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Individual Producer Responsibility: A Review of Practical Approaches to Implementing Individual Producer Responsibility for the WEEE Directive

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2010/71/TOM/ISIC

Individual Producer Responsibility:
A Review of Practical Approaches to Implementing Individual Producer Responsibility for the WEEE Directive

A Report by the INSEAD IPR Network

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0. EXECUTIVE SUMMARY

This report documents the interim findings of the INSEAD IPR Network in relation to investigating practical solutions enabling implementation of Individual Producer Responsibility (IPR) for the WEEE Directive.

The INSEAD IPR Network is a partnership of producers, academics and technical specialists from across the world working to identify, explore and develop practical solutions to IPR. The network is a project co-ordinated by the International graduate business school, INSEAD. Members and authors of this report are listed in Appendix 1.

0.1 Introduction to Individual Producer Responsibility (IPR)

Article 8.2 of the European WEEE (Waste from Electrical and Electronic Equipment) Directive establishes individual producer responsibility for the recycling of products put on the market after 13 August 2005. Making each producer responsible for financing the end-of-life costs of their own products is intended to enable end-of-life costs to be fed back to each individual producer. By modifications to the product design, the producer can directly influence the end of life cost. Without Individual Producer Responsibility these incentives for design improvements are lost.

0.2 Practical Approaches to IPR

This report demonstrates that there are already a range of approaches to Extended Producer Responsibility (EPR) for Waste Electrical and Electronic Equipment (WEEE) that have been implemented across the world; many of which attempt to account to a greater or lesser degree for the products and brands of each producer. Oekopol (2007)[1] already noted the development of such approaches, in contrast to the more prevalent collective market-share based implementations (Collective Producer Responsibility – or CPR). In their recent report to the European Commission, Oekopol stated: 'The alternatives are, in light of on-going efforts of producers, highly feasible.'

The following table provides an overview of EPR systems accounting for different brands products within different countries:

Example	Form of brand-based system	Scope	Operation
1. Japanese Specified Home Appliances Recycling Law (SHARL)	Brand separation and collection	Televisions Refrigerators Washing machines Air conditioners	End users pay a logistics and recycling fee at the point of disposal. The fee is collected by retailers and managed by individual companies, through the management of a common "recycling ticket centre". This accompanies the product through the recycling chain, enabling the traceability of individual waste products. Producers operate the recycling plants which enables feedback from own recycling operations to product design. From the money collected producers pay the recycling plants depending on how

[1] Sander, K., Schilling, S., Tojo, N., van Rossem, C., Verson, J. and George, C. (2007) The Producer Responsibility Principle of the WEEE Directive Final Report (Oekopol, Germany)

			many products are treated at the respective plants.
2. Japan: PC Recycling System	Separate collection of different brands	Desktop PC Laptop CRT Displays LCD Displays	Products returned by end user through postal system direct to the producers own recycling plant. No recycling fee charged for the products marked with "PC Recycling Mark". Therefore producers operate the recycling plant and only pay for the recycling of their own branded products.
3. ICT Milieu, Netherlands (1999-2003)	Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling	WEEE Directive Category 3 products: ICT, printers and telecommunications equipment	Until 1 January 2003, individual producers received a monthly invoice directly from the recycler based on the weight of the recycled products. Each waste product was weighed on a scale and the brands were visually identified. Each unit was assigned to a manufacturer and logged using a touch screen panel.
4. Maine: Return Share by Brand Sorting	Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling	Only household products are included. Displays over 4" including televisions and computer monitors	Municipalities collect WEEE and pass it to a consolidator. Every product is counted and weighed. Manufacturers required to choose in their recycling plan the method of payment for brand responsibility: Manufacturers can either collect a representative pile of WEEE from consolidator and undertake recycling; or pay the consolidator to undertake the recycling including a share of orphans; or have branded product separated including a share of orphans.
5. Washington State: Return Share by Brand Sampling	Counting and weighing of branded products based on a sample of WEEE collected	Any monitor, TV or other video display over 4" Desktop computers Laptop computers	Manufacturers must register with Department of Ecology. The law directs Department of Ecology determines the return share for each manufacturer from the Brand Data Management System developed by the National Centre for Electronics Recycling (NCER). Future years return share to be determined by sampling. Guidance, sample size and procedure developed by NCER. Manufacturers may join Standard Plan to finance central recycling programme or may start an independent plan on own or with others (if combined return share above 5%)

0.3 Evaluation of IPR Solutions

An evaluation of these brand-based EPR systems suggests that they match the collection performance of Collective Producer Responsibility (CPR).[2] Systems established in Japan and Maine have matched or exceeded collection levels achieved by CPR systems in Europe. For example despite a narrower scope than the EU WEEE Directive, the IPR system in Maine has achieved collection levels for categories 3 and 4 of the WEEEE Directive that exceed or compare with Estonia, Czech Republic, Slovakia, Austria, Hungary, Ireland, The Netherlands and the European average.

The evaluation suggests that both systems using brand-based allocations of responsility and those usingly only CPR are able to deliver high levels of recycling. In both Europe and in Japan the recycling systems have achieved and exceeded the national recycling targets. However variations in the method in which recycling levels are calculated, for example energy recovery does not count towards recycling levels in Japan, making a direct comparison difficult.

CPR systems provide few clear incentives for producers to design products to be easier to recycle,In contrast there is anecdotal evidence, based on separate collection of products by brand in Japan, that such approaches have stimulated design modifications in practice, exactly as intended under IPR.

In order to implement Individual Producer Responsibility (IPR), ensuring that producers are incentivized to improve the design of their products, it is important to ensure a direct relationship between a producer's end-of-life costs and the end-of-life costs of their products, and that such approaches are feasible from a cost and practical perspective. Systems that ensure producers have the option to physically recycle their own brands of products (such as those in Japan, The Netherlands, and Maine) theoretically have the potential to provide incentives for producers to improve the design of their products (and at least in theory reduce their end-of-life costs). This section also demonstrates that these approaches accounting for product brands do match the collection and recycling performance of systems based on collective responsibility, and are feasible on a practical and operational level.

Policy makers are also concerned about practical implementation. One concern is that IPR would lead to increased levels of orphan waste. This concern seems to be misplaced given that orphaned products constituted roughly 5% of the recycled products in Japan. In Maine orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This contrasts with current levels of free riders within European CPR systems of between 10-20%[3].

There is a misconception that IPR requires separate and individual collection systems. This is not the case. The examples shown here show how brand-based approaches can also be implemented by collectively organised recycling systems.

In order to implement IPR in the most efficient way operationally in the European context it is necessary to balance the benefits and drawbacks of the different operational possibilities.

[2] Collective Producer Responsibility is an approach where all producers participating in a system agree to share the costs of recycling and collection of all waste products, usually on the basis of units or weight of new products sold.

[3] **Future Energy Solutions** (2003) *Study into European WEEE Schemes: prepared for the Department of Trade and Industry* (DTI, London)

0.4 IPR in the Future

A series of technologies are evolving which may in time make sorting and segregation of WEEE according to brand more cost efficient. This will provide an additional mechanism to enable implementation of IPR. Several research projects are in development in order to investigate the applicability of RFID to WEEE recycling systems.

A selection of guarantees are being developed in Sweden for end of life vehicles and now for WEEE. These instruments are continuing to evolve in order to provide the market with affordable solutions. For certain products these financial guarantees are cost comparable or lower cost than the existing collective arrangements.

Given the main aim of EPR is to create such incentives, there can be no justification for maintaining the status quo of collective financing: further research and investigation is therefore crucial. This is already clear within the WEEE Directive Article 8.2, and EU Member States can work to ensure these core principles of EPR (that allowing IPR) are maintained and extended as far as is currently possible. As a market-based approach, it is clear from this research that a number of practical approaches may be developed and may yet emerge improving the allocation of responsibility over and above that currently possible under collective financial responsibility. Such approaches should be fostered in an environment that allows their continued development, adjustment, and adoption. This is key for the future success of EPR for WEEE: recommendations for various stakeholders are given below as intermediate findings of this working paper.

0.5 An Approach to Implementing IPR

This report demonstrates, using practical examples from around the world, that brand-based approaches to allocating responsibility for WEEE are practical and feasible. It also shows that there are different degrees to which a producer may be made responsible for their own products. The report suggests that the various approaches to brand-based allocation can be seen as a menu of choices for policy makers. From the analysis of the case studies it is possible to derive a number of important "building blocks" that may be deployed in future for the implementation of IPR:

- Firstly, producers should be credited for their own individual collection efforts. This is already possible in many CPR systems, and there is no reason this cannot be extended as a requirement of all national implementations. Allowing producers to exercise degree of freedom of enterprise must be at the heart of any economic / market instrument of government policy, to allow market forces to operate and to enable new services and technologies to be developed.

- Secondly, producers should be responsible for paying for their actual share of products in the waste stream in future. For example, there are now several examples where this is achieved, to a degree, by counting and / or separating products by brand. This demonstrates that schemes can indeed operate "collectively" in a system while assigning a financial responsibility to producers "individually" according to brand.

- Finally, in order to fully implement IPR, producers will need to be able to participate in systems that provide recycling or payment for, or representative of, the actual recycling costs of their own products. Again, the case studies all show that these approaches are not only feasible, but already implemented in practice. This can be through differentiation at the recycling plant (as in Japan).

0.6 **Recommendations**

In order to implement IPR, the report provides a series of recommendations. These include actions for policy makers, actions for producers and their compliance schemes, and also recommendations to resolve key strategic issues. These recommendations do not form a recommendation for a change of the EU WEEE legislation regarding producer responsibility, but proposals for possible operational implementation of IPR.

Recommendations for Policy Makers

R1. European Commission to ensure full transposition into Member State legislation of Article 8.2 of the WEEE Directive.

Recommendations for Producers and Compliance Schemes

R2. Compliance schemes to evaluate the range of existing and new options to ensure the principles necessary for IPR can be fulfilled.

R3. Compliance schemes and Producers can then determine the best implementation plan to ensure producers are only responsible for their own products in WEEE, and the transition time from CPR to IPR.

R4. Producers who wish to comply via IPR to notify Member State and ensure appropriate evidence is provided to demonstrate compliance.

R5. Compliance schemes implement new procedures to identify, sort, or sample products by brand, and fees which are differentiated based on product characteristics where this is specified within the rules defined for the IPR system.

Recommendations to Resolve Strategic Issues

R6. Compliance Schemes to determine commencement date from which IPR systems will be operational.

R7. In order to ensure a level playing-field, the requirements for a financial guarantee should be the same for producers choosing to join a collective scheme and producers choosing to develop individual systems of compliance.

R8. Producers wishing to finance recycling of only own products, or recycle only own products should be able to do so and should not be prevented or disadvantaged from taking this approach.

R9. Compliance schemes should consider the establishment of specific product categories and apply individual recycling or financing to these groups.

R10. Orphan waste should be prevented by proper enforcement (eg many existing regulations ban the sale of brands that are not registered to a producer that is compliant with the producer responsibility law).

R11. Recycling of WEEE of orphan products, produced after 13 August 2005, should be financed by the guarantees that are required by Article 8.2 of the WEEE Directive.

0.7 **Conclusions**

Without any attempt to implement IPR any incentives provided by the introduction of EPR to improve the design of electrical and electronic products will be absent, undermining one of the key objectives of the WEEE Directive.

Overall this report concludes that a number of practical approaches do exist allowing producers to account either directly or indirectly for their products and brands within WEEE. The extent to which these approaches could provide actual incentives for producers to improve the design of their products varies, and evidence of product design changes in practice is at this stage only anecdotal. Further analysis is therefore worthwhile to determine how current approaches, based on collective financial responsibility, can be improved to ensure effective EPR implementation for WEEE.

1. INTRODUCTION

1.1 Overview

This report documents the interim findings of the INSEAD IPR Network in relation to developing a practical solution to enable implementation of Individual Producer Responsibility (IPR) for the WEEE Directive.

The INSEAD IPR Network is a partnership of producers, academics and technical specialists from across the world to identify explore and develop practical solutions to IPR. The network is a project co-ordinated by INSEAD, the International Business School. Members and authors of this report are listed in Appendix 1.

1.2 Background to Individual Producer Responsibility (IPR)

IPR is the defined objective or intended outcome of Extended Producer Responsibility (EPR): that producers, by being made responsible for the societal costs of their waste products, should be provided with financial incentives to improve the design of their products to make recycling and treatment easier at end-of-life. The OECD defines EPR as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. An EPR policy is characterised by:

1. the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and
2. the provision of incentives to producers to take into account environmental considerations when designing their products.

The concept of Extended Producer Responsibility (EPR) was first put forward and discussed by academics in the early 1990's. Origins of the term Extended Producer Responsibility (EPR) can be traced back to a report submitted to the Swedish Ministry of the Environment in 1990, titled "Modeller för förlängt producentansvar" or Models for Extended Producer Responsibility (Lindhqvist & Lidgren, 1990)[4].

From the outset producer responsibility was considered as a means of creating green design incentives for manufacturers. Lifset (1993)[5] states: "There is little doubt that extended producer responsibility generates both economic and political incentives for waste recovery and more broadly, green design." The rational for EPR is that by

[4] Lindhqvist, Thomas, & Lidgren, Karl. (1990). Modeller för förlängt producentansvar [Models for Extended Producer Responsibility]. In Ministry of the Environment, Från vaggan till graven - sex studier av varors miljöpåverkan [From the Cradle to the Grave – six studies of the environmental impact of products]. (Ds 1991:9).

[5] Lifset, Reid. (1993). Take it back: Extended Producer Responsibility as a Form of Incentive-based Environmental Policy. *The Journal of Resource Management And Technology*, 21,4, 163-175

assigning the financial and/or physical responsibility to producers for the end-of-life management of their products, this should drive producers to re-consider issues around the end-of-life management of the products they produce. Rational producers would explore options to minimize the costs of end-of-life management through alterations in product design or choice of material.

Tojo (2004)[6] notes that development of the EPR concept can be viewed in the context of three main general trends in environmental policy-making at the time of its emergence. These include the prioritisation of preventative measures over end-of-pipe approaches, enhancement of life cycle thinking and a shift from the so-called command and control approach to a non-prescriptive, goal-oriented approach.

The creation of an economic incentive for producers to adapt product design to waste management is identified as one out of four major means to reach the objectives of the WEEE Directive. In the proposal for a WEEE Directive, the European Commission[7] stated (Pg11):

> *"The polluter pays principle is laid down in Article 174 of the EC Treaty. The idea behind this principle is to make those persons responsible for environmental pollution who have the possibility to improve the situation. Producers of electrical and electronic equipment design the product, determine its specifications and select its materials. Only producers can develop approaches to the design and manufacture of their products to ensure the longest possible product life and, in the event that it is scrapped, the best methods of recovery and disposal.*
>
> *At the moment there is hardly any economic incentive for the producer to take waste management, in particular recycling aspects, into consideration at the design stage. In this context, producers who have invested in design for recycling complain about the lack of financial incentives to maintain this product policy. As a result such actions run the risk of being discontinued. Therefore, the Proposal for a WEEE Directive seeks to extend the traditional role of producers by making them responsible for the management of electrical and electronic products at end-of-life. The creation of a link between the producers and waste management contributes to an improved product design with a view to facilitating recycling and disposal of products once they reach their end of life. Specialised recyclers confirm the practical relevance of improved design for the recycling of electrical and electronic equipment."*

1.3 What is Individual Producer Responsibility

Article 8.2 of the European WEEE (Waste from Electrical and Electronic Equipment) Directive establishes individual producer responsibility for the recycling of products put on the market after 13 August 2005. Making each producer responsible for financing the end-of-life costs of their own products enables end-of-life costs to be fed back to the individual producer. By modifying product design, the producer can directly influence the end of life cost. IPR simply serves to highlight the main aims of adopting EPR; furthermore; without it incentives for design improvements are severly diminished.

Individual producer responsibility takes a variety of forms. When individual producers operate their own take-back systems, they are able to design both the collection and

[6] Tojo, Naoko. (2004). Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality? IIIEE: Dissertations 2004:2. Lund: IIIEE, Lund University.

[7] Commission proposal for WEEE Directive COM(2000)347, 13 June 2000

processing systems and their own products to minimize end of life costs and environmental impacts. This allows producers to obtain the benefits that accrue from of their own efforts.

However IPR does not require each producer to have a separate infrastructure for the collection and treatment of only their own brand appliances. Producers can work together and set up collective recycling systems. Collective recycling systems can be arranged to encompass individual financial producer responsibility.
Merely enabling producers to have their own individual collection systems does not in itself implement IPR, for in most cases those individual collection systems are still required to fulfil a financial responsibility based on market share.

The variation in the type and amount of individual control experienced by a producer is usually described in terms of financial and physical responsibility. van Rossem, Tojo and Lindhqvist (2006)[8] provide definition to these two forms of IPR:

> A *producer* bears an *individual financial responsibility* when *he/she pays* for the end-of-life management of *his/her own products*. A producer bears an *individual physical responsibility* when 1) the *distinction* of the products are made at minimum by *brand* and 2) the producer has [responsibility for and] *control over the fate of their discarded products* with some degree of involvement in the organisation of the downstream operation.

According to this definition, physical responsibility can include the contracting out of specific portions of the end of life management (e.g., an OEM hires a logistics company to transport its own WEEE from a collection point to a recovery facility) as long as the distinction among brands and the control of the fate of the products is maintained.

Individual financial producer responsibility can be delivered by a collective recycling systems (B1 and B2). This approach requires the cost to the producer of the recycling of its WEEE to be differentiated to reflect the relative cost of end of life management. For example counting and weighing of all products collected by brand can allow producers to request that their share of products is treated and recycled separately should their end-of-life costs be lower (at least in theory).

When individual producers operate their own brand recycling systems (B3), brands are physically separated and recycled by their original producer. If the producer is able to design their products to minimize end of life costs and environmental impacts, the producer will obtain the financial benefits that accrue from this investment. At present recycling technologies process WEEE *en masse* such that there is little practical opportunity to differentiate recycling costs for different types of products. Given that products are made of very different materials with very different recyclability and treatment requirements, further work is also needed here.

A "return share" system, which allocates costs on the basis of the weight or number of units processed of each producer's products, allocates cost according to the proportion mixed collected overall, but the approaches in practice do not presently further differentiate those costs according the particular characteristics of the products that are collected and processed. That would require additional cost accounting and a system of differentiated fees.

[8] van Rossem, C., Tojo, N. and Lindhqvist, T. (2006b). Lost in Transposition?: A Study of the Implementation of Individual Producer Responsibility in the WEEE Directive. (Lund: IIIEE, Lund University). See also Kalimo, H. (2006) E-Cycling. Linking Trade and Environmental Law in the EC and the U.S. (Ardsley: Transnational Publishers), pp. 455-519.

1.4 Why is Individual Producer Responsibility Important

The principle of individual producer responsibility is recognised as an important tool in encouraging producers to have regard to the end-of-life management of their products at the stage of product design. Individual Producer Responsibility is intended to provide a competitive incentive for producers to design their products so that they are easier and therefore cheaper to recycle.

Without Individual Producer Responsibility these incentives for design improvements are lost. Producers would not be rewarded for making their products easier to recycle, as the end of life costs would not be directly attributed to those who produced the goods in question and thus the real costs of end of life management of producer's products.

Collective producer responsibility - where all producers are jointly responsible for the recycling and its financing of all products, including the products sold in the future - does not provide any incentive to a producer to design its products to be easier to recycle. With collective producer responsibility there is no differentiation of the recycling costs according to how easy the product is to recycle. With collective responsibility the costs are instead split based upon the market share of the producer. Therefore the costs of recycling will be the same for all producers, regardless if they produced products that are designed to be easier to recycle, or products that are more difficult to disassemble and recycle. This has the consequence that if recycling costs are financed collectively (e.g. according to 'market share'), manufacturers are more likely to focus only on, and minimise, the production costs, disregarding recycling properties and its cost. If recycling costs are increased due to a particular design modification, this would not be of financial concern to the producer, as the increased costs of recycling would be absorbed jointly by all producers.

Individual producer responsibility is also intended to encourage competition between companies over how to operationally manage the end-of-life phase of their products. This in turn drives innovation, including in product design and take-back logistics, as companies work to reduce the environmental impact of their products at the end of their life.

1.5 Individual Producer Responsibility and the WEEE Directive

The WEEE Directive[9] introduces producer responsibility for electrical and electronic waste. It is based on mass-based collection, recycling and recovery targets that must be achieved in all EU member countries. EU Member States are made responsible for ensuring a minimum collection target of WEEE, currently set at 4 kg per capita per year, free of charge to consumers. However they may assign this responsibility to other national actors.

The original assumption of the European Commission (COM) in proposing the WEEE Directive has been that: "This financial or physical responsibility creates an economic incentive for producers to adapt the design of their products to the prerequisites of sound waste management." (page 6 COM (2000) 347 final). This objective was further solidified by the modification and adoption of the Directive by the European Parliament and the Council by end 2002. The final WEEE Directive (2002/96/EC of 27 January 2003) states that:

"The establishment, by this Directive, of producer responsibility is one of the means of encouraging the design and production of electrical and electronic equipment which

[9] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on the waste electrical and electronic equipment (WEEE). OJ L37 13/02/2003 p. 24-39

take into full account and facilitate their repair, possible upgrading, reuse, disassembly, and recycling"

2002/96/EC: Recital 12

"In order to give maximum effect to the concept of producer responsibility, each producer should be responsible for financing the management of the waste from his own products."
2002/96/EC: Recital 20

Article 8 of the Directive, "Financing in respect of WEEE from private households", establishes the requirements for producer responsibility. It distinguishes between historical[10] and future[11] waste and the way these streams are treated. With respect to historical waste all producers, existing on the market contribute proportionally to the management of WEEE- according to their *current market share* by type of equipment. For future waste on the other hand, each producer is responsible for the WEEE from his/her own products. Article 8.2 states:

"For products put on the market later than 13 August 2005, each producer shall be responsible for financing the operations referred to in paragraph 1 relating to the waste from his own products. The producer can choose to fulfil this obligation either individually or by joining a collective scheme."

With collective producer responsibility, all manufacturers are jointly responsible for e-waste arising from all products. Under Individual Producer Responsibility, each manufacturer is responsible for the waste arising from his own products. It is argued that, as a refinement of the EPR concept, IPR could achieve such desirable outcomes as green design incentives.

Therefore Article 8.2 establishes IPR for the recycling of products put on the market after 13 August 2005. Making each producer responsible for financing the end-of-life costs of their own-branded products would enable end-of-life costs to be fed back to the individual producer. In theory, by modifying the product design, each producer could directly influence their end of life costs. Without IPR, these incentives for design improvements are lost, and the purpose of EPR overall may be brought into question.

1.6 Transposition of Article 8.2

The WEEE Directive became European law in 2003 and has been implemented by the European Union Member States during the period 2004-2007. The WEEE Directive has faced important implementation problems as the Member States have chosen not to follow the text of the Directive on several points. The directive is (to be) transposed and implemented in 27 Member States with the end result being that each EU Member State has its own unique implementation. This stems from the fact that the European Parliament and Council can impose directives on member countries, but the latter are free to translate those into national laws to suit national conditions, as long as they comply with the minimum requirements of the directive. Therefore, national or even regional laws can differ between member states.

Many countries have failed to transpose or implement a correct interpretation of the individual producer responsibility concept, as specified by Article 8.2 of the WEEE Directive into their national laws (van Rossem, Tojo, Lindhqvist, 2006). According to an

[10] Historical WEEE refers to EEE products that have been placed on the market prior to the WEEE Directive coming into force- set as 13 August, 2005 and subsequently become waste.
[11] Future, or sometimes referred to as New WEEE, means EEE products that are placed on the market on or after 13 August 2005 and subsequently become waste.

assessment made by a coalition of NGO and industry actors (IPRworks.org, 2007), only 13 out of 27 countries have transposed this article adequately while another 4 have transposed it only partially (see Table 1.1). 10 Member states (MS) have not transposed 8(2) as intended in the WEEE Directive. Instead, the legislation in these 10 countries makes producers jointly responsible for the recycling of future products, making it impossible to implement individual producer responsibility.

Table 1.1: Analysis of the Transposition of IPR in the EU (Source: www.iprworks.org)

Member States which have transposed Article 8.2	*Belgium, Cyprus, Czech Republic, Estonia, Ireland, Italy, Lithuania, Luxembourg, Malta, Romania, Slovakia, Sweden, and the Netherlands*
Member States which have inadequately transposed Article 8.2	*Bulgaria, Denmark, Finland, France, Greece, Latvia, Portugal, Slovenia, Spain, UK*
Member States which have partially transposed Article 8.2	*Austria, Germany, Hungary, Poland*

Similarly, a more recent report by Oekopol (2007)commissioned by the European Commission to support its ongoing WEEE Directive review process came to comparable conclusions regarding the outcome of transposition on Article 8.2. In this study, 9 of the 27 Member States have , in the contractor's opinion, correctly transposed the requirements of IPR for future WEEE and 8 out of 27 Member States have transposed Article 8.2) in an ambiguous manner, leaving considerable doubt as to whether IPR is legally binding in the national legal text. Likewise, the report finds that 10 out of 27 Member States have simply missed the requirement for each producer to finance the waste from his own products (Oekopol 2007).

The European Commission has recently confirmed that "some Member States seem to calculate the financing of WEEE of products put on the market after 13 August 2005 exclusively on the basis of market shares, a system which would, a priori, not be in compliance with the directive. The Commission will, if necessary, start infringement proceedings covering this point in the coming months".[12]

The EC Treaty obliges each Member State to implement the WEEE Directive in such a way as to give full effect, in legislation and in practice, to the wording, object and purpose of the WEEE Directive and not to put in place any measure that would jeopardise the attainment of the Directive's objectives. It is therefore crucial that the EU institutions and the Member States ensure that individual producer responsibility is correctly transposed and implemented in national legislation.

1.7 Developing IPR Solutions

IPR should not be seen as a new invention. A number of approaches and implementations across the world attempt to account for brand in their allocation of responsibility for WEEE to producers. This study aims to evaluate such approaches including those operating in Japan, the Netherlands (until 2002), Maine, and Washington State, and the degree to which these systems could or do provide incentives for producers to improve the design of their products.

1.8 Structure of the Report

[12] http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=P-2007-4971&language=EN

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Chapter 1 provides an introduction to the report, and outlines the policy context to Individual Producer Responsibility.

Chapter 2 provides a review and evaluation of approaches attempting to account for products by individual brand.
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Chapters 3 provides answers to frequently asked questions about IPR and discusses solutions to a series of key strategic issues related to the implementation of IPR.

Chapter 4 examines approaches that may assist in future IPR solutions, and outlines the steps that producers, policy makers and other stakeholders need to take to implement IPR.

Chapter 5 provides a summary of the studies, conclusions and a set of recommendations.

2. REVIEW OF BRAND-BASED SOLUTIONS

2.1 Overview

In this section a number of examples of EPR program implementation are provided which attempt to distinguish brands within WEEE.

2.2 Japan

1. Introduction

The Specified Home Appliances Recycling (SHARL) Law was enacted in 1998 and came into force in April 2001. The scarcity of final disposal sites, the increased volumes of EEE in the waste stream, and inadequate treatment facilities, were the main driving forces for the enactment of the law (Tojo 2004) (MOE 2003b). Treatment standards for printed circuit boards and cathode ray tubes (CRT) in TV sets are mandated through a revision of the Waste Management Law. Under the law, producers of these four types of household appliances are required to take back their discarded products, dismantle them and meet reuse, recycling and recover targets between 50%-60%.

Scope of the law

The regulations lay down specific recycling targets for the four types of appliance and only relate to household waste equipment. Commercial and industrial products are not included in the current scope. The recycling targets are as follows:

- Air conditioners 60%
- Televisions 55%
- Fridges/freezers 50%
- Washing machines 50%

SHARL is currently under review by the national authorities and there is strong indication that two additional product groups will be added to the scope in the revised law. These include clothes dryers and LCD-display and Plasma-display TV Sets.

PC Recycling System

Japan's Law for Promotion of Effective Utilization of Resources (often referred to as the Recycling Promotion Law) was enacted in 1991 to promote increased recycling of a variety of products and materials. One of the law's major goals was the promotion of product designs that facilitate waste reduction, recycling, and reuse. In 2001, the law was revised to address personal computers.

This revised law embraces the principle of extended producer responsibility (EPR) by requiring manufacturers to establish collection and recycling systems for used computers. As of April 2001, the law required recycling of PCs discarded by businesses. Since October 1, 2003, it has required recycling of PCs discarded by households.

The revised Recycling Promotion Law covers PCs and small peripherals such as the mouse and keyboard. These peripherals are only accepted along with the computer itself.

2. Operation of the Japanese Systems

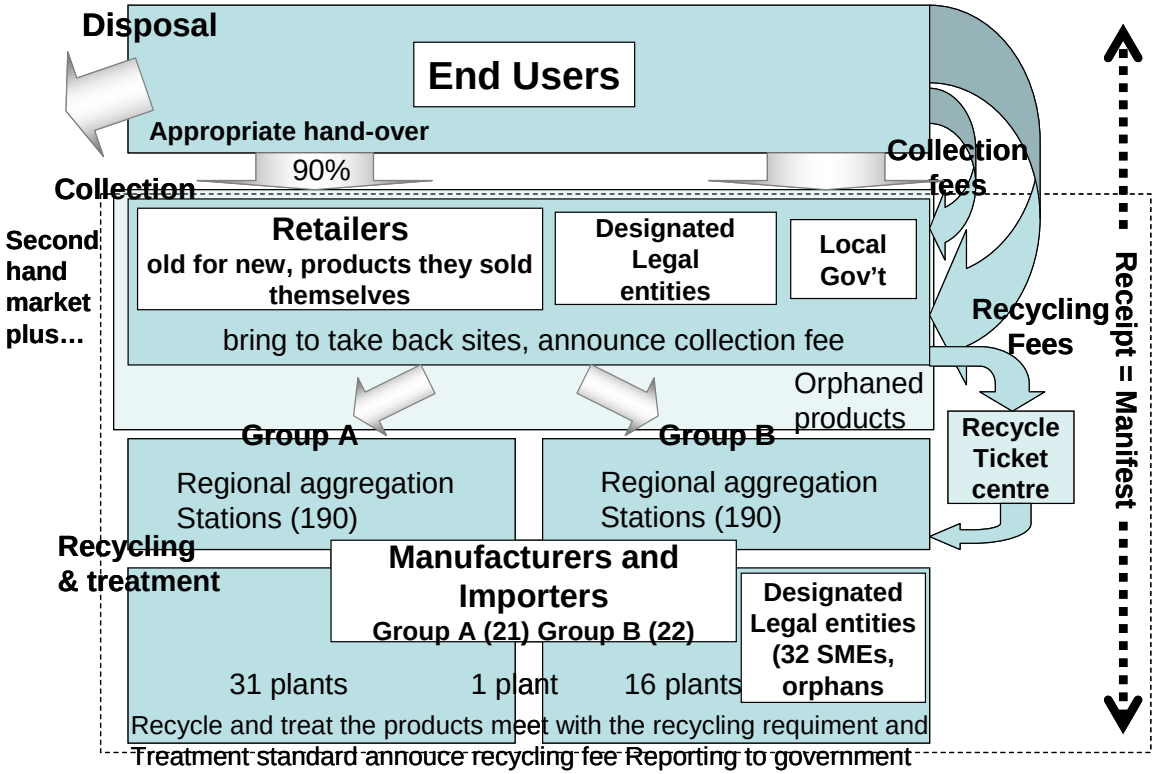
SHARL Recycling System

Figure 2.1 below, provides a comprehensive overview of how the system is structured. It displays the main actors involved in the management of WEEE under SHARL from collection, transportation & consolidation and treatment & recycling.

Collection and Recycling System

Under the law, retailers are mandated to accept end-of-life products from consumers when they sell products similar to the replacement product (1:1) as well as products they sold themselves in the past.

Figure 2.1: Schematic diagram of the flow of products and actors involved from collection to recycling (Source: Tojo, 2006[13])

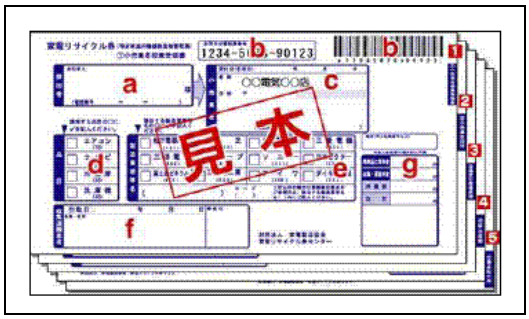


[13] Tojo, N. (2006) EPR program for EEE in Japan: Brand Separation? *In INSEAD WEEE Directive Series*. 30 November 2006.

Retailers are required to deliver collected products to regional aggregation facilities set up by producers and are permitted to charge consumers a collection fee to cover these costs. Approximately 90% of the volume of collected WEEE treated by producers is from retailers, while roughly 10% is collected by local governments (in remote areas) or designated legal entities in the case of orphan products.

Producers are also allowed to charge an end-of-life management fee to the end user when the product is discarded. This fee is collected by the retailers or from post offices (consumers purchase a recycling ticket or manifest, see Figure 2.2 below) and is forwarded to the appropriate producer account within the recycling ticket management organisation, known as RKC, once the final manifest copy is returned to the retailer from the recycling plant.

Figure 2.2: Recycling ticket (manifest)



The recycling ticket is used to track the product from the point of collection through to the regional aggregation centre and recycling plant. The recycling ticket has five copies of which the consumer retains the original. The retailer keeps another copy and the remaining 3 copies follow the product to the regional aggregation points. A copy is filed at the regional aggregation centre and the remaining 2 are transported with the product to the recycling plant. The recycling plant retains the 4th copy and sends the final copy to the retailer to complete the cycle. On each copy of the ticket, product details (model number and manufacturer name) and the name of the retailer that collected the waste product are recorded. This allows for a consumer to be able to track the status of their waste appliance, through various processing phases. It also allows producers to trace how many waste products it has collected fees on and when and where these products have been managed.

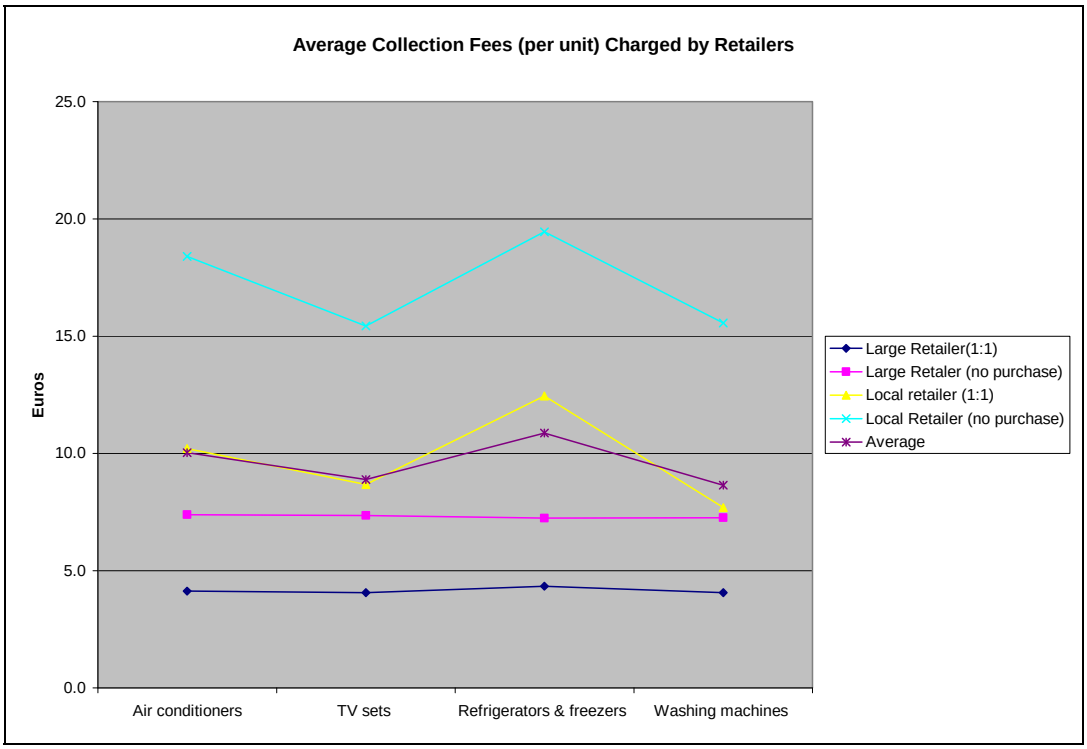
Under SHARL, producers have the operational responsibility for treatment and recycling. However, in order to fulfil their legal obligations, producers have formed two main groups imaginatively named Group A (21 manufacturers) and Group B (22 manufacturers). Waste products collected by retailers are separated into two streams according to the brands of either Group A or Group B and are then delivered (retailers responsibility) to consolidation or regional aggregation centres corresponding to the applicable producer group.

Group A manufacturers have chosen to contract with existing recycling operators as much as possible, but certain producers in this group have also invested in their own recycling plants. Alternatively, producers in Group B decided to establish their own recycling plants through joint ventures where ownership of each recycling plant appears to be dominated by one key shareholder with financial contributions from other members in the group (DTI, 2005).

Financial System

The fees retailers charge to offset collection and transportation charges vary considerable between large and small retailers and whether or not a new product is being purchased at the time of disposal. Figure 2.3 below illustrates this. In Figure 2.4, an average fee for all retailers was used to represent collection fees charged by retailers.

Figure 2.3: Range of Fees charged by retailers for collection of SHARL appliances (2006) (Source METI, 2007[14])



The recycling fees charged by all manufacturers in both Group A and B to consumers when returning products at end-of-life to collection points are the same. While there is no differentiation between the costs to manage individual brands within either Group A or B, since producers in Group B jointly own the facilities, any cost savings through efficient processing or product design remain with the producers. This creates incentives for the manufacturers to design recyclable products. The incentive is driven by the competition between the two collective systems. If manufacturers in one collection system could recycle their products cheaper, they would get a cost advantage over the competitors in the other collective system. It is also interesting to note that competition in Japan in product take-back is not over recycling fees charged to the consumers, but over ability to minimise recycling costs.

Figure 2.4: Fees charged per product type expressed as Euro/kg collected (2006) (Source METI, 2007[15])

[14] METI (2007).Tokutei Kateiyou Kiki no Haishutsu, Hikitori, Shori ni kansuru Flow ni kansuru Jisshi Chousa Kekka [The results of the Investigation of the Actual Flow regarding the Discard, Take-back and Treatment of the Specified Household Appliances]. [Online]. Available: www.meti.go.jp/committee/materials/downloadfiles/g61218a03j.pdf [28 March 2008].

[15] METI (2007).Tokutei Kateiyou Kiki no Haishutsu, Hikitori, Shori ni kansuru Flow ni kansuru Jisshi Chousa Kekka [The results of the Investigation of the Actual Flow regarding the Discard, Take-back and Treatment of the Specified Household Appliances]. [Online]. Available: www.meti.go.jp/committee/materials/downloadfiles/g61218a03j.pdf [28 March 2008].

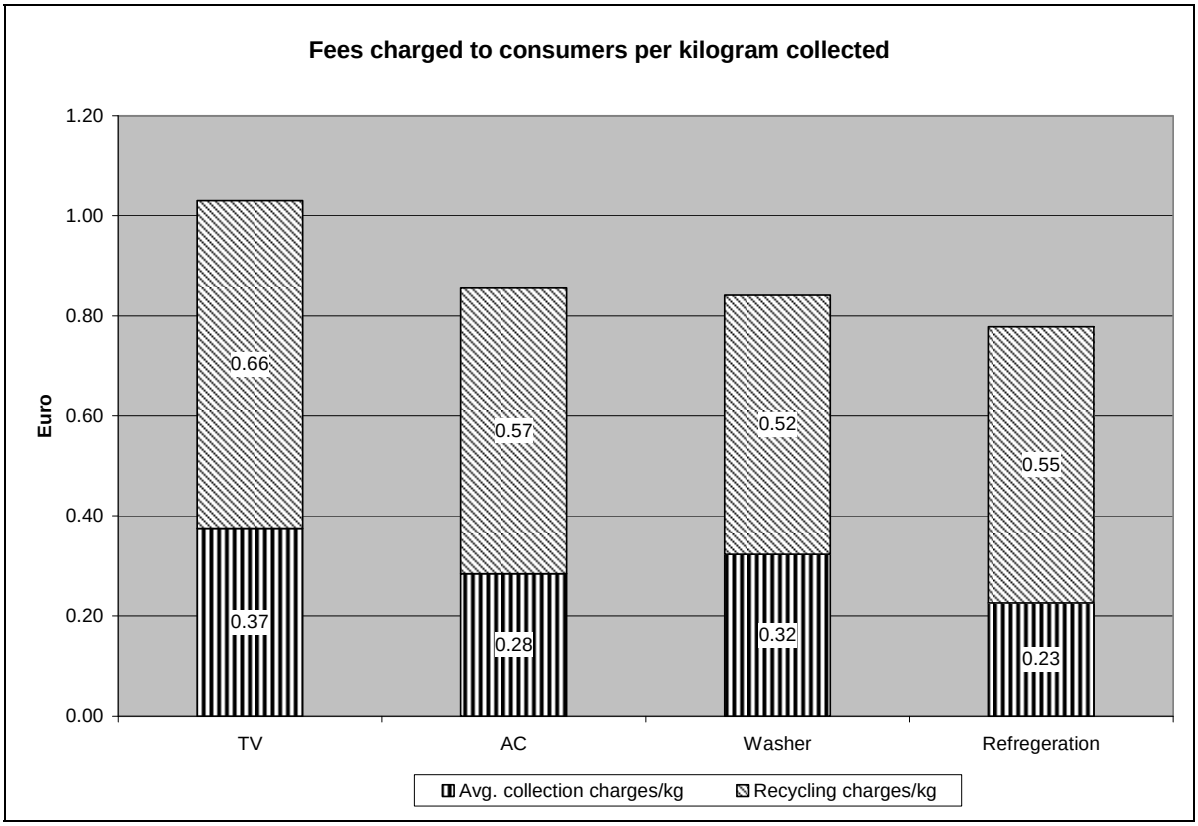

Fees charged to consumers per kilogram collected
Euro
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.66
0.37
0.57
0.28
0.52
0.32
0.55
0.23
TV
AC
Washer
Refregeration
Avg. collection charges/kg
Recycling charges/kg

Table 2.1: Breakdown of Average Costs and Revenues of Group A and Group B Systems[16]

Recycling Fee TVs	€ 18.7	
	Group A	Group B
RKC – manifest	1.3	1.3
Administration (Producers)	3.3	3.3
Management Firm	1.1	1.1
Transportation	2.1	2.0
Aggregation	4.3	3.5
Recycling Costs	9.5	11.2
Recycling Revenue	-2.1	2.6
Total costs	21.7	22.5
Net Costs	19.6	25.0

Recycling Fee ACs	€ 24.3	
	Group A	Group B
RKC - manifest	1.3	1.3
Administration (Producers)	3.3	3.3
Management Firm	1.1	1.1
Transportation	3.1	3.3
Aggregation	5.3	6.6
Recycling Costs	12.7	8.9
Recycling Revenue	-9.5	-8.2
Total costs	26.9	24.5

Recycling Fee Refrigerators	€ 31.9	
	Group A	Group B
RKC – manifest	1.3	1.3
Administration (Producers)	3.3	3.3
Management Firm	1.1	1.1
Transportation	4.4	4.1
Aggregation	8.9	7.2
Recycling Costs	21.8	27.2
Recycling Revenue	-4.6	-4.9
Total costs	40.8	44.3

Recycling Fee Washers	€ 16.6	
	Group A	Group B
RKC - manifest	1.3	1.3
Administration (Producers)	3.3	3.3
Management Firm	1.1	1.1
Transportation	2.4	4.1
Aggregation	4.8	7.2
Recycling Costs	11.3	27.2
Recycling Revenue	-2.7	-4.9
Total costs	24.3	44.3
Net Costs	21.5	39.4

From Table 2.1 above, it is apparent that for all products with the exception of ACs, net costs are higher than the recycling fee charged to consumers when the product is discarded. Since these figures have been released the announced fees for ACs charged by both producer groups have been lowered from 3500 Yen to 3000 Yen.

PC Recycling System

The Japanese Electronics and Information Technology Association (JEITA), operates the recycling program for PCs on behalf of manufacturers representing 98 percent of the personal computer market. The revised Recycling Promotion Law creates two different financing structures for used computers. For those purchased prior to October 1, 2003, recycling is financed by end-of-life fees ranging from $27 to $37. These fees apply to all

[16] Costs Based on Interviews from Autumn 2006- up until publishing of the report, Tonnages based on Fiscal 2005 as reported in AEHA (2006). Adapted from METI & MOE (2007). Joint meeting of the Working Group of Electrical and Electronic Equipment, Sub Committee of Waste and Recycling, Industrial Structure Council and Sub Committee on the Evaluation and Discussion on the Recycling System of Electric Home Appliances, Waste and Recycling Committee, Central Environment Council. (n.d.). Industrial Kaden Recycle Seido no Shikou Jyoukyou no Hyouka Kentou ni Kansuru Houkokusho (An) [Draft Report on the Evaluation and Discussion on the Implementation Status of the Recycling System of Electric Home Appliances (in Japanese)]. [On line] Available. http://www.env.go.jp/council/03haiki/y0311-16/mat02_1.pdf [2008, February 21]

personal computers, including orphan products. For personal computers purchased after October 1, 2003, the costs of recycling are included in the price of the product.

The PC collection system is largely dependent on Japan Post, the federal postal service, acting on behalf of JEITA. Collection of discarded computers takes place at 20,000 post offices nationwide. Japan Post also provides a service to collect equipment from private residences. Computers sold after October 1, 2003, bear the PC Recycling Mark and are collected free of charge by Japan Post. The postal service is responsible for sorting computers by brand and ensuring that they are transported to the appropriate recycling facility. Many of these facilities are operated by PC manufacturers.

3. Allocation of responsibility

- **SHARL: segregation of brands at collection points**
- **PC Recycling: separate collection of brands by each producer**

Since all waste appliances are tracked through the manifest system by brand and model, each producer receives the recycling fee paid by the consumer into their own account. Subsequently, producers are responsible for financing the number of units handled by the recycling consortium respective of their own brand. However, as far as can be determined at this point of juncture, there is no further differentiation of costs between brands, and a standard recycling fee/unit processed applies for all members in their respective consortia based on volume processed. (Bohnhoff, 2008).

IPR applies to both new and historical WEEE, as there is no distinction made between historical and new products in the Japanese system.

Producers in Group B own and operate recycling plants as joint ventures, where typically one producer is the primary shareholder operating the plant. Therefore, any efficiency that is achieved either through improved product design or improved treatment technologies that result in reduced end-of-life costs, benefits by the producers themselves. Similarly, the predominant producers in Group A have also invested in and operate at least one of their own recycling plants.

Therefore, for products covered by SHARL, producers pay in proportion to the amount of their own products returned for recycling, and then recover these costs from fees charged to end-users. In contrast, for PCs, producers organise the recycling of their own branded products at the costs of the producers themselves.

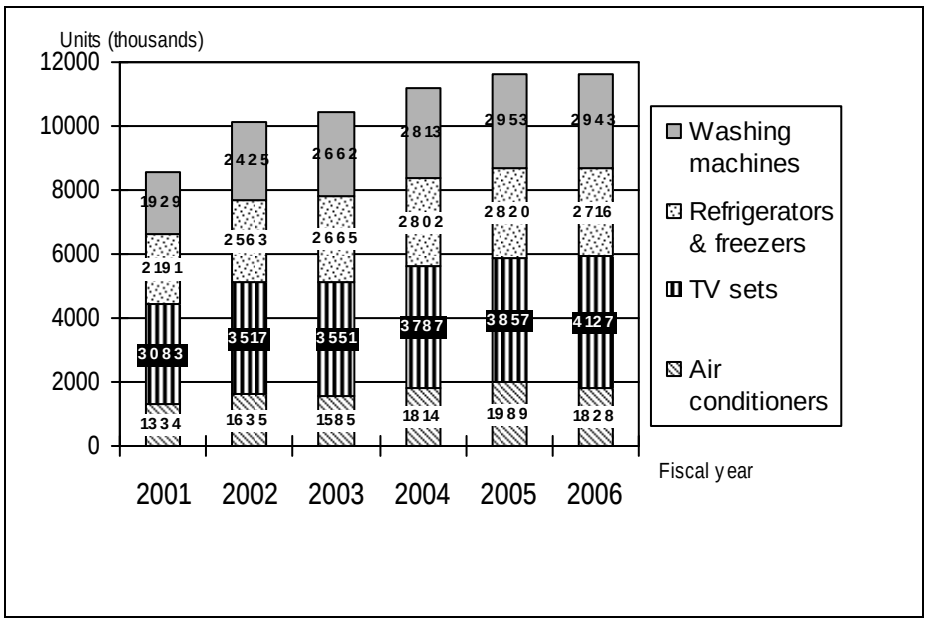
4. Results

Collection and Recycling Results

In fiscal 2006, METI reported that 22.87 million home appliance units were discarded by consumers and other parties. Of that total, retailers collected 17.2 million units for a fee and subsequently shipped 11.62 million units to manufacturer consortia for recycling. The table below illustrates a breakdown of the products shipped to manufacturers from retailers that are handled through the producer recycling systems. Since the start of the program in 2001 volumes collected have continued to rise until 2005, when volumes have begun to level off.

Figure 2.6: Total number of units collected by retailers and managed by producers: 2001-2006 (Source: Adapted from AEHA (2007), (2006), (2005), (2004), (2003), (2002)[17])

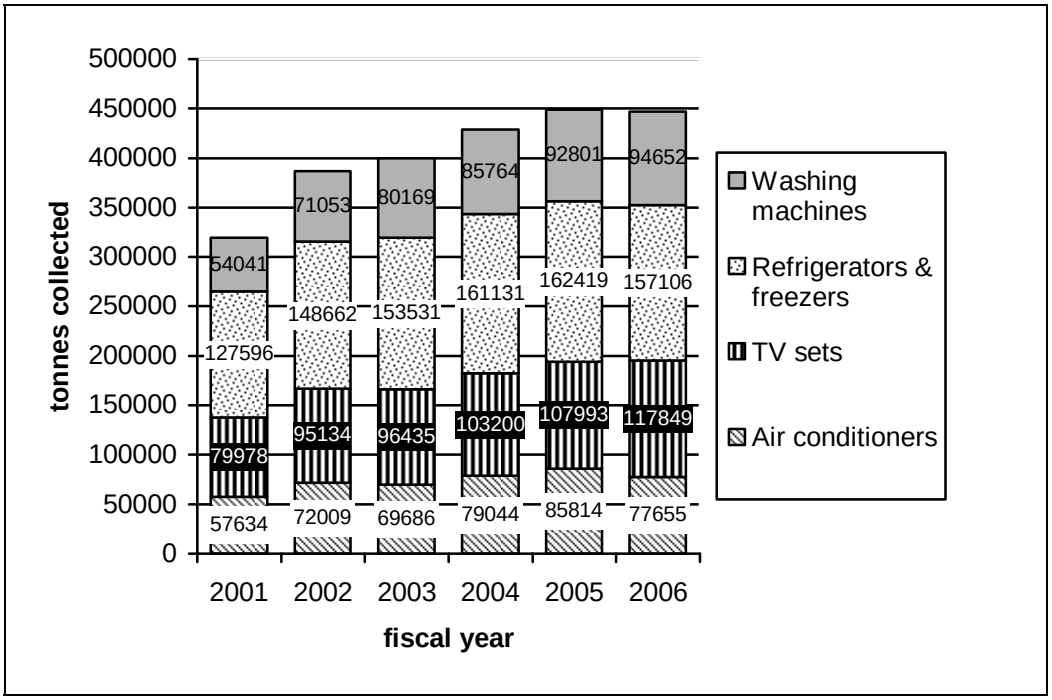
[17] AEHA. (2002). Tokutei Kateiyou Kiki Saishouhinka Hou ni Motozuki Seizougyousha tou oyobi Shiteihoujin ga 1 nenkan (Heisei 13 nen 4 gatsu 1 tachi kara Heisei 14 nen 3 gatsu 31nichi) ni Saishouhinka tou wo Jisshi shita Goukei no Joukyou. [The overall situation of the implementation of



The recycling ticket system provides very precise statistics on the number of collected units of each of the 4 large household appliances under SHARL. In addition to these aggregated statistics, producers also report the number of their individual products recovered in annual reports, usually released at the same time as the aggregated figures. Figure 2.7 below, shows the total tonnages of the 4 large household appliances that are managed through the official producer schemes. These have been estimated by taking total number of units managed and multiplying this by a standard weight for each appliance type.

Figure 2.7: Total tonnes collected by retailers and managed by producers: 2001-2006(Source: Adapted from AEHA (2007), (2006), (2005), (2004), (2003), (2002))

the reuse/recycling by manufacturers, designated legal entities etc. in one year (1 April 2001 – 31 March 2002), based on the Specified Household Appliance Recycling Law] [Online]. Available: www.aeha.or.jp/02/pdf/JISSEKI13.pdf [28 March 2008].
AEHA (2003)http://www.aeha.or.jp/02/pdf/JISSEKI13.pdf
AEHA(2004) http://www.aeha.or.jp/02/pdf/JISSEKI14.pdf
AEHA (2005) http://www.aeha.or.jp/02/pdf/JISSEKI15.pdf
AEHA (2006) http://www.aeha.or.jp/02/pdf/JISSEKI16.pdf
AEHA (2007) http://www.aeha.or.jp/02/pdf/JISSEKI17.pdf



In Figure 2.8, the total collection tonnages are expressed in a kilogram per capita ratio to give an indication of the relative success of the programme. Although the scope is considerably narrower than that of the EU WEEE Directive, the collection system is close to meeting the WEEE target of the EU of 4 kg/capita/year. It should also be noted that computers and their peripherals are managed under another system, and that Japanese home appliances are generally lighter than those of their European counterparts. Important to note is that the total units handled through the producer schemes is estimated to be just over 50% of the total waste units arising.

Figure 2.8: Per capita collection rates: 2001-2006 (Source: AEHA (2007), (2006), (2005), (2004), (2003), (2002), Statistical Bureau (2003), Statistical Bureau (2007)[18])

[18] Statistics Bureau. (2003). Heisei 13 nen 10 gatsu 1 nichi Genzai Suikei Jinkou[The approximate population as of 1 October 2001]. [Online]. Available: www.stat.go.jp/data/jinsui/2001np/index.htm [23 May 2003]

Statistics Bureau. (2007). Heisei 13 nen 10 gatsu 1 nichi Genzai Suikei Jinkou[The approximate population as of 1 October 2006]. [Online]. Available: http://www.stat.go.jp/data/jinsui/2001np/05k3e-a [20 May 2008]

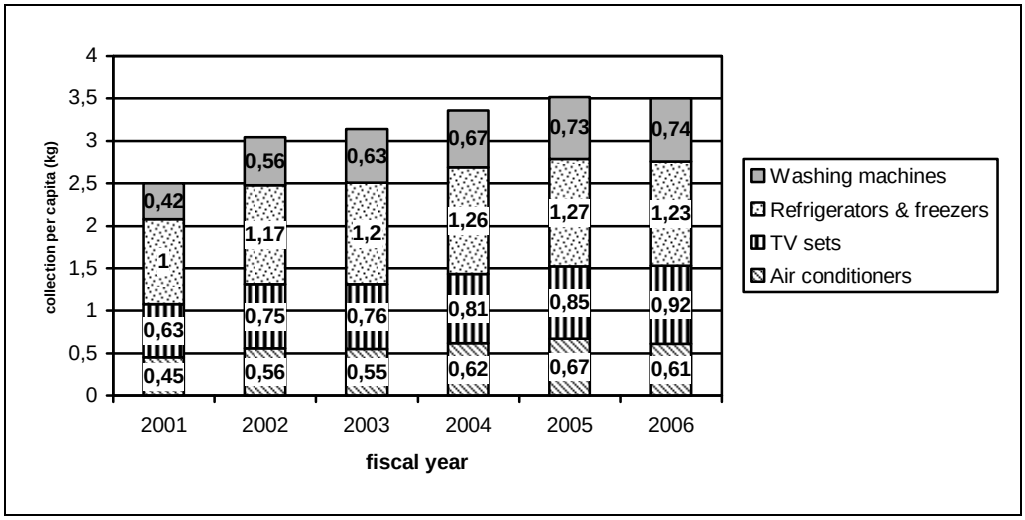
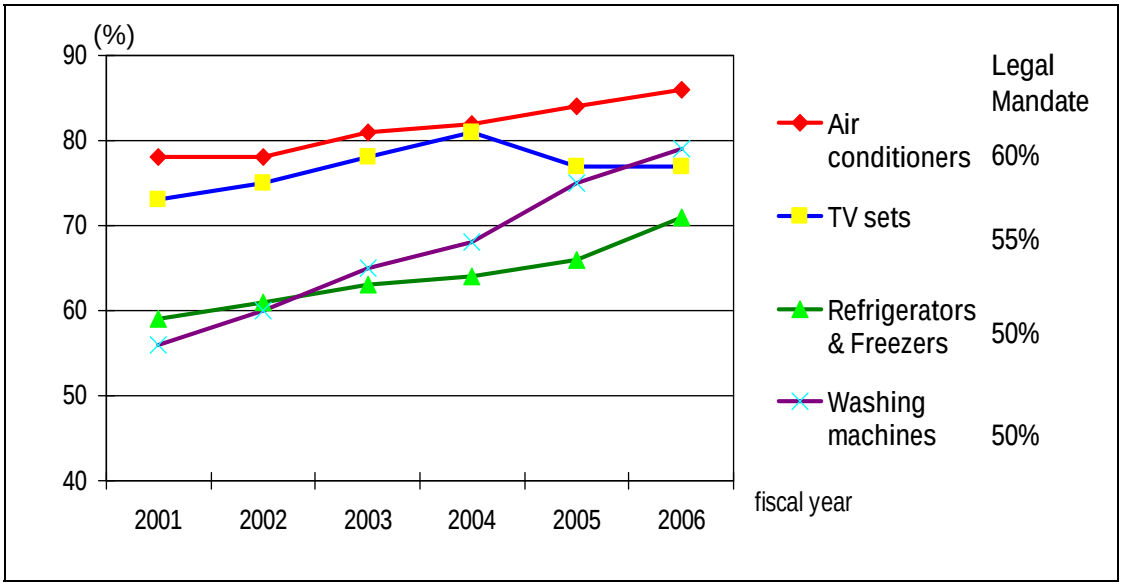


Figure 2.9: Recycling rates of collected appliances: 2001-2006 (Source: AEHA (2007), (2006), (2005), (2004), (2003), (2002)



Product Design

The advantage of the producer's implementation of the SHARL is the creation of a strong link between the downstream management of waste products and the producer. This system allows the manufacturer to get feedback about the end-of-life issues related to the product. The recycling plants provide the manufacturer with product design related feedback from the recycling of their own product. Feedback reports from the recyclers encourage proposals for design improvements on issues such as material composition, ease of disassembly, and labelling. Companies operating the recycling plants see them as very much part of their R&D structure, and a number of manufacturers test their equipment through the plants before it is released on the market (DTI, 2005).

Although it is recognised that determinants of product innovation are likely to come from a variety of push and pull factors including law, consumer preferences, customer requirements, Tojo (2004) provides empirical evidence that SHARL does provide tangible incentives for environmentally-conscious design in the case of electrical and electronic equipment (EEE) in Japan. The analysis of her interviews in 2001 revealed that all manufacturers that were interviewed considered anticipated regulatory requirements

posed by SHARL in their product development strategies. Upstream measures in design, both in terms of reduction of hazardous substances and enhancement of source reduction of material use, re-use and recycling, have been undertaken by many Japanese manufacturers.

Vertical integration of OEM into recycling activities allows for ready available markets for plastic recovered at recycling plants. For example, a large proportion of plastics recovered at Kansai Recycling Systems Corp (KRSC) (Group B recycling plant) is incorporated into new products by Sharp. This includes approximately 150 tons/yr. from SHARL appliances, 15 tons/yr. from photocopiers and 10 tons/yr. from personal computers (DTI, 2005). Similarly, the Sony example provided below provides an interesting case on the merits of this EPR system design for closing material loops.

Figure 2.10: Examples of recycling innovation in Japan by Sony

Sony's closed-loop plastic recycling of TVs and packaging

On December 4, 2007 Sony Corporation announced that it had established an industry-first in-house recycling system for polystyrene (PS) cabinets from previously sold Sony CRT TVs and PS packaging materials used to ship product parts. The in-house system incorporates post consumer and post industrial materials into high quality, flame-retardant polystyrene that will be used in the production of parts in "BRAVIA" LCD TVs, scheduled to be released on the Japanese market in the Spring of 2008.

Sources of recovered PS: Sony branded products and packaging

Currently, the source of Sony-branded PS TV housings are exclusively from Green Cycle Corp, one of 15 recycling plants of Group B handling TVs for its members and in which Sony is the primary shareholder. To date no figures on the total number of expected TVs processed to recover PS are available, but to give an indication of expected quantities, in fiscal year 2006 (April 1, 2006, and ended on March 31, 2007), approximately 760,000 Sony-manufactured televisions were recycled in all Group B facilities. It is currently not known whether Sony expects to expand the recovery of PS housings from its TVs processed by the other 14 Group B recyclers.

In addition to the recovered PS from TVs, Sony sources polystyrene from used packaging from product parts shipped to Sony. Previously this material was reused and reformed as polystyrene foam products only, however Sony has now implemented a new proprietary additive that enhances heat and impact resistance of the recovered PS foam to a sufficient level to be used in TV parts.

Environmental and Economic Benefits: Win-win Scenario

According to Sony, the activities in this area deliver two significant advantages to the firm by reducing Sony's use of virgin materials while simultaneously lowering production costs, estimated to be approximately 10% compared to new materials.

Sony is reaping the benefits of design investments made over 10 years ago

Sony claims that the development of this closed loop recycling system has been facilitated by many product design initiatives it has undertaken since the early 1990's including, replacing and reducing the range of flame-retardants it uses, labelling plastics with the type of plastics and flame-retardants used, homogeneity of the types of materials used and improving designs that improve disassembly efficiencies.

Sources of information: http://www.sony.net/SonyInfo/News/Press/200712/07-133E/index.html & Bohnhoff (2008)

DTI (2005) also identified that the number of separate parts in appliances was falling

allowing easier recycling and that there was evidence of design for disassembly' and use of 'automated disassembly used smart materials' (ADSM).

5. Strategic issues

Concern over illegal disposal

Since consumers or end-users of home appliances finance the end-of-life costs when they discard products, there has been some concern over the emergence of illegal disposal due to the relatively high fees (approx. 17 Euro to 32 Euro) incurred. However, this fear has largely been overestimated. According to the MOE, other than the first initial months of the system, the percentage of illegal disposal as compared to the total number of discarded products is less than 2% (MOE 2003a). More recent estimates of product disposal pathways, suggest that this percentage has been further reduced to 160,000 units out of a total of approximately 22,8 million units disposed of annually.

Orphan Products

Since it is final end users of appliances that finance the collection and recycling costs, there is no risk of costs falling on society or the remaining producers for orphan products. SHARL had a specific requirement that a 'designated legal entity' be formed to manage the physical responsibility of recycling products from producers that exit the market. This system was also available for small importers of products as well. According to Tojo (2004) the estimated amount of orphan product in Japan is around 5 per cent.

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MOE (Ministry of the Environment, Japan). (2003a) Heisei 13 nendo to Heisei 14 nendo no hikaku. [Comparison of Fiscal 2001 and Fiscal 2002. [Online], Available: www.env.go.jp/recycle/kaden/fuho/13-14/graph2.html [21 May 2003]

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Email Correspondence

January 21, 2008, Frans Loen, loen@sony.de. Re: Questions to Sony Japan on SHARL

February 14, 2008, Andreas Bohnhoff, Andreas.Bohnhoff@eu.sony.com , RE: First merits of Design for recycling: Recycling of CRT housing into the NEW Bravia line-up

2.3 ICT Milieu, The Netherlands (1999-2003):

1. Introduction

In the Netherlands manufacturers and importers have established two take back systems for WEEE. ICT Milieu collects IT equipment (including desktop PCs, monitors, printers, and laptops. White and brown goods (e.g. refrigerators and electrical consumer products such as television sets) are collected by a separate producer responsibility organization known as NVMP.

Both NVMP and ICT Milieu were created in December 1999 as voluntary programmes and have since become the framework for the operation of the WEEE Directive in the Netherlands. From its formation in 1999 to 1 January 2003 ICT Milieu based the costs of its members on the return share of their products in the waste stream. It is this period of operation that this case study analyses.

Scope of the law

ICT milieu collects IT equipment, printers, fax machines, photocopiers and telecommunication equipment.

2. Operation of the system

Collection and Recycling System

ICT Milieu uses a two-tier collection system through 540 municipal collection sites and 65 regional collection and sorting depots. Private Householders can dispose of their used ICT by returning it to the retailer at the time of purchasing a new product ('old for new'). The retailer must accept the PC free of charge from the consumer. Alternatively end users can return equipment to a municipality.

Discarded ICT equipment is collected by a carrier under contract with ICT Milieu. There is currently one contractor for the whole of the Netherlands. Approved processing plants, such as Computer Recycling Service (CRS) and MIREC take care of processing the discarded equipment.

Financial system

Until 1 January 2003, ICT Milieu allocated responsibility for the costs of WEEE treatment and recycling based upon the weight of each brand or product collected. Producers were charged a fixed annual fee plus a charge per kilo of equipment taken back and processed according to brand. Individual producers received a monthly invoice directly from the recycler based on the weight of their products that had been recycled. Each container which was delivered to ICT Milieu's recycler, MIREC, was subjected to a full brand count. Each product was weighed on a scale and using touch screen PCs each unit was assigned to a manufacturer. If a brand name was recorded which was not related to a registered member of ICT Milieu, it was recorded as a "free rider".

In addition to their own products, producers also covered the cost of orphaned products and products of free-riders. These were allocated to the respective producers pro rata in proportion to their return share. Because producers only paid for products coming back in the waste stream at the moment product recycling took place, membership of ICT Milieu provided sufficient financial guarantee, and so in this case a separate financial guarantee was not required. Financial guarantees are further discussed in Chapter 4.

However, from the beginning of 2003, the financing system changed to the allocation of cost based on the current market share and IPR ended. With this change sorting products by brand also disappeared. Although the free rider issue was a determining factor in the discontinuation of the individual financing mechanism in ICT Milieu, a more pressing issue was the role of changing proportion of market shares of members from a historical perspective. For example, a large PC manufacturer with a considerable market share in the past had seen a reduction in sales at the end of the 1990's. Given its historical presence in the market a large proportion of the total product returns at this time were from its own brand. Coupled with more recent reduced sales, this meant that this particular PC manufacturer had - in comparison with its competitors- much higher costs when proportioned to per unit placed on the market. Given these circumstances the manufacturer threatened to leave the system unless the financing model was changed. However, under the WEEE Directive, approaches to IPR should only apply to new WEEE. Therefore from 2004 onwards IPR has not been possible in the Netherlands.

3. Allocation of responsibility

Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling

Interestingly, under these approaches producers may additionally specify that their branded products should be separated out and delivered to their own appointed recycling facilities for further processing. This opt-out enabled IPR to operate for those producers concerned (RELOOP 1999), but would have introduced increased transport costs transferring producers from ICT Milieu's recyclers onwards, potentially dissuading many of producers from taking this option.

4. Results

Economic Factors

In 2002 the total system costs (including collection, treatment, recycling, and scheme overhead costs) were approximately €0.48 per kilogram. The cost of manual sorting was estimated at a few cent/kg. In comparison, the equivalentcosts of ICT Milieu in 2008 were €0.19 per kilogram. The reduction in cost levels is attributed to innovation by recyclers, a more business like relationship between ICT Milieu and recyclers incorporating a proper tender negotiation process, and changes to world commodity markets leading to a higher price for recyclates[19].

Table 2.2: ICT Milieu: Scheme Costs

Year	Scheme Cost (Million Euro)	Cost € per kg
1999	1.5	0.54
2000	3.4	0.51
2001	4.3	0.51
2002	4.8	0.48
2003-2007	Data missing	Data missing
2007		0.19

Collection and Recycling Results

[19] **Vlak, J.** (2008) [Personal communication]. 15 February 2008

In 2002, ICT Milieu collected and treated around 9 million kg of ICT related waste equating to 0.58kg per capita. This figure has increased to around 20 million tonnes in 2007. The increase in collection volumes is largely associated with an increase in the volume of WEEE discarded in the Netherlands.

Table 2.3: ICT Collection and Recycling Rates

Year	Tonnes WEEE Collected (000)	Kg per capita (Total)	Recycling Rate (including energy recovery)
1999	2800	0.17	
2000	6700	0.41	
2001	8500	0.51	
2002	9900	0.58	89%
2007	20500	1.20	97%

5. Strategic Issues

Enforcement

According to Savage (2003) enforcement within the ICT Milieu system depended on a degree of operational trust. Data supplied by both recyclers and producers was self certified. Furthermore as there was not yet any WEEE legislation in place in the Netherlands there was no retail ban for brands that were not registered under the producer responsibility system, in contrast to the enforcement strategy adopted in Maine and Washington. Today the electronic law in the Netherlands does provide for financial penalties and in exceptional circumstances criminal sanctions.

Free Riders

The ICT Milieu return share system was criticised for the high level of waste of orphan products (waste of products that could not be attributed to any member). In 2002, 35% of all equipment collected was orphan or free-rider products. Partly as a result, the system was changed for 2003. This was an effect of the system operating on WEEE that was put on the market long before the ICT system was started (similar to historical waste of WEEE Directive).

Table 2.4: ICT Milieu Orphan Volumes

Year	Orphan/ Free riders %
1999	48.1
2000	43.9
2001	36.8
2002	35.0

The ICT system was changed to financing based on the market shares of producers. Recent samples by ICT Milieu show that the orphan waste remains at 20-25 per cent in the Netherlands. In Maine, whose return share system is closely comparable to the return share system operated by ICT Milieu until 2003, orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This lower figure is attributable to stronger enforcement through banning the sale of products with brands that are not registered to a producer that is compliant with the producer responsibility law.

6. References:

Future Energy Solutions (2003) *Study into European WEEE Schemes: prepared for the Department of Trade and Industry* (DTI, London)

Perchards (2005) *Transposition of the WEEE and RoHS Directives in Other EU Member States: November 2005* (Perchards, St Albans)

Savage, M. (2006) *Implementation of the Waste Electric and Electronic Equipment Directive in the EU* (Directorate-General Joint Research Centre, European Commission)

2.4 Maine, USA

1. Introduction

The US state of Maine has enacted a 'return share' allocation of recycling costs of electronics displays to producers similar to that previously used by ICT Mileu in the Netherlands. This system has been in operation since January 18th , 2006, and was introduced by state legislation (Title 38, Chapter 16 of the Maine Statutes) entitled *Sale of Consumer Products Affecting the Environment*.

The aim of the Maine statute is to 'establish a comprehensive electronics recycling system that ensures the safe and environmentally sound handling, recycling and disposal of electronic products and components and encourages the design of electronic products and components that are less toxic and more recyclable'.

It is notable that promoting improvements in the design of electronic products is a key aim of the Maine legislation.

Scope of the law

The scope of products covered by the Maine legislation is limited to computers and electronic displays over 4" in size. This includes CRT display monitors, TV sets, laptop computers and portable DVD players, referred to as "covered electronic devices" or CEDs. The Maine legislation is limited to household products and excludes commercial waste. Desktop computers are not covered by the recycling elements of the statute, but desktop computer manufacturers are required to affix a brand to their products in order to be eligible for sale in the state.

The Maine Department of Environmental Protection (DEP) monitors the programme by setting processing standards, researching brand and manufacturer histories for orphan determination status, checking compliance, and educating the public about the programme.

2. Operation of the System

Collection and Recycling System

Municipalities are responsible for collecting covered electronic devices and transporting it to consolidator. The consolidator then records the product type, weight, and brand for each unit that enters its facility.

Once recorded, the consolidator must handle the CEDs in one of three methods chosen by the manufacturer in its plan submitted to the state DEP:

1. Under the first option, the consolidator physically separates the manufacturer's branded products until a full truckload is achieved. The manufacturer then arranges to pickup the material for shipment to its preferred recycler and is billed by the consolidator for the handling costs of its branded product plus management costs (including recycling costs) of any applicable orphan share.

2. Under the second option, the manufacturer will arrange for pickup of a representative volume of mixed branded CEDs for shipment to its preferred recycling and receives a bill from the consolidator for the handling costs of its branded product plus management costs (including recycling costs) of any applicable orphan share.

3. The third option is that the consolidator chooses to which recycler the material is sent and bills the manufacturer for the costs associated with handling, transportation and recycling based on weight of the products received for which that manufacturer is responsible plus its share of orphan products.

For the majority of products collected under the Maine system, the consolidator is also the recycler and processes material without transporting to a separate facility. The number of consolidators in Maine is currently seven. Of those seven, five are also recyclers. One of the dual consolidator/recyclers handled over 95% of the volume of returns in 2006.

Financial System

The Maine law states that (section D1):

*"Each computer monitor manufacturer and each television manufacturer is **individually responsible** for handling and recycling all computer monitors and televisions that are produced by that manufacturer or by any business for which the manufacturer has assumed legal responsibility, that are generated as waste by households in this State and that are received at consolidation facilities in this State. In addition, each computer manufacturer is responsible for a pro rata share of orphan waste computer monitors and each television manufacturer is responsible for a pro rata share of orphan waste televisions generated as waste by households in this State and received at consolidation facilities in this State. "*

Manufacturers of e-waste are required to submit a collection/recycling plan to the Maine Department of Environmental Protection in which they must specify the way they will satisfy the requirements of the legislation according to the three options listed above.

Overall the system in Maine is based on shared financial responsibility between producers and municipalities. Municipalities pay for collection costs (which may be passed along to e-waste generators through a recycling fee) and OEMs are billed for consolidation, transportation, and processing costs.

3. Allocation of responsibility

Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling

The approach adopted in Maine is based upon a full count of brands collected within waste, rather than sampling of the waste stream. In addition the system provides producers with the choice to segregate their own branded products. Therefore Maine, like the approach adopted previously by ICT Mileu, allows individual producers to 'opt-in' to a direct individual responsibility for their collected products. As for ICT Mileu, this may be at the penalty of additional transport costs, dissuading producers from pursuing the option in practice.

4. Results

Economic Factors

The costs of the Maine system are detailed in Table 2.5 below. The costs of the Maine system are the equivalent of €0.55 per kilogram collected. This compares to European WEEE systems in their early years of operation. ICT Milieu costs were €0.48 per kilogram in 2002. The volumes of WEEE generated in Maine are also currently relatively modest, thereby precluding economies of scale to be developed at this stage.

Table 2.5: Maine Scheme Costs

Stakeholder	Collection		Processing		System Management		Net Cost
	Cost	Revenue	Cost	Revenue	Cost	Revenue	
Electronics Consumers							
E-waste Generators	? [a]						
Collectors	? [b]	? [fees]					
Haulers	? [c]	$0.12M					
Consolidators	? [d]	$0.16M					
Processors			? [e]	$0.47M			
System Manager					$0.2M [f]	$0.2M	--
Retailers					? [g]		
OEMs	$0.28M [h]		$0.47M [i]				$0.75M Net Cost
Society					$0.2M [j]		$0.2M Net Cost

Description of Activities
[Reference. Stakeholder/Function: *Activity*]
a. E-Waste Generators/Collection: *Recycling fees (some locations)*
b. Collectors/Collection: *Collection & transport to consolidator*
c. Haulers/Collection: *Transport from consolidator to processor*
d. Consolidator/Collection: *Consolidation*
e. Processors/Processing: *Processing*
f. System Manager/System Management: *Management*
g. Retailers/System Management: *Management (enforcement of sales ban)*
h. OEMs/Collection: *Payment for consolidation, transportation to processor*
i. OEMs/Processing: *Payment for processing*
j. Society/System Management: *Payment for system management*

Collection and Recycling Results

According to Linnell (2008) the collection rate for Maine is 3.1 lbs per capita, the equivalent of 1.41 kg per capita. This is projected to increase to 3.4lbs per capita (1.45 kg per capita for 2007. This is compared against CPR systems in Chapter 3.

The levels of recycling have not been reported in Maine.

5. Strategic Issues

Free Riders

In Maine there is no division between historic and future waste. Furthermore no financial guarantee is required to secure funding, should a producer disappear, for future recycling costs of products placed on the market. There is a risk that this could be exploited by actors that choose to enter and exit the market. Due to the time lag between sales and the return of products in the waste stream, this system could enable a manufacturer to sell products now, withdraw from the market and therefore avoid the financial responsibility for these products at end-of-life. It remains to be seen if this becomes a problem.

Orphan Products

Given the experience of the Netherlands, where the return share system revealed a high percentage of orphan products, it might be expected that the proportion of orphan products would be high in the system in Maine. However, due to a number of factors the orphan volume has been relatively low. In 2006, the proportion of orphan products was 4.8 per cent.

First, the Maine statute requires that retailers only sell products from manufacturers that are in compliance with the producer responsibility law. Therefore a manufacturer not in compliance with the Maine statute is prohibited from offering a covered electronic device for sale in the State.
Secondly, the Maine law covers a limited scope of products. Third, the majority of Maine returns in 2006 were televisions (70% by volume), which is the product category that has the lowest relative orphan share of electronic devices.

6. References

Linnell, J. (2008) Producer Responsibility in the US. *In Waste Minimisation and Producer Responsibility Conference*. 6 March 2008, Brussels.

Maine State Legislature (2008) *Statute Title 38, Chapter 16: Sale of Consumer Products Affecting the Environment* (Available on the internet from http://janus.state.me.us/legis/)

National Centre for Electronics Recycling (2006) *A Study of the State-by-State E-Waste Patchwork* (National Electronics Recycling Infrastructure Clearinghouse)

National Centre for Electronics Recycling (2007) *State Recycling Requirements for CE Manufacturers and Retailers in the U.S* (Unpublished Presentation)

National Electronics Recycling Infrastructure Clearinghouse (2008) *State Electronics Recycling Law Implementation Status* (http://www.ecyclingresource.org/ContentPage.aspx?PageId=23; accessed 10/1/08).

2.5 Washington, USA

1. Introduction

Washington State in the USA has passed legislation which will establish allocation of responsibility for waste electronic equipment in proportion to the weight of each brand collected as waste. The Washington system will commence operation in January 2009, and is established by a state statute (Washington Administrative Code, Title 173, Chapter 173-900) entitled *Electronic Products Recycling Program.*

The Washington legislation shares many of the features of the Maine legislation. However the key difference is that in Washington allocation of financial responsibility is based on a brand sampling rather than a full brand count of all collected waste equipment.

The aim of the Washington legislation is to establish 'a convenient, safe, and environmentally sound system for the collection, transportation, and recycling of covered electronic products'.

Scope of the law

The products that are within the scope of the Washington legislation are desktop computers, laptop computers, portable computers, and televisions and computer monitors greater than 4"in size. In contrast to the Maine legislation, the Washington law applies not just to households, but also to small governments, small businesses, and charities.

2. Operation of the system

Physical recycling system

All electronic -product manufacturers must register with the Washington Department of Ecology annually. All manufacturers must participate in an approved recycling plan by January 1, 2009. Registered manufacturers must either participate in the standard plan developed by the State's Materials Management and Finance Authority (WMMFA), or they can choose to operate their own independent plan.

The manufacturers participating in an independent plan must represent at least five percent return share of covered electronic products. If manufacturers choose to operate an independent plan, they must seek the Department of Ecology's approval of their take-back and recycling plan. This plan must specify how manufacturers will provide collection points in both urban and rural areas throughout the state, supported by transportation services to processing facilities. These services must be provided at no additional cost to the consumer at the point of disposal.

Under the Washington law collectors, transporters and direct processors must be registered, approved and meet certain standards. Collection services must provide a place where people may bring their used computers and televisions to a collection centre for recycling. Collection sites may include electronics recyclers and repair shops, recyclers of other commodities, reuse organizations, charities, retailers, government recycling sites, or other suitable locations. The services must be offered to households, charities, school districts, small businesses, and small governments. Large businesses and large governments must provide and pay for their own system to recycle electronic products used by their employees.

Financial system

The Washington legislation requires that the manufacturers participating in an approved plan are responsible for covering all administrative and operational costs associated with the collection, transportation, and recycling of their plan's equivalent share of covered electronic products.

Each manufacturer is annually assigned a return share percentage via sampling of the waste stream in order to determine the percentage of covered electronic products by weight associated with each individual manufacturer's brand(s). From 2009 onwards an independent plan and the standard plan must implement and finance an auditable, statistically significant sampling of covered electronic products entering its programme each year. This sampling must include a list of the brand names of covered electronic products by product type, the number of covered electronic products by product type, and the weight of covered electronic products that are identified for each brand.

This will enable the department to determine the return share percentage for each manufacturer. A three year rolling average is to be used to construct the statistics needed for the return share. However for the first year, the department determined the return share using sampling data from other states. The Department of Ecology obtained the most comprehensive return share data available from the *Brand Data Management System* developed by the National Centre for Electronics Recycling (NCER).

The return share is then multiplied by the weight of collected equipment by the standard plan and all independent plans in order to determine the *equivalent share* of waste covered electronic products for which each individual manufacturer must take responsibility. The Department of Ecology will then require that each individual manufacturer within the standard plan and each independent plan take responsibility for their equivalent share. If at the end of the programme year, a plan has not collected its full equivalent share, the members of the plan must pay to the state $0.50 per pound of the deficit as a penalty. Conversely, plans that have collected more than their equivalent share receive per-pound payment of $0.45 for the excess ($0.05 is retained for administrative costs by the Department of Ecology).

Within each independent plan and the standard plan financial responsibility can be apportioned between its members according to return share, or it may be apportioned according to other financial models such as market share.

The operators of the Standard Plan, WMMFA, recently approved a finance plan known as the "50-50" policy that incorporates market share. During the Plan's first year of operation (2009), half of the costs will be financed based on market share and half will be financed based on return share. Over the course of seven years, all of the costs for manufacturers participating in the Standard Plan will be based on market share. WMMFA has also created an Independent Umbrella Plan (IUP) option to accommodate manufacturers who may have their own collection and processing activities. Under the IUP, members with at least a 1% return share in Washington will have the opportunity to get credit from the Authority for electronics products that they collect and process under the umbrella of the Standard Plan. IUP members will be responsible for the costs they incur to collect, transport and process their CEPs, and will be responsible for their portion of the administrative costs of the Authority, consistent with the 50-50 policy. At this time, it is expected that all manufacturers will participate in the standard plan for the first programme year.

In addition there is an annual administrative fee to be paid to the Department of Ecology, which is based on the market share of the manufacturer.

3. Allocation of responsibility

Counting and weighing of branded products within a sample of WEEE collected, with the responsibility of each producer calculated proportionately

The Washington law also aims to 'encourage the design of electronic products that are less toxic and more recyclable'; however, it should be noted that producers are not assigned the costs associated with their specific products, but a share of all mixed brands of products collected in proportion to the share of their branded products within the waste. Design incentives, therefore, are barely distinguishable from that of allocation of responsibility under collective financing systems i.e. mass-based allocation may incentivise weight reduction, and producers may delay their responsibility by designing longer lasting products. The latter of these incentives is significantly complicated by the fact that many electronic products are sent overseas at end-of-life, are likely to be disposed of before they are functionally obsolescent due to new technologies emerging, and that financial guarantees a re required 'up front' at the time of sale in anticipation of future end-of-life costs.

4. Results

Producer Responsibility does not commence until January 2009. Therefore it is not possible to report environmental results at this stage.

The National Centre for Electronic Recycling has developed a statistical model to ensure a representative sample of the waste stream. The sample size required is dependent on the brand share percentage of the largest producer in the system. If the largest brand share is 7 per cent, the number of samples required is 10,000 at a confidence level of 95 per cent and with a 0.5 per cent margin of error. The sample sizes decline if the brand share of the largest producer is lower than 7 per cent. NCER have determined that the cost of sampling 10,000 items is €28,627 per annum ($44,048).

5 Strategic Issues

Enforcement
The Washington law replicates the Maine statute by requiring that retailers only sell products from manufacturers that are in compliance with the producer responsibility law. A manufacturer not in compliance with the law is prohibited from offering a covered electronic device for sale in the State.

Free Riders
The Washington law provides stronger safeguards than are present in Maine to register manufacturers who previously sold covered products but who are no longer in the market; manufacturers whose products are not directly sold in or into Washington state but whose products are identified in the return share; and new manufacturers entering the market.

However as in Maine there is no division between historic and future waste, and again no financial guarantee is required to secure funding for future recycling costs of products placed on the market. Once again this could provide a competitive advantage for small producers who choose to withdraw from the market and therefore avoid the financial responsibility for their products at end-of-life. However, the legislation aimed to prevent smaller producers from creating independent plans that have little or no recycling obligation. A manufacturer or group of manufacturers is not allowed to create an independent plan without a combined return share over 5%, and "new entrants" - those selling a brand in the state for fewer than 5 years for IT products and 10 years for TVs – are prohibited from independent plans altogether.

Brand Owners as Manufacturers
The Washington Department of Ecology, in its implementation of the law, has been the strictest in deciding that the responsible manufacturer of a brand can only be a single entity. Whereas Maine allows multiple "manufacturers" for a single brand and licensees of brands to claim recycling responsibility, Washington only recognize the single legal entity that holds the intellectual property rights to the main brand on a covered product. This leads to the situation, for example, where Disney is the registered "manufacturer" for any television with a Disney character on the front, rather than the producer who manufactured the product. The implications for individual producer responsibility incentives need to be further examined for these brand owners who may license brands to a changing set of manufacturers year by year.

6. References

National Centre for Electronics Recycling (2006) *A Study of the State-by-State E-Waste Patchwork* (National Electronics Recycling Infrastructure Clearinghouse)

National Centre for Electronics Recycling (2007) *State Recycling Requirements for CE Manufacturers and Retailers in the U.S* (Unpublished Presentation)

National Electronics Recycling Infrastructure Clearinghouse (2008) *State Electronics Recycling Law Implementation Status* (http://www.ecyclingresource.org/ContentPage.aspx?PageId=23; accessed 10/1/08).

Washington Administrative Code (2008) *Title 173, Chapter 173-900 Electronic Products Recycling Program* (Available on the internet from http://apps.leg.wa.gov/WAC)

Washington State Department of Ecology (2006) *Focus on Washington's Electronic Product Recycling Program* (Ecology's Solid Waste and Financial Assistance Program)

Washington State Department of Ecology (2008) *Establishing a Return Share List* (http://www.ecy.wa.gov/programs/swfa/eproductrecycle/returnShare.html; accessed on 10/1/08)

2.6 Bosch led Power Tool Consortium, Germany

Return share IPR by brand count

1. Introduction

This case describes a manufacturer consortium take back and recycling program for power tools and power tool portable batteries in Germany. It covers 2 distinct periods of the program development, first as a voluntary initiative and secondly adaptation of the program to conform to legal requirements of the WEEE Directive as implemented in Germany through the ElektroG recycling law.

In the first period (Phase 1, from 1993-2005, 22 brand owners[20] led by Bosch Power Tools developed and operated the program in response to a draft WEEE Ordinance. These producers (representing approximately 80% of power tool market) wanted to fulfil their potential legal obligations through their own system independent of any national compliance scheme.

ElektroG**,** Germany's national transposition of the WEEE Directive, was introduced in 2005. This requires that for historical WEEE, producers finance a proportion of the total WEEE collected in the country relative to their market share in a particular compliance period (historical WEEE and new WEEE (Optional). In Germany, municipalities are required to collect WEEE in 5 categories of which tools fall into the 5th, commingled with other small household appliances, toys and sports, monitoring and medical equipment (see Table 2.6).

Table 2.6: Collection Categories at municipal collection sites

WEEE Collection Categories under ElektroG
1. Large household appliances, automatic dispensers
2. Refrigerators and freezers
3. IT and telecommunications equipment, consumer equipment
4. Gas discharge lamps
5. Small household appliances, lighting equipment, **electric and electronic tools,** toys, sports and leisure equipment, medical products, monitoring and control instruments.

[20] Including Bosch Power Tools, Metablo, Festoo, Atlas Copco, Hitachi, AEG, Fein, Protool, Kress, ELU, Milwakee, Dewalt, Wagner, Mafell, Berner, Dremel, Flex, Baier among oters.

In order to calculate tool producers share of WEEE collection in a given compliance period, Stiftung Elektro-Altgeräte Register (EAR), the German national producer register and clearinghouse determines the total EEE weights placed on the market for all EEE producer's products falling under collection category 5. Each producer is given an assigned percentage of the total EEE placed on the market in a given compliance period. Correspondingly, each producer is responsible for the same percentage of total WEEE collected.

After the introduction of the ElektroG the program was expanded to include collection of power tools at municipal collection facilities (collection category 5). Although the phase 1 system continued to operate, the tool producers decided to form a new consortium of 105 producers, made up of 73 members of the associations ZVEI power tools, ZVEI welding machines, ZVEI Automation and IVG (Industrievereinigung Garten) and 32 non-members of ZVEI.[21]

Scope of the law

Phase 1: *Not Applicable as the program is voluntary*

The system product scope included all *handheld power tools* from private households and businesses. Welding equipment, sewing machines, spraying equipment, that fall under EEE category 6 of the WEEE Directive were not included in the program.

Phase 2: All products that are listed in Category 6 of the scope of the WEEE Directive (see Table 2.7 below) are invited to be members of the Consortium.

Table 2.7: Products included in EEE category six of ElektroG

Category 6 of ElektroG : Electrical and Electronic Tools
(with the exception of large-scale stationary industrial tools)

1. Drills
2. Saws
3. Sewing machines
4. Equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials
5. Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses
6. Tools for welding, soldering or similar use
7. Equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substances by other means
8. Tools for mowing or other gardening activities

Under the ElektroG, Section 9(8) producers and importers of EEE in Germany have the option to set up and operate individual or collective take back systems for WEEE from private households. This provides the legal basis that allows for the consortium's individual collection efforts of WEEE collected from retailers, service centres and business customers to be recognized in the national system. Producers that operate independent (own) systems can reduce their obligation to collect WEEE from municipal collection points stipulated under Section 10(1). Therefore, as described in the introduction, the Power tool consortium needs to report its collected volumes from retailers, business

[21] Cerowski, Udo (2007, November 14). Email corresponsdance

clients, and repair centres and report this to EAR to be included in the total volume of WEEE collected in collection category 5.

WEEE collected from business clients and repair centres (both consumer and business products) is reported to EAR as collected WEEE from private households as all power tool producers in the consortium declare tool sales as EEE sold to private households (considered dual use products). Therefore, both tools sold to business clients as well as collected from business clients are included in the total household tons reported (put on the market and collected).

Within these framework conditions, the consortium continues to operate the Phase 1 system design (same product scope), but has opened up the consortium to other producers of all other products under the EEE category 6. Although these added products are not collected at retail collection points, the consortium has bundled compliance volumes to obtain a favourable price from recyclers for the recycling of mixed collection category WEEE collected at municipal collection sites.

2. Operation of the system

Phase 1

Waste tools and batteries collected at collection points were transported to a central recycling centre in Willershausen, central Germany, by a contracted logistics firm (Hellmann). Power tools were collected in cage containers, and their batteries were collected separately in cardboard shipping boxes.

All waste products and batteries were sorted by brand and each producer was responsible for financing the costs to manage its own products.

Producers financed all costs of collection from retailers comprising the provision of containers and transportation but excluding financial payment to retailers for administration costs. All costs for dismantling, sorting, and transportation to further material recycling were financed by producers in the consortium.

Phase 2

For WEEE tools collected through the retailers, commercial clients (B2B customers) and service centres, the consortium finances all costs of collection and recycling, as described in Phase 1.

WEEE collected at retailers, businesses and service centres is no longer sent to Willershausen for processing and brand counting and instead this WEEE is sent directly to various recyclers within Germany. Instead a sampling proxy is used to estimate relative brand return-share attributed to each producer.

Tonnages processed for each brand are reported to EAR and counted towards each producer's market share obligations. If tonnages are less than those calculated by EAR, then a brand owner is obligated to reach this tonnage through assigned pickups of containers from municipal sites. For WEEE arising at municipalities, assigned to member's consortia by EAR, members finance recycling costs split according to present market share.

Therefore individual producers obligations are based on the market share calculation in a compliance period, and checked against individual tonnages managed through their own system. Given that producers are financing the treatment of WEEE from municipal sites based on current market share, IPR is not directly possible, even though much of the WEEE processed to meet the obligations are from the management of participating

producers own products. In this sense, it is positive that producers are able to develop programs to collect WEEE outside the government operated collection system. Total collection of WEEE is increased and producers are rewarded by obtaining more valuable streams than expected at municipal recycling sites.

3. Allocation of responsibility

- ***Phase 1: allocation by full brand count & weighing***

Each producer financed the management of WEEE tools associated with their own products. Tools collected from non-member companies were financed by all producers proportionate to the return-share of their own brands.

- ***Phase 2: Own system: Return-share by brand sampling (against a market share obligation). WEEE from Municipalities: CPR by market share***

In Phase 2 the Bosch led consortium allocates responsibility between members based on return share by sampling. However the overall responsibility of the consortium within the German WEEE system is calculated based on the present market share of its members. Therefore Phase 2 applies Collective Producer Responsibility.

4. Results

Figure 2.16 below shows the total tons of power tools collected in phase 1 from 1993-2005. In 2005 the consortium collected a total of 853 tonnes of power tools.

Figure 2.16: Collection quantities of power tools from retailers, service centres and industrials customers (Phase 1) (Source: Cerowski (2003), Ceroski (2007)[22])

[22] Cerowski, Udo (2003). Recycling Centre Power tools in Germany. Presentation dated February 2003.

November 17, 2007, Udo Cerowski, Udo.Cerowski@de.bosch.com. Re: Information on Joint Producer Power Tool Recycling Centre Managed by Bosch

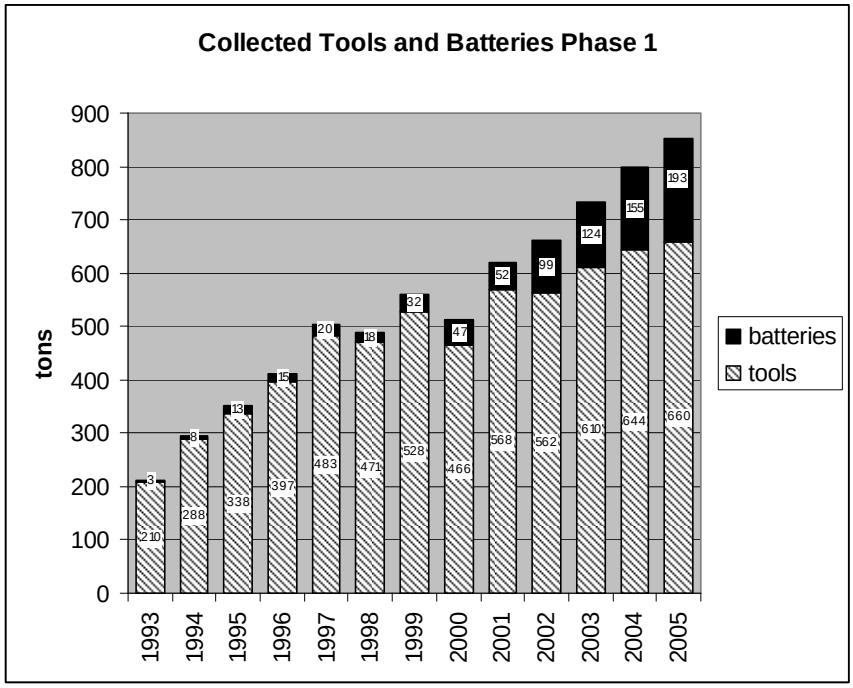
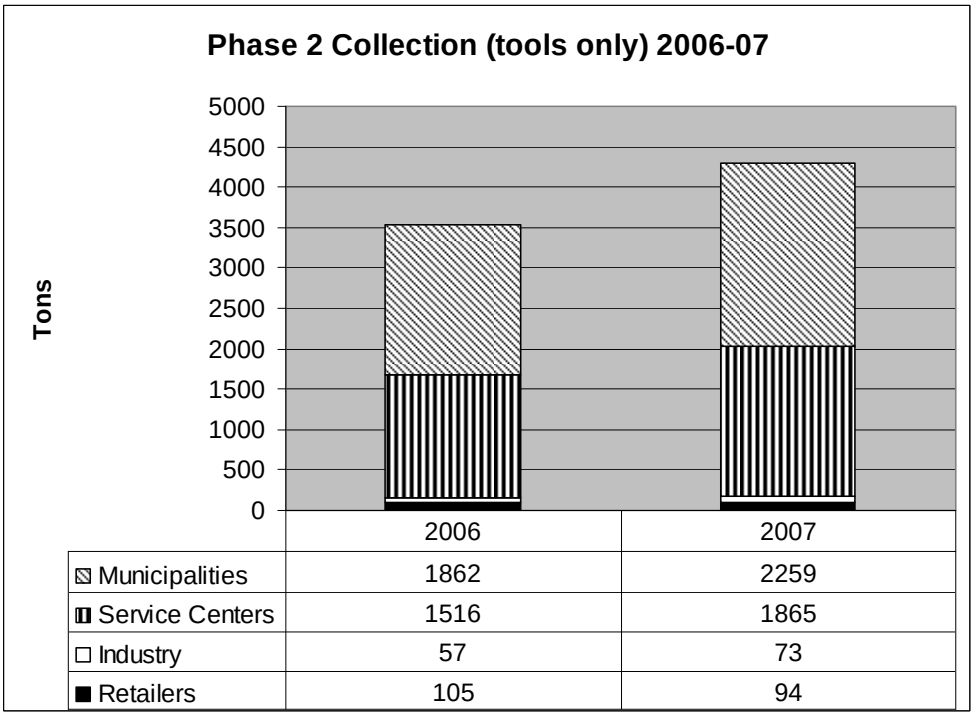


Figure 2.17 illustrates that the level of collection in 2006 following the transition to Phase 2. This shows that despite the overall move to CPR, the consortium has continued to operate and expand collection within its own individual collection system. In 2007 the consortium's individual system collected 2035 tonnes of tools. This is a significant amount of material collected, equivalent for tools of half of the Bosch consortium's overall obligation.

Figure 2.17: Collection Results: Phase 2 to date (Source: Ceroski (2007))



	2006	2007
Municipalities	1862	2259
Service Centers	1516	1865
Industry	57	73
Retailers	105	94

Neither EAR nor the Federal Environment Ministry has released data on the amount of

WEEE collected in Category 5 at municipalities or through producers own systems.

5. Strategic issues

IPR and collection rates
In phase 2 the WEEE collected by the Bosch consortiums individual system is counted towards the consortium's overall WEEE obligation. Since WEEE collected at municipal collection sites in Category 5, is a mixed batch of product types with varying recycling cost structures, the cost to manage this WEEE is higher than purer streams of primarily tools collected from retailers, businesses and service centres. This provides a business case for producers to become engaged in individual collection efforts in order to collect less mixed WEEE from municipalities. This may lead to increased total tonnages of WEEE collected in a country.

6. References

Cerowski, Udo (2003). Recycling Centre Power tools in Germany. Presentation dated February 2003.

Interviews:
January 15, 2008, Udo Cerowski, Bosch Power Tools: telephone interview

Email Correspondence:
November 17, 2007, Udo Cerowski, Udo.Cerowski@de.bosch.com. Re: Information on Joint Producer Power Tool Recycling Centre Managed by Bosch

January 23, 2008, Udo Cerowski, Udo.Cerowski@de.bosch.com. Re: Bosch power tool collection and recycling programme.

2.7 Individual producer collection systems

1. Introduction
This case study reviews the individual company collection efforts of the two largest producers of products in the IT sector, Dell and HP. The intention of this case is not to compare the performance of collection efforts within these company programmes, but rather to highlight a number of key implications of these systems concerning implementation of brand-based approaches to collection and recycling.

Not directly applicable for this case, however important to note is that the individual collection efforts described here refer only to WEEE from private households.

2. Operation of the Individual producer collection efforts

Below are descriptions of the programs from HP and Dell respectively.

Direct Take Back at HP
During 2006 HP launched a programme of direct take back events to provide an opportunity for members of the public in selected locations to bring back their old IT equipment for refurbishment and recycling. The programme is currently focused on the UK, France, Germany, Italy, Spain and Austria.

In the UK a series of events have been organized in London, Birmingham and Hertfordshire. In Germany, HP take back events are organised in partnership with retail partners, Media Markt and Saturn Markets. In 2007, 130 events took place across

Germany.

The programme is organized together with a refurbishment partner. WEEE that cannot be refurbished is sent to an HP approved recycler. A range of incentives have been used to encourage the public to bring back their equipment including donating selected equipment to a charity partner, or providing a discount on selected HP products for people bringing back old IT.

All brands of IT are currently accepted by the programme. The programme illustrates that individual collection systems are practical and financially viable, as the programme has been cost neutral.

Where the national laws enable, HP can deduct the volumes of WEEE it collects from its 'B2C' WEEE obligations. This encourages producers to make even greater efforts to collect WEEE. HP estimates that up to 50 per cent of its WEEE obligations could be achieved through direct take back.

Computer Take-Back at Dell

For consumers, Dell provides free take back for any Dell product, even when a customer does not buy a new product. If customers purchase a new Dell product, the company also provides take back for non Dell branded product. Dell collects the products and pays for shipping. Customers are required to provide their own box and packing materials.

The programme is operated via Dell's recycling website. Customers log a request, which triggers an email receipt and within a couple of days they receive a phone call from Dell's service provider to arrange a suitable collection date. The product is collected and moved to a Dell Recycling partner location for responsible disposal. Should the equipment be functioning and meet a certain specification customers can opt to donate it through Dell's donation programme (where available) instead of recycling it. Dell's free consumer recycling programme is available in 57 countries globally.

For Dell one of the main reasons for enacting such programs is to promote IPR by advocating the benefits of individual take-back, developing innovative forms of take-back and educating consumers.

The form of product take-back is expected to change over time. If consumers' return behaviour can be altered and more products are returned over time, a different approach aimed at low cost mass collection can be implemented. Dell expects to learn from the current model and reflect that knowledge on the future take-back innovation. The change in the collection scale in US can be an example: Dell's U.S. donation program will potentially take back up to 1 million pieces of electronic equipment each year.

The take-back program is expected to raise awareness on the benefits of IPR. Dell wants to show how an individual take-back program can be useful in extending the product life cycle.

3. Allocation of responsibility

The HP and Dell initiatives are examples of voluntary individual collection systems.

It is important to understand that in the context of compliance with the WEEE Directive, the own collection activities of Dell and HP presented here, are supplementary and running in parallel to their membership in collective compliance organizations. Where

applicable, both HP and Dell are reporting the WEEE tonnages that they collect through their respective programmes either to national authorities or compliance schemes in order to get compliance credit for these initiatives. However, this is not possible in all European countries, either by actual restrictions in the national law or by unwillingness of compliance schemes to recognize extra individual collection efforts by producers.

Both Dell and HP accept all brands of ICT equipment in their respective programmes. HP collection events are open to the public to dispose of unwanted equipment, regardless of whether an HP product is purchased, while for the Dell programme collection of non-Dell used equipment from consumers is available only when a new Dell product is purchased. All Dell branded products are collected regardless if a new product is purchased or not. Given that almost all products that are currently recovered through both programmes are historical WEEE, both Dell and HP are counting these tonnages collected towards their historical WEEE obligations that are based on current market share. This is compatible with Article 8(3) of the WEEE Directive.

Given this context, the current operation of these programmes cannot be considered as IPR as defined within the WEEE Directive, rather, these programmes can be seen as an important effort towards driving increased total collection of historical WEEE. In addition these systems help producers to explore the feasibility of individual collection systems.

4. Results

The tonnages of WEEE collected at the HP collection events range from 1 to 12 tonnes per event with an average of 5 tonnes collected per event. During 4 events in Hertfordshire during January 2008, 50 tonnes of WEEE was collected and a 35 per cent reuse rate was realised.

5. Strategic issues

The current own collection efforts of Dell and HP described in this case study clearly show increased opportunities for consumers to dispose of their unwanted IT hardware. Given that these programmes are running as supplementary efforts to membership in collective compliance schemes it can be expected that total collection of WEEE would increase as a result of these additional activities.

What this case shows is that these producers see strategic value in developing own collection programmes, that could very much develop into own brand collection programmes that would allow for these companies to capture value from the designs of their own products. The lessons learnt from these initial programs can help these companies to continue to develop innovative take back programmes in line with the principle of IPR.

2.8 Summary

As can be seen from this discussion, there are already a number of approaches which attempt to account for a producer's own branded products within WEEE. These provide different levels of design incentive, and present different practical challenges for implementation. The existence of these alternative approaches was confirmed by Oekopol (2007), in their report to the European Commission. Oekopol stated: 'The alternatives are, in light of on-going efforts of producers, highly feasible.'

3. EVALUATION OF APPROACHES

3.1 Overview

This section attempts to provide an evaluation of the brand-based approaches discussed in the previous section compared to systems based purely on CPR. Four performance indicators have been selected, which align with the original objectives and targets of the WEEE Directive.

There are a number of factors, which make a comparison of the performance of collective and brand-based systems subject to errors. There are fewer examples of brand-based systems to evaluate. In Europe, IPR has not yet been implemented, and therefore an evaluation of the potential effectiveness of such approaches in the European context is not yet possible. Some data are available from brand-based approaches in Japan. However the examples reviewed in North America are more recent and therefore data availability is limited. The scope of legislation in Japan and North America is different from the scope of the WEEE Directive. Furthermore in Japan and North America IPR applies to both historical and new WEEE.

3.2 Collection

Table 3.1 compares the collection performance between Japan, which operates systems that appear at least in theory to allocate responsibility on line with the principle of IPR, and European countries, which currently operate different forms of CPR. The data represents collection of products classified in category 1 of the WEEE Directive (Large Domestic Appliances).

Japan achieved 2.58 kg/inhabitant of category 1 products despite a narrower scope than the WEEE Directive. This matches or exceeds Austria, Czech Republic, Estonia, Hungary, The Netherlands, and Slovakia. Japan achieved 0.82 kg/inhabitant in category 4 despite narrower scope. This matches or exceeds Austria, Czech Republic, Estonia, Hungary, Ireland, Slovakia and closely matches the EU average (0.88 kg/capita).

In Maine collection levels of 1.41 kg per capita have been reported for 2007. The scope of the Maine legislation compares most closely to categories 3 and 4 of the WEEE Directive. However again the scope is much narrower than the WEEE Directive. Despite a narrower scope, the system in Maine has achieved collection levels that exceed or compare with Estonia, Czech Republic, Slovakia, Austria, Hungary, Ireland, The Netherlands and the European average.

This suggests that brand-based approaches and CPR can achieve comparable levels of collection. In Europe and Japan producers are not directly responsible for the collection of WEEE. Therefore it is likely that other factors, such as the extent of the collection infrastructure and consumer behaviour are the key determinants of collection rate.

Therefore these data need to be treated cautiously.

Table 3.1: A comparison of the collection performance between IPR implementation in Japan and CPR implementation in European countries in 2007.

For Category 1	Collection (kg/capita)	Scope
Japan	2.58	Data for fridges/freezers, air conditioners and washing machines
Czech R	0.14	Large cooling appliances Refrigerators Freezers Other large appliances used for refrigeration, conservation and storage of food Washing machines Clothes dryers Dish washing machines Cooking Electric stoves Electric hot plates Microwaves Other large appliances used for cooking and other processing of food Electric heating appliances Electric radiators Other large appliances for heating rooms, beds, seating furniture Electric fans Air conditioner appliances Other fanning, exhaust ventilation and conditioning equipment
Slovakia	0.35	
Estonia	0.48	
Hungary	0.91	
Austria	2.00	
Netherlands	2.59	
Belgium	2.99	
Euro average	3.11	
Finland	4.75	
Sweden	5.01	
Ireland	6.68	
UK	7.17	

Table 3.2: A comparison of the collection performance between the brand-based approach adopted in Maine, and CPR in European countries.

Country	Cat 3	Cat 4	Collection (kg/capita)	Scope
Maine			1.41	CRT display monitors, TV sets, laptop computers and portable DVD players
Estonia	0.04	0.10	0.14	Centralised data processing:; Mainframes; Minicomputers; Printer units; Personal computing:; Personal computers (CPU, mouse, screen and keyboard included); Laptop computers (CPU, mouse, screen and keyboard included); Notebook computers; Notepad computers; Printers; Copying equipment; Electrical and electronic typewriters; Pocket and desk calculators; and other products and equipment for the collection, storage, processing, presentation or communication of information; by electronic means; User terminals and systems; Facsimile; Telex; Telephones; Pay telephones; Cordless telephones; Cellular telephones; Answering systems; and other products or equipment of transmitting sound, images or other information by telecommunications; Radio sets; Television sets; Videocameras; Video recorders; Hi-fi recorders; Audio amplifiers; Musical instruments.
Czech R	0.12	0.05	0.17	
Slovakia	0.05	0.20	0.25	
Austria	0.10	0.20	0.30	
Hungary	0.09	0.22	0.31	
Ireland	0.43	0.67	1.10	
Netherlands	n/a	1.18	1.18	
Euro averageEuro average	0.65	0.88	1.53	
UK	0.59	1.10	1.69	
Finland	1.44	1.30	2.74	
Belgium	1.16	1.64	2.80	
Sweden	2.54	2.36	4.90	

3.3 Recycling

Table 3.3 provides a comparison between the recycling performance of the Netherlands, Sweden and Belgium which have mature CPR systems, and Japan, which has implemented the principle of IPR , particularly for PC recycling.

When comparing recycling percentages between Japan and the EU the following variances in calculation methods should be noted. In Japan, recycling rates must be achieved through component reuse or material recycling. Only the recycled materials that have positive or zero monetary value can be included when calculating the recycling rate. Energy recovery can not be used to achieve the target.

In Japan, manufacturers are responsible for achieving recycling rates of 60% for air conditioners, 55% for TV sets, and 50% for refrigerators and washing machines. Under the WEEE Directive, producers are responsible for meeting overall recovery targets of between 70-80%. Material, component and substance reuse as well as material recycling range between 50%-80%. This means that depending on the product category energy recovery of materials can be between 0% and 20%in order to meet the recovery targets.

Table 3.3a: A comparison of the recycling performance (%) between the Netherlands and Belgium.

	EU Target	Netherlands (NVMP 2001)	Netherlands (ICT Milieu 2007)	Belgium (2003)	Sweden (El Kretsen 2007)
Large Domestic Appliances	75	85		84	
Refrigerators and Freezers	75	74		81	
TV	75	80		83	
Small domestic appliances and ICT	70	60		82	
ICT	75		97		
Overall recycling and recovery		80	97	80	95.2

Source:
Data for The Netherlands and Belgium from Bio Intelligence Services, 2006[15]
Data for The Netherlands ICT from Mirec, 2008

Table 3.3b: The recycling performance (%) of Japan.

	Japan Targets	Japan (2006)	Sony Green Cycle
Washing Machines	50	78	89.5
Refrigerators and Freezers	50	64	92.9
TV	55	77	81.5
Air conditioners	60	87	91.4

Source:
Data for Sony Green Cycle from DTI (2006)

These data indicate that in both Europe and in Japan the recycling systems have achieved and exceeded the national recycling targets. Overall the data illustrates that

recycling levels are high in countries with CPR and brand-based approaches.

3.4 Product Design

Tojo (2006)[23]: analysed the design benefits of the Japanese e-waste recycling system. This showed anecdotal evidence from interviews that in Japan, the adoption of brand-based systems implementing the principle of IPR has helped the industry achieve the following benefits:

- Use of Design for Environment assessment tools including end-of-life phase
- Marking of materials and locations for ease of dismantling
- Homogeneity of materials (plastics, magnetic alloys)
- Reduction of the number of components and screws
- Standardisation of screws
- Use of recycled plastics in new components
- Development of recycling technologies
- Separation of various types of plastics
- Tools for ease of manual dismantling
- Communication between recyclers and designers

The Arcadis/RPA (2008)[24] report for the European Commission analysed the impact of systems implementing CPR established by the WEEE Directive in Europe on product design. The report stated that evidence that the WEEE Directive has provided incentives for eco design is inconclusive. This demonstrates that there is only a weak link between CPR and design improvements, at best. CPR systems seem not to provide any clear incentives to a producer to design products to be easier to recycle.

3.5 Practical Issues

There is limited information that can be used to directly compare the economic costs of brand-based approaches to CPR. From countries and producer operations where return share and /or sampling is undertaken costs appear to be comparitavely low.

Allocation of responsibility by return share calculated by brand sampling was the lowest cost approach investigated. According to the National Center for Electronic Recycling the total cost of sampling is €28,627 per annum ($44,048). Similar sampling trials also by the European Recycling Platform showed the low cost of these techniqies in Portugal and Ireland.

Whereas approaches counting or sampling brands may have similar costs to systems operating under CPR, such systems (e.g., as in Washington)do not achieve IPR as they do not directly link a producer to the costs of recycling their own products. Those that do (allowing producers to opt-out and have their brands separated) are disadvantaged by higher sorting and transport costs (such as the approach previously used by ICT Milieu and now adopted in Maine). Further development is needed to improve cost allocation by recycling schemes if such approaches are to progress and better support 'implementations' fulfilling the central aim of IPR and EPR.

[23] Tojo, N. (2006) EPR program for EEE in Japan: Brand Separation? *In INSEAD WEEE Directive Series*. 30 November 2006.

[24] Arcadis, RPA (2007) *WEEE component - The impacts of the WEEE Directive and its requirements with respect to various aspects of innovation and competition – Draft Report* (Arcadis, RPA, Belgium)

There are a number of practical issues regarding the feasibility and ease of implementation of IPR which concern policy makers. One of these concerns is the affect of IPR on levels of orphan waste. Products deposited for recycling that are the responsibility of a company that is either no longer present in the market or have not paid for their recycling, is known as orphan waste. The producers of products that are orphan waste are known as free-riders. High amounts of orphan waste create problems for WEEE recycling systems as these costs need to be covered by the remaining producers. The problem applies to systems that implement either IPR or CPR.

The ICT Milieu return share IPR system was criticised for resulting in a high level of orphan waste. In 2002, 35% of all equipment collected was orphan or free-rider products. As a result, the system was changed for 2003. However despite moving to a market share based system, according to recent samples by ICT Milieu orphan waste remains at 20-25 per cent in the Netherlands.[25] A key reason for the high level of orphan products during this time was that no financial guarantee was requested from producers when placing the products on the market. A more precise explanation of the 'orphan waste problem' facing ICT Mileu at that time was that some producers faced a historic waste obligation which exceeded their current volumes of sales and placed them at a competitive disadvantage relative to other newer producers, with larger market share, and lower share of historic waste obligations.

Data on the estimated levels of free riders in European CPR schemes in 2006 shows that free-riders currently represent between 10-20% by volume of products placed on the market.[26]

In contrast orphaned products constituted roughly 5% of the recycled products in Japan. In Maine, whose approach to brand-based allocation is closely comparable to that previously used by ICT Milieu, orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This lower figure is attributable to stronger enforcement through banning the sale of brands that are not registered to a producer that is compliant with the producer responsibility law. In Europe many producers advocate a similar system of enforcement where legislation only allows products to be sold where their producers could provide proof of registration.

Overall the percentage of orphans in the waste stream appears to be unrelated to the adoption of brand-based or CPR approaches, but to the degree of enforcement within a country. Adoption of brand-based approaches can help identify the missing brand holders, whereas CPR forces existing and registered producers to pay for products from those that no longer exist or simply did not register irrespectively of brand. Such information may be useful for enforcement agencies concerned on the ease of enforcement.

The suitability of IPR to the current infrastructure in Europe is also an important consideration. Policy makers are concerned that new collection systems would be required by implementing IPR. This often stems from the misconception that IPR requires separate and individual collection systems. The brand-based approaches evaluated here demonstrate that this need not be the case, even if the approaches still require further development in the way in which costs are allocated before they can be capable of fulfilling the aims of IPR, and by extension, EPR overall.

3.7 **Summary**

[25] Vlak, J. (2008) [Personal communication]. 15 February

[26] Bio Intelligence Service (2006) *Gather, process, and summarise information for the review of the waste electric and electronic equipment directive (2002/96/EC) Synthesis report Final version* (Bio Intelligence Service, France)

From an environmental perspective, own brand systems are the preferred option as this provides the incentives needed under IPR for producers to improve the design of their products. Section 3.4 suggests that IPR in Japan has already stimulated design modifications, whereas CPR in Europe has had little noticeable impact on product design. This section also suggests that collection and recycling performance in Japan matches that of systems developed based on CPR.

4. IPR IN THE FUTURE

4.1 Overview

This chapter examines future developments which may enhance the ability of producers and others to implement collection and recycling systems for WEEE achieving the aim of IPR. This includes technologies such as RFID (Radio Frequency Identification) which may provide an alternative solution to the sorting and segregation of branded products. The chapter also examines the development of financial guarantee instruments.

4.2 Return Share Allocation

With the return share method, responsibility for waste is based on the producer's proportion of the actual waste returned, and not the proportion of EEE it is currently placing on the market. In theory the method could be considered to be proportionate and relevant to an individual producer's waste responsibility. An important limitation is that, under the WEEE Directive and international accounting laws regarding company liabilities, it would require an adequate system of financial guarantees to ensure financing is in place for future products at the time each product is sold, and while end-of-life products are still diverted for reuse overseas in developing countries, such allocation may be unfairly distorted by such unreported exports. Thus further development is needed for such systems before they can effectively fulfil the aim for IRP. This section evaluates some of the practical issues of calculating and measuring return share. The future development and improvement of such approaches is a useful topic for future research.

In practice there are two possible options that could be developed for calculating return share:

Option 1: Based upon sampling of the waste stream. Random sampling of collection containers located at collection facilities enables the calculation of the proportion of each brand manufacturer's waste in each type of WEEE waste stream.

Option 2: Based upon full brand identification enabling exact measurement of the numbers of products in the waste stream. Technologies to measure products in the waste stream are emerging. These could in future include systems based upon bar codes and Radio Frequency Identification (RFID) tags (depending on the mainstream adoption of such technologies for use in retail and / or product service, which is still questionable).

The second option is allowed in the Maine law, since manufacturers can claim their products for recycling, provided that brand separation is feasible. A similar system is likely to be adopted in Oregon and Connecticut.

The Washington law on the other hand focuses on the first option. The statistical sampling of products and calculation of return shares will be handled by the State Department of Ecology with the aid of the National Centre for Electronics Recycling in the USA. These

organisations have created a brand responsibility spreadsheet in order to link various brand names to their producer so that responsibility for brands arising in the samples can be allocated accurately. NCER also developed best practice guidance on how to conduct a return share sample, and has also created a statistical model to determine the size of sample required to provide a representative and accurate set of results. As a result of the sampling NCER has established a Brand Data Management System (BDMS). The BDMS's reporting features offer insightful views of the data including brand return rankings over time, and brands identified as orphans.

4.3 Review of Future Technologies

Accounting for different brands within waste presents many technical challenges in order to maximise economies of scale, and minimise the costs of identification of EOL products. So far allocation of responsibility by brand counting and weighing has required either manual sampling, segregation at source or physical sorting of the waste stream in order for brands to be separated. However in the future tagging technologies may provide a cheaper and easier means to identify and separate brands in the waste stream.

Optical Bar Codes

Bar coding is the most widely used of the tagging technologies available today. Bar coding was invented in the early 1950s and has since become a critical element in the global retail market, as well as finding applications in other areas such as supply chain management, airline baggage tagging and parcel and mail tracking.

The bar code tag is easy to incorporate and involves simply a change to a printing process or the application of a label. Since bar-coding is based on an optical principle, line-of-sight reading is required. The bar code does not have to contact the reader however and can be located a long way from the reader. The read range depends on the barcode size and also the reader type. A handheld 1D barcode reader can read from up to 2m (82") away.

Barcodes can become obscured, dirty or damaged which makes them difficult or impossible to read. "Robust" barcodes exist which are more tolerant to dirty and harsh environments than paper label barcodes. However the requirement for line of sight is a problem which would inhibit the applicability of this technology to sorting and segregating mixed loads of WEEE. An additional point to note is that bar codes are read-only and no data modification is possible.

Chipless Tags

Chipless tags use physical principles such as magnetism and electrical resonance to enable data to be stored by methods other than using silicon chip memory. They and are cheaper than the more traditional options, e.g. contact tags, and fill the gap between optical barcodes and RFID.

Flying Null is a magnetic tagging technology developed at Scientific Generics. It can be considered as the magnetic equivalent of an optical barcode. Information is stored by varying the spacing between pieces of magnetic material on the tag. Data capacity increases with the length of the tag and is also dependent on the read range required. The read range of the tag can be several centimetres; however this range is considerably reduced if the tag is mounted on metal. Tag costs are typically a few cents and can be <1 cent for small, low data capacity tags.

PMR uses magnetomechanical resonators to create tags with a specific frequency response. When the tag is excited by an AC field at the appropriate frequency, it resonates and produces a signal that can be detected remotely. Data are stored by

enabling or disabling mechanical resonance modes in the strip of material in the tag. The technology is best suited to low data capacity applications, <8 bits and tag costs are approximately 10 cents.

Magnetic stripe tags are mature technology and are used on all credit cards. The principle employed is similar to that used with audio and video tape and essentially involves storing a magnetic barcode on a strip of high coercivity magnetic material. High data capacities can be achieved (100 bytes on a credit card stripe) but reading (and writing) data requires almost contact read of the stripe. The tag must also be swiped past the read head.

Radio Frequency Identification

RFID technology uses radio waves to read RFID tags embedded in, or attached to, objects in order to identify them. Though the technology has been around for several decades, only in recent years have the prices for RFID tags and readers declined and their capabilities increased so that it has become possible to contemplate using RFID tags to manage individual items in the retail supply chain. RFID is now being used primarily to track product pallets and cases, but it is increasingly being used to track high value individual items such as consumer electronics.

The development of tags suitable for tracking individual items in the retail supply chain began at MIT's AutoID Centre in 1999. Working with academic and industry experts from around the world, the Centre developed the Electronic Product Code (EPC), a numbering system for RFID tags that includes information now present in bar codes plus a unique identifier for the particular item bearing the tag. The tag, when interrogated by an RFID reader, wirelessly communicates its identifying information and the RFID reader receives the information and can then transmit it over a network to reach a database. The database could contain data about the identified object, such as when it was made, its physical or chemical composition, instructions for its assembly or disassembly, valuable or dangerous materials in its composition, recycling instructions, etc.

While growing at a rapid rate, the application of RFID technology to the supply chain is still at an early stage. Many issues remain to be resolved –access to spectrum around the world for using the readers, driving down the costs of tags, ensuring interoperability among many supply chain partners and providing security for the network.

Only recently have discussions begun about the potential positive environmental impact of RFID tags and the information they can convey to those participants in the electronics life cycle chain, such as material recyclers, organizations promoting the reuse of electronic products, and manufacturers using recycled materials. This technology could be adopted as an enabler for brand-based allocation of responsibility for WEEE. RFID would enable individual branded products to be traceable.

RFID on WEEE faces different technological and social challenges. The biggest technological challenges are the possibly high amount of metal in the surrounding and the hard to define read conditions. The metal surrounding significantly reduces the readability, especially of UHF transponders. Not defined read conditions mean that the position of the transponder cannot be guaranteed and thus the polarization is unclear.

The social challenges relate to the acceptance of the RFID technology by society due to concerns that RFID could reduce a person's privacy.

Future Research

Several research projects are in development in order to investigate the applicability of RFID to WEEE recycling systems. EPCglobal US is applying for funds to support a

collaborative project entitled "Promoting Understanding of RFID and the environment" (PURE). The project aims to identify ways in which the use of RFID tags within the production and distribution system for electronics products could reduce the environmental footprint of such products by minimizing the need for materials, facilitating reuse, and improving the efficiency of recycling, while providing benefits for those involved in the life cycle of electronics. A similar project has been proposed for European Commission funding as part of a project entitled ZeroWIN by a consortium led by the Austrian Society for Systems Engineering and Automation Management.

4.3 Review of Financial Guarantee Instruments

The WEEE Directive Article 8.2 states that a financial guarantee is required by producers in order to ensure that the costs of recycling these products do not fall on other producers or society if a producer exits the market. The implementation of this requirement is fully analysed by Oekopol (2007), which found that most Member States interpret membership in a collective compliance scheme as an appropriate guarantee for new WEEE obligations whereas producers that wish to comply individually must either have a blocked bank account or recycling insurance to satisfy the guarantee requirement. This would mean more financial burden for producers choosing to set up an individual system or limited brand compliance scheme. This has been cited by producers a key barrier hindering the adoption of approaches fulfilling the aim of IPR.

Oekopol suggest that in order to ensure a level playing-field, the requirements for a financial guarantee should be the same for producers choosing to join a collective scheme and producers choosing to develop individual systems of compliance. However Oekopol identify that the cost of this measure may be high. The availability of affordable financial guarantee solutions is a key challenge in implementing IPR. EICTA (2007) expressed concern that 'It is not beneficial for the EU economy when industry has to put a large financial reserve aside, which cannot be used actively to invest in e.g. sustainable growth or innovations'.

In order to explore whether these concerns are justified, this section reviews the alternative options. In Sweden, there are currently 4 major guarantee solutions proposed by producers or available on the market. Elektronikåtervinningföreningen (EÅF), Länsförsäkringar Insurance Solution (LF), El-Kretsen's Bank Guarantee through Nordic Guarantee and the Vitvaror Atervinning i Sverige AB (White Goods Recycling in Sweden Limited).

Länsförsäkringar LF Recycling Insurance

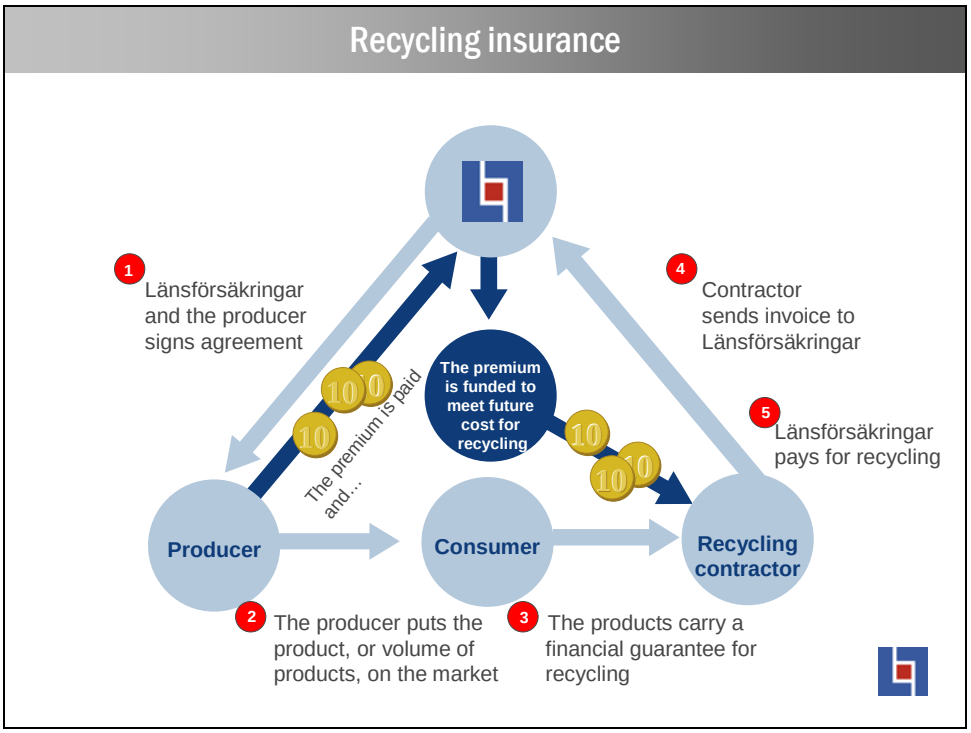
The Recycling insurance of Länsförsäkringar is a financial guarantee covering future costs for recycling. Länsförsäkringar Alliance (LF) is a leading insurance group in Sweden, having 10 years experience from delivering financial solutions providing long term guarantees for the recycling of products. The recycling insurance is a long term financial guarantee that works whether the producer is still in the market or not. The recycling insurance also provides a cover for higher recycling costs in the future and it promotes products designed for recycling. It can be used in combination with collective schemes for handling the logistics in the recycling process as well as for individual solutions.

Since 1998, five car producers in Sweden have established a recycling insurance for their vehicles. Each car carries a long term financial guarantee covering future costs for recycling within 30 years. Each vehicle will be identified at the time for recycling through the registration number and the insurance will pay for the recycling even if the producer at that time is no longer in the market. This insurance coverage takes away financial uncertainty from society as well as from producer's balance sheet.

The estimated future recycling cost is based on test scrapping according to already known future demands in the legislation. Today there is a demand for 85% of the weight of the vehicle to be recycled. In 2015 this demand will be increased to 95%, meaning higher costs for the recycling of all vehicles. The recycling insurance for vehicles promotes design for recycling. The easier the car is to recycle the lower the premium for the insurance.

A new model for recycling insurance available to individual producers or a group of producers (in a collective system for example) has been developed to satisfy the demands in the legislation now being implemented for WEEE. Instead of insuring each product, a specified generic volume of products are insured. When the producer puts the product on the market a premium is paid, providing a guarantee for the future costs for recycling. The premium is funded for the future recycling and invested to keep the costs as low as possible for the producer. When it is time to recycle the product there is a financial guarantee in place covering the costs for recycling (see Figure 4.1).

Figure 4.1: Model for operation of Länsförsäkringar recycling insurance (Source: Länsförsäkringar)

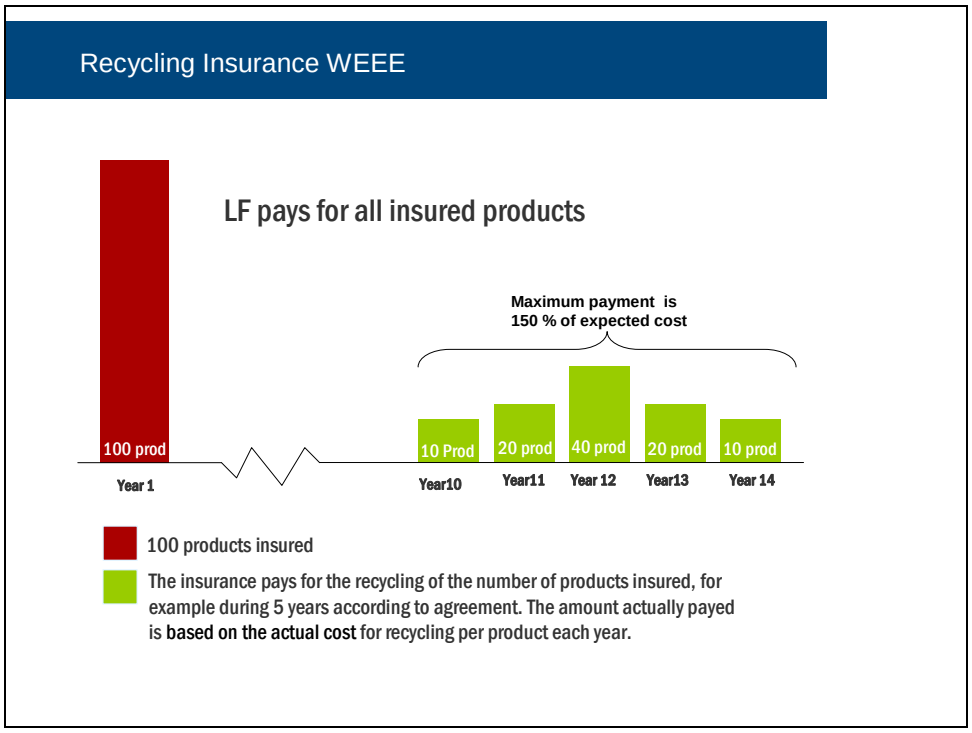


The premium is based on the volume of products sold. Länsförsäkringar and the producer agree on the expected life cycle (length to disposal) of the product, and the expected future costs associated with the type of products insured. The recycling costs will be paid as a claims settlement according to predetermined agreements. The amount paid by the insurer is based on the actual cost for recycling per product each year. If the producer has left the market the insurer will still pay for the recycling (to an actor that takes on the role of recycling WEEE of the insolvent party), thus eliminating the risk of this producer to become a free rider in the system (see Figure 4.1).

If a producer were to use this recycling insurance as a guarantee for new WEEE, the producer would still need to finance its current historical WEEE obligations separately (i.e. paying fees to a collective system) or developing its own nationwide network of

collection sites and financing its current share of historical WEEE (based on market share calculations). As the recycling insurance will pay out claims based on a pre-agreed model of waste arisings, the producer will receive payment from the insurance company which it can use towards financing its compliance costs. Thus if the producer is a member of a compliance scheme that continues to split the cost of recycling based on present market share of the members for both historical and new WEEE (rather than applying financing based on individual identification or a return share) then the insured producer can use the payout from the insurance company to finance the system costs that it is charged by their compliance scheme.

Figure 4.2: Model for financing Länsförsäkringar recycling insurance (Source: Länsförsäkringar)



This market share obligation that is assigned by the compliance scheme to the producer may not necessarily match the payment that it receives from the recycling insurance company which will be calculated based on a expected scrapping curve. However, the legislative demand for the financial guarantee is met, while at the same time the premium paid when the product was put on the market is returned to the producer, albeit at a later date.

In the future, when it will probably be possible to automatically identify the responsible producer at the time for recycling, the system can work the same way as it is described for vehicles. When this technique is adopted the producer can also be rewarded for products having lower recycling costs and the system will then fully support the principles of IPR.

Elektronikåtervinningsföreningen (Swedish Association of Recycling Electronic Products)

Elektronikåtervinningsföreningen (Swedish Association of Recycling Electronic Products) launched its own WEEE recycling insurance in Sweden in April 2007. The Association is owned by its members (currently Siba, Netlogic, Order, ON/OFF). It is open for all companies, designated as producers according to the ordinance implementing the WEEE Directive in Sweden.

The insurance provides a financial guarantee requirement, and also covers the financing of take back and recycling of historic WEEE. The Association charges its members a separate fee for the management of historic WEEE and for the future end-of-life management costs for new WEEE. With low administrative costs and good capital management, the Association promises to supply financial guarantees at attractive prices to its members. They claim that the level of combined cost for historical WEEE and financial guarantee for future fee, they offer today is, on average ca 80% of what El-Kretsen charges its members for historical WEEE, which employs charges for historic waste only, but ties members to agree to pay for WEEE at the time it arises in proportion to their share of sales tonnages at that – which is the basis of a reciprocal collective guarantee for WEEE.

Regarding the organisation of physical collection infrastructure, the Association has utilised members' retail outlets for collection points. Currently, the system collects WEEE from all producers regardless of the brand in order to ensure that its members' historical WEEE obligations are met. It is uncertain whether in the future only new WEEE from its members will be collected or whether mixed brands will be continued to be accepted. Since insured products are currently not individually identifiable (no distinct labelling with RFID tags), it is likely that the insurance solution covers a volume of products to be recycled in the future. Systems to allow individual ID are planned, pending ongoing technology procurement and pilot testing. If in the event that an individual member of the scheme exits the market, the other actors remaining within the scheme would receive the payout from the insurance scheme, effectively covering the cost of the `orphaned´ products. It would appear that the producer could theoretically leave the EAF system and go to another PRO and the EAF insurance structures would still pay out to another system.

EL-Kretsen/Nordic Guarantee

The current financing models used in El-Kretsen includes a per unit fee to manage the current costs to manage WEEE arisings as well as a ICT Model where each producer finances a proportion of the total monthly costs to collect and manage various IT products based on that producer's calculated market-share. These Pay as You Go (PAYG) financing models operate on the basis that the current costs to manage WEEE are divided proportionately to each producer's market share, and therefore new WEEE will be financed in a collective manner if this model is continued in the future.

El-Kretsen has now developed a financial guarantee solution on behalf of its members that can be classified as a collective bank guarantee. The solution is offered by Nordic Guarantee, an insurance company that specialises in surety bonds. According to Nordic Guarantee, the solution offered can be considered as secure as a traditional bank guarantee, without the demands for collateral, capital binding and unnecessary administration.

According to El-Kretsen the cost per annum to each producer for the bank guarantee would be approximately 1000 SEK (approximately 100 Euro) if all members signed up to the solution. El-Kretsen would use its reserve fund (150 MSEK) as part of the collateral for the bank guarantee solution. It claims that the total guarantee is adjusted yearly to reflect the cost of recycling, of all products placed on the market since 13 August 2005, with an average expected life cycle length of 8 years.

The agreement between El-Kretsen and Nordic Guarantee regarding the bank guarantee appears to be one whereby members (producers) agree to pay for the costs to manage both new and historical WEEE that is collected split based on current market share. In other words, members explicitly agree to finance the waste of other members

new WEEE (if one producer exits the market due to insolvency or ceases to operate while the scheme is in operation (reciprocal responsibility for orphaned WEEE)). However if the complete El-Kretsen scheme should collapse Nordic Guarantee would then cover any subsequently orphaned products, but the guarantee would no longer be valid to remaining solvent producers. In the event of the schemes collapse remaining solvent producers would need to form new guarantees, including retroactively for those products put on the market since August 13, 2005.

Similarly if a producer chooses to leave El-Kretsen, whilst still solvent, the bank guarantee will no longer be valid for the products it placed on the market since August 13, 2005 and therefore that producer must make new arrangements for the guarantee. It is not clear what happens concerning the El-Kretsen reserve fund, whether a producer leaving the scheme could take their part of the funds with them and its not clear what impacts this would have on the El-Kretsen fund. In other words the El-Kretsen guarantee solution does not allow the producer mobility. As the original proposal was based on the assumption that all members of El-Kretsen would choose the solution, it is uncertain at the moment how the choice of certain sectors (such as the white goods – see below) to develop their own guarantee has impacted the viability of the solution.

White Goods Recycling in Sweden AB

Vitvaror Återvinning i Sverige (White Goods Recycling in Sweden AB) shareholders represent nearly 95% of all large household appliance sales and 60% of small household appliances sales on the Swedish Market.

Approximately 20 shareholders from major white goods producers have established a company that manages funds to be used as a guarantee to ensure that the future costs of products placed on the market after 13 August 2005 will be financed (Category 1 & 2 only). This solution serves as financial guarantee only, meaning that the fund is not used directly to finance the current costs of recycling products in a compliance scheme (but it could be used to cover such costs if the producer so chose). Each of the company shareholders retains its own account within the company where it is required to have sufficient funds to cover expected future costs of recycling all its products placed on the market since August 13, 2005. Since the costs to manage white goods will not arise for an expected time of 15-20 years (life cycle used for large household appliances) or 8-10 years (life cycle used for small household appliances) the company has determined that 40 MSEK growing to 60 MSEK by the end of 2008 will be sufficient to cover the future costs of managing these products given the cost structures of managing these products today and reasonable expectations for future costs. In fact, for certain large household appliances, white goods producers are currently paying no fees to manage their historical products.

Currently, all shareholders of White Goods Recycling in Sweden AB are also members of El-Kretsen, the collective compliance scheme managing producer responsibility requirements of its member's historical and new WEEE obligations. The current financing models used in El-Kretsen for Category 1&2 (large and small household appliances) include a per unit fee to finance the current costs to manage WEEE arisings, although for large household products (non-refrigeration) the cost is currently zero.

Therefore, if one of the 20 producers in Vitrvaror Återvinning I Sverige AB were to exit the market, the funds earmarked to manage the future costs could be designated to a collective recycling scheme to manage the insolvent producer's waste products in the coming years. The details of how and when these funds would be available to the collective recycling system (El-Kretsen in this case) are currently unknown.

Affordability of Financial Guarantees

As stated above, many stakeholders have been concerned that financial guarantees will place a large financial cost on producers. Oekopol (2007 p211) explains that the cost of financial guarantees can lead to a barrier being created for producers who wish to move to IPR:

"Implementing this measure [PR] through individual guarantees is likely to incur significant costs for producers, due to the high cumulative costs of the guarantees. The use of collective insurance schemes, as in Germany, provides a lower cost option. This would not remove the potential barrier to establishing individual schemes; however, companies wishing to establish their own schemes may find lower costs solutions for their individual circumstances. The benefits of this option are difficult to quantify and it is therefore uncertain as to whether this measure could be justified in practice."

However Table 4.1 provides a comparison of the costs of an individual guarantee system (Elektronikåtervnningsföreningen) and a collective scheme (El Kretsen) in Sweden for four products that the system manages. This shows that for certain products, such as laptops and TVs the costs of Elektronikåtervinningsföreningen are higher than El Kretsen, and therefore providing a financial guarantee is more expensive. However for washing machines the costs are comparable and for vacuum cleaners the costs of the Elektronikåtervinningsföreningen system are lower than the costs of El Kretsen.

Table 4.1: Fee charged for management of historical products as well as financial guarantee and future end-of-life management of new products under Elektronikåtervinningsföreningen and El-Kretsen in 2007 (in SEK)

	Elektronikåtervinningsföreningen		El- kretsen	
	Management of historical WEEE	Financial guarantee and future management of new WEEE	Management of historical WEEE	
			February 1 2007-July 1, 2007	From July 1, 2007
Washing machine	3.50	3.04	5	0
Vacuum Cleaner	6.25	4.53	15[27]	15[28]
Laptop computer	6.12 (per unit)	4.44 (per unit)	2.2 (per kg)	2.2 (per kg)
TV 32 inch	75.60	71.13	100	120

4.4 Summary

This chapter shows that a series of technologies are evolving which may in time provide a cost effective means to sort and segregate WEEE according to brand, however the economic feasibility and infrastructure requirements are at present not possible to assess. Several research projects are in development in order to investigate the applicability of RFID to WEEE recycling systems.

A selection of guarantees have been developed in Sweden for end of life vehicles and now for WEEE. These instruments are continuing to evolve in order to provide the market

[27] Includes financial guarantee for new WEEE
[28] Ibid

with affordable solutions. For certain products these financial guarantees are cost comparable or lower cost than the existing collective arrangements.

5. RECOMMENDATIONS AND CONCLUSIONS

5.1 Summary

This report has presented the preliminary findings of the INSEAD Working Group on IPR. The report is meant to be input for further policy and academic discourse on IPR.

This report indicates that there are a range of feasible approaches already attempting to take account of producer's brands. Not all of these approaches, such as 'return share' achieve IPR, whereas others may not be practical for the European context (such as Japan). This does not mean that the aim of IPR cannot be achieved, and it may be possible to develop a system providing design incentives to producers while not accounting for their brands (as exists now for packaging). Nevertheless it remains important that research, development, and the recycling market itself be allowed and encouraged to develop further solutions and approaches.

The following table provides an overview of the adoption of brand-based approaches within different countries:

Example	Form of brand-based system	Scope	Operation
1. Japanese Specified Home Appliances Recycling Law (SHARL)	Brand separation and collection	Televisions Refrigerators Washing machines Air conditioners	End users pay a logistics and recycling fee at the point of disposal. The fee is collected by retailers and managed by individual companies, through the management of a common "recycling ticket centre". This accompanies the product through the recycling chain, enabling the traceability of individual waste products. Producers operate the recycling plants which enables feedback from own recycling operations to product design. From the money collected producers pay the recycling plants depending on how many products are treated at the respective plants.
2. Japan: PC Recycling System	Separate collection of different brands	Desktop PC Laptop CRT Displays LCD Displays	Products returned by end user through postal system direct to the producers own recycling plant. No recycling fee charged for the products marked with "PC Recycling Mark". Therefore producers operate the

			recycling plant and only pay for the recycling of their own branded products.
3. ICT Milieu, The Netherlands (1999-2003)	Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling	WEEE Directive Category 3 products: ICT, printers and telecommunications equipment	Until 1 January 2003, individual producers received a monthly invoice directly from the recycler based on the weight of the recycled products. Each waste product was weighed on a scale and the brands were visually identified. Each unit was assigned to a manufacturer and logged using a touch screen panel.
4. Maine: Return Share by Brand Sorting	Counting & weighing of each branded product collected, with the option to sort individual brands for separate recycling	Only household products are included. Displays over 4" including televisions and computer monitors	Municipalities collect WEEE and pass it to a consolidator. Every product is counted and weighed. Manufacturers required to choose in their recycling plan the method of payment for brand responsibility: Manufacturers can either collect a representative pile of WEEE from consolidator and undertake recycling; or pay the consolidator to undertake the recycling including a share of orphans; or have branded product separated including a share of orphans.
5. Washington State: Return Share by Brand Sampling	Counting and weighing of branded products based on a sample of WEEE collected	Any monitor, TV or other video display over 4" Desktop computers Laptop computers	Manufacturers must register with Department of Ecology. The law directs Department of Ecology determines the return share for each manufacturer from the Brand Data Management System developed by the National Centre for Electronics Recycling (NCER). Future years return share to be determined by sampling. Guidance, sample size and procedure developed by NCER. Manufacturers may join Standard Plan to finance central recycling programme or may start an independent plan on own or with others (if combined return share above 5%)

An evaluation of these approaches suggests that brand-based approaches match the collection performance of CPR. Systems fulfilling IPR requirements in Japan have matched or exceeded collection levels achieved by CPR systems in Europe. The evaluation also suggests that both brand-based approaches and CPR systems are able to deliver high levels of recycling. In both Europe and in Japan the recycling systems have achieved and exceeded the national recycling targets. However variations in the method in which recycling levels are calculated, for example energy recovery does not count towards recycling levels in Japan, makes a direct comparison difficult.

CPR systems provide few clear incentives for producers to design products to be easier to recycle, whereas an examination of IPR systems revealed that the Japanese e-waste

recycling system has led to a series of tangible improvements in the design of products to improve their reyclability.

Policy makers are also concerned about practical implementation. One concern is that IPR would lead to increased levels of orphan waste. This concern seems to be misplaced given that orphaned products constituted roughly 5% of the recycled products in Japan. In Maine orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This contrasts with current levels of free riders within European CPR systems of between 10-20%.

While these approaches are interesting, further research and development is needed in determining next steps and possible directions to ensure in the future EPR for WEEE can provide incentives for design of products easier to treat and recycle at end-of-life.

5.2 An Approach to Implementing IPR

While recognising that CPR is appropriate for handling historic waste (i.e. waste that is placed on the market prior to 13 August 2005), producers should be able to move towards systems that implement IPR, whereby each producer will be liable for financing the treatment and recycling of their own waste products.

This report demonstrates, using practical examples from around the world, that brand-based approaches are in fact perfectly practical and feasible. It also shows that there are different degrees to which a producer may be made responsible for their own products. From the analysis of the case studies it is possible to derive a number of clear principles for the adoption of IPR (as also shown in Figure 1).

- Firstly, producers should be credited for their own individual collection efforts. This is already possible in many CPR systems, and there is no reason this cannot be extended as a requirement of all national implementations. Allowing producers to exercise degree of freedom of enterprise must be at the heart of any economic / market instrument of government policy, to allow market forces to operate and to enable new services and technologies to be developed.

- Secondly, producers should only be responsible for paying for their share of products in the waste stream in future. There are now several examples where this is achieved, to a degree, by counting or sampling brands to derive a "return share" responsibility. While this return share does not allow differentiation on the recyclability of products as yet, it does demonstrate that schemes can indeed operate "collectively" in a system while assigning a financial responsibility to producers "individually" according to brand. Under a system of return share, financing for waste would be based on the proportion of the producer's products in the waste returned, calculated either by sampling or by counting all the received branded products.

- Finally, in order to fully implement IPR, producers will need to be able to participate in systems that provide recycling or payment for, or representative of, the actual recycling costs of their own products. Again, the case studies all show that these approaches are not only feasible, but already implemented in practice. This can be through differentiation at the recycling plant (as in Japan), or through the premium that producers pay in the form of guarantees or recycling insurances (as in Sweden).

5.3 Recommendations for Policy Makers

The first element that needs attention is the lack of correct transposition and implementation of the concept of IPR through the European member states' national WEEE laws. The WEEE directive itself encompasses the concept of IPR through Article 8.2. In ten EU member states this article has been ignored. This phased approach needs to be accompanied by an implementation strategy by each Member State. The following is an indicative list of the actions by policy makers needed to enable IPR:

R1.	*European Commission to ensure full tranposition into Member State legislation of Article 8.2 of the WEEE Directive*

R2.	*Member State guidance needs to be amended to recognise split between historic and future WEEE, and to enable producers to implement IPR.*

R3.	*Depending on the preferred method of implementing IPR, guidance needs to determine the methodologies for compliance schemes to determine producers share of responsibility under IPR and determine the approach of the Member State towards financial guarantees and grey imports.*

5.4 Recommendations for Producers and Compliance Schemes

The following actions are recommended in order to develop a practical system to enable IPR:

R4.	*Compliance schemes to evaluate the range of existing and new options to ensure the principles necessary for IPR can be fulfilled.*

R5.	*Compliance schemes and Producers can then determine the best implementation plan to ensure producers are only responsible for their own products in WEEE, and the transition time from CPR to IPR.*

R6.	*Producers who wish to comply via IPR to notify Member State and ensure appropriate evidence is provided to demonstrate compliance.*

R7.	*Compliance schemes implement new procedures to identify, sort, or sample products by brand, and fees which are differentiated based on product characteristics where this is specified within the rules defined for the IPR system.*

5.6 Recommendations to Overcome Key Strategic Issues

The key first step to the proper implementation of IPR is to transpose Article 8.2 of the Directive. In implementing IPR there are a number of strategic issues that require further consideration. This section examines these issues and proposes recommendations in order to resolve them.

Distinguishing Future WEEE

IPR only applies to 'future WEEE', that is WEEE related to products placed on the market after 13th August 2005. There is no legal mandate to apply IPR to historic WEEE. This presents a challenge as CPR should be applied to historic WEEE and IPR applied to future WEEE.

There are two options to enable producers to take responsibility for future WEEE. Firstly CPR systems could be applied to historic WEEE and IPR systems applied to future WEEE. The WEEE marking crossed out wheelie bin symbol can be used to identify that a product is future WEEE. However attempting to sort products into historic and future WEEE could be challenging.

Alternatively sampling can be used to determine when the waste stream is predominantly comprised of future WEEE. At this point all WEEE can be dealt with as future WEEE. From sampling in Sweden approximately 30 per cent of waste collected was 'future WEEE'. Recent sampling studies have revealed that ICT in the waste stream is on average between 7 and 9 years old. This would imply a trigger date of 2012 to 2014 for IPR for category 3. This analysis needs to undertaken for each product category as product life times are different. The commencement date at which the switch over is made should be flexible for recycling systems/producers to determine themselves, dependent on the specific country and product category.

R8. Compliance Schemes to determine commencement date from which IPR systems will be operational.

It should be emphasised that this is not a recommendation to alter the legal requirements contained within Article 8.2 of the WEEE Directive. This is a recommendation for a possible practical approach which may be adopted b y compliance schemes.

Grey Imports

Grey imports are products imported by entrepreneurs exploiting the lower price of a product elsewhere in the world. Because of the nature of grey markets, it is difficult or impossible to track the precise numbers of grey market sales. It is difficult to distinguish between grey imports and products sold by producers registered within a Member State. Grey imports, however, can be distinguished from producer sold WEEE by reference to their model number, and serial number. However attempting to allocate individual products to grey importers based on reading the serial number on a product would be an extremely complicated process. On a practical level producers are now turning to customs and excise information on products imported to identify producers that are non-compliant. Such an approach could also assist under an IPR system.

R9. There are two feasible alternatives to handle grey imports:
a. Producers take responsibility for grey imports related to their brand;
b. Importers continue to take a market share responsibility for grey imports, with producers able to take a return share responsibility.

Financial Guarantees

Article 8.2 of the WEEE Directive requires producers to establish a financial guarantee to cover the future recycling costs of products it places on the market. This ensures that if a producer disappears from the market, for example if it goes out of business, other actors are not required to finance the recycling of these products.

Oekopol (2007), found that most Member States interpret membership in a collective compliance scheme to be an appropriate guarantee for new WEEE obligations whereas producers that wish to comply individually, must either have a blocked bank account or recycling insurance to satisfy the guarantee requirement. This would mean more financial burden for producers choosing to set up an individual system or limited brand compliance scheme. This has been cited by producers a key barrier hindering the development of IPR.

Oekopol identify that the costs for products of this measure may be high. The availability of affordable financial guarantee solutions is a key challenge in implementing IPR. However Section 4.3 of this report illustrates that price competitive financial guarantee instruments are evolving in response to legislative requirements.

R10. In order to ensure a level playing-field, the requirements for a financial guarantee should be the same for producers choosing to join a collective scheme and producers choosing to develop individual systems of compliance.

Product Categories

IPR may not be more applicable for certain WEEE categories. ICT has been identified as a category which is well suited to IPR. Within this category the dynamic nature of product design would strengthen the incentives provided by IPR. In addition the variability in the design quality of ICT means that it is desirable for environmental reasons to apply IPR to this product category. However ICT is not currently collected separately, but instead collected with other WEEE including small household appliances, CRTs, consumer equipment and tools. Producers of these other products may not wish to have IPR applied to these products. Therefore it may be desirable to establish a separate collection group for ICT and apply IPR to this new collection group.

Definition of categories will no doubt play an instrumental role in ensuring producers pay for the recycling costs of their own products. Mixing of broad categories, as today, only serves to weaken the association of each producer with the actual costs of recycling their products.

R11. Producers wishing to finance recycling of only own products, or recycle only own products should be able to do so and should not be prevented or disadvantaged from taking this approach.

R12. Compliance schemes should consider the establishment of specific product categories and apply individual recycling or financing to these groups.

Orphan WEEE

The ICT Milieu return share system before 2003 was criticised for generating a high level of orphan waste. In Maine, whose return share system is closely comparable to ICT Milieu, orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This lower figure is attributable to stronger enforcement through banning the sale of brands that are not registered to a producer that is compliant with the producer responsibility law. In all return share systems orphan WEEE is financed by producers on a pro rata basis, based on their return share. However with the implementation of suitable financial guarantees the occurrence of orphan waste should be reduced if not eliminated.

R13. Orphan waste should be prevented by proper enforcement (eg many existing regulations ban the sale of brands that are not registered to a producer that is compliant with the producer responsibility law).

R14. Recycling of WEEE of orphan products, produced after 13 August 2005, should be financed by the guarantees that are required by Article 8.2 of the WEEE Directive.

5.7 Conclusions

Without actions to implement IPR the incentives provided by IPR to improve the design of electrical and electronic products will be absent, undermining one of the key objectives of the WEEE Directive.

In overall conclusion, this report provides a number of examples of brand-based approaches in practice and demonstrates that IPR can work (based primarily on experiences in Japan). Establishing incentives for improved design is the reason and main justification for IPR. Therefore it is very important to retain requirements specifying a producer's individual responsibility for "future waste" within the WEEE Directive (Article 8.2). IPR should not be considered as an optional and impractical approach, but a fundamental and achievable requirement in further need of development and implementation.

APPENDICES

A1 Frequently Asked Questions
A2 Contributors to the Report

A1 FREQUENTLY ASKED QUESTIONS

A.1 What is IPR

"Individual producer responsibility encourages competition between companies on how to manage the end-of-life phase of their products. This in turn drives innovation, such as in business models, take-back logistics and design changes, to reduce the environmental impact of products at the end of their life."
(Joint Statement by a group of Industry and NGOs on Producer Responsibility for Waste Electrical and Electronic Equipment, March 2007[29])

Individual Producer Responsibility (IPR) is a policy tool that provides incentives to producers for taking responsibility of the entire lifecycle of his/her own products, including

[29] www.iprworks.org

end of life. Article 8.2 of the European WEEE (Waste from Electrical and Electronic Equipment) Directive establishes individual producer responsibility for the recycling of products put on the market after 13 August 2005. Making each producer responsible for financing the end-of-life costs of their own-branded products enables end-of-life costs to be fed back to the individual producer. By modifications to the product design, the producer can directly influence the end of life cost. Without Individual Producer Responsibility these incentives for design improvements are lost.

OECD defines EPR (extended producer responsibility) as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. An EPR policy is characterised by:

- the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and
- the provision of incentives to producers to take into account environmental considerations when designing their products.

While other policy instruments tend to target a single point in the chain, EPR seeks to integrate signals related to the environmental characteristics of products and production processes throughout the product chain.

A.2 How does the WEEE Directive include IPR?

Recital 20 and Article 8 of the WEEE Directive clearly communicate the individual producer responsibility concept, though not using these words specifically.

Box A.1: Recital 20 and Article 8 of the WEEE Directive

Recital 20

Users of electrical and electronic equipment from private households should have the possibility of returning WEEE at least free of charge. Producers should therefore finance collection from collection facilities, and the treatment, recovery and disposal of WEEE. In order to give maximum effect to the concept of producer responsibility, each producer should be responsible for financing the management of the waste from his own products. The producer should be able to choose to fulfil this obligation either individually or by joining a collective scheme. Each producer should, when placing a product on the market, provide a financial guarantee to prevent costs for the management of WEEE from orphan products from falling on society or the remaining producers. The responsibility for the financing of the management of historical waste should be shared by all existing producers in collective financing schemes to which all producers, existing on the market when the costs occur, contribute proportionately. Collective financing schemes should not have the effect of excluding niche and low-volume producers, importers and new entrants. For a transitional period, producers should be allowed to show purchasers, on a voluntary basis at the time of sale of new products, the costs of collecting, treating and disposing in an environmentally sound way of historical waste. Producers making use of this provision should ensure that the costs mentioned do not exceed the actual costs incurred.

Article 8

Financing in respect of WEEE from private households

1. Member States shall ensure that, by 13 August 2005, producers provide at least for the financing of the collection, treatment, recovery and environmentally sound disposal of WEEE from private households deposited at collection facilities, set up under Article 5(2).

2. For products put on the market later than 13 August 2005, each producer shall be responsible for financing the operations referred to in paragraph 1 relating to the waste from his own products. The producer can choose to fulfil this obligation either individually or by joining a collective scheme.

Member States shall ensure that each producer provides a guarantee when placing a product on the market showing that the management of all WEEE will be financed and that producers clearly mark their products in accordance with Article 11(2). This guarantee shall ensure that the operations referred to in paragraph 1 relating to this product will be financed. The guarantee may take the form of participation by the producer in appropriate schemes for the financing of the management of WEEE, a recycling insurance or a blocked bank account.
The costs of collection, treatment and environmentally sound disposal shall not be shown separately to purchasers at the time of sale of new products.
3. The responsibility for the financing of the costs of the management of WEEE from products put on the market before the date referred to in paragraph 1 (historical waste) shall be provided by one or more systems to which all producers, existing on the market when the respective costs occur, contribute proportionately, e.g. in proportion to their respective share of the market by type of equipment.
Member States shall ensure that for a transitional period of eight years (10 years for category 1 of Annex IA) after entry into force of this Directive, producers are allowed to show purchasers, at the time of sale of new products, the costs of collection, treatment and disposal in an environmentally sound way. The costs mentioned shall not exceed the actual costs incurred.
4. Member States shall ensure that producers supplying electrical or electronic equipment by means of distance communication also comply with the requirements set out in this Article for the equipment supplied in the Member State where the purchaser of that equipment resides.

Article 8 of the WEEE Directive distinguishes between 'future' and 'historic' WEEE. The Directive states that producers should be collectively responsible for financing historic WEEE, that is products put on the market before 13th August 2005. This is because it is not possible for producers to influence the design of products that have already been produced. For 'future' WEEE, design changes can make products easier to disassemble, more recyclable and less harmful to the environment. Therefore the WEEE Directive states that for future products producers should be responsible for financing the recycling of their own-branded products.

Therefore Article 8.2 of the WEEE Directive establishes an Individual Producer Responsibility for 'future' WEEE, obliging producers to finance the costs of recycling their own products. Making each producer responsible for financing the end-of-life costs of their own-branded products enables end-of-life costs to be fed back to the individual producer. By modifications to the product design, the producer can directly influence the end of life cost.

A.3 Is the WEEE Directive intended to promote design for recycling?

Yes this is one of the main objectives of introducing the Directive. Article 8.2 establishes individual producer responsibility for the recycling of products put on the market after 13 August 2005. The full text of Article 8 of the Directive is available in the Box at the end of this document. The principle of individual producer responsibility is recognised as an important tool in encouraging producers to have regard to the end-of-life management of their products at the stage of product design. Individual Producer Responsibility (IPR) provides a competitive incentive for producers to design their products so that they are easier and therefore cheaper, to recycle. The European Commission's Explanatory Memorandum (2000[30]) states:

[30] Proposal for a Directive of the European Parliament and of the Council on Waste Electrical and Electronic Equipment, Proposal for a Directive of the European Parliament and of the Council on

Producers should take the responsibility for certain phases of the waste management of their products. ***This financial or physical responsibility creates an economic incentive for producers to adapt the design of their products to the prerequisites of sound waste management****. (p6)*

Producers of electrical and electronic equipment design the product, determine its specifications and select its materials. ***Only producers can develop approaches to the design and manufacture of their products to ensure the longest possible product life*** *and, in the event that it is scrapped, the best methods of recovery and disposal. (p11)*

Without Individual Producer Responsibility these incentives for design improvements are lost. Producers are not rewarded for making their producers easier to recycle as the end of life costs are related to market share of sales rather than the costs of end of life management of producer's products.

Individual producer responsibility also encourages competition between companies over how to manage the end-of-life phase of their products. This in turn drives innovation, including in product design and take-back logistics, as companies work to reduce the environmental impact and cost of their products at the end of their life.

A.4 Article 8 does not mention an economic incentive or reward?

This is not specifically mentioned in article 8, but it is the consequence and objective of the individual responsibility as formulated in article 8.2.

A.5 Don't manufacturers have an incentive to design appliances for easier recycling with a collective producer responsibility?

No. In fact the opposite may be the case. With collective producer responsibility there is no differentiation of the recycling costs according to how easy the product is to recycle. The costs are based upon the market share of the producer. Therefore the costs of recycling will be the same for a product that has been designed to be easier to recycle, and a product that is much more difficult to disassemble and recycle.

If recycling costs are financed collectively (e.g. according to market share), manufacturers are more likely to focus only on, and minimise, the production costs. If recycling costs are increased due to a particular design modification, this would not be of financial concern to one producer, as the increased costs of recycling would be absorbed jointly by all producers.

Therefore collective responsibility - where all producers are jointly responsible for the recycling of all products, including the products sold in the future - does not provide an incentive to a producer to design products to be easier to recycle.

A.6 The WEEE Directive states that producers can choose between individual or collective recycling systems. Does that mean that they can choose between individual and collective producer responsibility?

No it does not. The Directive states that the producer can fulfil its obligation by participating in a *collective or an individual recycling scheme*. This is the operational part, not the legal obligation. In relation to products placed on the market after 13

the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, COM (2000) 347 final

August 2005, the WEEE Directive states that producers are responsible for financing the management of waste from "his own products".

Therefore the WEEE Directive requires that for products placed on the market after 13 August 2005, producers are financially responsible for their own products, rather than collectively financing these costs. However producers have a choice between establishing individual producer responsibility collective collection systems.

A.7 What is the difference between Producer Responsibility (individual and collective) on the one hand and Recycling Systems (individual and collective) on the other hand?

There is a common misunderstanding that IPR implies that each producer needs to have a separate infrastructure for the collection and treatment of their own brand WEEE. This is not the case. Producers should be individually responsible for the recycling of the products produced in the future and have a possibility to work together to manage WEEE in collective or individual recycling systems.

Individual and Collective Producer Responsibility

For products put on the market after 13 August 2005, each producer shall be responsible for **financing the operations referred to in paragraph 1 relating to the waste from his own products**. The producer can choose to fulfil this obligation either individually or by joining a collective scheme.

The responsibility for the financing of the costs of the management of WEEE from products put on the market before the date referred to in paragraph 1 (historical waste) shall be provided by one or more systems to which all producers, existing on the market when the respective costs occur, contribute **proportionately, e.g. in proportion to their respective share of the market by type of equipment**.

Individual and Collective Recycling Systems

An "individual recycling system" is a recycling system managed by only one producer. An "individual recycling system" is not equal to "individual producer responsibility".

A "collective recycling system" is a recycling system organised by several producers working together to manage WEEE. A "collective recycling system" is not equal to "collective producer responsibility".

A.8 Who will take care (finance the recycling) of the waste in case a producer goes out of business?

Article 8.2 of the WEEE Directive requires producers to establish a financial guarantee to cover the future recycling costs of products it places on the market. This ensures that if a producer disappears from the market, for example if it goes out of business, other actors are not required to finance the recycling of these products. The objective of the

guarantee is explained in Recital 20 found in the Box at the end of this document.

A.9 Why are financial guarantees relevant to Individual Producer Responsibility?

The specific type of guarantee needed will depend on the specific details of each recycling operation once implemented. To be effective, a financial guarantee must ensure that the costs of collection and treatment of a producer's products in WEEE neither falls on producers that did not produce them or the public. In addition financial guarantees should not be set up in a way that prevents producers from establishing take-back and recycling processes in which they are financially responsible for their own products in future waste.

Some Member States have transposed the requirement for a financial guarantee so that membership in a collectively organised compliance scheme provides sufficient guarantee. This is not necessarily an appropriate guarantee. This depends on whether the guarantee is sufficient to prevent the cost of WEEE falling on other companies or society, if some of the producers leave the scheme.

A.10 How did you identify which MS have or have not transposed Art. 8.2 correctly (in such a way as to drive design for recycling)?

We studied the national Member State legal texts transposing the WEEE Directive to determine whether countries have established that "each producer is (financially) responsible for the recycling of the products he put on the market after 13 August 2005".

The table below is an assessment of WEEE financing in national legislation.

Country	**Inclusion of individual financing of future WEEE [31]**	
	Reference to national text	Assessment
Belgium (Flanders)[32]	3.5.1A. (1)	√
Belgium (Brussels)[33]	35(1)	
Cyprus[34]	8 (2)	
Czech Republic[35]	37n(1)	

[31] Article 8.2: "For products put on the market later than 13 August 2005, each producer shall be responsible for financing the operations referred to in paragraph 1 relating to the waste from his own products."

[32] Belgium (Flanders): VLAREA – Consolidated Version (updated to 14 July 2004)

[33] Belgium (Brussels): 18 JULY 2002.- Order of the Brussels Regional Government introducing a take-back obligation for some waste materials for the purpose of the useful application or elimination thereof

[34] Cyprus: EU Par III(I)O. 3888 30.7.2004, KDP 668/2004, Number 668: The Hazardous Waste (Solid Waste from Electrical and Electronic Equipment) Regulations 2004, issued by the Council of Ministers under the provisions of article 5 of the Hazardous Waste (Solids) Act 2002, after submission to and approval by the House of Representatives, have been published in the Cyprus Government Gazette in accordance with article 3 (3) of the Approval of Parliament (Regulations) Act, statute 99 / 1989 as varied by statute 227 / 1990.

[35] Czech Republic: 106 THE PRIME MINISTER promulgates full wording of Act No. 185/2001 Coll., on waste and amending some other laws, as follows from amendments introduced by Act No. 477/2001 Coll., Act No. 76/2002 Coll., Act No. 275/2002 Coll., Act No. 320/2002 Coll., Act No.

Estonia[36]	26(1),(4) & 26[2](4)
Ireland[37]	16 (1) (a)
Italy[38]	11 (1)
Lithuania[39]	34[6] 1(2)
Luxembourg[40]	9(2)
Malta[41]	9. (1) (b)
The Netherlands[42]	5. Section 11 (1.)
Romania[43]	8(2)
Slovakia[44]	54e(1)
Sweden[45]	12

167/2004 Coll.,
Act No. 188/2002 Coll., Act No. 317/2004 Coll. and Act No. 7/2005 Coll. ACT on waste

[36] Estonia: Waste Act: Passed 28 January 2004 (RT1 I 2004, 9, 52), entered into force 1 May 2004. Amended by the following Acts:
08.02.2007 entered into force 12.02.2007 – RT I 2007, 19, 94;
31.05.2006 entered into force 30.06.2006 – RT I 2006, 28, 209;
16.06.2005 entered into force 10.07.2005 – RT I 2005, 37, 288;
22.02.2005 entered into force 03.04.2005 - RT I 2005, 15, 87;
14.04.2004 entered into force 01.05.2004 - RT I 2004, 30, 208.

Requirements and Procedure for Marking Electrical and Electronic Equipment, Requirements, Procedure and Targets for Collection, Return to Producers and Recovery or Disposal of Waste Electrical and Electronic Equipment, and Time Limits for Reaching Targets1: Regulation No. 376 of the Government of the Republic of 24 December 2004 (RT2 I 2004, 91, 628), entered into force 1 January 2005

[37] Ireland: S.I. No. 340 of 2005 WASTE MANAGEMENT (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT) REGULATIONS 2005

[38] Italy: Legislative Decree 25th July, 2005 – no. 151, Implementation of the Directives 2002/95/CE, 2002/96/CE and 2003/108/CE concerning the reduction of the use of hazardous substances in the electrical and electronic equipments as well as the disposal of wastes.

[39] Lithuania: Extract from the Law on Waste Management of the Republic of Lithuania
CHAPTER VIII(1) RIGHTS AND OBLIGATIONS OF PRODUCERS, IMPORTERS AND DISTRIBUTORS

[40] Luxembourg: A – No. 13, 31 January 2005, WASTE FROM ELECTRICAL AND ELECTRONIC EQUIPMENT, Grand Duchy regulation of 18th January 2005 on waste from items of electrical and electronic equipment and the restrictions on the use of certain of their hazardous components. Page 214.

[41] Malta: ENVIRONMENT PROTECTION ACT(CAP. 435) Waste Management (Waste Electrical and Electronic Equipment) Regulations, 2004

[42] The Netherlands: WEEE management decree, DECREE OF july 6, 2004, establishing rules for the management of waste electrical and electronic equipment and for the use of certain hazardous substances in electrical and electronic equipment (WEEE Management Decree)

[43] Romania: GOVERNMENT DECISION no. 448/19.05.2005 (OJ no 491/10.06.2005)
on waste electrical and electronic equipment (WEEE)

[44] Slovakia: 733 ACT from December 2, 2004, by which the Act No. 223/2001 of Coll. On Waste and On Amendment of Certain Acts as amended by subsequent provisions and On Amendement of Certain Acts is amended

[45] Sweden: Swedish Code of Statutes 2005:09, Ordinance on producer responsibility for electrical and electronic products issued on 14 April 2005.

Austria[46]	7(3)	≠
Germany[47]	14(5) 1. or 2.	
Hungary[48]	15(1)(a)	
Poland[49]	28 (1)(1) & 62	
Belgium (Walloon)[50]	N/A	X
Bulgaria[51]		
Denmark[52]		
Finland[53]		
France[54]		
Greece[55]		
Latvia[56]		
Portugal[57]		
Slovenia[58]		

[46] Austria: Ordinance of the Federal Minister of Agriculture and Forestry, Environment and Water Management on Waste Prevention, Collection and Treatment of Waste Electrical and Electronic Equipment (WEEE Ordinance), BGBl. (Federal Law Gazette) II No. 121/2005

[47] Germany: Act Governing the Sale, Return and Environmentally Sound Disposal of Electrical and Electronic Equipment (Electrical and Electronic Equipment Act, or ElektroG) 1 of 16. March 2005

[48] Hungary: 264./2004 (IX.23.) governmental decree on taking back wastes of electric and electronic equipment

[49] Poland: Text of the Act concluded following the Amendments of the Senate Act of 29 July 2005 on Waste Electrical and Electronic Equipment

[50] Belgium: 10 MARCH 2005. - Order of the Walloon government modifying the Order of the Walloon government of 25 April 2002 instigating an obligation of recovery of certain waste items with a view to their enhancement of value or management.

[51] Bulgaria: DECREE No. 82 dated 10 April 2006, on the adoption of Regulation on the requirements to putting on the market of electrical and electronic equipment and treatment and transport of waste from electrical and electronic equipment

[52] Denmark: Statuatory order on management of waste electrical and electronic equipment (the WEEE Order) No. 664 of 27 June 2005

[53] Finland: Government Decree on Waste Electrical and Electronic Equipment (852/2004)

[54] France: Decree n° 2005-829 of 20 July 2005 relating to the composition of electrical and electronic
equipment and to the elimination of waste from this equipment (Official journal of the French republic - 22 july 2005) NOR: DEVX0400269D

[55] Greece: 5 March 2004, PRESIDENTIAL DECREE No 117, Measures, terms and programme for the alternative management of waste electrical and electronic equipment in compliance with the provisions of the Council Directive 2002/95 "on the restriction of the use of certain hazardous substances in electrical and electronic equipment" and Council Directive 2002/96 "on waste electrical and electronic equipment" of 27 January 2003".

[56] Latvia: The Cabinet of Ministers of the Republic of Latvia, Regulation No.736, Riga, 24 August 2004 (prot. No.50 29.§) Requirements for Labelling Electric and Electronic Equipment and Providing the Information Issued in accordance with Article 207 , Section two, Paragraph 1 and 4 of the Waste Management Law

[57] Portugal: Decree Law no. 230/2004, December 10

[58] Slovenia: Pursuant to the second paragraph of Article 19 and the third paragraph of Article 20 of the Environmental Protection Act (Official Gazette of the Republic of Slovenia no. 41/04) the

Spain[59]
UK[60]

Key
√ - as in WEEE Article 8.2
≠ - includes some differences from Article 8.2
X - not specified in national legislation

Country	Differences with national transposition of Article 8.2
Austria	Producers with individual guarantees must *sort* products by brand during collection (Article 7 [3] 1)
Germany	Producers may *choose* individual or collective historic financing for future waste (Article 14 [5])
Hungary	Mentions manufacturers bear responsibility for products manufactured "by him" but only defines responsibilities for historic waste (Article 15 [1] [a]).
Poland	Makes collective schemes responsible for future waste rather than producers (once producers are members of a collective scheme) (Article 62).

A.11 What are the problems with the current transposition of the WEEE Directive that will hamper design for recycling?

Analysis has shown that 12 Member States *(Belgium [Flanders and Brussels regions], Cyprus, Czech Republic, Ireland, Italy [pending operational decree to be published], Lithuania, Luxembourg, Malta, Romania, Slovakia, Sweden, and the Netherlands)* have incorporated into law provisions corresponding to Article 8.2 of the WEEE Directive. Such provisions enable the main objective of the Directive, i.e. to improve product design such as to enhance recycling.

Another 11 Member States *(Bulgaria, Denmark, Estonia, Finland, France, Greece, Latvia, Portugal, Slovenia, Spain, and UK)* have omitted this requirement of Article 8.2. Instead, the legislation in these countries makes producers jointly responsible for the recycling of future products, making it impossible to implement *individual* producer responsibility.

A.12 What are the consequences on the drivers of design for recycling of the poor transposition of the WEEE Directive?

The incentive to encourage producers to improve design is not provided within these national laws. This jeopardises meeting the Directive's objectives, which means that companies will not be financially rewarded for making products easier to recycle. These differences in national transposition cause different legal and financial exposures for the actors on the EU market.

Individual producer responsibility encourages competition between companies over

Minister for the Environment, Spatial Planning and Energy in agreement with the Minister for Economy issues the following DIRECTIVE on the management of Waste Electrical and Electronic Equipment

[59] Spain: ROYAL DECREE 208/2005, of 25 February, on electrical and electronic equipment and the management of the waste thereof.

[60] UK: 2006 No. 3289 ENVIRONMENTAL PROTECTION, The Waste Electrical and Electronic Equipment Regulations 2006: 12 December 2006

how to manage the end-of-life phase of their products. This in turn drives innovation, such as in business models, take-back logistics and design changes, to reduce the environmental impact of products at the end of their life.

A.13 What needs to be done to include the incentives for design for recycling?

The EC Treaty obliges each Member State to implement the WEEE Directive in such a way as to give full effect, in legislation and in practice, to the wording, object and purpose of the WEEE Directive and not to put in place any measure that would jeopardise the attainment of the Directive's objectives.

It is therefore crucial that the EU institutions and the Member States ensure that individual producer responsibility of article 8.2 is correctly transposed and implemented in national legislation.

A.14 Why not refer incentives for design for recycling to the Ecodesign for Energy-Using Products Directive?

The Ecodesign for Energy-Using Products Directive (EuP) is organised in such a way that it sets technical requirements on certain aspects for some specific products, while the WEEE directive, by establishing producer responsibly for recycling, the WEEE Directive provides an incentive for producers to improve the design of their products and thereby decrease the impact of their products at the end of life. EuP and WEEE are thereby different mechanisms that complement each other, rather than exist in conflict.

A.15 Should IPR be applied to all WEEE categories?

IPR may not be applicable or desirable for all WEEE categories. Producers wishing to opt for IPR should be able to do so and should not be prevented from complying through IPR, or disadvantaged from taking this approach.

A.16 How can own brand products be identified in the waste stream?

There are several ways to identify own brand products in the waste stream. Brand sampling, as adopted in Washington enables reliable return share percentages to be constructed through quarterly sampling. Alternatively products can be identified through a full brand count, as utilised in Maine and until 2003 in the Netherlands.

A.17 Where and how in the recycling chain can sorting take place?

If brand segregation is required there are several options available. In Japan for PC recycling, products are segregated at the point of collection, as branded producers are sent through the post system to producers own recycling facilities. In Maine sorting takes place after collection. A full brand count is used to construct the return share percentages of producers. This enables the segregation of individual branded products if requested by producers.

A.18 Does IPR lead to higher levels of free riding and orphan waste?

No. IPR merely makes the level of free riding and orphan waste transparent. CPR hides the level of free riding and orphan waste.

The level of free riding is influenced by the level of enforcement. The ICT Milieu return share system was criticised for generated a high level of orphan waste. In 2002, 35% of all equipment collected was orphan or free-rider products. As a result, the system was

changed for 2003. However despite moving to a market share based system, according to recent samples by ICT Milieu, orphan waste remains at 20-25 per cent in the Netherlands.

In contrast orphaned products constituted roughly 5% of the recycled products in Japan. In Maine, whose return share system is closely comparable to ICT Milieu, orphan waste constitutes 4.8 per cent of the total volume of electronic waste. This lower figure is attributable to stronger enforcement through banning the sale of brands that are not registered to a producer that is compliant with the producer responsibility law.

A.19 Won't IPR lead to lower collection levels, as argued by the UNU in their report?

There is no evidence that IPR leads to lower collection levels than CPR. Japan achieved 2.58 kg/inhabitant of category 1 products despite a narrower scope than the WEEE Directive. This matches or exceeds Austria, Czech Republic, Estonia, Hungary, The Netherlands, and Slovakia. Japan achieved 0.82 kg/inhabitant in category 4 despite narrower scope. This matches or exceeds Austria, Czech Republic, Estonia, Hungary, Ireland, Slovakia and closely matches the EU average (0.88 kg/capita).

For Category 1	Collection (kg/capita)	Scope
Japan	2.58	Data for fridges/freezers, air conditioners and washing machines
Czech R	0.14	Large cooling appliances Refrigerators Freezers Other large appliances used for refrigeration, conservation and storage of food Washing machines Clothes dryers Dish washing machines Cooking Electric stoves Electric hot plates Microwaves Other large appliances used for cooking and other processing of food Electric heating appliances Electric radiators Other large appliances for heating rooms, beds, seating furniture Electric fans Air conditioner appliances Other fanning, exhaust ventilation and conditioning equipment
Slovakia	0.35	
Estonia	0.48	
Hungary	0.91	
Austria	2.00	
Netherlands	2.59	
Belgium	2.99	
Euro average	3.11	
Finland	4.75	
Sweden	5.01	
Ireland	6.68	
UK	7.17	

In Maine collection levels of 1.41 kg per capita have been reported for 2007. The scope of the Maine legislation compares most closely to categories 3 and 4 of the WEEE Directive. However again the scope is much narrower than the WEEE Directive. Despite a narrower scope the IPR system in Maine has achieved collection levels that exceed or compare with Estonia, Czech Republic, Slovakia, Austria, Hungary, Ireland, The Netherlands and the European average.

Country	Cat 3	Cat 4	Collection (kg/capita)	Scope
Maine			1.41	CRT display monitors, TV sets, laptop computers and portable DVD players
Estonia	0.04	0.10	0.14	Centralised data processing:; Mainframes;

Czech R	0.12	0.05	0.17	Minicomputers; Printer units; Personal computing:; Personal computers (CPU, mouse, screen and keyboard included); Laptop computers (CPU, mouse, screen and keyboard included); Notebook computers; Notepad computers; Printers; Copying equipment; Electrical and electronic typewriters; Pocket and desk calculators; and other products and equipment for the collection, storage, processing, presentation or communication of information; by electronic means; User terminals and systems; Facsimile; Telex; Telephones; Pay telephones; Cordless telephones; Cellular telephones; Answering systems; and other products or equipment of transmitting sound, images or other information by telecommunications; Radio sets; Television sets; Videocameras; Video recorders; Hi-fi recorders; Audio amplifiers; Musical instruments.
Slovakia	0.05	0.20	0.25	
Austria	0.10	0.20	0.30	
Hungary	0.09	0.22	0.31	
Ireland	0.43	0.67	1.10	
Netherlands	n/a	1.18	1.18	
Euro averageEuro average	0.65	0.88	1.53	
UK	0.59	1.10	1.69	
Finland	1.44	1.30	2.74	
Belgium	1.16	1.64	2.80	
Sweden	2.54	2.36	4.90	

This suggests that brand-based approaches and CPR achieve comparable levels of collection rate. In Europe and Japan producers are not directly responsible for the collection of WEEE from households. Therefore it is likely that other factors, such as the extent of the collection infrastructure and consumer behaviour are the key determinants of collection rate.

Currently producers take responsibility for all separately collected WEEE. This would continue regardless of whether 'market share' or IPR is the predominant compliance mechanism.

A.20 What is the point of IPR when all WEEE ends up being shredded within the same recycling facilities?

The recycling of WEEE already varies significantly. In some countries substantial disassembly is currently undertaken prior to shredding. Such recycling processes will change over time and will respond to the demands placed on them. However without IPR, producers will not be rewarded for making their products easier to recycle. As described in 3.5 above, the opposite is the case, and it is financially attractive to decrease manufacturing costs and disregard the impacts this may have on end of life costs.

Barriers to increasing recycling rates could be overcome by IPR. For example plastic is one of the biggest problems. There are difficulties in the efficient recovery of plastic fractions due to the heterogeneity of the polymers present. IPR drives manufacturers to think about the plastics that they are using. In Japan, IPR has led design improvements including a greater homogeneity of materials, the separation of different types of plastics and a reduction in the number of components and screws improving the recyclability of these products[61]. Further, HP has reduced its use of different polymer types from 100s to only 5 on a global basis across the product range. This was driven by very sound business principles and could be extended further with greater individual responsibility.

A.21 How will you deal with grey imports?

Grey imports are products imported by entrepreneurs exploiting the lower price of a product elsewhere in the world. Because of the nature of grey markets, it is difficult or

[61] Naoko Tojo (2006) *EPR program for EEE in Japan: Brand Separation?* (Presentation to INSEAD WEEE Directive Series, 30 November 2006)

impossible to track the precise numbers of grey market sales. It is difficult to distinguish between grey imports and products sold by producers registered within a Member State. Grey imports can be distinguished by reference to their model number, and serial number. However in the immediate future this could prove to be a complicated process.

Therefore there are two feasible alternatives:

- Option 1: Producers take responsibility for grey imports related to their brand;
- Option 2: Importers continue to take a market share responsibility for grey imports, with producers able to take a return share responsibility.

Identification methods such as RFID could play a role in the long term to identify who the importer was thus allowing the cost to be borne by the importer and not the producer. Some producers will take full responsibility of their products at end of life regardless of if they were grey imported or not as they are the original producer of the product.

A.22 Will IPR be applied to historic WEEE?

No, there is no legal mandate to apply IPR to historic WEEE. As producers cannot alter the design of historic products it would not be sensible to apply IPR to these products.

There is thus a need to consider the operational shift from systems based on historic WEEE to those managing future WEEE. There are two options to enable producers to take responsibility for future WEEE. Firstly sampling can be used to determine the proportion of the producers return share which is comprised of future WEEE. The WEEE marking crossed out wheelie bin symbol can be used to identify that a product is future WEEE.

Alternatively sampling can be used to determine when the waste stream is predominantly comprised of future WEEE. At this point all WEEE can be dealt with as future WEEE. Recent sampling studies have revealed that ICT in the waste stream in on average 9 years old. This would imply a trigger date of 2014 for IPR for category 3.

A.23 What evidence is there that Individual Producer Responsibility leads to design improvements?

In Japan the IPR system has led to the following benefits[62]:

- Use of Design for Environment assessment tools including end-of-life phase
- Marking of materials and locations for ease of dismantling
- Homogeneity of materials (plastics, magnetic alloys)
- Reduction of the number of components and screws
- Standardisation of screws
- Use of recycled plastics in new components
- Development of recycling technologies
- Separation of various types of plastics
- Tools for ease of manual dismantling
- Communication between recyclers and designers

In Europe IPR has not been possible as Article 8.2 of the WEEE Directive has not been transposed by 10 Member States. This has impeded the ability of the WEEE Directive to influence product design. This was recently confirmed by Ecolas/RPA in their study for the European Commission[63].

[62] Naoko Tojo (2006) *EPR program for EEE in Japan: Brand Separation?* (Presentation to INSEAD WEEE Directive Series, 30 November 2006)

[63] Arcadis, RPA (2007) *Study for the Simplification of RoHS/WEEE Directive: Draft Final Report*

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