



TOTAL ENVIRONMENT CENTRE



# ReByte!

**Setting the Bar for**

**Computer Take-Back**

April 2006



ReByte! has been developed by Total Environment Centre (TEC) as a model to assess industry proposals for the responsible management of end-of-life computers. It is written as an industry document to fulfill regulatory directions, a move that is supported by TEC

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## **Executive Summary**

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Australia's computer industry recognises it has a key role to play in better managing the environmental impacts of end-of-life computers and computer related equipment. ReByte! is a key step towards fulfilling that role. ReByte!'s aim is to establish the most efficient and environmentally effective scheme to address post-consumer computer waste. More specifically, the scheme aims to divert hazardous materials from landfill and increase the recovery of valuable resources found in computer equipment through refurbishment and recycling. The scheme's design has been informed by local and international trials and schemes, and aims to achieve, as a minimum, international best practice.

The case for the effective environmental management of end-of-life computers has been well made, is supported by a substantial body of research and is endorsed by the wider community. So too is the understanding that the producers of goods, being responsible for the initial product idea, design, marketing and advertising should take responsibility for the end-of-life impacts of those products. This understanding informs the design of the scheme.

The ReByte! scheme outlines several key aspects of the environmental management of end-of-life computers including:

- Purpose of the scheme
- Scope of the scheme
- Administration of the scheme
- Targets and timeframes
- Funding
- Regulation
- Approach to orphan products
- Approach to white box products
- Inclusion threshold
- Collection systems
- Materials recovery
- Reporting, transparency and stakeholder involvement

# 1. Introduction

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## 1.1 Background

Australia is one of the biggest users of information and communication technologies (ICT) in the world. As the 13th largest ICT market, the industry generated total incomes of \$90 billion in 2002-03.<sup>1</sup> It is no surprise, therefore, that the legacy of computer equipment waste is large and growing.

It is estimated that around 1.6 million computers have already been sent to landfills and 5.2 million computers are now in storage, awaiting disposal.<sup>2</sup> On top of this, around 2.4 million new computers are sold in Australia each year<sup>3</sup>, with most being disposed of between 3 and 15 years after purchase.<sup>4</sup> The NSW Department of Environment and Conservation (DEC) estimates that around one million computers reach end-of-life each year in NSW alone.<sup>5</sup>

Computers contain a range of hazardous materials including: mercury, arsenic, cadmium, PVC, lead, solvents, brominated flame retardants, acids and other hazardous materials. Each CRT monitor contains approximately 2 kilos of lead. Computers can also contain around 28 rare and non-renewable materials that are wasted when disposed of in landfill including: gold, platinum, silver, palladium and antimony.

Only a very small percentage of computers is currently recycled.<sup>6</sup> The majority of obsolete computers are either left in storage or dumped in landfills. Without a scheme for collection and recycling, computers will at some stage make their way to landfill where hazardous materials can leach into the environment, damaging environmental and human health.

Computer collection and recycling currently costs around \$25 per unit.<sup>7</sup> This is the market cost for recovery that does not necessarily address issues of externalities such as resource depletion and pollution that result from the manufacture of computers. The full environmental cost of computers is likely to be much higher. Neither cost is included in the current price of computers. The mismatch between recovery costs and computer prices has resulted in the lack of an appropriate incentive for reuse and recycling. As a result, only around

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1 Australian Information Industry Association website at <http://www.aiia.com.au>

2 Meinhardt Infrastructure and Environment, *Computer and Peripherals Material Project*, October 2001, p. ES2.

3 Meinhardt Infrastructure and Environment, *Electronic Waste Recycling Development Strategy for Victoria*, March 2004, p. 9.

4 Meinhardt Infrastructure and Environment, *Electronic Waste Recycling Development Strategy for Victoria*, March 2004, p. i.

5 Department of Environment and Conservation, Report on the implementation of the NSW Extended Producer Responsibility Priority Statement 2004, September 2005, p.15.

6 Meinhardt Infrastructure and Environment, *Computer and Peripherals Material Project*, October 2001, p. ES2.

7 Based on an average across sources including: actual price for collection and recycling charged by Dell Recycling at [www.dell.com.au/recycle/home](http://www.dell.com.au/recycle/home); Nolan-ITU for Department of the Environment and Heritage and Resource NSW, *Electrical and Electronic Products Infrastructure Facilitation*, January 2004, p. 54; Department of Environment and Conservation and Australian Information Industry Association, *Recycle IT!*, October 2004, p. 82, Appendix L; Sustainability Victoria's Byteback! trial, in Minister for the Environment, 'Thwaites Calls for National Computer Recycling Program Following Victorian Trial Success', 11 Nov 2005.

1.5% of computers are recycled by companies and individuals who voluntarily 'pay' to manage computer waste, with the need for data destruction a major driver in the corporate sector.<sup>2</sup> ReByte! addresses this problem by incorporating the cost of recycling into the price of a new computer.

Presently, most discarded computers are picked up by local councils and dumped in landfills or recycled by low-value metal recyclers. In addition to wasting resources and creating a legacy of hazardous waste, this places a burden on all rate-payers to fund the management of computer waste. As such, it is in conflict with the principle of user-pays as all rate-payers are not necessarily computer consumers. ReByte! deals with this problem by transferring the cost burden of computer waste from local councils and rate-payers to the consumers that buy computers.

## **1.2 Australia's Progress to Date**

Australia lags behind many countries that have requirements for the take-back and recycling of electronic equipment. Europe, Japan, China, Taiwan, Brazil, Argentina, Mexico and numerous US and Canadian states have effective regulated or voluntary industry schemes in operation. The most significant of these is the EU's Waste Electric and Electronic Equipment (WEEE) Directive which requires take-back and recycling of 4 kgs of electric or electronic equipment per person per year by manufacturers and importers.

Australia's electrical and electronics industry has been in consultation with state and Federal governments for many years on the establishment of a voluntary or regulated extended producer responsibility (EPR) or product stewardship scheme. In June 2005, the Australian Information Industry Association presented its report, 'E-Waste Program Development Phase' to the Environment Protection and Heritage Council (EPHC). Following feedback from various jurisdictions, ReByte! more thoroughly addresses the issue of the management of end-of-life computer waste.

ReByte! proposes the essential features of an efficient and environmentally effective product stewardship scheme for computers. These features would be necessary to fulfill obligations under a regulated scheme.

## **2. Purpose**

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The purpose of the ReByte! scheme is to take responsibility for and achieve a major increase in the collection and recycling of end-of-life computers. The scheme recognises that the most effective way of achieving this is to fund collection and recycling services through an additional component in the price of each new computer.

### **3. Scope**

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#### **3.1 Equipment**

Equipment collected, processed and recycled through the ReByte! scheme will include:

- Personal Computers (PCs) including Central Processing Units (CPUs)
- Monitors
- Printers and scanners
- Keyboards
- Mice
- External drives, servers and modems etc
- Cables

#### **3.2 Scheme Elements**

The scheme will take responsibility for and fund the following elements:

- Implementation and administration of a producer responsibility organisation (PRO) to run the scheme
- Collection and transportation of end-of-life computers from the commercial and residential sectors
- Repair and remanufacturing of computers, where possible
- Hi-value resource recovery from end-of-life computers
- Information flows between end-of-life recovery and product designers, and research and development of technologies and systems to improve design for environment and to remove hazardous/problematic materials
- Diversion of all hazardous computer wastes from municipal landfills
- Responsible management of residual wastes
- Responsible management of hazardous wastes
- Education about and promotion of scheme
- Data collection
- Annual public reporting
- Stakeholder engagement

### **3.3 Geographic Coverage**

The scheme will initially be available to consumers in Australia's largest metropolitan areas. After two years, the scheme will extend to all urban areas. After five years, the scheme will become available to all consumers of computer equipment, including consumers in remote and regional areas.

### **3.4 Temporal Coverage**

The scheme will cover:

- all products that reached their end-of-life before the start of the scheme (including orphan products and unbranded products); and,
- all products manufactured after the commencement of the scheme.

Orphan and historical products, including funding for their recovery, are discussed below in Sections 8 and 9.

## **4. Producer Responsibility Organisation (PRO)**

ReByte! will establish a PRO to carry out various roles. The main goal of the PRO will be to administer the scheme to achieve collection and recycling targets. The PRO will also manage stakeholder relationships, engage with government and actively seek continuous improvement in the scheme. The PRO will determine advance recycling fees (ARFs), establish and manage contracts with collection and recycling contractors, and implement promotional activities to raise awareness of the scheme.

PRO staff will need to be skilled in project management, financial management, logistics, communications and stakeholder engagement. The PRO will be a stand alone, not-for-profit organisation to ensure its independence and its focus on computer collection and recycling.

## **5. Targets and Timeframes**

The computer industry commits to ultimately achieving a 95% collection and recycling rate of computers sold from 2002 by 2022. For historic computers (including orphans), the industry commits to achieving a 95% collection and recycling target by 2012.<sup>8</sup> To ensure progress, the following intermediate milestones have been established:

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<sup>8</sup> High recovery rates can be attained where a back-log of stored items exists. This is evidenced by results of Taiwan's product stewardship scheme for tyres which increased recovery from 51% in 1991 to 105.64% by 1995.

**Table 1: Collection Targets for Recent and Historic and Computers (incl. orphans)**

	Collection Target 5 year old computers <sup>9</sup>	Collection Target Historic and Orphan Computers (cumulative)	Collection Target Historic and Orphan Computers (annual)
<b>2006</b>	+/- 1% <sup>10</sup>	+/-1% <sup>10</sup>	+/-1% <sup>10</sup>
<b>2007</b>	1%	5%	5%
<b>2008</b>	3%	15%	10%
<b>2009</b>	5%	35%	20%
<b>2010</b>	7%	60%	25%
<b>2011</b>	10%	80%	20%
<b>2012</b>	20%	<b>95%</b>	<b>15%</b>
<b>2013</b>	30%		
<b>2014</b>	40%		
<b>2015</b>	50%		
<b>2016</b>	60%		
<b>2017</b>	70%		
<b>2018</b>	75%		
<b>2019</b>	80%		
<b>2020</b>	85%		
<b>2021</b>	90%		
<b>2022</b>	<b>95%</b>		

These targets recognise both the immature state of current collection and recycling infrastructure and the backlog of computer equipment currently being stored.

It is estimated that most computers are being disposed of between 3 and 15 years after purchase<sup>4,11</sup>. The scheme will therefore not expect to achieve the 95% recycling rate until 2022. However, once the scheme is in place, it is expected that ownership duration will decrease due to awareness of recovery incentives under the scheme.

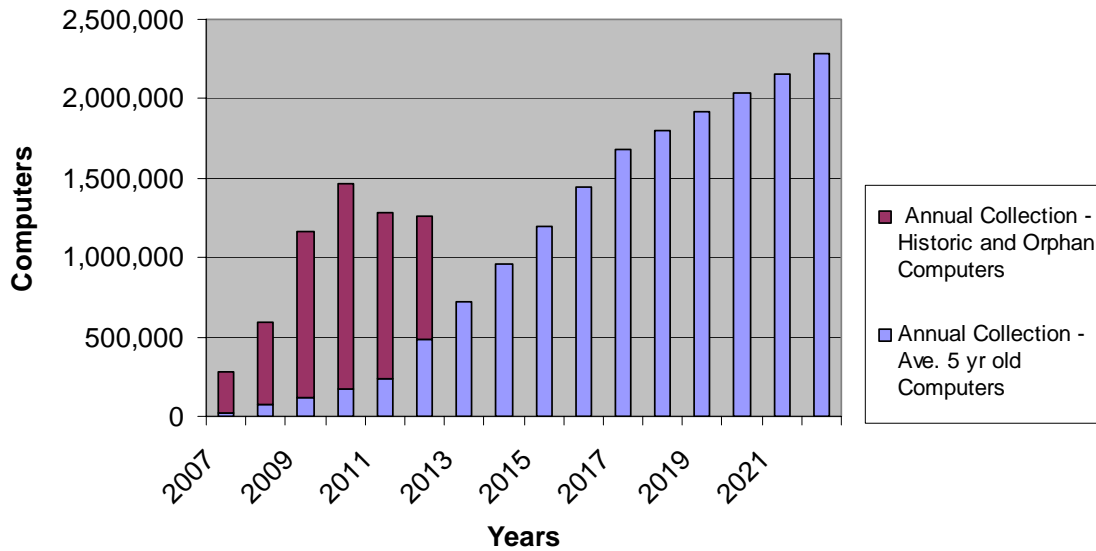
Graph 1 below shows the approximate collection amounts for recent and historic computers, based on a worst case scenario of 5,200,000 existing historic and orphan computers in storage. These computers will be collected within the first six years of the scheme.

<sup>9</sup> Based on estimate of average 5 year retention period for domestic users, in Meinhardt Infrastructure and Environment, *Computer and Peripherals Material Project*, October 2001, p. 25.

<sup>10</sup> Meinhardt estimates that around 1.5% of computers are currently recycled, in Meinhardt Infrastructure and Environment, *Computer and Peripherals Material Project*, October 2001, p. ES2.

<sup>11</sup> Various estimates for the age range of equipment exist. For example, 50% of computers recovered by the Recycle IT! trial in Western Sydney were between 9 and 13 years old, while monitors were between 4 and 8 years old. The Byteback! Scheme found that 86% of equipment was 5 to 9 years old. It is expected that the scheme will reduce this age by drawing computers out of households earlier.

**Graph 1: Collection Amounts for Recent and Historic and Computers**



*Note 1: Annual sales of 2,400,000 is retained for simplicity. Any real life scheme would be based on actual computers manufactured. It is expected that computer sales will continue to increase in future years.*

*Note 2: Assumes collections that begin in 2007 will begin to capture computers sold in 2002, based on average 5 year ownership.*

## **6. Funding**

### **6.1 Funding of Producer Responsibility Organisation**

Funding of the PRO and its operations will initially be through contributions made by computer industry participants.<sup>12</sup> Upon implementation of an advanced recycling fee (ARF), the PRO will be funded through ARFs on new computers. ARFs are discussed further in 6.3 below.

### **6.2 Use of Market Based Instruments**

Market based instruments (MBIs) are a means of achieving sustainability objectives through the use of market mechanisms.<sup>13</sup> The most sophisticated MBIs are those that help promote infrastructure and processes to maintain and recover material resources at their highest value. One of the main benefits of MBIs for industry is that they offer companies maximum freedom to achieve the desired outcomes. As the main element of the most basic MBI, an ARF will be placed on all new computers.

<sup>12</sup> Regulation to ensure that all industry participants contribute to the scheme is discussed in Section 7.

<sup>13</sup> Matthew Warnken, Total Environment Centre and Pratt Foundation, *Market Based Instruments and Sustainable Resource Recovery*, 2004, p.1.

### **6.3 Advanced Recycling Fee**

The ARF will be an up-front, visible charge that will be placed on each product to fund recovery at the end of its life. Producers / importers will apply this ARF to wholesale sales and wholesalers will pass this on to retailers. Retailers will pass the ARF on to consumers, retaining its transparency. A transparent ARF will serve to increase consumer awareness of recycling issues associated with end-of-life computers.

### **6.4 Advanced Recycling Fee - Component Costs**

Best use of the ARF would be to ensure that price signals communicate design improvements from recyclers to designers. A variable ARF will therefore be investigated for use to support best-practice environmental standards. The alternative to this approach would be to rely on mandated standards expressed through Government regulation, discussed in 12 below.

An ARF that includes three components will be investigated: a fixed component, a variable component and a refundable deposit. These are discussed below.

It is expected that all components will likely decline over time due to economies of scale, competition and efficiency gains.

#### **6.4.1. Fixed Component**

The fixed component would cover fundamental scheme costs, including an initial premium for historic and orphan products. It is expected that the fixed component would decline over time as the legacy of historical products is reduced. The fixed component would include:

- scheme administration costs
- collection costs
- temporary premium for historic and orphan products

It is noted that reserve funds accumulated from the fixed component of the ARF are expected to generate investment income over time, allowing for an overall reduction in the level of the ARF. After several years' operation, investment income will contribute significantly towards, if not cover completely, the ongoing costs associated with historic and orphan products. This will allow for the elimination of the historic and orphan component from the ARF even while these products continue to enter the system.

### **6.4.2 Variable Component**

The variable component of the ARF would provide essential feedback to incentivise designs that are less hazardous, use recycled content and are more easily disassembled and recycled. The PRO would determine the variable components of the ARF which could include:

- Disassembly costs
- Recycling costs
- Safe disposal of hazardous residuals costs
- Use of recycled content
- Value of recovered materials

### **6.4.3 Refundable Deposit**

The refundable deposit would provide a necessary incentive for consumers to pursue the collection and/or take-back of their end-of-life computers. This would reduce the scheme's collection costs. It will also act as a disincentive for the dumping of end-of-life computers, reducing the volume burden on local councils and reducing litter.

### **6.5 Initial Financial Support**

It is not expected that at the early stages all the funds required to support recovery costs will be derived from the ARF. The industry will, therefore, provide the required upfront supplementary resources in the first few years. These will be recouped over time. The geographical phasing-in of the scheme will also assist.

### **6.6 Funding by the Producer Responsibility Organisation**

The PRO will meet all collection, reprocessing, recycling and promotion costs. Governments will be responsible for the cost of regulation to ensure all companies participate.

ARFs collected by retailers will be forwarded to the PRO. The PRO will set up contracts with collection and recycling organisations. Costs of collection, disassembly and recycling will be passed onto the PRO according to product type, which will inform the variable component of the ARF, as discussed in 6.4.2 above.

## **7. Regulatory Support**

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### **7.1 The Need for Regulation**

Government support, in the form of regulation, will be required to ensure that all computer manufacturers are included in the scheme and that the scheme achieves its goals. Self-regulation and co-regulation are not feasible because of the heterogeneity of the sector, which limits the ability of representative industry associations to negotiate on behalf of individual members. This has been the case internationally, in particular in the Netherlands, where attempts to negotiate a voluntary covenant failed and the Government had to resort to regulation.<sup>14</sup> It is anticipated that regulation will be in the form of a National Environment Protection Measures (NEPM).

### **7.2 Regulatory Safety Net**

The regulatory safety net is essential to ensure a level playing field for all producers. Without a regulatory safety net, producers that fail to join the PRO would gain a competitive advantage over companies participating in the scheme. To ensure equity and efficiency, governments must be able to obtain information on computer and component imports to track all companies, including small-scale producers and component aggregators. The industry supports the phasing in of a unified scheme without exemptions for individual companies. Exemptions are likely to trigger an inefficient multiplicity of collection infrastructure which would fail to benefit from economies of scale, particularly for orphan computers and those returned by consumers.

Regulation will include targets and timeframes. The computer industry anticipates the requirement to meet the targets and timeframes outlined in Section 5 of this document.

### **7.3 Penalty**

Any scheme will require penalties to ensure that recovery targets are met and that sufficient attention is paid to the scheme's infrastructure. Without such a disincentive, it is likely for the PRO to collect the ARF but fail to ensure that funds are effectively spent on the recovery of end-of-life products.<sup>15</sup> The penalty will represent the opportunity cost for the environmental services that the PRO has failed to provide. Ideally, penalties will be directed back into the scheme to develop recovery infrastructure. Verifiable documentation of recovery amounts and processes will be reported annually to ensure accountability.

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<sup>14</sup> The resulting regulation was the *White and Brown Goods Disposal Order, 1998*

<sup>15</sup> This problem has been demonstrated by the voluntary scheme for mobile telephones, run by the Australian Mobile Telecommunications Association (AMTA) in which, despite collection of a levy and 7 years duration, less than 4% of phones have been collected. See Environmental Manager, 'Mobile phone companies haven't paid into recycling fund for two years', Issue 508, November 9, 2004 and 7.30 Report, 'Phone recycling claims called into doubt', 08/12/2004 at [www.abc.net.au/7.30/content/2004/s1260911.htm](http://www.abc.net.au/7.30/content/2004/s1260911.htm)

## 7.4 Additional Supportive Regulation

### 7.4.1 Landfill Bans

Additional supportive regulation is likely to assist in eliminating scheme loop-holes and creating more accurate price signals to improve computer design and recycling. The following regulations should be considered in concert with the scheme's regulations:

- landfill ban on computers
- landfill ban on particular computer components (eg., plastic housings)
- higher landfill charges for computers and components
- classification of computers waste as hazardous waste

### 7.4.2 Material Bans

Material bans for hazardous substances, such as lead, would also assist in the transformation of computer technologies so that they become less toxic and easier to recycle. Material bans on hazardous substances would also ensure that Australia does not become a dumping ground for sub-standard equipment as international standards for hazardous substances become more stringent. The EU has set a precedent for restrictions on the manufacture and import of equipment containing hazardous substances, with the World Trade Organisation determining that such a restriction does not comprise a trade barrier.

## 8. Orphan Products

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'Orphan' or 'historical' products are those that cannot be linked with an existing manufacturer. Currently, around 5% of end-of-life computer equipment is comprised of this equipment.<sup>16, 17</sup> Recognising that today's computer industry benefits from the economic and technical legacy of yesterday's companies and computers, including direct mergers and take-overs of previous businesses by current companies, the scheme will take responsibility for orphaned products.

Once the scheme has reached operational maturity and annual collection volumes have stabilized, by 2022, the quantity of orphan computers should decrease relative to branded computers. This is because most orphan products are currently in storage, representing a historic backlog.

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<sup>16</sup> This rate has been demonstrated in Sustainability Victoria's Byteback! trial, in Minister for the Environment, 'Thwaites Calls for National Computer Recycling Program Following Victorian Trial Success', 11 Nov 2005.

<sup>17</sup> Previous Australian Information Industry Association figures have over-estimated the amount of orphan products. This is due to data collection methodology in earlier trials that included small parts such as mice and keyboards when counting orphan components, rather than whole PCs or monitors, which are the major problem. AIIA figures can be found at Department of Environment and Conservation and AIIA, *Recycle IT!*, October 2004, p. 62.

The inclusion of historical and orphan products in the scheme will initially be subsidised by the fixed component of the ARF, which will be reduced as the backlog of these computers is gradually cleared.

## **9. White box Computers**

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'White box' or unbranded computers are those that cannot be identified as belonging to a particular brand. These are often manufactured by smaller companies. Currently, between 8% and 14% of end-of-life computer and monitor brands cannot be identified.<sup>18</sup> These computers will be included in the scheme through government regulation.

## **10. Inclusion Threshold**

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As a major proportion of the industry is composed of small companies<sup>19</sup>, including some extremely small 'back-yard' operations, it is essential that there are no exemptions from the scheme. If small operations are exempted, many manufacturers may lose market share to those companies not required to attach an ARF to their computers.

## **11. Collection System**

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Australia's dispersed urban and rural centres present a particular challenge for the scheme. For this reason, the collection system will include both an incentive for consumers to return end-of-life products, and a range of collection and/or drop-off options to ensure accessibility for most computers owners.

### **11.1 Collection Incentive**

As discussed in 6.4.3, a refundable deposit will ensure that the collection and/or drop off of computers is pursued by computer users for re-use and/or recycling.

### **11.2 Collection Options**

Collection options will need to ensure that computer equipment is not mishandled or damaged during the collection process. This is necessary to maximise reuse options and ensure the safe handling of hazardous materials.

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<sup>18</sup> Sustainability Victoria's Byteback! trial, in Minister for the Environment, 'Thwaites Calls for National Computer Recycling Program Following Victorian Trial Success', 11 Nov 2005; and Department of Environment and Conservation (NSW) et al, Household Electrical and Electronic Waste Benchmark Survey 2005, p. 4.

<sup>19</sup> Department of Environment and Conservation (NSW) et al, Household Electrical and Electronic Waste Benchmark Survey 2005, p. 4; Department of Environment and Conservation and AIIA, *Recycle IT!*, October 2004, p. 62.

Collection options may include:

- Permanent drop-off centres<sup>20</sup>, for example:
  - retail sites with sufficient on-site storage facilities
  - transfer stations
  - repair/recycling centres
- Use of reverse logistics via retail delivery systems to service consumers in remote locations and/or with limited transport and/or mobility.

## **12. Materials Recovery**

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### **12.1 Guiding Principles for Recovery**

Sorting, disassembly and recycling systems will be geared towards the identification and processing of computers according to their highest resource values. The scheme will base its systems for materials recovery on the hierarchy of, in descending order:

- Refurbishment and repair for reuse
- Recovery of individual components for reuse
- Closed-loop recycling (computers to computers)
- Open-loop recycling (computers to other products and processes)

In the short term, until adequate end markets for the use of residual materials are more firmly established, computer recovery may include:

- Responsible disposal of non-hazardous residuals
- Responsible management of hazardous residuals

Particular attention to Australia's Hazardous Waste Act will ensure that hazardous waste is not being exported under the banner of 'computers for reuse'.

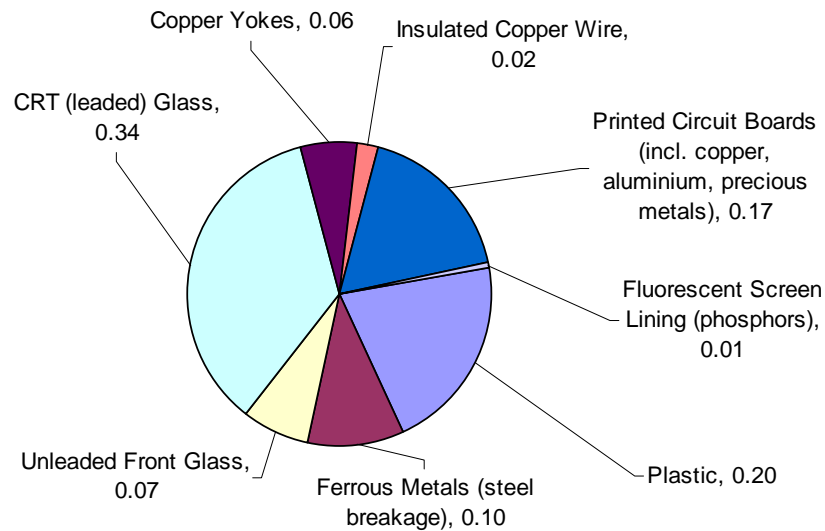
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<sup>20</sup> Shown to be the most cost-effective option for drop-off, compared to one-off events, in Recycle IT! Pilot.

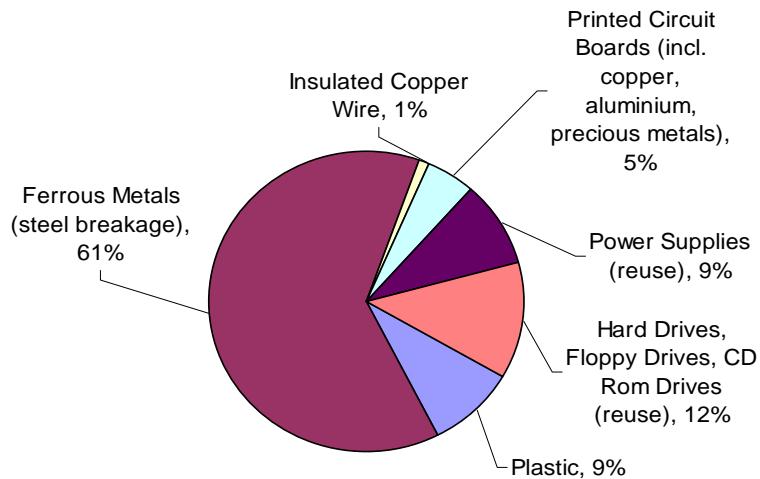
## 12.2 Targets for Materials Recovery

Initial recovery targets will be based on international best practice, with around 45% of computers being exported for minor repair or refurbishment, and resale. For computers that are beyond repair, current international best practice recycling standards will be leveraged from the recycling system (outlined in 15 below), with the goal of zero computer waste to landfill within 5 years. Charts 1 and 2 illustrate ReByte's goals for the recovery of materials from monitors and CPUs.

**Chart 1: Goals for Materials Recovery - Monitors**



**Chart 2: Goals for Materials Recovery – CPUs**



## 12.3 Recovery Incentives

To ensure that the highest resource value of materials is obtained, a system of recovery incentives may be established.<sup>21</sup> These will comprise of a graded payment to recovery organisations based on the hierarchy in 12.1 above. This will allow international best-practice standards for recycling of computer equipment to be adopted. Graded payments that incentivise high-value recovery may favour, for example:

- Reuse of working components
- Separation of front glass from CRT funnel glass in recycling
- CRT to CRT recycling
- Washing of leaded glass to enable glass to glass recycling
- Identification, separation and recycling of plastics, including brominated flame retardants (BFRs)
- Recovery of screen phosphors

Examples of the recycling processes that may benefit from the recovery incentive are found in the table below.

**Table 2: High-value Computer Recycling**

Separation Of	From	For
Cathode ray tubes (CRTs)	Monitor housings	Manufacture of new CRTs <sup>22</sup>
Monitor front glass	CRTs	Glass to glass or glass/fiberglass <sup>23</sup>
Printed circuit boards	Computer	Recovery of valuable materials
Polymers containing brominated flame retardants (BFRs)	Non-BFRs <sup>24</sup>	Recycling
High impact polystyrene (HIPS)	Other polymers	Recycling <sup>25</sup>
Acrylonitrile butadiene styrene (ABS)	Other polymers	Recycling <sup>25</sup>
Polyphenylene Ether (PPE)	Other polymers	Recycling
Polyphenylene Oxide (PPO)	Other polymers	Recycling
Phosphors and other rare earth materials	Monitor screens	Recycling

21 The precedent for this approach exists in Australia's Product Stewardship for Oil program, where benefits are designed to engender an increase in the collection and reprocessing of used oil and a shift of recycling from consumptive uses and into more sustainable recycling. Product Stewardship (Oil) Regulations 2000.

22 Sims E-Recycling currently ships crushed CRTs to Holland for recycling into new CRTs and other materials

23 Currently undertaken in Australia by MRI for recycling by Visy Glass.

24 Recent trials have shown that the identification and separation of BFR from non-BFR plastics is both economically feasible and environmentally preferable, from: Waste and Resources Action Program, *Develop a process to separate brominated flame retardants from WEEE polymers – Interim Report 2*, August 2005; and AEEMA et al, *Beyond the Dead TV*, May 2003, pp. 81-82.

25 A small market exists for clean, sorted HIPS and ABS in Australia, while a major market exists in China, in Nolan-ITU for Department of the Environment and Heritage and Resource NSW, *Electrical and Electronic Products Infrastructure Facilitation*, January 2004, p. 48.

In addition to the incentive scheme for high-value recovery, the PRO will ensure that recyclers contracted through the scheme will not shred whole computers, as current shredding technologies result in the loss of valuable components and produce a high percentage of hazardous 'shredder floc'.<sup>26</sup> Hazardous shredder flock has occupational health and safety risks, as well as the potential to leach from landfills, damaging human and environmental health.

The PRO will also ensure that recyclers contracted through the scheme will not dump flame-retardant plastics in landfill as these materials have the potential to leach into groundwater and damage environmental health.

### **13. Reporting and Transparency**

Transparent public reporting of the scheme's progress will be essential to maintain credibility with computer consumers and the wider community. The PRO will publish annual reports with data on progress towards targets, recycling standards and other relevant information. As a minimum, published data will include:

- Computer sales and imports
- Computer collections
- Computer repair
- Computer reuse
- Computer recycling

### **14. Stakeholder Involvement**

The PRO will establish a Stakeholder Advisory Group to provide feedback on the scheme. Representatives from industry, government, the repair industry, environment and community groups will be invited to comment quarterly on the scheme's progress.

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<sup>26</sup> Nolan-ITU for Department of the Environment and Heritage and Resource NSW, *Electrical and Electronic Products Infrastructure Facilitation*, January 2004, p. 42.

## 15. Scheme evaluation criteria and key performance indicators for NSW

	<b>Key Performance Indicator</b>	<b>Scheme Goal</b>												
<b>1. Scope and coverage</b>	Amount of products produced/imported by the sector covered by the scheme	All products will be covered.												
	Coverage of historical and/or orphan products	All historical and orphan products will be covered.												
	Percentage of NSW having access to the scheme	<p>Scheme will eventually cover all of Australia, including all of NSW.</p> <p>Access to the scheme in NSW will be staged as follows:</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Area</th> <th>Cumulative Population</th> </tr> </thead> <tbody> <tr> <td>Scheme Start</td> <td>Greater Sydney Metropolitan Area</td> <td>63%</td> </tr> <tr> <td>After 2 years</td> <td>Hunter and Illawarra Region</td> <td>78%</td> </tr> <tr> <td>After 5 years</td> <td>Rest of NSW</td> <td>100%</td> </tr> </tbody> </table>	Date	Area	Cumulative Population	Scheme Start	Greater Sydney Metropolitan Area	63%	After 2 years	Hunter and Illawarra Region	78%	After 5 years	Rest of NSW	100%
Date	Area	Cumulative Population												
Scheme Start	Greater Sydney Metropolitan Area	63%												
After 2 years	Hunter and Illawarra Region	78%												
After 5 years	Rest of NSW	100%												
<b>2. Targets and timeframes</b>	Coverage and population	<p>Initially covering Australia's largest metropolitan areas.</p> <p>After two years, all urban areas.</p> <p>After five years, all consumers including remote and regional areas.</p>												
	Collection (quantity) of end-of-life products	<p>95% of existing historic and orphan computers by 2012, equaling 46,800 tonnes within 6 years.</p> <p>Ultimately goal of 95% collection of recent computers by 2022, equaling around 21,600 tonnes per year.</p>												
	Reuse/recycling of end-of-life products, materials or components as a percentage of products sold	Ultimate goal of 100% resource recovery of computers collected												

	Industry participation as a percentage of market share	100% based on effective safety-net regulation
	End-user participation as a percentage of population	100% by 2012
	Product design based on design for the environment	The scheme foresees a gradual shift towards design for environment based on scheme incentives
	Reduction/control of littering or illegal dumping	Close to zero dumping due to refundable deposit as collection incentive
<b>3. Design for the environment</b>	Dematerialisation – level of reduction in product weight or size	The scheme foresees a gradual shift towards design for environment due to variable ARF incentive
	Extended life-span – increase in producer warranty periods or any other indicator	The scheme foresees a gradual shift towards longer life-spans due to variable ARF incentive
	Improved recyclability/disassembly etc – percentage increase in recyclable components or percentage increase in components that are easily disassembled for repair or reuse	The scheme foresees a gradual shift towards design for environment due to the scheme's internal incentives
	Use of recycled content – percentage increase in recycled content in products	The scheme foresees a gradual shift towards design for environment due to variable ARF incentive
	Demonstration that the product has been manufactured to international best practice standards	The scheme foresees a gradual shift towards international best practice standards due to variable ARF incentive
<b>4. Collection results</b>	The number of products captured by the scheme as demonstrated by the number of products/parts collected as a percentage of number sold	Ultimately goal of 95% collection of recent computers by 2022.

<b>5. Reuse and recycling – quantity and quality</b>	<b>QUANTITY</b>	Amounts of materials recovered will depend on actual amounts collected, which will be established annually. Refer to percentages below.
	Amount reused as a percentage of total collected	
	Amount sent for recycling as a percentage of total collected	See below
	Amount of materials recovered in recycling process	See below
	Amount of materials rejected due to contamination	See below
	<b>QUALITY</b>	Initial goal of 45% reused with minor repair/refurbishment within 5 years of commencement
	Percentage reused as whole product	
	Percentage reused as components in same product or other product types	Approximately 22% of monitors and CPUs will be reused as whole components. This amount includes hard drives, floppy drives, CD ROM drives, cables, power supplies and fans.
	Percentage material recovered for same or similar use	Closed-loop component reuse and recycling will occur where possible, encouraged by the scheme's recovery incentives.
	Percentage material recovered as lower quality material	Open-loop recycling will occur where all options for close-loop recycling have been exhausted
Amount of energy recovered	Goal of zero materials to energy recovery	
Percentage of recovered products and materials use in the domestic market	55%	
Percentage of recovered products and materials use in the international market	45%	

<b>6. End-user participation</b>	Percentage of end-user participation in the scheme	Ultimate goal of 100% participation by 2022
	Percentage of end-user knowledge/awareness of scheme	Ultimate goal of 100% participation by 2022
	Availability/access of collection points	Drop off/collection points, as well as reverse logistics collections will become available to all participants after 5 years.
	Any fees for participation	Fees for participation will be included in Advanced Recycling Fee, included in the retail price of computers.
<b>7. Industry participation</b>	Number of producers/importers participating in the scheme	Government safety-net regulation will ensure 100% producer/importer participation in scheme
	Percentage of market (sales) represented by participants	Government safety-net regulation will ensure 100% of market is comprised of participants
<b>8. Funding</b>	Basis of scheme funding	Short term: scheme member contributions  Long term: ARF
	Long term security of funding	Options for funding security are currently being investigated
	Funding of future orphan products	Future orphan products will be funded by scheme's ARFs
<b>9. Data collection</b>	System and timing of data collection	Data will be collected annually to establish: <ul style="list-style-type: none"> <li>▪ Computer sales and imports</li> <li>▪ Computer collections</li> <li>▪ Computer repair</li> <li>▪ Computer reuse</li> <li>▪ Computer recycling</li> <li>▪ Materials breakdown</li> </ul>
	Verification of data collection	The collected data will be independently audited
<b>10. Litter or illegal dumping</b>	Systems for reduction of dumping of computers and/or component parts	Scheme incentives will reduce dumping of computers

<b>11. Toxicity levels</b>	Removal of toxic substances	Variable component of ARF will incentivise removal of toxic substances
	Reduction of toxicity of materials	Variable component of ARF will incentivise removal of toxic substances