

PARTIAL REGULATORY IMPACT ASSESSMENT OF THE DRAFT STATUTORY INSTRUMENT TO IMPLEMENT THE EUROPEAN DIRECTIVE ON THE RESTRICTION OF THE USE OF CERTAIN HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

Purpose and intended effect of measure

The objective

1. Economic growth and technological developments have accelerated the production and use of Electrical and Electronic Equipment (EEE), and the rate at which EEE is replaced. EEE can contain some substances, which are potentially hazardous to both human health and the environment during the manufacturing of EEE and following the disposal of EEE as waste (WEEE).
2. This Directive aims to reduce these risks to human health and the environment by restricting the use of lead, mercury, cadmium, hexavalent chromium, and two brominated flame retardants (PBB) and (PBDE) in new EEE products placed on the European market after 1 July 2006. The RoHS Regulations will therefore ban the placing on the market of EEE containing more than the set levels of these substances from this date.

The background

3. This partial RIA discusses the potential costs and benefits to UK businesses, charities and the voluntary sector of the Statutory Instrument¹ to implement the Directive 2002/95/EC of the European Parliament and of the Council on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).
4. The RoHS Directive is a 'single market' Directive (its legal base is Article 95 EC). To ensure that the single market can continue to function fairly and efficiently the Directive provides a 'level playing field', by setting the same standards across all member States, for the environmental measures it contains.

Risk Assessment

5. The European Commission has identified the substances restricted by the RoHS Directive as having the potential to negatively impact on both human health and the environment. The extraction of these raw materials, the refining process, their use in manufacturing EEE and their eventual disposal can cause damage to

¹ Draft Statutory Instrument, 2004 No., Environmental Protection, the restriction of the use of certain hazardous substances in electrical and electronic equipment regulations 2004.

² Articles relating to prevention and adaptation to scientific and technical progress.

³ Discussion Paper of 28 March 2003 by the UK Government, Scottish Executive, Welsh Assembly Government, Northern Ireland Administration on the Implementation of Directives of the European Council and Parliament on Waste Electrical and Electronic Equipment and Restriction of the use of certain Hazardous Substances in electrical and electronic equipment.

⁴ www.dti.gov.uk/sustainability/weee/weee_rohsexecs.pdf

the environment (in terms of pollution risks to animals and biodiversity) and damage to human health (from occupational exposure and exposure following disposal).

6. In the UK, occupational exposure is controlled by the Health and Safety Executive. The main risks to the general population are via the disposal of untreated WEEE when it is landfilled or incinerated. There is potential for substances to leach, or be emitted to air, following landfilling or incineration. However, generally the use of the substances in EEE covered by the RoHS Directive is relatively small compared to their use in other applications; it is therefore difficult to quantify the risks of harm from the substances used specifically in EEE.

Options

7. Given that the legal base of the Directive is Article 95 EC, the UK must ensure that its implementation is consistent with that of other member States so as to facilitate free movement of goods on the single market.

Benefits

Economic

8. The primary benefits of the RoHS Directive are likely to be environmental, which are discussed below. Some of these benefits may lead to economic benefits, in terms of increases in productivity due to possible benefits to human health, but these are very difficult to quantify. Phasing out the substances in the RoHS Directive may also provide opportunities for producers to supply EEE to countries outside the EU that also have restrictions on the use of these substances. Again these benefits are very difficult to quantify.

Environmental

9. The main benefit of the RoHS Directive will be the potential reduction in harm to human health and the environment as a consequence of the restriction on use of the listed metals and brominated flame retardants in new electronic products. The hazards to human health and the environment are influenced by waste volume arisings, emission rates (from waste), population exposures (to emissions), and dose response functions (to exposure).
10. The main exposure pathways for the relevant substances are soil, water and air. The restriction of use in new products will have the likely effect of reducing the quantity of hazardous substances in all three pathways.
11. The restriction on the use of these substances will also facilitate increased recycling and recovery of WEEE, with the associated environmental benefits.

⁵ Component supply and assembly may be undertaken in house by manufacturers or may be outsourced. This is likely to vary from company to company.

Quantifying and Valuing the Environmental Benefits

Lead

12. Total consumption of lead in the UK in 2000 was estimated at 325,000 tonnes. It has been estimated that, approximately 2,000 to 4,500 tonnes of lead from WEEE is discharged to landfill every year⁶. In 1999 the estimated total emissions from EEE to air was 11 tonnes⁷. A restriction on the use of lead in new EEE products will reduce the amount of lead being landfilled and help reduce lead emissions to air. It will also contribute to reducing blood lead level in the UK. However, the blood lead level in the UK has declined from 0.12mg/day in 1980 to 0.024 mg/day in 1997, and is already below the “Provisional tolerable weekly intake” (PTWI) level set by the World Health Organisation (WHO). Thus, although it is extremely difficult to quantify the benefits that may result from the restricting of lead in new EEE products, it is likely that given the current exposure rates in the UK the potential benefits from the RoHS Directive may be somewhat limited.

Cadmium

13. In 2000, total consumption of refined cadmium in the UK amounted to approximately 584 tonnes. However, it is estimated that only 40 tonnes of cadmium was used in EEE, and its use has been declining in recent years. The restriction on cadmium in new EEE products will reduce emissions of cadmium post landfilling and incineration. However, the average intake of cadmium in the UK is below the PWTI level set by the WHO, and below the limit value suggested by the CSTE⁸. Added to this that cadmium in EEE accounts for only approximately 8-10 per cent of its total use, the restriction on cadmium in new EEE products is likely to have limited additional environmental and health gains in the UK.

Hexavalent Chromium (CrVI)

14. The quantity of hexavalent chromium used in the UK was estimated as approximately 900 tonnes in 2000. It is estimated that EEE accounted for 15 per cent of total use. A study conducted in the USA (Environment Protection Agency) suggested that CrVI in EEE products was responsible for approximately 10 per cent of land and water chromium contamination in the USA⁹. The restriction on its use in new EEE products may thus lead to an approximate decrease in CrVI releases of up to up to 10 per cent in the UK.

⁶ The ICER report says that between 12,000 and 27,000 tonnes of lead are annually found in WEEE that is landfilled. We divide this figure by six considering that the UK GDP is approximately one-sixth of the EU GDP (16 per cent).

⁷ Published in July 2001. Total emission were 553, of which 2 per cent are attributable to EEE.

⁸ CSTE, Opinion on: *Position Paper on ‘Ambient Air Pollution by Cadmium Compounds – Final version October 2000’*, 12 June 2001.

⁹ The Digest of Environmental Statistics reports that the estimated total chromium emissions to air in 1999 were 67 tonnes. It is not possible however to estimate the quote attributable to EEE.

Mercury

15. The European Commission estimates that 22 per cent of consumption of mercury is used in EEE products. The restriction on the use of mercury should reduce emissions of mercury in the UK. The UK's PWTI is already below that established by the WHO, but the hazardousness of mercury is likely to mean that any reduction in exposure will bring benefits.

Brominated flame retardants

16. Plastics used in EEE account for around 56 per cent of the brominated flame retardants market, while PBBs and PBDEs account for approximately 1 and 9 per cent of the total market of flame retardants respectively. According to a Danish estimate, WEEE represents about 78 per cent of the total content of brominated flame retardants in waste.¹⁰ It is estimated that in 1994 the UK used about 60 tonnes of PBBs, while there may be some 400 tonnes of PBDEs used in EEE each year in the UK. However, Deca-BDE is potentially exempt from the Directive, and Tetra-BDE and Penta-BDE are generally no longer used in EEE in the UK. Therefore the impact of the Directive will depend largely on the reduction of Octa-BDE, which is estimated to be 25 per cent of the 1994 estimate.

Social

17. The social benefits to the RoHS Directive, other than those related to the environmental benefits already discussed, are likely to be limited.

Costs

Economic

18. It is very difficult to quantify the precise costs of the Directive given its complexity and scope of impact. In addition there is currently limited information available about the extent and cost of substituting the banned substances. Research and tests, which are necessary to fulfil the Directives' requirements, are still ongoing and the results are uncertain. Furthermore, many of the components, containing the substances listed in the RoHS Directive, are not produced in the UK, therefore it is difficult to know what proportion of these costs will be sustained in the UK.
19. The substitution of the substances listed in the RoHS Directive is a process already under way and in some cases undertaken voluntarily by many manufacturers. The European Commission reports that leading European companies in the electronic industry have proclaimed an official policy of

¹⁰ Source: Explanatory Memorandum for a Proposal for a Directive on Waste and Electrical and Electronic Equipment, European Commission, 13 June 2000.

¹¹ Retailers, distributors and business users of EEE may be indirectly affected by the increased costs to EEE manufacturers; the scale of this impact will depend on the market structure for each type of product.

avoiding PBB and PBDE in their products. Cadmium is being replaced in electroplating as well as CrVI. Japanese companies signed a voluntary agreement to phase out the use of lead in specific areas of consumer electronics by 2005¹².

20. In order to comply with the Directive EEE manufacturers will have to sustain: costs of redesigning manufacturing machinery, general R&D costs to find and test alternative substances, and higher recurring operating costs.
21. The biggest technical challenges and therefore the most significant costs relate to the substitution of lead in solder (see paragraph 37). Substitutes do exist, however in most cases the manufacturing process needs to be adjusted to allow for the different properties of the lead-free solder. It is possible that the phasing out of some components or products will be brought forward due to the costs involved in adjusting the manufacturing process.
22. The opportunity cost associated with bringing forward the redesign of products to before 1st July 2006, may be higher for products with longer lifecycles (such as more specialist, higher value products or products with a low volume of sales). Companies specialising in these products may therefore face higher costs, per unit sold, than companies specialising in products with shorter lifecycles, although they may be able to pass these costs on to the consumer more easily, given the high value nature of this type of product.

Business Sectors affected

23. Given the wide-ranging nature of the RoHS Directive there is inevitable uncertainty about the total numbers of businesses that could ultimately be affected. The range of business sectors that could be affected, either directly or indirectly, include:
 - Producers of raw or refined materials and producers of secondary materials (reprocessors);
 - Component suppliers of EEE;
 - Product assemblers of EEE;
 - Manufacturers of EEE¹³;
 - Repairers of EEE.
24. There are two refined lead producers in the UK, some hexavalent chromium producers, while there are no producers of mercury and brominated flame retardants. There is one zinc smelter in the UK, which produces cadmium as a by-product. Since the use of lead, hexavalent chromium and cadmium in EEE is estimated to be less than 10 per cent of total consumption, the restriction on the use of these substances in new EEE products expected to have a relatively small impact on the producers of raw and refined materials.

¹²Phase out lead solders in new products by 2003 and in all products by 2005.

¹³ Retailers, distributors and business users of EEE may be indirectly affected by the increased costs to EEE manufacturers; the scale of this impact will depend on the market structure for each type of product.

25. It is likely that manufacturers of Electrical and Electronic Equipment and component suppliers will be directly affected. Whilst the restricted substances enter the production stream in the manufacturing of single components, the products, which then use these components, may need to be adapted or indeed re-designed to ensure that they can function with the new components. It is also possible that some firms will be vertically integrated and therefore R&D, production of components and final assembly of products will be done in-house in which case such firms will be directly affected at all levels. Where product design in manufacturing needs to change as a result of changes in components then manufacturing firms towards the end of the supply chain will be indirectly affected. It is difficult at this stage to estimate exact numbers given that the restricted substances will be used in some specific products more than in others, and so some sectors are likely to be more affected than others.
26. There are more than 20 large EEE repair centres in the UK that are contracted to EEE manufacturers to repair their goods. This type of repair centre accounts for approximately 80% of the all goods repaired in the UK. In addition there are many smaller repair centres. The additional costs that these EEE repairers will face relate to switching over to new soldering processes and the need to have a stock of components for both EEE manufactured to meet the requirements of RoHS Directive and EEE manufactured prior to the Directive coming in to force. In addition there may be difficulties in identifying which products have been manufactured to be RoHS compliant.

Capital costs (costs of redesigning machinery)

27. Costs of redesigning manufacturing machinery are one-off costs. Industry has estimated these costs to be in the range of £400 million to £570 million for the retooling of lead-use machineries (e.g. the substitution or refurbishment of solder bath machines and surface mount ovens). The annualised cost will be in the region of £40 million to £57 million assuming the average life of these machines is 10 years.¹⁴
28. According to one industry estimate, investment costs for the conversion from CrVI to trivalent chromium (CrIII) in plating plants are largely negligible. Although there is the necessity to substitute the plating equipment, the costs of new machinery will be broadly the same. Therefore, the only cost will be in terms of the opportunity cost of having to bring the investment forward as a consequence of the restrictions under the Directive.

DTI Best Estimate

29. An alternative estimate suggests that the total cost of redesigning machinery will be between £52 million and £255 million, with a corresponding annualised cost around £5 million to £26 million (assuming an average life of 10 years). This takes account of the most recent cost estimates for converting machines to lead-free soldering.

¹⁴ And assuming straight line depreciation.

R&D costs

30. R&D investment is required to find, test and develop substitutes for the banned substances. Once an alternative has been developed, it is necessary to test its reliability, assess and certify its performance under a range of different conditions. Many components require a very high degree of reliability and thus the development phase can take several years. Therefore estimating the value of such costs is difficult, especially as there is no guarantee of successful results.

Industry estimates

31. Orgalime (a trade association of electronics manufacturers in Europe) estimates a cost across Europe of €15 billion for “*new investment to deal with required technological change*”. This implies costs to the UK of the order of £1.7 billion¹⁵. At the time this estimate was made this would imply a cost to the UK in the region of £500 million per year up to the date the Directive comes into force.
32. Another industry estimate suggests that the total R&D costs will be £3 billion, including product testing, re-qualification and dual inventory costs.
33. One large EEE manufacturer estimates that R&D costs to develop and test substitutes for lead are approximately 9.5 per cent of its total R&D expenditures. If we apply this to R&D expenditures of the electrical and electronics sector in the UK (which is approximately £1,558 million per year¹⁶), we obtain an estimate for the R&D costs for the substitution of lead of approximately £148 million per year in the UK. Industry estimates suggest that R&D investment to replace CrVI and cadmium are relatively small.

DTI Best Estimate

34. An alternative estimate suggests that the total R&D costs will be between £500 million and £1 billion (£170 million to £330 million per year up to the date the Directive comes into force). This estimate takes account of the latest technological developments, particularly in lead-free technology, and the transfer of this knowledge from abroad.

Operating costs

35. It is estimated that annual operating costs (costs of using different processes and different substances) will be in general higher than those incurred in using the banned substances. This is due to:
- Increased costs of substances and components; substitutes for lead, cadmium and in some cases brominated flame retardants are generally more expensive;

¹⁵ Orgalime estimates €15 billion for ‘new investment’. These are interpreted as costs of the final implementation of RoHS (R&D costs). €15 billion equates to approximately £10 billion. UK GDP is approximately one-sixth of EU GDP so dividing this by six gives £1.7 billion.

¹⁶ Source: Business Enterprise Research and Development 2000.

- Increased costs of energy (alternative processes may require more energy to perform the same procedure): lead-free soldering, chromium passivation and brominated flame retardants use more energy;
 - The need to use a greater quantity of material (alternative processes need more material to achieve the same results); particularly for hexavalent chromium and cadmium;
 - Reduction in throughput on soldering machines and increase in waste from lead-free soldering machines.
36. The operating costs of alternatives will depend on the price of alternative raw materials. If the price of alternative metals, for example, fell then the costs of substitution would be lower. Operating costs are also related to the cost of energy; using a tin-silver-copper alloy to replace lead in solder, for instance, requires a higher temperature for the soldering process.
37. The European Commission estimates that additional operating costs of using tin-based solders at around €150 million per year for Europe as a whole. Applying this to the UK results in an estimate of approximately £15 million per year.¹⁷ An alternative estimate from industry is that additional operating costs for lead alone, would total around £200 million extra per year (with the possibility of reductions over time).
38. The total costs of metal currently utilized in tin-lead solders (as 63 per cent tin and 37 per cent lead) are approximately £21 million; the most common and indeed most expensive substitute is a tin-silver-copper (Sn-Ag-Cu) solder (as 95.8 per cent tin, 3.5 per cent silver and 0.7 per cent copper). If we assume that all tin lead solders are replaced with Sn-Ag-Cu solders the total cost of the metal will be approximately £52 million.¹⁸ Therefore, the additional costs of the substitution of lead solders with alternative alloys solders (i.e tin-silver-copper solders) is approximately £31 million per year. There will also be an increase energy required for heating and cooling boards (during the wave soldering and re-flow soldering processes). Estimates indicate an increase in energy usage of between 6 to 18 per cent. Assuming that energy prices remain constant in real terms this will result in additional costs of between £2.5 million and £7 million per year.¹⁹
39. Alternatives to CrVI are generally more expensive than CrVI itself - purchase prices for CrIII systems are 2-3 times higher; this could result in additional costs of approximately £50,000 to £100,000 per year.²⁰ The application costs, for the passivation process, are also higher, by approximately 50 per cent, but this is a relatively small element of the total process.

¹⁷ This figure is obtained extrapolating the European figure (£95 million) to the situation of the UK, assuming that the UK GDP is approximately 16 per cent of the EU GDP.

¹⁸ We assume that approximately 60 per cent of lead in EEE is used in solders.

¹⁹ This figure is based on the energy consumption for electrical and electronic sector (516,000 tonnes of oil equivalent) and a price of £76 per tonne of oil fuel Source: The energy report, DTI, 2000.

²⁰ Based on the assumptions that all 140 tonnes of Chromium VI are substituted with Chromium III and that the cost of Chromium VI is £350 per tonne.

40. Substitution of mercury in lamps may reduce lamp life; implying more lamps will be needed to achieve the same results over time. However, non-mercury switches are, for the time being, cheaper than mercury switches (prices range from £1.66 to £9.99 for mercury and £0.32 to £7.85 for non-mercury switches). The costs of substitution of mercury are thus unlikely to be large.

DTI Best Estimate

41. The current best estimate is that the total additional operating costs will be £100 million per year. In addition to the costs noted in paragraph 38, this figure includes an estimate of the increase in component costs, the costs caused by a decrease in throughput, and an increase in waste, associated with lead-free soldering machines.

Other costs

42. There will also be other costs, which currently are not possible to quantify including:
- Information costs: to inform businesses of the requirements of the Directive. These costs are likely to fall on the public sector;
 - Monitoring and enforcement costs of complying with the Directive: These costs will fall on the public sector, component manufacturers and manufacturers of the final product.

Total costs

43. Total additional costs of the substitution of the substances listed in the RoHS Directive, including capital and operating costs, are currently estimated to range between £105 million and £126 million per year for the first ten years after the Directive is implemented.
44. R&D costs are currently estimated to range between £170 million and £330 million per year. These costs will only be incurred up to the time the restrictions of the Directive come into force in the UK.
45. Due to the complex structure of the market and the range of sectors involved including producers of the substances, component suppliers, EEE manufacturers and assemblers, it is not possible to identify a typical business that could be affected by the RoHS Directive.

Environmental

46. The environmental costs of the RoHS Directive relate to the environmental impacts of the substitutes to the restricted substances used, referred to in the previous section.
47. The most common substitute for lead in solder is a tin-silver-copper alloy that requires a higher temperature for soldering. There will be an increase in the energy required for heating and cooling boards (during the wave soldering and re-flow soldering processes). Estimates indicate an increase in energy usage of

between 6 to 18 per cent. Reduction in throughput on soldering machines and increase in waste from lead-free soldering machines.

48. Substitution of mercury in lamps may reduce lamp life; implying more lamps will be needed to achieve the same results over time. The need to use a greater quantity of material (alternative processes need more material to achieve the same results); particularly for hexavalent chromium and cadmium.

Equity and Fairness

49. All the different elements of the supply chain for EEE - producers of the substances, component suppliers, product assemblers and manufacturers²¹ – are likely to be affected by the RoHS Directive. How the costs of the Directive are distributed will depend on the market structure of the particular EEE sector concerned. The extent to which costs are passed on to consumers will mean that they will bear some costs, but this is likely to vary across sectors and products.
50. In terms of the producers of these substances, it is estimated that EEE accounts for only a small proportion of total applications. Lead in EEE is estimated to account for only some 2 per cent of total uses, while for cadmium, hexavalent chromium and mercury the proportions are estimated to be 10 per cent, 15 per cent and 22 per cent respectively. Thus the impact on primary metal producers is, in most cases, likely to be limited. However, the UK is the largest producer of refined lead in Europe, and thus business may be more affected here than in other member States.
51. In the short term component suppliers are likely to bear the majority of the costs. However, in the medium to long term they are likely to pass these additional costs on to products assemblers and/or manufacturers. The magnitude of this will depend on the relevant market structure. Where component suppliers are located within the UK, the whole cost will fall on UK business. However, the majority of components used in the UK are imported and thus the final impact on UK business will derive generally from the proportion of total costs, which are passed on to final product assemblers/manufacturers in the UK.
52. The environmental benefits to the UK from the RoHS Directive are likely to be spread fairly evenly across different social and economic classes and different geographical regions. However, those more susceptible to the negative impacts that can result from these substances, such as children, the elderly, and pregnant women are likely to benefit more.

Consultation with small businesses: the Small Firms Impact Test

53. The RoHS Directive could disproportionately affect small businesses, as they may not have the financial resources to undertake R&D projects to develop substitutes. They may also find difficulty in absorbing the additional costs, to comply with the Directive.

²¹ Component supply and assembly may be undertaken in house by manufacturers or may be out sourced. This is likely to vary from company to company.

54. If the time to redesign components is limited, component manufacturers are likely to concentrate on redesigning those components that go into high volume products. This may affect the supply of components to smaller companies that specialise in products with low sales volumes.
55. The DTI, via the Small Business Service (SBS) has been very keen to engage with representatives of the small business community throughout the negotiation and transposition of the RoHS Directive. During the negotiations it established a working group to discuss progress. During the first round of consultation, an on-line version of the Department's Discussion Paper was made available specifically with the time and resource constraints of the SME community in mind. This initiative was funded by the SBS but take up was low, despite direct notification to over 15,000 small businesses

Competition Assessment

56. It is extremely difficult to assess the potential impacts on competition from such a wide-ranging and complex Directive as the RoHS Directive. EEE production is generally a competitive industry characterised by a large number of firms both domestically and internationally. However, within the broad category of EEE, there are a very large number of separate economic markets each of which may have quite different characteristics. The Directive sets the same standards for both incumbent firms and potential new entrants, and so should not raise barriers to entry.
57. There may be some impact on market structure if smaller firms are unable to finance the necessary R&D to develop new components or to adapt product design to accommodate them. However, we currently have no information that suggests that such impacts are likely to be significant within any specific market. The range of products available may reduce if appropriate substitutes cannot be found, but in an industry that is noted for its innovation and rapid technological development it is considered unlikely to be a widespread problem.
58. Thus an initial assessment of the competition impacts of the RoHS Directive using the RIU's Competition Filter suggests that the Directive will not have a significant detrimental impact on competition in the UK. However, we would welcome further information in response to this consultation from any stakeholder that may be aware of potential competition impacts in any specific market.

Enforcement and Sanctions

59. The draft Statutory Instrument says that the Secretary of State will be responsible for enforcement. Options for the method of enforcement are detailed in the Guidance. It is difficult to accurately cost this provision, as the method of enforcement has not yet been finalised. We would welcome your views on the costs of the options.

Monitoring and Review

60. The draft Statutory Instrument when laid will be monitored by the relevant environment agencies and the DTI itself. This monitoring will feed into the evaluation of the effectiveness of the Statutory Instrument.

Consultation

61. The costs and benefits of the UK complying with the requirements of the specific Articles²² of the RoHS Directive were outlined in the partial RIA forming part of the DTI's Discussion Paper published on 27 January 2003²³. A summary of these responses was published on 1st August 2003²⁴. DTI also undertook a review of the scientific and technical issues raised by the responses. Very few alternative estimates of the costs or benefits were provided by the responses to this Discussion Paper. An updated RIA was also included with the Consultation Paper published in November 2003²⁵. Again very few alternative estimates were provided to this consultation.

Summary and Conclusions

62. Implementation of the RoHS Directive in the UK will entail a reduction in the use of certain hazardous substances in EEE and therefore should result in reductions in risks to human health and the environment. However, it is not easy to *quantify* the resulting benefits.
63. The Directive may lead to an increase in energy use in the short term, however this will potentially be offset by energy saved through recycling and energy recovery following the implementation of the WEEE Directive. The overall impact of the RoHS Directive on energy use is also therefore difficult to predict.

Table 1 – Summary of costs for implementing the RoHS Directive

	Total Cost (£m)	Time period over which costs are incurred	Annual costs (£m)
Capital costs of redesigning machinery	52-255	10 years	5-26
Research and Development	500-1000	3 years (2003-2006)	170-330
Operating costs	-	Ongoing annual costs	100

64. The costs of the RoHS Directive include costs for the redesigning of manufacturing machinery, costs of phasing out the restricted substances, higher recurring operating costs, and the R&D costs to find and test alternative

²² Articles relating to prevention and adaptation to scientific and technical progress.

²³ Discussion Paper of 28 March 2003 by the UK Government, Scottish Executive, Welsh Assembly Government, Northern Ireland Administration on the Implementation of Directives of the European Council and Parliament on Waste Electrical and Electronic Equipment and Restriction of the use of certain Hazardous Substances in electrical and electronic equipment.

²⁴ www.dti.gov.uk/sustainability/weee/weee_rohsexecs.pdf

²⁵ Consultation paper of 25/28 November 2003

substances. There will be also some information, monitoring and enforcement costs.

65. Current best estimates of these costs outlined in this partial RIA as shown in Table 1 above, range from £105 million to £126 million per year for capital and operating costs (for the first ten years after the Directive is implemented) and between £170 million and £330 million per year for R&D costs (up to the date the Directive is implemented). The vast majority of the latter costs relate to the restriction on the use of lead.
66. The figures above suggest that over the next 10 years²⁶ the additional average annual costs of the Directive could be around £150 million. This is made up of: additional capital costs assuming that machinery is replaced in the early months of 2006, prior to the restrictions; additional operating costs following the restrictions; and additional R&D costs in the run-up to the date the restrictions come into force. However, these estimates should only be considered as being indicative given the difficulty of estimating costs for a complex Directive such as this.

²⁶ From 1 January 2003.