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Australia and New Zealand
Recycling Platform Limited

WHITE PAPER

Review of the Product Stewardship Act and National Television and Computer Recycling Scheme

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Executive Summary

Australia has a sound National Waste Policy that heralds a coherent, efficient and environmentally responsible approach to waste management to 2020. A key strategy of the Policy is product stewardship framework legislation – the *Product Stewardship Act 2011* (the 'Act') – to reduce environmental and other impacts of products across their life cycle.

July 2016 marked the fifth anniversary of the Act. The National Television and Computer Recycling Scheme ('NTCRS' or the 'Scheme') was the first producer responsibility scheme to be established under the Act which came into effect on 8 August 2011. The NTCRS has been a significant success and must be continued, diverting from landfill and safely recycling approximately 184,500 tonnes of e-waste since 2012, achieving a 99% compliance rate by manufacturers/importers, providing in excess of 900 free community collection points and events across Australia and supports local jobs in the recycling and transport industries.

The NTCRS was implemented approximately 10 years after the European Union (EU) legislation, yet Australia has already met or exceeded the recycling levels achieved by the EU for televisions and computers.

The legislative review of the operation of the Act and its subordinate legislation was announced by the Hon Josh Frydenberg MP, Minister for the Environment and Energy, on 10 March 2017. One of the review focus areas is the operation and scope of the NTCRS. The review provides an opportunity to analyse and implement recommendations from key learnings gained from the first five years of the Scheme and from best practices employed in international product stewardship schemes. It also presents an opportunity for all levels of government to create greater alignment in policy setting to manage e-waste in accordance with the waste hierarchy. Further, it provides an opportunity to explore how the Scheme can assist in the move to a more circular economy by treating e-waste as a resource, encouraging innovation in recycling, reducing landfilling and educating consumers in order to change behaviour.

The Australia and New Zealand Recycling Platform Limited (ANZRP) is an approved Co-regulatory Arrangement under the Act. ANZRP made a commitment to its Members to undertake its own independent review of the Scheme and submit its findings and recommendations to the Department of the Environment and Energy (the 'Department') via a White Paper. ANZRP's analysis, findings and recommendations of its review are provided in this White Paper.

KEY FINDINGS

Recycling rates of television and computer products in Australia were below 17% prior to the Scheme's commencement. The Scheme Target (i.e. the whole of Scheme recycling target) rapidly increased to 50% or 51,870 tonnes in 2015-16, which was not met as Co-regulatory Arrangements only recycled 49,892 tonnes. The Scheme Target climbed further to 58% in

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2016-17 and it is not yet known whether it was met. There are a number of barriers to achieving the Scheme Target including:

- The current waste arising calculation methodology overestimates the amount of e-waste available for recycling in Australia. It does not accurately account for the fact that not all new e-product imports result in available e-waste to the Scheme in the same year. The 2017-18 Scheme Target of 62% is the same as ANZRP's estimate of available e-waste.
- The loss of available e-waste to the export for reuse market. Although reuse results in greater benefits to the environment over recycling (as per the waste hierarchy principle), it cannot be used to meet the Scheme Target (as product is not recycled).
- Competition with other parties who offer cheaper treatment options for used e-products such as landfill (especially when there is no landfill levy) or a potential rebate (in the case of scrap metal recyclers).
- The public are largely unaware of the Scheme and often store working and non-working computers and televisions in the home.

Strong regulation and greater transparency of the Scheme is key to ensuring sound environmental and socio-economic benefits, upholding the reputation of the Scheme and its liable parties and ensuring confidence in the e-waste recycling industry. Auditing and enforcement of all stakeholders is required to guarantee high levels of transparency and reporting, consistent standards and responsible end markets both in Australia and downstream facilities that are offshore.

KEY RECOMMENDATIONS

The following is a summary of ANZRP's key recommendations:

- The e-waste reuse volume is to be reported under the Scheme (captured by tariff code), the Scheme Target is to be adjusted by this volume and a reuse target is to be developed. An agreed standard for preparing e-waste for reuse must also be adopted.
- Scaling factors are to be updated to reflect Australian Bureau of Statistics e-product export data.
- Conversion factors are to be reviewed and released annually and where applicable, tariff codes are to be converted to weight-based codes.
- The staged increases in the Scheme Target are to be reviewed and updated (using accurate estimates of future waste arising) by 1 July 2018.
- A federally led education and awareness campaign on the Scheme and benefits of product stewardship be implemented with participation by Co-regulatory Arrangements and State and Territory and Local Government.
- Local councils who have not partnered with Co-regulatory Arrangements should be encouraged and supported to offer an e-waste collection point to their residents.
- Retailers of e-products should be required to offer drop-off points to small, used e-products and provide information about the Scheme at point of sale.
- Auditing and enforcement by Regulators be conducted to ensure compliant practices by all Scheme stakeholders both in Australia and downstream facilities that are offshore.

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- The Scheme be expanded to include small household items that are compatible with current collection and recycling methods and do not pose a safety hazard. Separate targets for each new product category will also be required.
- Recyclers, collection sites and transport companies to be certified to/meet relevant requirements of AS/NZS 5377: 2013 Collection, storage, transport and treatment of end of life electrical and electronic equipment (with certification performed by accredited JAS-ANZ auditors).
- Co-regulatory Arrangements to require recyclers to transparently report material recovery levels (and have supporting evidence) and perform downstream vendor audits.
- Non-Scheme recyclers and landfill operators be required to report under the Scheme the volume of e-waste that they treat/receive.
- An overarching product stewardship program be created with sub-categories as opposed to separate programs, with each sub-category being accountable for achieving a relevant recycling target.

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1 Purpose of the White Paper

Australia has a sound National Waste Policy that heralds a coherent, efficient and environmentally responsible approach to waste management. The policy, agreed by all Australian Environment Ministers in November 2009, and endorsed by the Council of Australian Governments, sets Australia's waste management and resource recovery direction to 2020. One of the strategies of the policy is product stewardship legislation - the *Product Stewardship Act 2011* (the 'Act') – to reduce the environmental and other impacts of products across their life cycle and at end-of-life.

July 2016 marked the fifth anniversary of the Act. The legislated review of the operation of the Act and its subordinate legislation was announced by the Hon Josh Frydenberg MP, Minister for the Environment and Energy, on 10 March 2017. One of the review focus areas is the operation and scope of the NTCRS. The review provides an opportunity to analyse and implement recommendations from key learnings gained from the first five years of the Scheme and from best practices employed in international product stewardship schemes It also provides an opportunity to explore how the Scheme can assist in the move to a more circular economy by treating e-waste as a resource, encouraging innovation in recycling, reducing landfilling and educating consumers in order to change behaviour.

The National Television and Computer Recycling Scheme ('NTCRS' or the 'Scheme') was the first producer responsibility scheme to be established under the Act which came into effect on 8 August 2011. The Act provides a framework for product stewardship or 'extended producer responsibility' (EPR), to address the environmental, human and safety impacts of products and materials across all life cycle stages. Product stewardship commences at the concept design stage and continues through to disposal and recovery at end-of-life. EPR schemes have been and are in operation around the world for many products including e-products; Australia benefits from a global marketplace where the requirements of these schemes drive improved product safety and environmental outcomes.

The *Product Stewardship (Televisions and Computers) Regulations 2011* (the 'Regulations') underpin the Scheme and came into effect on 8 November 2011. Under the Scheme, television and computer manufacturers/importers are required to fund collection and recycling of a proportion of the televisions, printers, computers and computer parts and peripherals disposed of in Australia each year. The Scheme aims to deliver a staged increase in the rate of recycling of televisions, printers, computers and computer parts and peripherals in Australia from 30% in 2012–13 to 80% by 2026–27. The Scheme has three outcomes that are to be achieved by Co-regulatory Arrangements:

- Scheme Target (i.e., whole of Scheme recycling target, based on a percentage of product net imports)
- Material Recovery Target (recovery of a minimum of 90% of material to avoid landfill disposal)

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- Reasonable Access to collection services in metropolitan, inner regional, outer regional and remote areas (free drop off for recycling to the public and SMEs)

The Australia and New Zealand Recycling Platform Limited (ANZRP) is an approved Co-regulatory Arrangement under the Act. It is a not-for-profit organisation funded by over 50 liable parties (companies that import over thresholds, referred to in this White Paper as "Members") in order to meet their liabilities under the Scheme. These Members include leading global technology companies, many of whom are leaders in corporate responsibility and have taken leadership positions in establishing EPR schemes around the world. A number of these ANZRP Member companies were part of the industry group that drove the implementation of product stewardship legislation in Australia. ANZRP represents, on behalf of its Members, approximately 45% of the Scheme Target and has recycled in excess of 110,000 tonne of e-waste in its own right. ANZRP's Members demand and uphold strong principles in and around product stewardship together with a commitment to meeting standards for delivering sound environmental outcomes. These standards have been enshrined in the DNA of ANZRP.

In preparation for the statutory review and to ensure the continued success of the Scheme, ANZRP made a commitment to its Members to undertake its own independent review of the Scheme and certain elements of the Act, and submit its findings and recommendations to the Department of the Environment and Energy (the 'Department') via a White Paper.

The purpose of this White Paper was to review:
1. Whether the NTCRS has delivered enhanced environmental, social and economic outcomes
2. The operation and scope of the NTCRS and Regulations
3. Whether the objects of the Act are being met and are appropriate
4. The interaction of the Act with other Commonwealth, State and Territory and Local Government legislation, policy and programs

Our review was broken into five parts:
1. Environmental and socio-economic outcomes
2. Scheme target
3. Material recovery target
4. Reasonable access
5. Governance

ANZRP's analysis, findings and recommendations of its review are provided in this White Paper.

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2 Environmental and socio-economic benefits

Waste generation and management is a key environmental and socio-economic issue for Australia. Australians currently send approximately 23 million tonnes of urban waste to landfill each year (Wainberg, 2016). Between 1996 and 2015, Australia's population increased by 28% but waste generation increased by 170% (Ritchie, 2016a). As such, waste generation is growing at a rate of 7.8% each year (Ritchie, 2016a). In addition, for every dollar spent on economic activity in Australia, waste production increases by 50% (Ritchie, 2016b).

These figures support the need for national product stewardship and waste management legislation and policy in Australia under the National Waste Policy (which is endorsed by the Council of Australian Governments) and consistent with international commitments. These include the UN Sustainable Development Goals, in particular goal 12.5 "by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse" (Department of Foreign Affairs and Trade, 2017) and international conventions on transboundary movements of waste.

Australians are rapid adopters of new technology. As a result, e-waste is one of the fastest growing types of waste in Australia (Australian Bureau of Statistics, 2013). The Act and Scheme provide a national approach to managing waste televisions, printers, computers and computer parts and peripherals delivering the following environmental and socio-economic benefits:

- Provides a free drop-off and recycling service to the public and SMEs. In 2015-16 there were 920 permanent drop-off sites and events across the country in metropolitan, regional, rural and remote locations[1].
- Resulted in the recycling of approximately 184,500 tonnes of e-waste and therefore landfill diversion since 2012 (The Hon Josh Frydenberg MP, 2017).
- Is currently recycling approximately 2.2 kg of television and computer products per person in Australia[2].
- Resulted in avoiding 180,000 tCO_2e emissions since 2012[3]. This is due to the benefits associated with avoiding the production of virgin materials, in particular iron, aluminium, copper and platinum group metals.

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[1] Co-regulatory Arrangement annual reports for 2015-16 were accessed from http://www.environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme/coreg-arrangements. Drop-off services and events offered by each Co-regulatory Arrangement during 2015-16 were obtained from each Co-regulatory Arrangement report and summed to calculate the total Scheme drop-off and events services of 920.

[2] Based on the 2016-17 Scheme Target of 55,554,362kg and the Australian population reported in the ABS 2016 Census.

[3] Based on a carbon life cycle assessment performed for ANZRP. ANZRP engaged Lifecycles to calculate the average carbon footprint value for recycling one tonne of mixed television and computer waste using the life cycle assessment methodology in 2015-16. The assessment included emissions associated with the collecting, recycling and the downstream processing of e-waste and the benefits associated with avoiding the production of virgin materials. It was found that when ANZRP recycles one tonne of e-waste this resulted in a saving of 981 $kgCO_2e$ emissions. The

- Resulted in investment in new technologies, increased employment and significantly improved work health safety (WHS) and environmental management practices by Scheme recyclers. This has led to a more efficient and vibrant e-waste recycling industry which is key to the Scheme's success.
- Supports local recycling jobs in Australia. During 2015-16, Co-regulatory Arrangements used 28 recycling facilities located in Adelaide, Canberra, Launceston, Melbourne, Perth and regional New South Wales and Victoria[4]. Seven of these facilities are social enterprises.
- Supports the transport and logistics sector transporting e-waste from collection points to recyclers nationally.

The main objective of the Act is to provide a product stewardship framework for reducing the environmental and other impacts of products. Section 4 of the Act outlines that this is intended to be achieved by encouraging/requiring manufacturers, importers, distributors and others to take responsibility of those products by:

- Avoiding waste generation from products
- Reducing or eliminating waste from products to be disposed of
- Reducing or eliminating hazardous substances in products and their waste
- Managing waste from products as a resource
- Ensuring that products and waste are reused, recycled, recovered, treated and disposed of in a safe, scientific and environmentally sound way.

ANZRP has reviewed the Act's objects in relation to the Scheme below.

Table 1 Objects of the Act in relation to the Scheme

Object of the Act	Applicability to the Scheme
1. Avoiding waste generation from products	Avoiding e-waste generation is not covered by the Scheme. The Scheme focuses on recycling e-waste that has already been generated and diverting it from landfill.
2. Reducing or eliminating waste from products to be disposed of	Reducing or eliminating the amount of e-waste from end of life e-products to be disposed of is not covered by the Scheme. However, many liable parties are light weighting or converging e-products which will reduce e-waste generation when they reach their end of life.

CO_2 burden associated with collecting, recycling and processing e-waste is entirely offset by the benefits associated with avoiding the production of virgin materials: in particular iron, aluminium, copper and platinum group metals.

[4] Co-regulatory Arrangement annual reports for 2015-16 were accessed from http://www.environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme/coreg-arrangements. Recycling facilities utilised by each Co-regulatory Arrangement during 2015-16 were obtained from each Co-regulatory Arrangement report and summed to calculate the total recycling facilities used of 28.

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Object of the Act	Applicability to the Scheme
3. Reducing or eliminating hazardous substances in products and their waste	Reducing or eliminating hazardous substances in e-products and resultant e-waste is not covered by the Scheme. However, many liable parties are redesigning e-products with reduced hazardous substances (e.g. moving from CRT to flat panel televisions and monitors has reduced the generation of leaded glass waste) and are compliant with the European Union (EU) Restriction of Hazardous Substances Directive (RoHS). Due to the majority of NTCRS-covered products being manufactured offshore, Australia benefits from legislative requirements of other jurisdictions such as the EU, UK, Canada and USA.
4. Managing waste from products as a resource	Managing e-waste as a resource is covered under the Scheme via the Scheme Target and Material Recovery Target. Several liable parties are actively increasing the level of recycled content in e-products. In addition, as the Scheme is a co-regulatory model, the different Co-regulatory Arrangements compete for liable parties, available e-waste, access to collection points and logistics and recycling services. This has led to price competition, inhibited collaboration and collection and transport efficiency, driving the recycling price down to a negative value for some e-products and lower levels of compliance in some instances. This is discussed further in section 3.3.1.
5. Ensuring that products and waste are reused, recycled, recovered, treated and disposed of in a safe, scientific and environmentally sound way.	Ensuring that e-waste is recycled in a safe, scientific and environmentally sound way is covered under the Scheme. However, reuse is not covered by the Scheme (discussed in section 3.1.2). In addition, ensuring the safe, scientific and environmentally sound recovery, treatment and disposal of 'recycled' e-product (i.e. disassembled or shredded e-product[5]) by offshore vendors (i.e. downstream processors) is not adequately covered by the Scheme (discussed in section 4.1).

ANZRP supports the objects of the Act. However, it believes that improvements can be made to better align the Scheme to the objects of the Act and provide further environmental and socio-economic benefits in Australia. These improvements are discussed and recommendations made in the following sections.

[5] r.1.03 of the Regulations defines 'recycle' in relation to a television or computer product as the initial processing of the product for the purpose of recovering useable materials, and includes disassembly or shredding of the product.

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3 Scheme Target

An aim of the Scheme is to deliver staged increases in the rate of recycling of televisions, printers, computers and computer parts and peripherals in Australia from 30% in 2012–13 to 80% by 2026–27. These recycling targets have generated much debate within industry, academia and the broader community as to whether they are achievable and/or ambitious enough.

The initial Scheme Target of 30% was criticised as being too low. In response, the Department adjusted the annual staged increases in the Scheme Target by bringing forward the target of 80%. This adjustment was welcomed by many. However, it resulted in a sizeable increase with the Scheme Target jumping from 35% in 2014-15 to 50% in 2015-16, a target which was not subsequently met by the Scheme.

While the recycling target increased, a drop in the tonnage of covered e-waste was observed. For example, ANZRP experienced a drop in the tonnage of e-waste collected across its then-52 permanent collection sites between 2013-14 and 2015-16 by 33%. Reasons for this drop include:

- Clearing of back logs created in anticipation of the Scheme
- Treatment of the influx of televisions resulting from the analogue to digital switch-over
- Phasing out of some materials (e.g. CRT televisions and computer monitors being replaced by flat panels)
- Product convergence (e.g. the introduction of all-in-one computers and tablets)
- The increase in service life of many e-products

Many of these are positive market developments in terms of social and environmental impacts. However, they impact Co-regulatory Arrangements' ability to meet the increasing Scheme Target.

The 2015-16 Scheme Target was 50% or 51,870 tonnes[6]. However, one Co-regulatory Arrangement did not meet its share and another had to rely on excess tonnage recycled during 2014-15 to meet its share. This resulted in Co-regulatory Arrangements only recycling 49,892 tonnes in 2015-16[7]. As such, 2015-16 was the first year that the Scheme Target was not met. We believe this is primarily due to difficulty in sourcing available e-waste (refer to section 3.1).

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[6] Co-regulatory Arrangement annual reports for 2015-16 were accessed from http://www.environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme/coreg-arrangements. Recycling targets for 2015-16 were obtained from each Co-regulatory Arrangement report and summed to calculate a total Scheme target of 51,870 tonnes.

[7] Co-regulatory Arrangement annual reports for 2015-16 were accessed from http://www.environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme/coreg-arrangements. Total e-waste recycled in 2015-16 (including any allowable excess carried forward from 2014-15) was obtained from each Co-regulatory Arrangement report and summed to calculate 49,892 tonnes.

In comparison, and keeping in mind that most countries have a broader scope than televisions, computers and printers, international experience indicates a recycling target greater than 50% after five years is aspirational. Five years into the EU's scheme (the Waste Electrical and Electronic Equipment Directive or the 'WEEE Directive') in 2012, only four member countries had achieved a collection rate[8] above 50%, seven member countries achieved a collection rate of between 40% and 50% and the remaining 16 members achieved a collection rate below 40% (European Commission, 2014a). The average recycling rate across Europe was 35% in 2012 (Huisman et al, 2015). In the US, where 25 states have mandated e-waste recycling, a recycling rate of 40% for computers and 17% for televisions was achieved in 2010 (Electronics TakeBack Coalition, 2014). The Small Electrical and Electronic Equipment Recycling scheme in Japan (which has a broader scope than the NTCRS) has a recycling target of 140,000 tonnes which equates to a recycling rate of approximately 20% (Morris and Metternicht, 2016).

With Australia almost achieving a Scheme-wide recycling rate of 50% in 2015-16, it is ahead of the above international schemes.

Yet in 2016-17 the Scheme Target climbed further to 58%, or an estimated 55,500 tonnes, generating a risk that the Scheme Target will again not be met. A key issue in meeting the increasing Scheme Target is that the waste arising calculation methodology (discussed in the following sections) overestimates the amount of e-waste available for recycling in Australia. Recycling 55,500 tonnes of e-waste could in fact result in a recycling rate of 76%, which is the Scheme Target set for 2024-25 which is an additional financial impost upon industry. Another key issue in meeting the increasing Scheme Target is that the Scheme has not had the benefit of a sound consumer/SME education and awareness campaign (discussed further in section 6.1.5).

ANZRP believes there are a number of matters which must be dealt with to address the inequities of the Scheme. These are discussed in turn in the following sections.

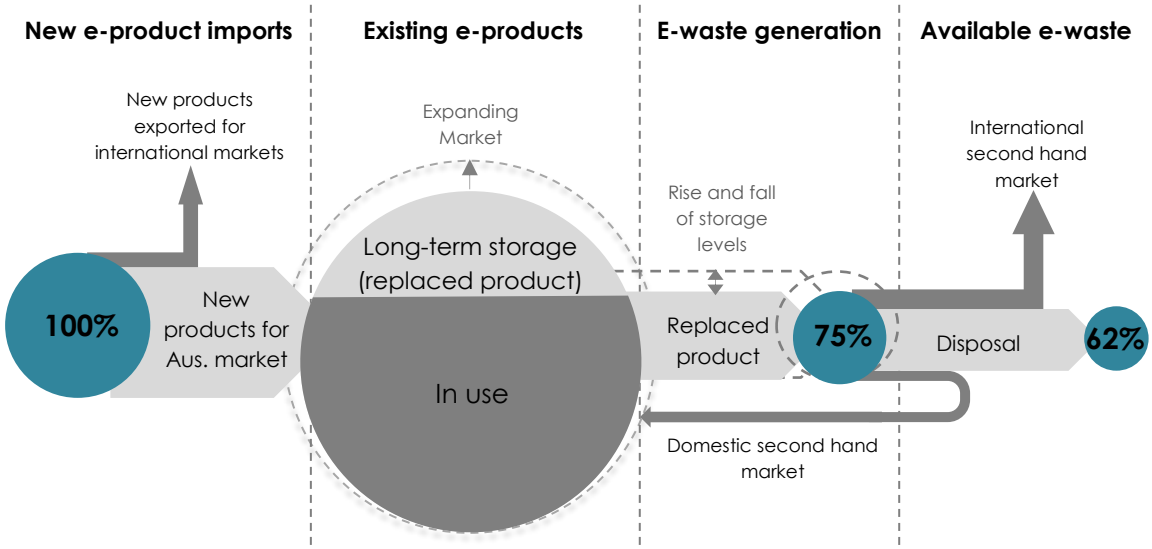
3.1 E-WASTE GENERATION AND AVAILABILITY

A key aspect for assessing whether the Scheme Target is achievable is to measure **e-waste generation** each year in Australia and then determine the percentage that is **available** to be collected for recycling in Australia.

The below diagram provides a process flow of e-waste generation and availability for recycling in Australia.

[8] The collection rate under the WEEE Directive is equivalent to a recycling rate under the Scheme.

Figure 1 E-waste generation and availability flow diagram



E-waste generation and availability flow description

- **New e-products** imported into Australia are destined to:
  - (a) enter the **existing e-products** pool, or
  - (b) be exported to neighbouring countries as new e-products.
- New e-products entering the existing e-product pool will be either:
  - (a) non-replacement purchases (i.e. the purchase is the first time the user will own that type of e-product[9], or the user is increasing the number of units of the e-product type that they own[10]) and will contribute to the expansion of the market, or
  - (b) replacement purchases that will subsequently result in an existing e-product being disposed of as e-waste and drive the amount of **e-waste generation** each year; however, a proportion of these replaced e-products will be put into **long-term storage** and disposed in a future year.
- Once replaced e-products become e-waste, a proportion will flow into the **domestic and international second hand markets** where they will continue to be used. The remaining e-products are disposed of becoming **available e-waste** in Australia. Available e-waste is either recycled (within or outside the Scheme) or landfilled.
- Refer to Appendix C for further detail.

3.1.1 E-waste generation in Australia

No Australian jurisdiction measures the stocks/flows discussed in Figure 1 to measure the actual generation of e-waste covered under the Scheme. Instead, waste arising (which is a proxy for e-waste generation) is calculated based on new e-product net imports adjusted by

[9] For example, a tablet is purchased to be used in addition to an existing laptop.
[10] For example, a new television is purchased for the living room and the existing television is moved to a bedroom.

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a scaling factor which accounts for the fact that not all e-products imported replace existing e-products which will subsequently be disposed of as e-waste[11].

At the beginning of the NTCRS the replacement level factor (which is one component of the scaling factor) was set to 90% (or 0.9)[12], that is, 90% of all new e-product imports result in a used e-product being replaced and disposed of as e-waste in the same year. However, ANZRP's analysis found that using a replacement factor of 90% results in an overestimation of the amount of e-waste being generated year on year.

3.1.1.1 Replacement purchases

Replacement behaviour is dictated by many factors such as product lifespan, technology changes and economic conditions. It differs between businesses and households, and also between e-products.

The quantity of imports of new televisions between 2010-11 and 2014-15 declined by over 40% and only increased slightly between 2014-15 and 2015-16, while the quantity of imports of new computers between 2010-11 and 2015-16 declined slightly (refer to Appendix A). In contrast, the number of televisions and computers per household is increasing (Lane, 2016) and is anticipated to continue increasing (Pitt & Sherry, 2015).

The increase of e-products per household (and the increase in the number of households in Australia), combined with the decline in imports, suggests that less replacement purchases are being made and that the percentage of e-product purchases that are replacement purchases, particularly for household computers and televisions, is lower than 90%.

Replacement purchases are not measured by the Scheme to accurately identify what the current replacement level is and what scaling factor should be applied. In a recent consumer behaviour study by Monash University, 30% of households who currently own a computer or tablet and 41% who currently own a television are still using their previous device (Lane, 2016). This corresponds to a study by IPSOS (2015) where 30% of households surveyed who currently own a laptop still use their previous laptop. For tablets the figure is 47% and for printers and computer monitors the figure is 18%. In a 2011 study (Commonwealth of Australia, 2012), 80% of new purchases of household televisions were to replace existing televisions, but about 35% of replaced televisions were still being kept in the home. These figures are below the current replacement level factor of 90%, impacting the estimation of waste arising.

[11] Annual waste arising volumes (weight) are calculated based on a moving average of the previous three years of imports multiplied by a scaling factor defined for each of televisions, printers, computers and computer parts and peripherals (refer to r.3.04 of the Regulations).

[12] The scaling factors are to account for non-replacement e-product purchases as well as available e-waste being lost to international second hand markets. They are stated in the Regulations as 0.9 for televisions, 0.8 for computers and 0.88 for both printers and computer parts and peripherals.

3.1.1.2 Service life

The scaling factors and subsequent staged increase in the recycling target were supported by the assumption that the average e-product service life will drop; that is, the age of e-products replaced will reduce over time as we turn over e-products more quickly, thereby accelerating e-product obsolescence (PricewaterhouseCoopers Australia, 2009). The average service life used in the original modelling was set to decrease over the life of the Scheme. However, this was updated by Pitt & Sherry (2015) for the Department to model a more stable service life, setting televisions to 6.4 years in 2016 and dropping slightly to 6.3 years in 2021. Service life was also updated for household and business computers from 2016 onwards to 6.3 years and 3.4 years respectively.

Evidence indicates that the decreases in service life in the original modelling did not take place. Market intelligence companies who track and forecast e-product imports have advised that consumers have not reduced the service life or refresh cycles of products within their models and they predict them to remain steady. In addition, a survey of ANZRP Members on the purchasing, replacement and disposal of their products by customers found that for large businesses and SMEs computer and printer fleet replacement cycles range from between 4-6+ years. These replacement cycles are being extended rather than reduced due to a combination of greater reliability and economic conditions.

3.1.1.3 Estimation of e-waste generation

Taking into account the issues with the assumptions of replacement purchases and service life discussed above, ANZRP estimates that the percentage of e-product replacement purchases that result in e-waste generation each year is 62% for televisions, 83% for computers and 86% for printers (refer to Appendix C). No estimation of the percentage of replacement purchases has been made for computer parts and peripherals so a figure of 90% has been used in line with the Scheme methodology.

Taking the above into account, ANZRP estimates the replacement component of the scaling factor to be 78%. Consequently, the amount of e-waste generated each year is being overestimated using the replacement factor of 90%. For 2016-17 this overestimation could equate to 11,700 tonnes.

3.1.2 E-waste available to the Scheme

As outlined in Figure 2, there are four main pathways for a replaced e-product in a given year:

- Long-term storage in the household or workplace
- Entry into the domestic second hand market
- Entry into the international second hand market (via export from Australia)
- Disposed of as e-waste (which may be recycled or landfilled)

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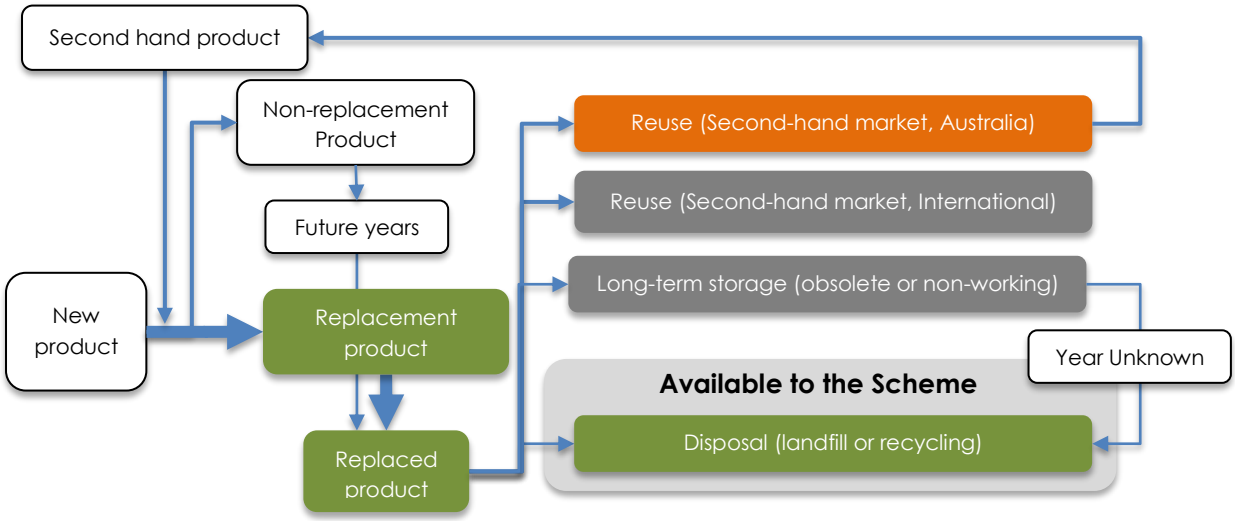
Figure 2 The replacement pathway



These pathways are discussed in the following sections.

3.1.2.1 Long-term storage

Long-term storage (considered to be greater than one year) of replaced e-products by consumers is an unpredictable aspect of the Scheme which impacts the amount of available e-waste each year (Mars et al, 2016 and Meta Economics, 2011). According to studies in Australia and around the world, 13% to 35% of households store a range of obsolete or non-working e-product (Lane, 2015, Alberta Recycling Management Authority, 2015, ECODOM, 2012, Commonwealth of Australia, 2012, Mars et al, 2016 and Statistics Canada, 2011). In a recent study by Monash University, 45% of households store working and non-working computers and televisions in the home (Lane, 2016). This storage of obsolete or non-working e-product has resulted in a stock of used e-products in Australia that will one day enter the e-waste stream.

If stock levels in Australia continue to grow, there will continue to be an overestimation of the amount of available e-waste year on year. Monitoring change in storage stock levels can be used as an indicator of behaviour change.

3.1.2.2 Australian second hand/reuse market

Replaced e-products that enter the Australian (domestic) second hand market primarily come from households and to a lesser extent SMEs, where used e-products are given to family and friends, donated to charity, sold to employees, sold online (e.g. eBay) or sold to refurbishers/remarketers or aggregators. There are no up-to-date data sets that measure the size of the e-product reuse market in Australia. However, behavioural analysis surveys asked households if replaced e-products were given to family or friends, charity, sold or traded (which represents used e-product entering the Australian second hand market). For televisions, this represented 20% (Lane, 2016) to 24% (Commonwealth of Australia, 2012), for

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desktop computers 30% (IPSOS, 2015), for laptops 22% (IPSOS, 2015) or for all computer products including tablets and monitors 15% (Lane, 2016).

These second hand products are not available to the Scheme while they are in use during their 'second' life.

The current scaling factor assumes that 100% of e-products entering the local second hand market replace an existing e-product which is then disposed of. However, when second hand e-products are replaced, they can also go into long-term storage in households or workplaces or re-enter the domestic second hand market. They are less likely to be exported for reuse due to their age, but may form part of illegal exporting of used e-products.

3.1.2.3 International second hand/reuse market

Replaced e-products can be exported to the international second hand/reuse market. E-products in demand from this market are primarily computers and printers from large business and to a lesser extent SMEs (Simpson, 2015). There is a competitive international market for used e-products, particularly for two-to three-year-old computers from Australia due to their value. This competition not only for used e-products and components but the precious metals they contain can lead to illegal export activities (refer to section 3.2.2). Exported e-products are unavailable for recycling in Australia and therefore the Scheme. As such, they must be removed from the Scheme Target.

In 2015 the Scheme adjusted the scaling factor to take into account that some replaced e-products are subsequently exported (Commonwealth of Australia, 2015b). The scaling factor of 0.9 was adjusted by 0.1 (or 10%) to 0.8 for computers, by 0.02 (2%) to 0.88 for printers and by 0.02 (2%) to 0.88 for computer parts and peripherals[13]. However, ANZRP believes that these scaling factors are still grossly underestimating the amount of used computers and printers being exported on an annual basis.

The IT Industry has consistently claimed that about 40% of computers imported into Australia are exported for reuse, and consequently the scaling factor for computers should be 0.6 (refer to Appendix B). To test these claims, ANZRP undertook research using Australian Bureau of Statistics (ABS) export data (refer to Appendix A), which found that export of new and used e-products (represented as a percent of imports) in 2015-16 reached 27% for computers and 25% for printers. For all e-waste the figure was 15%. These figures would likely be higher if the true amount of exports could be quantified (including illegal exports).

This high level of export is supported by examining what is recovered under the Scheme. Of imports, computers, printers and computer parts and peripherals (IT equipment) represent up

[13] The original scaling factor of 0.9 represented the level of new imports that were for e-product replacement purchases. It was subsequently adjusted in 2015 during a review to also recognise that some second hand products are exported. There was no indication by the Australian Government that the replacement level factor was also adjusted during this review.

to 68% of imports by weight[14]. However, they only represent around 40% of the weight ANZRP collects annually through public collections. More IT equipment is imported than is being recycled, suggesting it is going elsewhere in substantial volumes as supported by ABS export data. This creates an equity issue as importers of IT products must recycle television products in order to meet their liability. In the ideal world separate targets should apply, however, until the level of IT reuse is addressed it is not feasible as the IT target would not be able to be met.

3.1.2.4 Disposal

The final pathway for replaced e-products in Australia is disposal. Disposed e-products (i.e. e-waste) will be either recycled within or outside the Scheme or landfilled.

A survey of ANZRP Member companies on the purchasing, replacement and disposal of their products found that the majority of large businesses and many SMEs have arrangements in place to have their used computers and printers collected for recycling or reuse (predominantly during fleet refreshes). However, it was not possible to quantify the percentage of this volume which is recycled (under the Scheme or outside of the Scheme) or reused (domestically or internationally).

For household volumes, ANZRP undertook a survey of Australian local governments[15] which found that:

- 47% of councils who responded have contracts with Co-regulatory Arrangements directly or via third parties: as such, their e-waste is recycled under the Scheme
- 10% have contracts with scrap metal recyclers or not-for-profit organisations, indicating their e-waste may or may not be recycled under the Scheme
- 23% do not offer e-waste services to households due to cost restrictions, indicating their household e-waste is most likely still being sent to landfill, stored or given to charity (for recycling or reuse)

Unfortunately, e-waste is still being landfilled in Australia even though the Act was put in place to help address failures in the e-waste recycling market and divert e-waste from landfill. However, when Co-regulatory Arrangements try to source e-waste from waste holders, they compete with parties who offer cheaper treatment options such as landfill (especially when there is no landfill levy) or a potential rebate (in the case of scrap metal recyclers or buyers of components). In response, some Co-regulatory Arrangements have elected to pay waste holders for e-waste due to pressures to meet their recycling target. This ultimately results in increasing costs to liable parties with the creation of a secondary market that profits at the expense of liable parties

[14] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.
[15] Survey of 262 local governments in Australia undertaken in 2016.

No jurisdiction accurately measures and reports actual landfilling of e-waste. However, a number of states and local governments periodically conduct landfill and kerbside bin audits.

In New South Wales, municipal and commercial and industrial (C&I) waste audits were undertaken in 2011 (State of New South Wales, 2011) and 2014 (State of New South Wales, 2015) respectively. E-waste covered by the Scheme was estimated to account for 0.1% of the overall C&I waste stream. E-waste disposed of in kerbside was estimated to account for 1.3% of waste disposed, but e-waste in the municipal audit also included mobile phones, electrical items and toner cartridges.

In Victoria, a summary of kerbside bin audits in 2013 (Sustainability Victoria, 2014) estimated e-waste to account for 0.9% of residual kerbside waste with only 4% of the e-waste being products covered under the Scheme. No televisions or computers were recorded as being disposed of.

Using both the New South Wales and Victoria audit data and national landfill data for 2010-11 (Randell et al, 2013), the amount of covered Scheme e-waste landfilled in Australia was in the vicinity of 9,200 tonnes or in 2015-16 terms approximately 10% of net imports.

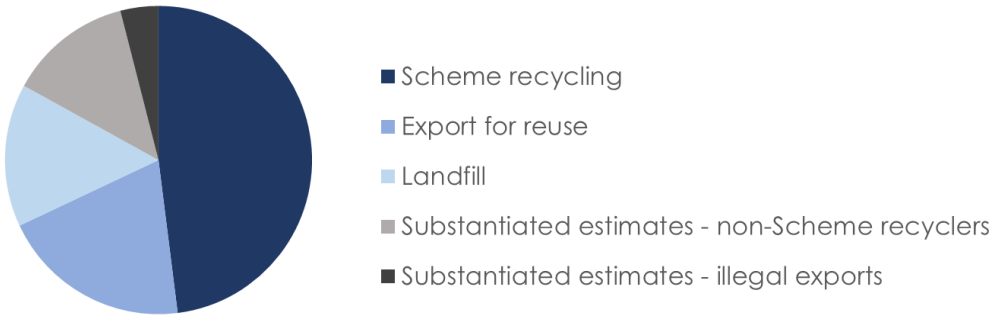
The level of e-waste recycling outside of the Scheme (or unaccounted for collections) is unknown. This impacts Co-regulatory Arrangements' ability to meet the Scheme Target, and will continue to have an impact in future years as the target increases. This issue has also been experienced overseas with European Union Member States indicating that one of the major threats to meeting recycling targets is the impact of unaccounted for collections (European Commission, 2014b).

To address collections unaccounted for, the UK has introduced the use of 'substantiated estimates' to assist with meeting the UK's collection target[16]. These substantiated estimates represent the quantity of WEEE that is collected and treated outside the operation of the current Regulations and not recorded (known widely as 'unobligated WEEE'). The level of unaccounted-for e-waste collections is sized by the UK Government and, as such, they reduce the target required to be met by the UK Producer Compliance Scheme by the amount of the substantiated estimates.

For Australia, substantiated estimates would include recycling outside of the Scheme and illegal exports (refer to Figure 3). In 2014-15 this has been estimated by ANZRP to be in the vicinity of 22% of e-waste availability.

[16] Collection target is equivalent to the NTCRS recycling target.

Figure 3 Destination of e-waste availability



3.1.2.5 Estimation of e-waste availability

Taking into account the issues with estimating e-waste generation, the assumptions around long-term storage behaviour and reuse in the domestic and international second hand markets, ANZRP estimates that available e-waste could represent 60% of televisions imports, 60% of computer imports and 63% of printer imports. No estimation has been made for computer parts and peripherals (refer to Appendix C).

Consequently, the amount of available e-waste each year (from which the Scheme Target should be set) is being overestimated using the current scaling factors. For 2016-17 this could be as much as 32% or 22,800 tonnes (refer to Appendix C) or 13,000 tonnes of e-waste that Co-regulatory Arrangements are required to source but are not available (using the Scheme Target of 58%). As such, recycling rates of 80% in future years are impractical.

An overestimation of even 1,000 tonnes of e-waste generation equates to the need to collect one of the following additional volumes per year[17]:

 OR  OR  OR  OR 

125,000 Televisions | 1.7 million tablets | 415,000 laptops | 280,000 printers | 1.25 million keyboards

3.1.3 Recommendations

The methodology for calculating annual waste arising needs to be flexible to avoid significant over-estimation of available e-waste. It also needs to accommodate the changing market conditions and behaviours over the life of the Scheme and be reviewed regularly. It is recommended that the following take place:

Recommendation 1 Immediately adjust the current scaling factor for computer and printer products to 0.7 supported by ABS data (i.e. to account for current new and used computer and printer export levels of 25-27% of imports using

[17] Based on 2014-15 ABS import product proportions and conversion factors in Schedule 1D of the Regulations.

ABS export data. Note, ABS export data does not support a change in the scaling factor for televisions).

Recommendation 2 In the longer term, develop a mass balance methodology for calculating annual waste arising by category using both actual product flow data and substantiated estimates as follows:
Waste Arising = I – E ± S – R – L, where:

- I = Imports of e-products obtained from ABS data (actual data)
- E = Exports of new and used e-product obtained from ABS data (actual data)
- S = Change in stock levels of used e-products (due to long-term storage of used e-product and non-replacement product purchases) obtained by undertaking behavioural surveys of households, SMEs and large organisations every two to three years (behavioural data)
- R = Recycling of e-waste performed outside of the Scheme obtained by undertaking periodic surveys of recyclers (substantiated estimates) or requiring recyclers to report volumes to the Department or state-based regulators (actual data)
- L = Landfilling of e-waste obtained by undertaking periodic surveys of landfills (substantiated estimates) or requiring landfills to report volumes to the Department or state-based regulators (actual data)

Recommendation 3 Using accurate estimates of future waste arising (as per Recommendation 2), review the staged increases in the Scheme Target listed in Schedule 2 of the Regulations to ensure they are achievable by 1 July 2018.

3.2 EXPORT OF E-WASTE

Section 4(e) of the Act states that it is intended that stakeholders will ensure that products (and their waste) are reused, recycled, recovered, treated and disposed of in a safe, scientific and environmentally sound way. However, the Scheme deals only with recycling e-waste. It does not account for the reuse of e-products in any way (even though it clearly affects the outcomes of the Scheme), nor is there any reference to repair. Reuse and repair are both higher in the waste hierarchy and deliver better environment/resource recovery outcomes.

Reuse results in greater benefits to the environment over recycling (as per the waste hierarchy principle). Reuse also represents the greatest value recovery opportunity from used e-products as it allows the material resources in the devices and the embodied energy from manufacturing processes to be captured and reused (Mars et al, 2016). This can be evidenced in the price received for refurbished versus recycled e-products. For example, the

average price of a refurbished laptop is USD450-700 versus the average price for the commodities from recycled laptops of USD17-18 (Mars et al, 2016).

3.2.1 Export of e-waste for reuse

As discussed in sections 3.1.2.3 and 3.1.2.2, reuse of used e-products (particularly computers and printers) takes place both domestically and internationally. There is an established remarketing and refurbishing industry globally with a high demand for Australian used e-products. However, there is no transparency around the volume of used e-products or their destinations and end markets. In Australia, used e-products are predominantly 'remarketed' by IT asset disposal (ITAD) companies and remarketers with a requirement that they conduct specifications checks and data wiping procedures on the e-product. This e-product is sold onto aggregators/distributors who sell and export them into international markets. Refurbishing of used e-products also takes place in the export destination.

The majority of e-product used by large businesses and organisations in Australia is leased for a set period of time (e.g. three to four years). At the end of the lease, the e-product remains the property of the leasing company. Many of these leasing companies sell the residual value of the lease to ITAD companies/remarketers. The e-product is refreshed and usually exported where it may be leased for another period or sold outright. This export of used e-products diverts e-waste from the Scheme which cannot be used to meet the Scheme recycling targets (as it is not recycled).

ANZRP has estimated this export volume for computers and printers (as a percentage of new e-product imports) using ABS export data (refer to section 3.1.2.3). In absolute terms, ANZRP estimates that 11,900 tonnes of used computers and printers were exported in 2015-16.

ANZRP supports the inclusion of reuse and refurbishment/repair of used e-products domestically and internationally and establishing a means to track the export of working product for reuse as part of the Scheme. However, the following needs to be considered before this can take place:

- A standard must be established and agreed to cover refurbishing/repair. There are available end of life refurbishing solutions in export countries that meet international standards (such as ADISA (Asset Disposal and Information Security Alliance) and ISO 27001 (Information Security Management Systems), the EU WEEE Directive requirements for preparation for reuse, the Responsible Recycling ["R2"] Standard for Electronics Recyclers, the WEEELABEX Standard on Treatment and the e-stewards Standard for Responsible Recycling and Reuse of Electronic Equipment) that require WHS and environmental management actions
- Compliance with hazardous waste export legislation

3.2.2 Illegal export of e-waste

We believe illegal exports of used e-products takes place. In destination countries e-waste can be refurbished or recycled with often substandard transparency and WHS, and

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environmental management practices. There are two types of illegal trade anecdotally occurring:

1. Export of working e-product and possibly non-working e-product under relevant tariff codes without a permit
2. Export of e-product (most likely non-working) under unrelated tariff codes or scrap codes

These export volumes again divert available e-waste from the Scheme which cannot be used to meet the Scheme Target, continuing to undermine the latter. In addition, illegal export of e-waste can lead to negative media coverage and public outrage as well as criticism and reduced trust in legitimate and well-intentioned e-waste product stewardship schemes.

This was the case when the Australian Broadcasting Corporation (ABC) reported that a computer monitor from St George Bank, destined for recycling in Australia, was found on a toxic e-waste dump in West Africa (Le Tourneau, 2017). It was also evidenced with the release of the Basel Action Network (BAN)'s 'Scam Recycling - e-Dumping on Asia by US Recyclers' report where BAN placed tracker installations in 205 LCD monitors, CRT monitors and printers, tracked their movement after disposal and found that a percentage were sent offshore to developing countries. ANZRP understands that BAN intends to implement trackers in e-waste recycled in Australia in future.

We understand exports without a permit are mostly for non-working computers and computer parts which are traded under the correct export codes, but they are incorrectly shipped as either 'working product' or 'non-hazardous' (which do not require permits). In theory this volume is accounted for within the ABS export data, but it cannot be quantified separately. Export of e-product under unrelated tariff codes is unquantifiable and unaccounted for as volumes are hidden in shipments where there is no trace of the type of product leaving the country. It may be time for a review of forms and declarations to ensure disclosure about the products being exported being new, used/working, used/not-working and if more than one type of commodity/product is included in the shipment.

ANZRP welcomes the Department's work to develop domestic technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention.

3.2.3 Recommendations

The timing of the following recommendations is critical to the longevity of the Scheme – waste arising is now less than or at best equal to the Scheme Target. It is recommended that the following take place:

Recommendation 4 Account for domestic and international e-product reuse in the Scheme by 1 July 2018 by implementing a requirement on refurbishers/exporters that facilitates the measuring and reporting of

the reuse volume and then reducing the recycling target by this volume.

Recommendation 5 Require international standards for the reuse of e-waste to be complied with or develop an e-waste reuse standard which outlines procedures and processes for remarketing and refurbishing devices and includes:

- Applicable definitions e.g. reuse, remarketing, remanufacturing, repair, working product and remanufactured product
- Requirements for WHS and environmental management
- Compliance with hazardous waste export legislation
- Requirements for transparency, reporting and auditing

To be implemented by 1 July 2018.

Recommendation 6 Develop a register of e-waste stakeholders who have permits for the compliant export of e-waste including volumes and destinations and develop more robust guidance material on how to compliantly export e-waste.

Recommendation 7 Further investigate and quantify the volume of illegal exports of e-waste.

3.3 COVERED PRODUCTS

3.3.1 Expansion of e-product categories

ANZRP supports the inclusion of electrical and electronic products on the 2016-17 Product List (in accordance with Section 108A of the Act) and the Department's intention to consider whether there is a case to expand the Scheme to include other categories of electrical and electronic products (Commonwealth of Australia, 2017).

For a large country like Australia where e-waste is transported over great distances to deliver it to recyclers mostly located in capital cities, including other electrical and electronic products into the Scheme will result in increased efficiencies in e-waste transport as well as in the recycling and material recovery processes. This is likely to lower Scheme cost per unit recycled. Recent industry experience in South Australia appears to support that collecting a broader product group will increase the collection of covered product by about 50%.

Greater e-waste volumes could also incentivise the investment in domestic technologies and facilities for the dismantling of products and recovery of material (The Economist Intelligence Unit, 2015) and generate end markets in Australia. This would therefore expand the domestic recycling industry and create jobs in both metropolitan and rural areas. Recycling jobs are considered to be predominantly recession proof as recycling rates do not typically fluctuate with the broader economy (Ritchie, 2016a). Recycling jobs cover a broad skill range including technical (engineering, chemistry, and science), commercial (sales, business) and operational (Ritchie, 2016a).

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Another benefit of increasing the categories of e-products covered by the Scheme would be reducing public confusion about what products can be taken to drop-off sites (Morris and Metternicht, 2016). Members of the public often deliver non-covered e-products to Scheme collection sites, particularly television peripherals, hi-fi equipment and other home appliances (Commonwealth of Australia, 2016). Some of these products are currently landfilled or may be sent to metal recyclers. In addition, the environmental benefits of recycling increased e-products include diversion from landfill and increased resource recovery.

Products included in the 10 United Nations University 'UNU-KEYS' e-product categories (which have all been adopted by the EU WEEE Directive) should be assessed to establish their handling requirements, work health and safety (WHS) hazards, ease of separation and potential yield prior to inclusion into the Scheme. ANZRP supports the inclusion of small household items that are compatible with current collection methods and do not pose a safety hazard. This could include the following products:

Table 2 UNU-KEYS Products

UNU-KEY Primary Category		Products to be included/excluded
1	Large household appliances	Microwaves, household heating and ventilation to be included
2	Small household appliances	All products to be included
3	IT and telecommunications equipment	All products to be included (includes printers, computers, computer parts and peripherals, mobile phones)
4	Consumer equipment	All products to be included (includes televisions)
5	Lighting equipment	All products to be included
6	Electrical and electronic tools	All products to be included
7	Toys, leisure and sports equipment	All products to be included
8	Medical devices	All products to be excluded
9	Monitoring and control instruments	Professional monitoring and control instruments to be excluded
10	Automatic dispensers	All products to be excluded

The weight of imports of the above products (excluding products already covered by the Scheme) in 2016 was 470,000 tonnes[18]. Given the weight of imports of covered product in

[18] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for calendar year 2016.

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2015-16 was 102,437 tonnes[19], including small household items in the Scheme could result in an expansion by 460% (by weight).

If the Scheme was expanded, separate product classes will be necessary, possibly based around the UNU-KEY or the new WEEE Directive categories with separate targets for each product class.

3.3.2 Changes to covered product

In order to extend the life of printers and MFDs and to keep them functioning, hardware parts must be replaced for wear and tear. As such, printer hardware parts are an essential component of the operation of printers. However, printer hardware parts are not currently covered under the Scheme despite collection channels and recycling solutions already being in place. It has not been possible to quantify annual volumes of printer hardware parts that support printers covered under the Scheme as the applicable tariff codes for the import of hardware parts are unclear.

Large form factor and high end printers weighing over 500kg (HS codes 8443.32.00.39 and 8443.31.00.28) are covered under the Scheme. However, they have an extremely long life span (typically 10-25 years) and a high reuse value, so are unlikely to ever enter the e-waste recycling stream and even less likely to enter landfill. These products are part of the exemption of Large Scale Stationary Industrial tools (LSSIT) from the European Union's Restriction of Hazardous Substances Directive (RoHS).

3.3.3 Reporting of covered product imports

It is essential that the Department be sufficiently resourced. In order to reduce the administrative and reporting burden of the Department, it is recommended that the Department consider self-reporting of product imports and exports by liable parties. For example, liable parties could be required to register for and complete 'put on market' reporting of covered product imports and exports by tariff code. A similar process is currently used in the WEEE Directive and under the Australian Energy Rating Label in accordance with the *Greenhouse and Energy Minimum Standards (GEMS) Act 2012*.

3.3.4 Recommendations

It is recommended that the following take place:

Recommendation 8 Investigate the expansion of the Scheme to include additional categories of e-product. E-products should be analysed to determine compatibility with the Scheme's collection and recycling networks and capabilities. Where compatible, create a recycling target for each class of product.

[19] Provided by the Department on 3 May 2017.

Recommendation 9 Investigate the use of the UNU-KEYS classification system. This classification system groups products that share comparable average weights, material compositions, end of life characteristics and lifespan distributions and can be linked to the Harmonised System (HS) codes used for the import of products into Australia.

Recommendation 10 Determine the volume of printer hardware parts which support covered printer products and include these hardware parts in the Scheme.

Recommendation 11 Remove large form factor and high end printers [HS codes: 8443.32.00.39 and 8443.31.00.28] from the covered e-product list under the Scheme.

Recommendation 12 Consider moving to a self-reporting model for liable parties to notify the Department of their 'put on market' volumes of covered product.

3.4 REVIEW OF CONVERSION FACTORS

Over the life of the Scheme there have been four scheduled updates to tariff codes and corresponding conversion factors (converted weights) to calculate the weight of product imported. The two main types of amendments made over the life of the Scheme have been:

- Creation of new tariff codes to either create weight based categories or to break down an existing weight based category (75% of tariff codes are now weight based)
- Adjusting (up or down) the conversion factor for particular tariff codes

These scheduled updates have been received positively as product sizes and weights continue to change over time. Weight-based categories (as opposed to size-based categories) result in a more accurate measure of product weights entering the country.

During ANZRP's analysis of imports using ABS trade data and Scheme conversion factors (refer to Appendix A), a potential overestimation of the weight of printers entering the country was identified. This was determined by comparing ABS import gross weight (adjusted for packaging of 5%) to ABS import quantities multiplied by Scheme conversion factors. Imported weight using the Scheme conversion factor was 9% to 37% higher than gross weight between 2012-13 and 2015-16.

3.4.1 Recommendations

It is recommended that the following take place:

Recommendation 13 Review and release a new conversion factor schedule annually and where practicable convert tariff codes to weight-based codes (if they are not already converted).

Recommendation 14 Review the printer conversion factors to determine whether an overestimation of the weight of printer imports is occurring.

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4 Material Recovery Target

The Scheme Material Recovery Target is the percentage of televisions, computers, printers and computer parts and peripherals which must be recovered and processed into useable materials and therefore diverted from landfill. At 90%, it is one of the highest Material Recovery Targets of any international e-waste product stewardship scheme. It has been suggested that high levels of reported material recovery means that less separation and recovery happens in Australia (Simpson, 2015).

Australian e-waste recyclers are usually responsible for the basic separation of e-products into components and parts with some also performing shredding. The majority of final separation of e-products into fractions (i.e. metals, plastic and glass) takes place offshore, often by several downstream providers to fully extract all materials. Data from these processes may not be provided or be incomplete leading to an overstatement of MRT.

4.1 DOWNSTREAM PROCESSING OF E-WASTE

Acceptable material recovery processes (manual, mechanical, chemical or heat processes) are listed in AS/NZS 5377: 2013 Collection, storage, transport and treatment of end of life electrical and electronic equipment (the 'Standard'). The Standard also provides some WHS and environmental management requirements for these processes. Traceability and record keeping requirements for downstream processing are provided in the Standard (although they are not overly prescriptive). It requires the weight, flow and processing of material and components from end of life electronic and electrical equipment to be recorded from receipt at the facility to final disposition downstream. Enforcing this part of the Standard for the NTCRS would ensure transparency and traceability.

Co-regulatory Arrangements are responsible for performing assurance activities to ensure they are being complied with by their recyclers. This is managed differently by each Co-regulatory Arrangement and it is challenging to obtain sound and reliable data particularly for smaller recyclers who use aggregators so have no contractual relationships past the first downstream vendor. Furthermore, only recyclers in Australia are required to be certified to the Standard; offshore recyclers and processors are not required to be certified to the Standard or any international standard (e.g. the WEEELABEX Standard, the R2 Standard, the e-stewards Standard or WEEE Directive requirements).

Downstream separation/processing can be undertaken in offshore facilities where WHS and environmental management practices may not be in line with Australian legislative requirements. In addition, there are no requirements on how they are to report/track material recovery and downstream material processing. However, Co-regulatory Arrangements are reliant on this data (which may not be accurate or be supported by robust evidence) to calculate their material recovery rates.

4.1.1 Recommendations

It is recommended that the following take place:

Recommendation 15 Require downstream recyclers and processors to comply with the requirements of an applicable international standard for e-waste recycling (e.g. the WEEELABEX Standard, the R2 Standard, and the e-stewards Standard or WEEE Directive requirements).

Recommendation 16 Perform assurance activities to check that the downstream processing of separated materials and the reporting of achieved material recovery rates complies with the Standard. This may include requiring recyclers or Co-regulatory Arrangements to:

- Report material recovery rates using approved templates/tools
- Provide evidence of achieved material recovery rates (e.g. invoices, shipping documents, batch processing results)
- Perform downstream vendor audits to an agreed standard/level

4.2 THE ROLE OF WASTE FROM ENERGY

Waste from energy is currently used by the waste industry as a treatment method for waste where reuse or recycling is difficult or unachievable. Waste to energy is used by many countries as part of an integrated waste management system which aims to divert waste from landfill. Many countries, particularly in Europe, have developed policies and funding programs to provide a clear direction and encourage the development of waste to energy (Ricardo-AEA, 2013).

The number of waste from energy installations/plants in the pipeline in Australia is rapidly increasing with $1.5B worth of projects announced (Clean Energy Finance Corporation, 2016). It is considered to have an important role to play in diverting waste from landfill and generating renewable fuels and electricity. It has been estimated that the proportion of landfilled waste in Australia which could be suitable fuels for waste from energy plants (e.g. plastics, paper, cardboard, wood and textiles) is at approximately 6.3 million tonnes per annum (Wainberg, 2016).

Waste from energy could be an appropriate treatment of e-waste material that cannot be easily recycled and is disposed of to landfill such as mixed plastics. The rise of plastics usage in electronics is creating issues for downstream processors as e-product devices tend to utilise multiple resins which can complicate recovery processes (Elliott, 2017). Mixed plastics is one of the most common yet lowest value material streams from e-waste.

Table 1 of the Standard includes waste to energy as acceptable processing applications for separated plastic materials. However, the Standard also states that energy recovery as a treatment should not be used as standard practice for disposal of end of life electrical and electronic equipment. In addition the Act states that one of its intentions is to ensure that

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products (and their waste) are reused, recycled, recovered, treated and disposed of in a safe, scientific and environmentally sound way, where 'recover' includes recovery of energy from those products or waste. The Regulations, however, are silent on energy recovery or waste to energy.

As such, the role of waste to energy in the Scheme is unclear. However, there is an opportunity that hard-to-recycle e-waste material streams, such as mixed plastics, could be processed domestically using waste from energy in the future.

4.2.1 Recommendations

It is recommended that the following takes place:

Recommendation 17 Research and assess the role of waste from energy in the Scheme for e-waste material streams which cannot be viably reused or recycled in Australia or overseas. Following this, include waste from energy requirements in the Regulations.

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5 Reasonable Access

The Regulations require each of the four Co-regulatory Arrangements to provide the public with Reasonable Access to collection services which can be permanent drop-off sites (e.g. local council transfer stations or retailer premises), drop-off events, mail back services or scheduled pick-up services. 'Reasonable Access' is defined in the Regulations for metropolitan, inner regional, outer regional and remote areas.

There are instances in inner and outer regional and remote areas where different Co-regulatory Arrangements have drop-off sites within a few kilometres of each other. In an ideal program, these drop-off sites would be spread out (where viable) to cover a greater radius and provide better accessibility to the town. This is in part due to the Scheme being co-regulatory which by its design creates competition.

The Regulations also do not prescribe the level of communication, signage or awareness (if any) Co-regulatory Arrangements need to provide to households and SMEs to make them aware of their collection services. They also do not prescribe the requirements for an event (e.g. length of event, hours/days of operation, type of venue and products covered) or for a mail back service (e.g. type of product that this service is applicable to). As a result, Co-regulatory Arrangements may not be providing a level of service that is deemed adequate by the public (or even known to the public) or indeed the Regulations.

Another issue has been the consistency of services provided due to the fact that Co-regulatory Arrangements are funded to meet their share of the Scheme recycling target (i.e. they are not funded if they over-collect). In the past, some Co-regulatory Arrangements stopped servicing particular towns or removed a collection site altogether without notice if they achieved their required collection volumes before the financial year was complete (Morris and Metternicht, 2016). This created serious issues for local government as residents continued to drop-off e-product, and generated negative media coverage. ANZRP's recent survey of local governments[20] indicated that this soured perceptions of the Scheme held be affected councils and led to the generation of e-waste stockpiles and subsequent landfilling at some councils as this was the cheapest solution. Some of these impacted councils also advised that they still do not have a solution for their e-waste.

5.1.1 Recommendations

It is recommended that the following take place:

Recommendation 18 Create a system to service remote locations in conjunction with local government that is contributed to by all Co-regulatory Arrangements

[20] Survey of 262 local governments in Australia performed in 2016.

based on their share of the Scheme Target (with the volume collected shared on the same basis).

Recommendation 19 Require all collection points under the Scheme to clearly advertise what they accept and what their opening hours are.

Recommendation 20 Develop a solution to encourage Co-regulatory Arrangements to 'over-collect' and to ensure fair and equitable contractual terms that provide adequate notice periods to collection points.

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6 Governance

6.1 SHARED RESPONSIBILITIES

The main objective of the Act is to provide a product stewardship framework for reducing the environmental and other impacts of products by encouraging manufacturers, importers, distributors and others to take responsibility of those products. The Regulations place responsibilities on liable parties (i.e. importers/brand owners), Co-regulatory Arrangements and the Minister and require recycling activities in Australia to be performed at facilities certified to the Standard. Responsibilities or incentives are not placed on retailers, distributors (unless importers), local government, state and territory government, consumers or transport and logistics companies even though they are key stakeholders in the Scheme and many already participate voluntarily.

ANZRP believes that extending the roles and responsibilities of some stakeholders will help to meet recycling targets and the objectives of the Act in a more fair and compliant manner.

6.1.1 Retailers

Retail stores are a convenient place for consumers to drop off small, used e-products especially when consumers are intending to make a replacement purchase. Many retailers have agreements with Co-regulatory Arrangements to offer drop-off services to consumers at their retail stores. All retail stores should be encouraged to provide drop-off points where viable (taking into consideration that there will be limitations on the size of e-products that can be accepted). Under the WEEE Directive, where retailers meet set floor space requirements and product type sales, they are required to provide a take-back service or fund a local government (equivalent) service.

ANZRP believes retailers are best placed to educate and make consumers aware of the Scheme, particularly as when the consumer is purchasing they are potentially considering what to do with the old e-product. Ideally, retailers could provide information about the Scheme at point of sale advising consumers how to find out where and how they can dispose of used e-products (e.g. website details printed on receipts or a card or flyer available in store).

Retailers also receive ‘dead on arrival’ and warranty return or faulty e-products that have been brought back to their stores by consumers. A survey by ANZRP of its Member companies (brand owners) found that warranty returns and ‘dead on arrival’ e-products comprise up to 2% of all e-product sales. Reverse logistics and/or asset management companies are contracted by some brand owners to collect and manage these e-products. Some brand owners make arrangements with the reverse logistics/asset management companies to have these e-products collected for recycling. Encouraging this practice with all parties who engage a retail channel to manage faulty e-products from retail stores would increase the rates of e-waste reuse or recycling.

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6.1.2 Transport and logistics companies

Transport and logistics companies are used by Co-regulatory Arrangements to deliver e-waste from collection sites and events to recyclers (which may also involve some form of interim storage/warehousing). However, some participating transport and logistics companies have a limited knowledge of the Scheme or the objectives and requirements for the transportation and storage of e-waste under the Standard. These include requirements for training, storage and handling procedures and lifting, handling and transportation equipment. The Regulations do not require transporters to comply with the Standard.

6.1.3 Local government

Local government is an important stakeholder in the Scheme with many local councils partnering with Co-regulatory Arrangements to offer collection sites or events. Councils that do not participate in the Scheme are also likely to receive e-waste from residents at transfer stations or via kerbside and hard rubbish collections. Councils are usually the first point of call for residents who do not know how to dispose of their e-waste., and the community expects councils to deal responsibly with waste. Local government has an on-going role to play in e-waste management as part of its community service.

ANZRP firmly believes that all local councils should be part of the Scheme and offer drop-off points. Appropriate local councils sites are the obvious drop-off point for consumers and could provide a one-stop for all wastes. This would further ensure all communities have access to drop-off points.

Local councils who offer e-waste collection sites under the Scheme, and indeed all collection sites, should be required to comply with the collection and storage requirements under the Standard. These include requirements for signage, handling and storage procedures and public access.

6.1.4 State government and state based regulators

State Government has an important role to play to set the policy framework to avoid e-waste from being disposed of to landfill. This includes using landfill levies, placing requirements on how e-waste is classified and disposed of to landfill (e.g. reporting, regulated waste tracking and receiving facility requirements) or banning e-waste from landfill altogether (as South Australia has done and Victoria is committed to do).

State Governments and Regulators should also require landfill facilities to report volumes of e-waste they receive to assist in making substantiated estimates (as per Recommendation 2). There has been discussion of including e-waste in waste tracking requirements and ANZRP would be very supportive of its inclusion to provide transparency of e-waste flows. State Government should be encouraged to invest in local government to establish safe, appropriate drop-off points for e-waste (and other wastes) to allow them to meet the Standard including collection areas on covered hardstand. For example, the NSW Environment Protection Authority and Sustainability Victoria have assisted in successfully implementing community recycling centres which reflect the models deployed in Europe

under the WEEE Directive. Such facilities would allow for the standardisation of collection units and lead to optimised logistics.

6.1.5 The Department and the Federal Government

To ensure confidence in the e-waste recycling industry, there needs to be greater transparency, consistent standards and proven, responsible end markets. Recent training conducted by ANZRP in conjunction with JAS-ANZ showed a lack of understanding of the key requirements of the Standard especially around appropriate controls for HSE risks and the need for downstream tracking and auditing. We recommend that the Department support the development of flexible, cost effective training program for auditors and recyclers about the requirements of the Standard. This should lessen the regulatory burden and if industry can rely on JAS-ANZ accredited certification bodies it will reduce costs to industry and to recyclers who have to undergo multiple audits.

The Department must enforce compliance and transparency under the Scheme to ensure its continued success. This includes ensuring that:

- Recycling facilities used by Co-regulatory Arrangements in Australia are certified to the Standard via accredited, independent auditors
- Transport and logistics companies and e-waste collection sites meet the relevant requirements of the Standard
- Co-regulatory Arrangements transparently report material recovery levels of recyclers (and have supporting evidence)
- Co-regulatory Arrangements require recyclers perform downstream vendor audits
- Recyclers and aggregators compliantly export e-waste (where applicable)

We suggest the Department investigate cost recovery for policing the Regulations, for example, investigate the cost of including in the Scheme a cost recovery component to ensure proper regulation of compliance. Inadequate policing adds to industry costs by introducing unfair competition.

The Department has a role to play in assisting the recycling industry to utilise compliant downstream processors. Offshore e-waste markets are continuing to change. For example, China, which has historically been a major importer of waste, has notified the World Trade Organisation that it will stop accepting 'foreign garbage' including waste plastic by the end of 2017 (Reuters, 2017). A considerable amount of Australia's separated plastic from e-waste is currently shipped to China for processing. As such, there is a role for the Department to advise the industry on compliant alternatives and to assist in developing local markets.

The Department also has an important role to play in communicating with and educating the public, given the low levels of public awareness of the Scheme. The Regulations require Co-regulatory Arrangements to communicate information to the public about the arrangement, including the activities of the arrangement and how its services can be accessed (r.4.01(d)). However, in practice Co-regulatory Arrangements are only held accountable for listing details of their collection sites and events on their websites and the Planet Ark recyclingnearyou.com.au website. The Department has not conducted any public

awareness campaign beyond its website. National consistent messaging is critical to the success of the Scheme. There is a leadership role for the Federal Government to establish and roll out a community awareness and education campaign which is supported by Co-regulatory Arrangements and State and Local Government.

Strategy 2 of the National Waste Policy states that "[a]ll governments as significant procurers of goods, services and infrastructure will embody and promote sustainable procurement principles and practices within their own operations and delivery of programs and services to facilitate certainty in the market" (Department of the Environment, Water, Heritage and the Arts, 2009). Relevant sustainable procurement tools such as the Sustainable Procurement Guide and the Guide to the sustainable procurement of services (Department of Sustainability, Environment, Water, Population and Communities, 2013a and 2013b) and the Whole of Government ICT Hardware Panel Fact Sheet (Department of Finance, 2016), should be updated to include the requirement to reuse or recycle end of life/end of lease televisions, printers, computers and computer parts and peripherals under the Scheme. The Scheme should also be promoted to the 200+ Commonwealth departments and agencies (Australian Government, 2017) to ensure that their e-waste is collected under the Scheme.

There is a critical need for all levels of Government to unite to review and seek to harmonise policy and regulations in order to ensure that there are clear and consistent requirements for waste management and tracking right across Australia and to support of our international agreements.

6.1.6 Consumers

Consumers are important stakeholders in the Scheme as it is their disposal behaviours which dictate how much volume is available for collection under the Scheme. Consumers need to be aware that every time they purchase an e-product there is an impact to the environment and that they have a responsibility to ensure any old devices are reused or recycled. Their responsibility includes reuse and/or recycling by dropping off used e-products to Scheme collection sites/events or disposing of them via other applicable local council collection and recycling channels. This responsibility appears to be more accepted when countries set and charge an advanced recycling fee on purchase.

Indeed, it is recommended that the **Countering WEEE Illegal Trade Summary Report** (CWIT) be reviewed for its findings and recommendations as part of the Scheme review as it is evidence of the similarities in the issues faced in a global market.

6.1.7 Recommendations

It is recommended that the following take place:

Recommendation 21 Require or encourage all retailers of televisions, printers, computers and computer peripherals to offer drop-off points for e-products at

their retail stores or support/promote the nearest local council collection point.

Recommendation 22 Require all retailers to provide information at point of sale about the Scheme to consumers and how they can dispose of used e-products. For example, retailers could provide the Planet Ark 'RecyclingNearYou.com.au' website on receipts or provide a Scheme flyer with purchases.

Recommendation 23 Promote the Scheme to reverse logistics/asset management companies who manage faulty e-products from retail stores and require them to report on e-product which gets recycled and reused either under or outside the Scheme.

Recommendation 24 Require transport and logistics companies who transport and store e-waste for a Co-regulatory Arrangement to meet the relevant sections of the Standard.

Recommendation 25 Encourage and support local councils who have not partnered with Co-regulatory Arrangements to offer an e-waste collection point to residents in order to increase recycling within the Scheme.

Recommendation 26 Require local councils who collect and store e-waste for a Co-regulatory Arrangement to meet the relevant sections of the Standard.

Recommendation 27 Establish an agreed panel of JAS-ANZ accredited auditors with respect to the Standard and mandate their use by Co-regulatory Arrangements and recyclers for certification audits. Also support the development of flexible, cost effective training programs for auditors and recyclers about the requirements of the Standard.

Recommendation 28 Expand and improve the assurance program to enforce key requirements of the Scheme including:

- Recyclers, collection sites and transport and logistics companies to be certified to/meet relevant requirements of the Standard
- Co-regulatory Arrangements to transparently report material recovery levels (and have supporting evidence) by recyclers and recyclers to perform downstream vendor audits
- Recyclers and aggregators to compliantly export e-waste (where applicable)
- Recyclers to comply with applicable standards for reuse activities
- Investigate the cost of including in the Scheme a cost recovery component to ensure proper regulation of compliance

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Recommendation 29 Develop and conduct a national public awareness campaign to be deployed by Federal, State/Territory, local governments and Co0regulatory Arrangements to educate the public on how to participate in the Scheme.

Recommendation 30 Update relevant government sustainable procurement tools/guidelines to include the requirement to reuse or recycle end of life/end of lease televisions, printers, computers and computer parts and peripherals under the Scheme and promote the Scheme to the 200+ Commonwealth departments and agencies.

6.2 CONSOLIDATION OF PRODUCT STEWARDSHIP SCHEMES

ANZRP supports the inclusion of batteries on the Department's 2016-17 Product List (Commonwealth of Australia, 2017) in accordance with Section 108A of the Act and the establishment of a product stewardship program for batteries. However, a new program for batteries (or multiple programs for different types of batteries and energy storage devices) is not recommended.

ANZRP firmly believes product stewardship should be managed more holistically rather than using the current model of individual schemes for each product type or class (there are currently individual product stewardship schemes for more than 20 products[21]). This will ensure consistency, increase efficiency, reduce confusion by the public and make it easier for the Department to monitor and enforce. For example, the WEEE Directive is one product stewardship program for all products that require a power source (electricity or battery) with sub-categories rather than many separate product specific programs.

Another opportunity to holistically manage product stewardship is around packaging. IT and television brand owners currently have to join one of the four Scheme Co-regulatory Arrangements and also be a signatory to the Australian Packaging Covenant for their covered products. This entails two sets of membership and reporting to and funding two different product stewardship management bodies for their products. It would be more efficient and cost effective if one product stewardship body was authorised to manage the product stewardship requirements for both the product and its associated packaging and meet the requirements of both programs. This is the way it is managed in most of Europe and Canada, for example, Eco-systèmes (the largest ERP scheme in Europe) collects and recycles WEEE, batteries and packaging.

[21] The is a mandatory scheme for motor oil, the co-regulatory NTCRS for televisions, printers, computers and computer parts and peripherals, accredited voluntary arrangements for mercury containing lamps and tyres and other programs for agricultural chemicals and containers, batteries, beverage containers, cartridges and toners, decorative paint, mattresses, medicines, mobile phones, motor oil containers, newspapers, office furniture, packaging, plastic silage wrap, plastic shopping bags, PVC and refrigerants.

Managing product stewardship holistically and reducing the number of individual product stewardship programs will be more efficient for industry as well as the Department. It will reduce overheads, compliance procedures, reporting processes, contractual complexity and duplication of collection and transport services whilst driving economies of scale.

6.2.1 Recommendations

It is recommended that the following takes place:

Recommendation 31 Create an overarching product stewardship program with sub-categories as opposed to separate programs, with each sub-category being accountable for achieving a relevant recycling target.

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Appendix A: New and used product import and exports

The import and export of new and used e-products covered under the Scheme is a major element to working out the amount of e-waste generated and available to e-waste recyclers in Australia. Products covered under the Scheme are:

- Televisions: CRT televisions, LCD/flat panel televisions
- Computers: desktops, laptops/notebooks, PDAs/tablets, all other computers, CRT monitors and projectors, LCD/flat panel monitors
- Printers: Printers and multifunctional devices (MFDs)
- Computer parts and peripherals: power supplies, adaptors and UPS, cables, parts and accessories, toners and ink cartridges contained with a printer where they cannot reasonably be removed

New e-product imports are considered to drive the amount of e-waste generated each year by replacing existing e-products that subsequently become e-waste. However, not all new e-product imports will result in e-waste generation as:

- A proportion will be for non-replacement purchases (i.e. the purchase is the first time the user will own that type of e-product, or the user is increasing the number of units of the e-product type that they own) so any existing e-products will remain in use
- A proportion will be for replacement purchases, but the replaced e-product will be put into long-term storage rather than be disposed of as e-waste (an increase in long-term storage levels will result in less e-waste generation from replacement purchases)

Once replaced e-products become e-waste, a proportion will flow into the domestic and international second hand markets where it will continue to be used. The remaining e-products will be disposed of, becoming available e-waste (which will either be recycled or landfilled). A proportion of e-products purchased from the domestic second hand market will be replacement purchases resulting in existing e-products being disposed of as e-waste.

Of the replaced e-products, a considerable amount will be in working order and able to be reused. Depending on their age, replaced e-products, particularly computers and printers, will be highly sought-after in the international market. This makes exporting used e-products a more attractive prospect as opposed to recycling domestically. As a result, the used e-products become unavailable to Australian e-waste recyclers and the Scheme.

IMPORT TRENDS (2008-09 TO 2015-16)

The analysis of import trends of new e-products provided below is based on ABS trade data for 2008-09 to 2015-16[22] and conversion factors outlined in the Regulations.

[22] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.

Televisions – The quantity of televisions imported steadily declined between 2011-12 and 2014-15 and then slightly increased between 2014-15 and 2015-16. Almost 4 million units were imported in 2010-11 but this decreased to 2.2 million units in 2014-15 before increasing to 2.4 million units in 2015-16 (refer to Figure 4). The weight of imported televisions followed a similar trend due to declining import volumes as well as light weighting (refer to Figure 5).

Computers – The quantity of computers imported was fairly constant at over 10 million units between 2011-12 and 2013-14 and then reduced in the following two years to 8.8 million in 2015-16 (refer to Figure 4). The weight of imported computers followed a similar trend, and updates to the Scheme conversion factors resulted in a reduction in tonnage over recent years (refer to Figure 5).

Computer parts and peripherals – The quantity of computer parts and peripherals imported reduced significantly from 27 million units in 2010-11 to 14.6 million units in 2015-16 (refer to Figure 4). The weight of imported computer parts and peripherals followed a similar trend (refer to Figure 5), but there was a slight increase in 2015-16 partially attributable to updates to Scheme conversion factors.

Printers – The quantity of printers imported fluctuated from 2.7 million units in 2010-11 to 2.3 million units in 2015-16 (refer to Figure 4). The weight of printers imported followed a similar trend.

Figure 4 Total units imported by NTCRS product group, 2008-09 to 2015-16

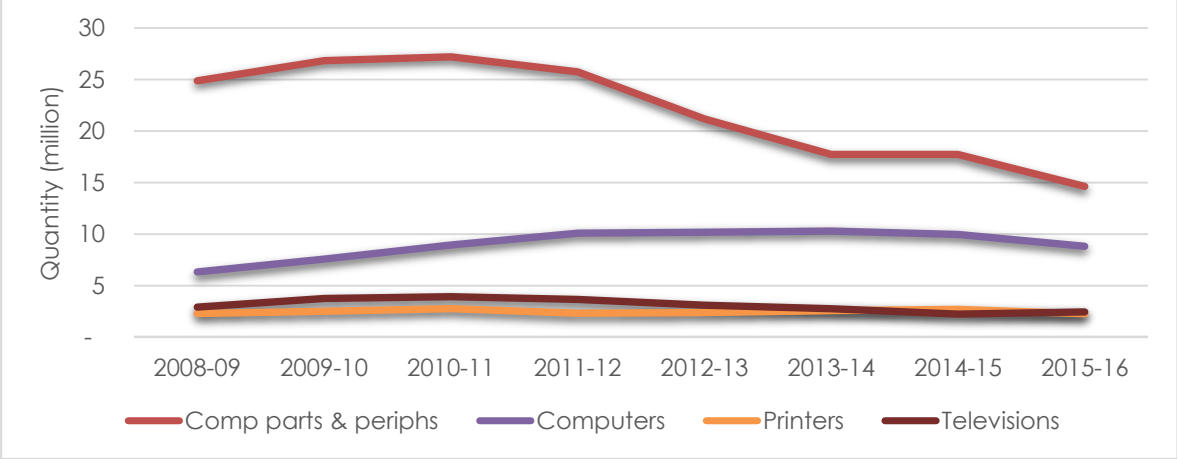

Figure 5 Total tonnes imported by NTCRS product group, 2008-09 to 2015-16

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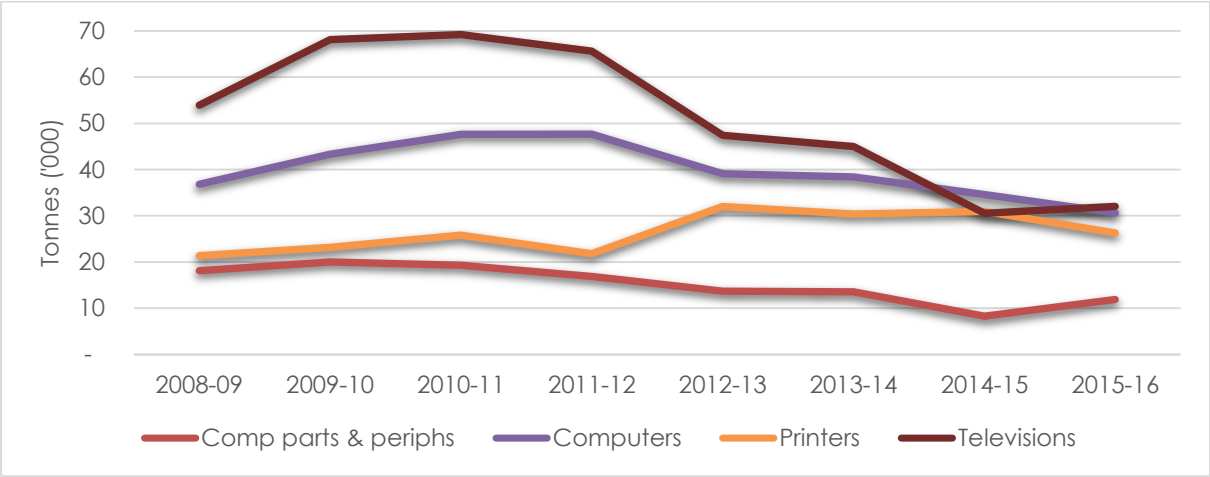
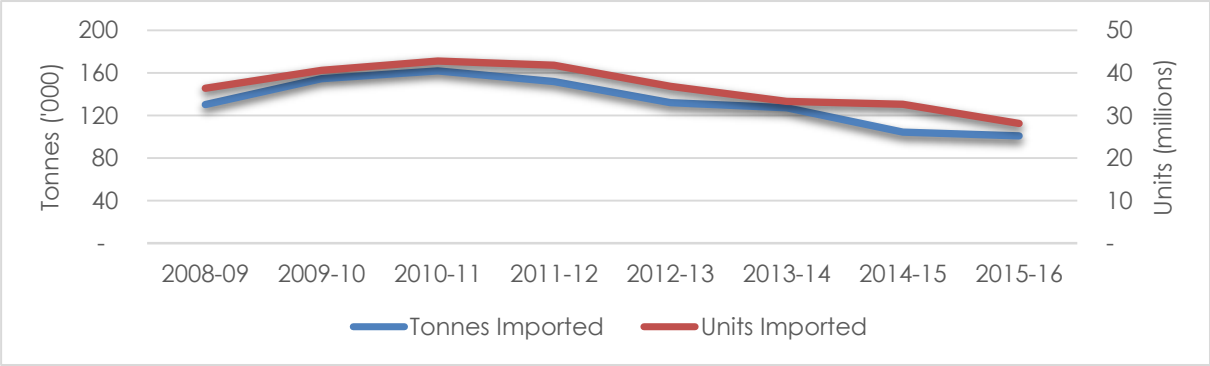


Overall the total quantity of imports of covered products under the Scheme declined between 2011-12 and 2015-16 (refer to Figure 6), primarily due to the significant decline in imports of computer parts and peripherals over this period.

Figure 6 Total units and tonnes imported, 2008-09 to 2015-16



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EXPORT TRENDS (2008-09 TO 2015-16)

The analysis of export trends of new and used e-products provided below is based on ABS trade data for 2008-09 to 2015-16[23]. According to the Regulation Impact Statement (Commonwealth of Australia, 2015), thirteen Australian Harmonized Export Commodity Classification (AHECC) codes correspond to Scheme covered products (refer to Table 3).

Table 3 AHECC export codes corresponding to Scheme covered products

HTISC Code	Description	Codes	Scheme product category
8443	Printing machinery used for printing by means of plates, cylinders and other printing components of 8442; other printers, copying machines and facsimile machines, whether or not combined; parts and accessories thereof	84433105	Printers
		84433207	Printers
8471	Automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	84713011	Computers
		84714121	Computers
		84714930	Computers
		84715040	Computers
		84716050	Computer parts & peripherals
		84717000	Computer parts & peripherals
8473	Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of 8469 to 8472	84733010	Computer parts & peripherals
8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	85284101	Computers
		85285101	Computers
		85287205	Televisions
		85287305	Televisions

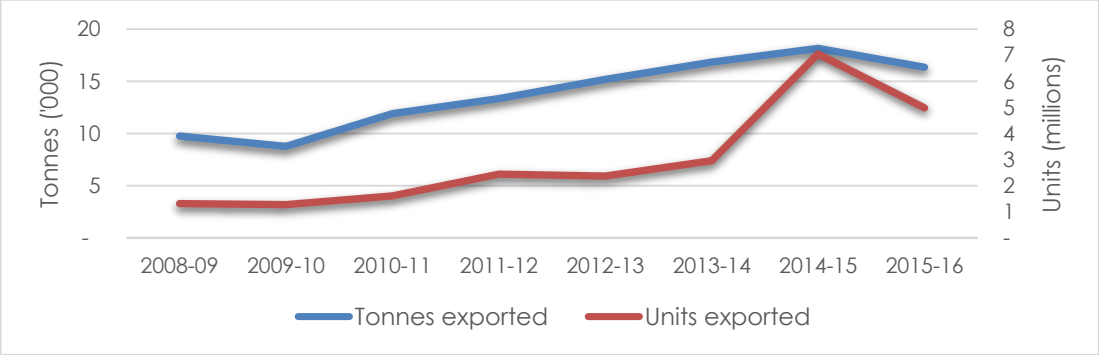
The overall export of new and used computers, printers and televisions steadily increased from 9,800 tonnes in 2009-10 to 18,000 tonnes in 2014-15 before declining slightly to 16,300 tonnes in 2015-16 (refer to Figure 7). Computers and printers make up 97% of new and used e-products exported.

Total tonnes of exports of e-products as a proportion of imports of e-products consistently increased from 5.4% in 2009-10 to 16.5% in 2014-15 before declining slightly in 2015-16 to 14.9%.

[23] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.

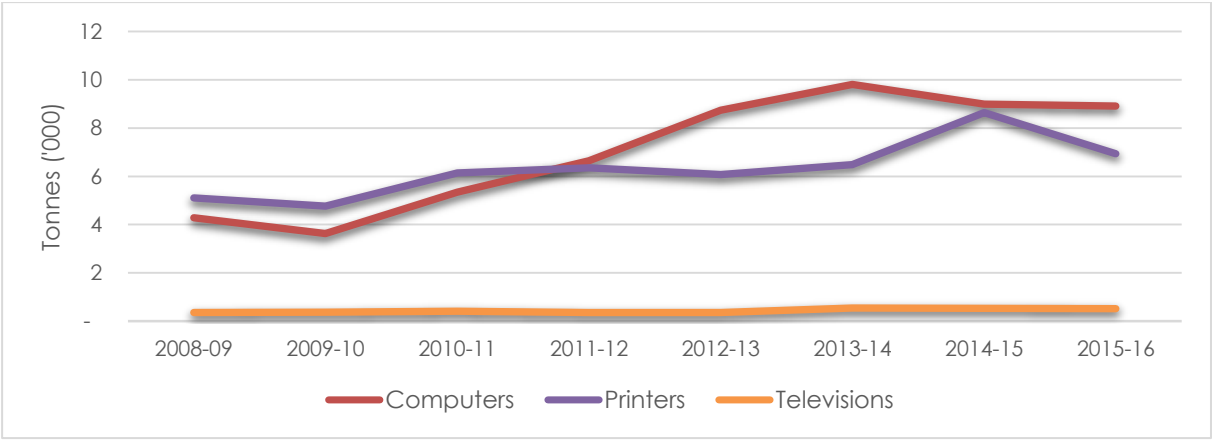
For computers (including monitors) and printers, exports as a proportion of imports was equivalent to 27% and 25% respectively in 2015-16.

Figure 7 Gross weight (tonnes) and quantity of units of new and used e-products exported, 2008-09 to 2015-16



Note: In 2014-15, total quantities of printers and computers units significantly increased. ANZRP queried the ABS in regards to these two figures. A response from ABS on 7 April 2016 confirmed an error in the quantity of computers which could not be resolved while the quantity of printers appeared to be error free.

Figure 8 Gross weight (tonnes) of new and used computers, printers and televisions exported, 2008-09 to 2015-16



Using exports of new computers reported by ANZRP liable parties, ANZRP estimates that during 2015-16 used computers and monitors accounted for approximately 80% of all computer and monitors exported by weight. Desktops comprised the majority of computer exports at approximately 43% by weight. In terms of quantity, the majority of computer exports were laptops and tablets at approximately 48%. Using the same methodology, used printers accounted for approximately 88% of all printers exported.

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Appendix B: Used computer exports

According to various industry sources, up to 70% of used computers are being exported. To investigate this claim, ANZRP engaged Monash University to research disposal channels for used computer products in Australia. Monash University completed its investigation and provided ANZRP with the final report in February 2015 (Simpson, 2015). Monash University was unable to establish an estimated volume of used computer exports, but provided a number of insights in regard to export of used computer products such as:

- Between 60% and 80% of business-based used computer products are estimated to be lost to exports
- Up to 20% of waste arising from consumer-based used computer product disposal is lost to exports
- Medium to large business users typically dispose of their computer fleet on a 3 year cycle with smaller businesses tending to use a longer replacement cycle of 4 to 5 years
- Small business users rely less on asset service firms while it is the preference of medium to large sized firms to exclusively use asset service firms for used computer product disposal
- Consumer disposal of used computers is primarily on a single unit basis and therefore uneconomical for direct collection by asset service firms (who are the predominant exporters)

ANZRP undertook further analysis to develop low and high estimations of used computers being exported by large business, SMEs and households using ABS import trade data for 2008 to 2017. The parameters used to estimate volumes are provided in Table 4 below. The market share of computers by each consumer group was based on IDC Tracker 2016 data. The percentage of computers exported by each consumer group was calculated using a combination of sources including a further the Monash University report (Lane, 2016), IPSOS behavioural data (IPSOS, 2015) and a survey of ANZRP Members in 2016. The estimates include laptops and desktops only; i.e. tablets and monitors are excluded.

Table 4 Computer export percentages by consumer group

	Market Share		Used computer exported	
Consumer group	**Laptop (%)**	**Desktop (%)**	**Low (%)**	**High (%)**
Large Business	22%	31%	60%	80%
SME	18%	39%	20%	40%
Household	60%	30%	5%	20%

ANZRP estimated that between 2013-14 and 2015-16 the export of used laptop and desktops ranged between a low of 4,000 tonnes to a high of 9,600 tonnes (see Table 5). ANZRP

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compared the results with export tonnage data obtained from ABS trade data for 2008-09 to 2015-16[24].

Table 5 ABS export trade data and ANZRP estimates of used laptop and desktop computer exports

	2013-14 (tonnes)	**2014-15 (tonnes)**	**2015-16 (tonnes)**
ANZRP Low	5,632	5,057	4,032
ANZRP High	9,665	8,704	6,961
ABS export trade data	5,700	5,315	5,576

It can be seen that the derived ABS export tonnages are similar to ANZRP's 'low' estimates of exports. The fact that the derived ABS export tonnages are not closer to ANZRP's 'high' estimates of exports could be in part explained by the likely export of used computers through non-computer export codes (which represent illegal exports).

[24] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.

Appendix C: Scaling factor calculation methodology

E-waste generation and availability is dictated by many factors such as product lifespan, technology changes and economic conditions, and differs between businesses and households. In order to improve the calculation of e-waste generation and availability, ANZRP has undertaken analysis on different product groups (tablets, laptops, desktops, monitors, printers and televisions) and consumer groups (households and businesses). No analysis has been completed on computer parts and peripherals.

The following data has been used in this methodology:

- ABS trade data for 2008-09 to 2015-16 (for all weight based calculations)[25]
- Assumptions used in the current Scheme calculations
- Consumer segment splits for tablets, laptops, desktops, monitors, printers sourced from IDC Tracker 2016 (refer to Table 6)
- Consumer splits for televisions sourced from Pitt & Sherry (2015) (refer to Table 6)
- New product exports derived using liable party data

Table 6 Household and business market share by e-product category

	Tablets	Laptops	Desktops	Monitors	Printers and MFDs	Televisions
Household	90%	60%	31%	38%	51%	73%
Business	10%	40%	69%	62%	49%	27%

NEW E-PRODUCT IMPORTS

New e-products imported into Australia are destined to:

- Enter the existing Australian market; or
- Be exported from Australia to neighbouring countries as new e-products

In 2015-16, around 8.8 million computers, 2.26 million printers and 2.4 million televisions were imported to Australia equating to around 30,600, 26,300 and 32,000 tonnes respectively. Computer parts and peripheral imports were 14.6 million units or around 11,900 tonnes.

Based on liable party data, the majority of new e-products exported from Australia by weight are desktops and printers, but in terms of units, tablets, laptops and printers make up the majority of exports (using ABS data). In 2015-16, export of new e-products equated to 0.1% for televisions through to 11% for desktops with overall new e-product exports as a proportion of imports being 3%.

[25] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.

Therefore, of all new e-product imports, 97% will remain in Australia to influence e-waste generation.

EXISTING E-PRODUCTS AND MARKET SIZE

According to Commonwealth of Australia (2012) there were about 18.7 million working television sets in Australian households in 2011, with an average of 2.2 in each home. In a recent study by Monash University, there was a net increase in the number of tablets, laptops, desktop computers and monitors in households with approximately one in two households having a net addition of one of these products (Lane, 2016). The number of televisions and computers per household has been rising and is anticipated to continue rising (Pitt & Sherry, 2015).

E-WASTE GENERATION

Utilising household behaviour studies by IPSOS (2015) and Commonwealth of Australia (2012), ANZRP has modelled replacement levels as outlined in Table 7 to estimate e-waste generation. According to the study by IPSOS (2015), 30% of households surveyed who currently own a laptop still use their previous laptop. For tablets this figure is 47% and for printers and computer monitors the figure is 18%. In the study by Commonwealth of Australia (2012), 80% of new purchases of household televisions were to replace existing televisions, but about 35% of replaced televisions were still being kept in the home. This corresponds to a recent study undertaken by Monash University which found that 30% of households who currently own a computer or tablet and 41% who currently own a television are still using their last device (Lane, 2106). No data was obtained for business replacement levels so ANZRP has estimated them to be 90% for all product groups except tablets which are estimated at 55%.

Table 7 Proportion of new purchases by households and businesses resulting in a replacement of an existing e-product

	Tablets	Laptops	Desktops	Monitors	Printers and MFDs	Televisions
Household	53%	70%	84%	82%	82%	52%
Business	55%	90%	90%	90%	90%	90%

Using the above parameters, ANZRP estimates that the percentage of e-product purchases that are replacement purchases and drive the amount of e-waste generation each year is in the vicinity of:

- 62% for televisions
- 83% for computer
- 86% for printers

No estimation has been made for computer parts and peripherals and therefore the percentage of e-product purchases that are replacement purchases is set at 90% as outlined in the Scheme methodology.

Therefore, of all new e-product imports, 75% will result in e-waste generation after the following are accounted for:

- New e-product exports out of Australia to neighbouring countries
- Non-replacement purchases (of new e-products)

Consequently, the Scheme is overestimating the amount of e-waste generated each year by using the figure of 90% in the scaling factor, which is more in the vicinity of 78%[26]. Adjusting the Scheme scaling factor to the levels outlined above suggests that in 2016-17 e-waste generation will be overestimated by around 11,700 tonnes.

AVAILABLE E-WASTE FOR RECYCLING IN AUSTRALIA

Once replaced e-products become e-waste, not all will be available for recycling in Australia. A proportion will flow into the domestic and international second hand markets where they will continue to be used.

Domestic second hand market

The level of replaced e-products entering the domestic second hand market for reuse at the end of their 'first life' is calculated using parameters outlined in Table 8. Household disposal behaviours to the second hand market have been derived using studies by IPSOS (2015) and Commonwealth of Australia (2012). As there was no data for business disposal to the second hand market, a conservative estimate of 90% was used.

Table 8 Proportion of household and business replaced e-products entering the domestic second hand market

	Tablets	Laptops	Desktops	Monitors	Printers and MFDs	Televisions
Household	26%	22%	30%	26%	21%	24%
Business	90%	90%	90%	90%	90%	90%

To account for acquired second hand e-products not resulting in e-waste generation, ANZRP has estimated the level of non-replacement acquisitions of second hand e-products to be 10%.

Using the above parameters, 15% of replaced e-products on average are being sent to the domestic second hand market. In 2015-16 this would have been equivalent to approximately 10,800 tonnes. Of this, ANZRP estimates that 90% are replacement purchases. As such, 10% or 1,080 tonnes are non-replacement purchases and will not influence available e-waste.

[26] The current Scheme methodology accounts for new e-product exports post application of the scaling factor to account for non-replacement purchases and used e-product exports. The methodology used by ANZRP accounts for new e-product exports before applying the scaling factor for non-replacement purchases and subsequently used e-product exports.

Therefore, of all new e-product imports, 74% will result in e-waste generation immediately being available for recycling after the following are accounted for:

- New e-product exports out of Australia to neighbouring countries
- Non-replacement purchases (of new and second hand e-products)

International second hand market

To investigate and estimate the size of the used e-product export market, ANZRP utilised ABS trade data for 2008-09 to 2015-16[27].

In 2015-16, approximately 12,400 tonnes of replaced e-products were exported for reuse out of Australia (this had been increasing over six years up until 2014-15 before decreasing in 2015-16). This equates to 16% of e-waste generation using the parameters outlined in this Appendix. The real size of the export market will be higher than reported due to illegal export activity that is known to be occurring but not quantified.

Taking into account used e-product exports, ANZRP estimates that e-waste available for recycling in Australia could represent:

- 60% of television imports
- 60% of computers imports
- 63% of printer imports

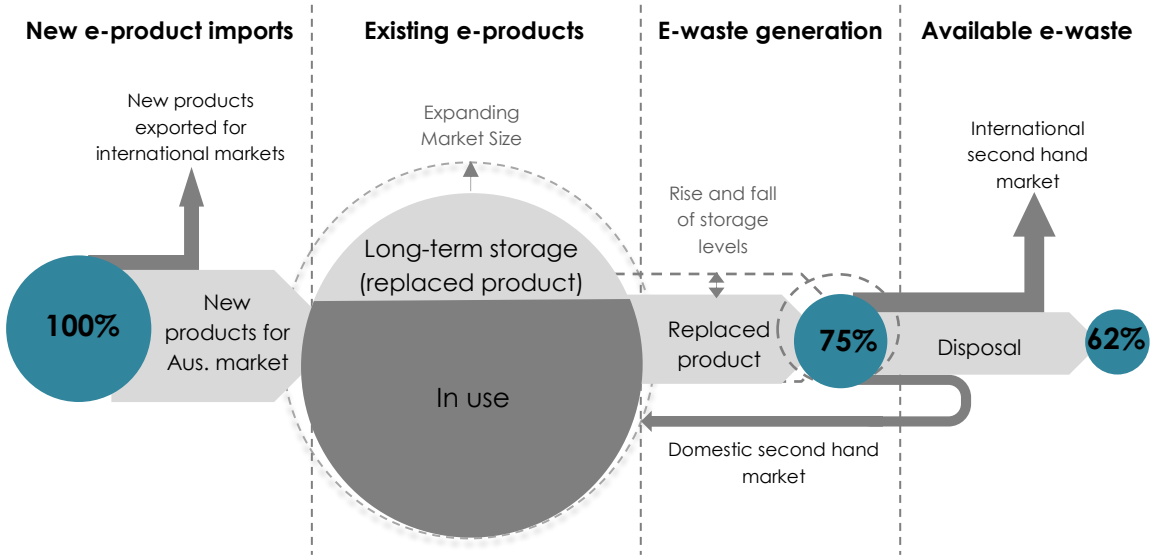
Therefore, of all new e-product imports, 62% will result in e-waste generation immediately being available for recycling in Australia after the following are accounted for:

- New e-product exports out of Australia to neighbouring countries
- Non-replacement purchases (of new and second hand e-products)
- Export of used e-products for reuse

This is summarised in the following figure.

[27] Based on Australian Bureau of Statistics data provided in the International Merchandise Trade: Customised Report prepared for ANZRP for 208-09 to 2015-16.

Figure 9 E-waste generation and availability flow diagram



Consequently, the Scheme is overestimating the amount of e-waste available for recycling in Australia each year. Adjusting the Scheme scaling factors using the methodology above and data available, e-waste generation and availability in 2016-17 will be overestimated by around 22,800 tonnes or 32%.

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