# Risk Evaluation in the United Kingdom: Legal Requirements, Conceptual Foundations, and Practical Experiences with Special Emphasis on Energy Systems

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## discussion paper

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# Preface

One of the central issues in the controversial debate on energy systems is the evaluation of risks associated with different options for energy supply and demand. Models of risks evaluation help to promote a rational discussion about the criteria for judging the acceptability of energy options. These normative criteria should meet the test of intersubjective validity, i.e. they should be, at least in principle, agrreeable or acceptable to all affected parties. Any decision on acceptability is also a decision about the allocation of risks, because it determines the relationship between the costs for suffering the potential consequences of the remaining risks and the costs for risk reduction.

Any judgment on acceptable risk levels relies on explicit or implicit criteria to evaluate the appriopriateness of each risk evaluation model. Such a comparison of models for risk evaluation requires a selection of meta-criteria. We chose the following meta-criteria: efficiency, incentives for risk reduction, applicability / feasibility and distributive fairness. All models of risk evaluation have been analyzed and evaluated on the basis of these four meta-criteria. The purpose of the exercise has been to generate a comparative review of different evaluation models and to point out the relative advantages and disadvantages of each model according ot the meta-criteria.

In a democratic system a risk evaluation model may encounter support only if the interests of those who produce risks are equally important to the interests of those who suffer from these risks. Our starting point for analyzing risk evaluation models has therefore been the individual utility of both, the risk producers and the risk bearers. Individual utilities constitute the final yardstick for evaluating risk acceptability in an ideal world. The crucial question, however, is

how to aggregate individual utilities for collective decision making and how to include external effects. There are four basic models that promise at least a partial solution to the problem of collective decision making (see Fig. 1/ sorry  Fig. 1 is not available at the moment).

The first basic model refers to governmental regulation. A governmental agency is given the mandate to determine an acceptable risk level. This level is binding for risk producers and risk bearers. From an economic perspective „risk“ is conceptualized as a public good that needs governmental intervention. This baisc model includes risk evaluation methods such as comparisons, quantitative or qualitative setting (Best Available Control Technology = BACT ; As Low As Reasonable Achievable = ALARA) and economic valuation (cost-effectiveness-analysis, cost-benefit-analysis, decision analysis).

The second basic model refers to methods by which acceptable risk levels are negotiated between risk producers and affected individuals. The role of governmental agencies is confined to determine the legal conditions for those negotiations and to assure that they take place in a fair setting. The participants of those negotiations tend to internalize risks by selecting a risk reduction and management strategy on which all affected parties can agree, in principle. If all affected parties are involved in the negotiations, external effects of imposing risks on third parties are effectively internalized. This model comes closest to the market approach to risk management. Beyond direct negotiations, liability law is used for ex-post compensation of potential victims. It can be based on two different principles: causality (weak or strong) or intent and negligence.

The third basic model refers to the elicitation of criteria by experts. This model can be combined with the governmental approach to risk regulation. The idea is that experts in various fields should be empowered to set standards or to define the threshholds between acceptable and non-acceptable risk levels. Instruments within this model include expert panels, Royal Commissions and similar propfessional councils. Formal procedures such as Delphi, Consensus Conferencing, or Meta Analysis are used to determine a collective judgment.

The fourth basic model builds upon discursive approaches to risk management. These models emphasize democratic decision making enhanced by competent knowledge input and fair

representation of social interests and values. Although there is some similarity to the market model of negotiation, the main idea is not to bargain between different interests, but to develop a common solution to the risk problems. This solution should be based to the exchange of arguments among the people who will be affected by the decision. Discursive methods include consensus conferences, citizen juris, citizen panels and similar forms.

Each of those solutions to risk evaluation has its advantages and disadvantages. The theoretical approaches to risk evaluation can be compared with the actual practice of risk regulation procedures in several countries. These procedures are described and analyzed in the following reports:

- **Energy risk evaluation in France** (Marc Poumadère, Ecole Normale Supérieure de Cachan, Claire Mays, Institut SYMLOG, Cachan), discussion paper No. 89

- **Risk Evaluation: Legal Requirements, Conceptual Foundations and Practical Experiences in Italy. Case Study of the Italian Energy Sector.** (Natascia Petringa), discussion paper No. 90

- **Risk Assessment in the Netherlands.** (Giampiero E.G. Beroggi, Tanja C. Abbas, John A. Stoop, Markus Aebi, Delft University of Technology), discussion paper No. 91

- **Risk evaluation in the United Kingdom: Legal requirements, Conceptual Foundations, and Practical Experiences with Special Emphasis on Energy Systems.** (Ragnar Löfstedt, University of Surrey, Guildford), discussion paper No. 92

- **Risk evaluation: Legal Requirements, Conceptual Foundations, and Practical Experiences in the United States.** (Dale Hattis, William S. Minkowitz, Clark University, Worcester, Mass.), discussion paper No. 93

- **Risk Assessment in the Federal Republic of Germany.** (Ulrich Hauptmanns, Universität Magdeburg), discussion paper No. 94

Each study describes the required legal and procedural processes for risk evaluation in each country with special emphasis on energy systems. The authors analyze the reasons and the philosophy behind the adopted procedures. Furthermore, each study documents the practical experiences with the present practice of risk evaluation and collects the critical remarks that have been published in the literature or that have been expressed to them in personal interviews. Finally, each study concludes with a critical evaluation and assessment of the legal requirements and the practical applications of risk evaluation.

The various reports convey an extensive insight into the theoretical foundations and practical experiences associated with risk evaluation procedures. All volumes together provide a substantial contribution to the ongoing debate about risk evaluation and harmonization of risk regulations within Europe and beyond.

Gerhard Pfister and Ortwin Renn, November 1997

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## List of abbreviations

| | |
|---|---|
| ALARA | As Low As Reasonably Achievable |
| ALARP | As Low AS Reasonably Practicable |
| ACSNI | Advisory Committee on the Safety of Nuclear Installations |
| BNFL | British Nuclear Fuels Limited |
| CEGB | Central Electricity Generating Board |
| CPRE | Council for the Protection of Rural England |
| DEn | Department of Energy |
| DoE | Department of Environment |
| DTI | Department of Trade and Industry |
| DU | Deregulation Unit |
| EU | European Union |
| HMIP | Her Majesty‘s Inspectorate of Pollution |
| HSC | Health and Safety Council |
| HSE | Health and Safety Executive |
| MAFF | Ministry of Agriculture, Food and Fisheries |
| NII | Nuclear Installations Inspectorate |
| NGO | Non-Governmental Organization |
| PRA | Probabilistic Risk Assessment |
| TMI | Three Mile Island |

UK United Kingdom

UKAEA United Kingdom Atomic Energy Authority

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# 1. Introduction - the purpose of the paper

This report gives an overview of the United Kingdom's risk management strategy with a special emphasis on the country's energy sector. The report is divided into eight distinct parts. Section one discusses some issues of definition concerning UK risk management; section two focuses on the main actors involved with UK risk management; section three examines the legislation and history pertaining to the sector; section four reviews the aspects of UK risk management which make it unique: mainly a retroactive approach; the public inquiry system, the effects of privatization; and the Conservative government's emphasis on deregulation. Section five examines the advantages and disadvantages of the various risk management techniques currently used in the UK and section six focuses on the likely major influences on UK risk regulation in the future. The seventh and final section briefly summarizes the positive and negative aspects of risk management in the UK and suggests how other nations could learn from its example. The overall purpose of this report is to highlight and discuss the main risk management strategies in order to enable other nations to learn from the country's successes and failures.[1]

## 1.1 Issues of definition for the UK report

Before addressing the UK's energy risk management strategy there are several background issues that readers should be aware of.

### 1.1.1 British Energy Policy

[1] This paper is written from an outsider's perspective. The author is of Swedish origin, educated in the United States and only recently moved to the United Kingdom. As a result the paper draws on existing documentation, interviews with major players and on practical experience of energy risk management in the United States and Sweden.

In conducting research for this report I was often confronted by statements such as, "Britain has no energy risk management strategy because it has no energy policy". To give an overview of Britain's energy policy, or lack of it, would go beyond the scope of this report, thus for illustration it is sufficient to say that the Government's view of energy policy is such that: a) the market rules (energy production and distribution sources should be controlled by the private sector); b) the Government should not interfere; c) voluntarism is better than regulation; d) there is sufficient concern about national and international environmental obligations; and e) regional and industrial demands are considered (eg siting nuclear power plants in areas with high unemployment).[2]

### 1.1.2 The Definition of Risk Management and Risk

According to the Royal Society's 1983 report, risk management is defined as procedures by which the Government and regulatory bodies "determine(ing) what controls are needed, whether these controls are reasonable, and are in fact carried out, and whether they and their costs are acceptable to the public".[3] This will be the definition used in this report. Additionally, it has to be made clear that, unlike the National Academy in the United States where attempts have been made to separate risk assessment (measurement of harm) from risk management,[4] the Risk Committee of the Royal Society believes risk

[2]. Department of the Environment. 1990. This Common Inheritance: Britain's Environmental Strategy. HMSO, London;
Department of the Environment. 1994. Sustainable Development: The UK Strategy. HMSO, London; O'Riordan, T. 1994. Professor of Geography, School of Environmental Sciences, University of East Anglia, personal communication, February.

[3]. Royal Society. 1983. Risk Assessment: A Study Group Report. London, Royal Society, p.149.

[4]. National Research Council. 1983. Risk Assessment in the Federal Government: managing the process. National Academy Press, Washington D.C.

assessment is a necessary procedure for risk management, so the two processes are not separated in this report.[5]

Risk has many definitions. In carrying out the research for this project, for instance, I spoke to individuals in the privatized energy industry who wanted to discuss business risk and hedging of energy prices. This report does not examine commercial and related risk aspects as being distinct from the main topic of interest. Rather the report, using the Royal Society definition of risk "as probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge",[6] focuses on the legal requirements, conceptual foundations, and practical experiences of management of risks to safety within the energy/environment arena.

### 1.1.3 Energy Risk Management in the UK

Energy risk management in the UK is no different from other forms of risk management. The energy sector, just as other industrial sectors, has adopted the As Low As Reasonably Practicable (ALARP) principle (see Section 3.3), with both retroactive and proactive risk management strategies used in principle, although retroactive strategies clearly dominate. Hence, this report does not in the first four sections single out energy risk management, although examples from the energy sector are frequently used. In the final three sections, where we specifically examine both the uniqueness of the UK risk management approach and how it could be improved, we focus more closely on the energy sector.

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[5]. Hood, C.C., D.K.C.Jones, and N.F.Pidgeon et al. 1992. Risk management. In Risk Analysis, Perception and Management. Royal Society, London, Royal Society. 1983. Risk Assessment: A Study Group Report. London, Royal Society.

[6]. Royal Society 1983, p.22.

### 1.1.4 The importance of risk assessment in the UK

In the UK, risk assessment is probably considered the most important tool for proper risk management. Since the publication of the Royal Society 1983 report Risk Assessment,[7] risk assessment has grown in popularity. There are several reasons for this: firstly, in adopting the As Low As Reasonably Practicable (ALARP) principle a knowledge of risk assessment is essential to understand the costs and benefits of the risk being analyzed. Secondly, with the Government's recent support for deregulation which has led to the growing importance of self-regulation within industry, risk assessment is a necessary practical tool for both employers and employees. Thirdly, risk assessment is seen both by industry and the Government as a tool to reduce regulatory costs.

There are many signs of the importance of risk assessment in the UK. A study by the Health and Safety Executive (HSE) for the London underground showed that 80 percent of the safety expenditure went to study fire hazards which represented only 3 percent of the actual risk. Additionally, HSE has recently published a short booklet containing a simple guide to risk assessment. Also in 1993, HSE hosted an international conference on risk assessment which was well attended. Finally, HSE is advising the EU on how to better implement risk assessment techniques.[8] Hence, throughout this report there will be considerable discussion of risk assessment and its use in risk management.

[7]. Royal Society. 1983. Risk Assessment: A Study Group Report. London, Royal Society.

[8]. HSC. 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk.

# 2. The main UK risk management actors

The important risk management actors in the UK include: the Health and Safety Executive (HSE) which has four inspectorates and is a part of Department of Employment; the Department of Environment (DoE); The Ministry of Agriculture, Fisheries and Food (MAFF); the National Radiological Protection Board; the Subject and Industrial Advisory committees; the Ministry Offices of Deregulation, and the industry itself. As the report is limited in length and scope there has been no attempt to cover all of UK's risk management actors. Hence, there is no mention of the consultant firms that conduct risk management studies, or the important role of local authorities in regulating risks within their jurisdictions.

## 2.1 The Health and Safety Commission and the Health and Safety Executive (HSC and HSE)

The most influential regulator in the United Kingdom today (some experts even say Europe) is the Health and Safety Commission (HSC) and its operational arm the Health and Safety Executive (HSE). HSC is comprised of ten people appointed by the Secretary of State for Employment and representing a set of organizations that includes local authorities, employees and employers. HSC's primary function is the safety and welfare of employees and the public in the UK. The organization conducts research, proposes new laws and standards, and provides information. HSC receives assistance and advice from its operational arm HSE, which has a staff of 4500 ranging from scientific and medical experts, to technicians, policy advisors and inspectors. HSC-HSE is a relatively new organization formed only in 1974 following the Health and Safety at Work Act when it replaced the previous Factory Inspectorates.[9] The Act was the Government's response to the

[9]. UK Government. 1974. Health and Safety at Work etc. Act 1974. HMSO, London.

conclusions of the 1972 Robens Committee which stated among other things, that the UK regulatory system suffered from over legislation which was complex and un-wieldy. The committee felt that an organization was needed to facilitate greater self-regulation among the workforce and employers in UK industry.[10] In other words, the 1974 Act and consequently the formation of HSC-HSE, was an attempt by the Government to bring together the various bodies and authorities involved with safety regulation.

The broad focus of HSE is to give advice and information on regulatory policies and enforce regulation (when necessary) in industry that is practising self-regulation. Through the formation of HSE, detailed (and often outdated) codes of practice and statutes were replaced with voluntary and more flexible regulation.[11]

The 1974 Health and Safety at Work Act and the formation of HSE was welcomed by many within and outside the regulatory agencies.[12] It was felt that the Factory Inspectorates were on occasion unable to do their job properly. One clear example of this is the 1974 Flixborough disaster which should not have occurred, as two weeks before the accident happened, the Factory Inspectorate gave it a clean bill of health.[13]

HSC-HSE is an "umbrella" organization. The Secretary of State of Employment is responsible for handling HSC-HSE's resources and staffing as well as issues concerning the

[10]. Hutter, B.M. and P.K. Manning. 1990. The Contexts of Regulation:the impact upon Health and Safety Inspectorates in Britain. Law and Policy, Vol.12, n.2, p.103-136; Robens (Committee on Safety and Health at Work). 1972. Safety and Health at Work, HMSO, London.

[11]. Hutter, B.M. and P.K. Manning. 1990. The Contexts of Regulation:the impact upon Health and Safety Inspectorates in Britain. Law and Policy, Vol.12, n.2, p.103-136.

[12]. Slater, D. 1994. Chief Inspector and Director of Her Majesty's Inspectorate of Pollution, personal communication, March.

[13]. Slater 1994.

protection of workers and the public, except when these activities come under the responsibility of a different government ministry. For instance, the Department of Trade and Industry (DTI) is responsible for regulatory matters relating to nuclear safety and health and safety aspects pertaining to trade and related activities, while the Department of Transport is responsible for, among other things, public safety on railways and the transport of hazardous substances. In these cases there is a working agreement between HSC-HSE and the appropriate Ministry. The functional bodies of HSE are the specialist inspectorates, which manage and monitor safety in a certain sector throughout Britain. These inspectorates include: the Nuclear Installations Inspectorate (NII), the Agricultural Inspectorate, the Factory Inspectorate, and the Mines and Quarries Inspectorate.[14]

According to Manning the inspectorates have two primary functions:[15]

1) To monitor and regulate phenomena that occur infrequently, yet are important when they do occur, on a case by case basis. As a result the inspectorates are "bottom heavy" (employ a large number of inspectors) and this is where most of the resources go.

2) To produce compliance within the regulated industry through a conciliatory style of regulation, using As Low as Reasonably Practicable (ALARP) as the guiding mechanism.

The main problem with the HSE inspectorate's system is that all the inspectorates were in existence prior to the 1974 Act and they were created at different times. Because of

[14]. HSC (Health and Safety Commission). 1992. The Health and Safety System in Great Britain. HSE, Suffolk.

[15]. Manning, P.K. 1992. Managing Risk: Managing Uncertainty in the British Nuclear Installations Inspectorate. In J.F.Short Jr. and L.Clarke eds. Organizations, Uncertainties, and Risk. Westview Press, Boulder, CO., p.257-273. The two points that Manning refers to can be found on pages 266-267.

their various histories, the consolidation of the inspectorates under one organization was not entirely problem free. For instance, the Factory Inspectorate was established in 1833 and therefore has greater regulatory experience than the Nuclear Installations Inspectorate which was created in 1959.[16] HSE also has a series of "units" that assist both the HSC and the HSE management as a whole: these units include the Major Hazard Assessment Unit which conducts detailed evaluations of major accidents, and the Risk Assessment Policy Unit which aims, among other things, to promote consistent and coherent approaches to risk assessment in HSE, and to develop a further understanding of risk assessment approaches within the UK.[17]

A large portion of HSE's research and investigatory work is contracted to outside organizations on a consultancy basis as it has insufficient staff and expertise in the various risk fields that it deals with. At the moment the UK Atomic Energy Authority is responsible for 75 percent of HSE's consultancy work.

HSE has been widely criticized by academics, public interest groups, and other organizations saying that it is understaffed, lacks resources, and that its staff are demoralized.[18] These criticisms stem from several factors. Budget constraints means that inspectors are poorly paid in comparison to their industrial counterparts and many HSE staff have left for industrial posts. As a result the organization is unable to assess all the

[16]. Hutter, B.M. and P.K. Manning. 1990. The Contexts of Regulation:the impact upon Health and Safety Inspectorates in Britain. Law and Policy, Vol.12, n.2, p.103-136.

[17]. HSC (Health and Safety Commission). 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk.

[18]. Boehmer-Christiansen, S. and J. Skea. 1991. Acid Politics. Belhaven Press, London; Hutter, B.M. 1989. Variations in regulatory enforcement styles. Law and Policy, Vol.11, n.2, p.153-174; Hutter, B.M. and P.K. Manning. 1990. The Contexts of Regulation:the impact upon Health and Safety Inspectorates in Britain. Law and Policy, Vol.12, n.2, p.103-136; National Audit Office. 1994. Enforcing Health and Safety Legislation in the Workplace. HMSO, London; O'Riordan, T. 1988. Environmental policy in Britain. Environment, Vol.30, n.8, October, p.5-9, 39-44.

"safety cases" which so far have been submitted for large hazardous sites.[19] The Government's deregulation stance is partly responsible for this lack of resources in the HSE. Also within the present Government emphasis (and thereby rewards) is placed on quantitative output. If an organization is able to produce a large amount of certain output, it receives more funding from the Government. Rimington, the Secretary General of HSE, feels that this puts the regulatory agencies at a distinct disadvantage as it extremely difficult to measure regulatory output quantitatively.[20] Hence, some researchers argue that HSE's comparatively small budget has led to a further move away from proactive to retroactive risk management,[21] where industrial inspections become less frequent and are more often replaced with accident inquiries.

On the other hand both industrial risk managers and regulators, both within and outside HSE, argue that it is a "proud" organization. This group argues that the UK has a relatively low accident rate compared to other European countries,[22] and that HSE is highly respected within industry.[23] Some individuals put this down to the high levels of motivation among those working at HSE. In this respect the regulators and industrialists hold the opposite view to the academic community. For instance, in anonymous interviews with people working at HSE, several industrial inspectors said that they had joined the

[19]. National Audit Office. 1994. Enforcing Health and Safety Legislation in the Workplace. HMSO, London.

[20]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[21]. Hutter, B.M. 1986. An inspector calls:the importance of proactive enforcement in the regulatory context. The British Journal of Criminology, Vol.26, p.114-174.

[22]. HSC (Health and Safety Executive). 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk.

[23]. Garlick, A. 1994. Head of risk Management, UK Atomic Energy Authority, personal communication, February.

organization because they wanted to save lives in industry. Despite the higher salaries on offer in industry, they felt that their job satisfaction was more important than the money.[24]

There is some truth to these comments made by industrialists and regulators, as the critiques of HSE put forward by the academic community appear to be outdated. Although it is true that between 1987 and 1989 HSE had difficulties in recruiting and retaining staff, it has significantly expanded its operations over the last few years.[25] The Piper Alpha Inquiry, for instance, established that HSE and not the Department of Energy should in the future be responsible for the health and safety aspects of the off-shore oil industry.[26] This and other expansions are clearly seen by examining HSE's staffing levels which show an increase from April 1991 to April 1993 of 660 people, from 3877 to 4537 employees.[27] However, that said, based on the National Audit report discussed earlier, more staff are still needed.

## 2.2 Department of the Environment [DoE]

DoE is both directly and indirectly involved with risk management in the UK. It plays an active role through Her Majesty's Inspectorate for Pollution (HMIP) which has been coined the 'little brother' of the United States Environmental Protection Agency.

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[24]. Anonymous. 1994. Personal communication with several employees at the Health and Safety Executive and various privatized energy companies who wished to remain anonymous.

[25]. HSC (Health and Safety Commission). 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk.

[26]. Department of Energy. 1990. The Public Inquiry into the Piper Alpha Disaster. HMSO, London.

[27]. HSC (Health and Safety Commission). 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk.

HMIP has a long regulatory history. It was founded as the Alkali Inspectorate in response to the 1863 Alkali Act which called for a 95 percent reduction of hydrochloric acid from chemical industries. At that time the Parliament as well as the English agricultural lobby were concerned about the effects of uncontrolled hydrochloric acid emissions on large tracts of country.[28] Following the founding of the Alkali Inspectorate a cooperative non-adversarial regulatory approach was established as the factory owners at that time had the power to make work for the inspectors highly uncomfortable.[29]

In 1906 the Parliament passed the Alkali and Works Regulation Act enlarging the regulatory role of the Alkali Inspectorate from hydrochloric acid to a large number of industrial air pollution sources. The Inspectorate maintained this function, albeit changing its name to the Alkali and Clean Air Inspectorate until the 1974 Safety at Work Act when it became a part of HSE. The Inspectorate, which changed names again in 1982 to the Industrial Air Pollution Inspectorate, remained within the HSC/HSE framework until 1987 when it was incorporated with the DoE and renamed Her Majesty's Inspectorate of Pollution (HMIP). Today, following the passage of the Integrated Pollution Control guidelines in the 1990 Environmental Protection Act, the HMIP is known as the industrial environmental regulator and is in charge of managing and monitoring air, water, and waste pollution originating from industrial sources.[30] In this regard, HMIP plays a major role in regulating environmental and health risks from power stations.

The DoE also has an indirect role in influencing risk management legislation as it is in charge of siting and planning large industrial plants such as nuclear reactors which have

[28]. Ashby, E. and M.Anderson. 1981. The Politics of Clean Air. Clarendon Press, Oxford.

[29]. Boehmer-Christiansen, S. and J. Skea. 1991. Acid Politics. Belhaven Press, London.

[30]. HMIP (Her Majesty's Inspectorate for Pollution). 1993. Annual Report. HMSO, London.

national implications.[31] Hence, when an industry wants to locate and build a large chemical plant somewhere in the UK, DoE is responsible for the planning procedure which necessarily involves some form of risk management. For public inquiries on power stations the DoE works together with the Energy Ministry (part of the Department of Trade and Industry) which is responsible for generating plants under the so called Electric Lighting Act of 1909. For instance, in the Sizewell B public inquiry, the rules and guidelines used were based on DoE documentation, but the then Department of Energy was responsible for the inquiry itself (see discussion in Section 4.4 and 4.4.1).

## 2.3 Other Government Agencies

There are several other Government agencies dealing with risk management. The Ministry of Agriculture, Fisheries and Food (MAFF) is responsible for regulating and monitoring food safety in the UK. It also together with HMIP monitors pollution and radiation in the countryside which involves it in the planning process for large industrial plants in rural areas. Additionally, in the case of installations owned by MAFF, the Ministry is liable to pay compensation to victims in case of an accident. MAFF, with its research arm, Institute of Food Research, is carrying out public risk management and perception studies on bio-technology, food safety and preservation, and food choice as postulated in the 1985 Food and Environmental Protection Act. It was involved in monitoring radioactive contaminated lamb in Cumbria after the Chernobyl accident. Its handling of the incident and the information made available to the public was rather uncoordinated and the Ministry came under sharp criticism from local farmers. Many of these farmers experienced financial hardship due to inaccurate information on radiation levels.[32] It also handled the Government's response to the domestic and foreign concern

[31]. Local authorities are in charge of siting and planning all industrial plants and the like if there are no national implications in doing so.

[32]. Wynne, B. 1989. Sheepfarming after Chernobyl: a case study in communicating scientific information. Environment, Vol.31, n.2, p.10-15, 33-39.

about BSE or "Mad Cow disease" entering the food chain. Like to all other Governmental organizations, MAFF adopts an ALARP/ALARA approach (see discussion in Section 3.3).

The National Radiological Protection Board, a quasi- independent advisory body created in 1970, has several risk management functions. It is in charge of: advancing the knowledge on protecting the public from radiation; providing advice to the nuclear industry and other bodies on how best to regulate radiation hazards; and, researching and monitoring radioactivity.

## 2.4 Subject and Industrial Advisory Committees

Amongst the most influential risk management actors in the UK are the Subject and Advisory committees. UK risk regulators such as HSC-HSE, MAFF and others obtain considerable amount of their scientific advice from these committees. The regulators rely on them to provide reviews of: scientific literature, evaluations of various forms of risks and available control measures, as well as information on the specific risk approaches they should adopt.[33] These advisory committees meet formally and have no legal obligations to hold public meetings or to share or explain the results of their deliberations to the general public. In several cases the reports of the advisory committees have been completely confidential, but in others where there has been a great deal of public concern, the reports have been published.[34] For instance, the Advisory Committee on the Safety of Nuclear Installations which reports directly to the Health and Safety Executive, in its 1993 report, Organizing for Safety, argued for the "safety culture" approach which exists in some part of industry to be adopted more widely.

[33]. Jasanoff, S. 1987. Cultural aspects of risk assessment in Britain and the United States. In B.B.Johnson and V.T.Covello eds. The Social and Cultural Construction of Risk. Leiden, D.Reidel Publishing Company, p.359-397.

[34]. Jasanoff 1987.

## 2.5 Deregulation Units (DU)

The Deregulation Units are now prevalent in all the Government's Departments and they see risk assessment and management as one means for industry to adopt flexible self-imposed regulatory standards, thereby reducing Government costs. These Units publish their own risk assessment-risk management documents and meet regularly to discuss deregulation processes. In December of 1993, for instance, the DU for the Department of Trade and Industry (DTI) published a handbook for companies on how to manage risks internally[35] and this was followed up by a second document, Thinking About Regulating- a guide to good regulation, which gives advice on how policy makers can improve the quality of regulations.[36] In theory, deregulation would not only relieve burdens on British industry and make it more competitive but also reduce the work of HSE and other regulatory agencies (and thereby Government costs).

## 2.6 Risk management within industry

Industry is largely responsible for its own risk management and hence is an important actor. Within the energy sector the main risk management actors are the UK Atomic Energy Authority and several of the large oil companies such as British Petroleum. These actors (along with the rest of the industry) operate by the same risk management principles. That is to say, they have adopted the ALARP/ALARA approach with flexible safety criteria (see Section 3.3), and have a consensual (working) relationship with the

[35]. Department of Trade and Industry [DTI]-Deregulation Unit. 1993. Regulation in the Balance: a guide to risk assessment. DTI, London.

[36].
DTI - Deregulation Unit. 1994. Thinking about regulating - a guide to good regulation. DTI, London.

regulator (see Section 4.2). Within the ALARP/ALARA framework, each corporation is free to adopt its own risk management policy. For instance, the UK Atomic Energy Authority, which is responsible for safety in its nuclear laboratories, attempted in the late 1980s to set up a corporate policy on societal risk. It established a Working Group on the Risk to Society from Potential Accidents. The Group consisted of risk managers from in and outside of the organization and examined strategies on how to best cope with societal risks.[37] Risk management policies within British Nuclear Fuels (BNFL), on the other hand, have been greatly influenced by outside organizations, particularly the National Radiological Protection Board which in turn has received advice from the International Commission for Radiological Protection.

[37]. Allen, F.R., A.R.Garlick, M.R.Hayns, and A.R.Taig. 1992. The Management of Risk to Society from Potential Accidents. Elsevier Applied Science, London.

# 3. UK's Risk Management History and Legislation

UK risk management has a unique history and its legislation is made up of a mixture of unique and general legal acts. This section of the report examines both of these areas. Particular attention is paid to the As Low As Reasonably Practicable (ALARP)[38] and the self-regulation and deregulation legislation, but also to European legislation and to other UK legal acts and inquiries.

## 3.1 The history of energy risk management in the United Kingdom

The UK has a long regulatory history. In 1273 it passed its first piece of anti-pollution legislation calling for the banning of burning sea coal, and in 1863 the UK founded the world's first environmental regulatory agency, the Alkali Inspectorate, whose job it was to regulate emissions of acid fumes from the alkali industry. At this time the regulators were concerned how these and other fumes would affect public health rather than the environment per se.[39]

Rather than discuss each regulatory event in UK industrial history, this section looks specifically at the risk management advances in the nuclear industry as this has been the main area of energy-associated risk in the UK.

When the first nuclear power plants were built in the UK in the 1950's there were no quantitative safety criteria for the reactors, and the only risk guidance available came from

[38] ALARP is similar to ALARA=As Low As Reasonably Achievable. For the sake of simplicity I have in this review focused on ALARP.

[39]. McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

the International Commission for Radiological Protection and from engineers in the chemical industry.[40] The standards then assigned were extremely vague and cannot realistically be considered as regulations. This created problems for nuclear plant manufacturers who were unsure of what safety criteria they should adopt.[41] Crude risk assessments were also applied to the siting of nuclear plants. For instance, "in any 10-0 sector around the reactor there should be less than 500 people within 1.5 miles, less than 10,000 people within 5 miles, or less than 100,000 people within 10 miles."[42] The main agent of risk from nuclear power plants was seen to be Iodine 131. Following the 1957 fire at the Windscale nuclear site[43] which released a number of radionuclides into the surrounding environment, the risk assessment procedures were refined to include a weighting factor based on how much a radioactive dose would decline over distance from the emission site. This led to the establishment of a 1-3 site rating scheme, in which only site 1 would be acceptable for siting a nuclear plant.[44] The other direct result of the fire was the formation of the Fleck Committee (1957-58) whose findings led to improvements in safety features on plants, as well as the 1959 Nuclear Installations Act and the establishment of the Nuclear Installations Inspectorate in 1960.[45]

In 1967 F.R.Farmer, the then head of the UK Atomic Energy Authority's Safety and Reliability Directorate proposed a whole new set of safety criteria for the nuclear sector

[40]. Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford.

[41]. O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218.

[42]. Farmer, F.R. ed. 1977. Nuclear Reactor safety. Academic Press, New York. Quote from pages xi-xii.

[43] The two reactors located at Windscale (now Sellafield) were used to manufacture plutonium for nuclear weapons.

[44]. O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218.

[45]. Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford.

based on statistical probabilities and reliability techniques that were used in the aerospace sector (see Figure 2).[46] These techniques, now referred to as probabilistic risk assessment (PRA) comprised fault and event trees and changed risk management profoundly. For the first time, decision makers had some idea of the probability of a risk occurring. Farmer's statistical techniques became standard within the industry and were used widely: for instance, they were implemented in the Reactor Safety Study, conducted by the US Regulatory Commission in 1975, and in the design of new nuclear reactors.

These techniques (especially PRA's) developed for the nuclear power sector were considered markedly superior to the safety tools used by the rest of UK industry.[47] Thus, following the formation of the HSE in 1974 and its absorption of the Nuclear Installations Inspectorate, PRA's were used to estimate the probability of risks in other sectors. The risks associated with a large petro-chemical complex to be built at Canvey Island (near London) were assessed using PRA techniques in 1978 and again in 1981, and are to date the most comprehensive PRA studies conducted in the UK.[48]

In the development of nuclear risk management in the UK, the 1970's were characterized by two important events: the 1974 Health and Safety at Work Act discussed elsewhere in this report, and the Three Mile Island Accident (TMI) in the United States which caused the UK government to question its nuclear strategy leading to the 1982-85 Sizewell B inquiry.

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[46]. Farmer, F.R. ed. 1967. Siting criteria - a new approach. In Containment and siting nuclear power plants. International Atomic Energy Agency, Vienna, p. 303 -329; Green, A.E. and A.J.Bourne. 1977. Reliability Technology. Wiley, New York.

[47]. Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford.

[48]. HSE (Health and Safety Executive).1978. Canvey, An Investigation. HMSO, London; HSE. 1981. Canvey, A Second Report. A Review of Potential Hazards from the Operations in the Canvey Island/Thurrock Area Three Years after the Publication of the Canvey Report. HMSO, London.

Following the 1979 TMI accident up to the present, UK risk management has been influenced by a series of factors discussed in numerous sections of this report including: European risk legislation, the Sizewell B Inquiry which in turn led to the Layfield report and the HSE's 1988 tolerability report outlining quantitative guidelines for the ALARP principle (see discussion in Section 3.3), the government's deregulation initiative, and the Piper Alpha inquiry.

### 3.1.1 Risk management and the public

Nuclear power was not widely criticized by environmental NGO's or the general public prior to 1974. In that year the environmental non-governmental organization (NGO), Friends of the Earth (established only three years earlier) took an antinuclear stance partially because of safety issues.[49] Concern about managing risks associated with nuclear power plants among environmental NGO's and the general public increased significantly at the time of the 1977 Windscale Inquiry. The inquiry dealt with the building of the THORP nuclear waste reprocessing plant and marked the culmination of previously antinuclear protests staged by Friends of the Earth.[50] Since then the public and environmental NGO's have increasingly sought to participate in energy risk management decisions, for example, through the Sizewell B Inquiry and the very recent attempts to prevent the THORP plant from becoming operational.[51]

## 3.2. UK Risk Legislation

[49]. Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford.

[50]. Chicken 1982.

[51]. Malcom, R. 1994. A Guidebook to Environmental Law. Sweet and Maxwell, London.

Before the introduction of European regulatory legislation which is based on across the board standards, UK risk management legislation did not have a firm legal basis. That is to say that UK risk management is based on risk assessment on a case-by-case and site-by-site basis, combined with certain measurable exposure limits which in turn make the risk controllable and enforceable.[52] As a result, risk management is inherently flexible, and any disputed matters of legislation are handled by the courts. This is the normal basis for all UK legislation as the UK has no formal constitution (See section 3.5.1). The critique of this flexible UK regulatory approach is that the exposure limits set are in many cases considerably lower (at least in theory) than those found in other European nations (the UK adopts 10-4 as the highest acceptable risk for the public, while the Netherlands has adopted a 10-6 as their standard). To achieve this flexibility as well as practicability within UK risk management, it has adopted the so called As Low as Reasonably Practicable or ALARP.[53]

### 3.3 The ALARP Principle

UK policy makers have long held the belief that regulation should follow the reasonably practical or best practice rule. The "best practice" principle was first introduced by the government in 1842 as a way of decreasing its involvement with regulation in

[52]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[53]. Chicken, J.C. 1975. Hazard Control Policy in Britain. Pergamon Press, Oxford; Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford; Chicken, J.C. 1986. Risk Assessment for Hazard Installations. Pergamon Press, Oxford; Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March; Hawkins, K. 1984. Environment and Enforcement, GUP, Oxford; Hawkins, K. and B.M.Hutter. The response of business to social regulation in England and Wales: an enforcement perspective. Law and Policy, Vol.15, n.3, p.199-217; McCormick, J. 1991. British Politics and the Environment. Earthscan, London; O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218; O'Riordan, T. 1988. Environmental policy in Britain. Environment, Vol.30, n.8, October, p.5-9, 39-44.

industry.[54] The more modern concept "safe as reasonably practicable" was first coined in the 1949 court case of Edwards vs the National Coal Board when Lord Asquith, presiding over the case, referred to it.[55] However, it was not until the 1974 Health and Safety Act, which was largely based on the findings of the Robens Committee, that As Low As Reasonably Practicable (ALARP) became the UK standard.

The ALARP principle entails (in theory) a simple form of risk-benefit (cost-benefit) analysis to decide whether the cost of taking a specific action to reduce a risk is justified (HSE 1988 and 1992).[56] However, when the Health and Safety Act of 1974 was published there were no set quantitative guidelines concerning what levels of exposure to risk fitted within the ALARP principles. This lack of clarity posed several problems for the risk- or cost-benefit approach, and as a result most early exposure limits were determined on a case by case basis in the courts. Following the Sizewell B inquiry where the Inspector, Sir Frank Layfield, recommended a more quantified approach to the ALARP principle as the regulatory agencies did not have any clear risk targets, the HSE published Tolerability of risk from nuclear power stations as an attempt to attach numerical values to the principle.[57]

Following the 1988 HSE report, ALARP risk-benefit analysis now contains a set of basic criteria or exposure limits which industries and the regulators must follow: risks that are estimated to be greater than 10-4 to the general public and 10-3 in the occupational

[54]. Ashby, E. and M.Anderson. 1981. The Politics of Clean Air. Clarendon Press, Oxford; McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

[55]. Asquith, Lord. 1949. In Edwards vs National Coal Board (1949) 1 KB; 1949. 1 AII ER743, p.712 and p.747, a case of interpretation of S 102 (8) of the Coal Mines Act 1911.

[56]. HSE (Health and Safety Executive). 1988. The Tolerability of Risks from Nuclear Power Stations. 1st Edition. HMSO, London; HSE. 1992. The Tolerability of Risks from Nuclear Power Stations. HMSO, London.

[57]. HSE (Health and Safety Executive). 1988. The Tolerability of Risks from Nuclear Power Stations. HMSO, London.

sector (See Table 1) should not be considered acceptable and dealt with no matter what the cost.[58] Risks that fall between 10-4 to 10-6 for the public and 10-3 to 10-6 for industry should be dealt on a ALARP basis, and risks that are deemed to be 10-6 or less should only be dealt with under particular circumstances (see Figure 1 and Table 1).[59]

The goal of ALARP is that the public and employees where possible should not face a risk greater than 10-6, the so called de minimis level (Table 1).[60] However, these criteria are somewhat flexible. For instance, it is stated that every effort should be made to reduce the risk if it is deemed to be at the upper bounds of the tolerability level, unless cost are very much higher than benefits, while risks seen to be in the middle of the tolerability bands should be dealt with unless the costs are much higher, and finally for risks deemed to be near the acceptable levels (10-6), a ratio of 1:1 costs vs. benefits should be considered.[61] However, this latter ratio has not been strictly enforced. Results have shown that instead of the ratio being 1:1 it varies from 3:1 to as high as 10:1.[62] Below the broadly acceptable (10-6), de minimis level, there should be no trade-off of cost against risk.

**Table 1. HSE Tolerable Fatal Risk Levels**

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| Accident Type | Just Tolerable | Broadly Acceptable |
|---|---|---|

[58]. Ball, D. 1992. Understanding the risks. Chemistry and Industry, 19 October, p.776-779.

[59]. HSE (Health and Safety Executive). 1988. The Tolerability of Risks from Nuclear Power Stations. HMSO, London;
HSE. 1992. The Tolerability of Risks from Nuclear Power Stations. Second edition. HMSO, London.

[60]. Ball, D. 1992. Understanding the risks. Chemistry and Industry, 19 October, p.776-779.

[61]. Ball, D. 1992. Understanding the risks. Chemistry and Industry, 19 October, p.776-779.

[62]. O'Riordan, T., R.V. Kemp, and H.M.Purdue. 1987. On weighing gains and investment at the margins of risk regulation. Risk Analysis, Vol.7, p.361-369.

| | | |
|---|---|---|
| Occupational | 10-3 | |
| Public | 10-4 | 10-6 |
| new nuclear | 10-5 | |
| Major Accident* | 10-4 | |

*nuclear accident leading to 100 deaths from cancer.[63]

In theory all risk is thus treated fairly, and in the long-term this will decrease risk for everyone as only those that fall within the ALARP range are dealt with, instead of spending money on reducing risks below the de minimis level.[64] In practice, it is not so simple. Although HSE has a policy, dating back to 1982, that all new regulatory controls should be supported by discussion of additional benefits and costs that this regulation may entail,[65] inspectors admit that they do not like to use cost-benefit analysis [66] as it is fraught with problems. For example, some risks are more political than technical in nature and need special attention (eg nuclear power) often necessitating regulation beyond the de minimis level, no matter what the actual cost may be. There are also the so called "popular" risks. These risks, usually amplified by lots of media exposure, result in a public outcry calling for more stringent regulation (such as in the case of asbestos). In some of these situations a tense political atmosphere develops where the Ministry in charge, under pressure from public sources, demands that stricter legislation beyond the de minimis level should be

[63]. Source: adopted from Ball 1992, page 777, based on HSE 1988 and 1992.

[64]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[65]. HSE 1992.

[66]. O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

adopted.[67] For instance, Sir Frederick Warner recommended in the 1983 Royal Society Risk report, that in some cases a 10-7 de minimis level should be adopted.[68] The main problem with this flexibility is that it leads to un-justifiably high standards in some sectors and considerable weaker ones in others,[69] something that HSE wanted to avoid in the first place.[70] This has wide repercussions: for instance, in the UK the theoretical cost of a human life varies between £200,000 and £400 million sterling depending upon what type of risk is being regulated.[71]

Related to the above, the lack of legislation (the HSE tolerability levels are only guidelines), means that disputes over tolerability levels are considered by the courts on a case by case basis.[72] This in turn results in different rulings on how high or low a tolerability level should be.

[67]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[68]. Royal Society. 1983. Risk Assessment: A Study Group Report. Royal Society, London.

[69]. Layfield, Sir Frank. 1987. Sizewell B Public Inquiry Report. HMSO, London; O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218.;
O'Riordan, T. 1988. Environmental policy in Britain. Environment, Vol.30, n.8, October, p.5-9, 39-44.

[70]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[71]. Soby, B.A., D.J.Ball, and D.P.Ives. Safety investment and the value of life and injury. Risk Analysis, Vol.13, n.3, p.365-369.

[72]. Farmer, D. 1989. So Far as is Reasonably Practicable. Croner Publications.

Criticisms of ALARP stem from the fact that it is doubtful that the quantitative evidence is likely to be perfectly comprehensive, and that to some extent decisions have to be based on qualitative evidence.[73]

### 3.4 Self Regulation and Deregulation

Under UK legislation, industry rather than the regulator is responsible for regulation. The Government has been the main proponent of self-regulation as they see it as a prerequisite for Government deregulation. Self-regulation came to prominence following the 1974 Health and Safety at Work Act. The Robens Committee felt that the responsibility for regulating a risk should be with the same body which create the risk, as they will understand that risk better than the regulator. In this sense the Government's role is to establish a framework in which health and safety regulation could propagate and to influence safety attitudes.[74] The committee stated, for instance:

> "we need a more effectively self-regulating system. This calls for the acceptance and exercise of appropriate responsibilities at all levels within industry and commerce - it calls for better systems of safety organization, for more management initiatives and for more involvement of work people themselves." [75]

[73]. Hood, C.C., D.K.C.Jones, and N.F.Pidgeon et al. 1992. Risk management. In Risk Analysis, Perception and Management. Royal Society, London; Wynne, B. 1992. Public understanding of science:new horizons or halls of mirrors? Public Understanding of Science, Vol.1, p.37-43.

[74]. Robens (Committee on Safety and Health at Work). 1972. Safety and Health at Work, HMSO, London.

[75]. Quoted from the 1972 Robens report by the Advisory Committee for the Safety of Nuclear Installations [ACSNI] 1993. Organizing for Safety. HMSO, London, p 16).

In other words it was arguing for what would be called today a safety culture.

The most obvious case of combining deregulation with risk management and self regulation is expressed by The Prime Minister John Major. He provides the Government's position on this in the foreword to Department of Trade and Industry's (DTI) recent Deregulation Unit's Handbook Regulation in the Balance.[76] In it he states that:

* to a certain extent regulation is needed to protect the public; but
* regulation can impose huge costs for industry and Government; also
* regulation hampers individual freedom; thereby
* over-regulation reduces the creativity and dynamism needed to produce a strong economy.
* new regulation may be needed when there is a high chance of serious injury, but there should be no attempt to regulate against all risks.
* therefore, a balanced risk assessment and risk management strategy is needed. One way of achieving this is for everyone to understand how risk assessment and risk management works. This highlights the Government's view of risk assessment and risk management techniques as tools for the self-regulation of the private sector thus reducing Government regulation.

Among the advantages of self-regulation in industry are: that industry itself is legally liable for the risks it causes and is thus encouraged to adapt itself continuously as new technology comes along. In contrast if the regulator is responsible for regulation, as in the United States, industry is not encouraged to reduce risk below the set baseline.

[76]. Department of Trade and Industry [DTI]-Deregulation Unit. 1993. Regulation in the Balance: a guide to risk assessment. DTI, London.

Additionally, from the Government's point of view, self-regulation is considerably cheaper than government regulation. The onus of carrying out research on new technologies and substances is on industry. Finally, self-regulation encourages industry to adopt a safety culture which is beneficial to everyone.[77]

Set against this, self-regulation has a series of disadvantages. Studies have indicated that the initial self- regulatory structure, outlined in the Robens Report and in the Health and Safety at Work Act, did not take into consideration the large diversity of employees; the difficulties for employers to understand how self-regulation actually works; and the lack of human initiative to implement self-regulation.[78] This last point is very important as studies have shown that in most cases employers would only implement safety improvements if it was explained in detail what they should do and enforced by a government safety inspector.[79] This challenges the Government's assumption that, in a deregulated environment, market forces would lead to the development and maintenance of self-regulation.[80] There are also many firms, particularly smaller ones, that do not understand the risks associated with these activities and who cannot afford the necessary safety specialists. Such firms would benefit from the Government's advice and guidance on safety legislation. Larger firms which are more able to practice self-regulation feel that some form of prescriptive law would make their task easier.[81] These last two points are interesting, as

[77]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

[78]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London; Dawson, S., P.Willman, M.Bamford, and A.Clinton. 1988. Safety at Work-the Limits of Self-Regulation. Cambridge, Cambridge University Press; Genn, H. 1987. Great expectations: the Robens legacy and employer self regulation. Unpublished manuscript, HSE, London.

[79]. ACSNI 1993; Hutter, B.M. 1986. An inspector calls:the importance of proactive enforcement in the regulatory context. The British Journal of Criminology, Vol.26, p.114-174.

[80]. Dawson, S., P.Willman, M.Bamford, and A.Clinton. 1988. Safety at Work-the Limits of Self-Regulation. Cambridge, Cambridge University Press.

[81]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

the Government has adopted an opposing view, maintaining that over-regulation harms small firms by reducing their competitiveness.[82]

### 3.5 Legal Acts and Enquiries

Most risk management policies and decisions in the UK are the result of Act of Parliament. The 1974 Health and Safety at Work Act originated in the late 1960's at a time of large scale labour unrest in the UK. The then Labour Government, concerned that worker dissatisfaction was partially due to poor and unsafe working conditions, commissioned an enquiry. They selected Lord Robens, who had been Minister of Labour in the previous government and afterwards the Head of the National Coal Board and Chancellor of the University of Surrey, to be in charge of this study. The result of the Commission's work was the 1972 Robens Report which led to the Health and Safety at Work Act being made law by the Labour Government that was in power in 1974 and to the foundation of the Robens Institute at the University of Surrey.

Several of the major acts passed after the 1974 Health and Safety at Work Act have followed risk policies similar to those outlined in the 1974 Act. For instance, the 1987 Consumer Protection Act, re-enforced the ALARP principle. Similarly, the 1990 Environmental Protection Act (discussed in Section 6.3) which gave more power to environmental regulators also stressed the importance of the ALARP principle, by emphasizing BATNEEC (Best Available Technology not Entailing Excessive Cost).[83]

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[82]. DTI - Deregulation Unit. 1994. Thinking about regulating - a guide to good regulation. DTI, London.

[83]. Prichard, P. 1994. Risk management. Unpublished manuscript; Soby, B.A., D.J.Ball, and D.P.Ives. Safety investment and the value of life and injury. Risk Analysis, Vol.13, n.3, p.365-369.

Other important risk legislation includes the 1863 Alkali Act which led to the establishment of the Alkali Inspectorate, the 1959 Nuclear Installations Act that was based on the recommendations of the Fleck Commission which was set in motion after the 1957 Windscale fire (discussed in Section 3.1). The 1959 Act was amended in the 1965 Nuclear Safety Installations Act, which harmonized UK nuclear legislation with that of Europe. One of the most important provisions of the Act was that the licensee of a nuclear power station would be held liable for physical damage (not economic loss) caused by ionizing radiation, without there being a need to prove negligence.[84]

The recommendations of inquiries have been another important source for risk regulation in the UK; this type of retroactive regulation is further discussed in Section 4.4. The Department of Energy's public inquiry following the Piper Alpha off-shore oil accident, for instance, recommended a shift in regulatory responsibility for off-shore oil platforms from the Department of Energy to HSE. This led to the formalization of the so called "Safety Case" procedure for off-shore oil platforms. Similarly, the Flixborough chemical accident inquiry, the so called Brian Harvey Committee, resulted in the establishment of the Major Hazards Assessment Unit within HSE and the formalization of simple safety reports (cases) for the chemical industry.[85],[86]

[84]. Chicken.J.C. 1982. Nuclear Power Hazard Control Policy. Pergamon Press, Oxford; Friends of the Earth [1988] J.P.L. 93; Merlin v British Nuclear Fuels [1990] 3W.LR 383.

[85] The modified and more comprehensive Safety Case, which is now standard in UK risk regulation (and the rest of Europe) was created by EU's Seveso Directive (discussed in Section 3.4). It requires industries to prepare a report on the procedures and processes for integrating safety improvements for the regulatory body (in most cases the HSE)(Department of Energy 1990). Once the highly detailed safety case has been prepared the regulatory agency can either accept it or ask for it to be modified. The Safety Case procedure has been criticized by safety consultants who feel that the procedure creates more paper work than necessary (Chicken 1994). For instance, currently the HSE has a large backlog of safety cases: 132 of the 331 cases so far submitted have not been assessed (National Audit Office 1994).

[86]. Department of Employment. 1975. The Flixborough Disaster: Report of the Court of Inquiry. HMSO, London.

### 3.5.1 UK Law-A Brief Overview

As mentioned above most risk management strategies and decisions in the UK are the result of a legal act of Parliament (also called statutes or primary legislation). Unlike many other European nations, Parliament is the main sovereign body in the UK, even though the country is in effect a monarchy. Most acts come about through the Government being concerned that there is not enough legislation in a certain area or that legislation requires consolidation or repeal. Acts of Parliament frequently deal with policy issues leaving to be enacted by Ministers of the Government in the form of secondary legislation known as Regulations. Most of this secondary legislation deals with very small detailed particulars and for any single Act of Parliament there can be several pieces of secondary legislation. It is the secondary legislation that the Government is now trying to abolish through the deregulation mechanism (See Section 6.1).

Unlike other European nations where courts have the power to say whether an Act is unreasonable or unconstitutional, the courts in the UK must apply the Act in the case at hand. However, following the 1993 House of Lords' decision in Pepper v.Hart,[87] it was decided that no longer are the courts confined to applying the exact wording of the statute but are allowed to interpret the statute based on the debate in the Parliament that took place in the passing of it. Secondary legislation, however, can be considered unreasonable or ultra vires by the courts and thrown out as the legislation was passed by a Minister of Government and not by the Parliament itself. There have been several cases in which the judge feels that the Minister has abused his/her power concerning the regulation in dispute

[87]. Pepper v Hart [1993] 1a11 ER 42.

and has revoked it. European Directives are usually implemented by Ministers by Regulations and are thereby subject to the rules of any other form of secondary legislation.

Unlike most European countries the UK does not have a written constitution. This in it self is not negative. It means that there is a form of muddling through process. The Parliament passes one Act, and when they want to repeal or amend it they pass another Act. Secondary legislation is subject both to Parliamentary approval and judicial control. There are several examples of this in the risk regulation field. For instance, following Justice Potts' decision in the High Court that after the THORP reprocessing plant came on line, in the future all new nuclear plants whose operation would lead to an increase of radioactive emissions would have to be justified through a public consultation exercise.[88] This decision will, of course, have radical effects on the future building of nuclear plants in the UK as building nuclear plants invariably leads to more radioactive emissions.

### 3.6 European Risk Legislation

Over the last decade European risk legislation has increasingly influenced UK risk legislation. In this section we discuss some of the effects of European risk legislation on the UK up to 1987. (For a discussion on the current and future effects of European risk legislation see Section 6.2). European risk legislation has a significantly different make-up compared to UK risk legislation. While the UK approach is essentially flexible (often called discretionary), such as that enshrined in the ALARP principle, the European approach is one based on across-the-board standards to encourage uniformity among EU's member states (often referred to as regulatory).

[88]. Beavis, S. 1994. New setback for Sizewell B. Guardian 15 August, p.8.

Probably the most comprehensive risk legislation emanating from Brussels is the Seveso Directive. The Directive contains comprehensive risk management guidelines which industry was required to adopt. On the whole, industry in the UK had a positive view of the Directive. The Seveso guideline for the establishment of the industrial Safety Case, for instance, simply extended the existing safety case policy, and in many instances little additional work was required. Where the procedure was extended into new areas, industries mainly welcomed the legislation as it forced them to look more critically at their existing safety procedures.[89]

Article 8 is another important part of the Directive calling for member states to:

1) "ensure that persons liable to be affected by a major accident originating in a notified industrial activity...are informed in an appropriate manner of the safety measures and of the correct behaviour to adopt in the event of the accident.

2) at the same time make available to the other Member States concerned, as a basis for all necessary consultation within the framework of their bilateral relations, the same information as that which was disseminated to their own nationals".[90]

The UK had 85 percent compliance with Article 8 by the 8th of January 1988, the deadline the Government had set, making it the only nation to achieve compliance by their

[89]. Garlick, A. 1994. Head of Risk Management, UK Atomic Energy Authority, personal communication, February.

[90]. Adopted from Wynne, B. 1990. Risk communication for chemical plant hazards in the European Community Seveso Directive. In M.S.Baram and D.G.Parton eds. Corporate Disclosure of Environmental Risks-Us and European Law. Butterworths Legal Publications, Oxford, p.90.

target date.[91],[92] The UK was able to achieve this for several reasons. Firstly, unlike some other European nations, emergency planning is not divorced from licensing procedures at the local government level, and secondly, due to deregulation, responsibility for providing public information about various risks and risk management as a whole will be the responsibility of regulating agencies so major changes were not needed.[93]

European regulatory legislation works both ways. Not only can Europe influence the UK, but the UK can influence Europe. For instance, Rimington points out that HSE has adopted an innovative, reliable and simple method of risk assessment which can be used to identify and prioritize substances considered to be risky for further attention.[94] This method will now be adopted by the EU to assess future risk legislation.[95] This is of extreme importance as the EU is considering measures to assess over 100,000 potentially hazardous substances, which is in practice not feasible. Additionally, HSE has been very active in attempting to persuade the European Union to balance risks, costs, and benefits in their proposals. HSE was rewarded in their persuasion efforts when the European Committee on Safety Health and Hygiene submitted a programme in 1992-93 where some of these issues where addressed.[96]

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[91]. Wynne, B. 1987. Implementation of Article 8 of Directive 501/82/EEC: A Study of Public Information, Commission of The European Communities, DG XI, Brussels; Wynne 1990.

[92]. It should be noted that the enforcing regulation was only limited to a small number of sites.

[93]. Wynne, B. 1990. Risk communication for chemical plant hazards in the European Community Seveso Directive. In M.S.Baram and D.G.Parton eds. Corporate Disclosure of Environmental Risks-Us and European Law. Butterworths Legal Publications, Oxford.

[94]. Chemicals Directive 1987 as amended by EU (67/548).

[95]. Rimington, J.D. 1993a. Coping with Technological Risk: a 21st Century Problem. The Royal Academy of Engineering, London.

[96]. Cullen, J. 1993. Chairman's forward. In Health and Safety Commission Annual Report 1992/93. HSE, Suffolk, p.x-xii.

# 4. What are the factors that make UK risk management unique?

As stated earlier there are several factors that combine to make the UK's risk management process unique. This section looks at some of these in more detail. Among the issues that will be examined are: the process of trial and error, the importance of consensual regulation, the role of privatization, and finally the importance of the public inquiry system.

## 4.1 The Trial and error process

The reliance on trial and error as a means of risk management makes the whole process retroactive.[97] This is to say that most decisions concerning safety improvements are made after an accident has occurred. This happens as the monitoring of various hazardous sites by HMIP, HSE and other regulatory bodies is too limited and does not uncover all the potential hazards. In HSE, for instance, Hutter and Manning argue that crisis continuously shapes the organization, as well as reshaping the allocation of resources and priorities.[98],[99]

[97]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London; Hutter, B.M. and P.K. Manning. 1990. The Contexts of Regulation:the impact upon Health and Safety Inspectorates in Britain. Law and Policy, Vol.12, n.2, p.103-136; Wildavsky, A. 1988. Searching for Safety. Transaction Books, New Brunswick.

[98]. Hutter and Manning 1990.

[99] There are numerous examples of retroactive decision making in the risk management area: the 1957 Windscale accident led to the formation of the Nuclear Installations Inspectorate; the Flixborough chemical disaster resulted in the formation of a whole new unit in the HSE, as well as the safety case procedure; vast safety improvements were made after the Piper Alpha accident, and on the railways, British Rail made major changes to their safety regulations after a train crash at Clapham Junction, as did London Underground after a fire at King's Cross. See: ACSNI 1993; Chicken 1982; Hutter and Manning 1990.

There are, however, several persuasive reasons for adapting a retroactive process: its simplicity; cheapness compared to hazard assessment; and post-accident analysis allows it to become easily comprehensible to managers.[100],[101]

However, in terms of the effectiveness of the procedure in managing and mitigating risks, it does have several major drawbacks. The retroactive approach focuses on the type of accident that has already occurred. Future safety measures are thus targeted to avoid another accident of the same type, which ignores the actual probability of this type of accident happening again (ie. no comprehensive risk assessment is undertaken).[102] Similarly the process looks at present, often outdated technology, and how the safety of this technology can be improved rather than the possibility of accidents occurring in the technology superceeding it.[103] Many in the engineering community feel that the rate of change of technology allows for little possibility of learning by trial and error. The nuclear sector is the major exception to this. Within the nuclear industry, regulators are acutely aware that accidents are not allowed to occur, as the consequences would be too devastating. Hence, in this sector, proactive risk management using probabilistic risk assessment techniques are the norm.

Perhaps most worrying is that regulators are ignoring proactive safety measures such as safety audits and the adaptation of safety cultures as these measures could prevent many

[100]. ACSNI 1993.

[101] Some industrial safety consultants, however, feel that retroactive risk management is an expensive process, as managers have no clear risk reduction targets to aim at, and therefore waste precious time. See: Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March.

[102]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London; Ball, D. 1990. Assessing the Environment: Challenges in the Assessment of Societal Risk. NSCA Annual Conference Proceedings, 1990.

[103]. ACSNI 1993; Baldissera, A. 1987. Some organizational determinants of technological accidents. Quaderni di Sociologica, Vol.33, n.8, p.49-73; Pidgeon, N.F. 1988. Risk assessment and accidents analysis. Acta Psychologia, Vol.68, p.355-368; Turner, B.A. 1991. The development of safety culture. Chemistry and Industry, April, p.241-243.

accidents from happening in the first place. The so called "causation theory", (meaning that all accidents follow a causation structure going back to a single fault) integral to the trial and error process (as it helps to assign blame), is also flawed as in many cases an accident has multiple origins that affect one another. This in turn gives rise to a series of problems as, based on the causation theory, blame is placed on the individual involved in the accident, rather than on managers who may have created an unsafe working environment.

Wildavsky has been one of the most enthusiastic proponents of trial and error processes.[104] He has addressed the critiques of the process by stating that accidents and disasters usually look predictable with hindsight, but in most cases they are impossible to predict due to the uncertainty surrounding the behaviours of the individuals involved in the accidents.[105] Rather, he says, it would be better for organizations to adapt to the unexpected by taking-out extra insurance and planning emergency procedures (eg fire drills). In addition, too much attention on proactive risk management could lead to a lowered capacity of an organization to respond if a major accident occurred (Cuny 1983; Hood et al 1992).[106]

### 4.1.1 Proactive risk management within the UK

It would be unfair to say that all of the UK's risk management is based on the retroactive approach. For instance, the development of quantitative risk assessment techniques using fault and event trees by Farmer in 1967 was an attempt not only to predict the total risk resulting from a risky activity, but also to help risk assessors and managers to

[104]. Wildavsky, A. 1985. Trial without error: anticipation vs resilience as strategies for risk reduction. Centre for Independent Studies, Sydney; Wildavsky, A. 1988. Searching for Safety. Transaction Books, New Brunswick.

[105]. Hood, C.C., D.K.C.Jones, and N.F.Pidgeon et al. 1992. Risk management. In Risk Analysis, Perception and Management. Royal Society, London.

[106]. Cuny, F.C. 1983. Disasters and Development. Oxford University Press, Oxford; Hood et al 1992.

identify areas where risks could occur.[107] At present these types of quantitative techniques are used by many large industries. There are industries with exemplary safety records, usually based on a safety culture system, which do not adopt retroactive management principles.[108] Additionally, the inspectorates within HSE have, for the most part, adopted a proactive risk management strategy. By inspectors visiting industries on an un-announced basis they hope to reduce the probabilities of risks occurring. Hutter has pointed out, however, that this proactive element within HSE is disappearing as a lack of resources forces inspectors to focus on accident inquiries.[109]

### 4.2 The Regulator-Industry Relationship: regulation by consensus

Unlike many other nations, the UK regulators have pursued a consensual, non-controversial relationship with industry.[110] Regulatory standards and time frames are determined jointly on a case by case basis.[111] This regulatory approach has its roots in the 1842 pollution control laws [112] and it is widely believed by regulators in other nations to be the most successful form of risk regulation.[113]

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[107]. Ball, D. 1990. Assessing the Environment: Challenges in the Assessment of Societal Risk. NSCA Annual Conference Proceedings, 1990.

[108]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

[109]. Hutter, B.M. 1986. An inspector calls:the importance of proactive enforcement in the regulatory context. The British Journal of Criminology, Vol.26, p.114-174.

[110]. O'Riordan, T. 1985. Approaches to regulation. In H.Otway and M.Peltu eds. Regulating Industrial Risks. Butterworths, London.

[111]. Hawkins, K. 1984. Environment and Enforcement, GUP, Oxford; Reiss, A.J.Jr. 1985. Compliance without coercion. University of Michigan Law Review, Vol.4, p.813-819.

[112]. Ashby, E. and M.Anderson. 1981. The Politics of Clean Air. Clarendon Press, Oxford.

[113]. Jasanoff, S. 1987. Cultural aspects of risk assessment in Britain and the United States. In B.B.Johnson and V.T.Covello eds. The Social and Cultural Construction of Risk. Leiden, D.Reidel Publishing Company, p.359-397.

Behind the "success" of the consensual approach is secrecy. Under the UK's Official Secrets Act there is no obligation to disclose discussions between the regulator and the regulatee concerning the levels of acceptable risk, so that frank discussions are encouraged. In addition, the regulatory agency (usually one of the HSE inspectorates or the DoE's HMIP) is often reluctant to enforce regulation strongly as this would go against the Government's de-regulation policy. In other words, the regulators have adopted the approach of encouraging industry to regulate itself. As a result, in most cases where a violation has occurred the inspectors will attempt to persuade and inform the industry on how to best meet regulatory requirements. Enforcement is often only carried out in situations where there have been a series of repeated violations. This "cosy" atmosphere is made possible by the fact that the majority of inspectors have previously worked in industry before joining the inspectorates and in some inspectorates this is a requirement for the job.[114]

While this can foster good understanding between the regulator and the regulatee it has a worrying side. Environmental NGO's and others have criticized the regulatory agencies for being "in the pockets" of the industry and as result the agencies are not stringent enough. There has been some confirmation of these fears, for example when, following the privatization of the UK water industry, several regulators were appointed to the boards of the privatized companies.[115] This is all the more worrying considering the

[114]. Boehmer-Christiansen, S. and J. Skea. 1991. Acid Politics. Belhaven Press, London; Jasanoff, S. 1986. Risk Management and Political Culture. New York: Russell Sage Foundation; Jasanoff, S. 1987. Cultural aspects of risk assessment in Britain and the United States. In B.B.Johnson and V.T.Covello eds. The Social and Cultural Construction of Risk. Leiden, D.Reidel Publishing Company, p.359-397.

[115]. McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

fact that in comparison with other industries, water companies, currently violate water pollution controls more frequently.[116]

A second criticism of the consensual approach is that it has often been too lenient. For example, in the British offshore oil industry the regulators, in their quest for consensus, sacrificed safety for cooperation, and it has been argued that this has led to needless loss of life.[117] Carson states that the regulatory agencies' attempts to achieve cooperation on safety with the oil companies when offshore oil exploration began in the 1960's took the place of a statutory regulatory framework for the industry, and had this been in place at an earlier stage it would have led to higher safety standards. However, because of the regulator's quest for consensus, a regulatory framework was not in place until the end of the late 1960s. Additionally, the fines assigned by the regulator to the off shore industry for non-compliance were minimal: an average of £214 sterling, a ludicrous sum in comparison with the turnover of the oil companies. This in turn led to further violations within the sector.[118]

### 4.3 Privatization of the service sectors and the effects on UK regulatory legislation

Following the 1979 elections (when Margaret Thatcher came to power) there has been an ongoing policy of privatizing nationalized industry. Among the industries considered for privatization were not only regular, quasi-private industries such as car manufacturers but also service industries such as water, gas, railways, and electricity. The privatization of the "service" group has had some important effects on UK risk management policy.

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[116]. Ryan, S. 1994. Water companies exposed as worst polluters of rivers. The Sunday Times, 6 March, p.1 and 22.

[117]. Carson, W.G. 1982. The Other Price of Britain's Oil: Safety and Control in the North Sea. Rutgers University Press, New Brunswick, New Jersey.

[118]. Carson 1982.

It is generally believed that privatization has had either directly or indirectly a positive affect on UK risk management.[119] An example of this is the recent privatization of the water industry. At the time when the water services were nationalized, the Government, through the ten Regional Water Authorities, was responsible for delivering of drinking water into homes and for sewage treatment. However, due a lack of funding and the difficulties in enforcing sewage regulations, UK water standards steadily declined, so that by the time of privatization UK water quality was among the lowest in Europe.[120] The situation deteriorated further as the Government refused to allow the old water authorities to invest in environmental improvements because this would have reduced the profit to be made by the shareholders when they were floated. In 1986 the Thatcher Government planned to transfer virtually all the responsibilities of the former Regional Water Authorities to the newly privatized water companies. In so doing, companies would be regulating themselves just as the old water authorities had done. However, many environmental NGOs including the Council for the Protection of Rural England (CPRE) considered this arrangement to be unsatisfactory and sought legal advice. This advice indicated that the privatized companies would be breaking EU law if they were in charge of pollution control. The EU was alerted to the situation and forced the UK Government to place the regulation of sewage discharges in a newly established agency called the National Rivers Authority (NRA).[121] Alongside this development, the public, became aware, for the first time, of how bad UK water quality actually was and this led to a national outcry for greater regulation. This combination of European legislation and greater public awareness is now leading to gradually higher water standards in the UK.

[119]. Garlick, A. 1994. Head of Risk Management, UK Atomic Energy Authority, personal communication, February; McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

[120]. McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

[121]. McCormick 1991.

Privatization is also believed by many risk experts to be improving energy risk management. According to officials in the electricity sector, the regional electricity companies and the two large generators now pay greater attention to safety issues. According to interviews with anonymous individuals in the privatized electricity and gas sectors and industrial safety consultants, there are several reasons for this.[122] As industries are now responsible for managing and developing their own insurance and financial polices they are much more aware of the real costs of obtaining approval for the siting of generating plants as well as accident rates. At the time when they were nationalized, if they had underestimated these costs they would have received compensation from the treasury. Secondly they are now forced to pay more attention to risk management due to the Government's emphasis on deregulation and self-regulation, European legislation, and perhaps most importantly, public opposition and concern on risk, energy and environmental issues. Thus, due to economic, public, and political factors, not improved regulation per se, a greater emphasis has been placed on risk and safety issues.[123]

The increased awareness of risk and safety issues in recently privatized service industries is interesting and several explanatory hypotheses have been put forward. Majone argues that before service industries were privatized there existed a type of 'bonding' in the form of identification and legitimacy between the public and the nationalized service industry. Privatization changed this. The bond was destroyed and the public required higher safety criteria from the industry than before.[124] Additionally, privatization of the

[122]. Anonymous. 1994. Personal communication with several employees at the Health and Safety Executive and various privatized energy companies who wished to remain anonymous; Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March.

[123] Others argue that before privatization the nationalized utilities were under pressure to keep the costs down. Only after they were privatized were the utilities allowed to raise the tariffs as much as necessary to cover investment to improve standards of both safety and security of supplies. This was in line with the Thatcherite simplistic doctrine that all public expenditure was bad and all private expenditure good. See: Brooks, L. 1994. Former Chief Economist of the UK Atomic Energy Authority, personal communication, March.

[124]. Majone, G. Regulation in Europe. Forthcoming.

service sector has shed light on some of the regulatory secrets that existed between the regulator and the regulatee (as in the case of the water sector).

However, it is doubtful if privatization always leads to higher standards. Public outcries and environmental NGO pressure may prompt the Government to apply stricter regulation but ultimately it is the responsibility of the regulator to enforce self-regulating guidelines. It is too soon in the history of the privatization of service industries to be able to tell whether the regulator is willing to continue to enforce the self-regulating guidelines.[125] It is also likely that in some sectors safety standards will be reduced. Within the railways, for example, privatization will mean many new, inexperienced actors owning and operating trains and as result safety may well suffer. HSE is now in the process of setting up national railway safety guidelines which should help to alleviate this problem,[126] although it is generally acknowledged that even with these measures safety may well be sacrificed for competitiveness.[127]

**4.4 The UK public inquiry system.**

[125]. Wynne, B. 1994. Research Director of the Centre for the Study of Environmental Change, Lancaster University, personal communication, February.

[126]. Department of Transport and the Health and Safety Commission. 1993. Ensuring Safety on Britain's Railways. Department of Transport, London.

[127]. Anonymous. 1994. Personal communication with several employees at the Health and Safety Executive and various privatized energy companies who wished to remain anonymous.

From the outset the public inquiry system in the UK has been characterized by political intent, private vs public interests, and ideological controversy.[128] The system has its roots in the 18th and 19th century enclosure movement which enabled the UK agricultural sector to go from a feudalist mode of production to a capitalist one by privatizing large tracts of the country's communal fields. This did not occur automatically, as enclosures needed not only to be legitimate but also legal. Prior to 1845, these requirements were covered by Acts of Parliament. However, as Parliament became increasingly overburdened by the large number of Enclosure Acts, an inquiry mechanism was implemented to help the parliamentary legislative body to examine various land developments. This was only a temporary measure as the number of inquiries increased exponentially with the Industrial Revolution. As time went on, Parliament increasingly granted public bodies such as local authorities power to regulate the uses of and the acquisition of private property. By the beginning of the 20th Century this system had evolved into what is now known as a public inquiry (O'Riordan et al. 1988).[129]

At present most public inquiries are used as an administrative, quasi-democratic tool to assist in land planning issues. The system which advocates fullness, thoroughness, and fairness has two main purposes: legal and administrative. The legal purpose focuses on an individual's right to a fair hearing before any decision can be taken that may affect that individual's personal or property rights. Closely related to this, it is also seen as way of letting opposing parties defend their rights in an open forum. To make the legal aspect valid examination and cross-examination in an adversarial context are used. The second purpose of the public inquiry is an administrative one: that is to say to provide the government minister involved or the inspector with the necessary facts and materials to

[128]. O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

[129]. O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

enable them to make a sensible and rational decision on the issue in question. In this sense the inquiry plays an advisory role.[130]

Most inquiries are open-ended, that is to say that they do not have a closely defined legal framework, and they consist of: a proposing party, the so called premissor for a development (the individual/organization that wants to impose something on a community ; a neutral inspector (usually an individual with legal experience in the area in question); an opposing party (local planning authority, individuals and/or organizations that oppose the land use plan). Additionally, there are and no time limits, which can result in severe delays in decisions being made (the Sizewell B inquiry lasted 340 days).

### 4.4.1 The importance of public inquiries to risk management

The United Kingdom's risk management strategy is affected by the public inquiry system in two ways: through the influence of opposing groups, especially of environmental NGOs and their increasing concern over safety and, secondly, through the various recommendations put forward by the Inspector in charge of the enquiry.

Over the last twenty years public inquiries, particularly in the energy sector, have become protracted affairs. These inquiries not only discuss whether or not a plant or other physical structure should be sited in the first place but, due to the administrative purpose discussed above, it is increasingly seen as a chance for NGO's and other groups to influence government.[131] One area where these groups have been very active is in the safety of

[130]. O'Riordan et al. 1988.

[131]. Grove-White, R. 1983. Public expectations and the Sizewell inquiry. In Issues in the Sizewell B Inquiry. Centre for Energy Studies, Polytechnic of the South Bank, London; Grove-White, R. 1991a. Land use law and the environment. In R.Churchill, J.Gibson, and L.M.Warren eds. Law, Policy and the

proposed energy (usually nuclear) installations. The Sizewell B Inquiry, for instance, is the longest of its kind in the UK lasting 340 days (1983-85) with the majority of time spent discussing the issues raised by the opposing parties rather than the case put forward by the proposer the Central Electricity Generating Board (CEGB). On numerous occasions the UK's energy risk management strategy and safety was questioned. Whether nuclear reactors can be safe, and how the Sizewell B reactor design differed from the ill-fated reactor at the Three Mile Island site in Harrisburg, Pennsylvania were major discussion points. The head of HSE was cross-examined on his views of risk management and why current risk legislation was so vague. In this regard, the NGOs firmly placed risk and safety on the agenda of the inquiry, although the influence of their actions on Government policy as a whole remains unclear.

The Inspector can also influence risk management legislation as was very apparent in the Sizewell B Inquiry. Sir Frank Layfield, possibly influenced by the points brought up by the opposing parties, was quite critical of the Government's guidance on safety principles and stated this in his report.[132] He was concerned about several areas and made specific recommendations. These included the formulating of clear guidelines on the tolerability of risk as these were vague and led to inconsistency in the use of ALARP principles (eg practical difficulties of using cost and risk benefit approaches); the NII was poor at incorporating outside advice; NII had no set working plan; there was little public information available to enable an individual to understand how the nation's nuclear reactors were regulated; and there was also no definition of societal risk.[133] The Government took many of these ideas seriously and altered their thinking on risk

Environment. Basil Blackwell, London; O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

[132]. Layfield, Sir Frank. 1987. Sizewell B Public Inquiry Report. HMSO, London.

[133]. Allen, F.R., A.R.Garlick, M.R.Hayns, and A.R.Taig. 1992. The Management of Risk to Society from Potential Accidents. Elsevier Applied Science, London; Layfield, Sir Frank. 1987. Sizewell B Public Inquiry Report. HMSO, London; O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218.

management. For instance, one year after the publication of the Layfield report, HSE published The Tolerability of Risk from Nuclear Power Stations which addressed the issue of quantifying ALARP.[134] In 1992, the UK Atomic Energy Authority, also affected by Layfield's strong criticisms, published The Management of Risk to Society from Potential Accidents [135] which sought to define social risk.

[134]. HSE (Health and Safety Executive). 1988. The Tolerability of Risks from Nuclear Power Stations. HMSO, London.

[135]. Allen, F.R., A.R.Garlick, M.R.Hayns, and A.R.Taig. 1992. The Management of Risk to Society from Potential Accidents. Elsevier Applied Science, London.

# 5. What policy tools should Britain use for energy risk management? The author's perspective

This report examines the more important tools that the UK Government uses for the country's energy risk management strategy. Particular attention is paid to public inquiries and participation, the use of the ALARP principle, consensual regulation, trial and error vs proactive regulatory measures, and self regulation within industry. In this section I discuss whether some of these tools should be used for future energy risk management in the UK.

The criteria that I use to determine whether these regulatory tools should be used are: are they useful and practical regulatory tools that reduce risk; do they stimulate public participation in the regulatory process which I see as important as UK is a democracy; do they encourage the adaptation of a safety culture.

## 5.1 Public Inquiries

The Government is beginning to change its view of public inquiries. Firstly, it attempted to shorten the process through improving the efficiency of the pre-inquiry and inquiry stages.[136] However, this was seen by some environmental NGO's as limiting their ability to participate.[137] Secondly, recent experience is showing that the Government is moving away from public inquiries, seeing them as too costly and time consuming to other forms of proven, albeit cheaper procedures. The building of the channel tunnel, for

[136]. Department of the Environment (DoE). 1984. Draft Code of Practice for the Pre-inquiry stages of Major Inquiries. DoE, London; Department of the Environment. 1986. Planning: Appeals, Call-In and Major Public Inquiries. The Government's Response to the Fifth Report from Environmental Committee Session 1985-1986. HMSO, London.

[137]. Council for the Protection of Rural England.(CPRE) 1984. Major public inquiries and the Sizewell factor. CPRE, London.

example, was examined through a Parliamentary Bill procedure,[138] and there are now plans to use this same procedure for the siting of a rail-air link between central London and Heathrow (London) airport.

As a policy tool, the objective of a public inquiry to advise the Government is particularly interesting. There are those who advocate its appropriateness for risk management and siting as well as those who oppose its use in this way. One of the main proponents of the view, Robin Grove-White, believes that the inquiry system offers environmental NGO's and hence the public, a unique opportunity to directly influence the policy making process.[139]

However, despite this access to the policy making process, those challenging a planning decision receive no public funding and thus often have problems raising sufficient resources to present their case. This is in sharp contrast to the considerable public or private resources that the energy industry has access to. The Sizewell B Inquiry illustrated this: the CEGB was represented by five barristers, whereas CPRE, one of the opposing parties, only had enough funds to hire a single barrister. The other opposition groups represented themselves.[140] The odds are thus clearly in favour of the proponents winning

[138]. O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

[139]. Grove-White, R. 1983. Public expectations and the Sizewell inquiry. In Issues in the Sizewell B Inquiry. Centre for Energy Studies, Polytechnic of the South Bank, London; Grove-White, R. 1985. Environmental issues. In R.Belgrave and M.Cornell eds. Energy Self-Sufficiency for the UK? Gower, Aldershot, p. 145-159; Grove-White, R. 1988. Public inquiries, environmental groups, and the policy issue. Unpublished manuscript; Grove-White, R. 1991a. Land use law and the environment. In R.Churchill, J.Gibson, and L.M.Warren eds. Law, Policy and the Environment. Basil Blackwell, London.

[140]. Kemp, R.V.T, T.O'Riordan, and H.M.Purdue. 1984. Investigations as legitimacy:the maturing of the big public inquiry. Geoforum, Vol.15, n.3, p.477-488; O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218; O'Riordan, T. 1988. Environmental policy in Britain. Environment, Vol.30, n.8, October, p.5-9, 39-44.

their case with little chance of the NGO's/public influencing the government's risk management policy.[141]

Following on from this is the overall cost of the inquiry system. The Sizewell B Inquiry lasted 340 days (total of three years if the time of writing the Layfield report is included) , and cost the State somewhere between £25 and £80 million sterling.[142] That amount of money could have funded proactive risk management procedures for several nuclear plants. Other critics of the public inquiry system offer contrasting views. The length of time that inquiries take can deter potential investors from building a plant in the UK, as similar siting processes in Germany and particularly in France are usually considerably shorter. Time lag from inquiry to project completion can also be a problem. For instance the 1977 Windscale Inquiry into the building of the THORP nuclear waste reprocessing plant lasted for 100 days, and focused on arguments that are now outdated.[143] Today, Greenpeace and other environmental NGO's want a second public inquiry to discuss the present situation. If this was to happen, which is highly unlikely, it would call into question the point of having inquiries at all.

Perhaps the most worrying criticism of the public inquiry system is that they are a waste of time and resources as the Government is only seeking to legitimize its planning case. In the Sizewell B Inquiry, for instance, Greenpeace refused to participate for these reasons.[144]

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[141] Also there are significant time and economic considerations which the opposing parties have to consider in preparing their evidence for the inquiry. See: Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March.

[142]. O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

[143] Seventeen years on, the uranium that THORP is to produce is currently in over supply and fast breeder reactor are no longer thought to be economically viable, so the market for plutonium, another THORP product, has collapsed.

[144]. Greenpeace as cited in: O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

In spite of these problems, it would be a mistake to abandon the public inquiry system. This author agrees with Grove-White [145] that it is an efficient way for NGO's and other concerned groups to exert indirect influence on policy. If the public inquiry system were abolished, the only other legal alternative would be the Parliamentary Bill procedure where Parliament exercises both a legislative and judicial function. The only way that concerned parties can then influence the process is through lobbying individual MPs to table questions on the Bill in the House of Commons. In contrast to this the public inquiry system is eminently preferable, but it could be improved in several ways. These include providing public funds for parties opposing a proposed siting, organizing side meetings, and putting time limits on the inquiry.

### 5.2 Public participation in the policy and regulation making process

One question that has arisen in energy risk regulation is whether or not the public can participate in the policy making process in the UK. The public inquiry system does allow for some public intervention when the government so desires (as stated before a government does not have to use the public inquiry system) but there are few, if any channels that the public can effectively use.

Several reasons have been suggested for this. As Lord Hailsham said over twenty years ago UK government style should be considered an "elected dictatorship": each Member of Parliament (MP) is elected on 'a first past the post system', and the executive (the leader and all the ministers) is the leading element of the legislature. This can, and

[145]. Grove-White, R. 1983. Public expectations and the Sizewell inquiry. In Issues in the Sizewell B Inquiry. Centre for Energy Studies, Polytechnic of the South Bank, London; Grove-White, R. 1985. Environmental issues. In R.Belgrave and M.Cornell eds. Energy Self-Sufficiency for the UK? Gower, Aldershot, p. 145-159.

does, lead to undemocratic decision making. For instance in the mid-1980s when the Thatcher Government was pursuing a strong pronuclear policy line, only 15 percent (in 1984) of the public supported the Government's view.[146]

The secrecy surrounding UK policy making, as discussed before, is an obvious constraint to public participation.[147] Although the Government expects NGOs, industrial interest groups and other organizations to help shape their energy and environmental policies to a certain extent, it is extremely reluctant to involve the general public.[148] This is justified by claiming that they understand the problems better than the public, and it is better not to 'worry' the public with things they do not understand.[149]

It has also been suggested that in fact the public misunderstands industry. Hence, rather than initiating some form of risk communication between the public, the industry and government, the focus has been on educating the public. This is outlined in both the Government's White Paper on Science and Technology 1993 and by the Chemical Industrial Association, by placing high priority on public awareness in the research councils, Office of Science and Technology and industry.[150] If the public understands industry and science, the view goes, they will not oppose it.

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[146]. Young, K. 1987. The nuclear reactions. In R. Jowell, S. Witherspoon, and L. Brooks eds. British Social Attitudes: The 1987 Report. Gower Publishing Ltd, Aldershot, UK.

[147]. Jasanoff, S. 1987. Cultural aspects of risk assessment in Britain and the United States. In B.B.Johnson and V.T.Covello eds. The Social and Cultural Construction of Risk. Leiden, D.Reidel Publishing Company, p.359-397; O'Riordan, T. 1985. Approaches to regulation. In H.Otway and M.Peltu eds. Regulating Industrial Risks. Butterworths, London.

[148]. McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

[149]. McCormick 1991.

[150]. Simmons, P. and B. Wynne. 1992. In K.Fisher and J.Schot eds. Environmental Strategies for Industry, Island Press, Washington D.C., p.201-226.

The role of local government in the UK also constrains public participation. It is here where effective community involvement could take place, but the Government appears to be doing everything it can to reduce local government's decision making power,[151] and consequently most people take little interest in local politics.[152]

Due to the lack of public participation in the policy making process environmental NGOs have become an indirect conduit for public opposition particularly on issues of siting energy installations and roads.[153] In the Sizewell B Inquiry, for instance, the strongest opposition to the building of the nuclear power plant came from environmental NGO's and in the case of THORP Greenpeace has been the most vociferous critic of its building and operation.

One can only view this situation for public participation in the UK with pessimism. It is questionable that environmental NGO's become indirect spokepersons for the public, as they have no mandate or democratic base, even-though they may think more in the long-term and are more innovative.[154] Hence, I would favour some form of direct democratic system as found in some states of America or Switzerland, where politically binding referenda are the norm, rather than the representative democratic system in the UK. Although, it would be difficult to implement a direct democratic system in the short or even medium-term the long-term benefits would be considerable. This comes with a realization

[151]. McCormick, J. 1991. British Politics and the Environment. Earthscan, London; Wynne, B. 1994. Research Director of the Centre for the Study of Environmental Change, Lancaster University, personal communication, February.

[152]. O'Riordan, T. 1988. Environmental policy in Britain. Environment, Vol.30, n.8, October, p.5-9, 39-44.

[153]. McCormick 1991; O'Riordan, T., R.V.Kemp, and H.M.Purdue. 1988. Sizewell B: An Anatomy of the Inquiry. MacMillan, London.

[154]. Grove-White, R. 1991b. The emerging shape of environmental conflict in the 1990s. RSA Journal, Vol.139, p.437-447.

that governments and industry have no intrinsic need to protect the public or the environment for the future.[155]

### 5.3 The Use of ALARP

ALARP is the basis of UK risk legislation and it characterizes the UK's pragmatic approach of attempting to be practical, flexible, and efficient. In order to determine the future use of ALARP it is useful to compare it to the Dutch and German experiences, which are widely viewed as alternatives. As stated earlier Dutch risk assessment adopts a 10-6 highest tolerability level and 10-8 de minimis level (Section 3.3), and everything in between on the ALARA principle (similar to ALARP). Several questions on these guidelines have been raised by UK risk experts. Many feel that the legislation is only suitable for certain situations, and is only likely to be useful for public relations purposes.[156] The cost of adopting 10-6 across-the-board as the lowest possible tolerable level is likely to be high and it offers little opportunity for flexibility.[157] Following on from this, the costs of enforcing across-the-board 10-6 are likely to be prohibitive, resulting in a virtual halt of new industrial construction as in the Netherlands.[158]

The German precautionary principle is advocated by other UK risk experts and is enshrined in the Treaty of the European Union.[159] This involves industry having to prove

[155]. Boehmer-Christiansen, S. 1990. Energy and public opinion. Energy Policy, Vol.18, p.828-837.

[156]. O'Riordan, T. 1994. Professor of Geography, School of Environmental Sciences, University of East Anglia, personal communication, February; Wynne, B. 1994. Research Director of the Centre for the Study of Environmental Change, Lancaster University, personal communication, February.

[157]. Ball, D. 1994. Head of the Environmental Risk Assessment Unit, University of East Anglia, personal communication, February; Layfield, Sir Frank. 1987. Sizewell B Public Inquiry Report. HMSO, London.

[158]. Ball 1994; Layfield 1987.

[159]. Wynne, B. and S.Mayer. 1993. How science fails the environment. New Scientist, 5 June, p.33-35.

that what they are doing is "safe", according to Government criteria, before committing themselves to a project. This approach has resulted in the German Government passing strict safety laws before there was conclusive scientific data to support them.[160] This approach has been criticized by the UK industry and by industrial consultants for being non scientific and haphazard.[161]

By comparison, ALARP has different problems. Wynne[162] is quite correct in stating that there are many uncertainties in using ALARP and that these have to be examined in more detail. The lack of inclusion of social and environmental externalities in the ALARP calculations is another problem. This, however, is difficult, as up to the present most economic instruments used to measure externalities have completely failed.[163] The vagueness of the quantitative guidelines and the high degree of flexibility have also caused problems for ALARP's credibility.[164] This is partially due to the fact that ALARP is based to a certain degree on human judgment. In the case of THORP, BNFL's view of what was 'As Low As Reasonably Achievable' (ALARA) (similar to ALARP) was quite different to that of Greenpeace and as a result the issue had to be settled in the courts. The lack of more quantitative risk management structure in the UK regulatory system is unclear. Several views are put forward. Some say it is due to the conservatism of British scientists and their reluctance to endorse quantitative results for fear of being disproved.[165] Others

[160]. Wynne, B. and S.Mayer. 1993. How science fails the environment. New Scientist, 5 June, p.33-35.

[161]. Milne, A. 1993. The perils of green pessimism. New Scientist, 12 June, p.34-37

[162]. Wynne, B. 1992. Public understanding of science:new horizons or halls of mirrors? Public Understanding of Science, Vol.1, p.37-43.

[163]. Sterling, A. 1992. Regulating the electricity supply industry by valuing environmental effects. Futures, December, p.1024-1047.

[164]. Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March.

[165]. Wynne, B. 1994. Research Director of the Centre for the Study of Environmental Change, Lancaster University, personal communication, February.

say that it is caused by the ignorance of UK politicians and civil servants who have difficulty in reviewing and understanding technical evidence.[166] The comparative absence of risk education among middle-management in industry and elsewhere is also seen to work against acceptance of quantitative risk management structures.[167] Additionally, particularly in the nuclear sector, risk regulators are over-reliant on probabilistic risk assessment techniques[168] and more concrete quantitative measures need to be found. There is no simple way to address these criticisms. The HSE could come up with stricter quantitative guidelines, but these would be less flexible and possibly less enforceable. The PRA could also be modified, but there is always the problem of human judgement which drives every such form of study.[169]

Overall, however, I do feel, with some reservations, that the UK should retain the ALARP approach if the regulators are able to implement the modifications discussed above. The approach, unlike the Dutch model or the German precautionary principle is still practical and flexible which makes it enforceable, and that should be the aim for every risk regulator.

### 5.4 Consensual regulation

[166]. Chicken, J.C. 1994. Head of J.C. Consultancy Limited, personal communication on numerous occasions between January and March; O'Riordan, T. 1987. Assessing and managing nuclear risk in the United Kingdom. In R.E. Kasperson ed. Nuclear Risk Policy. Allan and Unwin, Boston, p.197-218; Ravetz, J. 1986. Usable knowledge, usable ignorance. In W.C. Clark and R.E. Munn eds. Sustainable Development of the Biosphere. Cambridge University Press, Cambridge.

[167]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

[168]. Garlick, A. 1994. Head of risk Management, UK Atomic Energy Authority, personal communication, February; Wynne, B. 1994. Research Director of the Centre for the Study of Environmental Change, Lancaster University, personal communication, February.

The issue of consensus has, somewhat contrarily, precipitated much debate in the UK. Its contributions as a tool for managing energy risks stems mainly from its engagement of industry and incremental problem solving. However, the UK approach, where deliberations between regulators and industry are in secret, works against reaching a consensus in the public interest. Thus, the government needs to be accountable for its regulatory decisions in the energy sector with some form of efficient public participation (see Section 6.2).

## 5.5 Trial and error vs proactive risk regulation

As discussed in Section 4.1 the UK has, for the most part, adopted a retroactive 'muddling through' approach in its risk management strategy; ie. the majority of regulatory decisions on safety issues have been taken after major accidents. This illustrates the main problems of the UK's risk management strategy: it is shortsighted and seeks to reduce costs over and above other concerns. Shortsightedness is not unique to the UK, as parliamentary terms in the rest of Europe are limited to 3-5 years. However, the UK Government has lacked innovative and creative ministers at cabinet level such as Klaus Töpfer (the German Conservative Environmental Minister) or Birgitta Dahl (the former Social Democratic Energy and Environmental Minister of Sweden) or Peter Winsenius (the former Deputy Prime-Minister of the Netherlands). Grove-White suggests that this shortsightedness is also due to the UK's political culture being centralized and managerial where civil servants seek to mediate tensions rather than addressing the cause of the tensions.[170]

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[169]. Hoos, I. 1980. Risk assessment in a social perspective. In National Council on Radiation Protection Measurements ed. Perceptions of Risk. Washington D.C., p.37-85.

[170]. Grove-White, R. 1991a. Land use law and the environment. In R.Churchill, J.Gibson, and L.M.Warren eds. Law, Policy and the Environment. Basil Blackwell, London.

In order to address this problem of retroactive risk management two issues need to be addressed: firstly, HSE's resources should be significantly increased allowing them to develop proactive risk management strategies (the same applies to HMIP). Secondly, the Government should more actively promote a safety culture as outlined in the ACSNI report Organizing for safety.[171] A possible way of promoting this would be by appointing a cross-disciplinary regulatory group directly responsible to Parliament.

### 5.6 Self regulation and deregulation

As stated in Section 3.4 the UK's approach places the responsibility for safety with industry and not Government. By adopting this approach the Government is promoting deregulation in forcing industry to regulate themselves. The approach has strengths and weaknesses.

I am encouraged by the self-regulation concept in that it forces industry to think in-depth about its regulatory systems, but I am also wary of the Government's deregulation approach, as I feel that central government should play an important role in regulation. I agree with ACSNI,[172] Hutter[173] and others that the Government is naive if it believes that most of British industry feels comfortable regulating itself and that in all instances it is willing to adopt tough voluntary controls. Almost all the individuals that I interviewed in the energy industry, with the notable exception of the UK Atomic Energy Authority, felt uneasy about designing their own risk management strategies and contracted these tasks out

[171]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

[172]. Advisory Committee on the Safety of Nuclear Installations (ACSNI). 1993. Organizing for Safety. HMSO, London.

[173]. Hutter, B.M. 1986. An inspector calls:the importance of proactive enforcement in the regulatory context. The British Journal of Criminology, Vol.26, p.114-174.

to industrial safety consultants. In the energy sector as well as other industrial sectors, I would suggest a self-regulatory approach without Government deregulation. In other words, self-regulation in industry should be encouraged but HSE, or any other regulator, should assist by setting bench-mark standards and enforcing safety measures. Additionally, it cannot be expected that small industries are able to conduct detailed self-regulating inspections.

# 6. Current and Future Trends in UK Energy Risk Management

The UK appears to be facing a risk management dilemma in its energy sector. On the one hand, the Government is in the process of expanding deregulation, while on the other the European Union is increasingly becoming the dominant force of regulatory initiatives win the UK. These two developments are in themselves interesting, as they show the differences in thinking between the EU and the UK on regulatory matters. However, based on the following discussion, indications are that Europe legislation will have a greater influence on UK regulations than the UK's own deregulation initiative. Finally, there is the new, creative HMIP regulatory approach which combines the flexibility of ALARP with strict regulation. Maybe this is the path that the UK should take?

## 6.1 The UK Government Deregulation Initiative

At present the UK Government is reviewing its regulatory commitments to see if there is any further potential to reduce regulatory costs without increasing health and safety risks to the public. The far-reaching review involves HSE and seven industrial Task Groups. They aim to examine all the regulatory legislation in HSE's framework and to test risk-benefit criteria, particularly how it influences small businesses.[174] It is unclear what exactly the results of this review will reveal, but there are some preliminary indications that a large body of risk regulation will be deemed unnecessary and that the HSE will see a decrease in its future budgets. If this is the case, it is likely that there will be a further move from proactive to retroactive risk management. In the long-term this could have major implications for the energy sector.

[174]. Cullen, J. 1993. Chairman's forward. In Health and Safety Commission Annual Report 1992/93. HSE, Suffolk, p.x-xii.

## 6.2 The European Union and UK Regulation

As a result of the 1987 Single European Act, the passing of the Treaty of the European Union (Mastricht Treaty), and the passing of the Qualified Majority Voting Procedure, European regulatory legislation is increasingly determining that in the UK. In the HSE's annual report, the Secretary General J.D.Rimington[175] writes that the introduction of six European health and safety directives (the so called 'six pack') on January 1st 1993 has been the most important regulatory event in the UK since the 1974 Health and Safety Act. Additionally in the same report, Sir John Cullen, who retired as Chairman of HSC after ten years of service in 1993, wrote that over the decade of his chairmanship there was "a much increased international commitment, expressed partly in a shift of focus to the European Community which now markedly determines our priorities and to an extent our policies."[176] In fact, 70 percent of UK regulatory legislation now comes from European sources.

Examples of European risk legislation affecting the UK are numerous: the European 'six pack' directives focusing on equipment safety, workplace conditions, manual handling loads, personal protective equipment, use of display screens, and temporary workers will have considerable impact on the UK regulatory system. Additionally, in 1993 the UK passed the EU directive of the Radioactive Substances Act which ruled any additional discharge of radioactivity must be justified and a net benefit for the general public must be demonstrated. This law has caused considerable difficulties for the UK nuclear sector

[175]. Rimington, J.D. 1993b. Director General's foreword. In Health and Safety Commission Annual Report 1992/93. HSE, Suffolk, p.xiii-xv.

[176]. Cullen, J. 1993. Chairman's forward. In Health and Safety Commission Annual Report 1992/93. HSE, Suffolk, p.x-xii. Quote from page x.

which had until then operated strictly on a version of the ALARP principle, called ALARA (As Low as Reasonably Achievable). In particular this has caused problems for the start-up of the Sizewell B reactor which is now likely to be delayed for six to nine months until it can meet the new safety criteria (eg. Greenpeace and other NGO's will attempt to show that the costs of additional radioactive discharge from Sizewell are not justified as there are limited public benefits).[177] Because of this major regulatory change, the Government's review of the nuclear industry, which was due to start in March 1994, has been postponed.

In the long-term the role of EU will probably reduce consensual regulation within the UK as there will be a shift from flexible regulation to across-the-board standards, while environmental groups have increased their influence on risk and environment regulation in Europe.[178] McCormick[179] states several reasons for this. When the UK joined the Community interest groups could use European policy tools which had not previously been available to them. For example, environmental NGO's now have locus standi to use the judicial review system to pressure UK policy makers at the High Court. There has also been an increased number of complaints made directly to the Commission by interest groups and in some cases consultations with interest groups have been an important part of the policy making process. Some groups are keen to increase their role and are now attempting to gain representation on the Commission's consultation committees. In other words, as Robin Grove-White writes, "...it has been the NGOs who have been groping for expressions of new intuitions and energy, and who have found uncolonised niches in our political culture."[180] This is not to say that the UK does or will accept European regulatory Directives at face value. In previous cases the UK Government has voted against

[177]. Brown, P. 1994. Sizewell faces further delay. Guardian, 14 March, p.14.

[178]. Grove-White, R. 1991b. The emerging shape of environmental conflict in the 1990s. RSA Journal, Vol.139, p.437-447; McCormick, J. 1991. British Politics and the Environment. Earthscan, London.

[179]. McCormick 1991.

[180]. Grove-White, R. 1991b. The emerging shape of environmental conflict in the 1990s. RSA Journal, Vol.139, p.437-447. Quote from page 441.

Europe's health and safety directives, and if they still pass, the Government has (and probably will in the future) attempted to weaken or delay their implementation, especially if it feels that the Directive will create significant costs for the UK economy or where the regulatory costs are not significantly lower than the benefits.[181] Furthermore, the Government's strenuous opposition to EU's health and safety regulations as well as environmental policy, is one reason why it is trying to keep the 23 vote veto even if the EU is enlarged by four countries. Finally, as discussed in Section 3.6, the UK Government has on numerous occasions been successful in influencing European risk legislation,[182] and it is highly likely that these persuasive activities will continue.

In the Spring of 1994 there were renewed attempts to block the adoption of future EU risk management directives. UK industry feels that the UK are following the EU guidelines too closely and as a result they are loosing their competititive edge. The argument they make is why should the UK adopt so many of EU's stringent guidelines when many Mediterranean countries do not.[183] HSE takes a similar view. John Rimington, the Director General of HSE, stated recently that the EU is seeking to enforce a safety and environmental regime upon both its less developed and more advanced members in a quick fashion. This is unfair, as the advanced members such as the UK which already have a similar regime in place are now forced to adopt to the EU's guidelines in a far too fast pace which is costly not only to industry but also to the regulator, while the less developed members such as Portugal have no problem to adopt the guidelines because they have no

[181]. HSC (Health and Safety Commission). 1993. Health and Safety Commission-Annual Report 1992/93. HSE, Suffolk; Wynne, B. 1993. Implementation of greenhouse gas reductions in the European Community. Global Environmental Change, Vol.3, n.1, p.101-128.

[182]. Cullen, J. 1993. Chairman's forward. In Health and Safety Commission Annual Report 1992/93. HSE, Suffolk, p.x-xii.

[183]. Mobbs, N. 1994. Sensible regulation of industrial harms. Paper presented at the Sensible Regulation of Industrial Harms workshop, Royal Society, 12 May.

such regime to begin with.[184] If these critiques are repeated by other people with influence, maybe the Government will start to ignore some of EU's more stringent risk legislative guidelines.

### 6.3 A new regulatory style in HMIP

One approach that is currently being developed within Her Majesty's Inspectorate of Pollution (HMIP) is to have a somewhat flexible ALARP/ALARA approach, commonly referred to as Best Available Techniques Not Entailing Excessive Cost (BATNEEC), combined with tough enforcement and no consensual regulation. The 1990 Environmental Protection Act (EPA), which greatly increased the power of the regulators, has enabled HMIP to adopt this approach; BATNEEC is the a basic condition with which industry must comply under the 1990 EPA.[185] Potentially it has many advantages: a) environmental legislation in the UK is now backed by strict enforcement criteria; b) each case is still based on the ALARP/ALARA principle, allowing flexibility, but the greater powers of the inspector mean that standards may increase over time; c) HMIP has a greater "hands on" role and in many cases determines emission controls based on independent and objective data, rather than that from joint industry measuring studies as previously.

The Chief Inspector and Director of HMIP, Dr. David Slater, believes that these non-consensual regulatory measures will have a positive impact on risk regulation not only in the other UK (HSE) inspectorates but also in European legislation (should they choose to adopt them), as he sees the latter to be too reliant on uniform standards.[186]

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[184]. Rimington, J.D. 1994. Sensible regulation of industrial harms. Presented at the Sensible Regulation of Industrial Harms workshop, Royal Society, 12 May.

[185]. Prichard, P. 1994. Risk management. Unpublished manuscript.

[186]. Slater, D. 1994. Chief Inspector and Director of Her Majesty's Inspectorate of Pollution, personal communication, March.

Slater has received a great deal of criticism for this approach. The industry feels that HMIP is too hard on them, while environmental groups believe that HMIP is still too lenient. According to Slater one of the main reasons why these criticisms exist is that HMIP, until recently, has not been a high profile regulator, which in turn has limited public knowledge of the agency: for instance, on several occasions according to reports from DTI, companies have clearly benefitted from the new approach put forward by HMIP. The agency also works behind the lines trying to prevent accidents before they happen and this, of course, never receives much publicity.[187] It will be interesting to follow HMIP's approach. If it is accepted by all parties as Slater believes it will be, then maybe it can form the basis for a new viable UK risk management approach combining some of the aspects of the original UK design such as ALARP with more stringent EU legislation.

[187]. Woolf, G. 1994. Slater fights back. The Chemical Engineer, 17 March, p.38.

# 7. Conclusions: what can be learnt from the UK example?

This report has highlighted some of the unique features of the UK's risk management policy. These are largely the products of its historic development: public inquiries came about following Enclosure of agricultural land, the consensual style of regulation has its roots in 19th century England, and the ALARP principle is based on the 'best practical means' principle first put forward in 1842. Along with other aspects of the UK regulatory system these processes have been the main influences on UK energy risk management.

However, the role of the EU in determining the UK's regulatory system is steadily increasing and it is likely that, in the medium-term, several of these approaches will decline in importance or disappear all together. In view of this development it is nevertheless important that the positive aspects of the UK process are not lost and that the negative aspects are not repeated by other countries seeking to rationalise their approaches to managing energy risks.

Positive and negative aspects of UK energy risk management

The positive aspects of the UK's energy risk management strategy can be summarized as follows:

* Self-regulation necessitates a greater awareness of operations, potential faults and monitoring and review of safety standards amongst plant operators.
* The ALARP principle, despite its problems, enables enforceable and practicable energy risk legislation in the UK.
* Privatization has improved risk and safety management procedures in many instances.

* Public inquiries, although expensive to implement, facilitate some public participation in the risk management process.

The negative aspects:

* Deregulation places too much emphasis on voluntary compliance, and unnecessary burdens on small industry.

* The secrecy under which the industrial and subject advisor committees carry out their deliberations and technical assessments works against public participation and independent external review in the regulatory decision making.

* Technical understanding among civil servants is poor and they are unable to comment from an informed position on regulatory rulings.

* The trial and error approach does little to prevent accidents from occurring in the first place.

Despite the problems identified in this report the UK does appear to have utilized risk management tools that have flexible, cost-effective and positive benefits for the general public.