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2 MARSHAM STREET
LONDON SW1P 3EB

My ref:

Your ref:

9 November 1984

Dear David

GOVERNMENT RESPONSE TO SELECT COMMITTEE REPORT ON ACID RAIN

I enclose the text of the Government's response to the House of Commons Environment Select Committee's report on acid rain (which was published on 6 September). My Secretary of State has taken account of the Prime Minister's views on the text and those of his colleagues who have the greatest interest in this issue and now proposes to publish the present text in the form of a Command Paper.

Strong interest in the matter has been expressed in the House and my Secretary of State therefore wishes to publish the response at the earliest possible date. He will assume that unless he hears to the contrary by close on Tuesday 13 November, colleagues are content that he should proceed to publication.

Copies of this letter and the accompanying text go to the private secretaries to members of the Cabinet, the Paymaster General, and Sir Robert Armstrong, and to Mr Bernard Ingham.

Yours ever

Andrew

A C ALLBERRY
Private Secretary

David Barclay Esq

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DEPARTMENT OF THE

ENVIRONMENT

Acid Rain:

The Government's reply to the Fourth Report from the Environment Committee, Session 1983-84, HC446-1

Presented to Parliament by the Secretary of State

for the Environment

by Command of Her Majesty

November 1984

LONDON

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I. INTRODUCTION

1.1 The Government welcomes the Environment Committee's timely Report on the important subject of Acid Rain. As the Committee rightly note, a term which had a single meaning when first devised has now been extended to cover a variety of forms of air pollution arising from a number of emissions and from chemical interactions of those emissions in the atmosphere. The Government considers that this process of broadening has also blurred important issues which need to be disentangled if effective solutions are to be found.

1.2 The Government acknowledges that this is an area of wide concern. It recognises in particular that a number of European countries are sustaining damage which they attribute in whole or part to acid deposition. This damage is far more extensive than we appear to be experiencing in the United Kingdom. Some countries can point to evidence that pollutants emitted in neighbouring countries, including our own, are contributing to their damage - and consider that without concerted international action their problems are not soluble. The United Kingdom believes in the principle of good neighbourliness; and the Government - both in the European Community and in the relevant international Convention - has repeatedly expressed its willingness to develop environmentally effective and economically feasible policies. It will continue to play a full and positive part in international discussions and research programmes designed to identify the cause of damage and to provide solutions.

1.3 Building on the nearly 40% reduction in SO_2 emissions achieved since 1970, the Government aims to achieve a further reduction of 30% from 1980 levels of SO_2 emissions by the end of the 1990s and a similar reduction in levels of NO_x emissions. It also intends to support stricter emission standards for petrol engined cars, achievable by development of lean-burn engines. It does not believe that the very substantial expenditure (running into hundreds of millions of pounds) which would be required to install flue-gas desulphurisation plant at existing power stations can be justified while scientific knowledge is developing and the environmental benefit remains uncertain. It will, however, continue to encourage the development of new technologies which can provide more cost-effective solutions.

1.4 Pollution is dealt with by political action, but it is explained by science. Science is dynamic, and the policies of this and other Governments must evolve to meet new evidence about the environmental situation. What is durable within this framework of change is the Government's overall policy: that action against pollution shall rest on the best scientific evidence, the best technical and economic analysis, and the best possible assessment of priorities. The United Kingdom has a proud record of achievement in tackling the massive legacy of pollution inherited from the past and the Government firmly intends to sustain that record.

1.5 This response to the Select Committee is in two main parts. Chapter II comprises a short general essay which sets out, very much in summary terms, the Government's present interpretation of the scientific evidence and the evolution of our response to it. This chapter is intended to set the detailed responses to individual recommendations, which follow in Chapter III, within the broad context of the Government's overall policy on acid rain.

II. ACID DEPOSITION

2.1 The Select Committee discuss many kinds of risk and damage - to human health, crops, forests, freshwater life, stonework and other materials. Although air pollution may contribute to all these kinds of damage, the relative importance of pollutants and of natural factors like climate, and the pollutants likely to be of most significance, vary from one situation to another. There are subtle interactions between pollutants and the natural components of air, soil and water and many of these are still imperfectly understood. Mathematical models of these complex phenomena are still being developed and tested.

2.2 These diverse processes cannot be described comprehensively in a short essay. The simplification required in order to achieve brevity and clarity brings an inevitable risk of distortion. Uncertainities, expressed in alternative hypotheses, tend to be glossed over. Moreover, this is a field in which knowledge and understanding are developing rapidly. The following short explanation of the Government's present interpretation of the scientific evidence is not regarded as in any way a last word on the subject, or a substitute for the increasingly extensive and authoritative scientific literature (much of it international in character).

Atmospheric pollutants and their interactions

2.3 The Select Committee draw attention to three principal problems associated with acid deposition: damage to buildings and materials, damage to freshwater ecology, and damage to forests. They refer in less detail to possible hazards to human health and to crops. The agents and mechanisms of these different kinds of damage differ, and the Select Committee were wise to treat them separately.

2.4 Air pollutants fall into two broad categories: "primary" and "secondary". The first are those directly emitted from factories, domestic chimneys, cars or power stations. The most common are those produced in fuel combustion: smoke, carbon dioxide, sulphur dioxide (SO_2) and oxides of nitrogen (NO_x). Only the last two of these are important in the process of acid deposition. In addition there are many other primary pollutants, from combustion and other sources, a

few of which are important because they are involved in the chemistry of acid deposition. Among them are hydrocarbons, ammonia (or the substances that produce it as a secondary pollutant) and some chlorine-containing compounds. "Secondary" pollutants are produced in the air by the transformation of primary pollutants. Sulphur dioxide and nitrogen oxides are converted in this way to sulphuric and nitric acids, and ozone is generated by chemical reactions involving NO_x and hydrocarbons in the presence of sunlight. Ozone can be directly damaging to plants and materials, and also plays a key role in the oxidation of SO_2 and NO_x to strong acids, and the conversion of other nitrogen oxides to the environmentally active nitrogen dioxide (NO_2). Ammonia, in contrast, has a neutralizing influence, producing the ammonium sulphate haze that is believed to be the main cause of the impaired visibility on which the Select Committee also comment.

2.5 As the Select Committee recognise, environmental damage can occur both through the direct impact of SO_2 and NO_x (sometimes called "dry deposition"), and through the "wet deposition" of the sulphuric and nitric acids derived from them in mist (particularly important at higher altitudes) and in rain. The proportions of the two strong acids varies with situation: it is commonly stated as 70:30 sulphuric: nitric, but some hill mists have proved to contain more or less equal amounts of the two. Rain is naturally acid (because atmospheric carbon dioxide dissolves in it to form dilute carbonic acid, volcanoes puff out SO_2, and NO_x is produced in forest fires and biological decomposition). But there is no reason to doubt that in the industrial regions of the northern hemisphere, where some 90% of the SO_2 originates from human activities, rain has been made much more acid by man.

2.6 The chemical transformations and interactions in the air are complex, involve dozens of identified reactions (and probably many that have not yet been described) and have been the subject of a copious scientific literature (1,2). The implications of variations in concentrations, rates, and meteorological conditions are best explored

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1) Reference: Cox, R A and S A Penkett (1983)
Formation of atmospheric acidity in acid deposition (ed S Beilke and A J Elshout) Brussels: CEC (pp58-83)

2) Buckley-Golder, D H (1984)
Acidity in the Environment
Department of Energy, Energy Technology Support Unit Report R.23 (HMSO)

using mathematical models. One recent model result in the UK (3), which uses data appropriate to British conditions, indicates that hydrocarbons may be a key factor in ozone formation and require even more stringent control than NO_x if this process is to be minimised.

Damage to Health

2.7 The Select Committee review assertions made in a number of countries that SO_2 emissions may damage human health, both directly via the lungs and indirectly because the acidification of fresh waters can make them more liable to dissolve toxic metals from rocks, sediments or water supply systems. There is no doubt that in the past high urban concentrations of smoke and SO_2 did kill people prematurely: the London smog of 1952/53 was notorious for this and led directly to the Clean Air Acts. Since then maximum urban SO_2 concentrations have been reduced by 90% and such deaths are not now recorded in Britain. There is no clear evidence that the much lower air pollution concentrations today constitute a health hazard. As to water supplies, the role of air pollution in raising toxic metal concentrations in drinking water is still unclear (para 3.26) but the capacity of acid waters to dissolve lead from plumbing has been known for many years and has led to preventive action, especially in Scotland.

Damage to buildings

2.8 Buildings built of, or faced with, limestones are particularly vulnerable to SO_2 attack. The process involves both dry deposition, in which the gas penetrates the porous stone and converts the insoluble calcium carbonate which is the main ingredient into soluble calcium sulphate, and the penetration of moisture (whether acidified or not). Repeated crystallization of calcium sulphate and other salts during cycles of wetting and drying causes slow crumbling of the stone. Such salts can remain inside the stone for long periods so that the damage can continue after exposure to SO_2 is reduced: much of the damage now being observed is believed to be due to past pollution.

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3) Derwent, R G and O Hov (1980)
Computer modelling studies of the impact of vehicle exhaust emission controls on photochemical air pollution formation in the United Kingdom

Env Sci Tech 14 1360

2.9 This form of damage is governed by SO_2 concentrations in the levels of the atmosphere near the ground. Most of this pollution occurs in urban areas and comes from local domestic, commercial and industrial sources: less originates from power stations, which are now mainly located in rural areas and disperse their emissions through tall stacks. Ground level urban SO_2 concentrations have fallen sharply in the last 20 years, largely because of the substitution of sulphur-free natural gas for high-sulphur coal and fuel oil: concentrations in 1970/71 and 1981/82 were 62% and 32% respectively of the peak concentrations in 1962/63.

2.10 If this analysis is correct, the disturbing accounts of damage to historic monuments described in the Select Committee's report may well be the result of the high pollution episodes of 30 years ago, and the improvements in air quality already secured will have greatly reduced the risk of new damage. But this does not mean that action is not still required. Although the natural acidity of rainfall may cause damage to some permeable limestones any elevation of SO_2 above natural background levels increases the risk of some deterioration. Little is known about the effects of nitrates and wet-deposited nitric acid on building materials, and this needs further research. It is clear that neither SO_2 nor NO_x is involved in concrete deterioration: the problem here is carbon dioxide, causing a change called carbonation, and as this is not one of the phenomena to which the Select Committee draw attention it is not considered further in this response.

Effects on Soils and Freshwaters

2.11 Although it was the report of changes in freshwater systems, and especially in fish populations in Scandinavia, that first drew attention to problems of acid rain, very little of the latter falls directly into river and lake systems. The chemistry of freshwater acidification is largely governed by the interactions between dry and wet deposited acids and the vegetation and soils they encounter as they drain through a catchment.

2.12 Many kinds of vegetation are naturally acid: the mossy Sphagnum bogs that cover our wetter northern and western hills are an extreme example. The decay of dead plant material, including leaf litter, releases acid as does the bacterial oxidation of mineral or organic

sulphides in the soil. Forests act as an effective trap for both dry and wet acidic depositions, and the water falling through the leaf canopy or passing down the main stem, especially of old coniferous trees, is often more acid than the incoming precipitation.

2.13 Vegetation can therefore add to the acidity reaching the soil surface. Tree-growth can also acidify some soils directly by withdrawing neutralizing metallic ions such as calcium and magnesium. Once water reaches the ground, subsequent changes depend critically on whether it drains swiftly from an impermeable surface or percolates through the soil layers, undergoing at least some degree of chemical transformation. If the drainage is through mineral-rich layers, calcium and magnesium are dissolved: if the neutralizing capacity of the soil is low, as it is in shallow layers over granite or in many sands, the acidity remains high. Acid drainage through some kinds of soil can bring aluminium into solution, and this is important later because free inorganic aluminium is toxic to fish.

2.14 Both sulphate and nitrate, deposited in rain and mist, are capable of contributing to the acidification of fresh waters, but the nitrate is probably generally absorbed fairly quickly by vegetation since it is an important plant nutrient.

2.15 If fresh waters are made more acid, they progressively lose their capacity to support many kinds of freshwater life, including molluscs, insects, crustaceans and fish. The eggs and young of fish are most sensitive, and the hatching rate and survival of fry are reduced before the adults suffer: it is possible for a population to dwindle because it cannot reproduce. The young stages are also particularly at risk in some species because spawning occurs in small streams and shallows which are especially exposed to "pulses" of acidity when accumulated acidified snow melts or the first autumn rains flush out acidity that has developed in the soil in summer. If the acidity of the water is high enough aluminium may be brought into solution, and waters with a combination of high acidity, high aluminium and low calcium are especially likely to lose their fish.

2.16 The story of freshwater acidification is not a simple one. It has reached different degrees in different areas in a fashion that is probably related particularly to rock and soil types, rainfall, vegetation and industrial history. Data on the progress of the pheno

menon in Britain are, as the Select Committee point out, incomplete. Substantial research is in progress, in the UK and elsewhere, to elucidate the details of the many processes involved.

Effects on Forests

2.17 An increasing amount of forest damage over a wide area of the Federal Republic of Germany and neighbouring countries has been reported in the past three years, and the latest Federal German government statement, indicating a further deterioration in the position, has appeared very recently (4). Similar damage has been recorded in Sweden and North America. It was originally believed that acid deposition was a major factor causing this damage, and in some areas (for example along the frontier between the Federal Republic and its eastern neighbours) where SO_2 concentrations in the air are very high, direct damage from this gas may well be important. In other areas hypotheses linking wet-deposited acid to aluminium release in the soil, with toxic effects on roots, have been put forward. In yet other areas the pattern of pollution and of damage suggests that altitude, climatic stress, and fungal and insect attack, are also involved, very probably in combination with air pollution.

2.18 Concentrations of ozone measured in damaged areas of the Black Forest are often comparable with those observed in parts of the United States where this secondary pollutant is believed to cause forest damage. They also match levels found to damage coniferous trees in laboratory experiments. Ozone concentrations are consistently greater at higher altitudes in both the Federal Republic of Germany and the USA, matching the observed fact that forest damage is greater at altitudes above 600m - 800m. There is therefore an increasing belief that ozone is a major factor.

2.19 Ozone concentrations in southern Britain in summer are similar to those in parts of Europe where tree damage has been reported, but annual mean concentrations in the UK are lower than those in areas of Germany and the USA where forest damage occurs. The situation in the United Kingdom therefore remains uncertain, and is the subject of investigation (see paragraph 3.16). Although a new form of damage to

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4) Federal Minister of Food, Agriculture and Forestry 1984 Forest Damage Survey - 16 October 1984.

trees has recently been observed in North and West Britain, this bears only a superficial resemblance to that associated with air pollution in Germany.

Reactions and Remedies

2.20 In the United Kingdom it was urban air pollution, and especially the deaths caused by smoky smogs in the 1950s and early 1960s, together with damaging fumes from industry (first recognised in the 1860s), that stimulated control. The Clean Air Acts regulated smoke from low level sources and the Alkali Acts dealt with major polluting industries. The success of the results, alongside changes in fuel (including the replacement of coal by natural gas in domestic heating), is well known. The quality of urban air has been transformed in little more than a generation.

2.21 Total SO_2 emissions in the UK have also declined steadily in recent years. In 1970, total UK SO_2 emissions peaked at 6.09 million tonnes. Since that year they have fallen so that in 1980 the total was 4.67 million tonnes. The latest figure - for 1983 - is 3.72 million tonnes, a reduction of nearly some 40% from the peak year of 1970 and of 20% since 1980. A number of factors have contributed to the decrease, including energy economies which are estimated to account for about 4% of the decline since 1980, reduction in the sulphur content of fuel (4%), changes in fuel use patterns (about 5%) and industrial modernisation (6%). The nature of these reductions is such that resumed industrial growth is unlikely to reverse them.

2.22 This very improvement has led to concentrations in SO_2 in all areas in the country being below, and generally well below, the limit value set for health protection by the European Community (although domestic smoke exceeds these values in a few areas). In contrast, in the urban areas of some other countries, including some EC member states, levels of sulphur remain a problem. As the effects of the acute local pollution of the past have receded the possibility that dispersed emissions may have effects at long range from their sources has taken some time to emerge as a serious issue. Effects of this sort may have been hidden behind the effects of more obvious causes in the past. However, the problem has been studied seriously in the UK since the early 1970s. The Meteorological Office, for example, has played an

active role in the study of acid rain, performing theoretical research and carrying out fundamental measurements from its instrument research aircraft over the North Sea since 1971 (5). Such studies have involved significant cooperation with other countries in exchange of information and study, notably in the forum provided by the United Nations Economic Commission for Europe Convention on Long Range Transboundary Air Pollution (the UNECE Convention).

2.23 Elsewhere in Europe, although urban and industrial pollution has been responsible for severe environmental damage in some areas, public concern over the effects of acid deposition resulting from long-distance dispersion across national frontiers was first aroused in Scandinavia in the late 1960s. A report on the subject was submitted by the Swedish Government to the United Nations Conference on the Human Environment held at Stockholm in 1972. The Organisation for Economic Cooperation and Development (OECD) mounted an international study which showed that long range transport of SO_2 did occur - and that under certain weather conditions up to half that produced in Britain could leave the country. In 1979 the UNECE Convention was signed in Geneva. In 1982 Sweden hosted a conference in Stockholm which heightened awareness of the problem. Since then the seriousness with which these matters are viewed internationally has been stressed in many conferences and at two meetings of the Executive Body of the UNECE Convention.

2.24 Within the past year, a number of Governments have committed themselves to make a 30% reduction in their total annual national emissions of SO_2 by 1993 (using their 1980 emissions as a baseline). The number of countries in this 'club' is now 20 including Canada, the Federal Republic of Germany, France, the Scandinavian countries and some Eastern European countries. In the European Community the Commission has published a draft Directive which would require member states to achieve 60%, 40% and 40% reductions respectively by 1995 in their SO_2, NO_x and particulate emissions from large combustion plants including power stations. The Committee recommend that the Government should accept all these proposals. In parallel, and because of mounting concern over ozone as a possible cause of damage, proposals

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5) Meteorological Office Annual Report 1983, Directorate of Research, Special Topic - Meteorological Aspects of Acid Rain pp 76-99.

for more stringent controls of motor vehicle emissions (which account for a significant proportion of NO_x and hydrocarbons) have been brought forward.

2.25 The Government welcomes this opportunity to make clear its position on these important issues. It agrees with the Committee on the need to continue to reduce emissions contributing to acid deposition. It shares this objective with those countries that have already joined the "30% club". But in considering that specific objective and the emission control proposals by the Commission, the Government has to take account of the current state of scientific knowledge of the problem, and the need to ensure that the most cost effective remedial measures are applied.

2.26 The scientific evidence reviewed in this chapter has led to a greater understanding of the mechanisms involved in the formation of acid deposition, and in its relationship to environmental damage. It is clear that the problems are much more complex than was earlier envisaged. While air pollutants emitted in the United Kingdom may be involved in the damaging processes described, the precise role of primary and secondary pollutants varies with the circumstances. It seems unlikely for example that transboundary pollution is the dominant element in ozone concentrations identified as a possible contributory factor to forest damage, and certainly UK vehicle emissions are unlikely to form anything more than a very small proportion of transboundary pollution.The contribution to environmental damage of distant and local sources also varies. For instance, damage to stonework seems principally due to very local sources.

2.27 The costs of emission control measures have to be assessed against this scientific evidence. As the Committee point out, they would be substantial; meeting the requirements of the Commission's draft Directive for SO_2 would mean installing flue gas desulphurisation (FGD) plant at power stations, at a cost of some £1.5bn. Control costs for individual and smaller industrial combustion plants are also likely to be unacceptably high. In addition it is possible that several million pounds per power station would be required to install NO_x controls. Expenditure of this order clearly requires reasonable certainty that it will achieve the desired results.

2.28 The Government is however determined to continue the attack on air pollution. The UK has already made a substantial contribution; our emissions of SO_2 have fallen by nearly 40% since 1970. The Government will build on this firm foundation; specifically it intends:

i. to achieve further reductions in national sulphur dioxide emissions aiming at a reduction of 30% from 1980 levels by the end of the 1990s;

ii. to aim for the same reduction in nitrogen oxide emissions;

iii. to support stricter emission standards for petrol engined cars achievable by development of lean-burn engines; and

iv. to continue to support a well balanced programme of research on air pollutants, their effects and the technology for their control, participating fully in international research efforts already deployed in these fields.

In pursuit of these objectives the Government is participating in the work of the UNECE Convention and negotiating with its fellow signatories on policies for further measurement and control of emissions which all can endorse. It is expanding monitoring in the UK on the processes of transport, transformation, deposition and effects arising from emission of air pollutants. It is backing new developments in the technologies of fuel combustion and emission control that offer the prospect of much more economic solutions to the problem than are currently available. It will pursue these objectives with urgency and vigour. The United Kingdom has a proud record of achievement in tackling the massive legacy of pollution inherited from the past and the Government firmly intends to sustain that record.

III. THE COMMITTEE'S RECOMMENDATIONS

3.1 This Chapter deals with the Select Committee's detailed recommendations. For convenience, the responses which follow have been cross-referenced to the relevant paragraphs of volume I of the Committee's report as well as to the conclusions, and follow the same order. The Government considers, however, that the key elements of its response relate to the Committee's recommendations on the reduction of SO_2 and NO_x emissions. These are discussed in paragraphs 3.61-3.68.

Paragraph 18 page xvi (Recommendation 1)

Recommendation

3.2 We recommend that BRE be commissioned to conduct detailed research into the effects of acid rain on different types of stone and concrete in a variety of environments.

Response

3.3 The Building Research Establishment (BRE) has been commissioned to conduct research into the effects of acid rain on materials of economic importance, including stone, concrete, slate, plastics, paint and glass. The programme will comprise both laboratory and atmospheric studies and will cover factors such as temperature, humidity, variations in wetness with time, materials composition and concentrations of particular air pollutants known or suspected to cause deterioration.

3.4 In addition a separate research programme on the micro-climate around buildings is being undertaken in which local meteorological factors affecting the movement of wind and rain close to building surfaces are being studied.

3.5 A precursor to all these investigations is the preparation at BRE of an inventory of the different locations, amounts of materials and types of buildings within the UK which are likely to be at risk. As far as possible, this inventory will include all monuments and buildings of historic importance and will attempt to separate the

deterioration which has arisen from past high levels of pollution and that which is likely to occur from existing or future levels of pollution.

3.6 The Department of the Environment (DOE) is also proposing to fund work at the National Physical Laboratory on the corrosion of metals by air pollutants and is in discussion with the University of Manchester Institute of Science and Technology regarding a programme on the interaction of air pollutants with building materials, with special emphasis on NO_x.

Paragraph 23 page xviii (Recommendation 2)

Recommendation

3.7 We welcome the commitment of PSA's Chief Executive to conduct a short survey of acid rain damage. We recommend that suitable cases should as a matter of course be referred to BRE, and that PSA use a selection of buildings in different materials to monitor any damage additional to natural weathering.

Response

3.8 PSA has now completed its short regional survey of acid rain damage and will refer the cases of damage identified to BRE as subjects for their further research. Cases identified in the future will be treated in the same way. PSA is also making arrangements for a selection of buildings in different materials on its estate to be monitored for damage additional to natural weathering. BRE has agreed to assist in this if required.

Paragraph 36 page xxii (Recommendation 3)

Recommendation

3.9 We recommend that a substantial research programme on the effects on buildings of low-level emissions be initiated.

Response

3.10 Studies of the deterioration in the fabric of buildings of notable historic importance, specifically St Paul's and Wells Cathedrals, have been in progress for several years. The work has been jointly undertaken by staff from BRE and University College London. Future work will include Lincoln Cathedral, and will look particularly at the effects on stained glass windows. BRE has in the past commissioned studies from the British Glass Industries Research Association on methods of reducing environmental attack on mediaeval windows, from Aston University on evaluating the synergistic effects of air pollutants (ozone, NOx, SO_2) on plastic and surface coatings, and from the Paint Research Association on the soiling of and damage to paint surfaces. Existing studies on natural stone are being extended to monitor damage in regions with higher pollution levels than those generally existing in urban areas. Bolsover Abbey has been specifically chosen for this purpose because of its close proximity to an industrial complex. The results will be compared to those from the Wells Cathedral project.

Paragraph 37 page xxii (Recommendation 4)

Recommendation

3.11 We recommend that the Government give urgent and immediate consideration to the cost/benefit of preventing the avoidable erosion of both historic and modern buildings.

Response

3.12 Urgent attention is being given to evaluating the extensive damage to buildings arising from wet and dry deposition and ways of preventing these effects. Methods of preventing acid deterioration of natural stone have been developed by BRE, but they are expensive and can be used economically only on especially vulnerable external surfaces (see para 3.20). Two important factors have to be resolved in evaluating the cost/benefit of preventative action. The first is to quantify the area of materials at risk, and the second is to deduce the dose-response relationship for existing and projected levels of atmospheric pollution. The BRE programme is designed to provide a

basis for assessing both these factors and to establish what can best be done, at least cost to the community, to preserve the heritage and secure the design life of modern buildings and other constructions.

Paragraph 92 page xli (Recommendation 5)

Recommendation

3.13 We recommend that the Forestry Commission using its own and West German experts, conduct a survey on the same lines as that in Sweden forthwith.

Response

3.14 The Forestry Commission is now undertaking a survey of the health of Norway and sitka spruce and Scots pine in Britain. In order to take advantage of the experience gained in such surveys in West Germany, a scientist from the Lower Saxony Forest Research Institute was invited to visit sites in Scotland, England and Wales in September 1984 and his advice on methods and the design of the survey has been accepted. Following the initial survey, a number of the sites will be designated for long-term monitoring.

Paragraph 93 page xli (Recommendation 6)

Recommendation

3.15 We recommend that the Forestry Commission undertake detailed NOx and ozone monitoring and begin research into acid rain and trees.

Response

3.16 The Government considers that detailed NOx and ozone monitoring should remain part of DOE'S responsibility and that the recommendation should be acted upon within the Department's overall air pollution monitoring plan, which is drawn up in consultation with the Forestry Commission and other appropriate Government Departments. The DOE is planning to extend its NOx and ozone monitoring networks substantially, partly in response to recommendations made in the 10th Report of the Royal Commission on Environmental Pollution. A network of about 20

NOx and 10 ozone monitoring sites is currently being considered. The installation costs of such a network would be in the region of £400,000 and the annual running costs approximately £150,000. By the end of 1985, the UK will also have 9 primary sites in remote areas (5 are already operational) capable of measuring a range of air pollutants including SO_2, particulates, anions and cations in precipitation and ultimately, NOx, ozone and hydrocarbons. These sites contribute results to meet UK international obligations arising from our membership of the UNECE cooperative programme for monitoring and evaluation of long range transmission of air pollutants in Europe (EMEP).

3.17 In the same recommendation the Committee say that the Forestry Commission should begin research into acid rain and, by implication, ozone and trees. Extensive research is already being funded in these areas by DOE and NERC at Research Council laboratories such as the Institute of Terrestrial Ecology (acid rain), Universities like Imperial College (ozone) and the Meteorological Office which undertakes both experimental and theoretical research into the dispersion and chemical transformation of pollutants. The Forestry Commission provides assistance to these bodies and has recently put in hand in-house research into the effects of air pollution on the health and growth of trees in forest areas. Specific measurements of pollution will be made for experimental purposes in addition to information acquired from DOE's background monitoring. UK research into the effects of air pollution on terrestrial systems, including forests, has been coordinated through the Committee on Air Pollution Effects Research (CAPER) which is organised by NERC. DOE, MAFF and the Forestry Commission are all members of this committee, and the Government Departments concerned will now review with the other members the need for additional research on the topics the Select Committee identify.

Paragraph 113 page xlvii (Recommendation 7)

Recommendation

3.18 We recommend that the Government commission research on the effects of acid rain on materials, and on means of protecting them, as a matter of urgency.

Response

3.19 For several years the BRE has collaborated with the Central Electricity Generating Board (CEGB) on a programme exposing a range of building and construction materials to ambient levels of air pollution around power stations and at a CEGB site at the Glasshouse Crops Research Institute at Littlehampton, Sussex. Stone samples which have been exposed for a designated period at these sites are currently being examined at BRE to evaluate the extent of deterioration. The present intent is to continue the programme and to take advantage of the special exposure facilities available at the CEGB sites.

3.20 BRE has also been working for many years on protective measures for stonework. The well known Brethane treatment is effective but expensive and has only been used to protect exposed stone surfaces that are particularly vulnerable, such as stone statuary on historic buildings. Other less expensive methods of preservation which restrict the ingress of pollutants and acid waters into stones are also being studied, including the use of silicones, silicates, stearates and acrylic formulations. So far these have not proved as effective as the Brethane treatment. Work is continuing.

3.21 The main agents that damage organic materials such as rubber, plastics and paints are UV radiation, ozone and photochemicals. Most damage to these materials occurs in urban areas, and motor vehicles are the main source of the precursors which give rise to ozone and photo-oxidants. The Government is currently considering research proposals in this area in addition to the programme on building and construction materials already mentioned.

Paragraph 117 para xlviii (Recommendation 8)

Recommendation

3.22 We recommend that research on visibility degradation be commissioned.

Response

3.23 A study of the records of the Meteorological Office shows that since the Clean Air Act, the incidence of fogs in the UK has generally decreased significantly. There is no evidence of any recent reversal of this trend. However in some areas there is evidence of an inverse correlation between visibility and ozone concentration. This is due partly to the generation of some particulate matter being linked with the same air chemistry reactions as are involved in the local generation of ozone. But other factors such as prevailing meteorological conditions and humidity are often the over-riding factors determining visibility. This means that the monitoring of atmospheric visibility is not a good method of detecting atmospheric pollution. Generally it is more satisfactory to measure directly the concentration of individual pollutants. The Government will consider further the need to set up a research programme into the causes and control of reductions in atmospheric visibility, building on early work undertaken by the Meteorological Office, Warren Spring Laboratory (6) and Environmental Sciences Division, Harwell.

Paragraph 124 page xlix (Recommendation 9)

Recommendation

3.24 We recommend that the Government should commission research in this country on all aspects of risk to human health to which US, Swedish and German research has drawn attention, with a view to establishing whether similar risks exist in this country.

Response

3.25 Within the UK it has been demonstrated that the clear-cut acute effects of air pollution on health linked with the former high concentrations of smoke and sulphur dioxide in towns have been eliminated, principally by actions taken under the Clean Air Acts. There are other pollutants in urban atmospheres, derived from both stationary and

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6) Report LR 348(AP), 1980.

mobile sources, that could adversely affect health, at relatively high concentrations, but present ambient concentrations are not such as to suggest the likelihood of significant effects (7). Thus NO_2 concentrations in the UK do not exceed the World Health Organisation (WHO) guidelines, although there may be isolated exceptions. It is not therefore considered that NO_2 levels in the UK represent a significant environmental health risk (8). The Committee refer to other statements concerning possible health effects arising from air pollution (para 122 p xlix). A preliminary report on a desk study by the WHO European Office on the health effects associated with acid rain was presented at the second meeting of the Executive Body of the UNECE Convention, and further examination of these matters has been remitted to WHO. The Government will consider its own position further in the light of the results.

3.26 Dissolved lead from plumbing systems can be a problem in areas of the country where there are acidic soft waters. The reason for the acidity of these waters is that they originate from naturally acidic peat-covered uplands. Generally treatment of such waters with lime to reduce the acidity reduces the problem, although in particularly difficult cases replacement of lead plumbing may be required. Government action on the wider lead problem is set out in its response to the Ninth Report of the Royal Commission on Environmental Pollution (9). Copper is considered to have relatively little health effect and the EC Directive on drinking water (80/778/EEC) recommends that up to 3000 microgrammes per litre can be tolerated. In contrast, the same Directive recommends a limit of 50 microgrammes per litre for lead.

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7) S. Chinn, C. du V. Florey, I. G. Baldwin, and M. Gorgol, The relation of mortality in England and Wales 1969-73 to measurements of air pollution. J. Epidem. Community Health, 1981, 35, 174-179; R. E. Waller, Control of air pollution: present success and future prospect. In Recent Advances in Community Medicine, Edit., A. E. Bennett pp 59-72. Churchill Livingstone, Edinburgh, 1978.

8) A memorandum on the effect of NO_2 on human health was presented by the Chief Medical Officer of DHSS to the enquiry of the House of Lords Select Committee on the European Communities on Air Pollution - 22nd Report, pp 190-191 June 1984.

9) Lead in the Environment. Pollution Paper no 19 (1983). HMSO.

3.27 Data reported in the 1973 MAFF Food Survey showed that levels of mercury in freshwater fish (0.09 and 0.03 ppm respectively for brown and rainbow trout) were considerably lower than in marine fish and well within safety levels. Pike were an exception in having rather higher mercury levels (0.52 ppm), but this is considered to be a function primarily of their long life and predatory feeding habits, rather than a consequence of habitat acidification. Although pike is occasionally eaten in this country, it is not a sufficiently important element of diet to be a significant source of mercury to UK consumers. It is recognised that this monitoring was not specifically aimed at fish originating from acidic waters, although doubtless fish from such sources were included in the sample. The Government will initiate a limited programme to determine mercury levels in fish originating from acid waters on catchments naturally rich in heavy metals.

Paragraph 134 page lv (recommendation 10)

Recommendation

3.28 We recommend that a rural network of monitoring stations at different altitudes over the whole country be set up.

Response

3.29 The Government agrees that monitoring of air pollution in rural areas is essential.

3.30 There already exists a network of sites over the whole country to monitor atmospheric levels of sulphur.

3.31 The recently published report of the UK Review Group on Acid Deposition (the Warren Spring Laboratory Report to which the Select Committee refer) recommends that more sites be established to monitor both wet and dry acid deposition in rural areas of the UK to provide proper coverage of the whole country. The report also identifies the need for more monitoring sites at different altitudes. The Government has already accepted the recommendations of the Review Group and is taking steps to implement them.

3.32 As to NOx and O_3 the Royal Commission on Environmental Pollution in its tenth report proposed extension of the monitoring network for these pollutants, and the Government intends to extend the network in accordance with that recommendation by 1986. The need both to cover the whole country and to monitor at different altitudes will be taken into account in designing the new network.

3.33 In addition to these measures (and as stated in paragraph 3.16), the Government intends to have in place by 1985 a primary network of nine well instrumented sites in remote areas providing national background levels for a range of air pollutants and reporting to the EMEP.

3.34 Finally the Meteorological Office and DOE are funding research which will lead to the development of mathematical models capable of predicting variation of precipitation with altitude over mountainous areas.

Paragraph 141, page lvii (recommendation 11)

Recommendation

3.35 We recommend that greater impetus be given to the perfection of PFBC technology for commercial use.

Response

3.36 The Government agrees with the Committee that pressurised fluidised bed combustion (pfbc) technology offers excellent prospects for emission control at relatively low costs. It is for this reason that the Department of Energy is contributing to the joint CEGB/ National Coal Board (NCB) design studies for a full-scale generating plant based on pfbc. Decisions on the expansion of work on this promising process will be a matter for the two industries in the light of these design studies and in the light of the £25m two-year joint development programme at the pfbc experimental facility at Grimethorpe which the two Boards recently announced.

Paragraph 145, page lviii (recommendation 12)

Recommendation

3.37 We recommend that the necessary resources be devoted to fgd by the CEGB, not least in order to reduce its cost.

Response

3.38 This is a matter in the first place for the commercial judgement of the CEGB which, in accordance with the polluter pays principle, would have to meet the costs of any environmental controls with which it was required to comply. The Board's task is to prepare itself to meet any such controls, using means which are economically feasible and technically adaptable. To this end, the Board maintains a substantial programme of evaluation of the various fgd systems which have been developed, especially in Japan and the USA, and which have been in commercial use for some years. These systems are available "off the shelf" and their costs are governed by normal commercial considerations. The Lodge Cottrell process referred to by the Committee is still being evaluated by the Board. The Board has made it clear that, if it becomes necessary to install fgd, the equipment would be manufactured in the UK irrespective of the system chosen.

Paragraph 146, page lviii (recommendation 12A)

Recommendation

3.39 We recommend that further encouragement be given to the development of British technology both through NCB and CEGB research and through grants towards development costs by the Department of Trade and Industry.

Response

3.40 The Government agrees that the development of British technology should be encouraged. Development work by the NCB and CEGB is directed towards the efficiency and competitiveness of their operations and to this end both Boards have in hand work which is relevant to the

control of emissions. The experimental pfbc facilitity at Grimethorpe has already been mentioned. In addition, the CEGB has work in hand on a pilot installation of a chloride prescrubber which is necessary for UK coals if the flue gases are to be cleaned. Jointly with the NCB, it is studying a number of coal cleaning techniques including their optimum use in conjunction with FGD. It is also undertaking work on coal/water mixes as power station fuel (as a substitute for fuel oils).

3.41 The Government itself recognises both new low-pollution combustion techniques and emission control technologies as worthwhile areas for sponsorship. It is important that UK industry should run with the leaders in this field. The Government has provided financial assistance to a number of companies in the past and is willing to consider any new application. DOE is currently considering possible research support in relation to a test fluid combustion bed.

Paragraph 154, page lx (recommendation 13)

Recommendation

3.42 We recommend that any programme to limit NOx and hydrocarbon emissions from motor vehicles should be based on lean-burn technology.

Paragraph 198, (last sentence), page lxxii (recommendation 17A)

Recommendation

3.43 We recommend that new motor vehicles be required to have reduced NOx emission levels by 40% by 1.1.87 and that the Department of Transport should inquire into the best possible means of reducing emissions from existing motor vehicles.

Response

3.44 The Government accept that new standards for emissions controls should be achievable by lean-burn technology. Vehicle emissions in the European Community are governed by a Council directive which was amended in June 1983 so as to reduce HC and NOx emissions by about 30% for all new cars from 1 October 1986. Discussion has already started

in Brussels on a further amendment to this directive, to become operative between 1989 and 1991. The UK is arguing that emission standards for the end of this decade should be set at levels achievable with lean-burn technology. The potential exists for a further reduction of 25% in combined HC + NOx and 40% in NOx alone within this time scale. Subject to Community agreement therefore, a 40% reduction in NOx levels can be achieved. Some models of vehicles with lean-burn engines and lower NOx emissions can be expected to appear on the UK market from next year onwards. But we do not believe that the standards under discussion could be imposed on all new vehicles as early as the beginning of 1987. The process of development and setting up production over the whole model range, and type approval by Department of Transport and other authorities, can be expected to take four to five years from the agreement of the standard in a Council directive.

3.45 It is not clear what the Committee had in mind in recommending that the Department of Transport should enquire into the best possible means of reducing emissions from existing vehicles. The fact is that it is impracticable to use retrospective modification of existing vehicle engines to influence their gaseous emissions. Studies of NOx emissions from existing vehicles in service have shown that they are generally well within the relevant standards to which they were manufactured and approved. Although NOx emissions do not tend to increase with vehicle age, they do increase at high speeds. So possible means of reducing emissions from existing motor vehicles would, therefore, be the better enforcement of the 70 mile per hour speed limit, or some lower limit. Since high-speed motoring is a small proportion of UK total car mileage, however, the potential reduction in total NOx emissions is very small. And, of course, such a proposal would raise much wider issues than the effect on air pollution.

Paragraph 171, page lxvi (recommendation 14)

Recommendation

3.46 We recommend that those industries reliant on high combustion temperatures, for example the cement and glass industries, should not have NOx controls put upon them.

Response

3.47 The Government agrees that in industries where, in the judgement of the Industrial Air Pollution Inspectorate and equivalent Inspectorates in Scotland and Northern Ireland (the Inspectorates) NOx controls would not constitute best practicable means, such controls should not be required.

Paragraph 172, page lxvi (recommendation 15)

Recommendation

3.48 We recommend that the UK should follow what is known as the "bubble approach": it should, in agreement with its EEC partners, agree an overall level of reduction. Each member country should determine how to achieve that. We recommend that existing, small industrial plant should be excluded from emission controls. All new plants should meet SO_2 emission levels contained in the draft Directive, and all those not reliant upon high combustion temperatures should meet the NOx levels.

Paragraph 195, page lxxii (not recorded in the conclusions as a recommendation)

Recommendation

3.49 We recommend that within whatever national levels (of emissions) are agreed each Government should be free to decide how to achieve the necessary reduction.

Paragraph 196, page lxxii (recommendation 17)

Recommendation

3.50 We recommend -

(a) that the United Kingdom join the 30 per cent club immediately, and that this target be achieved by the CEGB being required to reduce its emissions accordingly;

(b) that in the medium term as power stations come to be refitted the CEGB should be required to install equipment to attain the overall national reduction of 60 per cent in accordance with the EEC draft directive, that is, by the end of 1995.

Paragraph 197, page lxxii (recommendation 15)

Recommendation

3.51 Insofar as industry is concerned, we are aware that for some the high costs of meeting control standards may render them uncompetitive, and for others, even if cost is not of major consideration, it would be impractical to install control technology. Accordingly, we recommend that:

(1) EC emission control levels for SO_2 should apply to all new industrial plant over 50 MW from 1.1.89;

(2) For all existing plants the stringent application of "best practicable means" by the Air Pollution Inspectorate should continue;

(3) The Government should give assistancce to industry to convert existing plant to meet SO_2 control standards.

Paragraph 198 (except for last sentence), page lxxii (recommendation 17A)

Recommendation

3.52 We recommend, consistent with best practicable means, that all power stations should have low NOx burners installed during routine shut-downs. With the exception of those industries totally dependent on high combustion temperatures, which we feel should continue to explore other means of reducing their NOx emissions, we recommend that all industrial users be required to fit low NOx burners. We recommend that Government give assistance to industry to install low NOx burners in existing plants.

Response

3.53 The recommendations in these paragraphs are closely interrelated. The question addressed is that of reduction of SO_2 and NOx emissions from industrial combustion plants and the manner in which such a reduction might be achieved.

3.54 The present position in the UK is that industrial operators are controlled by the Inspectorates, which have required the use of the best practicable means to prevent emissions to their satisfaction. Judgement of what is practicable has taken account of the environmental effect of the emission concerned and of technical and economic feasibility of control. If the Inspectorates judge that it is not practicable to abate certain emissions at source, other steps have to be taken to render them harmless. The Inspectorates have accordingly required the abatement of dust emissions from power stations by the best practicable means, but have judged that abatement of SO_2 and NOx emissions is not practicable because of the high costs involved. Operators have therefore been required to construct stacks sufficiently high to ensure that those emissions are dispersed and diluted in the air to reduce ground level concentrations of the gases to the minimum.

3.55 Emissions from other industrial combustion plants are controlled by local authorities under the provisions of Clean Air legislation. The effect of this legislation is much the same as that achieved by the Inspectorates under Health and Safety at Work legislation; grit and dust emissions are abated, and SO_2 and NOx emissions are dispersed from chimneys.

3.56 Dispersal of SO_2 and NOx emissions has been widely practised by Western industrial nations for many years. However, in recent years an increasing number of countries have required the abatement of these emissions at source. For the most part these requirements apply to new plant only but, in the Federal Republic of Germany in particular, there is now legislation requiring SO_2 and NOx abatement technologies to be fitted to existing combustion plants.

3.57 Recognition of the involvement of SO_2 and NO_x in long-range transboundary air pollution, and therefore the interdependence of countries in seeking a reduction in deposited acidity, led directly to the UNECE Convention and to the commitment by a number of countries to reduce their total annual national SO_2 emissions by 30% by 1993 on the basis of total emissions in 1980. This approach - viewing each country's emissions as a whole and setting a reduction target to be achieved in ways of countries' own choosing - is referred to by the Select Committee as "the bubble approach", a term derived from an administative mechanism devised in the USA for reducing emissions within defined areas. As recorded in Chapter II, the "30% club" of countries are pressing others within the UNECE region (Europe, Canada and the USA) to make a similar commitment, and negotiations are under way within the framework of the Convention to prepare a specific agreement on reduction of SO_2 emissions. The UK is participating in these negotiations.

3.58 The European Community draft Directive referred to has been passed by the Commission to the Council. It would require limitation of emissions from large combustion plants above 50 MW rated thermal output. This category of plant includes all power stations together with the largest industrial combustion plants in refineries, chemical factories etc. In the UK these plants give rise to some 80% of total SO_2 and 50% of total NOx emissions. The draft Directive contains two main provisions:

(i) that total annual national emissions of SO_2, NOx and dust from the category of plant in question should be reduced by 60%, 40% and 40% respectively by 1995 using 1980 annual emissions as the base, and

(ii) that all new plants of the category described should be subject to limits on emissions of SO_2, NOx and dust which would, in the UK, require the introduction of abatement equipment for SO_2 and NOx as well as for dust.

This proposal is now under negotiation between member states.

3.59 Against this background, the Select Committee recommends:

(i) that the UK should subscribe to the principle of the bubble approach, that is, to the principle of overall national reductions in emissions in agreement with EEC partners (paragraphs 172 and 195)

(ii) that in respect of SO_2 emissions:

(a) the UK should join the 30% club and should agree to the reduction in SO_2 emissions from large plants as proposed in the EC Directive, both targets being met by the application of controls to existing CEGB power stations alone (paragraph 196)

(b) all new power stations should meet the SO_2 emission limits proposed in the proposed EC Directive (paragraph 172)

(c) the requirement to use best practicable means in relation to SO_2 emissions from existing industrial combustion plants other than CEGB power stations should be stringently applied (paragraph 197(2)) and the Government should assist industry to introduce SO_2 controls in existing plant (paragraph 197(3)). Existing small industrial plants however should be excluded from emission controls (paragraph 172)

(d) emission limits for SO_2 as proposed in the draft EC Directive should be applied to all new industrial plants other than power stations of more than 50 MW thermal output with effect from 1.1.89. (Paragraphs 172 and 197(1))

(iii) that in respect of NOx emissions:

(a) control of NOx emissions should be introduced to all existing power stations consistent with the best practicable means possible (paragraph 198)

(b) all new power stations should meet the NOx emission limits proposed in the draft EC Directive (paragraph 172)

(c) all existing industrial combustion plants other than power stations with the exception of those dependent on high temperatures should be required to introduce NOx controls and the Government should provide assistance to industry to this end (paragraph 198)

(d) emission limits for NOx as proposed in the draft EC Directive should be applied to all new industrial plants other than power stations except for those plants dependent on high temperatures (paragraph 172)

3.60 The comments which follow are without prejudice to the negotiations in which the Government is now engaged both in the European Community and in the UN/ECE.

SO_2 emissions

3.61 Consideration of the case for reduction of SO_2 emissions has to have regard to the scientific, technological and economic position. The Government's view of the scientific position is outlined in Chapter II of this response.

3.62 The arbitrary choice of 1980 as a base year masks the UK's achievements in the previous decade. UK SO_2 emissions declined by 23% from the peak year of 1970 when total emissions amounted to 6.09m tonnes, to 4.7m tonnes in 1980. In 1983 emissions amounted to 3.72m tonnes, representing a cumulative reduction of nearly 40% since 1970. This reduction has been due to a number of factors such as fuel substitution, energy conservation and industrial restructuring, which may continue to influence emission patterns over the next 15-20 years. It is reasonable to assume that much of this reduction will not be reversed as a consequence of continued industrial growth. However, the future pattern of industrial structure and energy use is not easy to predict, making it difficult in turn to estimate what further effort and investment might be required in order to be certain of achieving the targets set by the "30% club".

3.63 The substantial costs of meeting the draft EC Directive have already been mentioned (paragraph 2.27): some £1.5 billion for power stations alone. This represents the costs of installing FGD at some

ten major power stations at a capital cost and an annual operating cost of £150m and £35m respectively for each station. This would add some 5% to electricity bills. Joining the 30% club could require relatively little action to abate emissions if the trends in recent years (paragraph 2.21) continue. But stronger growth in electricity demand could reverse these trends and could entail the installation of FGD at a number of power stations involving expenditure of several hundred million pounds. Control costs for industrial plants would be even higher in relation to the emissions abated.

3.64 The Committee's recommendation that a 60% reduction in emissions from large plants should be accomplished by 1995 by controls on CEGB power stations alone would be particularly onerous. Even on the assumption that power generation remained at the level of the past few years, achievement of the 60% target would require retrofitting of controls to many more than the 10 major stations mentioned above. These would inevitably include a number of older stations with a short remaining life and low load factors, substantially increasing the costs of such a programme and extending it well beyond 1995.

3.65 The Government will continue to keep under review projections of likely future emission levels. It also believes that there are good prospects that new and better combustion technologies which will lead to reductions in SO_2 emissions will be developed as a consequence of research now in hand or foreseen. In these circumstances the Government does not intend to commit the country to expensive emission controls, especially when there is uncertainty about the environmental benefits to be achieved in this country and in continental Europe. The Government intends to achieve further reductions in national SO_2 emissions, aiming at a reduction of 30% from 1980 levels by the end of the 1990s.

3.66 When the time comes to build new fossil-fuelled power station plant, it will be for decision what should be regarded as the best practicable means for preventing or rendering harmless SO_2 emissions in the light of technical developments and other factors at the time but this decision cannot be prejudged.

NOx emissions

3.67 Emissions of NOx are far more difficult to estimate than SO_2 emissions, since combustion temperature as well as quantity of fuel influences the level of emissions. Best estimates are that industrial emissions have declined over the past 15 years although not to the same extent as SO_2 emissions; this decline has been offset by increased vehicle emissions. Low NOx burner technology does appear to have potential for reducing emission levels, but is not yet available in a form suitable for most UK power station boilers. The CEGB research in this field is well advanced and the Board expects to start field trials of a new design soon, possibly in 1986. But despite promising research, in which the CEGB is taking a leading role, the technology has yet to be fully developed for use in UK conditions and with UK fuels; nor are the economics established.

3.68 It is therefore not yet possible to judge whether low NOx burners could become the best practicable means of control, as the Committee recommend. In consequence, it would not be sensible to set a target or timetable for emission reductions from existing plants, or emission limits on new plants, and there could be no question of the Government assisting industry to convert existing plants. That would be contrary to the polluter pays principle, and the Government rejects it here as for other emissions. However, economically feasible technology to reduce NOx emissions from vehicles is further advanced. Against this background, the Government intend to achieve further reductions in national nitrogen oxide emissions from motor vehicles aiming again at a reduction of 30 per cent of the 1980 levels by the end of the 1990s.

Paragraph 185 page lxix (Recommendation 16)

Recommendation

3.69 We recommend that in any review of the desirability of combined heat and power/district heating, full account should also be taken of the pollution aspects highlighted by our report.

Response

3.70 The Government is taking account of the potential for energy efficiency of the use of combined heat and power technology. A report by W S Atkins published in 1984 by the Department of Energy discussed the possible national benefits of large scale combined heat and power technology. As a result of this report the Government has invited proposals from consortia led by the private sector for preparation of a prospectus for up to three UK city schemes. Full consideration will be given in this programme to minimising polluting emissions.

Paragraph 199 page lxxiii (Recommendation 18)

Recommendation

3.71 We recommend that the Government make a long-term commitment to air pollution research.

Response

3.72 The Government accepts that in the area of air pollution research there is need for long-term commitment. Its current and proposed research and monitoring programmes in air pollution (£2.5M for 1984/85 and (projected) £3.5M in 1985/86) provide an indication of the Government's resolve to continue these activities on a long-term basis. This will allow the impacts of variables such as changes in emissions, land management and forestry practice to be adequately measured and evaluated over sufficiently long time scales.

3.73 In making this commitment the Government also recognises the need for a well coordinated approach to air pollution research in the UK with adequate resources. Coordination is achieved through committees such as the NERC Committee on Air Pollution Effects Research, the DOE group on Acid Waters and Soils, the DOE UK Steering Group on Long Range Transport of Air Pollution and the NERC Coordinating Committee on Atmospheric Chemistry Research. Discussions are currently taking place with a view to setting up a similar DOE research coordinating committee on the effects of air pollution on materials, including historic buildings and cultural monuments.

Paragraph 200, page lxxiii (recommendation 19)

Recommendation

3.74 We recommend that the Government require the emitters of SO_2 and NOx from plants over 50 MW to monitor their emissions sources.

Response

3.75 Emissions of SO_2 over extended periods are readily calculated from the sulphur content of the fuel and knowledge of fuel consumption. With any one fuel, a sulphur dioxide monitor would merely reflect the output of the plant.

3.76 If equipment were fitted to remove sulphur during or after combustion then some form of sulphur dioxide monitor would be required to show that the plant is operating effectively.

3.77 The emission of NOx depends on the conditions of combustion of all fuels and also, in the case of coal, on the nitrogen content of the fuel itself. With pre-set combustion conditions such as low NOx burners and with any one particular fuel the concentration of NOx would not fluctuate greatly and would, in any case, be outside the control of the operator. There would therefore be little to be gained from the fitting of continuous NOx monitors which, in themselves, are expensive and require considerable maintenance.