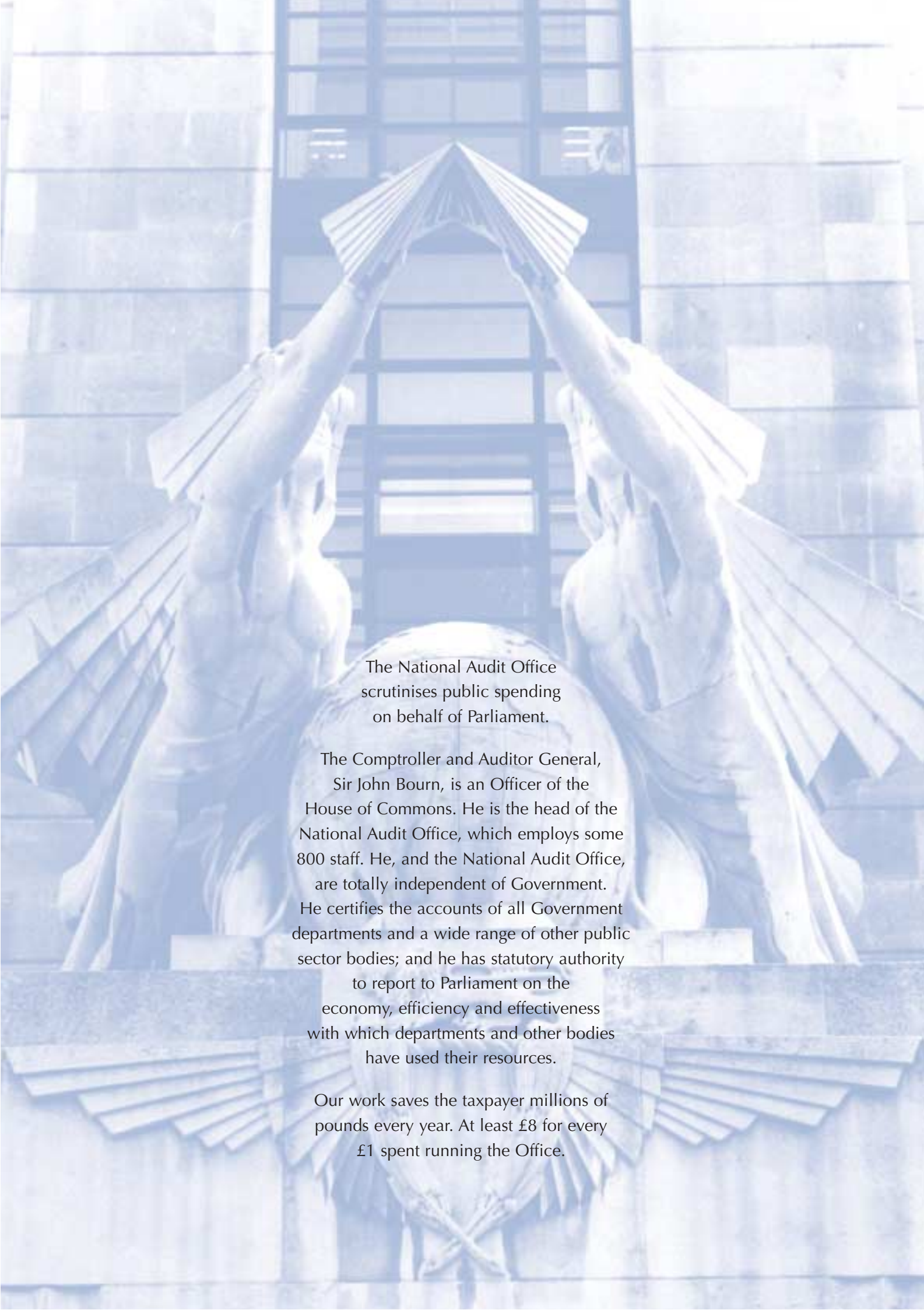


The UK Emissions Trading Scheme

A New Way to Combat Climate Change

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 517 Session 2003-2004: 21 April 2004





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The UK Emissions Trading Scheme

A New Way to Combat Climate Change



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John Bourn National Audit Office
Comptroller and Auditor General 01 April 2004

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executive summary

- 1 The UK is a signatory to the 1997 Kyoto Protocol, an international agreement to reduce emissions of greenhouse gases¹, which are believed to cause global warming. In addition, the UK Government aims to go beyond the reductions required under the Kyoto Protocol using a set of policy instruments, the UK Climate Change Programme (the Programme), to achieve this. The UK Emissions Trading Scheme (the Scheme) is part of the Programme. The Department for Environment, Food and Rural Affairs (the Department) manages the Programme and the Scheme.



- 2 The Scheme began with an auction in March 2002, in which companies and other organisations (known collectively as 'Direct Participants') bid emission reductions over the five years 2002 to 2006 in return for a share of £215 million incentive funding from the Department. From April 2002 the Direct Participants and other organisations could trade their emissions 'allowances' - the emissions allowed after the promised reductions. Each year, Direct Participants are issued with allowances equal to their target emissions for the year, and at the end of each year, each must hold enough allowances to cover its actual emissions for that year. A Direct Participant can choose to reduce its actual emissions below its target (releasing emissions allowances to sell to other companies or to save for use in future years), meet its target, or buy allowances to cover any emissions in excess of its target.

¹ Carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.


- 3 The Scheme aims to secure significant reductions in UK greenhouse gas emissions - 3.96 million tonnes² in 2006, or about 6 per cent of the 65.8 million tonnes reduction it was estimated that the policies and measures in the Climate Change Programme might deliver by 2010; to help UK firms to learn about emissions trading and prepare for international emissions trading; and to establish the City of London and the UK as an international centre for emissions trading. The Scheme should lower the cost to the UK of reducing emissions, compared to more traditional methods of regulation, because companies with lower-cost ways of making emissions reductions will tend to sell allowances to organisations facing higher costs. The Department also wanted the Scheme to influence the development of a European Union (hereafter referred to as 'European') emissions trading scheme due to be launched in 2005.
- 4 We examined the Scheme's origins (Part 1 of our report), its impact on emissions reductions (Part 2), and its wider benefits (Part 3). Our report is based on a range of methods, including consultation with participants and other stakeholders, examination of case studies involving four of the biggest Direct Participants, and an expert panel to advise us on our methods and findings. We were also assisted by specialist consultants. Our methods are set out in more detail in Appendix 1.

Key findings

- 5 The Department has successfully set up a novel and functioning emissions trading scheme, which has the potential to benefit the UK economy. Companies participating in the Scheme told us that they have gained greater understanding of how they can reduce emissions and practical experience of using the emissions market. Companies providing emissions trading services, such as brokerage and verification, have established themselves in the UK market and gained experience that places them in a strong position to gain further business as European and international emissions trading develop.
- 6 The UK Scheme has encouraged the development of the European scheme and influenced its design in some aspects. The experience gained in establishing the Scheme is helping both the Department and industry prepare for the launch of the European scheme in 2005. In addition, the Department is adapting the registry system for the UK Scheme, which records the numbers of allowances held by participants, for use in the European scheme and other trading schemes. The Department is collaborating with a number of European Union member states who have expressed interest in adopting the UK system for their own registries. Nonetheless, the overlapping timetables of the two schemes will bring complexities - there are fundamental differences between the schemes - and wider benefits to the UK and participants in the UK Scheme may be less than hoped for.
- 7 The Department had to work hard to attract enough Direct Participants, but eventually secured more than enough (34) to make the auction viable, and the total amount of reductions committed was in line with predictions. More organisations may have taken part if given more time to prepare; this would most likely have resulted in more emissions reductions at a lower price, but the tight timescale was due to the need to gain the benefits of early emissions trading experience for the UK.

2 Throughout this report, 'tonnes' refers to emissions reductions or allowances measured in tonnes of carbon dioxide equivalent (tCO₂e) - the term is explained in Appendix 2.



- 
- 8** Based on expert advice, the Department used a 'descending clock' method for the auction (explained in Appendix 3). Bidders were limited to receiving no more than 20 per cent of the total budget, in order to prevent one company receiving a disproportionate share and to allow sufficient numbers to enter the Scheme. This limit reduced the quantity of reductions that could be purchased to some extent, but otherwise the Department's method of conducting the auction was an effective way of maximising the quantity of reductions bought from the bidders for the Department's budget of £215 million. A different approach to the auction, for example a 'sealed-bid' system (in which bidders offer to make reductions at a range of different prices), rather than the 'descending clock' method which was used, might have given the Department the option of securing slightly fewer emissions reductions at a much lower price. However, the Department was concerned that this approach might have discouraged some Direct Participants from joining the auction and that a more open auction format would encourage Participants to bid more strongly than a sealed-bid format.
- 9** Each Direct Participant's targets for making reductions were set by reference to a 'baseline', calculated from emissions in the three years 1998 to 2000 (either as a simple average or an adjusted figure, retrospectively taking account of any regulatory limits on emissions applying at the start of the Scheme in 2002). The auction resulted in promised reductions from baseline of 4.03 million tonnes in 2006, (reduced to 3.96 million tonnes after three Direct Participants dropped out of the Scheme), with targets for the years 2002 to 2005 increasing by 20 per cent a year towards the 2006 total. Taking into account the need to meet the targets for 2002 to 2005 as well as 2006, over the five years Direct Participants will be required to deliver reductions from baseline totalling 11.88 million tonnes, at a price of £17.79 a tonne.
- 10** Companies' performance against their targets is measured and verified annually.³ In the Scheme's first year (2002), Direct Participants (those receiving incentive payments under the Scheme) reported reductions of 4.64 million tonnes compared to targets for that year totalling 0.79 million tonnes; an excess of 3.85 million tonnes (487 per cent). These reported reductions in the first year even exceeded the required target for 2006, 3.96 million tonnes, by 0.68 million tonnes or 17 per cent. Because participants can sell excess allowances or save them for later use, the ultimate impact of Direct Participants' 2002 performance on reported reductions will be less than 4.64 million tonnes. At present it is not possible to say by how much, but it does appear that the reported reductions for 2002 may overstate the impact of the Scheme to date.
- 11** In some cases, Direct Participants' levels of emissions in the years immediately before the start of the Scheme were substantially below their baselines. The result of this was that for some Direct Participants, their targets to reduce emissions had been achieved even before the Scheme came into operation. Potentially, these Direct Participants could receive incentive payments merely for continuing their operations at the same level, rather than accepting them in return for additional efforts to meet reduction targets.

³ Companies' baselines (see paragraph 9) were also verified in the first year of the Scheme.

- 12 However, our consultants' research into four cases has established that the companies have in practice made significant additional efforts to cut emissions, and they report that incentive payments are helping to pay for emissions reductions. These four Direct Participants were selected because in the first year of the Scheme they had reduced emissions beyond their targets by the greatest extent. They are not typical of the Direct Participants as a whole. However, between them they account for more than 50 per cent of the incentive funding, and they are therefore significant in their own right.
- 13 The additional measures taken by these Direct Participants, often funded by the incentive payments, have had the effect of taking them well beyond their Scheme targets. In 2002 their emissions were 3.78 million tonnes below their baselines, nine times the target of 0.42 million tonnes. According to our consultants' estimates, approximately 66 per cent (2.49 million tonnes) of the reductions reported by these four companies for 2002 is attributable to the Scheme; while an estimated 34 per cent (1.28 million tonnes) is not. The value of this 34 per cent cannot be calculated precisely, since tighter baseline rules would have been likely to affect participation in the Scheme, and thus alter the value of allowances held and the incentive payments received. The value is likely to lie in the range £2.8 million to £9.8 million. However, the Department felt unable to set more demanding baselines as the Scheme needed to be based on even-handed application of general principles, and to allow some 'credit for early action' for participants who had reduced significantly their emissions before the Scheme's launch.



- 14 Many of the issues identified above (the difficulty in attracting participants, the limitations of the auction design and undemanding targets) stem from the voluntary nature of the Scheme and the consequent need for an incentive payment. In a mandatory trading scheme, these issues either would not occur or, in the case of target-setting, would not give rise to an incentive payment. At the time the Scheme was developed, however, the Department felt it could not launch a mandatory Scheme and considered that the wider benefits of early experience of emissions trading were more likely to be achieved through a voluntary scheme.



Conclusion

- 15 The Scheme is a pioneering initiative. Innovation in policy-making carries risks, and the issues identified above have resulted, at least in part, from the development of policy in a completely new area. And these issues must also be put against the significant achievements of the Scheme, not least in setting up a well-functioning emissions trading system and encouraging participants to identify emissions reductions and make them available to others. A key aim of the Scheme has been 'learning-by-doing' and it is important that the Department makes the most of its opportunity to learn from the experience of the Scheme in further developing this Scheme, in continuing to influence the European emissions trading scheme and in designing other trading schemes planned in the environmental area.

RECOMMENDATIONS

Existing UK and developing European emissions trading schemes

16 The Department should:

- 1 **In the existing UK Scheme, where some Direct Participants have gained unduly from the way in which baselines were set, further consider ways of improving the value obtained from the payment of incentives**, for example by agreeing with these participants further emissions reductions and/or voluntary limits on the sale of surplus allowances. The development of such agreements should be based on review by the Department of the factors contributing to key Direct Participants' emissions reductions, including the results of the Scheme's second year (2003). The Department has been looking at the scope to address this issue since the results of the first year became available.
- 2 **In implementing the European Scheme, continue to press for UK companies to retain as much benefit as possible from their experience in the UK Scheme and for elements of the UK Scheme to be adopted by other member states.** One of the aims of the Scheme was to benefit the UK economy by enabling UK-based service providers such as brokers, verifiers and consultants to win business at home and abroad. The Department should use its influence to ensure that barriers to these companies' expansion into the European Scheme are removed: for example, by ensuring that verifiers in the European Scheme are accredited to the same standards as in the UK Scheme. The Department should continue to collaborate with other member states to help them establish emissions trading registries based on the UK system.

The Department is currently planning to develop trading schemes for waste and for sulphur dioxide. For these and any other future trading scheme, the Department should:

- 3 **Take early advice from technical experts on the industries concerned, when designing the rules for new schemes.** The UK Scheme aimed to operate an open, consistent and simple set of rules. However, applying this approach across a range of participants resulted in some companies benefiting unduly and unexpectedly. More extensive consultation at an earlier stage with the Environment Agency, with its knowledge of prospective participants' operations and of the basis for setting regulatory limits, might have helped the Department better understand the likely impact of its proposed rules, and improve their design accordingly.
- 4 **Develop the way it uses any other regulatory requirements on scheme participants, based on experience from the UK Scheme.** In general, the baseline figures for the Direct Participants were calculated as an average of their emissions for the years 1998-2000 inclusive. However, where Direct Participants' emissions in any of these years were higher than the regulatory limit applying at the start of the Scheme in 2002, the regulatory limit was substituted for the actual emissions in the relevant year in the calculation. Although such limits define maximum rather than likely typical levels of future emissions, this had the positive effect of lowering these Direct Participants' baselines. Given the tight timescale, the Department had little alternative but to use these regulatory limits on this occasion. In future it should provide itself with scope to set baselines based on an assessment of likely average emissions, rather than on the regulatory limit, and involve the regulator (principally the Environment Agency in this case) in the design of the Scheme, as in recommendation 3 above.
- 5 **Fully inform participants about plans to introduce trading and provide enough time for them to prepare.** Companies can only take advantage of trading schemes if they fully understand the concepts, their relevance and how to participate effectively. Innovative policies such as trading require extensive publicity and education, particularly directed towards smaller companies. The Department recognises the importance of effective publicity and is working closely with the Emissions Trading Group and industry Sector Associations in advance of the introduction of the European Scheme.
- 6 **Consider carefully the size of pilots used to test scheme design, especially where knowledge of the market is limited.** The auction was originally planned to be the first of three. One of its purposes was to act as a pilot, to improve the limited information about the emissions market and the costs of abatement. However, the auction may not have fully realised the potential level of participation and reductions available, despite large sums in incentives being committed. A smaller initial auction might have been sufficient to learn lessons, at a lower cost.

- 7 **Develop explicit plans to make the best possible use of the scheme to improve its information on, for example, the cost of measures to reduce emissions.** For example, a 'sealed-bid' system rather than the 'descending clock' method might have given the Department better information on which to decide how much to spend in the auction; while requiring Scheme participants to provide information on their costs could help inform policy development in the future. The Department was concerned that these measures might deter participation in the UK Scheme, which is voluntary, but in future mandatory schemes this will not be a problem.
- 8 **Continue to share the good practices developed by the Department's emissions trading team with other parts of the Department and other government departments.** The Department's emissions trading project team brought together policy, economic and legal specialists in an effective multi-disciplinary team to develop an innovative policy instrument. It also worked closely with business and the City and gained experience with a number of out-reach events to promote the Scheme. The Department has adopted a similar project management approach to its implementation of the European Scheme. The team should continue to disseminate the benefit of this experience more widely to their colleagues and those in other departments.
- 9 **Ensure that risk management procedures provide for sufficient challenge.** The Department used good techniques to identify and mitigate a number of risks to the development and implementation of the Scheme. However, these risks were predominantly operational, and did not include more fundamental and problematic issues, such as the major differences between the Scheme and the European Scheme that became apparent as the latter developed. The Department's risk management procedures should provide strong and independent challenge. Since the scheme was developed, more rigorous procedures for identifying and managing risk have been adopted across the Department.



Part 1

The UK Emissions Trading Scheme is an innovative programme to combat climate change

- 1.1 The UK is a signatory to the 1997 Kyoto Protocol, an international agreement to reduce emissions of greenhouse gases⁴, which are believed to cause global warming by trapping heat from the sun in the earth's atmosphere. In addition, the UK Government aims to go beyond the reductions required under the Kyoto Protocol (Appendix 2) using a set of policy instruments, the UK Climate Change Programme (the Programme), to achieve this. The UK Emissions Trading Scheme (the Scheme) is part of the Programme. The Department for Environment, Food and Rural Affairs (the Department) manages the Programme and the Scheme.
- 1.2 Six greenhouse gases (listed in Appendix 2) are regulated under the Kyoto Protocol. Carbon dioxide, the most well-known and significant of the six gases, is produced mainly by burning fossil fuels (oil, coal or gas). The other greenhouse gases result from various industrial processes, such as chemical manufacturing, and from other sources such as agriculture.
- 1.4 In contrast, the Scheme is an innovative example⁵ of the use of economic incentives to secure reductions in emissions. The Scheme has several direct aims:
- To secure a significant quantity of emissions reductions at a reasonable cost.
 - To give organisations early practical experience of participating in emissions trading, ahead of a European and international trading system.
 - To establish the City of London and the UK as a centre for emissions trading (encouraging emissions brokers and other service-providers, such as consultants, to develop business in the UK).
- A further important aim of the Department in establishing the Scheme was to influence the development of European Union action to meet the Kyoto targets, by showing that emissions trading was practical and demonstrating the UK's commitment to it.

The Scheme is a novel economic instrument

- 1.3 The Kyoto Protocol suggests a number of measures, including emissions trading, to reduce greenhouse gas emissions, but most signatory countries have yet to plan or implement trading schemes. The more traditional measures include those of 'command and control' environmental regulation, in which industry groups, individual organisations or individual industrial plants are set limits for emissions, and breaches of these limits result in penalties or other enforcement action, and taxation. In the UK conventional control over emissions is pursued mostly through the regulation of industrial pollution by the Environment Agency in England and Wales and its counterparts in Scotland and Northern Ireland.
- 1.5 There are two stages to the Scheme:
- **Auction:** To initiate the Scheme, the Department held an auction on 11-12 March 2002 and agreed to pay successful bidders incentives worth £215 million, over the five years 2002 to 2006, in exchange for delivering emissions reductions. Direct Participants could either enter the whole of their business into the Scheme, or just part, for example a particular factory. The auction led to promises to reduce total emissions by 4 million tonnes⁶, to be achieved in stages over the five years from 2002. This amount compares to total UK emissions in 1990 (the year against which progress is measured under the Kyoto Protocol) of 762 million tonnes, and is about 6 per cent of the total reductions projected under the UK Climate Change programme. The 34⁷ companies that took part in the auction are referred to as 'Direct Participants' in the Scheme. The mechanics of the auction are set out in Appendix 3.

⁴ Carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.

⁵ The other major example in the UK is the Climate Change Levy and associated Climate Change Agreements, described in paragraph 1.9 overleaf.

⁶ Measured in tonnes of carbon dioxide equivalent (tCO₂e) - the term is explained in Appendix 2.

⁷ 35 companies feature on the Department's list of successful participants, but two (Dalkia Utilities Services and Dalkia Energy) are the same organisation, bidding as two separate participants.

■ **Trading:** Following the auction, Direct Participants' commitments to reduce emissions were converted into an annual amount of emissions allowances (the emissions allowed after promised reductions), which can be traded with Direct Participants, with other eligible companies known as 'Agreement Participants' (paragraph 1.10 below), or with traders. At the end of each year, Direct Participants' actual emissions must match the amount of allowances they hold.

- 1.6 The economic logic behind the Scheme is that it should lead to emissions reductions being made by those companies that can deliver them most efficiently. Each company can decide its best strategy by comparing the market price of emissions allowances with the cost if it were to reduce its own emissions. In general, companies that can find lower-cost ways of making emissions reductions will tend to sell allowances to organisations that face higher costs. The overall effect will be to reduce the total cost of achieving any given level of emissions reductions. The wider the participation in the Scheme, the greater the cost reductions are likely to be.
- 1.7 A market in emissions can arise from mandatory reductions required by government, or from voluntary reduction agreements such as those resulting from the Scheme. By the late 1990s, when the Scheme was being developed, the UK was well on its way to meeting its Kyoto targets. It was believed, therefore, that there was little case for imposing further mandatory emissions reductions on industry and consumers, especially given the potential impacts on UK competitiveness of acting ahead of other countries. In addition, the Department considered that the wider benefits of early experience of emissions trading - in particular those for participating companies, but also the development of verification, broking, consultancy and other ancillary services - were more likely to be achieved through a voluntary rather than a mandatory scheme. It consequently decided to opt for a voluntary Emissions Trading Scheme, with incentive payments.

The Scheme is the first of its kind and extent in the world

- 1.8 The Scheme is the first greenhouse gas trading scheme in the world which allows many companies to participate. A pilot greenhouse gas trading scheme in Denmark, which operated between 2001 and 2003, was only open to eight electricity generators. There are established trading schemes in the United States of America for other types of emissions such as sulphur dioxide, one of the causes of 'acid rain'. The multinational oil and gas groups BP and Shell have operated their own in-house emissions trading schemes. Several national governments, including Canada, Japan and Norway, are currently developing proposals for domestic greenhouse gas trading systems. Appendix 4 describes these other trading schemes in more detail.
- 1.9 The Department decided to establish a trading scheme on the basis of a report⁸ published in 1998 by Lord Marshall on the use of economic instruments to combat climate change. The report recommended that both a trading scheme and a tax on energy use should be established.
- 1.10 The energy tax was implemented in the form of the Climate Change Levy, based on energy use, announced in the March 1999 Budget and implemented in April 2001. In the period preceding the introduction of the Levy, the government developed Climate Change Agreements to mitigate its impact on energy-intensive industry sectors. Under these Agreements, industry groups and their members contract with government for an 80 per cent reduction in the Levy in exchange for reductions in emissions. Nearly 6,000 companies in 46 industrial sectors participate in these Agreements, and can buy or sell in the emissions market to meet their targets. These companies are referred to as 'Agreement Participants' in the Scheme.

⁸ 'Economic Instruments and the Business Use of Energy', Government Task Force on the Industrial Use of Energy, October 1998.

1.11 The Government committed itself to encourage emissions trading in the March 2000 Budget and followed this by allocating initial funding in the Spending Review 2000. The Scheme was developed by government and business working closely together, primarily through the UK Emissions Trading Group. The Group was set up by two industry organisations (the Confederation of British Industry and the Advisory Council on Business and the Environment). Representatives of the Department, HM Treasury and the Department of Trade and Industry attended meetings. Appendix 5 sets out the membership of the Group, and the extent to which its members later took part in the Scheme. Some members of our advisory panel commented that this relationship could be perceived by outsiders as a case of government working too closely with big business, but the Department and the Emissions Trading Group told us that members felt that this was a new way of developing innovative policy which had been very effective. In developing the Scheme, the Department took account of expert advice, drawing on experience with other trading schemes (particularly in the United States), and commissioning consultants to model various aspects of the Scheme.

The Scheme has had some influence on the development of a Europe-wide scheme

1.12 In 2005 the European Union will implement an Emissions Trading Scheme. The European Scheme will be mandatory and will apply to every company with certain types of industrial operation, across the European Union. The Department believes, and the European Commission agrees, that the UK Scheme has been a key influence on the European Union's decision to use emissions trading rather than more traditional forms of regulation. The Environment Directorate of the European Commission told us that the UK's commitment, as a leading member of the European Union, to emissions trading had "given the debate a whole new dynamic" and facilitated the adoption of the Emissions Trading Directive.

1.13 Although the UK Scheme has influenced the development of the European Scheme, there are differences in design and timing complications which may give rise to integration difficulties. These are discussed more fully in Part 3 of this Report.



Part 2

The Scheme has achieved some emissions reductions

2.1 The UK Emissions Trading Scheme began with the auction in March 2002 of incentive funding in return for voluntary emissions reductions. Following the auction, the trading scheme itself was launched in April 2002. This Part examines the results of the first year of the Scheme, how targets were set for Direct Participants, and the expected overall effect of the Scheme on emissions, before going on to discuss the price secured in the auction and the Scheme's cost effectiveness compared to other policies.

The Scheme's results to date appear good

2.2 The auction resulted in 34⁹ Direct Participants undertaking to:

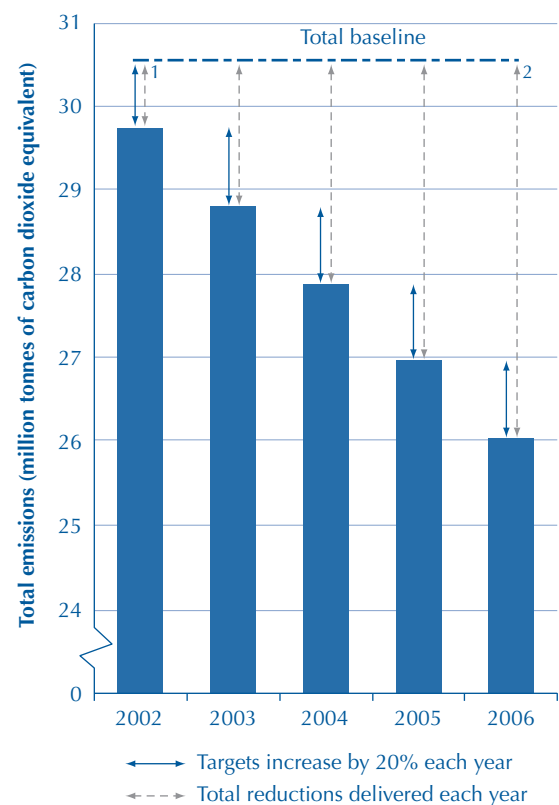
- deliver emissions reductions of 4.03 million tonnes in 2006 (later reduced to 3.96 million tonnes after three Direct Participants dropped out of the Scheme) for the activities that they entered into the Scheme; these reductions represent 13 per cent of "baseline" emissions for these activities (30.5 million tonnes);
- as interim steps towards the 2006 target, deliver annual reductions increasing by 20 per cent a year, starting in 2002 and ending with the 2006 target (**Figure 1**).

In all cases, Direct Participants can achieve their targets by reducing their own emissions or by buying emissions allowances in the market to cover any emissions in excess of their targets. Each Direct Participant will receive annual incentive payments of 20 per cent of its total payment if it meets its annual targets.

2.3 By the end of 2002, two of the smaller Direct Participants had withdrawn from the Scheme and a third withdrew during 2003. There were 31 remaining Direct Participants, with total targets to deliver emissions reductions of 3.96 million tonnes by 2006. Their total targets for 2002 were therefore one fifth of this amount, i.e. 0.79 million tonnes (Figure 1).

1 Direct Participants' total targets

Direct Participants need to deliver both their target for 2006, and targets for 2002 to 2005.



NOTES

- 1 2002 total target, 0.79 million tonnes (20% of 2006 target, 3.96 million tonnes).
- 2 Promised total reductions, 3.96 million tonnes.

Source: National Audit Office

9 35 companies feature on the Department's list of successful participants, but two (Dalkia Utilities Services and Dalkia Energy) are the same organisation, bidding as two separate participants.

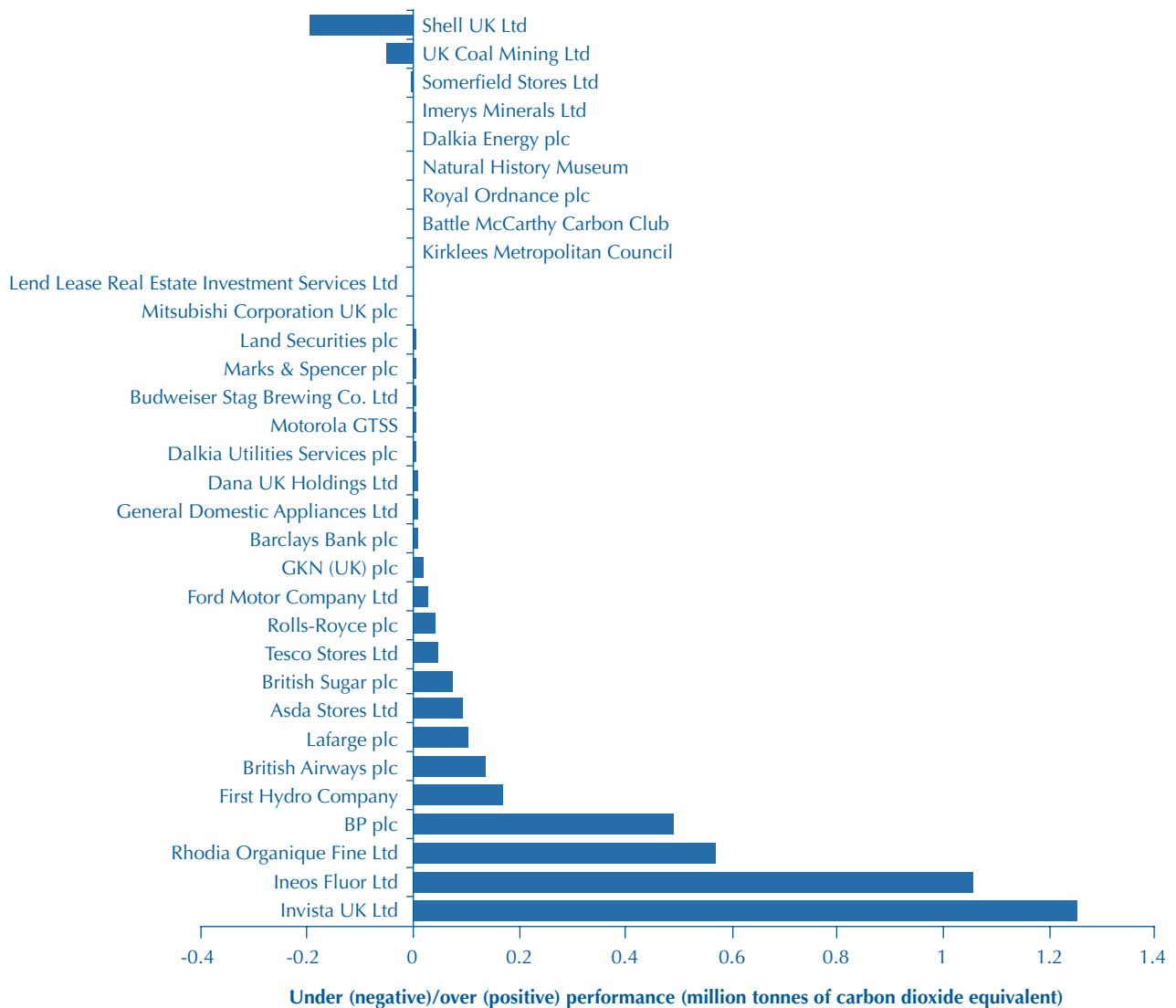
2.4 In the event, in 2002, the 31 remaining Direct Participants reported net total reductions in 2002 of 4.64 million tonnes compared to the 0.79 million tonnes target: an excess of 3.85 million tonnes or 487 per cent. 23 of the 31 remaining Direct Participants reduced their own emissions by as much as or more than their targets (Figure 2) and all of the others have been able to make good the shortfall by purchasing emissions allowances in the market. As a result, all 31 of the Direct Participants remaining in the Scheme complied with their targets for the first year of the Scheme, and they have now been paid incentives for 2002 totalling just under £43 million.

However, some emissions reduction targets may be undemanding

2.5 The payment of an incentive makes it particularly important that Direct Participants' targets are demanding, and that they are not rewarded for making emissions reductions they would have made anyway, for example in response to environmental regulation - a criticism that has been made of the Scheme in some Press reports. We therefore examined how the Department managed this risk, focusing on:

2 Direct Participants' performance in the first year of the Scheme

Most Direct Participants reduced their emissions by more than their targets.



NOTES

- Participants in the lower two thirds of the chart reduced their emissions by more than required by their targets; conversely, those in the top third reduced their emissions by less than their targets.
- The graph shows actual performance prior to the allowance purchases which under-performers made in order to meet their targets.

Source: National Audit Office/the Department's transaction log

- its processes for verifying Direct Participants' reported performance;
- how the baselines for measuring Direct Participants' reductions were set;
- how the Department sought to take into account the effect on Direct Participants' emissions of environmental regulation; and
- Direct Participants' action to reduce emissions in response to the Scheme.

closing or selling off part of their business - if this happens, the company's baseline and targets must be adjusted. We reviewed the application of these rules for a sample of two companies (chosen at random) and were satisfied that they had been applied appropriately.

In some key cases, emissions baselines were well above Direct Participants' emissions at the start of the Scheme

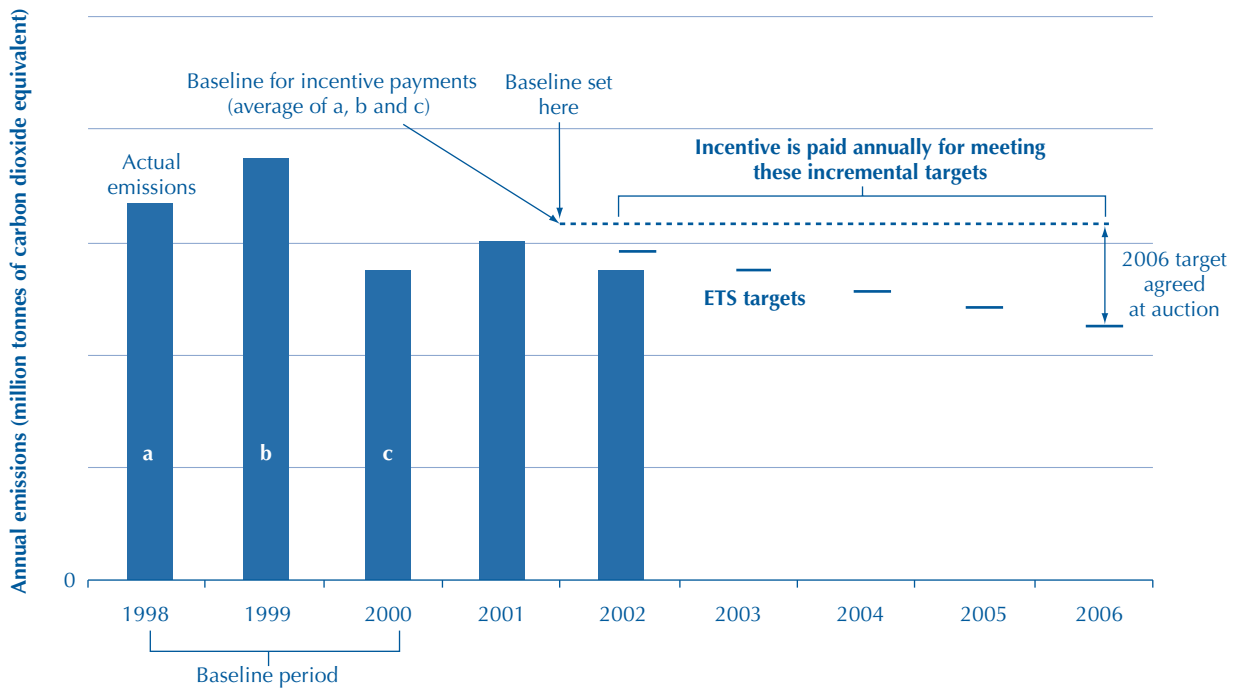
Participants' reported results have been carefully checked

2.6 Direct Participants' performance against their targets is checked by independent and accredited verifiers. Verifiers certify the accuracy of Direct Participants' emissions baselines and their reported emissions in each year of the Scheme. Verifiers must also ensure that Direct Participants' reports of their emissions are in accordance with the rules of the Scheme. For example, some rules are designed to ensure that Direct Participants cannot gain emissions allowances by simply

2.7 A fundamental part of the Scheme is the establishment for each Direct Participant of a baseline against which its subsequent emissions reductions are measured. The Department set a rule that baselines should normally be calculated as the average of the Participant's emissions¹⁰ over the years 1998-2000 (the 'baseline period') (Figure 3). The Department's rules for baseline-setting were tighter than those proposed by some industry representatives. The Department felt that using a three-year period was a reasonable approach that would normally ensure that companies were committing themselves to change their usual mode of operation and to make real efforts to reduce emissions.

3 Calculation of Direct Participants' baselines

For most Direct Participants, baselines were set as their average emissions from 1998 to 2000.



Source: National Audit Office/Scheme rules

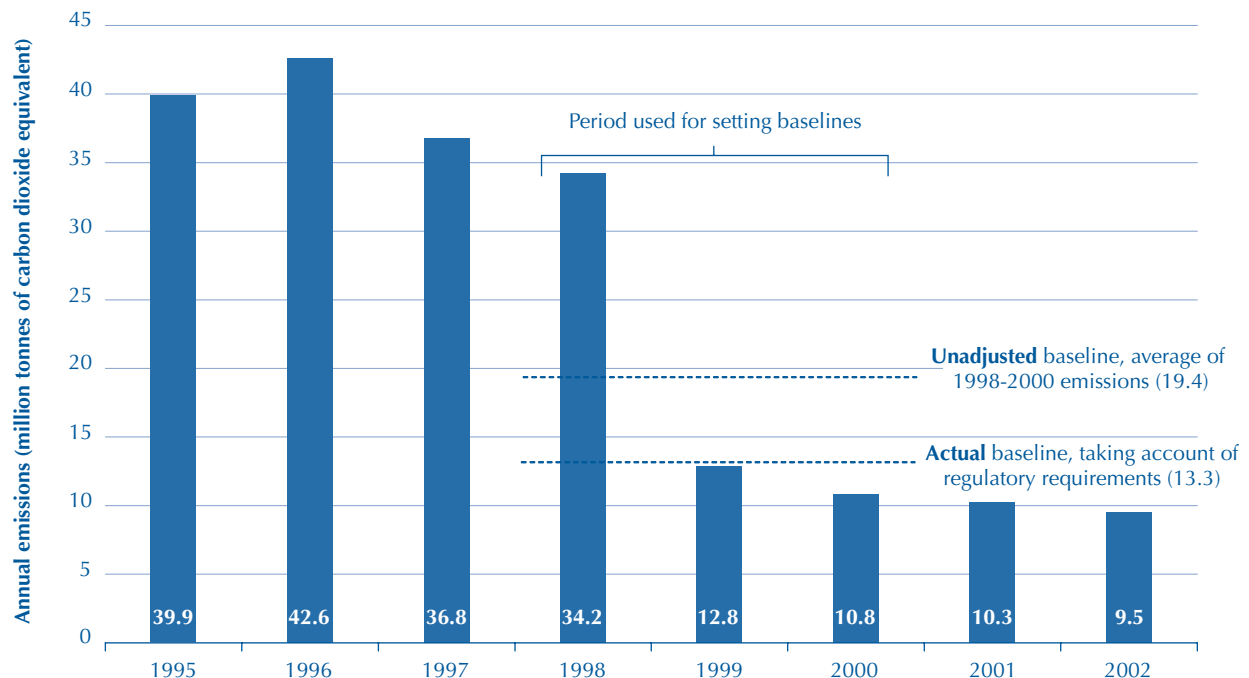
¹⁰ Not necessarily all their emissions - in line with the voluntary nature of the Scheme, companies were free to select which parts of their operations they wished to enter into the Scheme.

- 2.8 However, where a Participant has had steeply declining emissions during the baseline period, the application of this rule could mean that the baseline would be well above the company's normal level of emissions at the start of the Scheme. Such a Participant might then be able to score 'reductions' for the purposes of the Scheme without changing the level of its emissions at all.
- 2.9 To assess how emissions baselines were set and Direct Participants' responses to the Scheme, our consultants examined the four Direct Participants that achieved the biggest reductions in 2002.¹¹ For this reason, these four Direct Participants are not typical of all Direct Participants, but nonetheless they account for over half of the emissions reductions promised under the Scheme, totalling 2.1 million tonnes in 2006. If they achieve their annual targets over the whole of the life of the Scheme they will receive incentive payments totalling £111 million.

- 2.10 Emissions trends vary between the four Direct Participants analysed by our consultants, but the total emissions showed a decline before and during the baseline period (Figure 4). A major reason for this decline was that all four Participants had taken action in recent years to reduce their emissions, in response to environmental regulation¹² and/or in line with corporate policy, for example in two cases by means of capital investment in equipment to destroy greenhouse gases before they are emitted to the atmosphere.
- 2.11 The Department was aware in designing the Scheme that some Direct Participants had reduced their emissions during the baseline period in response to regulation and sought to take account of this in the rules of the Scheme. One of the Department's objectives for the Scheme was that it should bring about emissions reductions additional to those that would have resulted from 'business as usual'. Accordingly, where Participants' emissions were affected by regulation, the Department adopted the principle that Direct Participants should not benefit from reductions which they were legally obliged to make under a regulatory limit.

4 Total emissions of the four Direct Participants, for the activities participating in the UK Scheme, up to the first year of the scheme (2002)

There has been a sharp decline in the aggregated emissions of four of the largest Direct Participants in the years before the Scheme began.



NOTE

The four companies are BP, Invista UK (formerly known as DuPont (UK)), Ineos Fluor and Rhodia Organique Fine.

Source: Our consultants' analysis/National Audit Office

¹¹ BP, Invista UK (formerly known as DuPont (UK)), Ineos Fluor and Rhodia Organique Fine.

¹² Environment Agency regulation of emissions in the cases of Invista UK, Ineos Fluor and Rhodia Organique Fine, and Department of Trade and Industry regulations on gas flaring in the case of BP. Ineos Fluor and Invista emphasised to us that their emissions reductions were driven by corporate policy rather than regulation. BP commented that their emissions reductions were very much driven by the company's corporate policy to reduce emissions by 10 per cent from 1990 levels, including through the use of its own internal emissions trading scheme.

2.12 The Department considered the Direct Participants affected individually, and set rules to adjust baselines on the following basis:

- Baselines would continue to be calculated as an average of figures representing emissions in each of the years 1998 to 2000. However, the figures used would not always be the actual emissions in each year.
- For any one year in which a Direct Participant's emissions exceeded a relevant regulatory limit (one applying at the start of the Scheme, 1 January 2002), the figure used for that year in calculating the baseline would be the regulatory limit rather than actual emissions.
- For any one year in which the Direct Participant's emissions were below the regulatory limit, the figure used for that year would be the actual emissions.
- In one case, where the Environment Agency had not set a numerical regulatory limit but instead required the company (Rhodia) to make a series of operational improvements by 1 January 2000, the actual emissions for 2000 were used in place of the (higher) actual emissions in 1998 and 1999. The emissions limit was therefore the 'average' of the same figure (the 2000 emissions) for all three years.

2.13 The timetable for the development of the Scheme (Figure 5) meant that at the time the Department was developing these rules it did not have figures showing the likely effect of its rules on companies' baselines. This was because Direct Participants were not required to incur the expense of developing a verified baseline until they had taken part in the auction and committed themselves to deliver reductions. And at no time, then or since, have Direct Participants been required to provide the Department with details of their annual emissions prior to the Scheme's launch - the only requirement has been for them to provide a figure for their baseline, checked by an independent verifier. Some Direct Participants did supply this data, but the Department did not have full information on the likely effect of its rules on Direct Participants' baselines, apart from in the case of Invista, which disclosed its annual emissions figures for 1998 to 2000 during its negotiations with the Department.

2.14 Subsequent measurement of the four Direct Participants' emissions shows that the Department's adjustments to their baselines had the effect of lowering the total baselines of the four Direct Participants concerned from approximately 19.4 million tonnes (the simple average of 1998 to 2000 actual annual emissions) to 13.3 million tonnes, i.e. by 6.1 million tonnes (Figure 4). Even so, this total, 13.3 million tonnes, used as the

5 Timetable for baseline setting

Direct Participants depended on the publication of the Scheme rules to calculate their baselines.

| Scheme Stage | Date | Department | Participants |
|---|--------|---|--|
| Pre-registration period - Department marketing of Scheme and expressions of interest | Aug 01 | Framework document (general principles of entry including baseline-setting) and monitoring and reporting guidelines published | Prospective participants made aware of Scheme, consider their operations and whether to enter |
| | Sep 01 | Work to market the Scheme (continues into Jan 2002) | |
| | Oct 01 | | |
| | Nov 01 | | |
| | Dec 01 | Draft Scheme rules (including detailed baseline-setting rules) - 17 Dec | |
| Registration period for auction | Jan 02 | Auction programme published 30 Jan | 3-stage application: 1 Demonstrate eligibility 2 Submit Source List (including provisional baseline) for approval 3 Sign Direct Participant Agreement with Department |
| | Feb 02 | Finalised Scheme rules - 13 Feb | |
| | Mar 02 | Auction held 11-12 Mar | |
| Trading begins | Apr 02 | Registry operates (records transactions and number of allowances held by participants) | Able to trade allowances Baseline verified during remainder of 2002 |

Source: National Audit Office

baseline for the start of the Scheme in 2002, still exceeded their actual emissions in both 2000 and 2001, and in one case (Invista), also exceeded annual emissions in 1999 (Figure 6). The difference between the adjusted baseline and average actual emissions in 2000 and 2001 varied between 0.3 million tonnes a year (BP) and 1.3 million tonnes a year (Ineos Fluor). As a result, if these four Direct Participants' operations continue at the same level as in these years, only one of the four (BP) needs to reduce its emissions from the average of 2000 and 2001 in order to achieve its targets under the Scheme.

The Department felt unable to set more demanding baselines for Direct Participants

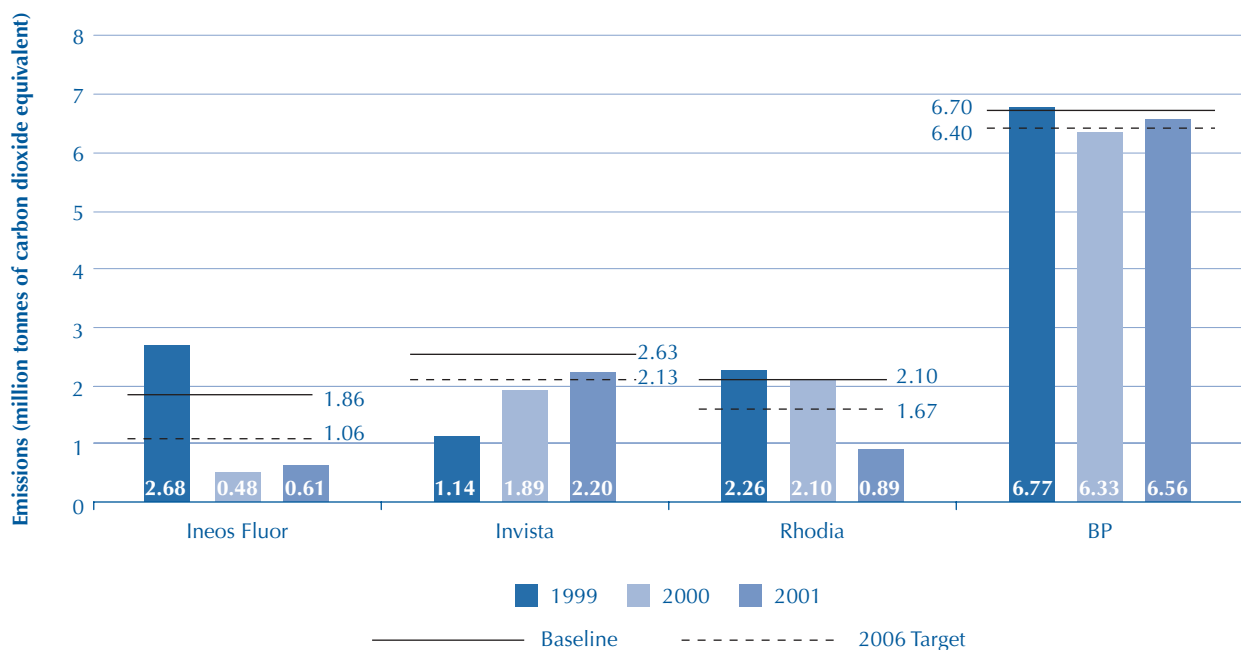
2.15 When it finalised the rules for setting baselines, the Department knew that some Participants were affected by regulatory limits on their emissions, and that these limits had required significant reductions in emissions by some Direct Participants during the baseline period. Otherwise, it had little information on the recent emissions of Direct Participants and felt unable to go any further in tightening their targets (for example, by using only the lowest emissions in the three-year baseline period), for three main reasons.

2.16 The most important reason was that the Department did not feel that it had a defensible basis for going any further. The Scheme needed to be based on the even-handed application of general principles to all Direct Participants if it was to be proof against challenge for being unfair state aid to particular Direct Participants. This was an important consideration because the Department had needed to obtain European Commission agreement that the Scheme did not constitute unfair state aid before introducing the Scheme. The Department believed that its use of regulatory emissions limits was proof against such a challenge because these limits had a clear statutory basis. However, there was no equivalent basis for setting tighter baselines and the Department was concerned that to attempt to do so would expose the whole of the Scheme to the risk of challenge.

2.17 A second reason was a concern that, as is accepted in some other emissions trading schemes, the Scheme should allow some Direct Participants so-called 'credit for early action'. This would allow them to benefit from reductions made immediately prior to the Scheme's launch, so as to avoid penalising companies that had made early efforts on their own initiative to reduce their emissions. The Department felt it would be undesirable, as well as impractical, not to recognise this.

6 1999-2001 actual aggregate emissions, baseline and targets for the four Direct Participants

Targets for the four Direct Participants were close to levels already achieved before the Scheme began.



NOTE

When the auction was held and the incentive decided, in March 2002, the Department did not know all of the annual emissions figures shown. Scheme rules did not require annual emissions during the baseline period (1998-2000), or in 2001, to be disclosed, although two of the four Direct Participants did so.

Source: Our consultants' analysis/National Audit Office

2.18 Third, the Department was concerned that to further tighten the rules for individual participants would risk prospective Direct Participants dropping out. This was a real concern, because, as described below, the Department needed to work hard to attract companies to take part in the auction. However, our consultants' discussions with the four Direct Participants suggest that all four had taken (and were planning to take further) additional actions to reduce emissions in response to the Scheme. It seems likely, therefore, that they would still have been able to take part in an auction if the rules for setting baselines had been tightened, even if further adjusting their baselines would have reduced the quantity of reductions they could offer. The Department told us they were concerned that other, smaller organisations might have been deterred from joining if the baseline-setting rules had been tighter.

The Scheme is encouraging participants to reduce their emissions

2.19 To assess how Direct Participants had behaved in response to the Scheme, our consultants assessed with the four Direct Participants who had achieved the biggest reductions in the first year the reasons for the trends in their emissions in the period leading up to the introduction of the Scheme and in 2002. As Figure 4 shows, between 1996 and 2002 these Direct Participants reduced their total emissions from over 40 million tonnes to 9.6 million tonnes. As already noted (paragraph 2.10) a major reason for this reduction was action taken by the Direct Participants in response to regulation, but our consultants found that there were several additional reasons:

- Companies had existing or longstanding policies to minimise avoidable emissions, as part of a more general policy to operate in an environmentally responsible way. In some cases, the companies had corporate policies to reduce greenhouse gas emissions going back as far as 1990. For example, BP had a corporate policy to reduce emissions by 10 per cent from 1990 levels, which it successfully managed to achieve by the end of 2001. Invista (formerly DuPont) had an emissions reduction policy since 1993 and had made a major investment in equipment in 1998.
- Emissions control equipment installed in response to environmental regulation was performing better than required merely to meet regulatory emissions limits.
- Production, and thus emissions, had been lower than expected in some cases, for example because of lower than expected sales of their products or production breakdowns. Three of the four Direct Participants reduced their plant operating rates during 2001 to 2002 due to reduced demand for their

products, whilst in one case a temporary plant closure due to breakdowns reduced emissions. It is important to note here that emissions limits (used in setting the companies' baselines) are generally set to cater for normal operating rates; so the reduced operating rates in 2002, the first year of the Scheme, had the effect of allowing companies further surplus allowances.

2.20 In addition, our consultants found that these Direct Participants were taking action to reduce emissions specifically in response to the Scheme and that incentive payments were helping to pay for emissions reductions. For example:

- Ineos Fluor intended to invest in improving the performance of its existing emissions control equipment and in additional measures to prevent emissions escaping to the atmosphere when emissions control equipment was not working.
- Rhodia Organique Fine planned to install new emissions control equipment solely in response to the Scheme. It was also undertaking technical improvements to its plant operating methods.
- BP was investing in various emission reduction measures, such as improving equipment reliability, start-up procedures and other similar enhancements across a wide range of its North Sea platforms. BP also told us that all incentive monies received as a result of successful participation in the Scheme are being re-invested into further emission reduction projects.
- Invista and Ineos Fluor were both investing in their emissions control equipment to a greater extent than would have been economic without the incentive funding.

2.21 These four Direct Participants had targets to reduce their emissions by 0.42 million tonnes in the first year of the Scheme. Of the 3.78 million tonnes of reductions which they achieved in practice, our consultants estimated that approximately 2.5 million tonnes (66 per cent) was attributable to the Scheme, while 1.28 million tonnes (34 per cent) was not. Valued at the market price for emissions allowances at the time of writing, (around £2 per tonne), this 34 per cent would be worth £2.6 million, around 12 per cent of the £22.2 million incentive these four companies received in the first year of the Scheme. Alternatively, valuing it on the basis of 34 per cent of the £28.8 million total value these companies have derived from the Scheme (£22.2 million received in incentive plus surplus allowances worth £6.6 million at the market price) before their costs, yields a much higher value of £9.8 million. It cannot be valued more precisely because of the difficulty of predicting the impact of drawing the rules for setting baselines more tightly, on participation in the Scheme and on participants' subsequent behaviour.

2.22 These figures are cautious in classifying reductions as not attributable to the Scheme and a smaller proportion of the reductions may in fact be attributable to the Scheme. Some of the Direct Participants commented that they expected to increase production in the future, which would potentially make it more difficult to meet their emissions targets. Ineos Fluor, for example, told us that production in 2003 would be about 1.6 times production in 2000, for its main source of emissions.¹³ However, our consultants estimated that any such increases were unlikely to put any of the four at risk of failing to deliver their targets under the Scheme, particularly taking into account the significant over-achievement in the first year, which can be 'banked' and used to meet targets in future years.

2.23 The experience of these four Direct Participants illustrates the difficulty of using regulatory limits on emissions in setting participants' baselines. The purpose of setting baselines is to give a measure of the 'business as usual' level of emissions of a Participant, i.e. the likely level of its emissions in the absence of the Scheme. Regulatory limits, such as those imposed for 2002, however meet a different purpose - they are set to provide a maximum, which if breached may lead to legal action against the Participant. In this case the regulatory limits applying in 2002 were substituted when these were lower than the actual annual emissions in any year of the baseline period 1998-2000. These new regulatory limits reflected advances in abatement technology. Nevertheless, they also incorporate both regulators' caution about what can be achieved, and plant operators' wish to have some 'headroom' between their actual emissions and the limit. In future emissions should normally fall below these levels.

2.24 The Department might have explored alternatives, such as setting baselines from a period of time shorter than the three years used for the Scheme, combined with using actual emissions information, or asking environmental regulators to make an independent assessment of Direct Participants' likely normal emissions. However, the Department told us that time limitations, as well as the likelihood that regulators' judgements would be disputed, prevented them from developing this idea. The Department wanted to avoid lengthy negotiations with individual companies (which had previously held up its development of the Climate Change Agreements) and to find some pragmatic point from which to start the Scheme, while recognising that not every company would be going beyond 'business as usual' emissions. In addition, a shorter period, such as one year's emissions, may not provide a good indicator of a company's typical level of operation and could allow scope for strategic behaviour by participants.

Reductions achieved may be offset by increased emissions at a later date, or elsewhere

2.25 Where Direct Participants reduce their own emissions by more than their own targets they will have spare allowances equal to the excess. They can either sell these allowances or save them for possible sale or use in a later year of the Scheme - a process known as banking. Purchasers of allowances may then also sell or bank allowances. Alternatively, purchasers may use them to cover their own emissions - known as retirement - after which the allowances cannot be sold or used again.

2.26 As discussed in paragraph 2.4, in 2002 Direct Participants exceeded their targets by a large margin. Most of the over-achievement, 3.69 million tonnes, was banked, but approximately 0.42 million tonnes were used by other companies to allow them to produce emissions in excess of their targets. We estimate that of this 0.42 million tonnes, approximately 0.16 million tonnes was used by companies subject to Climate Change Agreements to increase their emissions above the levels permitted by their agreements, while the remainder was used by Direct Participants that had failed to achieve their individual emissions reduction targets.

2.27 It is not possible at this stage to predict how much of the 3.69 million tonnes in allowances that has been banked will actually be used in the future. However, in so far as these allowances are used, the result will be that the additional reductions made by Scheme Direct Participants will be offset by increased emissions elsewhere. If all of the banked allowances are eventually used, then all of the overachievement of targets by the Direct Participants will have been offset by extra emissions elsewhere and the quantity of reductions achieved by the Scheme will be limited to the amount needed by Direct Participants to achieve their targets. If a significant proportion of the 'reductions' reported by Direct Participants were made before the Scheme came into operation and for this or other reasons are not attributable to it (paragraph 2.21), the effect would be to reduce the quantity of reductions achieved by the Scheme.

The auction offers lessons for the future

2.28 To assess the Department's handling of the auction, we examined how far the Department secured a competitive auction, the auction design and the operation of the auction itself.

The Department secured enough participants for a viable auction

It was difficult for the Department to predict the likely number of participants

2.29 Following the announcement of the Scheme in the March 2000 Budget, the Department carried out initial modelling of the likely level of participation in the Scheme as the basis of a proposal by the Department to HM Treasury. This modelling focused on firms employing more than 500 people and suggested that the financial benefit of the incentive would outweigh the costs of participating for between 420 and 3,100 firms, and that reductions of around 7.3 million tonnes could be delivered at a cost of around £40 million to £84 million a year. Following further development of the Scheme, based on this modelling, HM Treasury agreed on the provision of the £215 million incentive (over five years), which the Department estimated would yield commitments to emissions reductions of around 2.9 million tonnes.

2.30 The consultants who carried out the modelling also highlighted its limitations, noting that "...the costs of abatement are a key input into this model. We do not believe there is any very certain information about this...In many ways this is the most difficult issue as the margin of uncertainty is large." The modelling also did not include any assessment of the qualitative factors which would influence companies' decisions to participate.

2.31 The Department's modelling was carried out for the purpose of determining a budget for the Scheme and was not intended to provide a realistic estimate of the number of firms that might actually take part in an auction. In the period immediately before the auction, the Department's "working criteria" for sufficient numbers of participants to establish a working market was "in the tens rather than the hundreds", based on guidance from its economists and auction experts. In practice, 38 organisations took part, which resulted in 34 undertakings to become Direct Participants and to deliver reductions of 4.03 million tonnes.

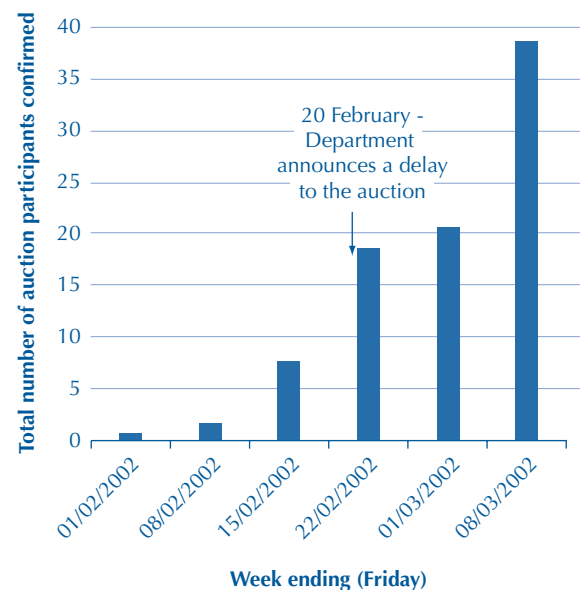
The Department needed to work hard to attract companies to take part

2.32 The Department initially planned to hold the auction in January 2002. It had no definite target for the number of Direct Participants in the auction, but told us that by this time it was aiming for at least 20, which our consultants agreed would be enough to avoid risks of collusion or anti-competitive behaviour in an auction of this type. However, the Department had to work hard to recruit firms to take part in the auction:

- In August 2001 the Department mailed around 5,000 companies, selected using four criteria: members of the FTSE100 index of leading shares; the largest members of industry sectors covered by Climate Change Agreements; members of the Emissions Trading Group; and companies accredited with the environmental management standard EMAS. This mailing resulted in just 30 companies registering their interest by the end of September.
- The Department then employed a public relations firm, during October to December 2001, to recruit Direct Participants directly (primarily via a telephone marketing campaign) and to promote the Scheme to the media.
- In January 2002 the Department appointed an 'emissions trading champion', a former Shell chief executive, to further encourage companies to take part.

2.33 Because of the difficulty in recruiting firms the Department initially postponed the auction from January 2002 to 25 February 2002. By 15 February only seven firms had confirmed that they would take part and on 20 February the Department postponed the auction a second time, to 11-12 March 2002. The target of 20 registered Direct Participants was reached the week before this date and in the end the auction went ahead with substantially more than the target number of Direct Participants - 38 at the start of the auction, of which four dropped out during the auction, leaving 34 successful participants (Figure 7).

7 Number of auction participants committed prior to the auction, 11-12 March 2002



NOTE

The graph shows the 38 companies who signed agreements to take part in the auction. Four of these dropped out during the auction, leaving 34 successful.

Source: Defra records/National Audit Office

2.34 Whilst 34 Direct Participants was enough for a viable auction and to avoid risks of collusion or anti-competitive behaviour, securing even more participants, bidding more emissions reductions in total, would have increased competitive tension and provided scope for the Department to buy even greater emissions reductions within the budget of £215 million. However, competitive tension was limited by several factors:

- the number of Direct Participants is likely to have been limited by companies' awareness of the plans to introduce a European Scheme, which the European Commission announced several months before the UK auction;
- one company which did not take part in the auction because it felt it did not have time to prepare, told the Department (in post-auction research) that it could have offered 2 million tonnes of reductions if it had more time;
- the leading participant, Ineos Fluor, wanted to bid a further 0.65 million tonnes of reductions, 80 per cent more than its agreed bid, but was prevented under Scheme rules that no one Participant could gain more than 20 per cent of the incentive.

A different method of bidding might have achieved a better result

The Department used a 'descending clock' method, inviting bids at descending prices until bid volume and price matched the incentive monies available

2.35 The incentive auction aimed to maximise the reductions offered in return for £215 million. To achieve this, it was designed as a so-called 'descending clock'. The process followed is shown in Appendix 3, but, in brief, it began with the announcement of the starting price, £100 per tonne of reduction in 2006 (or £33.33 per tonne over the life of the Scheme¹⁴). The Department set this 'reserve price' on the basis of an analysis of the 'social cost of carbon', the estimated long-run economic cost to society of climate change.

2.36 Participants then bid the quantities of emission reduction they were prepared to make at this opening price. The Department adjusted bid quantities where necessary to ensure that no participant would account for more than 20 per cent of the incentive payments, multiplied the price by the total adjusted quantity bid and found that it exceeded the budget (£215 million) available. It then announced a lower price and asked for bids at this price. This process was repeated at successively lower prices until the total adjusted quantity of emissions bid, multiplied by the current price, was just within the budget of £215 million.

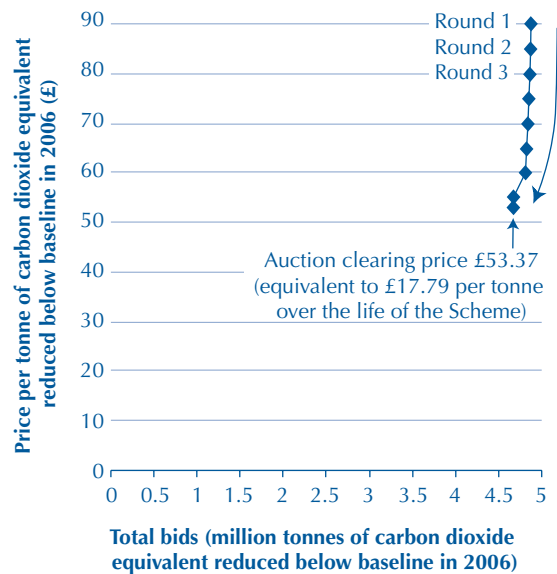
2.37 The progress of the auction is shown in **Figure 8**. The final outcome, after nine rounds, was the purchase by the Department of a total of just under 4.03 million tonnes in 2006 (equivalent to 12.1 million tonnes in total - now 11.88 million tonnes following the withdrawal of three Direct Participants from the Scheme) at a price of £53.37 per tonne in 2006 (equivalent to £17.79 per tonne over the life of the Scheme). This price is significantly above an estimate of about £11 per tonne suggested by consultants to the Department prior to the auction, although this price was described as "subject to major uncertainty".

Using an alternative system, such as one of sealed bids, may have helped the Department assess whether it would have done better to buy fewer reductions at a lower price

2.38 Our consultants advised that the descending clock method was a reasonable way of securing the maximum reductions from the auction participants for the total incentive available. However, there may have been scope for the Department to secure somewhat fewer reductions at a significantly lower price if it had chosen to spend less than the full budget available (with the possible option of using the money withheld to buy further reductions at a later date).

8 The progress of the auction

The auction set a price of £53.37 per tonne in 2006, equivalent to £17.79 per tonne over the life of the Scheme.



Source: The Department/National Audit Office

¹⁴ Because each participant has to meet annual intermediate targets as well as the final reduction target in 2006, each tonne reduced below the baseline in 2006 is equivalent to a total reduction of 3 tonnes over the five years of the Scheme (0.2 in 2002, 0.4 in 2003, 0.6 in 2004, 0.8 in 2005 and 1.0 in 2006).

- 2.39 The potential for benefit of doing this is suggested by a variety of evidence:
- During the auction the total amount of reductions bid reduced by only 4 per cent, from 4.89 million tonnes to 4.68 million tonnes (as shown by Figure 8 opposite). Our consultants, Frontier Economics and Byrne Ó Cléirigh, felt this evidence indicated that participants were bidding conservatively and most would have been prepared to sell significant quantities of reductions below baseline at a price well below the clearing price of £53.37 per tonne in 2006 (£17.79 per tonne over the life of the Scheme).
 - With the actual bids that were made in the auction, increasing the Department's budget by, say, 10 per cent (£21.5 million), would have increased the quantity of reductions bought by only 0.7 per cent, with the extra reductions costing £724 per tonne.
 - Our consultants estimated that the emissions reductions made between 1995 and 2001, by two of the Direct Participants they examined, had been achieved at a cost to the companies (based on discussions with the companies and knowledge of their investments during this period) of less than £1 per tonne. Direct Participants would also expect the auction price to cover verification and other transaction costs and a premium for the risk of taking on legally-binding emissions targets in an unknown market. Nevertheless, this level of abatement cost suggested that they might have been prepared to offer significant quantities of reductions at prices below the final auction price of £17.79 per annual tonne. The current market price of allowances of around £2.50 per tonne (paragraph 2.45 and Figure 9), also suggests that the Department could have bought significant quantities of reductions at a lower price.
- 2.40 There are several possible ways open to the Department to seek to secure fewer reductions at a lower price. Within the rules of the Scheme established by the Department, on the first round only of the auction, the Department had the option to announce that it would withhold some of the £215 million available to it, and carry out the auction within a lower total budget (a minimum of £150 million). The Department decided not to do this because it considered that there was sufficient interest in the auction to achieve an acceptable price, and that spending the full £215 million available would maximise the quantity of emissions reductions it bought. The Department felt that greater flexibility on the available budget, for example by adopting a lower minimum potential spend than £150 million, might have deterred participation.
- 2.41 Alternatively, if the Department had designed the rules of the auction differently, our consultants, Frontier Economics, suggested that the use of a 'sealed-bid' process, asking the Direct Participants to submit details of how many reductions they would bid at a range of prices, may have been a better way to set the budget and allocate it. Another possibility would have been to use the descending-clock format but to hold further rounds of the auction, to gather information on the volumes available at lower prices in order to inform a final decision on how much to spend. Our consultants' suggestion is explained in more detail in Appendix 6.
- 2.42 A sealed-bid system would have required Direct Participants to assess in advance how many reductions they would bid at a range of prices. However, Direct Participants would have been well advised to do this in any case, and asking them to do so would have given the Department better information on which to base its final decision on how much to spend. It would have given the Department more information about the true cost to companies of making emissions reductions, and allowed it to decide whether a better result could be obtained by spending less than the full budget - for example, whether, say, 3.5 million tonnes by 2006 could have been pledged at, say, £40 a tonne (a commitment of £140 million) rather than the 4 million tonnes at just over £53 a tonne (the full £215 million).
- 2.43 The Department's consultants on the auction design identified a sealed-bid auction, our consultants' suggested format, as one of their three preferred options, but finally recommended the 'descending clock' format. They felt an auction based on sealed bids might have appeared complex and would therefore have deterred smaller organisations from entering. They felt that a more open auction format would encourage Participants to bid more strongly than a sealed-bid format, which would have prevented participants from altering their bids in response to those of others. The Department also believed that greater flexibility over the budget might have deterred participants, and it was important to attract enough Direct Participants in order to create an active market. Some members of our advisory panel felt that an auction based on sealed bids would not have been acceptable to business and would have lengthened the tight timescale for the auction.

The auction process itself went smoothly

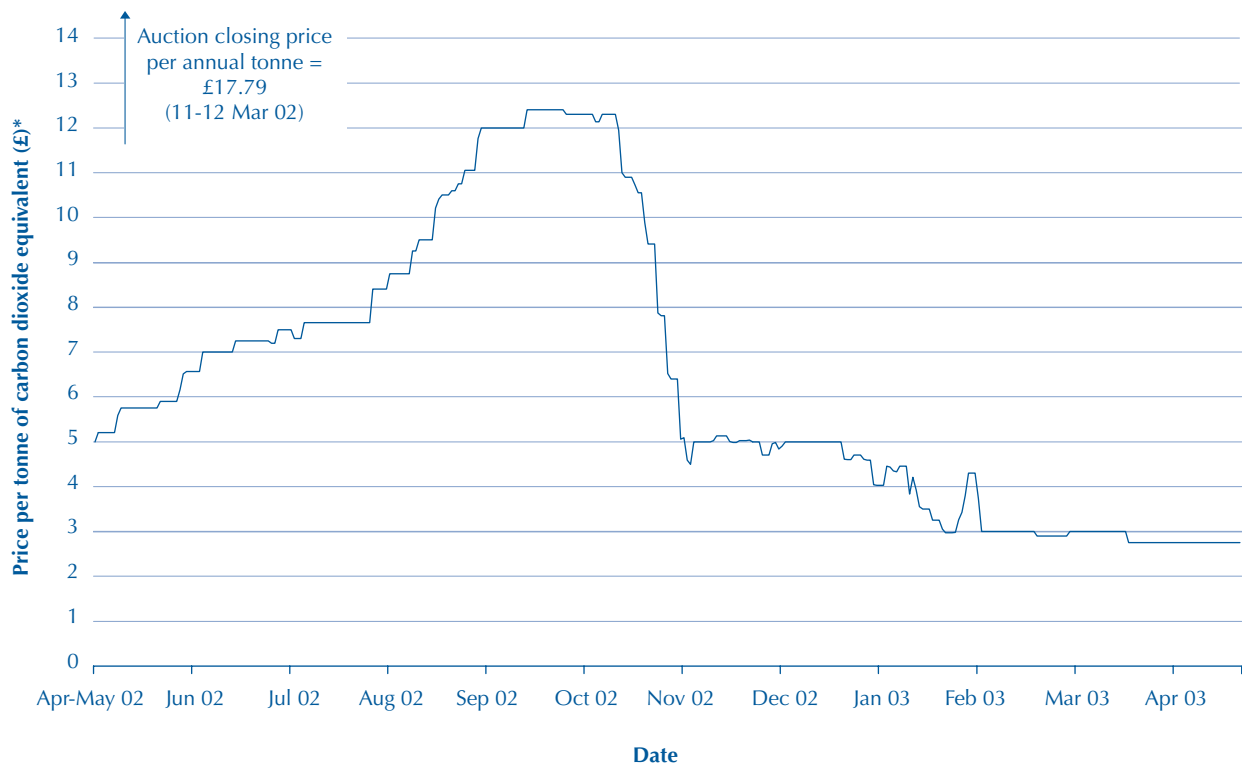
2.44 The auction of incentive funding was held over two days, 11-12 March 2002. Participants submitted their bids in half-hour rounds. The Department took expert advice on the design and operation of the auction (for example, on the software to be used, security and back-up precautions) and the auction operated smoothly. For example, Ineos Fluor, the participant with the largest share of the incentive, told us that the auction was "very accessible" and that the company was "quite impressed by the process." Most participants said the only costs associated with participating in the auction were those of time for the individuals involved. Several commented that the trading system as a whole, including the 'registry' (the Department's system for recording participants' allowances and status against their targets) and communications with the Department, had worked well.

Market prices for allowances have been substantially lower than the price paid by the Department in the auction

2.45 The market in emissions allowances since the Scheme began has been very variable, both in the quantities traded and the prices obtained. The price of allowances peaked at around £12.50 per tonne in September and October 2002, before sharply dropping back to around £5.00 per tonne and then declining further (Figure 9). Since the first compliance deadlines for Scheme participants (February for Agreement Participants and March for Direct Participants), the market has seen very little activity and prices have been around £2.50 per tonne or less. At no time has the price exceeded the price set in the auction of £17.79 per tonne.

9 Price development in the first year of the Scheme

Following the auction, market prices for allowances started trading at less than one third of the auction price, then rose to around two thirds of the price, but have since fallen.



NOTE

* This graph shows a daily, volume-weighted price index for emissions allowances.

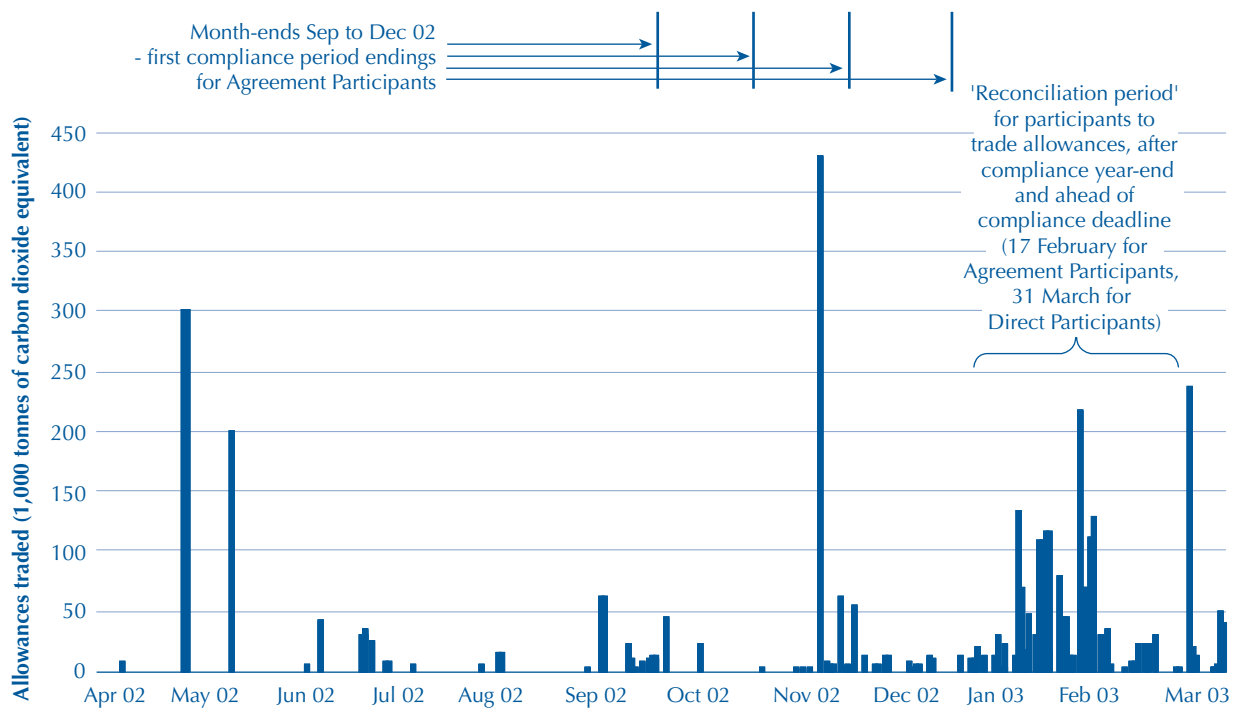
Source: James Emanuel, independent emissions trading consultant

2.46 The price peak in September and October 2002 was caused by demand from Agreement Participants for allowances to meet their targets, and was also affected by uncertainty for some on how many allowances they might need, combined with delays in verifying some Direct Participants' baselines and making their allowances available for sale. There was also a lack of allowances for sale by Agreement Participants during this period because, unlike Direct Participants, they do not receive any allowances until they reach the end of

each compliance period. This combination of limited supply and demand caused the price to rise. Since allowances became available and trading in quantity began, prices have dropped. The large reductions made in 2002 by Direct Participants, in excess of their targets (paragraph 2.4 above), led to an increase in supply of allowances, while demand from Agreement Participants declined once their compliance deadline had passed (Figure 10).

10 Trading volumes in the first year of the Scheme

Little trading of allowances took place before November 2002.



Source: National Audit Office analysis of the Department's registry



Part 3

The Scheme promises some wider economic benefits

3.1 A key purpose of the Scheme has been to secure voluntary reductions in greenhouse gas emissions in a cost-effective way. However, from the outset the Department considered that early experience with the Scheme and emissions trading would give the UK wider economic benefits. This Part discusses the extent to which those wider benefits have materialised.

For some participants, the Scheme has been a useful learning experience

3.2 One of the Department's objectives in setting up the Scheme was to give participants an advantage over their international competitors, through 'learning-by-doing', in preparing for the introduction of European and international emissions trading:

- The process of setting a baseline and committing to a target for emissions reductions was expected to lead participants to review the way in which they collect and use data on energy use or emissions, and to help them identify and invest in new ways to reduce their emissions.
- Participants should also gain hands-on experience of using the emissions market and of working with verifiers and brokers.

We consulted Scheme participants on the realisation of these benefits to date.

Direct Participants feel that the Scheme has been valuable

3.3 Direct Participants we consulted generally had very positive views of the learning benefits of taking part in the Scheme. We asked them about ten aspects of 'learning-by-doing' (for example, how the Scheme had helped them improve their collection of emissions data, and how it had helped them use this data). All respondents reported improvements, on average in eight out of the ten areas we asked about.

3.4 A large majority (69 per cent) of Direct Participants responding said their participation in the Scheme had improved their collection of data on their energy use; several commented that they had been able to correct inaccurate invoices from their energy suppliers. Direct Participants with direct emissions of carbon dioxide or other greenhouse gases from their production processes had also been able to improve their measurement and understanding of their emissions. In some cases, the Scheme had provided an incentive to measure these emissions for the first time, or to standardise their existing processes to the protocols laid down in the Scheme rules.

3.5 Perhaps unsurprisingly, all respondents agreed that the Scheme had improved their understanding of the benefits that emissions trading could bring to them. A majority of respondents (57 per cent) said that the Scheme had improved their confidence in using the emissions market, although several players commented that they had not yet needed to use the market because they had been able to achieve their targets for the first year of the Scheme without the need for trading. Direct Participants also felt that the process of verification for the Scheme had been a useful learning experience, but some complained of costly and complex verification procedures.

3.6 For the Direct Participants surveyed, the Scheme appears to have been effective in securing corporate commitment to projects to reduce greenhouse gas emissions, for example through increases in the capital budget for such projects, earlier project approval and the earmarking of incentive money for emissions reduction projects. One Direct Participant, Ineos Fluor, also told us that it has used its experience in the Scheme to support its participation in an emissions reduction project in Gujarat, India. This project will result in emissions allowances which can be traded internationally.

A minority of Agreement Participants made use of the emissions market

3.7 'Agreement Participants' in the Scheme are companies that have signed up to Climate Change Agreements (see paragraph 1.10). The Agreements commit companies to deliver emissions reductions or improvements in energy efficiency in return for an 80 per cent rebate on their Climate Change Levy. Reductions are delivered either by reducing emissions or by buying emissions allowances in the market. The targets work at two levels: companies in the same sector, through an industry association, commit to an overall target; in addition individual companies have their own targets. If the sector target is achieved, all companies in the sector receive the agreed rebate irrespective of their individual performance. Companies also receive the rebate if they achieve their individual target, even if the sector target is breached. Companies that beat their individual targets can convert the excess into emissions allowances which they can sell in the emissions trading market provided that they first have their emissions verified.

3.8 In the first year of the Scheme, some 'learning-by-doing' benefits of emissions trading have been confined to the minority of Agreement Participants who used the market. Some 866 Agreement Participants, representing 17 per cent of nearly 6,000 potential participants, used the market, mostly as buyers (743) rather than sellers (123). Of those that did use the market, around half traded once only (Figure 11), indicating that the

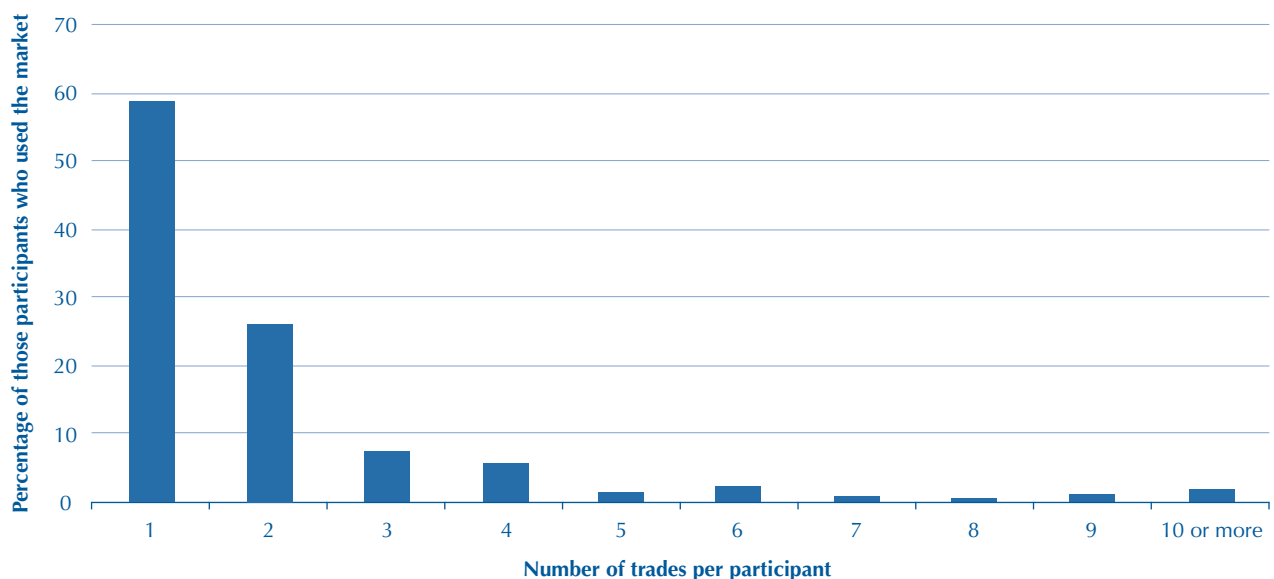
'learning' benefits were likely often to have been confined to the experience of setting up an account and using the market once, rather than frequent trading.

3.9 We consulted a selection of Sector Associations (who administer the Climate Change Agreements for each industry sector, acting as a link between companies and the Department) to gather their members' experiences of emissions trading. Despite the relatively limited participation by Agreement Participants in the market, Sector Associations generally felt that the process of using the emissions market was straightforward, for those that used it. However, they highlighted two issues:

- Sector Associations suggested that the cost of verification was an important deterrent to greater participation in the market, particularly for small companies.
- Sector Associations also said that the timescale for Agreement Participants to trade was very short in the first year of the Scheme. Due to the way in which the Climate Change Agreements were set up, the 'compliance year' over which companies' actual emissions performance is measured could end in September, October, November or December 2002, depending on the sector. However, all companies and sectors had the same deadline of February 2003 to buy allowances to cover any shortfall against their targets, leaving those whose compliance year ended in November or December (13 out of the 46) a short 'window' in which to trade.

11 Number of times Agreement Participants using the emissions market traded in the first year of the Scheme

Around half of Agreement Participants who traded did so once only.



Source: The Department's registry/Frontier Economics

Integration with the forthcoming European Scheme will be difficult

- 3.10 One of the most important 'learning' benefits of the UK Scheme was expected to be the chance for participants and others to prepare for the introduction of emissions trading in the European Union and gain an advantage over their European competitors. The European Scheme will be launched in January 2005.
- 3.11 The experience gained through the UK Scheme has had some influence on technical aspects of the European Scheme, for example the UK Scheme's provisions for 'banking' allowances (allowing companies to save surplus allowances for future use) and penalties for missing targets. The development of the UK Scheme has meant that much of the administrative work needed to make emissions trading function effectively has already been completed in the UK, while some other member states are expected to have difficulty meeting the ambitious timetable for introduction of the European Scheme. The European Scheme, however, has fundamental differences from the UK Scheme, summarised in **Figure 12**. The simultaneous existence from 2005 of the two schemes, will bring complexities for UK companies and the Department, as discussed in the rest of this section.

Electricity generation adds complications

- 3.12 The most fundamental difference between the schemes is the different way in which they treat emissions from electricity generation. The European Scheme assigns responsibility for these emissions to electricity generators - so-called 'direct treatment' - while UK climate change policy (both the UK Emissions Trading Scheme and Climate Change Agreements) gives it to consumers - so-called 'indirect treatment'. This leads to potential problems of double counting, where emissions allowances may be created for both the producer and consumer of electricity.
- 3.13 Both approaches have their merits, but UK climate policy is based on indirect treatment because this avoids effects which are felt to be undesirable in the wider context of UK energy policy - primarily, the fact that direct treatment tends to push up electricity prices, impeding the government's efforts to combat fuel poverty among domestic consumers. Direct treatment of emissions also tends to encourage electricity generators to switch from fuels which produce more carbon dioxide emissions, such as coal, to 'cleaner' fuels such as natural gas; in the UK this would undermine the government's aim to maintain a diverse generating system based on a mixture of fuel types.

12 Comparison of the UK and European Union Schemes

The UK and European Schemes have important structural differences.

| Source of difference | UK Trading Scheme | European Trading Scheme |
|--------------------------------|--|---|
| Basis of participation | Voluntary, with incentive payments | Mandatory for those operations falling within the scope of the Scheme |
| Gases included | All 6 greenhouse gases | Carbon dioxide only (potential to include other gases at a later date) |
| Electricity generators | Excluded | Included |
| Other industry sectors covered | Any company or public body (manufacturing or service) can join | Certain sectors only: <ul style="list-style-type: none"> ■ All combustion installations over a certain size (20 megawatt thermal input) ■ Oil refineries ■ Coke ovens ■ Iron and steel works ■ Pulp and paper industry ■ Minerals processes (e.g. cement, glass and brick production) |

Source: National Audit Office

3.14 By the time the proposal for the European Scheme was published in September 2001, preparations for the launch of the UK Scheme, based on indirect treatment of emissions, were well advanced and the Climate Change Agreements were operating. The Department urged the European Commission to develop the European Scheme based on indirect treatment, in line with UK climate policy, but was unsuccessful. In the European Scheme, the liberalisation of European power markets meant that a scheme based on indirect emissions was felt to be unworkable, but by the time that this decision was taken, it was too late to change the design of the UK Scheme.¹⁵

3.15 The Department aims to eliminate the problem of double counting by making adjustments to the calculation of emissions allowances to be allocated to the generators under the European Scheme. The Department admits, however, that this will be difficult to achieve with precision. The inclusion of the generators also raises the prospect that electricity costs in the UK may rise, as generators pass on the cost of buying allowances to customers. Also, some companies fear

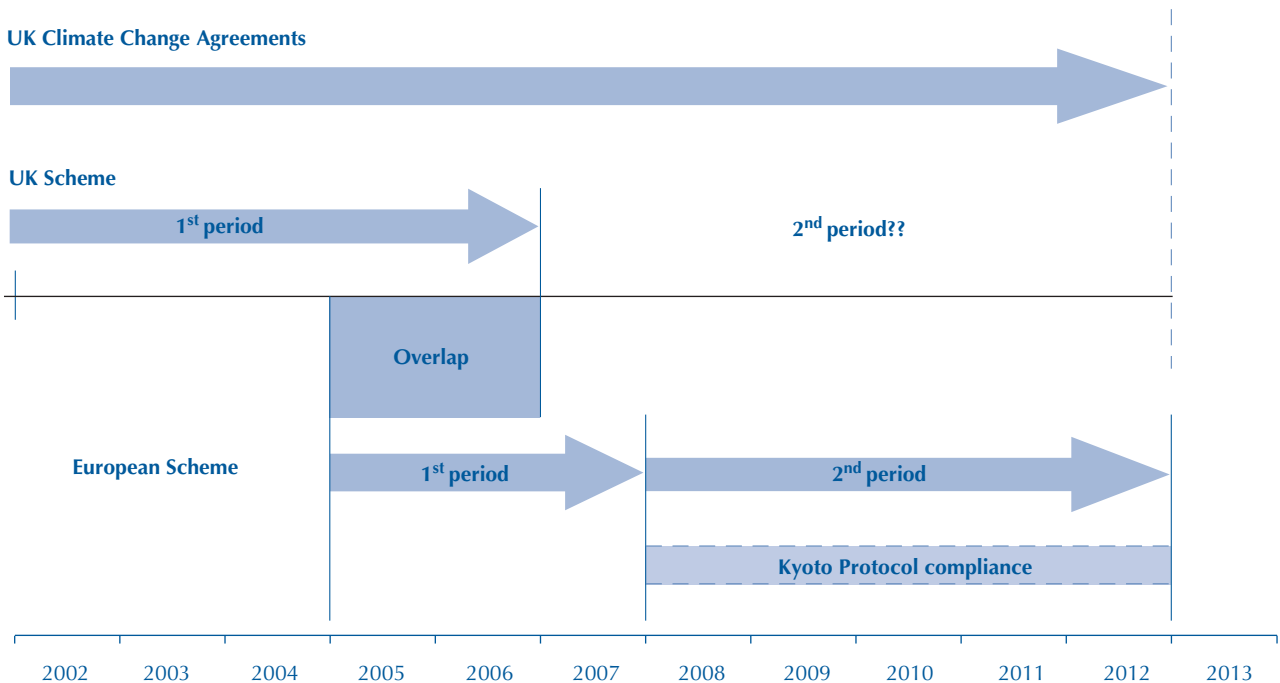
that the cost of allowances may discourage industrial users of heat from investing in combined heat and power (CHP) schemes, which help to reduce total greenhouse gas emissions in the economy but can increase on-site emissions for the company operating them. The Department will set out how it intends to treat CHP schemes and participants in national climate initiatives in the UK's National Allocation Plan for the European Scheme, which was not finalised at the time this report was prepared.

Some participants will need to choose between the UK and European Schemes

3.16 In addition to the differences in scope and focus between the two schemes, there is a complicated timescale (Figure 13) which will force companies to make difficult choices about which scheme to participate in. When the European Scheme is launched in 2005, the UK Scheme will still have two years to run, while the UK Climate Change Agreements do not expire until March 2013.¹⁶

13 Timelines for UK climate change policy and the European Scheme

UK climate change policies do not integrate well with the timetable for the European Union Scheme.



Source: Adapted by NAO from Irving, W¹⁷, 2002 'The Interface between the UK ETS and the proposed European directive on greenhouse gas emissions trading'

15 Direct treatment is preferred for the European Scheme because of the volume of international trade in electricity on the Continent, which makes it very difficult to estimate accurately how much carbon dioxide is produced per unit of electric power consumed in each member state.

16 The UK Scheme may need to be extended for a second period to allow the Agreement Participants to continue to trade.

17 William Irving, of the United States Environment Protection Agency, studied the UK and European Schemes as a research fellowship project during 2002.

3.17 The effect of these timing complications on UK companies will vary depending on whether they are currently Direct Participants in the Scheme, Agreement Participants, or outside the Scheme altogether - and whether they have operations which are included in the European Scheme. There will be some companies who fall into more than one of these categories - for example, a cement company might be a Direct Participant in the UK Scheme, also be a member of the cement sector Climate Change Agreement, and will also be covered by the European Scheme, which includes minerals processes such as cement manufacture.

3.18 The Department estimates that around 2,000 UK 'installations' may fall within the European Scheme. It believes that 10 of the 31 Direct Participants have some installations in the UK Scheme that could potentially move to the European Scheme. Similar complexities in coverage exist for Agreement Participants.

3.19 The Department recognises the potential difficulties produced by the differences between the two schemes, but feels that it has made significant achievements in negotiations with the European Commission, which will ease the transition. For the first period of the European Scheme, from 2005-07, the Directive allows for an 'opt-out' at the request of an EU member state. Under this provision, UK companies that wish to opt out of the European Scheme can ask the Department to put forward their request to the Commission. Approval to use the opt-out is dependent on the UK providing evidence that domestic climate change policies are as stringent as the European Scheme.

3.20 The extent to which companies will use the opt-out is unknown at present; some will welcome the opportunity to move into a larger European emissions trading market, but others may decide that the benefits of remaining in the UK Scheme outweigh this. Their decisions will affect the relative sizes of the UK and European emissions markets, and hence the liquidity of the UK market. A substantial UK Scheme is likely to remain for a period, for example to cater for companies whose emissions are of gases other than carbon dioxide, smaller emitters of carbon dioxide who will be below the minimum size limit of the European Scheme and Agreement Participants.

3.21 Trading in the UK and European Schemes will operate separately; allowances from each scheme will not be tradable in the other. Some commentators have suggested that this will make UK Scheme allowances valueless, depending upon participants' eligibility for the European Scheme and decisions to opt into it.

However, this will become clearer once the criteria for demonstrating equivalence have been agreed with the European Commission.

Preparation for the European Scheme needs to progress quickly

3.22 A significant concern expressed by participants in the UK Scheme was the timetable for designing the UK's National Allocation Plan for implementing the European Scheme. The Plan will propose the overall level of allowances that should be issued to the UK and how they should be distributed among different industry sectors and companies. The Department and the Department for Trade and Industry are currently consulting on the Plan and are due to submit proposals to the European Commission by the end of March 2004. Along with plans from the other 14 current European Union member states and 10 accession countries to the EU, the UK Plan must be assessed by 30 June 2004. All preparations for UK implementation of the European Scheme must then be finalised over the following six months, in time for its launch on 1 January 2005. Many organisations feel that this timetable is too tight because of the complexities involved. However, the UK has at least some emissions trading experience and the Department feels that it is in an advantageous position compared to other member states.

There is now a small core of emissions trading expertise in the City

3.23 One of the Department's reasons for setting up the UK Scheme was to provide an opportunity for the City of London to become established as an international centre for emissions trading. The potential for emissions trading to be a good business opportunity was recognised by leading City executives' membership of the UK Emissions Trading Group which developed the Scheme.

3.24 Emissions allowances can be bought and sold just like commodities or financial products. The long-term potential market may be substantial; one major broker told us that in 20 years' time it expects the international carbon market to have reached a size similar to that of the bond market, where trades totalling \$300 billion per day are carried out. While the vast majority of trades in the UK Scheme to date have been simple transactions for immediate (or 'spot') fulfilment, more complex financial products, known as derivatives¹⁸, are expected to be developed further as international trading grows.

¹⁸ For example, 'futures' - agreements to buy or sell a number of emissions allowances, at a defined future date and at a price determined at the time of the trade.

3.25 City firms have two current roles in the UK Scheme:

- As **brokers** - acting as intermediaries, linking buyers and sellers. They make money by taking a commission on each transaction they complete.
- As **traders** - taking speculative positions in the market on their own behalf and making money by selling allowances for more than they paid for them. To date, trading has been limited to the trading arms of international energy suppliers.

As the market grows, a range of other opportunities is expected to become available, including risk management, corporate finance and market-making.

3.26 Six firms have operated as brokers in the UK Scheme since its launch. They include large international firms with activities in many markets, and smaller specialists in energy or environmental markets. The greenhouse gas emissions business is particularly attractive to those who already have expertise in allied areas, such as oil and gas trading, weather derivatives¹⁹ or Renewables Obligation Certificates²⁰, or those firms with US experience of trading in other forms of pollution. Most firms have only one or two staff working on the UK Scheme. This is sufficient for current volumes of trading, which are a small proportion of firms' total business.

3.27 The brokers are participating in the UK Scheme as a 'long-term bet' rather than an immediate commercial opportunity. They see the Scheme as a chance to gain experience in emissions trading and establish relationships with the participants, ahead of European trading from 2005 and international trading from 2008. None of the firms claimed to be making a profit from the UK Scheme. Most appear prepared to subsidise a current loss-making small operation in return for the longer-term benefits, but one major broker dropped out of the UK Scheme market (and all other environmental products) in May 2003.

3.28 Five brokers remain in the UK market, but despite their long-term commitment to it, they express some disappointment with aspects of the market's operation to date:

- **Agreement Participants are not always well-informed about the Scheme** - brokers told us that the UK emissions market, in contrast to other markets, required them to actively hunt for clients by 'cold-calling', particularly the Agreement Participants (nearly 6,000 companies). It was rare for companies to contact brokers themselves, and when brokers made calls they often encountered resistance and even hostility. The brokers attributed this lack of interest and understanding of the Scheme

to ineffective marketing of the Scheme to potential participants. They felt that the Scheme had relied on the Sector Associations to market emissions trading to their members, and that the associations lacked the resources and financial expertise to do this effectively.

- **Trading mechanisms are not yet fully developed** - brokers suggested that the UK Scheme should operate via a system providing a 'screen' showing the prices offered and taken for allowances, as for many other financial markets. The market does not currently have this facility, and small companies participating in the market would often contact only a single broker and would pay the first price they were offered. Two brokers told us that this lack of transparency would be "unacceptable in any other market". We note, however, that in other markets responsibility for establishing such systems generally rests with brokers and their trade associations and the Department has not inhibited this in any way.
- **Low prices** - as discussed in Part 2, the market has seen a price peak in the first year, followed by a slump to very low pricing levels and a minimal level of market activity. As a result, transaction volumes have been small (brokers quoted typical volumes of 500-1,000 tonnes) and commissions (typically 2 per cent) low.

3.29 In the early promotion of the UK Scheme, the Department suggested that the Scheme would contribute to the City of London becoming a global centre for emissions trading. It is still too early to say whether this will be the case once European and international emissions trading is launched, but London is currently perceived to be more developed as a centre for trading than its putative rivals, Frankfurt and Paris, which will participate in the European Scheme. Some international banks have already chosen to base their emissions trading operations in London. However, some brokers suggested that European companies might prefer to use brokers based in their home countries, particularly given the differences between the UK and European Schemes. They also pointed out that the barriers to entry into the emissions market, such as gaining regulatory approval, are low for established brokers, who can set up an emissions operation based on their experience in other commodity markets. Beyond Europe, US financial centres such as New York and Chicago are developing greenhouse gas emissions markets based on US experience of trading in the 'acid rain' gases sulphur dioxide and nitrogen dioxide, while Tokyo and Singapore are expected to become centres for Asian and international emissions trading in the future.

¹⁹ Financial contracts used by companies to protect themselves against the business risks of poor weather (for example, the risk of lost revenue to an ice-cream manufacturer if there is a cold summer).

²⁰ ROCs are traded by UK electricity suppliers to meet their requirement to produce a proportion of power from renewable sources.

Some UK service-providers can use their experience internationally

- 3.30 The Scheme was also expected to result in business opportunities for UK companies providing services associated with emissions trading, such as verification of participants' baselines and actual emissions, and consultancy advice on reducing direct emissions or improving energy efficiency.
- 3.31 To date, these wider economic benefits have mainly consisted of verification business for the professional services firms which are accredited to act as verifiers for the UK Scheme. Some consultancies have also established business related to emissions trading, working with Direct Participants, Agreement Participants, or, indeed, the various government departments involved in the Scheme.

Verifiers for the UK Scheme have developed experience on which they hope to build in future

- 3.32 Verifiers have a key role in the UK Scheme, providing an independent check of companies' baselines and actual emissions for each compliance period. At the time of writing there are eight verifiers for the UK Scheme. They have a variety of industry specialisms and professional specialities, including standards assessors, international finance and management consultants and environmental consultants.
- 3.33 In common with the brokers, the verifiers for the UK Scheme became involved with the Scheme because they saw it as a long-term business development opportunity, rather than as a chance for immediate profit. Several firms said that they had developed new skills, or had combined their existing services in new ways (for example, by bringing together financial assessments and process evaluation).

- 3.34 Verifiers agree with brokers that they have faced most difficulty in developing business with smaller participants in the Scheme. Smaller companies often failed to understand what was required for verification, and the costs involved.²¹ They also felt that the sector associations lacked the necessary expertise to explain the verification process to their members. And, UK verifiers are concerned to know whether the same accreditation standards used in the UK will be adopted for the European Scheme, enabling them to expand their business into other member states.

Specialist consultants have begun to develop niche market opportunities

- 3.35 A small number of UK environmental consultancies and environmental law specialists are developing businesses related to emissions trading. In common with the brokers and verifiers operating in the UK Scheme, these specialists see the Scheme as the small beginning of a much larger opportunity in the long-term. They have begun to develop services in areas such as policy advice, project development, financial advisory services related to emissions trading, energy engineering and management, feasibility studies, training and specialist software.

²¹ Typical costs for verification are around £1000-1500 per day per assessor for verification under the UK ETS; total costs, depending on the size and complexity of the operation being assessed, are around £40-50,000 for large companies and around £2,500 for small companies.

Appendix 1

Methodology

We examined two issues:

- Has the incentive and auction achieved the primary aim of delivering greenhouse gas emissions reductions at reasonable cost?
- Is the market achieving the expected benefits?

Our overall focus in terms of greenhouse gas reductions was on the Direct Participants in the Scheme (those who took part in the auction of incentive money in March 2002) and their achievements against their targets. We examined the ways in which Agreement Participants (companies in Climate Change Agreements) used the emissions market, but we did not examine the Climate Change Agreements themselves, which were established prior to the launch of the Scheme.

In undertaking the examination, we:

- interviewed senior staff from the Department for Environment, Food and Rural Affairs;
- reviewed documentation from the Department's files on key decisions during the Scheme's development;
- consulted other government departments involved in the development of the Scheme, including the Department of Trade and Industry and HM Treasury;
- commissioned two consulting firms (Frontier Economics, a specialist in environmental economics and Byrne Ó Cléirigh, specialists in environmental management and engineering), working in partnership, to examine and report to us on three key aspects of the Scheme:
 - the design of the incentive auction;
 - the emissions reduction targets and achievements of the four Direct Participants with the largest achievements in the first year of the Scheme (see opposite);
 - the functioning of the market subsequent to the auction.
- worked with an expert advisory panel, including consultants and academics specialising in emissions trading, to advise us on the key issues for our study and to review our draft report;
- interviewed a range of members of the UK Emissions Trading Group, the industry-led group which worked with Government to develop the Scheme;
- interviewed the public relations firm which was employed by the Department to market the Scheme to potential Direct Participants;
- surveyed all the Direct Participants on their views of the Scheme and experiences of its first year of operation;
- consulted a sample of Sector Associations (who operate the Climate Change Agreements) on their views of the Scheme and their members' experiences of it;
- accompanied a verifier for the UK Scheme on visits to a leading Direct Participant's sites;
- discussed the development of verification processes for the Scheme with a range of verifiers and with the United Kingdom Accreditation Service (UKAS), responsible for accrediting verifiers under the Scheme;
- interviewed emissions brokers working in the UK emissions market;
- visited the Environment Directorate of the European Commission to discuss the development of the European Scheme and its differences from the UK Scheme;
- consulted a range of other stakeholders and interested parties on their view of the UK Emissions Trading Scheme, including the Corporation of London, the United States Environmental Protection Agency, the Chicago Climate Exchange and the specialist consulting firms Enviro and Ecosecurities.

The four case-study companies

The four companies examined by our consultants were Ineos Fluor, Invista UK (formerly known as DuPont UK), Rhodia Organique Fine and BP. Brief details of their activities are given below:

| Company | Key activities included in UK Scheme | Overall reduction target tonnes | Total incentive if targets met £ million |
|-----------------------|---|---------------------------------|--|
| Ineos Fluor | Chemical manufacturing (refrigerant chemicals) | 805,635 | 43.0 |
| Invista UK | Chemical manufacturing (nylon raw materials) | 500,000 | 26.7 |
| Rhodia Organique Fine | Chemical manufacturing (refrigerant chemicals) | 430,000 | 22.9 |
| BP | Offshore oil and gas exploration and production | 353,500 | 18.9 |

Appendix 2

The Kyoto Protocol and UK targets

- 1 International policy to address climate change is laid down in the United Nations Framework Convention on Climate Change, which governments adopted in 1992. The ultimate aim of the Convention is to stabilize the amount of greenhouse gases in the atmosphere, at levels that will prevent dangerous interference with the climate system.
- 2 The Kyoto Protocol, added to the Convention in 1997, agreed that industrialised countries should cut their greenhouse gas emissions by a total of 5 per cent from 1990 levels, by 2008-2012. This total cut is shared out so that individual countries, or sub-groups such as the European Union, have their own emissions targets. The Protocol also outlined various 'mechanisms' for meeting the targets, including emissions trading.
- 3 Targets for the UK and the other European Union member states are shown in the table below. The UK has a target to achieve a 12.5 per cent reduction under the Kyoto Protocol, one of the more stringent national targets in the European Union, reflecting the potential to switch from coal-fired to gas-fired power generation in the UK. In contrast, some European Union member states with expanding economies have targets which allow their emissions to rise. The UK government has also set a separate, more ambitious domestic goal of reducing carbon dioxide emissions to 20 per cent below 1990 levels, by 2010.

| Region/country | Reduction on 1990 levels by 2008-2012 | Region/country | Reduction on 1990 levels by 2008-2012 |
|--|---------------------------------------|------------------------|---------------------------------------|
| Developed world | -5 per cent | Overall European Union | -8 per cent |
| Individual European member states | | | |
| Belgium | -7.5 per cent | Luxembourg | -28 per cent |
| Denmark | -21 per cent | Netherlands | -6 per cent |
| Germany | -21 per cent | Austria | -13 per cent |
| Greece | +25 per cent | Portugal | +27 per cent |
| Spain | +15 per cent | Finland | 0 per cent |
| France | 0 per cent | Sweden | +4 per cent |
| Ireland | +13 per cent | United Kingdom | -12.5 per cent |
| Italy | -6.5 per cent | | |

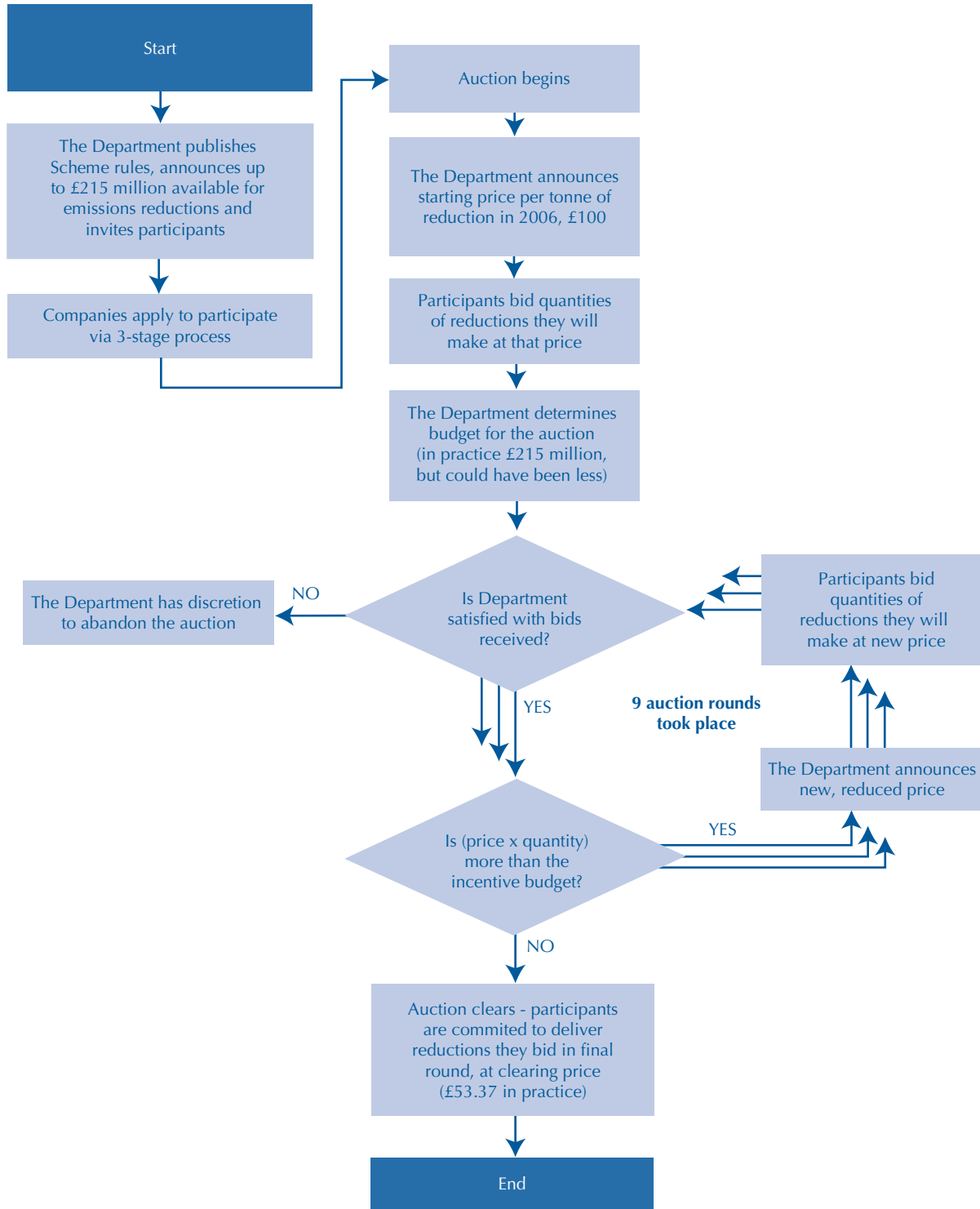
- 4 The emissions targets under the Protocol cover the six main greenhouse gases, shown in the table below. Countries' international emissions targets are expressed in terms of just one of these gases, carbon dioxide. For emissions of other gases, a conversion factor (the Global Warming Potential (GWP), different for each gas) is used to calculate the equivalent amount of carbon dioxide which would have the same effect on the atmosphere.

For example, the hydrofluorocarbon gas HFC-23 has a GWP of 11,700, meaning that one tonne of HFC-23 will have the same effect on the atmosphere as 11,700 tonnes of carbon dioxide and will be measured as an emission of 11,700 tonnes of carbon dioxide (CO₂) equivalent (tCO₂e). A small change in the baseline or target will therefore be exaggerated for companies with emissions of non-carbon dioxide gases.

| Gas | Sources | UK 2001 emissions, weighted by GWP (million tonnes of carbon dioxide equivalent (tCO ₂ e)) |
|----------------------|---|---|
| Carbon dioxide | Electricity generation, manufacturing, transport | 560.8 |
| Methane | Waste, agriculture, oil and natural gas production, coal mining, industrial processes | 46.1 |
| Nitrous oxide | Agriculture, waste, fuel combustion, industrial processes, transport | 42.4 |
| Hydrofluorocarbons | Refrigeration, chemical manufacturing processes | 8.7 |
| Perfluorocarbons | Electronics, refrigeration/air conditioning | 0.7 |
| Sulphur hexafluoride | Electrical insulation, magnesium smelting, electronics, training shoes | 1.8 |

Appendix 3 The incentive auction process

The incentive auction process



Appendix 4

Other emissions trading schemes

| Country/Company | Start Date | Participants | Mandatory/ Voluntary | Coverage |
|---|--|--|-------------------------|---|
| Current and former greenhouse gas schemes | | | | |
| Denmark | 2001, closed 2003 | Eight electricity companies | M | Carbon dioxide only |
| BP: internal company CO ₂ trading | 2000 (trial period 1998-2000), closed 2002 | All business units: each has individual allowance, the sum of which is BP's total emissions target | M | Carbon dioxide and methane, excluding emissions from purchased power and heat |
| Shell/ Royal Dutch Tradeable Emissions Permits System | 2000, closed 2002 | Six business units based in Australia, Canada, Europe and the US | V | Carbon dioxide and methane |
| Hesse Tender (Hesse region of Germany) | 2003 | Six companies | V | Carbon dioxide |
| Proposed greenhouse gas schemes | | | | |
| European Union | 2005 | See Figure 12 in main text | M | Carbon dioxide only (other gases potentially later) |
| Norway | 2005 | Various industrial processes, gas, coal burning, cement production | M | Carbon dioxide |
| Japan | 2005 | Voluntary - not yet known | V | Not known |
| Chicago Climate Exchange | October 2003 | 14 companies and organisations at launch | V | All six greenhouse gases |
| Examples of existing trading schemes for other polluting gases | | | | |
| US: Sulphur Dioxide Cap and Trade Program | 1995 | 110 companies, mainly coal-fired electricity utilities | M | Sulphur dioxide |
| US: Ozone Transport Commission (13 US states and districts) | 1998 | Electricity companies, chemical plants, refineries, waste incinerators, other industries | M | Nitrogen oxides |
| US: RECLAIM | 1994 | Emitters in the Los Angeles Air Basin region of Southern California | M | Sulphur dioxide and nitrogen oxides |

Appendix 5

Emissions Trading Group members

The following table shows the membership of the Emissions Trading Group when it put together outline proposals for the UK Scheme and their involvement with the Scheme. Since the early development of the Scheme, the Emissions Trading Group has expanded and it now includes over 200 members. The Group is now primarily concerned with work on the implementation of the European Scheme.

a Companies that became Direct Participants in the Scheme, with the total amount of incentive they will receive if their targets over the five years of the Scheme are met

| | |
|---|---------------|
| ICI / Ineos Fluor ²² | £43 million |
| British Airways | £6.7 million |
| British Sugar | £5.3 million |
| Invista UK | £26.7 million |
| Shell UK | £23.4 million |
| BP | £18.9 million |
| Blue Circle Industries/Lafarge Cement ²³ | £13.3 million |
| Ford Motor Company | £0.67 million |

b Electricity generators not permitted to participate in the Scheme (as regards their generation activities), and their trade associations

| |
|--------------------------------------|
| Association of Electricity Producers |
| BNFL Magnox Generation |
| British Energy |
| British Nuclear Fuels |
| Electricity Association |
| National Power/Innogy ²⁴ |
| Powergen |
| Scottish Power |
| TXU Europe/Powergen ²⁵ |

c Companies and organisations providing services to participants in the Scheme or representing participants

| Company/Organisation | Principal interest |
|---|---|
| AON Carbon | Provides carbon risk management services |
| BRE | Energy efficiency research |
| Combined Heat and Power Association | Emissions trading affects market for Combined Heat and Power technology |
| Corporation of London | Represents City of London banks' interest in Scheme |
| EcoSecurities | Consultant to Scheme participants |
| Energy Intensive Users Group | Represents industry sectors with heavy energy use |
| ERM (Environmental Resources Management) | Consultants to Department and Scheme participants |
| ESD (Energy for Sustainable Development) | Consultants |
| IPE (International Petroleum Exchange) | Oil and gas trading, plus related commodities (e.g. emissions allowances) |
| Lloyd's Register | Verifier - Lloyd's Register Quality Assurance (LRQA) |
| Natsource | Broker under the Scheme (following merger to form Natsource Tullett) |
| OM Group | Financial/energy services |
| UKOOA (UK Offshore Operators Association) | Trade association for the offshore oil and gas industry |

²² Ineos Fluor's operations covered by the Scheme were previously owned by ICI.

²³ Blue Circle was purchased by Lafarge Cement, which then participated in the auction.

²⁴ National Power demerged in October 2000 to form Innogy and International Power.

²⁵ TXU Europe was acquired by Powergen in October 2000.

d Other companies and organisations with an actual or potential interest in the Scheme, for example as a Climate Change Agreement Participant

| Company/Organisation | Principal interest |
|-----------------------------------|--|
| Calor Gas | Supplier of LPG (liquefied petroleum gas) and refrigerant gases |
| Corus Group | Steel manufacture |
| Total Oil Marine | Potential Direct Participant - pre-registered for Scheme but did not join auction, now part of TotalFinaElf |
| Amerada Hess | Oil and gas company |
| BG Group | Natural gas company |
| Paper Federation of Great Britain | Members are Agreement Participants (via paper sector Climate Change Agreement) |
| Air Products | Industrial gases company |
| BOC Group | Industrial gases company |
| Nestle | Food manufacturer |
| Chemical Industries Association | Members are Direct Participants and/or Agreement Participants (via chemical sector Climate Change Agreement) |
| Pilkington plc | Agreement Participant (via glass sector Climate Change Agreement) |
| Alcan | Aluminium and packaging manufacturer |
| UK Steel | Sector Association for steel sector Climate Change Agreement |
| Vauxhall | Motor manufacturer and participant in motor manufacturing Climate Change Agreement |

Appendix 6

Frontier Economics' views on the auction format

- 1 This appendix summarises a paper prepared by Frontier Economics arguing that an alternative auction format would potentially have allowed the Department to achieve better value for money, by purchasing emissions reductions at a lower cost per tonne.

Introduction

- 2 The Department implemented a descending clock auction to allocate emissions reduction incentive money. Given the particular circumstances of the auction, Frontier Economics believe that a different form of auction would potentially have allowed the Department to achieve better value for money in procuring emissions reductions at lower unit cost, while recognising that this was not the sole purpose of the auction. The key factors leading to this conclusion are:

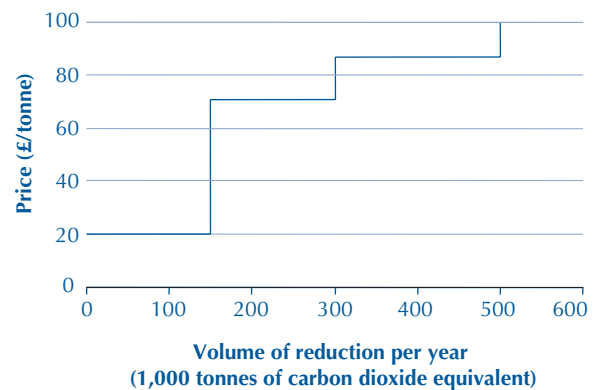
- the acknowledged risk of paying for reductions that would have occurred in the absence of the scheme; and
- the Department's readiness/wish to delay setting its budget until bidders had submitted bids in the first round, for which there was provision in the rules the Department developed for the auction.

- 3 Given that the government was not going to set its budget definitively until the auction had started, the Department had the opportunity to design the auction so that it received the best possible information to help it make the most appropriate budget decision.

The alternative auction

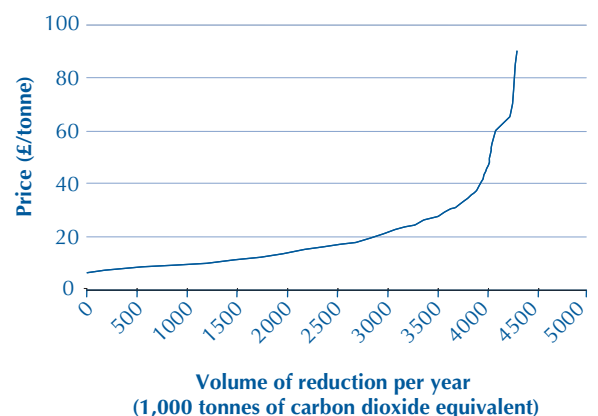
- 4 Frontier Economics propose an alternative format for the auction in which each bidder would submit their bids to reduce emissions over a wide range of prices per tonne. A bidder might, for example, submit a schedule showing that at £100 per tonne it would offer a reduction of 500,000 tonnes and would continue to offer this volume at prices down to £87 per tonne. At prices in the range £87-71 per tonne it might offer 300,000 tonnes, at between £71-20 per tonne 150,000 tonnes and below £20 per tonne it might offer nothing. **Figure 14** illustrates this offer graphically. Asking bidders to provide bids in this form should not be a burden, as individual bidders will need such information to be prepared to participate in the descending clock auction that was used.

14 Individual supply curve



- 5 Armed with this information from all bidders, the Department would then be able to add the bids together, to find the total quantity of reductions it could buy at each price in the range. **Figure 15** illustrates such an 'aggregate supply curve' graphically (using hypothetical information because bidders were not asked to provide bids in the required form in practice). The Department could also calculate the cost of buying the reductions available at each price, and hence calculate: (a) the quantity of emissions it could buy by spending the whole of its budget of £215 million, and (b) the quantity of reductions it could buy for a variety of lower budgets. With this information it could then assess the quantity of reductions it would lose by setting a lower budget, and make a better informed decision on the budget, taking into account any other factors relevant to its objectives, such as the number of participants in the Scheme.

15 Aggregate supply curve



Potential benefits over the actual auction

- 6 The alternative format above has the advantage of providing the Department with much more information about the quantity of reductions that each bidder would be prepared to offer at various prices before the Department decided on the total budget to be spent. Under the 'descending clock' format that was actually used, the only information available to the Department before the budget decision was the volumes that bidders were prepared to offer at the starting price of £100 per tonne in 2006. Volumes at further prices emerged as the auction progressed, but only down to the clearing price of £53.37 per tonne in 2006.
- 7 It is not now possible to say what the shape of the aggregate supply curve would have been below £53.37 per tonne, precisely because the Department's auction format required the auction to end at that point. However, the shape of the segment of the aggregate supply curve down to that point (Figure 8) is very steep and makes clear that any higher budget would have been incrementally very bad value for money. This suggests that, unless the supply curve were sharply kinked just below the clearing price, the Department probably would have achieved better value for money if it had implemented an auction format providing fuller revelation of the supply curve prior to the final budget decision.
- 8 The Department's views on the advantages of a descending-clock auction over the format described above are summarised in paragraph 2.43 of the main text of this report.

Appendix 7

UK implementation of the European Union Emissions Trading Scheme

- 1 In January 2004 the UK was the first of the European Union member states to publish its draft National Allocation Plan (NAP) for implementation of the EU Emissions Trading Scheme (the European Scheme). The UK NAP lays out a provisional approach to the allocation of emissions allowances to 'installations' (equipment producing emissions) covered by the European Scheme. The Department asked for comments on the draft UK NAP by 12 March, and planned to submit it to the European Commission by the end of April 2004. The final allocation of allowances will be decided by 1 October 2004.
- 2 The draft UK NAP maintains the target set under the UK Climate Change Programme, of a 20 per cent reduction in carbon dioxide emissions by 2010, against 1990 levels. The proposed allocation of allowances for the first phase of the European Scheme will contribute 16.3 per cent to this target, while the allocation for the second phase (2008-2012) will make up the difference. The target goes beyond what the UK is required to deliver under the Kyoto Protocol and industry representatives objected to it when the draft NAP was first published.
- 3 The draft UK NAP proposed that allowances would be allocated to individual installations in a two-stage process: first of all amongst activities and industrial sectors covered by the European Scheme, on the basis of the projected level of UK emissions for these activities and sectors; then, according to the average (excluding the lowest year) of emissions in the period 1998-2002. Individual allocations would be distributed in three equal instalments.