consequence. But this proposal has been rejected by the IMO, which is always demanding more documentation. It was agreed however at the last meeting of the sub-committee that stricter requirements for the Baltic would be permissible, but only within ten nautical miles from the coast – to improve the quality of the air in ports.

"We are always talking at cross purposes. The countries around the Baltic are worried because of the depositions of acidifying air pollutants. But those nations that are dominated by oil interests are deliberately holding up developments," says Stefan Lemieszewski of the shipping administration. The Baltic countries, which are agreed among themselves, should in his opinion have the final decision.

The matter of maximum sulphur content for bunker oil will come up

for decision at the next meeting of the IMO Marine Environment Protection Committee in September, but unless the oil companies have lost a great deal of their influence by then, the voting is likely to go the same way as in the sub-committee.

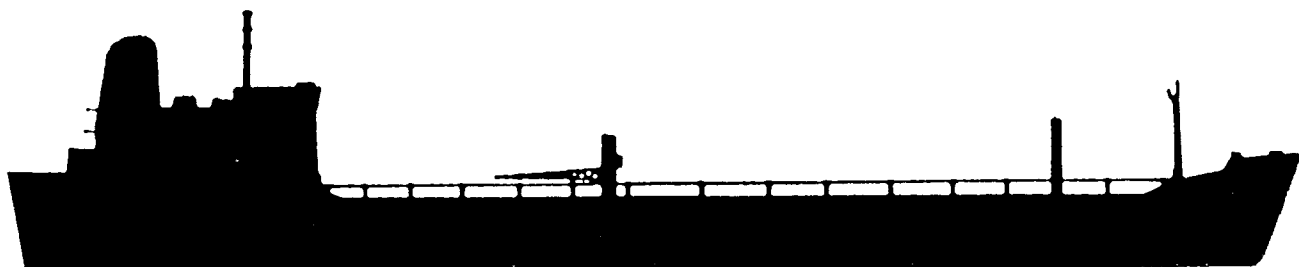
The full annex on air pollution is expected to be ready for consideration some time in 1996-97. Besides sulphur it will cover nitrogen oxides, volatile organic compounds, and CFCs. The proposal will probably be that all new vessels should be required to clean away at least 30 per cent of their discharges of nitrogen oxides. That requirement should not, according to Lemieszewski, be such a stumbling block as sulphur has been, since it does not affect the oil companies to the same extent. They are nevertheless trying to set up obstacles: limiting NO<sub>x</sub> might pave the way to stricter requirements regarding sulphur.

Even if the annex were to be adopted within the next few years, it would probably not come into force until around 2010 – which Lemieszewski says is quite unacceptable. His administration now wants the Swedish government to press for arrangements by which the Baltic Sea countries could decide among themselves what stricter environmental requirements they want (see AN 4/94, pp. 16-17). Although such special requirements could only apply to vessels registered in the littoral countries, their effect within the area would still be relatively great.

PER ELVINGSON

Sources: Svenska Dagbladet, October 23, 1994, Natur&Miljö Bulletin, October 14, 1994.

MARPOL is the principal global instrument for regulating pollution from shipping.



# With a year-round aim

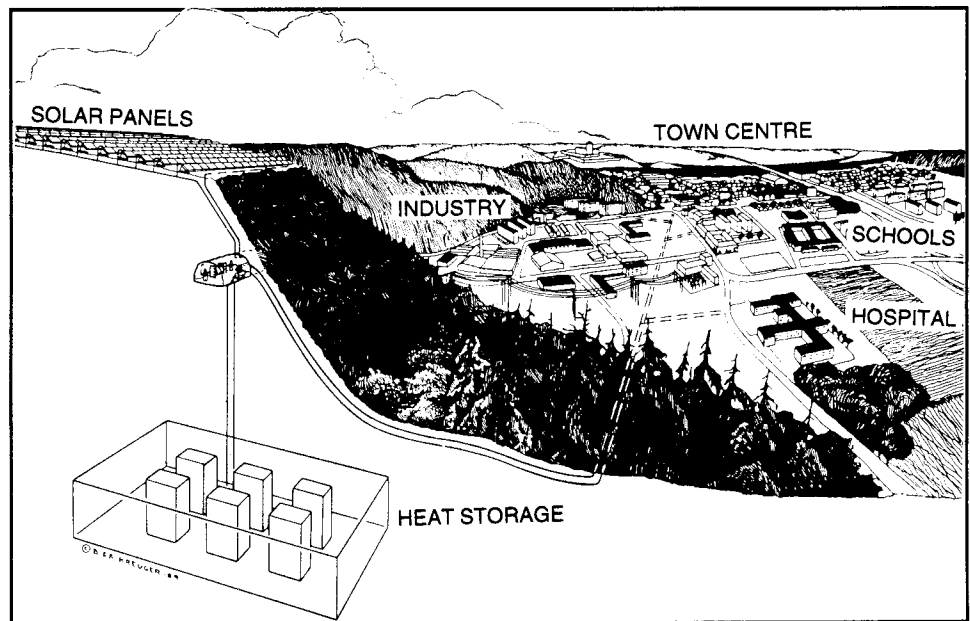
IT MAY SEEM ILLOGICAL to try and use solar energy for heating dwellings – when it is precisely an insufficiency of incoming energy from the sun that makes heating necessary. But even in high northern latitudes the amount of solar heat falling on a one-family house is actually more than sufficient for its heating needs. The problem is to store the summer heat for use in the coming winter. Efforts are now being made in Sweden, Denmark, and Germany to develop systems with seasonal storage of the heat.

Capturing solar radiation to heat water presents little difficulty, although technical advances can still be made to improve efficiency and lower the cost. Numerous small systems are in fact already in operation all over the world to provide hot water for household needs.

The big systems that have so far been built, with large arrays of solar panels, have usually been experimental installations, incorporated in existing district-heating networks, and providing at best short-term storage to help maintain temperature in the system over a few days. At Falkenberg, on the west coast of Sweden, there is for instance an installation with a 5500 sq. metre array of panels which supplies a lot of heat during the summer months, but nothing at all in winter. Calculated on a whole-year basis it provides about 6 per cent of the district system's heat requirement – all the rest coming from a boiler fired with wood chips or gas.

The solar array at Falkenberg could be made bigger, but then some way would have to be found of storing the surplus summer heat for winter use.

Simple solutions will however be needed, otherwise the heat will be too expensive. Attempts have been made at several small projects in Sweden, such as by using caverns filled with water or letting water circulate in holes drilled in the bedrock. At Nynäshamn, just south of Stockholm, the possibilities are being explored of using caverns that



*Meeting the needs of the town of Kungälv, W. Sweden, pop. 6000, would call for a solar array with a total area of 120,000 square metres and heat storage in an uninsulated cavern with a capacity of 400,000 cubic metres. Although it is still uncertain whether the scheme will be followed through, estimates indicate that it could be relatively economic.*

had previously been used for storing oil. Those that are being considered can hold 360,000 cu. metres of water, and the corresponding solar array is planned to have an area of 130,000 sq. metres.

In Denmark storage is being tried in open pits, insulated and filled with water. A pilot installation with a capacity of 1500 m<sup>3</sup> is currently being built to supply a small housing area on north Jutland, to be followed by a larger one for demonstration purposes holding 75,000 m<sup>3</sup> of water heated from an array of panels with an area of 25,000 m<sup>2</sup>. This is intended to be inserted in the district-heating network at Skorpung.

Germany is also planning to use insulated pits for storage. Here there are two projects where the solar panels are intended to be built as an integrated part of the roofs – one at Hamburg/Bramfeld with a panel area of 3500 m<sup>2</sup> and a 5000 m<sup>3</sup> storage pit, to heat about a hundred row houses, the other to heat 500 flats at Wiggenshausen/Friedrichshafen with 5600 m<sup>2</sup> of solar panel and 12,000 m<sup>3</sup> storage. A preliminary study is also being made for a housing scheme just outside Bremen.

Much of the development work on large panel installations and heat storage facilities is being done in collaboration between Swedish, Danish, and German scientists and engineers.

PER ELVINGSON

Source: *Solsverige 1995*. Yearbook of the Swedish Solar Energy Association.

## Car tax shift

An interministerial working group in Norway has proposed a new taxation system that would penalize owners of cars that do not meet coming emission standards.

For cars without catalytic converters, the group proposes increasing the basic annual vehicle tax of 1575 kroner (US\$242) by almost two thirds, or 1000 kroner. For cars meeting Norway's emission standards of 1989 – the year catalytic converters became mandatory – the additional tax would be only 200 kroner a year. No additional tax would be levied on cars that meet the EU emission norms that will come into force in 1996/97.

The group also wants to change the basis for the sales tax on new cars. At present it is proportionate to the price of the car, but now the group propose setting it in accordance with engine volume.

**Environment Watch: Western Europe**, December 2, 1994.



# Policies condemned

"WE ARE NOT anti-car or anti-lorry. But the growth in traffic that has been forecast cannot be accommodated in a sustainable transport policy." With these words, Sir John Houghton, Chairman of the Royal Commission on Environmental Pollution, summarized the essential conclusion of its long-awaited report on transport and the environment.

Among other things, the report says:

□ Economic growth cannot continue in a sustainable way unless transport and the planning of land use are integrated.

□ Technology must be improved so as to cut fuel consumption and make vehicles less polluting. A 40-per cent increase will be needed in the average fuel efficiency of new cars sold in the United Kingdom between 1990 and 2005, with smaller improvements for trucks.

□ New residential, commercial and leisure developments should be sensibly located, so people do not have to travel long distances and are not forced to use cars.

□ The cost of private transport will have to rise because at the moment

it does not reflect the damage done to health and the environment. The duty on fuel should be steadily increased, so as to double the price, in real terms, by 2005. The Government should also press for a similar year-on-year increase throughout the European Union.

□ Resources should be switched from road building to improving public transport; expenditure on motorways and roads should be cut by a half, thus freeing some £1.5 billion a year for improvements in public transport. Extensive building of new roads will only lead to an increase in the volume of traffic.

"The report is perhaps the RCEP's most important to date, and presents the Government with a hefty challenge to deliver on its promises of sustainable development. The question now is whether Ministers have the political will to take up the gauntlet – and attempt to break the gridlock of current transport policy," comments ENDS Report.

Source: ENDS Report, No. 237, October 1994.

## New roads, more traffic

A DEVASTATING CRITIQUE of the methods used by Britain's Department of Transport to justify its £19 billion road program was delivered recently by the department's own advisers.

The independent Standing Advisory Committee on Trunk Road Assessment said that building new roads generates traffic. For decades the department has maintained that the growth of traffic has nothing to do with new roads. But according to the committee the answer to the question of whether new roads generate traffic is "an unequivocal 'yes.' Any other response defies credibility."

The problem is particularly acute in urban areas, where traffic congestion deters drivers from using their cars. Cutting travel times by 10 per cent could lead, the committee says,

to an increase in traffic of 5-10 per cent.

The committee is also critical of the Department's forecasts of how much new roads will be used. It says that more than half of the department's forecasts in this respect were out by more than 20 per cent. Forecasts of traffic are however central to the planning of new roads – to determine the cost-benefit and see whether any scheme is worth it or not.

The embarrassment the committee's report caused the Department of Transport can be gauged by the delay in publishing it. It was sent in to the Department in May last year but not published until just before Christmas.

Adapted from an article in *New Scientist*, January 7, 1995.

### Solar power

Two companies in the United States plan to make solar power cheaper by mass-producing solar panels. Amoco, an oil multinational, is joining forces with Enron, a natural-gas producer, to build a factory that will produce enough solar devices each year to generate 10 megawatts of electricity. They plan to sell the panels to power companies to give them extra generating capacity at times of peak demand. If the panels are made in large quantities, the cost of the electricity is supposed to fall to 5.5 cents a kilowatt-hour.

*New Scientist*, January 14, 1995.

### Tighter standards for trucks

The US Environmental Protection Agency is leaning toward drafting a stricter national NOx emission standard for heavy trucks, a move that will provide needed assistance to areas such as California and the Northeast that are struggling to comply with the Clean Air Act. A tighter standard, 4.0 grams per brake-horsepower hour, is due to take effect in 1998, but it is too lenient to provide much assistance to areas struggling with air problems.

In the Federal Implementation Plan proposed for California, EPA has called on the state to enforce a 1.5 grams limit for heavy vehicles. California has fought this requirement, saying that it will be technically impossible to execute. In consultation with California, EPA is now considering a national standard somewhere inbetween; 2.0 to 2.5 grams may be achievable, though the agency will first have to make a study to see whether the costs can be justified by the benefits. The FIP will not affect heavy trucks in California until 1999, and because of the lead-time restrictions in the Clean Air Act, the earliest any national legislation can be introduced is 2004.

*Car Lines*, Michael P. Walsh, 1994.

### Saving electricity

In April last year 100,000 households in Saarbrücken, Germany, were given a low-energy lamp, and urged to help save five million kilowatts a year in order to make a new power station unnecessary. People could either fetch a lamp themselves from the electricity company's information centre, or let someone come and install it for them, and give suggestions for other ways of saving electricity.

*Sveriges tekniska attachéer*, 1994

# Prime areas threatened

IN EUROPE, acidifying pollutants are damaging at least half of the prime nature conservation areas and will continue to do so even if the nations actually reduce their emissions in accordance with the new sulphur protocol (see AN 4/94, p. 10-11).

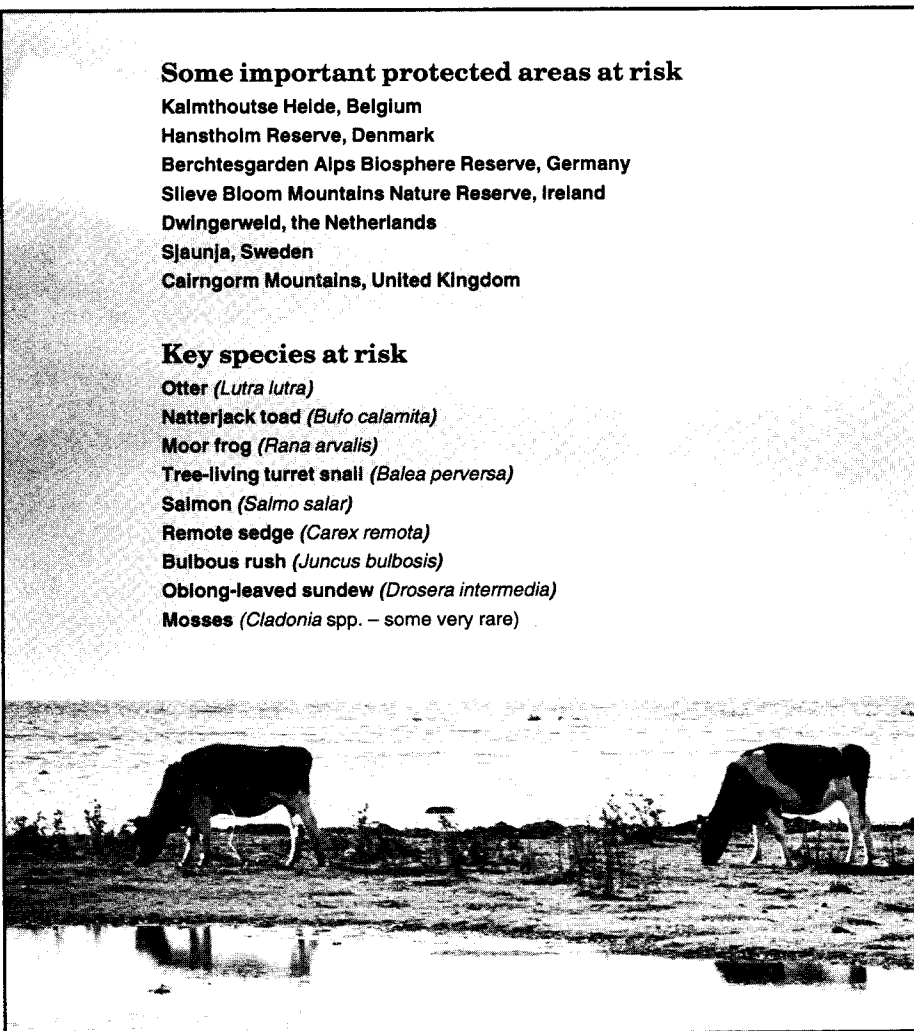
A report recently published by the World Wide Fund for Nature gives data on important conservation areas as well as on a great number of wild plant and animal species that are known to be at risk from air pollution. These are placed alongside other data on critical loads – indicating the amounts of pollution a species or ecosystem can take without suffering damage.

Then, using the RAINS computer model, the researchers have analyzed the probable developments in the light of three different scenarios: one assuming current reduction plans, the second more stringent pollution control through the use of end-of-pipe techniques, and thirdly a similar one to the second, but relying more on improvements in energy efficiency.

In either of the last two cases 95 per cent of the whole land area would, as a result, be saved from depositions in excess of their critical loads. But 20-25 per cent of the conservation areas just happen to be in places where the critical loads would be exceeded.

It should be noted, however, that the revised sulphur protocol is only expected to result in a reduction of emissions by 50 or so per cent – leaving more than half of the protected areas exposed to depositions that will be greater than the soil can neutralize.

The risk is moreover unevenly spread. Some countries, especially around the Mediterranean and in the Balkans, have protected areas which, largely on account of well-buffered soils and comparatively low air pollution, are less likely to suffer damage from acid depositions. Even where sites are at risk, a fairly moderate reduction of sulphur dioxide would eliminate most of the danger. Such lower-risk countries include Portugal, France, the former Yugoslavia, Albania, Greece,



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## Some important protected areas at risk

Kalmthoutse Heide, Belgium  
 Hanstholm Reserve, Denmark  
 Berchtesgarden Alps Biosphere Reserve, Germany  
 Slieve Bloom Mountains Nature Reserve, Ireland  
 Dwingerweld, the Netherlands  
 Sjaunja, Sweden  
 Cairngorm Mountains, United Kingdom

## Key species at risk

Otter (*Lutra lutra*)  
 Natterjack toad (*Bufo calamita*)  
 Moor frog (*Rana arvalis*)  
 Tree-living turreted snail (*Balea perversa*)  
 Salmon (*Salmo salar*)  
 Remote sedge (*Carex remota*)  
 Bulbous rush (*Juncus bulbosus*)  
 Oblong-leaved sundew (*Drosera intermedia*)  
 Mosses (*Cladonia* spp. – some very rare)

and Bulgaria. Nevertheless, if development there were to follow the same pattern as that of the rest of Europe, emissions would soar and the risk increase.

Generally at higher risk are protected areas in a second group of countries, including the Baltic States, Finland, Poland, the Czech Republic, Slovakia, Hungary, Romania, and Italy. Here however plans for reducing air pollution could in most cases, if carried out, bring down the risk to near zero.

The outlook is much bleaker for countries of a third group: Ireland, the United Kingdom, Belgium, the Netherlands, Denmark, Sweden, Norway, Germany, and Switzerland. Even if these countries were to bring their emissions down to levels below those called for in the sulphur protocol, a significant proportion of their protected areas would still be at risk.

The reason is to be found in a combination of factors, among which are proximity to big emission sources, relatively sensitive soils, and the prevailing weather patterns.

The WWF study also reveals that thirty of Europe's endemic species are at risk, as well as twenty-six other species of international importance or rarity. It notes however that in this respect the study is far from comprehensive, having tended to focus on plants rather than on animals.

The WWF claims that this revealing of the threat to biological diversity represents an important step forward, since most of the previous work has concentrated on the damage that acid rain is causing to managed forest or freshwater systems. It warns European governments not to allow themselves to become complacent about the seeming progress em-

bodied in the revised protocol on sulphur, insisting that many countries, including some of the worst polluters, will have to raise their commitments. It also says that new mechanisms may be required, to provide less affluent countries with the financial means for reducing their emissions.

The report also points to nitrogen as a factor not to be overlooked. Although in Europe sulphur is the prime cause of acidification, nitrogen also poses a serious problem, by acting as an acidifying agent in systems that are already saturated

with it. Saturation has in fact already occurred in parts of the Netherlands, in northern Germany, Denmark, southern Sweden, and the United Kingdom. The WWF therefore urges governments to adopt firm reduction targets when the nitrogen protocol comes up for revision under the UN ECE Convention.

PER ELVINGSON

**Acid Rain and Nature Conservation in Europe.** WWF Special Report, by Andrew Tickle and Malcolm Ferguson, 1995. Available from WWF International, CH-1196 Gland, Switzerland.

## SOLAR CELLS

# Price cuts expected

GLOBAL TRADE in photovoltaic cells increased in 1993 by 4 per cent, rising to 60.1 megawatts (Fig. 1). This represents a slower rate of growth than the ten-year-average of 11 per cent a year, the reason probably being the economic recession that was still plaguing Europe and Japan.

To spur the solar-cell industry, governments – led by the European – have initiated commercialization programs. The German government's plan has led to PVs being placed on 2500 rooftops over the past three years, and Switzerland launched a program in 1991 aimed at installing at least one PV system in each of the country's 3000 villages by the end of the decade. Japan is set to start an ambitious effort at commercialization involving some 62,000 units, with a combined capacity of 185 megawatts, which are intended to be in place by the turn of the century.

In the United States, a coalition of more than 60 utilities is planning to install 50 megawatts of solar cells between 1994 and 2000 – much of them at household level. The total cost will be more than \$500 million

of which the utilities have offered to pay 70 per cent, while the federal government has been asked to cover the remainder.

Since reaching its nadir in the late eighties, government funding of research and development for PVs has increased substantially, having nearly doubled in the four years up to 1992. Price is still the largest obstacle to the proliferation of solar power generation. Price cuts are however expected as a result of more efficient cells and lower-cost manufacturing. Historically, each time the production of PVs has doubled, prices have fallen by 20 per cent (Fig. 2).

The prospect of growing sales has led some manufacturers to start building larger factories, including one capable of producing as much as 10 megawatts of solar cells per year. It is believed that with plants of this size, PV prices can be brought down to less than half the current figure.

**Vital signs 1994 – trends that are shaping our future.** Published annually by the World Watch Institute, 1776 Massachusetts Ave. NW, Washington DC 20036, USA.

Figure 1. Global trade in photovoltaic cells, 1971-93

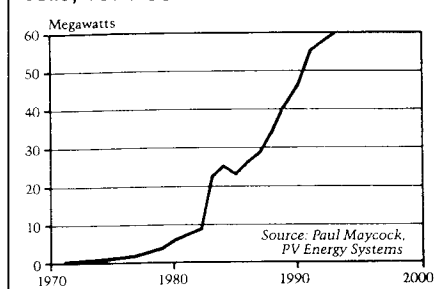
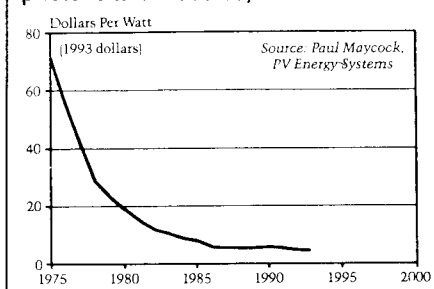


Figure 2. Average factory prices for photovoltaic modules, 1975-93.



## CLIMATE

# Norway gives up

NORWAY HAS BEEN THE FIRST country to renege on its climate promise. Its awaited plan for the climate will reveal – contrary to what has been internationally agreed – an increase in the country's emissions of carbon dioxide.

In 1989 there was complete unanimity in the Storting (parliament) that emissions should have become stabilized at their 1989 levels by the year 2000. According to information in *Natur&Miljø Bulletin*, the organ of the Norwegian Society for Nature Conservation, the plan that will be presented prior to the international climate conference in Berlin in March will indicate an increase instead of stabilization. The political opposition in Norway is criticizing the government, pointing out that stabilization is *not* a target, but simply a necessary step on the way towards real reductions.

While Norway is thus announcing that it will not even achieve stabilization, a number of other European countries are planning to reduce their emissions of carbon dioxide. According to a survey made by the OECD and Climate Network Europe (an organization for coordinating environmentalist groups' climate work), only four out of fifteen western European countries will be setting their sights lower than Norway in this respect. There are three on the other hand that are making no commitments.

Germany	-25-30%	1987-2005
Denmark	-20%	1988-2005
Austria	-20%	1988-2005
Luxembourg	-20%	1990-2005
Belgium	-5%	1990-2000
Italy	-4%	1990-2005
Netherlands	-3-5%	1990-2000
United Kingdom	0	1990-2000
European Union	0	1990-2000
Iceland	0	1990-2000
Sweden	0	1990-2000
Switzerland	0	1990-2000
Norway	0	1990-2000
France	+11%	1990-2000
Ireland	+20%	1990-2000
Spain	+25%	1990-2000
Finland	stabilizing from 2000	
Greece	no target specified	
Portugal	no target specified	
Turkey	no target specified	

Source: *Natur & Miljø Bulletin*, January 13, 1995.

# Effects of higher concentrations

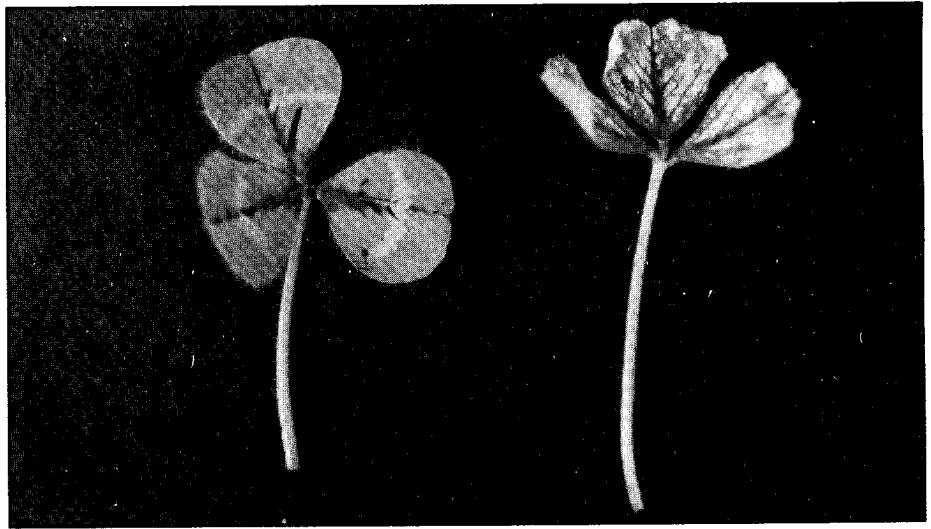
WHEN THE SUN IS SHINING at its brightest, there will be the greatest risk of high levels of ozone and other photochemical oxidants in the atmosphere. Given the presence of nitrogen oxides and volatile organic compounds, the sunlight will set off a long chain of reactions. But oxidants are not only a danger during periods of high pressure in summer. Equally troubling is the fact that background levels of ozone are steadily increasing – having doubled over the last 50-100 years in central and northwestern Europe. The concentrations that are now being recorded are high enough to affect people's health, corrode materials, damage vegetation, and contribute to global warming.

**HEALTH.** Ozone affects mucous membranes and the lungs, eye trouble often being the first symptom. Being a strong oxidant, ozone can cause irritation of the nasal cavity and the throat, as well as harming sensitive parts of the lungs. The effect on the lungs may be heightened if exposure takes place simultaneously with physical exertion, as it also will be if the exposed person is asthmatic or for other reasons suffers from impaired lung functioning.

According to the World Health Organization's guideline, the average eight-hour concentration should never exceed 100-120 micrograms per cubic metre of air. At that level, however, there is no safety margin. For weak and sensitive persons, amounting perhaps to a tenth of the population, the limit has to be lower. The lung function of children and young people has been found to be impaired after exposure to 160  $\mu\text{g}/\text{m}^3$  during only six hours.

Following a recent study, a limit of 100  $\mu\text{g}/\text{m}^3$  has been proposed for ozone in Great Britain. The group of experts who have made it estimate that in order to come down to that level, the emissions of nitrogen oxides and VOCs will have to be reduced by 75-95 per cent (AN 4/94, p.5). New air-quality guidelines may also be expected from WHO in the next few years.

Because urban air contains a mixture of a great number of pollutants,



*Forage species are especially susceptible to damage from ozone. One kind of clover is often used as indicator, a healthy leaf (left) here being compared with a damaged one.*

it is difficult to distinguish the effect of any one from that of the others. There is a suspicion that ozone can combine with other pollutants to cause allergies, asthma and other diseases affecting lung functioning. The photochemical smog formed during periods of high pressure in summer can also include particles containing organic substances and heavy metals with a highly negative effect on health.

**MATERIALS.** It has long been known that high concentrations of sulphur dioxide pose a serious threat to cultural objects and buildings generally. But the breakdown of materials continues unchecked despite markedly reduced levels of sulphur dioxide – a contributing cause probably being the increased concentrations of oxidants and nitrogen compounds, especially nitrogen dioxide and nitric acid. The latter is a strongly corrosive substance formed through photochemical reaction.

A cooperating factor may also be involved. It has been shown by experiment that nitrogen dioxide, ozone, and sulphur dioxide will corrode stone more strongly in combination than they would separately. Soot and other airborne particles can also combine to intensify attacks, which cost the community large sums every year. In Sweden the Board of National Antiquities has proposed that as a means of protect-

ing materials, ozone concentrations should not be allowed to exceed 50  $\mu\text{g}/\text{m}^3$  as a long-term average.

**VEGETATION.** Damage traceable to low-level ozone was first observed in southern California in the end of the forties. It came to notice earliest there because of a combination of huge emissions of air pollutants, primarily from road traffic, with a climate that favoured the formation of oxidants. Similar effects have subsequently come to light in large areas of the industrialized world. While attention has mostly concentrated on ozone, other oxidants, such as peroxyacetyl nitrate (PAN) for instance, have also been found to cause damage to vegetation, although the actual extent has yet to be determined.

Plants that are most sensitive to ozone are those with short-leaved leaves, such as spinach and clover. Visible damage may appear on the leaves after only a few hours' exposure to concentrations of 100-120  $\mu\text{g}/\text{m}^3$ . Although the damage may not be so easily discernible in other plants, particularly those with long-lived leaves, their life length will nevertheless be adversely affected by high concentrations. The pattern of reaction varies from one species to another and sensitivity also varies between populations of the same species. Although only a few wild plants have so far been investigated, there is a strong suspicion that the

composition of ecosystems will also be affected.

While there is no detailed knowledge of the manner in which ozone affects plants, there is strong evidence of damage being caused to various cell structures as a result of ozone penetrating into the stomata. It can also disturb the functioning of the stomata, and thus upset the plant's moisture balance.

In the United States a great deal of research has been devoted to the effects of ozone on crops, and there at least 90 per cent of the damage attributable to air pollution is thought to be due to ozone. This means a loss in production of 5-10 per cent for American farmers, and in northern Europe similar losses have been noted for wheat.

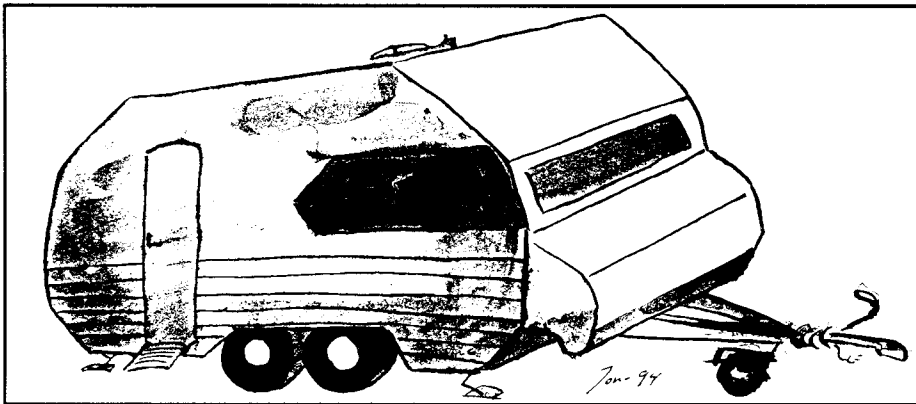
Forestry has also been hit. Damage to Ponderosa pine was another early discovery in southern California, followed later by observations of similar effects on coniferous species in the eastern states, as for instance

on White pine in the Appalachians. In Europe there have also been studies indicating ozone as a cause of damage and reduced growth rates in coniferous trees, it having been shown that the trees' green parts definitely age more quickly as a result of exposure. While ozone in all probability contributes to the forest damage associated with air pollution in Europe, the manner in which the various pollutants co-act with each other and with stress, for example due to drought, has yet to be investigated.

**GREENHOUSE EFFECT.** Increasing concentrations of ozone contribute to global warming, since the gas absorbs radiation that would otherwise have escaped from the atmosphere.

PER ELVINGSON

Source: **Ground-level ozone and other photochemical oxidants in the environment.** Swedish Environmental Protection Agency, 1993. Report 4243.



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CARAVANS

## Effect on emissions

DRAMATIC INCREASES in the emissions of pollutants in the exhaust gases from cars have been noted when a caravan for instance is attached. The emissions from one car model were found to be as much as twenty-five times the permitted limits, in a test carried out by the Swedish auto magazine *Vi Bilägare*. (In Sweden American standards apply.) In the case of the "best" of the six cars that were tested, the emissions were three times more than the limits.

The reason for the emissions increasing more strongly when more pull is needed is that the engine responds by calling for a richer fuel

mixture. The resulting exhaust gases in turn diminish the oxidizing ability of the catalyzer, with a consequent increase in the emissions of carbon monoxide and hydrocarbons. A diesel engine on the other hand, under hard loading, emits more nitrogen oxides.

If a catalyzer is to function properly even when the engine is being forced, the fuel supply to the engine has to be choked, with a resulting loss of power – an idea that has no particular appeal to the car makers.

A great increase in fuel consumption was also noted in tests of cars towing a caravan.

Source: *Vi Bilägare*, No. 12, July 1994.

## Motorizing China

China intends to stimulate its automotive manufacturing sector through various incitements to car and truck makers as well as to individual purchasers. The aim is to make China the world's leading maker by 2010, by increasing output from 1.5 to 4 million vehicles a year, of which half would be passenger cars.

Prime minister Li Peng has pinpointed the automotive industry as one of the four cornerstones of the country's new, market-oriented economic policy – the other three being computers, telecommunications, and petrochemicals. Automotive manufacturers from all over the world have been invited to come and help start things moving. With 1.2 billion inhabitants, China is largely virgin territory for foreign companies, and interest is great. The country's state-controlled production of vehicles, consisting mostly of trucks, is small and technically backward.

There are however complications. China's infrastructure is primitive, and warnings are being issued of chaos if traffic should be allowed to increase too fast – both within and outside the big cities. The oil supply is also limited, domestic production being already insufficient. The sudden appearance on the roads of millions of new vehicles could quickly lead to a new oil crisis.

*Svenska Dagbladet*, September 24, 1994.

## Mandatory standards proposed

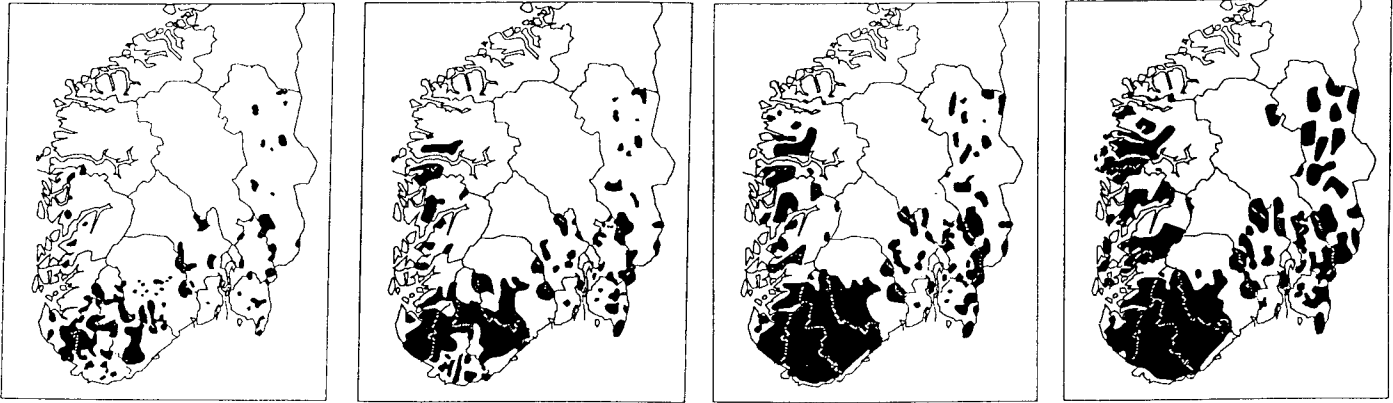
The European Commission has proposed mandatory EU standards of energy efficiency for household refrigerators, freezers, and combinations of the two that will require an average 10 per cent improvement over 1992 levels.

The standards, which the refrigeration industry opposes as unnecessary, are unchanged from the draft norms described as far too lax by Greenpeace and other energy efficiency advocates more than a year ago (*AN* 1/94, 5/94) – except that the deadline for manufacturers to meet them has been changed from 1997 to 2000. A second stage of tighter standards, originally a firm intention, is now only a vague possibility.

The directive will come before the Council of Ministers this spring. There support from a weighted majority of countries is needed to put standards on the statute book. Denmark, the Netherlands, and some other countries have said they are going to try for an improvement.

*Environment Watch: Western Europe*, December 16, 1994.

# Salt increases the effect



The growing spread, from the 1950s to the 1980s, of those areas of southern Norway where fish populations have been hit by acidification – which is now estimated to affect a third of the country.

ACCORDING TO A REPORT published by seven of Norway's leaders in acidification research, altogether 117,000 sq. kilometres, amounting to a third of the country's total area, are now showing damage from acid.

An especially marked spread of the damage since 1950 has been found along the west coast, facing the North Sea. Lesser but still considerable increases have also been noted inland, in the east towards the Swedish border. The effects of acidification can be seen particularly in lakes and streams, where fish populations have been badly affected – although other kinds of fauna as well as vegetation have also suffered.

As everywhere, the basic cause is of course the airborne pollution – sulphur and nitrogen – blown in from far and wide. In Norway, however, the natural environment is also affected in high degree by salt carried in from the sea, increasing and compounding the effect on already acidified ground.

This became evident in late winter 1993, when extensive freshwater fishkills occurred in Vest Agder and Hordaland counties as well as in a number of fish farms further up along the coast in Sogn and Fjordane. It happened after a period of very strong winds, unusually high temperatures, and heavy rain and snow. During that time between three and ten times the usual amount of salt was deposited in these parts.

Latterly research has shown how acidification gives rise to highly complicated pattern of damage. It turns out that salmon parr for instance is more sensitive than had previously been supposed. After growing up in relatively little acidified water they find it difficult to manage the changeover from fresh water to salt when they emigrate to the sea.

“Laboratory and field investigations have added strength to the suspicion that acid precipitation may have contributed to a reduction of

the salmon populations in rivers that are not normally regarded as threatened by acidification,” say the Norwegian scientists in their report.

The country has long had a liming program to counteract the effects of acidification. Norwegian officials and environmentalist groups are also pressing hard internationally for agreements to reduce the emissions of airborne acid pollutants.

In the meantime still more liming will be needed to help protect the natural environment – and still greater efforts will have to be made to save the stocks of species that are especially sensitive to acidification, possibly through gene banks. Spending on that now, the researchers emphasize, would bring a much greater return than if the money were to be invested later.

Adapted from an article by K.J. Bondeson in Göteborgs Posten, December 27, 1994.

## Using Italian sunshine

In Italy the state electricity company ENEL has just inaugurated a fully automatic solar plant at Serre in the southern part of the country. One of the world's largest, its array of solar panels covers an area of seven hectares. With a capacity of 3.3 MW, it will produce 5 million kWh a year. The cells have been made for the most part in Italy, but also in France, USA, and Japan. The aim is to use the plant for testing the best ways of

transmitting power from cells to network. The possibility of reducing the panels' area, such as by letting them rotate with the sun, will also be studied. The plant has cost 40 billion lire (US\$27m), and is expected to produce electricity at 50 cents per kWh.

Europe Environment, November 8, 1994.

## Cleaner public transport

The Norwegian government is planning to allocate 260 million kroner (US\$40

million) for subsidizing so-called “environmental” diesel fuel for public transportation. This type of fuel emits fewer harmful particulates than ordinary diesel. The government had considered subsidizing less-polluting diesel for use in all vehicles but has postponed decision pending the outcome of a joint fuel-quality study being made by the European Commission and the oil and car industries, to be completed in 1995.

Environment Watch: Western Europe, December 2, 1994.



# Big increase proposed



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OVER THE NEXT ten to fifteen years it is proposed to lime more than one million hectares of forest land in southern and central Sweden at a cost of at least one-and-a-half billion kronor (approximately £125 million). The proposal comes from a forest damage commission that was especially appointed last year by the National Board of Forestry.

Earlier surveys have shown the pH value of the soil on some 650,000 hectares of forested land in South Sweden to be below 4.4, which is thought to be the critical level at which the release of potentially toxic metals will start. On a further 700,000 hectares the pH value ranges between 4.4 and 4.7, and unless the depositions of acidifying airborne pollutants are dramatically reduced, within a couple of decades the pH value will go below the critical level in these soils too – thus, in other words, increasing acidification.

Another effect of acidification is the greatly increased leaching of plant nutrients from the soil. In some areas of South Sweden more than half of the available magnesium, potassium, and calcium has become lost as a result.

The National Board of Forestry had presented a plan for liming forest soils already in 1990. In 1993, the Riksdag (parliament) allocated 20 million kronor for large-scale trial liming, and in that year too the government requested the Board of Forestry to gather more data on

forest damage, and make proposals for counter measures. This task was assigned to the *ad hoc* Forest Damage Commission, which has now presented its report.

One of the commission's main conclusions is that the acidification of forest soils, with its accompanying effects, entails a great risk for forest ecosystems as well as forestry itself. It has therefore evaluated various means of counteracting the steady acidification of forest soils, such as by liming and vitalizing fertilization, and changes in forestry practices. Among its proposals for the latter is the suggestion that in areas of high exposure to air pollution, the proportion of broad-leaved trees should be increased.

Opinion differs among scientists as to the benefits of liming. Not all are convinced that it is advisable. German experience of spending one-and-a-half billion deutschmarks on liming damaged forests during the past ten years has been discouraging, there having been no visible improvement. Conservationists, too, are worried about the effects on flora and fauna. Another matter of concern is the risk of increased leaching of nitrogen from limed areas.

But according to the commission, the positive effects of liming more than compensate the negative ones. It proposes that large-scale liming should start in 1996, and in the worst hit areas of South Sweden

that vitalizing fertilization (the application of various combinations of lime and nutrients) should start in 1997.

It is proposed that spending on these measures should gradually increase from the present 20 million kronor to about 150 million annually as from 1999. The cost per hectare has been estimated to amount to 1500-2000 kronor. Eighty per cent should be paid by the government, and the remainder by the forest owners themselves.

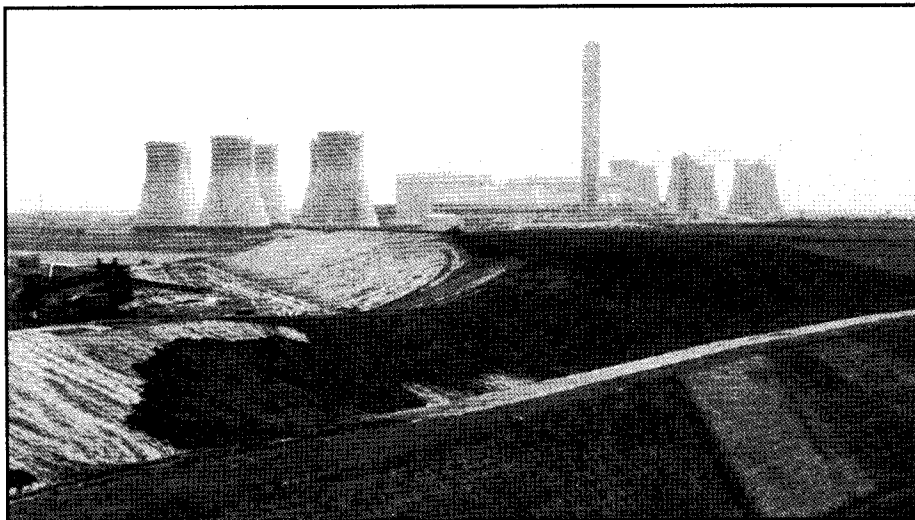
The commission's report was presented to the government in August. It will be carefully considered, and some of its recommendations possibly adopted. Eventually it will be up to parliament to decide how much money should be spent on forest liming projects. Some 200 million kronor is already being spent annually in Sweden to counter the effects of acidification in lakes and rivers.

Whatever the final outcome, forest owners are already facing an awkward choice. On the one hand they might accept continued acidification, with all its known consequences by way of liberated metals and the leaching away of nutrients in the soil, changes in flora and fauna, and so on. On the other hand they have the seemingly favourable prospect resulting from liming and vitalizing fertilization, which yet entails certain risks and the possibility of unpleasant surprises.

The only really tenable solution lies in a quick reduction of the emissions of acidifying air pollutants. The most sensitive soils are only able to neutralize depositions of one-tenth the size of those to which they are now being subjected. Yet the commitments made by European countries in the new international treaty on sulphur, signed by twenty-six countries in Oslo, Norway, last July, are expected to result only in a halving European emissions by 2010.

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The Commission's report is entitled *Skogskador i Sverige – nuläge och förslag till åtgärder*. Skogsstyrelsen rapport 7, 1994. Available in Swedish only.



BRITAIN

## FGD in doldrums

IN BRITAIN, both National Power and PowerGen have admitted that at times of low demand for electricity they switch off units that are equipped for flue-gas desulphurization and run other, cheaper but more polluting, plants instead.

This suggests that the existing regulatory mechanisms may be inadequate to ensure the environmental benefits envisaged under the country's FGD program, which has cost British taxpayers over £1 billion.

One condition when the power industry was privatized in 1991 was that the two generators, PowerGen and National Power, should retrofit 8 gigawatt of existing coal-fired plant for desulphurization. Results began to appear in 1994, with the completion of the first installations at National Power's 4 GW Drax station in N. Yorkshire and PowerGen's 2 GW at Ratcliffe-on-Soar in Leicestershire. PowerGen was supposed to retrofit 2 GW at Ferrybridge, also in Yorkshire, but has so far failed to do so.

The demands of the British electricity market have in fact led to the FGD program not being fully carried out. Operating the FGD units increases the cost of generating electricity, according to National Power by as much as 30 per cent – making the generators more inclined to use

their cheaper plants, as indeed they have now admitted doing.

Power plants' emissions of sulphur dioxide are controlled in two ways: first through company-wide emission quotas set by the Department of the Environment under a National Plan for complying with the EC Directive on large combustion plants, and then through allocations agreed for each separate power station. So long as the total quota is not exceeded, that agreement is however not binding.

At present neither National Power nor PowerGen is in danger of exceeding its quota, mainly because both have lost market share to nuclear power and new gas-fired plants.

Emissions from individual power stations can in principle be more tightly controlled through IPC, integrated pollution control, with its requirement for the use of the "best available techniques not entailing excessive cost" (BATNEEC). So far however this opportunity has not been taken by HM Inspectorate of Pollution. The whole matter of desulphurization has moreover become bogged down as a result of long-drawn-out negotiations for the upgrading of all existing stations to new-plant standards.

ENDS Report, No. 238, November 1994.

## Coming events

### Climate Forum '95

At the time of the Conference of the Parties (COP) to the Climate Convention in Berlin, March 28 to April 7, environmentalist NGOs will be staging various events, exhibitions, and seminars with relevance to the agenda of the official summit.

*Inquiries:* Climate Forum Coordination Bureau, Behrenstrasse 23, D-10117 Berlin, Germany. Tel. +49-30 202 20 30.



### Health at the Crossroads. London, Great Britain, April 4-7, 1995

A conference that will present and assess the health burden related to urban traffic, especially asthma, and present innovative transport policy initiatives to assess the expected benefits in terms of health and quality of life.

*Inquiries:* Alice Dickens, Conference secretary, London School of Hygiene and Tropical Medicine, Keppel Street, London, England WC1E 7HT. Fax. +44-171-580 7593.

### Acid Reign '95? 5th International Conference on Acidic Deposition. Gothenburg, Sweden, June 26-30, 1995.

Focus will be on recent findings in regard to the origins and effects of acidic deposition and the various measures that have been taken to counteract them – especial importance being attached to the use of the critical-load and other effect-oriented concepts for developing abatement strategies. The program will include, besides plenary and poster sessions, visits to various demonstration sites and experimental plots relevant to the subject of the conference – immediately preceding which there will be a three-day excursion to the Czech Republic and southwestern Poland.

*Inquiries:* Gainmore AB, Conference & Exhibition Services, St. Badhusg. 18-20, S-411 21 Göteborg, Sweden.