

15 Safety

Introduction

15.1. Our terms of reference require us to consider the efficiency of AEA in implementing the safety procedures and standards agreed with or imposed by the safety authorities. In this chapter we first describe the statutory framework applicable to safety in AEA and the role of the various regulatory agencies concerned. We then discuss AEA's safety management system and its costs and performance. In this context the costs considered only relate to safety management; they do not include the safety element of capital costs associated with the construction of plant. The chapter ends with a summary of the views put to us by the regulators, followed by our conclusion and recommendation (paragraphs 15.59 and 15.60).

Statutory framework

15.2. In common with other employers AEA is subject to the provisions of the Health and Safety at Work Act 1974. However, because of its nuclear activities it is also subject to a number of other Acts and Regulations specifically related to radiological safety. The principal Acts and Regulations are summarised in the following paragraphs.

15.3. The Health and Safety at Work Act 1974 places a general duty on employers to ensure, so far as reasonably practicable, that no harm comes to workers or members of the public from their undertakings. This duty extends, *inter alia*, to the provision and maintenance of plant and systems of work, the use, handling, storage and transport of articles and substances and the provision of information and training. This and other duties under the Act (for example, to prepare written safety policies) are supplemented by an extensive range of regulations and Approved Codes of Practice issued under the provisions of the Act.

15.4. Of particular importance to AEA are the Ionising Radiations Regulations 1985, which lay down the safety requirements in regard to all work with ionising radiations. They require that doses received from this work, both by radiation workers and by other persons, should be kept as low as reasonably practicable. They stipulate legal dose limits and require investigations to ensure that adequate protection arrangements are in place when doses exceed a specified annual level.

15.5. Under the Nuclear Installations Act 1965 and the Nuclear Installations Act 1965 (Repeal and Modification) Regulations 1990, licences are required from NII-now part of HSE-for sites wishing to undertake prescribed nuclear activities. AEA was exempt from this requirement until 31 October 1990. Since that date the sites licensed in whole or in part are at Dounreay, Harwell, Springfields, Windscale and Winfrith.

15.6. Under the Radioactive Substances Act 1960 AEA can only dispose of radioactive waste to water, land and air under the terms of authorisations granted by the authorising bodies. These bodies are, in England and Wales, HM Inspectorate of Pollution (HMIP, part of DoE) and the Ministry of Agriculture Fisheries and Food (MAFF) and, in Scotland, the Scottish Office Environment Department. The authorisations state conditions applying to the disposal and usually require operators to use best practicable means to limit the radioactive content of disposals. AEA sites not licensed under the Nuclear Installations Act 1965 which use radioactive substances on site are required to register that use.

15.7. There are various Government regulations which stipulate the safety requirements in respect of transport by road, air, rail and sea of all radioactive substances. The safety requirements for all modes of transport are based on recommendations of the International Atomic Energy Agency (IAEA). The Department of Transport (DTp) enforces the regulations and in doing so approves some package designs. It also carries out site inspections of the arrangements covering all aspects of transport-including manufacture, maintenance and use of all packages.

15.8. The Environmental Protection Act 1990 empowers the authorising bodies under the Radioactive Substances Act 1960 to charge the operator the cost of regulatory work carried out in respect of such authorisations. AEA is therefore required to refund HMIP, MAFF and their counterparts in Scotland the costs associated with inspecting AEA sites and monitoring the environment nearby.

15.9. Part 1 of the Environmental Protection Act also lays down general requirements in relation to the use of prescribed non-nuclear processes and substances (which generally do not apply to AEA operations) and applies the principle of Integrated Pollution Control to environmental protection. The principal enforcement bodies under Part 1 of the Act are HMIP (on behalf of DoE and the Welsh Office) and the Scottish Office Environment Department.

15.10. The Water Resources Act 1991 lays down requirements for discharges to watercourses. Such discharges require formal consents, with conditions attached. These consents are usually issued by the National Rivers Authority in England and Wales under the Water Resources Act and the River Purification Boards in Scotland under the Control of Pollution Act 1974. Where prescribed substances are included authorisations are issued by HMIP under the Environmental Protection Act.

Other safety requirements

15.11. Additional safety requirements applicable to AEA are as follows:

- (a) The current letter of objectives from the Secretary of State to AEA's Chairman (see Appendix 1.3) asks AEA to continue to have in place arrangements which secure at all times the highest standards in safety that are reasonably practicable, in its day-to-day activities, in its decommissioning activities and in the management of radioactive waste.
- (b) *Nuclear safety incidents reportable within 24 hours.* Under arrangements announced in the House of Commons by the Secretary of State on 30 April 1987, nuclear safety incidents in defined categories are required to be reported within 24 hours to Government officials.
- (c) *Emergency planning arrangements for nuclear sites.* There are legal requirements for emergency planning at nuclear sites in respect of conditions attached to licences issued under the Nuclear Installations Act 1965 and in the Ionising Radiations Regulations 1985. In addition, the lead Government departments (DEn and the Scottish Office Industry Department), in consultation with other departments and NII, lay down guidance on principles to be met in civil nuclear emergency planning arrangements, particularly regarding off-site implications of emergencies. The guidance to date covers the provision of off-site facilities and arrangements for taking counter-measures to protect the public. The National Radiological Protection Board (NRPB) gives advice, in respect of radiation doses which may be received by members of the public off-site, on the Emergency Reference Levels at which special protection counter-measures are required.
- (d) *Other advice by NRPB.* NRPB provides national advice which, whilst not stating legal requirements, is strongly persuasive for nuclear operators. NRPB's current advice on the protection of radiation workers-that doses should not exceed an average of 15 mSv a year-has been incorporated in an Approved Code of Practice to the Ionising Radiations Regulations 1985 by HSE. With respect to public protection, NRPB advises that doses to the most affected member of the public from discharges to the environment from a single site should not exceed 0.5 mSv.

- (e) *Article 37 of Euratom Treaty*. This requires operators in member states to prepare a full submission to a Community group of experts regarding any *new* proposal to dispose of waste which could affect the space of another member state.

The regulatory agencies

15.12. Enforcement of safety legislation requirements in relation to AEA's site operations is primarily the responsibility of HSE acting through its Inspectorates, principally NII and the Factories Inspectorate. As noted in paragraph 15.5, five of AEA's sites are now licensed or part-licensed under the Nuclear Installations Act 1965. NII issues the site licences and monitors compliance with the licence conditions and the provisions of the Ionising Radiations Regulations 1985. NII does not prescribe detailed standards or codes of practice for nuclear plant. Rather it expects licence applicants or licensees to develop their own design safety criteria and requirements which it then assesses using the published Safety Assessment Principles (see paragraphs 15.29 and 15.30).

15.13. The operation of a nuclear facility is regulated by NII by means of conditions attached to the site licence. These conditions are designed to ensure that all reasonably practicable steps are taken by the licensee to protect both workers on the site and members of the public from risks associated with its use. They require AEA to make arrangements to address a wide range of issues including operating limits; operating, test and maintenance procedures including requirements for periodic shutdown; plant modifications; management of radioactive wastes; reporting of incidents and arrangements for dealing with accidents or emergencies.

15.14. In exercising its nuclear licensing function NII utilises three main instruments. These are 'Consents', 'Approvals' and 'Directions'. At the discretion of NII a Consent may be required before any activity specified in the licence can be carried out; NII must be satisfied that the proposed action is safe and that all procedures necessary for its control are in place. An Approval is required for any arrangement which NII decides is important for safe operation. Once approved, the relevant procedures cannot be changed without NII's agreement. The power of Direction is used by NII when it requires specified action to be taken, such as, for instance, shutting down a plant.

15.15. It is expected that, during the life of a plant, some operating limits and procedures will need to be changed and some modifications made to the plant. A licensee is required to set up a safety committee to consider these and other more general safety matters and to advise on issues which could have significance for safety. The approval of NII is required before any important changes or modifications are implemented. NII, by monitoring the operating plant and scrutinising submissions made to the safety committee, provides an independent check on the proposal and effectiveness of the safety controls.

15.16. To ensure compliance with the requirements of the licence conditions and to provide an overall surveillance of activities on a licensed site, inspectors pay frequent visits to each operating installation. The site inspectors, who spend about 25 per cent of their time on sites, are supported by other inspectors who carry out specialist assessments or inspections as necessary. On occasions a special safety audit may be carried out on a particular aspect of safety.

15.17. On licensed sites NII inspects for compliance with the site licence, paying particular attention to matters which could affect nuclear safety. Other sites and non-nuclear activities on licensed sites are inspected by the Factories Inspectorate which liaises closely with NII when necessary. The NII inspection regime reflects the importance attached to protecting the public and workers from the effects of nuclear incidents. For this reason NII inspects more frequently than its colleagues in the Factories Inspectorate, which is primarily concerned with the protection of workers from the conventional hazards of the workplace. HSE publishes a number of Approved Codes of Practice which, while not themselves legal requirements, provide guidance on current best practices. There is a right of appeal to an Industrial Tribunal against formal notices issued by HSE under the Health and Safety at Work Act whereas there is no right of appeal against formal decisions of NII (unless it be an appeal to judicial review on account of improper process taken in enforcing the provisions of the Nuclear Site Licence).

15.18. Discharges of radioactive waste from nuclear sites are subject to authorisation by DoE, the Welsh Office and MAFF or the Scottish Office under the Radioactive Substances Act 1960. Because the authorising departments need to ensure that waste management considerations are properly taken into account at all stages of the nuclear fuel cycle, and not simply when wastes require disposal, there is also a need to:

- (a) assess the design and proposed operation of plants which create, treat or discharge wastes, and to inspect plant and processes; to ensure that best practicable means are used to keep quantities of waste as low as possible; to ensure that handling and treatment methods are compatible with disposal routes; and to ensure that the likelihood of unplanned discharges is minimised; and
- (b) examine the waste management implications of proposals to store, or continue to store, waste on site.

There are working arrangements in the form of an inter-departmental agreement between the authorising departments and HSE to ensure that the waste management aspects of plant are examined and inspected without conflicting requirements being placed on the licensee.

15.19. The pollution inspectorates in England and Scotland (HMIP and HM Industrial Pollution Inspectorate respectively) and MAFF authorise the disposal of radioactive waste. Their inspectors visit sites to examine release arrangements and to review monitoring results. They may also monitor discharges and the Inspectorates may prosecute for violations of authorisations.

15.20. AEA told us that for radioactive discharges, the ground rules, and to some extent the relationship with the regulatory bodies, had changed over the years. Regulation was initially based on an assessment of the health effects to man using International Commission on Radiological Protection (ICRP) guidance over a range of acceptable organ dose levels. With the passage of time, discharge authorisations were being based more upon the need to discharge than the effects.

15.21. The Environmental Protection Act (1990) introduced the concept of the 'best practicable environmental option' to ensure that the overall impact of releases on the environment taken as a whole is minimised. The Act also introduced the requirement to apply the Best Available Techniques Not Entailing Excessive Cost. This is the United Kingdom interpretation of an EC rule to use the best available technology taking account of economic viability. AEA told us that the means and standards to be used in complying with this requirement remained to be clarified.

15.22. A number of Authorities exist with responsibility for regulating the transport of radioactive material, depending on mode. However, in Great Britain most transport is by road and here the responsible authority is DTp. As indicated in paragraph 15.7, DTp lays down the legal requirements and the standards that the designs of container must satisfy; the standards become more demanding with increases in radioactivity and go from light packaging for low-activity materials through to heavy robust flasks for spent nuclear fuel. The DTp regulations are based on the IAEA Safety Series No 6, introduced to establish international standards of safety when transporting radioactive material. This allows packages and containers certified in one country to be used in another. The requirements for container design are prescriptive and given in considerable technical detail; compliance with them is not a matter of subjective judgment.

The non-regulatory agencies

ICRP and NRPB

15.23. ICRP has for some time been regarded as the main authoritative international body on radiological protection. It produces detailed recommendations on dose calculation, assessment, and the effects of dose, and on the limits of dose to workers and the public.

15.24. ICRP takes into account in formulating its recommendations estimates of the risk from radiation developed by other international bodies, primarily the United Nations Scientific Committee on the Effects of Atomic Radiation, and by national bodies such as the US Academy of Sciences Committee on the Biological Effects of Ionising Radiation.

15.25. As mentioned in paragraph 15.11(c) and (d), within the United Kingdom NRPB is charged with offering definitive advice to the Government. In particular it has a direction to advise whenever ICRP or other international bodies issue recommendations on standards. NRPB also advises in its own right if necessary and issues detailed guidance in some areas where ICRP is less definitive, such as the levels of dose at which emergency action might be contemplated to protect the public.

15.26. There is a link between NRPB advice and statutory legislation in so far as compliance with the Ionising Radiation Regulations is concerned. These regulations contain dose limits in compliance with EC Directives and consistent with NRPB advice but also introduce additional concepts such as dose levels at which exposures should be investigated (see paragraph 15.4).

IAEA

15.27. IAEA has in recent years become the focus for international nuclear safety standards. It is the vehicle favoured by NII as a means for reaching international consensus on fundamental safety standards. AEA pays significant attention to the Safety Principles, Safety Guides and Safety Series documents produced by IAEA.

The Organisation for Economic Co-operation and Development (OECD)

15.28. OECD is active in international co-operation on nuclear safety matters through its Nuclear Energy Agency. In particular, the Committee on the Safety of Nuclear Installations and two other committees (on Radiological Protection and Radioactive Waste) are relevant to AEA's operations. AEA participates in discussions in the relevant areas and in general terms may seek to follow the technical advice generated.

Safety Assessment Principles

15.29. The fundamental United Kingdom regulatory requirement is to ensure safety, so far as is reasonably practicable. We were told that this concept had been a powerful stimulus in the nuclear industry for change and improvement and, together with limits which must not be exceeded, formed the basis of NII's safety assessment philosophy. Furthermore, this philosophy is embodied in a set of principles-the Safety Assessment Principles (SAPs)-specifically developed by NII as a guide to its assessors in the assessment of safety cases submitted by licensees or prospective licensees. Safety cases are detailed documents prepared by operators covering the purpose, design and construction of plant as well as operating, maintenance and monitoring procedures. They are subject to independent peer review within the operator's organisation prior to submission to NII (in AEA this peer review for the potentially most hazardous plant is usually undertaken by staff in the S&R business) and need to demonstrate that all licence and statutory safety requirements will be met.

15.30. SAPs for nuclear power reactors were first published by NII in 1979 and a further set introduced in 1983 to cover nuclear chemical plants. These principles are based on many years of accumulated experience within the inspectorate and reflect the best engineering practices both in the United Kingdom and abroad. They contain statements of what is reasonably practicable distilled from previous experience. The SAPs are kept under review and are updated as necessary to ensure that account is taken of the wider experiences and advances in nuclear safety.

AEA's safety management system

15.31. To meet the various statutory and other safety requirements placed on it AEA's safety management system (SMS) is designed to:

- (a) lay down clear responsibilities and accountabilities;
- (b) define procedures to be followed;
- (c) select and train staff to operate within an effective safety culture;
- (d) identify monitoring arrangements; and
- (e) identify routes for reporting and analysing performance.

At present the system is operated on a three-tier basis-corporate, sites and business, as described below. From April 1992, following abolition of the sites organisation (see Chapter 2), it will be operated on a two-tier system (see paragraphs 15.45 and 15.46).

15.32. At the corporate level the AEA Chief Executive, advised by the Director of Safety, issues a policy statement which all must follow. The approved policy is set out in Corporate Safety Directives which are mandatory throughout AEA. Assistance in interpreting and applying the directives is available through Safety Guidance Notes. AEA told us that the directives interpreted the major safety requirements placed on AEA in relation to the work undertaken in such a way that adherence to the directives implied a corporately consistent satisfaction of the requirements.

15.33. Site Directors are responsible for ensuring that all operations on their site are carried out within corporate and legal requirements. A Site Director sets out in Site Safety Instructions (SSIs) the detailed arrangements and procedures which businesses must follow if they are to operate plant on his site. These SSIs build on the directives and other requirements not addressed in the directives and reflect the particular operations, history and style of the site. In order to enable the Site Director to exercise his safety responsibilities, only he can authorise the operation of the most hazardous plant, he must endorse the appointments of staff to key safety posts and he monitors safety performance on his site.

15.34. In businesses, staff must operate to the local SSIs and set up internal arrangements to ensure this. In particular, detailed Safety Cases, Safety Rules, Operating, Maintenance and Emergency Procedures and Instructions must be set down and approved for each individual plant.

Safety committee system

15.35. A key feature of AEA's SMS is that those with the responsibility for authorising operation must be provided with expert advice. For the most potentially hazardous plant, authorisation is by the Site Director (endorsed by the Director of Safety for plant with off-site hazard potential), who is advised by the Site Safety Committee, which must contain members from outside AEA as well as a representative of the Director of Safety. Each site also has a number of safety working parties which undertake detailed consideration of technical safety issues.

Safety of operations

15.36. AEA told us that the requirements of the SMS were reflected in appointment criteria and in training programmes. The actual achievement of safety in operation was monitored by a system of Safety Audits, Surveys and Inspections. Additionally, QA audits revealed the levels of non-compliance with established operating procedures.

15.37. AEA added that it had a comprehensive set of procedures for categorising, reporting and analysing safety incidents at sites. Incidents in the most severe categories, or requiring urgent external reporting action, or those of possible public interest, were reported corporately, publicly investigated and recommendations made and circulated for executive management action.

15.38. AEA told us that its safety procedures to ensure that the statutory and other safety requirements were met were as follows:

- (a) *Health and Safety at Work Act and related Regulations*
AEA's safety policy and arrangements were contained in statements and letters from the Chairman and Chief Executive to top management which laid down clear responsibilities for safety and for complying with legal safety requirements. Corporate Safety Directives drew attention to and interpreted relevant legal requirements.
- (b) *Licensing under the Nuclear Installations Act*
Corporate Safety Directives and SSIs laid down procedures for compliance with the conditions attached to site licences. There were clearly established communication routes between AEA and NII on licensing matters.
- (c) *Radioactive Substances Act*
Measurements taken at AEA sites ensured compliance with disposal authorisations. Further checks were carried out by environmental monitoring off-site.
- (d) *Radioactive Substances (Carriage by Road) (Great Britain) Regulations*
Arrangements were in place to ensure that all containers used for radioactive substances complied with design approvals and that road movements complied with regulations.
- (e) *Environmental Protection Act*
AEA had recently agreed to adopt a corporate environmental policy statement and was putting arrangements in place to clarify responsibilities for complying with the new environmental legislation.
- (f) *Water Resources Act*
Measurements were taken at AEA sites to ensure compliance with consents for discharges of non-radioactive waste to water.
- (g) *Incidents reportable within 24 hours*
AEA corporate and site procedures covered the specific requirements to report these categories of incidents.
- (h) *Emergency planning for nuclear sites*
AEA's Emergency Planning Working Group co-ordinated AEA action to ensure compliance with Government planning principles. AEA was represented on the Government committees where the principles were discussed.
- (i) *NRPB advice*
This was taken into account and applied when formulating AEA radiological protection policy.

Safety performance

15.39. The actual safety performance of AEA operations is measured under three broad headings:

- (a) radiological dose;
- (b) incidents; and
- (c) accidents.

15.40. AEA told us that its safety concerns continued to be dominated by the potential health hazards to workers and the public arising from radiation from the significant quantities of radioactive materials with which it worked. The overriding requirement was to ensure that radiation doses were As Low As Reasonably Achievable (ALARA). AEA operated a tiered radiological protection policy which required local managers to agree dose limits for their staff below corporate ceiling levels. Progress under AEA's dose restriction policies is illustrated by Table 15.1.

TABLE 15.1 Trend of collective annual doses and numbers of AEA employees exceeding 15 mSv and 30 mSv

Date	Collective dose (Man Sv)	Number of individuals assessed	Individual workers with annual doses exceeding 15 mSv	Individual workers with annual doses exceeding 30 mSv
1981	23.32	7,553	345 (4.7%)	77 (1.02%)
1982	21.45	7,305	291 (4.0%)	43 (0.59%)
1983	19.84	7,329	225 (3.1%)	46 (0.62%)
1984	18.58	7,255	188 (2.6%)	20 (0.28%)
1985	16.89	7,596	153 (2.0%)	21 (0.28%)
1986*	18.57	7,443	160 (2.1%)	18 (0.24%)
1987	16.75	7,312	132 (1.8%)	11 (0.15%)
1988	13.97	7,169	70 (1.0%)	2 (0.03%)
1989	12.00	6,380	81 (1.3%)	0 (0.00%)
1990	8.55	5,630	12 (0.2%)	0 (0.00%)

Source: AEA.

*The dose information recorded for 1981 to 1985 relates to external dose only. From 1986, as required by the Ionising Radiations Regulations 1985, the dose information comprises the sum of the effective dose equivalent from external radiation and the committed effective dose equivalent from that year's intake of radionuclides.

15.41. Typically AEA records about 2,000 incidents per year, including about 400 of a radiological nature. A Ministerial Direction defines a category of potentially most serious radiological incidents which must be reported to Ministry officials within 24 hours. Over the last four years the numbers of such incidents have been 6, 7, 9 and 7 (in 1990) and shown no significant trend.

15.42. AEA said that whilst radiological safety would always be a major concern, increasing attention was being devoted to conventional industrial safety. In 1990 1,372 injuries had been recorded, of which 115 involved lost time and of which 74 were reportable to HSE. The lost time accident record could be analysed in a variety of ways, but one index widely used in industry was the lost time injury frequency rate, and values of this index are shown in Table 15.2. There are site-to-site variations reflecting differing work patterns but little trend over time. AEA believed its corporate index of 0.6 was comparable with other nuclear organisations but that some organisations in the chemical industry had achieved significantly lower figures.

TABLE 15.2 Summary of lost time injury (LTI) frequency rate

Site	LTI/man lifetime			
	1987	1988	1989	1990
Dounreay	1.0	0.94	1.37	0.8
Winfrith	1.1	0.8	0.56	0.8
Windscale	1.2	1.5	1.6	1.1
Harwell	0.67	0.37	0.3	0.4
Risley	0.56	0.42	0.58	0.74
Culham	0.51	0.58	0.15	0.4
Springfields	<u>1.1</u>	<u>1.2</u>	<u>0.95</u>	<u>0.95</u>
Total	0.82	0.65	0.58	0.64

Source: AEA.

Waste discharge and environmental monitoring

15.43. AEA's licensed nuclear sites all have authorisations under the Radioactive Substances Act 1960 to discharge radioactive waste to air and water (see paragraph 15.18). In recent years, the authorising departments have been reconsidering the authorisations and setting lower limits more in line with the sites' real needs. In 1990 the highest percentage of the authorised limit actually discharged for any nuclide at any site was 12 per cent.

15.44. Environmental monitoring is carried out in river, marine and terrestrial environments around AEA sites to check that discharge control procedures are effective. Details of the results are regularly published and doses to the most affected members of the public from AEA operations were substantially below the limits recommended in national guidance from NRPB.

Future arrangements

15.45. Because of the change in the sites organisation planned for April 1992, AEA will make a number of modifications to its SMS. The objectives of the changes are to:

- (a) simplify and clarify safety management arrangements by reducing the number of safety tiers from three to two;
- (b) improve inter-site consistency in the application of safety procedures; and
- (c) clarify the line management responsibility for the safety of operations.

AEA stated that in order to address the first two of these objectives it planned to merge the site Safety Groups with the Director of Safety's close support team into a new Corporate Safety Directorate. In this way the core safety function would still be undertaken at sites but within a corporate framework with executive authority to address overall efficiency and consistency.

15.46. AEA intended to change the safety reporting route so that it lay directly along the executive management line up to Board level. Each Managing Director would thus report separately on the safety of his operations. The Director of Safety would continue to be responsible to the Chief Executive on policy and monitoring activities and the Chief Executive would chair AEA's Safety Committee. The operator's prime responsibility for safety would be emphasised by clearly placing responsibility for authorising the operation of the plant with the operator and senior line management in the businesses.

Safety management costs

15.47. AEA told us that safety was an integral part of all its operations and for many activities, particularly those which were nuclear-related, it had a major impact on the operations. For these reasons it was not possible unambiguously to identify total AEA expenditure associated with the operation of the SMS. However, costs were estimated by AEA taking account of the following:

- (a) production of corporate safety policy, directives and guidance;
- (b) production of SSIs;
- (c) emergency planning;
- (d) production of safety cases;
- (e) safety committees;
- (f) safety monitoring;
- (g) environmental monitoring;
- (h) safety training;
- (i) occupational health;
- (j) industrial safety;

(k) nuclear material transport; and

(l) regulatory costs.

Costs in the following areas were *not* covered:

(m) fire and ambulance services;

(n) security services;

(o) waste management;

(p) safety-related plant hardware; and

(q) safety R&D.

15.48. For a number of the items included in the definition of safety management, costs are not separately identified or accounted for within AEA's financial system. This is particularly so for the safety costs occurring within the businesses where there is no clear line between some safety and operational activities. In these cases an element of judgment was used by AEA to estimate the safety costs. For this reason, the cost figures produced should not be regarded as definitive but as indicative estimates.

15.49. The estimated safety management expenditure for the five years commencing in 1990 is shown in Table 15.3. The costs incurred corporately, within site organisations and within businesses are shown separately. Comparable data are not available for the period before April 1990, when AEA was reorganised. AEA told us that radiological safety management accounted for about 90 per cent of the total costs.

TABLE 15.3 **Safety management costs in AEA**

	<i>£ million, 1991/92 prices</i>				
	<i>1990/91</i>	<i>1991/92</i>	<i>1992/93</i>	<i>1993/94</i>	<i>1994/95</i>
<i>Corporate</i>					
NII	2.65	2.50	2.50	1.80	1.70
Other regulators	0.00	0.45	0.50	0.50	0.50
Authority Safety Projects	2.80	2.50	2.22	1.97	1.75
CHQ	<u>0.40</u>	<u>0.45</u>	<u>0.45</u>	<u>0.45</u>	<u>0.45</u>
Total	5.85	5.90	5.67	4.72	4.40
<i>Sites</i>					
Dounreay	8.25	5.93	5.93	5.93	5.93
Windscale	1.74	1.69	1.76	2.26	2.26
Risley/Springfields	1.03	0.95	0.80	0.70	0.70
Harwell/Culham	7.80	6.60	6.60	6.60	6.60
Winfrith	<u>5.78</u>	<u>4.19</u>	<u>4.00</u>	<u>3.99</u>	<u>3.99</u>
Total	24.60	19.36	19.09	19.48	19.48
<i>Businesses</i>					
D&R	1.73	2.47	2.22	2.12	2.08
E&E	0.50	0.52	0.55	0.58	0.61
AEAE	0.05	0.05	0.05	0.05	0.05
FS	2.20	2.70	2.30	2.10	2.00
FUS	0.25	0.25	0.25	0.25	0.25
InTec	1.29	1.00	1.00	1.00	1.00
APS	0.25	0.25	0.25	0.25	0.25
RS	3.40	3.40	3.40	3.40	3.40
S&R	<u>0.07</u>	<u>0.08</u>	<u>0.08</u>	<u>0.09</u>	<u>0.09</u>
Total	9.74	10.72	10.10	9.84	9.73
Total	40.19	35.98	34.86	34.04	33.61

Source: AEA.

15.50. The estimates of future expenditure given in Table 15.3 are based on the assumption that the existing three-tier safety management structure remains in place. AEA told us that the change to a two-tier system from April 1992 would have an impact on costs as it offered some scope for improved efficiency. However, a detailed assessment of the cost implications of the proposed new system had not yet been completed.

15.51. AEA added the following explanation of the figures in Table 15.3:

- (a) the estimates for NII charges for the years 1991/92 and beyond were based on preliminary indications provided by NII (NII told us subsequently that the 1991/92 figure was likely to be £1.83 million);
- (b) the estimates of other regulatory charges, which principally relate to HMIP, MAFF and their Scottish equivalents, were AEA estimates;
- (c) the costs associated with the preparation for NII licensing on 31 October 1990 had been excluded from the quoted 1990/91 figures for sites and businesses; and
- (d) the safety costs associated with the Dounreay PFR following its planned closure in 1994 were included in the RS total even though responsibility for decommissioning would fall to DRAWMOPS.

15.52. The total costs of safety management for 1991/92 represent about 8 per cent of AEA's turnover and the effort involved is about 8 per cent of the workforce. AEA told us that from time to time it made comparisons of safety costs with other nuclear operators in the United Kingdom. These indicated a similar level of effort with around 8 per cent of the operators' workforce employed in roles primarily related to safety. However, exact comparisons were difficult because of the different nature of the operations undertaken, for example as between routine plant operation and R&D. Some attempt had been made to produce international comparisons but similar difficulties arose, further complicated by different regulatory regimes. However, comparisons with similar undertakings in Denmark and the USA indicated that safety costs were broadly in line. AEA told us that while the United Kingdom regulatory requirements were complex and expensive, it did not believe that the arrangements added unnecessarily to costs. Furthermore, the responsibilities of the regulators were clearly defined so that conflict and overlap were usually avoided.

Views of the regulators

15.53. In the course of our inquiry we received written submissions from HSE and from other regulating agencies. We also held hearings with HSE and with main agencies responsible for pollution control. As explained earlier (see paragraphs 15.12 to 15.17), the HSE Inspectorates have prime responsibility for regulating the safety of AEA's site operations, including their licensing.

15.54. HSE told us that overall it was satisfied with the extent of the commitment to safety displayed by the management and staff of AEA. In general adequate resources had been made available to ensure that an acceptable level of safety was maintained on the licensed sites and a programme of reasonably practicable improvements had been agreed with NII and was well in hand. In respect of the more conventional aspects of safety (non-nuclear), we were told that AEA's performance was seen as better than average.

15.55. The other regulators also expressed general satisfaction with AEA's performance in relation to dealing with radioactive waste and other pollutants. There were problems from time to time but nothing of major significance had arisen. Some concern was expressed over lack of forward planning in AEA, a particular instance being the arrangements at Dounreay for dealing with the storage of intermediate- and low-level waste in the future. We were told that, for the immediate future, this particular matter had now been dealt with.

Dounreay uranium stock discrepancy

15.56. At a late stage in our inquiry, early December 1991, AEA issued a statement announcing a nuclear material accountancy discrepancy at Dounreay involving some 11 kg of enriched uranium. The discrepancy was revealed in the course of a routine stocktaking and, in accordance with standard practice, the plant was shut down and a full investigation mounted. The investigation was completed in early January and the results passed to the regulatory authorities.

15.57. As part of the investigation a further, more detailed and comprehensive stocktake of the enriched uranium associated with the plant, including extensive measurements of the related waste streams, resulted in a reduction of the material unaccounted for to about 3 kg. AEA considered this to be an acceptable level of discrepancy for the type of operations concerned over the period covered by the investigation (April to December 1991).

15.58. The investigation found that much of the material previously unaccounted for had entered waste streams, both solid and liquid. However, the amount of radioactivity contained in the liquid waste discharged to the sea was a very small percentage of the authorised discharge and would have no discernible effect on the environment. The investigation confirmed that the incident had not involved any safety hazards and also that there were no grounds for believing that security procedures were deficient. It did, however, recommend modifications to the plant to improve performance, possible changes to materials accountancy arrangements, and improvements to other management procedures. AEA has accepted all the recommendations and taken action to implement them.

Conclusion and recommendation

15.59. AEA's safety management system is currently based on a three-tier approach-corporate, sites and businesses-but this will be reduced to two tiers from April 1992 with the removal of sites' responsibilities. The system is forecast to cost £36 million in 1991/92, of which about 90 per cent arises from radiological safety requirements. Safety management costs represent about 8 per cent of AEA's turnover. AEA told us that the percentage of staff time devoted primarily to safety-related matters was similar to that found in other major United Kingdom nuclear undertakings. International comparisons were difficult because of different regulatory systems and requirements but where similar operations existed safety costs had been found to be similar. As to safety performance we were told by the regulators that AEA's performance was good. We conclude that the cost of radiological safety is high.

15.60. We recommend that in making regular reviews of the cost and effectiveness of its safety arrangements AEA should compare them with safety performance in the United Kingdom and elsewhere.