



Electronics Product
Stewardship Canada

2016 DESIGN for ENVIRONMENT REPORT

Elemental Evolution in the Electronics Industry

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2016
**DESIGN for
ENVIRONMENT**
REPORT

MESSAGE FROM ELECTRONICS PRODUCT STEWARDSHIP CANADA (EPSC)

EPSC is pleased to release our 8th Design for Environment Report.

Our focus this year is on the evolving design and materials in new electronics and the impact on end of life management.

A much wider choice of materials with improved functionality is transforming electronic products. Innovation in materials and processes are allowing manufacturers to evolve products to meet consumer and environmental needs. At the same time refurbishment and recycling at the end of the device's life is also evolving to handle new materials.

Electronic products are valued for their ability to improve our lives in so many ways. Even after they are discarded, electronics are either refurbished or broken into their basic elements and sold into a global resource pool.

This year's Report illustrates how our industry's drive for continuous innovation results in reduced environmental impact. New products are more energy efficient and use less materials than previous generations. A net positive for our society and the environment.

Designers incorporate the environmental 3R's of Reduce, Reuse and Recycle to improve tomorrow's electronic products for our customers and our environment. These changes are having a significant impact on our carbon footprint and the development of a circular economy.



Shelagh Kerr
President and CEO



Jeff Van Damme
Chair of the Board





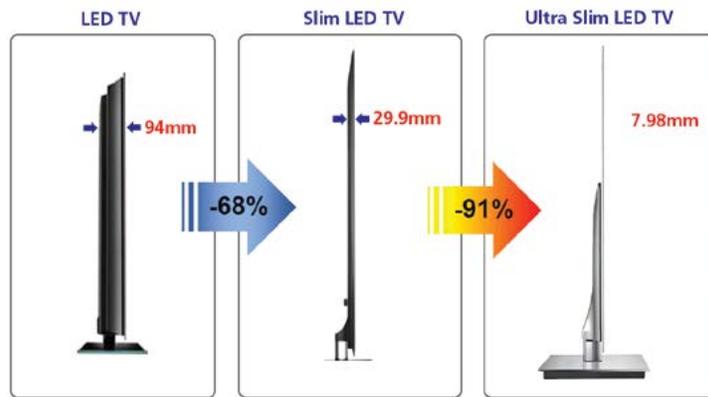
2016
DESIGN for ENVIRONMENT
 REPORT

THE 3 R'S IMPACT ON ELECTRONICS DESIGN

1. REDUCE:

LESS MATERIAL, MORE FUNCTION

Products are continually being produced using less material while at the same time, quality and functionality continue to increase.



Televisions, for example, have undergone constant changes with light weight and ultra-flat-panel displays now the norm.¹

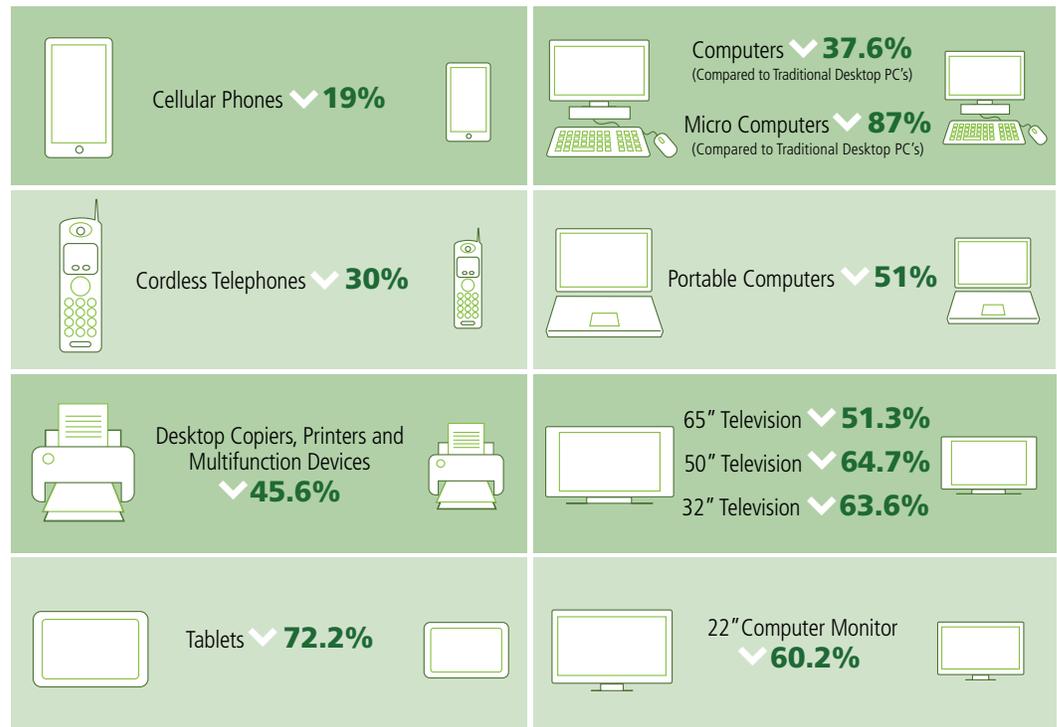
Smaller laptops and tablets are replacing many desktop computers especially in the home.



The weight of the average 65" television has been reduced 51% between 2009 - 2016

Smaller mobile phones are replacing landline telephones and for many, cameras.

The material footprint of the electronics industry is shrinking rapidly with lighter weight products (2009 vs 2016 average weight declines per category).²





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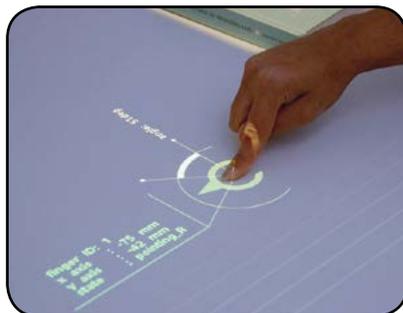


Image Credit: Sony of Canada Ltd.

Not only are products shrinking, but sometime disappearing altogether.

Sony for example has designed a virtual screen that turns any flat surface into an “Interactive Tabletop” that responds to touch, detects objects placed on the surface and adds animation to some books. Although it’s a prototype at the moment, the projector “could act as an intermediary between the screens we have now and the type of augmented reality and hologram-based tech seen in movies.

2. REUSE:

KEEPING PRODUCTS IN THE MARKETPLACE FOR LONGER

Many manufacturers have their own Design for Environment Principles that incorporate Refurbishment, Reuse and Reuse of materials.

Cisco	Design for Environment Principles ³
	Mechanical parts greater than 100 grams consist of one material.
	Plastic parts greater than 25 grams are designed with material coding, so plastic material types can be more easily identified at the recycler.
Dell	All plastic parts are free of metal inlays and can be separated with common tools, improving recyclability.
	Design for Environment Specification ⁴
	Plastic parts over 100 grams may not contain paints or coatings that are not compatible with recycling or reuse. If parts over 100 grams are painted, suppliers must provide documentation showing the paint does not inhibit recycling or reuse of the plastic.
	Metallic paint (e.g. epoxy primer with metallic pigments, non-conductive) shall not be used.
Hewlett Packard	Galvanic coating (conductive, e.g. EMC shielding) shall not be used.
	Paints and coating on plastics part should be compatible with recycling process (IZOD impact. Reference ASTM D256).
	Environmental Product Design for Computing Solutions ⁵
	Use of glues, adhesives and welds from product construction has been avoided where feasible
	Using common fasteners
Including snap-in features	
Plastic and metal are easily separable for easy dismantling and recycling	





2016 DESIGN for ENVIRONMENT REPORT

USE OF POST-CONSUMER CONTENT AND CLOSED LOOP MANUFACTURING

Recycled Carbon Fiber



In an industry first, **Dell** has partnered with their supplier SABIC to recycle excess carbon fiber and scrap raw materials into new Dell products beginning in late 2015. Initially, select Latitude and Alienware products contain postindustrial recycled carbon fiber, with plans to expand across these two product portfolios in 2016.

Dell estimates that by partnering with SABIC, it will prevent 450,000 kilograms of carbon fiber from ending up in landfills in 2015 and 2016. Recycled carbon fiber material reduces carbon emissions by approximately 10% compared with virgin carbon fiber composite.

Lenovo uses post-consumer recycled content (PCC) plastics in the manufacture of new notebooks, desktops, workstations, monitors, and options. Since early 2005, Lenovo has used net PCC of over 55.1 million pounds of PCC plastics in the manufacture of new products. Lenovo's use of post-consumer recycled content and post-industrial recycled content plastics in its products has resulted in the avoidance of over 38,798 metric tons of CO2 emissions since Lenovo began using these environmentally preferred materials in May 2005 ⁶.

In 2013, **Samsung Electronics** increased the amount of total recycled plastic in its product portfolio to 3.4% and plans to increase this to 5% by 2015. Recycled plastic is used primarily for interior parts of home appliances including refrigerators, washing machines, and air conditioners. It is also used in mobile phones, monitors, and some exterior parts ⁷.

Sony engineers have incorporated recycled plastic in as many parts as practical in the new **Digital 4K Handycam FDR-AX33 (pictured)**. Some parts are also made of SORPLAS™, Sony's proprietary recycled plastic made of up to 99% recycled materials. Overall, approximately 76.3% of its plastic parts by weight contains recycled plastic ⁸.



Parts made of recycled plastic contained in the Sony Digital 4K Handycam FDR-AX33



Toner Cartridge Recycling

Since 1992, **Canon** has operated a closed-loop recycling system for toner cartridges. As of 2014 Canon has achieved a cumulative reduction in the use of new resources of approximately 232,000 tons and a reduction in CO2 emissions of about 502,000 tons ⁹.





Electronics manufacturers themselves take back a large volume of electronics equipment for the purpose of reuse and refurbishment. Original equipment manufacturers in Canada collected 6,093 tonnes of product for reuse and refurbishment in 2014. (EPSC survey)

REFURBISHMENT OF EQUIPMENT

Used electronics that have been refurbished are bridging the digital divide by making affordable electronics available to more people. In addition to reusing electronic devices, many electronic parts and components can be reused to manufacture completely new and different products.

There is also a great deal of reuse and refurbishment activity taking place in Canada that is not captured in statistics. This activity is mainly undertaken by the many Microsoft Authorized Refurbishers that specialize in the purchase of used IT equipment for the purpose of refurbishment and resale.

The informal consumer market also enables devices to have a second life through gifting to family and friends, small repair and refurbishment businesses, charitable donations, Computers for Schools and online second hand markets.

The Reuse of equipment and parts is a robust business that can easily be harmed by overly prescriptive or inappropriate regulation. It is important to support this profitable activity to ensure we maximize the use and value of returned equipment. A good example is smart phones which retain value when returned, often on lease, to a telecom for resale in a secondary market.

Global Dell Outlet

The Global Dell Outlet (GDO) team is responsible for managing systems that are returned to Dell. Until last year, the team was focused on the US & UK markets only, but has now expanded geographically to implement a standardized process across all of our operations. The smart strategies to reuse, refurbish, and recycle products benefit the environment and offer financial benefits to Dell. The company now sells these refurbished products through carefully researched channels instead of scrapping the systems.

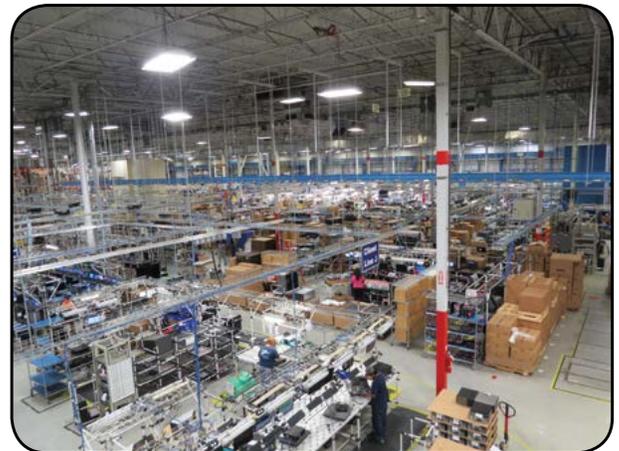


Image Credit: Dell Canada Inc.

The team added tear-down initiatives to extract parts for internal use and to separate precious metals that can be recycled or reused. These environmentally responsible processes benefit both the environment and Dell. The GDO Business Operations team works very closely with Global Operations to manage its reverse logistics processes efficiently. They focus on fulfilling out-of-policy exchanges using GDO refurbished units, thus extending the life of the products, globally. They manage about 800,000 units returned each year. Approximately 93 per cent of returned units are refurbished; the rest are recycled responsibly.





Panasonic Eco Technology Center Co., Ltd. (PETEC) in Kato City, Hyogo, Japan is devoted to recycling. Panasonic is promoting various initiatives to recover and reuse resources from old products. Innovative recycling technologies are developed to recover resources from used products and to make new products.

Used products such as CRT televisions, and flat panel televisions are all recycled in the same sequence:

Dismantling by Hand -> Shredding -> Sorting -> Processing

At PETEC, special recycling technologies have been designed to recover each individual resource (such as iron, copper, and plastic) from the used products.

Panasonic is developing technologies to make new products from recycled materials. For example, a unique technology reuses the non-lead glass from discarded CRT televisions to make vacuum insulation materials.

Panasonic has also developed equipment to separate different plastics as well as molding technologies to reuse these plastics in new products. Recycled plastic is used to make the bodies of vacuum cleaners and rice cookers as well as the under-frames of washing machines. Meanwhile, glass wool recycled from CRT televisions is used to make vacuum insulation material for refrigerators.



Resin Sorting machine at PETEC



Glass wool made from recycled CRT glass

There are many different types of plastics, such as polypropylene and polystyrene. In order to recycle and reuse mixed plastics of various resin compositions, we first need to separate out the different types. In the past, this separation was difficult to achieve with a high degree of purity. However, Panasonic has developed a high precision resin-sorting system as a solution. Near-infrared rays are used to identify the individual types of plastic, to separate them out into pure fractions, and then to recover each type.

Panasonic is also promoting initiatives to develop more ways of using recycled plastics in new products. With the technology of 3D in-mold decoration, they are able to use recycled plastic in cosmetic applications by coating them with a layer of high extension film.





Apple has developed a robotic system called Liam to take apart discarded iPhones to recover valuable materials that can be recycled.

Liam will initially focus on the iPhone 6 before expanding to deal with different devices and recover more resources.

Liam can take apart one iPhone 6 every 11 seconds to recover aluminum, copper, tin, tungsten, cobalt, gold and silver parts.

The recycling system consists of 29 robotic modules on a single site near Apple’s headquarters in California. A second Liam is being installed in Europe.

As research continues on larger-scale recycling, Apple hopes to reuse more materials in future products. <http://www.apple.com/ca/recycling>

3. RECYCLE

URBAN MINING- RECOVERING VALUE IN THE WASTE STREAM

Electronics stored in Canadian homes, represents an above ground “urban mine”.



Electronics products are composed of steel, plastics, glass, aluminum and copper, materials which are relatively easy to separate, shred and sell as raw commodities. Electronic products also contain materials of high value such as gold, silver, palladium and platinum in smaller amounts. Modern electronics also contain many elements which are considered scarce.

Primary production of such materials, especially of precious metals, is energy intensive. The recovery and recycling of materials found in electronics can reduce the need to mine virgin materials. For example, a metric ton of computers contains more gold than that recovered from 17 tons of gold ore¹⁰.

Greater investment in recovery and processing infrastructure will result in higher recovery rates of elements in limited supply. This type of investment requires enough volume to be profitable.

Image source above: ProSUM (modified)¹¹

The processes behind the 3 R’s- Reduce, Reuse and Recycle are continually being improved.





Electronics in an Average Household	Units in Use and Storage
Computer Monitors	2
Printers and other imaging equipment	2
Desktop computers	1.5
Portable computers	1.5
Televisions	3
Cellular telephones	3
Telephones and telephone answering machines	4
Image, audio and video devices	6

At the recovery and recycle end, Canada was the first jurisdiction in the world to introduce a responsible recycling standard. EPSC produced the Electronics Recycling Standard in 2004 and it has gone through 5 revisions, the latest EPSC Standard requires certification to the International R2 Standard as a baseline, with additional Canadian requirements.

Many of the products offering customer benefits of new technology have not yet moved through to end of life. For example the old TV and computer monitor CRT technology with leaded glass, has not been sold into the market since 2009. However CRT technology remains the largest weight and cost of materials returning for recycling. Although returns of these products have started to flatten and decline. This alone represents a significant improvement for the environment and the safety of the recycling process.

Also more and more materials are becoming easier to separate, making recycling more efficient. The use of Corning's Gorilla Glass, for example, can now be recycled like regular glass.

Gorilla Glass is used in smartphones, tablets, notebooks and televisions. It is made with a chemical strengthening process where large ions are "stuffed" into the glass surface, creating a state of compression. This layer of compression creates a surface that is more resistant to damage from everyday use, extending the life of products.

Owning an electronic device today comes with a responsibility for its end of life management. Customers are increasingly moving towards leasing electronic products as opposed to buying them with the increased use of smartphones, the defining technology of today. Smart phones and office IT equipment returned on lease, allows high value products to be refurbished and resold at a much higher value than if they were recycled into material commodities.





INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL (IC&I) PRODUCTS, A SPECIAL CASE:

IC&I equipment- floor standing printers, photocopiers and multifunctional devices as well as computers and monitors have value to refurbishers and resellers. This equipment is often on a lease plan of 3-5 years in government offices, banks, large companies, schools and other institutions.

IC&I equipment is the responsibility of the generator either through vendor take-back leasing arrangements or other refurbishment and recycling initiatives such as donations to Computers for Schools.

IC&I products are refurbished and sold into secondary markets or harvested for component parts.

EPSC supports keeping the accountability for commercial products with the generator to let the competitive private market extract the maximum value from end of life electronics.

IC&I market supports highly effective 3R processes with high levels of Reuse, much higher than the residential marketplace. Regulatory intervention in this market is unnecessary and might lead to recycling over reuse.

ENERGY EFFICIENCY OF ELECTRONICS PRODUCTS

The replacement of desktop PCs by laptops, tablets and smartphones has resulted in reduced energy usage. Using less energy is a net positive for the environment.

Research conducted by the **Fraunhofer USA Center for Sustainable Energy Systems**¹² has found that the installed base of consumer electronics in U.S. households increased by 31 per cent between 2010 and 2013, while during the same period of time overall electricity consumption decreased by 13 per cent.

Device	Trend leading to decreased energy consumption
Televisions	Active-mode power draw has decreased from an average of 104 W in 2010 to 90 W in 2013, even while average screen size continues to increase (34" in 2013, up from 29" in 2010 and 26" in 2006).
	The annual energy consumption of TVs in the US has reduced by 23 percent between (2010-2013).
Computers	The total annual electricity consumption of all computers has decreased by 25% since 2010.
	Consumers have migrated from desktop and laptops to less energy intensive tablets. Tablet ownership has increased 25 fold (2010-2013). This transition is significant as tablets are nine times more energy efficient than laptop computers.
Computer Monitors	The annual electricity consumption of computer display monitors has decreased by 54% (2010-2013) due to reduced usage of desktop PCs and increased efficiency associated with LED backlighting technology.





Reducing Energy use during Manufacturing

Efforts to continue improving the energy efficiency of products are complemented by also managing the greater use of energy in manufacturing. **Apple**, for example, has launched an initiative to become more energy efficient and to use clean energy for their manufacturing operations. **Apple** will partner with suppliers in China to install more than 2 gigawatts of new clean energy production. By 2018, **Apple** hopes that their clean energy projects will generate as much energy as is consumed during the manufacturing of the iPhone¹³.

Smart TVs

Samsung Electronics' smart TVs save energy consumption by 61% by reducing the number of LED lamps and adopting light sensors that adjust display brightness. In addition, **Samsung's** Evolution Kit is able to extend a product's life cycle by upgrading the existing TV's multimedia contents, picture quality and smart functions once installed¹⁴.

ENERGY STAR

EPSC members proudly support the voluntary and globally aligned ENERGY STAR labelling program, administered by Natural Resources Canada. The ENERGY STAR label was established to reduce greenhouse gas emissions and other pollutants caused by the inefficient use of energy and to make it easy for consumers to identify and purchase energy-efficient products that offer savings on energy bills without sacrificing performance, features, and comfort.¹⁵



Electronics products that are eligible for ENERGY STAR include: computers, displays (monitors), imaging equipment, small network equipment, televisions, audio/video products, cordless telephones, set-top boxes and recently added servers and data storage devices¹⁶.

The full list of qualified electronics products can be viewed on the Natural Resources Canada website¹⁷.

ENERGY EFFICIENCY ACHIEVED THROUGH OPTIMIZATION SOFTWARE

Software has been developed to further aid optimization of energy usage. It is being widely adopted by households as well as businesses.

Greater Energy Efficiency Achieved through Cloud Computing

Cloud computing offers an on-demand, efficient way to run IT applications and systems. For example, a banking client transferred its IT infrastructure to an **IBM** hybrid cloud solution, placing the bank's online and mobile workloads on the public cloud and its large-scale transaction workloads on a private cloud. This reduced the server infrastructure by 60 percent, achieving significant reductions in energy consumption and other operations and maintenance costs¹⁸.

PACKAGING INNOVATION AND TRANSPORT EFFICIENCY

Packaging design is being continually optimized to ensure that packaging performs its essential functions of containment and protection while minimizing use of materials, energy resources, and environmental impacts across the life cycle of the packaged product¹⁹.

Consumer electronic products are also becoming more compact and light weight which not only leads to less materials being used in the manufacturing phase, but also less in transport packaging.





Packaging Optimization to Increase Transport Efficiencies

Beginning from the design phase, **Canon** promotes reduced environmental impact through the development of smaller, lighter products. For instance, Canon's PIXMA multifunction inkjet printers were reduced in size through improvements to the paper feed mechanism, while its stronger exterior body requires less package cushioning. Compared to the 2009 MP560 model, the MG5600 series models, released in 2014, were approximately 7% smaller in size and 22% lighter in weight. Additionally, the number of boxes loadable in a 40-foot container was increased from 832 to 880, an approximately 5% improvement in load efficiency.²⁰

Lenovo's packaging specifications include requirements for minimum amounts of recycled content, and labelling for proper recycling. All corrugated container packaging has a minimum of 50% post-consumer recycled fiber and all paperboard packaging contains a minimum of 45% post-consumer recycled fiber and 100% recovered fiber²¹.

GREEN PROCUREMENT TOOLS AND SUPPLY CHAIN COMMUNICATION

Electronics manufacturers are working to reduce or eliminate the use of chemicals of concern in electronics products and replacing them with safer alternatives.

Using procurement policies, electronics manufacturers are able to communicate with suppliers regarding compliance with regulation, assessing the potential for substitutions, and to identify valuable materials that can be targeted for recovery.

An example of a tool to inform manufacturer procurement policies is **GreenScreen® for Safer Chemicals**. GreenScreen® is a publicly available and transparent chemical hazard screening method used to identify chemicals of concern and assess safer alternatives.²²

HP, uses GreenScreen, to assess alternatives when replacing a restricted substance. GreenScreen enables HP to identify better materials, not just those that are minimally acceptable. HP began using GreenScreen as part of an initiative to make all of its power cords PVC-free. Through the use of the GreenScreen tool, HP also ensures that the material(s) chosen by suppliers as a substitute for PVC is both non-toxic and able to function as well or better than the original material.²³

Apple requires all suppliers to adhere to their Regulated Substances Specification, which describes Apple's global restrictions on the use of certain chemical substances or materials in products, accessories, manufacturing processes, and packaging used for shipping products to customers. The Regulated Substances Specification is derived from international laws or directives, agency or eco-label requirements, and Apple policies, often going beyond the minimum required by law²⁴.

Addressing concerns about environmental pollution and health risks posed by incorrect disposal of products containing mercury, **Sony** has worked for years to develop mercury-free micro batteries. In 2004 an advance in eliminating this element in silver oxide batteries led to the world's first mercury-free silver oxide batteries the next year, which was followed in 2009 by a breakthrough in developing alkaline micro batteries without mercury. In March 2014, **Sony** terminated in-house production of silver oxide or alkaline micro batteries containing mercury.²⁵

LED Backlit TV: Market data is showing that mercury-free televisions are now the dominant type of television.





ECO LABELS

Manufacturers are able to differentiate themselves and their products in the market by using ratings systems such as the Electronic Product Environmental Assessment Tool, or **EPEAT**, based on IEEE Standards. Large-scale purchasers, such as governments, schools and other institutions are increasingly requiring the use of these types of sustainable procurement tools to prioritize sustainability in their product choices.

EPEAT’s Assessment Categories

Reduction/elimination of environmentally sensitive materials	End-of-life management	Consumables (unique to Imaging Equipment standard)	Energy conservation	Packaging
Product longevity/life extension	Corporate performance	Indoor Air Quality (unique to Imaging Equipment standard)	Materials Selection	Design for end of life

Two of EPEAT’s Assessment Categories, **Materials Selection** and **Design for End of Life** are outlined in greater detail below to illustrate to importance of this assessment tool in encouraging innovative product design that further supports the global circular economy:

Category	Material selection	Design for end of life
Assessment Criteria for Television Category	<p>Required:</p> <ul style="list-style-type: none"> • Declaration of postconsumer recycled plastic content (%) • Declaration of renewable/bio-based plastic materials content (%) • Declaration of product weight (lbs) 	<p>Required:</p> <ul style="list-style-type: none"> • Identification of materials with special handling needs • Elimination of paints or coatings that are not compatible with recycling or reuse • Easy disassembly of external enclosure • Marking of plastic components • Identification and removal of components containing hazardous materials • Minimum 65 percent reusable/recyclable
	<p>Optional</p> <ul style="list-style-type: none"> • Minimum content of postconsumer recycled plastic • Higher content of postconsumer recycled plastic • Minimum content of renewable/bio-based plastic material 	





PUBLIC POLICY SUPPORTING DESIGN FOR THE ENVIRONMENT

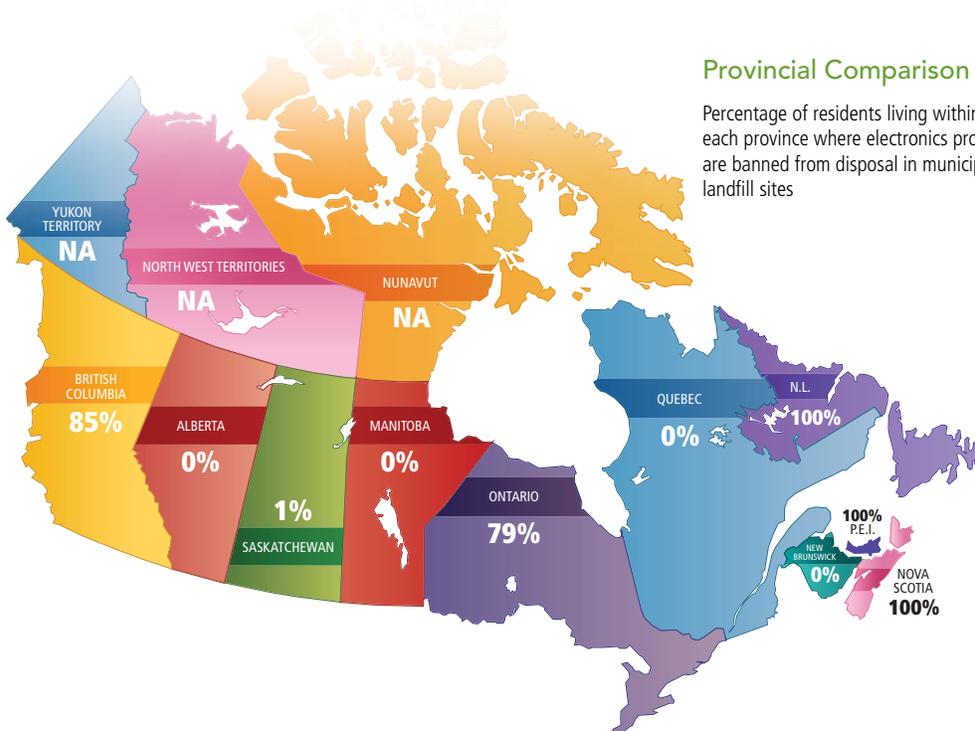
As described throughout the report, end of life electronics represent real value in the marketplace. Equipment sold or leased into the ICI sector is effectively managed at end of life, recovering this equipment to harvest still functioning components, refurbish and recover raw materials.

There is also a value in the end of life equipment sold into the residential market. It is important that this resource is recovered through collection and responsible recycling.

Harvesting Value from Residential & Commercial Waste Streams



Canadians are able to participate in the regulated electronics product stewardship programs operated by the Electronics Product Recycling Association (EPRA) www.epra.ca. However, in order to ensure that all stewarded materials are diverted from landfill, province-wide landfill bans need to be introduced.





2016 DESIGN for ENVIRONMENT REPORT

ENDNOTES

- 1 Samsung IERC 2016 presentation
- 2 EPSC data on product weight reductions from 2009-2016
- 3 http://www.cisco.com/assets/csr/pdf/CSR_Report_2014.pdf#page=105
- 4 <http://i.dell.com/sites/content/corporate/corp-comm/en/Documents/design-for-environment.pdf>
- 5 http://www8.hp.com/us/en/hp-information/environment/pc-design.html#_VrJsbblrKM8
- 6 http://www.lenovo.com/social_responsibility/us/en/materials/
- 7 http://www.samsung.com/common/aboutsamsung/download/companyreports/2014_Environmental_Report.pdf
- 8 <http://www.sony.net/SonyInfo/csr/SonyEnvironment/products/FDR-AX33.html>
- 9 <http://www.canon.com/csr/report/pdf/canon-sus-2015-e.pdf>
- 10 <http://h20195.www2.hp.com/V2/GetPDF.aspx/c04297138.pdf>
- 11 European Commission and PROSum <https://ec.europa.eu/easme/en/news/prospecting-critical-raw-materials-e-waste>
- 12 [http://www.ce.org/CorporateSite/media/Government-Media/Energy-Consumption-of-CE-in-U-S-Homes-in-2013-\(Fraunhofer-revised-March-2015\).pdf](http://www.ce.org/CorporateSite/media/Government-Media/Energy-Consumption-of-CE-in-U-S-Homes-in-2013-(Fraunhofer-revised-March-2015).pdf)
- 13 <http://www.apple.com/ca/pr/library/2015/10/22Apple-Launches-New-Clean-Energy-Programs-in-China-To-Promote-Low-Carbon-Manufacturing-and-Green-Growth.html>
- 14 http://www.samsung.com/common/aboutsamsung/download/companyreports/2014_Environmental_Report.pdf
- 15 <https://www.energystar.gov/products/how-product-earns-energy-star-label>
- 16 <http://www.nrcan.gc.ca/energy/products/energystar/why-buy/13631>
- 17 <http://www.nrcan.gc.ca/energy/products/energystar/12519>
- 18 http://www.ibm.com/ibm/environment/annual/IBMEnvReport_2014.pdf
- 19 https://www.sustainabilityconsortium.org/wp-content/themes/sustainability/assets/pdf/product-categories/Printer%20Ink_Sustainability%20Insights.pdf
- 20 <http://www.canon.com/csr/report/pdf/canon-sus-2015-e.pdf>
- 21 http://www.lenovo.com/social_responsibility/us/en/packaging/
- 22 http://www.greenscreenchemicals.org/static/ee_images/uploads/resources/2pager_greenscreen_2014.pdf
- 23 http://www.greenscreenchemicals.org/static/ee_images/uploads/resources/2pager_greenscreen_2014.pdf
- 24 http://images.apple.com/supplier-responsibility/pdf/Apple_Regulated_Substances_Specification_Sept2014.pdf
- 25 <http://www.sony.net/SonyInfo/csr/SonyEnvironment/initiatives/>

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2006



2009



2011



2012



2013



2014



2015





ABOUT EPSC

Electronics Product Stewardship Canada (EPSC) is a not-for-profit, industry-led organization working to represent the interests of electronics manufacturers for innovation in enhanced end-of-life solutions for electronic products in Canada.

EPSC members have shown environmental leadership by working with stakeholders to create effective environmental stewardship programs across Canada, by investing in design improvements to their products and processes, and by establishing an innovative standard for the responsible handling of end-of-life electronics.

Responsible electronics manufacturers are members of EPSC:

Board Members

- Apple Canada Inc.
- Canon Canada Inc.
- Cisco Systems Inc.
- Dell Canada Inc.
- HP Canada Co.
- IBM Canada Ltd.
- Lenovo Canada Inc.
- Panasonic Canada Inc.
- Samsung Electronics Canada Inc.
- Sony of Canada Ltd.

Associate Members

- Asus
- BenQ America Corp.
- Brother International Corp.
- EMC Corporation
- Epson of America Inc.
- Fujitsu Canada Inc.
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- Hewlett Packard Enterprise
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- Lexmark Canada Inc.
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- MMD-Philips
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