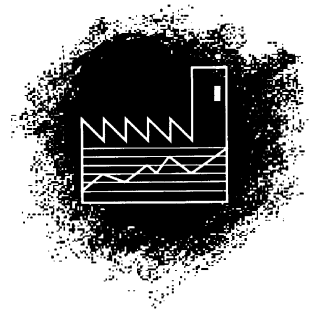
European Environment
Eur. Env. **11**, 125–139 (2001)
DOI: 10.1002/eet.257

DETERMINING THE COSTS TO INDUSTRY OF ENVIRONMENTAL REGULATION



Gary Haq[1,*], Peter D. Bailey[1], Michael J. Chadwick[1], John Forrester[1], Johan Kuylenstierna[1], Gerald Leach[1], Delia Villagrasa[1], Malcolm Fergusson[2], Ian Skinner[2] and Sebastian Oberthur[3]

[1] Stockholm Environment Institute, University of York, UK
[2] Institute for European Environmental Policy, London, UK
[3] Ecologic, The Independent Non-Profit Centre for International and European Environmental Research, Berlin, Germany

During the negotiation of international and European environmental regulations, the industry sector typically raises the issue of the cost of compliance. It is often maintained that the cost of complying with environmental regulations restricts business profitability and competitiveness. This paper provides an overview of the cost of compliance by considering the arguments, strategies and cost estimates that were presented by industry during the negotiations of several different environmental regulations in Europe and North America, and at the global level. It examines the difficulties associated with comparing costs using pre- and post-regulation cost data and discusses the strategies adopted during the negotiations of the regulation and once the regulation was implemented. The paper concludes that although some proposals for regulation may impose burdens on industry, which it will oppose, industry has come to recognize that environmental regulation does not necessarily mean increased costs at the level anticipated. While regulation cannot guarantee innovation or lead to greater competitiveness and higher productivity for all firms, those that seize the opportunities will usually gain benefits. The paper reinforces the view that the EU should give careful consideration to the costs presented by industry as in the past it has tended to overestimate costs of compliance and underestimate the potential for the development of new technology. The introduction of independent cost assessments and technology assessments may be one way of overcoming this problem. Copyright © 2001 John Wiley & Sons, Ltd. and ERP Environment.

* Correspondence to: Gary Haq, Stockholm Environment Institute, University of York, PO Box 373, York YO10 5YW, UK. E-mail: gh7@york.ac.uk

INTRODUCTION

The European Union is increasingly framing environmental policy in its member states. Initially this was undertaken with the aim of harmonizing environmental laws that might directly affect competitiveness and the functioning of the Common Market. However, recently the environment has taken on a higher profile in European Policy. The Single European Act started the trend as it provides the legal basis for action on the environment, which is to preserve, protect and improve the quality of the environment as well as ensuring the rational use of natural resources (Haigh, 1989). The Amsterdam Treaty, which came into force in May 1999, increased the profile of the environment further, as it made sustainable development an explicit objective of the Union and strengthened the requirement that the environment should be integrated into other EU policies (Haigh, 1999). New environmental laws in the form of regulations, directives and decisions have had direct effects on the industrial sector, which have included a reduction in polluting emissions to air and water as well as waste production and disposal.

During the negotiation of international and European environmental regulations the industry sector typically raises the issue of the costs of compliance. It is often maintained that the cost of complying with environmental regulations unduly restricts business profitability and competitiveness, reduces economic growth and stifles innovation. Although cost and economic competitiveness are important issues that need to be addressed, it is judged by many that strategies and cost estimates presented by industry during such negotiations prove to be considerably higher than the actual post-regulation costs of implementation or compliance.

This paper provides an overview of the costs of compliance by considering the arguments, strategies and cost estimates presented by industry in different negotiations of environmental regulations in Europe and North America, and at the global scale. It is based on the findings of a study funded by the Swedish Ministry of the Environment (SEI, 1999) and undertaken by the Stockholm Environment Institute (SEI) in collaboration with the Institute for European Environmental Policy (IEEP) and Ecologic. The study examined case studies of environmental regulations and compared and contrasted the strategies and cost estimates presented by industry during the negotiation of the regulations with the actual costs incurred, and effects which took place once the regulations had been implemented.

ENVIRONMENTAL REGULATION OF INDUSTRY

It is generally accepted that without government intervention the market will allow the overexploitation of common property resources and/or the underprovision of public goods (Gouldson and Murphy, 1998). Regulatory theorists have developed several models to explain when, and under which circumstances, government regulates business. Stigler (1971) suggests that regulations are driven by the needs of business and are acquired, designed and operated primarily for the benefit of business to increase profits and protect against competition. This 'self-interest' theory is based on the view that the regulated industry has a great deal at stake compared to the public, who are notional beneficiaries. Consequently, industry has an incentive to maintain a close relationship with the regulator, which could result in regulatory capture when the regulator is under undue influence by special interest groups and liable to corruption by self-seeking officials (Eckersley, 1995). In contrast, Wilson (1974) argues policy-makers regulate in response to broad social movements or crisis situations and act to protect the public, thus balancing industry opposition to regulation.

Over the past 20 years there has been a considerable expansion in the environmental regulation of the industrial sector. Mandatory regulations have demanded that businesses assume more responsibility for the environmental impacts that they create during the production process or in the final end

product. Voluntary initiatives have also been used for the same purpose, but have often been criticized for being too lenient on industry.

Commonly used in the United Kingdom (UK) in the 1980s, voluntary initiatives have also played a part in achieving environmental objectives as has the more adversarial and mandatory approach adopted by nations such as the United States (US). Indeed, US regulatory policy has been more ambitious and this has resulted in greater resistance from business. In contrast, it has been argued that, because the UK approach demanded less, the requirements were perceived as reasonable, and therefore industry was more likely to comply with environmental regulations (Vogel, 1986).

Negotiation has been seen as an alternative to the adversarial approach. Caldart and Ashford (1999) argue that negotiation is an efficient use of societal resources because it is more likely to lead to a result that all sides can accept. Moreover, negotiation is likely to result in creative solutions because it focuses on cooperation rather than confrontation. In the European Union, the Commission, business and national governments have recognized that environmental protection and economic growth are mutually enforcing goals (Thairs, 1998). There is now discussion of how to achieve environmental objectives in the most cost effective way. Measures used to regulate the effect of industry on the environment can be divided broadly into the 'command and control' approach based on imposing mandatory environmental standards (e.g. emission limits) and the more 'hands-off' approach of employing incentives and market-based instruments (e.g. pollution permit trading) (RCEP, 1998).

Industry has expressed its growing concern regarding the extent to which increasingly stringent environmental regulations have affected international competitiveness. Environmental protection measures will soon account for a significant proportion of total operating costs. If costs cannot be passed on to the consumer or if planned investments are delayed, then firms will be more active in lobbying governments to dismantle the regulations in question (Salter, 1992).

TECHNICAL APPROACHES TO CONTROLLING POLLUTANT EMISSIONS

Early approaches to controlling and abating environmental pollution tended to employ the 'dilute and disperse' concept. A good example is the belief that, by increasing the height of industrial chimney stacks, pollutants would be released much higher into the atmosphere, thus reducing environmental impacts by diluting and dispersing the pollutants. Although this approach was effective in reducing local air pollution, it contributed to increasing regional air pollution problems.

A more sophisticated strategy has involved end-of-pipe abatement approaches, which involve the use of control technologies to regulate the release of particular pollutant streams into the local water or atmosphere surrounding the plant (Jackson, 1996). Control technologies may be easy to retrofit to existing plants or to incorporate into the design specifications of new plants. End-of-pipe techniques have been effective in reducing point-source pollution from industrial stacks and pipelines; however, add-on technology can result in a number of additional technical and economic impacts. For example, fitting flue gas desulphurization (FGD) units in power plants reduces the overall efficiency of the plant by between 1 and 5 per cent, thus leading to an increase in fuel consumption. Likewise, the catalytic converter is known to increase fuel consumption of vehicles and thus carbon dioxide emissions. Control technology may create additional environmental impacts. In the case of FGD technology, limestone is required as an input, which must be quarried from geological deposits and calcium sulphite and sulphate are end products needing disposal.

THE PORTER HYPOTHESIS

The conventional view on environmental protection is that there is a trade-off between environmental protection and economic growth. This trade-off sets the social and

ecological benefits that arise from the results of applying environmental standards against the costs of pollution prevention and clean-up. Industry often perceives this as cost-ineffective. Its response usually stems from a concern over the costs of implementation and reduction of competitiveness resulting in the fear of market loss to businesses that operate in regimes that are more lax. Generally, the response of industry to tighter regulation has been to argue that the effect of market pressures and heightened corporate social responsibility and environmental awareness are more effective spurs for ensuring environmental protection (Salter, 1992).

Porter (1991) argued that 'strict regulations do not inevitably hinder competitive advantage against foreign rivals, indeed, they often enhance it'. What has been termed the 'Porter hypothesis' is in contrast to the conventional industry view. This argument has been adopted by senior officials in the American government (Gore, 2000).

Rather than regulations imposing a cost on industry, Porter and van der Linde (1995) argue that strict regulations, if properly designed, can in fact stimulate firms to discover hidden win–win opportunities. The neoclassical economic models of the firm as a profit-maximizer with perfect knowledge does not exist in reality and many opportunities exist for firms to improve their environmental performance cost-effectively. Porter and van der Linde (1995) argue that strict regulation is necessary to stimulate firms into discovering opportunities, and to achieve cost-effective compliance, thus enabling firms to overcome barriers to change such as bounded rationality[1] (Simon, 1997) and principal–agent problems[2], which are problems that arise in many spheres of economic activity. However, critics of the Porter hypothesis have argued that Porter's arguments are based on 'inconclusive anecdotal evidence' (Palmer and Simpson, 1993) and that there is little evidence to support the view that environmental regulation actually stimulates innovation and improves international competitiveness (Jaffe *et al*., 1995). Walley and Whithead (1994) argue that win–win situations rarely exist, although the findings of Feldman *et al*. (1996) that improving a firm's environmental management results in a higher stock price hardly upholds this view.

[1] A term used to describe managers of firms who operate on the basis of imperfect knowledge. Although they attempt to act optimally, their rationality is bounded due to their cognitive ability to process a finite amount of information.

[2] When one person, the principal, hires an agent to perform tasks on his behalf but cannot ensure that the agent performs them exactly the way the principal would like. The efforts of the agent are expensive or impossible to monitor and the incentives of the agents differ from those of the principal (Black, 1997).

THE RESPONSE OF INDUSTRY TO ENVIRONMENTAL REGULATION

Corporate strategies and responses to the growth in environmental regulation vary according to the type of industry. While some industries may gain in their world market share because of strict environmental standards, others will lose out. This can cause some firms to close down or relocate to a country with lower standards. Vogel (1995) argues that stricter environmental regulations can represent a source of competitive advantage for domestic producers. Often it is easier for domestic producers to comply with strict standards, hence they can compete with firms from other political jurisdictions by raising rather lowering their standards. National patterns of health, safety and environmental regulation illustrate the 'California effect' (named after the state with cutting edge environmental regulation), which results in strict regulation causing a 'race to the top' among trading partners to achieve higher regulatory standards.

In several countries environmental regulations have actually stimulated technological innovation in terms of both prevention and control measures, for example, in Japan, Germany and the US. However, from the firms' point of view, the costs of investing in developing the technology to meet a specific regulation have to be offset against future benefits from selling the technology. For example, there are a number of initiatives to encourage the use of, and therefore provide for a market for, alternative-fuelled vehicles. In California,

the state authorities set a requirement that 10 per cent of the new car sales should be zero emission vehicles by 2003. Similarly, in Europe, the ALTER programme aims to create a market for alternative-fuelled vehicles by committing cities across the continent to introduce measures to encourage their use. Initially, it was thought that a new fuel, such as ethanol or methanol, would be needed, which, in turn, could be used only in cars with redesigned engines. The potential of new fuels led the oil industry to devise new formulae for gasoline that would achieve similar emission levels as those resulting from the use of alternative fuels in the engines of existing cars (Cairncross, 1992).

For the more environmentally conscious firms, pollution prevention measures have resulted in cost savings. Improvement in the efficiency of energy and material use in the production process is an important part of preventive environmental management. If less material input is required to provide the same output, this will represent tangible cost savings to the company. Although the company will incur initial investment costs, the savings may, on the whole, outweigh the costs. The US company 3M was one of the first industrial corporations to adopt a preventive approach to the environmental management of process wastes. In 1975 3M introduced a programme to reduce environmental costs during an economic recession. The programme was a success and resulted in a saving of more than US $17 million for US facilities and US $3.5 million for subsidiary overseas firms. The company was also able to eliminate the equivalent of 75000 tonnes of air pollutants, 1325 tonnes of water pollutants, 500 million gallons of polluted waste water and 2900 tonnes of sludge per year (Jackson, 1996).

Despite the conflict between industry and government authorities during the negotiations of new environmental regulations, some firms have endeavoured to take a proactive approach to environmental management, which has been driven by a strong profit motive. However, in many cases, environmental management has not been a goal in itself. The main aim has been to improve the company's public image to ensure that it remains competitive. In fact, a quantitative and detailed study (Feldman *et al*., 1996) concludes 'investments in environmental management and performance may be costly. Nonetheless, when appropriately evaluated, many of these investments may be shown to provide substantial, positive returns and lasting value to the firm'.

SELECTION OF CASE STUDIES

In order to examine the strategies that have been promoted by industry during the negotiations of specific environmental regulations, 28 potential cases studies of environmental regulations were identified. In order to select the case studies the following criteria were used:

- clear relation to a statutory environmental regulation;
- clear documentation of the costs estimated by industry prior to the negotiation for that regulation; and
- clear documentation of the costs realized or alternative strategies employed in the implementation phase.

Five case studies of environmental regulations were selected for the analysis and provide best illustrative examples:

- UN/ECE Protocols of the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP) on Acidification and the EC Directive 88/609/EEC on Air Emissions from Large Combustion Plants (Box 1);
- EC Directive 91/441/EEC on Vehicle Emission Standards (Euro I Standards and Catalytic Converters on Cars) (Box 2);
- the European Auto-Oil Programme (Box 3);
- the United States Clean Air Act (Box 4) and
- the Montreal Protocol on Substances that Deplete the Ozone Layer (Box 5).

The five case studies were examined to determine the predicted costs presented by industry during the negotiation of the regulation and the actual costs incurred in

implementing the regulation. Where it was not possible to determine precisely the actual cost of compliance, emphasis was given to the strategies adopted compared to those initially envisaged by the industry in question.

Box 1. Convention on Long-Range Transboundary Air Pollution *and* EC Directive 88/609/EEC – Emissions to Air from Large Combustion Plants.

The 1979 Convention on Long-Range Transboundary Air Pollution provides a framework for controlling and reducing damage to environment and human health caused by transboundary air pollution. The Convention was the first international legally binding instrument to deal with problems of air pollution on a broad regional basis. Besides laying down the general principles of international cooperation for air pollution abatement, the Convention set up an institutional framework bringing together research and policy. It resulted in 34 Governments and the European Community (EC) signing the Convention, which came into force in 1983 and has been extended by eight specific protocols:

Long-term financing of the Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP) (1994);
Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes (1985);
Protocol on the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes (1998);
Protocol on the Control of Emissions of Volatile Organic Compounds (VOCs) or their Transboundary Fluxes (1991);
Protocol on the Further Reductions of Sulphur Emissions (1994);
Protocol on Heavy Metals (1998);
Protocol on Persistent Organic Pollutants (POPs) (1998);
Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (1999).

The Protocol to the Convention on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent entered into force in 1987. The Protocol aims at abating one of the major air pollutants. As a result of this Protocol, substantial cuts in sulphur emissions have been recorded in Europe: taken as a whole, the 21 Parties to the 1985 Sulphur Protocol reduced 1980 sulphur emissions by more than 50 per cent by 1993. Also individually, based on the latest available data, all Parties to the Protocol have reached their reduction target. Eleven Parties have achieved reductions of at least 60 per cent. Given the target year 1993 for the 1985 Sulphur Protocol, it can be concluded that all Parties to that Protocol have reached the reduction target of reducing emissions by at least 30 per cent.

The Large Combustion Plant Directive aims to reduce the principal causes of acid rain: sulphur dioxide (SO_2) and oxides of nitrogen (NO_x) and dust in the emissions from large combustion plants, which are plants of at least 50 Megawatts (MW) net rated thermal input. It sets phased reductions with different limits for different member states. Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants was the first directive to be adopted under the framework Directive 84/360/EEC on the combating of air pollution from industrial plants.

Member states had to draw up programmes for the phased reduction of total annual emissions of SO_2 and NO_x from plants whose original operating licence was granted before 1 July 1987. For new plants, or plants whose capacity has been extended by 50 MW or more, licences for construction or operation must contain conditions for compliance with emission limit values for SO_2, NO_x and dust, and appropriate conditions for discharge of waste gases. Member states may impose tighter requirements.

If a new plant is likely to have significant effects on the environment in another member state, the member state must ensure that the other member state is consulted appropriately, under Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

The Large Combustion Plant Directive has largely been adhered to by the British electricity industry. This is partly through flue gas desulphurization units at power stations and also because increasing numbers of gas-fired power stations have meant that coal is now less widely used. In Germany, domestic law pre-dated the Directive by almost five years. German firms manufacturing flue gas desulphurization units were well placed to sell abroad once the same standards became law elsewhere.

Source: Mumma, 1995; IEEP, 2000; UN/ECE, 1999.

Box 2. European Union Auto-Oil Programmes.

Directives 91/441/EEC and 94/12/EC had the effect of requiring catalytic converters on new petrol-engined cars. This measure proved highly controversial and resulted in complaints from the motor industry in particular that neither the costs nor the benefits of the proposals had been properly or rationally assessed. In response to these criticisms the Commission embarked upon a significant new approach to Community air pollution policy, by setting up the so-called European Auto-Oil Programme. Central to this programme was a tripartite initiative of the Commission, the motor industry and the oil industry to address road vehicle emissions and air quality in a more holistic way. In this process the participants sought to pool their information and to set a rational framework for assessing the most cost-effective contributions from a range of measures to meeting future air quality standards. The policy areas covered were to include not only new vehicle emissions standards, but also a framework of fuel quality specifications, evaporative emissions controls and inspection and maintenance programmes. Non-technical measures such as pricing policies and provision of public transport were considered in order to evaluate the correct balance of technical and non-technical measures. Other environmental impacts were taken account of only to a very limited extent. The second Auto Oil programme (Auto Oil II) was established in order to make recommendations for further emission limits to be applied from the year 2005. It was in many ways a broader and more ambitious programme than the first, and set out to rectify what were seen as weaknesses in the first programme. For example, representatives from member states and NGOs were included in the programme from the outset. It also included an inventory of pollution from stationary sources in order to attempt a cross-optimization of emission reductions from different economic sectors. The Auto Oil programmes have established a model which is likely to have a profound influence on the future development of vehicle emissions and fuel quality legislation at EC level, and possibly on other areas of emissions control policy as well. They represent a significant step forward in creating a 'rational' and scientific assessment within the transport and environment field. They have also been quite ambitious in terms of the scope of their analysis.

Source: Skinner and Fergusson, 1998.

Box 3. EC Directive 91/441/EEC on Vehicle Emission Standards (Euro 1 Standards and Catalytic Converters on Cars).

The base-directive 70/220/EEC lays down the technical requirements and the limit

values for carbon monoxide and unburnt hydrocarbon emissions from the engines of motor vehicles. These requirements have been made much more stringent over the past 25 years by a series of amending directives. EC Directive 91/441/EEC introduced a three-stage process of emissions for petrol and diesel motor vehicles. It extended emission limits for small cars stipulated in Directive 89/458 to all new model cars. EC Stage 1 or 'Euro 1' limits came into force in 1993. In order to meet these limits all new petrol cars needed to be fitted with a closed loop three-way catalytic converter, which removes 70–95 per cent of carbon monoxide, hydrocarbons and nitrogen oxides in vehicle exhaust emissions.

Source: IEEP, 2000.

Box 4. US Clean Air Act.

The US Clean Air Act of 1970 is a comprehensive Federal Law, which regulates air emissions from area, stationary and mobile sources. It established the National Ambient Air Quality Standards (NAAQS), which set maximum standards for a range of air pollutants. The goal of the Act was to achieve NAAQS in every state by 1975.

In 1977, the Clean Air Act was amended and set out new goals for achieving NAAQS since most of the states had failed to meet them by 1975. The 1990 amendment was aimed at addressing issues such as acid rain, ground-level ozone, stratospheric ozone depletion and air toxins, which had been previously neglected by the Act.

Although the Clean Air Act is a Federal law, much of the work has to be undertaken by the individual state administrations, since pollution reduction requires knowledge of the local circumstances. States are permitted to have more stringent standards than the NAAQS but they cannot promulgate weaker standards. They also have responsibility for deciding on permit applications by power or chemical plants and for fining companies who do not comply with regulations. The states are required to develop State Implementation Plans (SIPs), which contain a compendium of the regulations that they will implement in order to clean up polluted sites. Individual states are also obliged to include the public, for example, through hearings, in the development of each SIP. The Environment Protection Agency (EPA) must approve the SIPs and, if they are not approved, the EPA can enforce the CAA in the state. The EPA also assists states by providing scientific research and funds to support CAA programmes.

Source: SEI, 1999.

Box 5. The Montreal Protocol on Substances that Deplete the Ozone Layer.

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted by governments in 1987. The aim of the Protocol is to reduce and eventually eliminate the emissions of man-made ozone-depleting substances. The ozone layer is found in the stratosphere between 10 and 50 kilometres above the ground. It protects against the harmful effects of certain wavelengths of ultra-violet (UV) light from the sun. Any significant decrease in ozone in the stratosphere would result in an increase of UV-B radiation reaching the earth's surface, which will have significant implications for human health, animals, plants and plastic materials.

The Protocol was ratified by 29 countries and the EU, when it came into force on 1 January 1989, which represented approximately 82% of world consumption. Since then several other countries have joined. As of July 2000 175 parties have ratified the Protocol. Its control provisions were strengthened through four adjustments adopted in London (1990),

Copenhagen (1992), Vienna (1995), Montreal (1997) and Beijing (1999). One of the important aspects of the Montreal Protocol is that it was drafted in a manner that takes into account the impact of international trade and investment on the environment. The drafters of the Protocol recognized that totally unregulated trade in ozone-depleting chemicals would be likely to result in relocation of production facilities to countries that did not join the Protocol.

Source: UNEP, 2000.

COMPARING COSTS AND STRATEGIES

It is difficult to compare the estimated and actual costs of compliance. The term 'cost' has many different meanings in everyday language and within technical or disciplinary discussions. This wide usage provides an opportunity for differing interpretations and reinterpretations of the cost of an environmental regulation – a problem that can be mitigated only by adopting rigorous and agreed rules, in advance, for comparative costing exercises. Cost issues relate to where the boundaries of the activity undertaken are to be drawn, cost estimation and auditing procedures, discount rates, interest and exchange rates and their change over time, external costs and the form in which costs are (or have been) presented.

While specific cost data did exist for some case studies, it has proved difficult to demonstrate simply and unambiguously that estimates made in advance of regulatory abatement compliance were in excess of the eventual 'real' cost, or that a consistent factor emerges by which the 'real' cost was exceeded by the pre-compliance estimates. In a minority of cases it is possible to make fairly clear comparisons of the costs before and after implementation of a regulation. This is where the strategies and technologies suggested during negotiation were actually implemented. For example, in the case of the installation of FGD units, which were implemented to meet the emission limits under the EC Large Combustion Plant Directive, the claims of German Power Plant Association (VDEW) that the real investment costs would be twice that of the Umweltbundesamt (UBA) estimates were not borne out in practice (Schaerer and Haug, 1986, 1990). In fact the real costs turned out to be similar to those estimated in advance by UBA. In the case of VOC emission reductions, it seems clear that the costs proposed by industry in the Netherlands were approximately twice those of the Dutch Central Bureau of Statistics (VROM, 1989).

Furthermore, during the European Auto-Oil Programme early estimates of the cost of achieving a 30 ppm sulphur content in petrol were found to be over-estimated by 17 per cent, and for 50 ppm in diesel by 55 per cent (Arthur D. Little, 1998). These lower costs were sufficiently large to justify a much greater emphasis on fuel improvements, and influenced the position of the European Parliament. The case study concerning the introduction of catalytic converters for cars also allows some comparison, which indicates that the costs proposed by industry were higher than implementation costs.

In some case studies the before and after compliance costs are not directly comparable as they refer only to unit costs and exclude other important costs such as those relevant to installation. Another problem centres on manufacturing scale. Initially, the unit cost of production is typically high but, as production increases, costs fall. There are indications from the case studies that the lack of consideration of such economies of scale led to incorrectly high estimates from industry. A further costing problem is that industry may absorb some costs rather than passing them on to customers. This is one reason why the effect of the cost of catalytic converters on car price is difficult to discern. In other cases comparisons are not simple because:

- the strategy adopted was not the one for which costs were discussed during negotiation;
- the claims made by industry were not specific and cost claims by different stakeholders referred to packages of measures;

- the costs were reduced due to unforeseen or neglected potential to improve current technologies and improve efficiency; and
- the potential for industrial innovation was underestimated.

ARGUMENTS PRESENTED BY INDUSTRY

Five arguments are typically raised by industry representatives in responding to the need for new environmental regulations:

- the proposed policy will fail to yield the anticipated environmental benefits (i.e. the environmental goal may be valid but the proposed instrument is economically inefficient because it imposes unnecessary costs);
- the proposed instrument will make particular sections of industry less competitive or disadvantage an industry as a whole compared with other countries or regions;
- employment opportunities will be adversely affected;
- there is a lack of high quality scientific evidence linking cause and effect and hence the action demanded will be unlikely to yield the desired result; and
- there is an unresolved conflict between society's desire for higher environmental standards and a company's goal of adding to shareholder value.

A broad conclusion to emerge from the analysis of the five case studies is that comparisons of predicted, versus actual, costs of implementation oversimplify the positions and strategies adopted by industry during negotiations of environmental regulation compliance. The potential for job losses was emphasized in several of the case studies, but with a very wide range of predicted disbenefits varying from workforce reductions to extensive plant closures (in oil refineries), to warnings that 'entire industries could fold' with ensuing 'economic chaos', as in negotiations on the phase-out of chlorofluorohydrocarbons (CFCs) (Cogan, 1988). Other arguments hinged upon the lack of scientific evidence for impacts suggesting that regulation was not required (as in the US Clean Air Act (CAA) negotiations) (Dowd, 1990). In summary, although the cost of compliance is often a central theme during regulatory negotiations, it is by no means the only argument employed.

A second conclusion of the analysis is that the negotiating positions taken by various stakeholders continually change. Thus, in the negotiations concerning catalytic converters, luxury motor manufacturers were more positive about their introduction than manufacturers of small and lower-priced cars. During the European Auto-Oil Programme the motor industry opposed the oil industry on costs for the introduction of fuel standards, as the development of new engine technologies required the higher quality, low-sulphur fuels that the oil industry was resisting. However, it is common during negotiations that such industries are represented by branch organizations presenting a common 'industry' perspective.

In certain cases government and industry had a similar bargaining position. During the initial European negotiations on the Sulphur Protocol and Large Combustion Plant Directive the UK and German Governments represented the interests of the power industry, using cost arguments to oppose regulation. As pointed out by Boehmer-Christiansen and Skea (1991), 'polluting industries in Germany were not, initially, any keener than their British cousins to implement costly measures, especially retrospective requirements on existing power stations'. Later, the governments changed their position for a number of reasons, including a recognition that costs might be considerably less than the power sector was suggesting (Highton, 1984). With the Montreal Protocol, sections of industry changed their position dramatically to the point where they strongly supported more stringent regulation on ozone-depleting substances (ODS) as they developed viable chemical alternatives that could give them a competitive advantage in the field (Cogan, 1988).

In a number of cases lower costs of implementation were realized through the improvement of existing technologies that were not addressed by industry during the negotiation phase. Germany's Umweltbundesamt initially assessed that the emission control technology required to meet Euro IV standards for cars using advanced catalyst technology would cost a maximum of DM 200–350 in production models. It has been subsequently found that the same standards can now be met even less expensively (for DM 100 or less) by fine-tuning existing technology rather than through major advances in the type of treatment used (Rodt *et al*., 1995). The Auto-Oil case study indicated that some of the investment costs in achieving strict motor fuel standards in the Scandinavian refining industry were offset by efficiency gains and other benefits in the refining process. In addition, the greater availability of sweeter crude oil supplies, an exogenous factor that perhaps was not envisaged, helped to keep down the costs.

One consistent finding is that the potential for innovation in industry is often under-estimated, such that the costs of compliance are consequently overestimated. Fast-moving technical innovation typically contributes to rapidly reducing unit costs. Factors such as these are difficult to capture in advance, resulting in a degree of conservatism in industry cost estimates. In a climate of constant technical innovation it is also difficult to agree which costs or benefits should be fairly ascribed to a regulatory change. These important issues are most clearly demonstrated by events leading to the Montreal Protocol. During the negotiations expectations regarding availability of substitutes and alternatives to existing ozone depleting substances, and the potential for innovation in this area, were underestimated, which had a direct impact on the assumptions concerning the costs of phasing out CFCs and other ozone depleting substances (Glas, 1989; UNEP, 1991). Based on rather static assumptions, a series of Rand Corporation studies conducted during the first half of the 1980s found relatively limited potentials for reducing CFC use and steeply rising cost curves (Palmer *et al*., 1980; Mooz *et al*., 1982; Wolf, 1980). The industrial dynamics have subsequently proven these assessments to be far too pessimistic. The example of the Montreal Protocol suggests that costs are easily exaggerated for those sectors of the economy that have a high potential for innovation. Industry may tend not to take into account, or may underestimate, this innovation potential as there is no certainty that it will deliver the needed solutions. In addition, a number of unforeseen factors can inhibit the realization of the full potential for innovation in industry. The dynamic evolution of the Montreal Protocol and the rapid phase-out of major ODS have, in large part, resulted from a very remarkable response from industry. Initial resistance to regulation by some industries was relieved through technological innovation, which led to the development of substitutes and alternative technical processes that allowed the phase-out process to proceed much faster than previously anticipated – and at greatly reduced cost. As a consequence, industry played an increasingly constructive role in the Montreal Protocol process. However, it was fortunate in this case that the industry losing the CFC market was identical to the industry that gained the new markets for hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs) that the Protocol introduced. In political terms this situation can, of course, be much more precarious if the benefits of regulation do not accrue to 'loser' industries.

INNOVATION AND TECHNOLOGICAL CHANGE

The nature of the technologies and techniques that are developed and applied in response to an environmental regulation reflects its impact on society. Over a number of decades many countries have experienced a change in the technological and sectoral composition of their economies. This has resulted in technological change with the environmental intensity of production in key sectors falling, whether measured in terms of resources consumed or emissions generated (Jänicke *et al*., 1989). Ashford (1993) explains the lack of

commitment of firms to improve environmental performance, even when it may lead to environmental benefits, and suggests four organizational barriers to innovation:

- lack of information on costs and benefits;
- lack of confidence in the performance of new technologies and techniques;
- lack of material capacity and financial capital to with transition costs of reorganizing the production process; and
- lack of awareness of the long-run benefits of environmental management resulting in low priority being assigned to environmental issues.

In addition to organizational barriers, a range of technical barriers also exists that can limit the potential for environmental management initiatives aimed at changing the way firms undertake an activity rather than what they do. Thus change has occurred incrementally over time.

The presence of barriers to innovation and the potential for diminishing marginal returns establishes a clear rationale for regulation that promotes the necessary conditions for innovation and the development and the application of new technologies (Gouldson and Murphy, 1998).

Firms have gradually begun to recognize the economic and environmental potential of integrated, preventative and clean technologies. Rather than simply reacting to regulation by using end-of-pipe technologies, many firms have gone further and are attempting to develop and apply technologies that can improve environmental performance and productive efficiency.

DISCUSSION

The case studies illustrate cost arguments generally presented by industry and its representatives in the negotiation of these environmental regulations. It should be noted that it is difficult to extrapolate conclusions from five case studies to industry as a whole and it has proved difficult to demonstrate simply and unambiguously that estimates made in advance of compliance with regulations were in excess of the eventual 'real' cost. However, the case studies do demonstrate examples where industry stressed a high cost of compliance during negotiations, prior to the adoption of the regulation in question. From the analysis of the case studies examined, it can be inferred that industry's actual costs for implementing environmental regulations were lower than its predictions of these costs during the negotiations. In short industry tended towards overestimation of predicted compliance costs and, in certain cases, based its substantive opposition to regulations on such cost estimates.

The major conclusions from the five case studies support this generalization. For example, the case study on large combustion plants illustrates this point, where it was shown that in the United Kingdom, Germany and The Netherlands initial pre-negotiation estimates of the investment requirement (CEGB, 1979), future operating costs and the rise in product (in this case electricity) prices were overstated by those who originally opposed (Highton, 1984), or were reluctant to accept, the abatement measures deemed necessary by pollution control policies. Similarly, in the case study on the US CAA, evaluation of the Act shows that most of the compliance costs for industry have not been as high as predicted. Industry pre-compliance figures of US $51 to US $91 billion per year contrast sharply with EPA post-compliance estimates of US $22 billion (EPA, 1997).

Negotiating positions taken by various stakeholders are dynamic. It is, for example, not always the simple situation where industry opposes government. 'Industry' consists of many different stakeholders, each with different positions. Sometimes they side with government; sometimes a national government will take the side of a particular industry. The Auto-Oil Programme case study shows that, while two industries were involved in the negotiations, as negotiations progressed the oil industry and motor industry representatives effectively took different sides. Motor manufacturers began to question the cost estimates of the oil industry, emphasizing in particular the lower costs already emerging from

Swedish and Finnish experience. Motor manufacturers also began to emphasize the need for much lower sulphur levels in fuel to allow for the development of more efficient engine technologies. The Fuel Quality Directive, which resulted from the negotiations, to which industry eventually agreed, set standards to be achieved by 2000 and 2005. However, the speed with which the oil industry has introduced fuel in some countries that went beyond 2005 standards, in some cases, was a marked contrast to the opposition shown to the standards by industry in the course of negotiations.

Focusing on fiscal costs alone does not do justice to the full range of arguments used by industry representatives in the debate concerning regulations. The potential for a wide range of predicted disbenefits was frequently emphasized, varying from workforce reductions to extensive plant closures. The US CAA case study shows clearly that the dramatic reduction in employment did not occur (EPA, 1997). Indeed, in terms of social costs the CAA has provided a number of significant benefits for human health, the environment and even job creation in some sectors.

Another problem in making broad generalizations is that, in some cases, the strategy adopted after an environmental law has been passed has not been the one for which costs were discussed during negotiation. In particular, the sulphur targets for the United Kingdom have not had any significant impact on electricity generation costs and consumer prices as the national ceilings on sulphur emissions in the UK are being met by the introduction of gas-fired power stations, rather than the installation of flue gas desulphurization equipment. In other cases (for example, the case study on catalytic converters) the effect on prices to the consumer is clearly difficult to discern. It is argued, for example, that this is because manufacturers may have chosen, or been forced, to absorb some of these costs rather than pass them on immediately to customers.

The Montreal Protocol case study suggests that costs are easily exaggerated for those sectors of the economy that have a high potential for innovation. Industry may tend not to take into account, or underestimate, this innovation potential.

The case studies indicate that technical advances, innovation and economies of scale can provide various opportunities for the reduction of costs in the implementation of regulations. However, factors such as these can, in some cases, be difficult to capture in advance, resulting in a degree of conservatism in industry cost estimates.

CONCLUSIONS

Some regulatory approaches to environmental improvement that are being initiated by the EU and other international organizations may impose a burden on certain firms, which industry representatives have tended to oppose; however, other parts of industry have come to recognize that properly designed regulation need not increase costs. Good regulation has often enhanced competitiveness in firms receptive to opportunities of advances in technology, according to the expectations arising from the Porter hypothesis. For example, in response to new fuel consumption standards, Japanese and German automobile manufactures developed lighter and more fuel-efficient cars. In contrast, the less competitive US car industry fought such standards but eventually realized that it would lose out if it did not compete through enhanced innovation.

Although the conclusions that can be drawn from five case studies regarding industry as a whole and its position in the negotiations of environmental regulations are by no means universal, the case studies examined demonstrate that industry generally stressed a high cost of compliance during the negotiation of the regulation in question. In this respect the study reinforces the need to view costs claims by industry in the course of environmental negotiations with careful consideration as industry has tended, in the past, to overestimate costs of compliance and underestimate the potential for the development of new innovation and technology.

As well as being responsible for environmental policy-making within its own borders,

the EU also has a role in international environmental policy-making and overestimated costs of implementing environmental regulations to address global issues may detract from the common interest.

There is a case for independent cost assessments of public policy to be undertaken that would consider the cost to the whole economy rather than a particular sector. In addition, independent technology assessment procedures and institutions could prove useful in identifying the potential of technology to meet the regulatory standards. Decision-making based on industry's estimates can in the long term be damaging to the general interest and may even be counterproductive for industrial development as in some cases there are net benefits to be gained. Environmental regulation does not necessarily generate innovation or stimulate greater competitiveness or higher productivity for all firms; however, those firms that seize the opportunity to innovate will ultimately prevail in terms of enhanced competitiveness, which has important implications for the formulation of future European environmental policy.

ACKNOWLEDGEMENTS

The authors would like to thank Svante Bodin of the Swedish Ministry of the Environment for providing the opportunity to undertake the study on which this paper is based. Special thanks go to Christer Ågren of the Swedish NGO Secretariat on Acid Rain for his valuable insight and advice, which he contributed throughout the preparation of the study, and to Deborah Cornland and Johannah Bernstein of SEI for their assistance.

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