



GLOBAL
ELECTRONICS
COUNCIL®

Advancing Responsible Technology

USER GUIDE FOR EPEAT® 2.0 BENEFITS CALCULATOR FOR ICT PRODUCTS

CONTENTS

1. Introduction	2
2. How the calculator estimates the lifecycle benefits of purchasing EPEAT products	2
3. Using the calculator	3
3.1 Required input	3
3.2 Optional input	3
3.2.1 Energy	3
3.2.2 Extended Product Use, Donating the Product for Reuse, and Recycling	4
3.2.3 Additional Customization	5
4. Understanding The EPEAT Benefits Calculator Results	6
4.1 Benefits	8
4.2 Results report levels	9
APPENDIX A: Product Level Assumptions	12
APPENDIX B: Use Phase Energy Consumption Assumptions	19
APPENDIX C: Regional electricity grid mix (IEA data)	21
APPENDIX D: Recycled content assumptions in product	21

1. INTRODUCTION

This environmental benefits calculator 2.0, developed by the Global Electronics Council (GEC), allows purchasers to assess the environmental benefits associated with purchasing IT products that meet the sustainability criteria of GEC's EPEAT 2.0 ecolabel — the leading global ecolabel for the IT sector.

By purchasing and using EPEAT-labeled IT products, organizations lessen their impact on the environment, including reducing greenhouse gas emissions, energy use, and generation of toxic substances and solid waste. GEC's calculator enables purchasers to quantify these, and other environmental benefits associated with their purchase of sustainable IT products.

This benefits calculator covers four product categories - mobile phones, servers, imaging equipment and computers and displays. For support in using the calculator, please contact us at purchaserrelations@gec.org.

2. HOW THE CALCULATOR ESTIMATES THE LIFECYCLE BENEFITS OF PURCHASING EPEAT PRODUCTS

A lifecycle approach is used to estimate the benefits of purchasing and using EPEAT products compared to non-EPEAT products. The analysis captures environmental impacts associated with raw material extraction, component, and product manufacturing and energy consumed during product use. The lifecycle benefits estimate the reduction in impacts resulting from product design and manufacturing changes reflected in EPEAT-registered products.

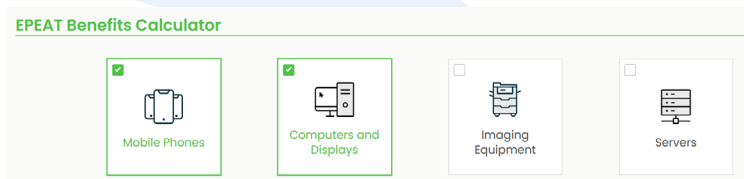
The end-of-life analysis (optional data entry) estimates the potential benefits of reusing and recycling EPEAT products when they are taken out of service compared to sending the products for disposal in landfills. The calculator also estimates the additional environmental benefits that can result from keeping the products in use longer before replacement, which avoids impacts associated with producing new products and components.

The calculator uses SimaPro LCA software to model the environmental impacts from producing, using, reusing and recycling EPEAT registered products and baseline (non-EPEAT) products. Industry studies combined with expert review augmented the software data, as needed to address specific EPEAT criteria.

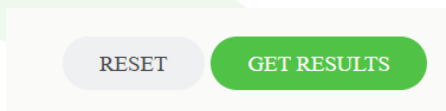
Benefit savings represent the difference in lifecycle impacts for EPEAT and non-EPEAT products, based on EPEAT 2.0 criteria. All EPEAT products are assumed to meet the required criteria. The optional criteria differentiate between the three EPEAT levels—bronze, silver, and gold. Note that only those criteria that can be quantitatively measured at this time are included in the benefits calculations; for example, environmental benefits of providing a user or recycler with documentation are not quantifiable. Appendix A to E summarizes the major data sources and assumptions for EPEAT and non-EPEAT products.

3. USING THE CALCULATOR

The EPEAT benefits calculator is separated into four product categories, or modules – mobile phones, servers, imaging equipment and computer and displays. To run the calculator, navigate to <http://epeat.net/calculators/2-0> and check each applicable product category you want to calculate for:



For each category selected, a section will appear below to fill out the number of units, the region of use, and any optional data entry fields that you chose. To run the calculator, click the green get results button.



The calculator will store all the data entered until the “Reset” button is used, or the user leaves the calculator webpage, which allows the user to modify data entry, if needed.

3.1 Required Input

Before using the calculator, you will need to know the number of EPEAT products purchased and the registered EPEAT levels (bronze, silver, gold). You will also be required to enter the region where the products are being used by using the drop-down menu. The regional choices are Africa, Asia Pacific, Eurasia, Europe, Middle East, North America and South and Central America, based on International Energy Agency (IEA) regional statistics.

3.2 Optional Input

After entering the required data, you have the option of customizing your results by clicking on the Optional Data Entry icon. The sections below explain how environmental benefits are calculated for optional data inputs.

3.2.1 Energy

The calculator estimates the environmental impacts from electricity production during the use phase based on the IEA regional energy fuel mix for the IEA region (See Appendix Table C) selected in the required data section. However, you can customize the cost of your electricity by entering the cost per kWh at your location in the first optional entry box. After entering the value for the cost/kWh, use the drop-down menu to select the currency for the electricity cost you entered. For example, if a Canadian user enters the cost/kWh value corresponding to currency units of Canadian dollars, select “Dollars” from the drop-down currency options. The cost savings shown in the results table will then show the energy savings in Canadian dollars (number of kWh saved multiplied by the cost/kWh in Canadian dollars). The calculator relies on your input and does not convert currency values. If you choose to skip the optional energy cost during user input, the energy cost will be shown based on the US cost/kWh in US dollars.

3.2.2 Extended Product Use, Donating the Product for Reuse, and Recycling

How long do you plan to use the products on average (in months)?

The calculator shows the environmental and economic savings resulting from using the product longer than the calculator default, which varies by product (See App endix Table A2). If you enter a value less than the default, the calculator assumes the default period of use.

Extending the product life will impact two phases: 1) savings during the product use phase, due to the improved energy efficiency of the product (e.g., more energy efficient mobile phone charging), and 2) savings from avoided production of a fraction of the product and packaging as determined by length of the extended life. When viewing the main aggregated table, the use phase energy benefits of extending product life are reflected in the Purchasing EPEAT Products row, and the avoided production benefits of extended use are included in the Optional Reuse and Recycling row.

In the more detailed lifecycle phase results table, the product use phase savings for extended useful life are shown in the Product Energy Use row, and the savings for avoided production are shown in the Optional Reuse and Recycling row. Note that the Optional Reuse and Recycling phase row of the results table will also include impacts for any product reuse or recycling entered by the user. Therefore, if you wish to view only the avoided production benefits for extended use by the first user, enter the number of months for the extended life but do not enter any data into the reuse or recycling optional data entry fields.

How many of the products purchased do you plan to manage through reuse or recycling?

Mobile phones that go to a secondary user are assumed to undergo a minimal refurbishing process in which the battery is replaced, and the original battery is recycled. No other part replacements or repairs are modeled. The calculator estimates the savings from avoiding the production of a new baseline phone, with no projections about the fate of the mobile phone after secondary use. The calculator assumes that reused phones are issued with a new adapter, charging cord, and packaging, so production of these items is not avoided. The calculator estimates the impacts of recycling processes and assigns credits for avoiding virgin production of the materials recovered from the recycled mobile phones and batteries. Recycling also avoids landfill disposal of the phone and battery.

Servers that are returned to the original equipment manufacturer or recycler are assumed to undergo evaluation to determine which products can be reused, harvested for parts, and recycled. The calculator estimates the reuse savings from avoiding the production of a new baseline server, with no projections about the fate of the server after the secondary use. Servers harvested for parts are disassembled/dismantled to extract memory devices, cables, batteries and mainboards from the chassis. These components are either reused in new or remanufactured servers or recycled. The fraction of servers not reused or harvested for parts are recycled.

Computer products reused by a secondary user are assumed to avoid the impacts from producing a new baseline product, external power supply (for notebook and tablet), and packaging. The calculator estimates the impacts of recycling processes and assigns credits for avoiding virgin production of the materials recovered from the recycled products. Recycling also avoids landfill disposal of the product and battery.

Imaging Equipment reused by a secondary user are assumed to avoid the impacts from producing a new baseline product. The calculator estimates the impacts of the impacts of recycling process and assigns credits for avoiding virgin production of materials recovered from the recycled products. Recycling also avoids landfill disposal of the product.

Number of products disposed of at end of life?

Calculator automatically calculates the number of products going to landfill by subtracting the number of products reused and recycled from the number purchased. Note that if the user leaves the reuse and recycling fields blank, no disposal of any type (including landfill) will be modeled. If the user enters a zero in either or both reuse and recycling fields, purchased products not recycled or reused will be modeled as landfilled.

3.2.3 Additional Customization

For some product categories, additional customization is possible through optional data entry.

1) Mobile phones: Average weight per unit

The calculator allows you to customize your mobile phone purchase by entering the weight in grams of the mobile phone with battery (excluding adapters, charging cord, or packaging). Most manufacturer specifications show the weight of the mobile phone with battery. The calculator scales the weights of the display, housing, and battery as the mobile phone's weight increases. The other components such as the circuit board, capacitors, and camera are assumed to remain the same as in the default mobile phone.

2) Rack servers: Number of CPUs per server

Do the purchased rack servers have >2 CPUs per server?

Energy consumption during product use is a major contributor to the lifecycle environmental impacts of servers. The rack server default assumption of 2 CPUs per server can be customized if rack units are purchased with more than 2 CPUs per unit. Selecting this option ("yes") replaces the default energy consumption for 2 installed processors with energy consumption estimates for rack servers with greater than 2 installed processors, provided by EPA's ENERGY STAR program. ENERGY STAR values are calculated from the composite performance (numerator) and composite power (denominator) of overall SERT scores for each product's typical configuration.

3) Imaging Equipment: Use of remanufactured cartridges & Recycled content in paper use.

What percentage of the cartridges used in the imaging equipment are remanufactured cartridges? What is average recycled content in the paper used in the imaging equipment?

The calculator allows you to customize the percent share of remanufactured cartridges in total cartridge use and percent recycled content in paper use. Note that if the user leaves the reuse and recycling fields blank, a default percentage share of remanufactured cartridges (13%) and recycled content in paper (18%) will be used.

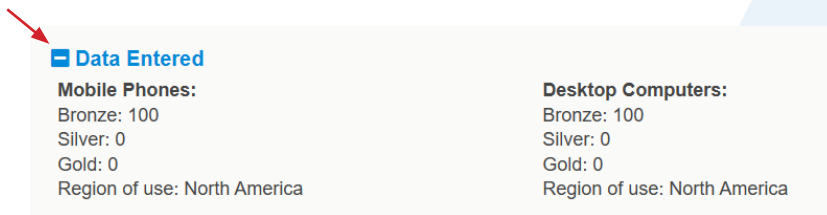
4. UNDERSTANDING THE EPEAT BENEFITS CALCULATOR RESULTS

The calculator displays the benefits of purchasing EPEAT products on a single page with expandable sections. The aggregate benefit results are shown in the main table in two categories:

- Purchasing EPEAT Products
- Optional Reuse and Recycling

See below for an explanation of the results, as well as options for viewing results by product and lifecycle phase.

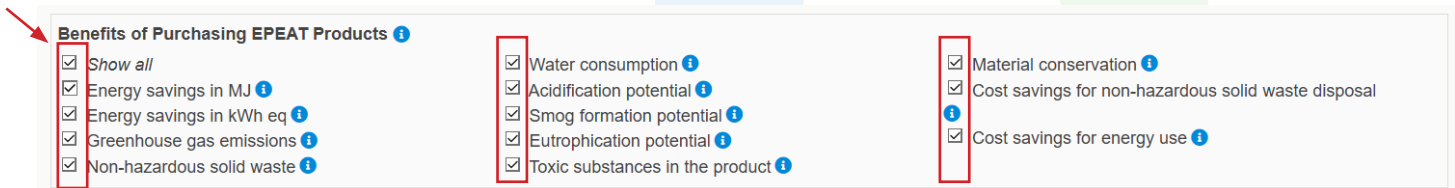
To view the data that you entered, click on the first expandable section “Data entered” which summarizes data entered on the first page.



Data Entered

Mobile Phones: Bronze: 100 Silver: 0 Gold: 0 Region of use: North America	Desktop Computers: Bronze: 100 Silver: 0 Gold: 0 Region of use: North America
--	--

The results table includes 12 environmental and cost benefits. The calculator defaults with all benefit categories selected and shown in the table. However, you have the option of viewing a selection of individual categories by checking or unchecking the individual benefit category boxes.



Benefits of Purchasing EPEAT Products

<input checked="" type="checkbox"/> Show all	<input checked="" type="checkbox"/> Water consumption	<input checked="" type="checkbox"/> Material conservation
<input checked="" type="checkbox"/> Energy savings in MJ	<input checked="" type="checkbox"/> Acidification potential	<input checked="" type="checkbox"/> Cost savings for non-hazardous solid waste disposal
<input checked="" type="checkbox"/> Energy savings in kWh eq	<input checked="" type="checkbox"/> Smog formation potential	<input checked="" type="checkbox"/> Cost savings for energy use
<input checked="" type="checkbox"/> Greenhouse gas emissions	<input checked="" type="checkbox"/> Eutrophication potential	
<input checked="" type="checkbox"/> Non-hazardous solid waste	<input checked="" type="checkbox"/> Toxic substances in the product	

To return to the data entry page, scroll up to reset or change your inputs

Table 1 defines the key terms as used in the results tables.

Table 1. Definitions of Key Terms Used	
Purchasing	Purchasing EPEAT products includes raw material extraction through product manufacturing, transport, and product use. Purchasing does not include end-of-life management of the product or any associated components.
Manufacturing	<p>Manufacturing includes all steps from raw material extraction through product manufacturing and transport for production of the product and its packaging. For mobile phone calculator, this includes the phone, battery, adapter, charging cord, and packaging. For server calculator, manufacturing includes the server and its packaging. Rack servers include cables/power cords. The blade server modeled is the blade unit only, since the server standard covers the blade unit only and excludes the shared enclosure.</p> <p>For computer products and display calculator, manufacturing includes the products, cables/power cords, and packaging. Notebook and tablet computers manufacturing includes an external power supply and long-life battery. For imaging equipment calculator, manufacturing includes the products and packaging.</p>
Use	<p>Use of EPEAT products by the initial user is included in the aggregate Purchasing results. The environmental benefits attributed to energy-efficiency of the product during use are broken out in the detailed results by lifecycle phase.</p> <p>Use of EPEAT products is credited for the reductions in electricity-related impacts due to energy efficiency of EPEAT products during the period used by the initial user. Reduced impacts from electricity consumption are based on average regional grid fuel mixes from International Energy Agency (IEA) statistics for the geographical region chosen (Africa, Asia Pacific, Eurasia, Europe, Middle East, North America and South and Central America).</p> <p>Energy savings during use are calculated based on kWh saved and the cost per kWh entered by the user in the currency selected by the user. If no currency is specified, the calculator uses US cost per kWh in US dollars.</p>
End of life management (optional)	<p>The optional section of the calculator has several options that affect the end-of-life results for purchased phones:</p> <ul style="list-style-type: none"> • Reuse by a secondary user • Recycling • Landfill <p>Users can leave this section blank, in which case no end-of-life modeling of the EPEAT products is included. If the user enters any number of purchased phones for any end-of-life option(s), the purchased products with no fate specified are modeled as going to landfill. Impacts from end-of-life management options (reuse, recycling or landfilling of the EPEAT products) are not included in the impacts estimated for purchasing.</p>

4.1 Benefits

Table 2 lists the environmental and economic benefits with a short description for each. These explanations are also available by clicking the information icon for each metric on the results page.

Total energy savings are displayed with two units of measurement to meet the most common reporting requirements (megajoules and kilowatt hour equivalents).

Savings are shown to two decimal places. For some categories such as toxic materials, the results may be <0.01. However, when <0.01 appears in the results for non-hazardous solid waste, water consumption, and non-hazardous solid waste disposal costs, this may indicate a situation where increased use of recycled content or recyclable fiber in EPEAT products or packaging results in tradeoffs. For example, recycled plastic requires more water consumption during the recycling process compared to production of virgin resins but use of recycled plastic results in benefits in other categories such as reduced energy consumption and greenhouse gas emissions.

Table 2. Benefit categories and description.

Benefits	Description	Unit
Energy savings in megajoules	Total energy used during the life cycle of the equipment, from point of extraction; results include both renewable and non-renewable energy sources	(MJ)
Energy savings in kilowatt hour equivalents	Total energy used during the life cycle of the equipment, from point of extraction; results include both renewable and non-renewable energy sources.	(kWh eq)
Greenhouse gas emissions reduction, expressed as global warming potential	Represents the heat trapping capacity of the greenhouse gases released during the life cycle. Important emissions: CO ₂ fossil, CH ₄ , N ₂ O, chlorinated and fluorinated hydrocarbons.	(kg CO ₂ eq)
Non-hazardous solid waste reduction	Total weight of fuel-related, process-related and postconsumer wastes disposed from the product life cycle.	(kg)
Water consumption savings	Freshwater withdrawals which are evaporated, incorporated into products and waste, transferred to different watersheds, or disposed into the sea after usage.	(liters H ₂ O)
Acidification potential savings	Addition of acids (e.g., nitric acid and sulfuric acid) into the environment, or emissions of other substances (e.g., ammonia) that increase the acidity of the environment due to various chemical reactions and/or biological activity. Acidification can cause damage to forests, ecosystems, and buildings. Important emissions include SO ₂ , NO _x , NH ₃ , HCl, HF, H ₂ S, and more.	(kg SO ₂ eq)

Benefits	Description	Unit
Smog formation potential savings	Characterizes potential of emissions to form reactive substances (e.g. tropospheric ozone) that can cause harm to human health and vegetation. Important emissions include NO _x , BTEX, NMVOC, CH ₄ , etc.	(kg O ₃ eq)
Eutrophication potential savings	Assesses impacts from excessive load of macro-nutrients (nitrates, phosphates) to the environment, which can lead to results such as algal blooms and fish kills. Important emissions include NH ₃ , NO _x , COD and BOD, N and P compounds.	(kg N eq)
Toxic substances avoided in the product	Total mass of toxic and restricted substances in devices.	(kg)
Material conservation	Reduction in mass of virgin material consumption due to increased recycled content of EPEAT devices and packaging.	(kg)
Cost savings for non-hazardous solid waste disposal	Cost of non-hazardous waste disposal.	(US\$)
Cost savings for energy use	Costs associated with the electricity used during the useful life of the equipment.	(Dollars)

4.2 Results Report Levels

The calculator displays the results in several ways:

Reduction in Environmental Impacts and Costs Resulting from Purchasing EPEAT:

Aggregate results are presented in the main table for Purchasing EPEAT Products and the Optional Reuse and Recycling data entry, if applicable. Purchasing EPEAT products includes the reduction in impacts and costs associated with raw material extraction through product manufacturing and transport plus the energy savings associated with electricity consumption during use by the initial user. This high-level display sums all products and all EPEAT levels into a single value for each metric.

Show me more details Reduction in Environmental Impacts and Costs

A series of expandable tables allows you to see more detailed results, including: By Product Category, By Product Type, and By Lifecycle Phase. Clicking on the + symbol displays the benefit reductions in more detail.

- **By Product Category:** This table displays the benefits of purchasing EPEAT mobile phones, servers, imaging equipment and computers and displays which includes the benefits for raw material extraction through EPEAT product manufacturing and transport plus the energy savings associated with electricity consumption during use by the initial user. The summation of these three rows is equal to the high-level results shown in the aggregate results table discussed above.

- **By Product Type:** Since the calculator only estimates saving for one type of mobile phone, these results are the same as results for By Product Category. For servers, imaging equipment and computer products, this table breaks down the results by the product types included on the data input page, including two types of servers (rack and blade), four types of imaging equipment (MFDs small, MFDs large, Printers small, Printers large) and five computer product types (desktop computer, computer display, notebook computer, tablet computer, and integrated desktop computer).
- **By Lifecycle Phase** –The benefits of raw material extraction through manufacturing and transport, energy savings associated with electricity consumption during use by the initial user, and end of life management of EPEAT products are shown in this table.

The summation of the first two rows (Raw Material Extraction Through Manufacturing and Transport and Product Energy Use) is equal to the product results shown in the By Product Category table.

The Optional Reuse and Recycling rows shows the reduction in environmental impacts resulting from reuse and recycling of EPEAT products at end of life. If the initial user has extended the useful life beyond the calculator’s default value, the benefits of avoiding production of a new product and packaging are included. Savings are based on not producing a fraction of new products, as determined by length of extended life. If you choose not to enter any reuse, recycling or extended life optional data, no results will show in this row.

The Total All Lifecycle Phases row is a summation of the three rows in these tables.

Excel Download

Below the benefits results table, there is an Excel Download button. Clicking on this will generate an Excel table with your data input and results that can be used for reporting purposes.

By Product Category:
By Product Type:
By Product Lifecycle Phase (All Products):
Mobile Phones by Lifecycle Phase:
Servers by Lifecycle Phase:
Computers and Displays by Lifecycle Phase:
Photovoltaic Modules:

Equivalencies Table

The last expandable table shows the aggregate benefits results as equivalencies. The calculator translates your results into familiar tangible terms, such as the number of households that could be powered by the energy savings benefit from purchasing EPEAT products or the equivalent number of US households' annual trash represented by the non-hazardous solid waste savings (reduction) benefit. The equivalencies are calculated using the Total row under Reduction in Environmental Impacts and Costs Resulting from Purchasing EPEAT (third line of results). If you want to calculate equivalencies for other rows of results, click on Data and Assumptions for Equivalencies, which can be applied to the respective results.

Equivalencies

Metric	Equivalencies (based on the total benefits displayed in the main table)
Energy Savings	Electricity to power 19.93 US household(s) for a year
Greenhouse Gas Emissions Reduction	Equivalent to removing 10.87 passenger car(s) from the road per year
Non-hazardous Solid Waste Reduction	Solid waste generated by 2.52 US household(s) in a year
Water Consumption Savings	Water to fill 0.23 olympic-sized swimming pool(s)
Toxic Substances Avoided	The weight of 8.53 brick(s)
Material Conservation	The weight of <0.01 18-wheeler (tractor-trailers)

Calculator Development

GEC developed this updated EPEAT 2.0 Benefits Calculator for ICT products with internal technical LCA expertise. Wherever feasible, GEC maintained consistency in the approach and design output of the GEC EPEAT 1.0 and 2.0 Benefits Calculators for ICT products.

GEC also engaged an external technical review panel comprised of representatives from industry, government, academia, technical consultancies, and organizations purchasing IT products, to review the data, assumptions and analysis underlying the calculators' results.

GEC extends its appreciation to the many individuals that contributed to the technical review of the extensive data and analysis supporting the benefits calculations. Technical reviewers included: Dr. Callie Babbitt, (Rochester Institute of Technology); Ms. Cate Berard (U.S. Department of Energy); Dr. Hema Madaka (Aligned Incentives, a Bureau Veritas Company); Dr. Tim Smith (TASA Analytics, LLC); Mr. David Allogia (Government of Canada); Dr. Mathew Realff (Georgia Institute of Technology); Mr. Puneet Shrivastava (Dell Technologies).

APPENDIX A: PRODUCT LEVEL ASSUMPTIONS

Table A1. Product Weight Assumptions

Product Categories	Product Type	Product Weight (kg)	Data Source/Notes
Computers & Displays	Desktop	11.3	Based on computer production process and inventory in Ecoinvent database.
	Notebook	1.5	Average notebook weight is calculated based on average screen size of notebooks in the EPEAT registry (14 inches) and estimated average screen size to weight ratio (9.14 inches/kg) from data points from web (https://whatlaptops.com/average-laptop-size-and-weight/).
	Monitor	5.1	Based on LCD display production process and inventory in Ecoinvent database.
	Integrated desktop	4.4	Based on data in: Subramanian and Young (2017). 'Life cycle assessment study of an integrated desktop device -comparison of two information and communication technologies: Desktop computers versus all-in-ones'. Journal of Cleaner Production 156.
	Tablet	0.5	Average weight of 10 inch tablet estimated from data points in https://sizechartly.com/tablet-screen-size-chart-for-various-brands/
Mobile Phones		0.16	Based on data in: Cordella, M., F. Alfieri, and J. Sanfelix. 2021. Reducing the carbon footprint of ICT products through alternative material efficiency strategies: A life cycle analysis of smartphones. Journal of Industrial Ecology.

Table A1. Product Weight Assumptions

Product Categories	Product Type	Product Weight (kg)	Data Source/Notes
Servers	Rack Servers	11.53	Weight per rack unit. Weight of 2 rack server divided by 2. Source: Ecodesign Preparatory Study on Enterprise Servers and Data Equipment. ENTR Lot9," Publications Office of the European Union, Luxembourg, 2015. Accessed: Nov. 21, 2024. [Online]. Available: https://data.europa.eu/doi/10.2873/14639
	Blade Servers	6.54	Weight per server unit. Weight of 8 blade server divided by 8. Source: Ecodesign Preparatory Study on Enterprise Servers and Data Equipment. ENTR Lot9," Publications Office of the European Union, Luxembourg, 2015. Accessed: Nov. 21, 2024. [Online]. Available: https://data.europa.eu/doi/10.2873/1463
Imaging Equipment	Printers ≤ 25 kg	13	Estimated average weight of printers in the EPEAT registry that weigh below 25 kg.
	Printers > 25kg	65	Estimated average weight of printers in the EPEAT registry weighing above 25 kg.
	MFD ≤ 25 kg	13	Estimated average weight of MFDs in the EPEAT registry weighing below 25 kg.
	MFD > 25 kg	75	Estimated average weight of MFDs in the EPEAT registry weighing above 25 kg.

Table A2. Product Lifespan Default Assumptions

Table A2. DEFAULT PRODUCT LIFESPAN			
Product Categories	Product Type	Life Span (Months)	Data Source/Notes
Computers & Displays	Desktop	48	Average of desktop lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv). ENERGY STAR also assumes 48 months as average lifetime of notebook computers.
	Notebook	48	Average of laptop lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv). ENERGY STAR also assumes 48 months as average lifetime of notebook computers.
	Monitor	60	Average of monitor lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv).
	Integrated desktop	48	Assumed same as notebooks and desktops.
	Tablet	36	Average of tablet lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv). ENERGY STAR also assumes 48 months as average lifetime of notebook computers.
Mobile Phones	Smartphones	36	Average of smartphone lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv).

Table A2. DEFAULT PRODUCT LIFESPAN

Product Categories	Product Type	Life Span (Months)	Data Source/Notes
Servers	Rack Servers	48	Average of server lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv).
	Blade Servers	48	Average of server lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv).
Imaging Equipment	Printers ≤ 25 kg	60	Average of printer lifetime data points reported in Boavizta (https://boavizta.org/en/manifesto) dataset (https://github.com/Boavizta/environmental-footprint-data/blob/main/boavizta-data-us.csv).
	Printers > 25kg	60	HP Laserjet Enterprise Flow MFP M528z also reports 5 years as lifetime.
	MFD ≤ 25 kg	60	
	MFD > 25 kg	60	

Table A3. Product Material Composition and LCI

Table A3. Product Material Composition and LCI			
Product Categories	Product Type	Notes	Data Source
Computers & Displays	Desktop	LCI: Desktop computer production process in Ecoinvent database.	Ecoinvent
	Notebook	LCI: Laptop computer production process in Ecoinvent database.	Ecoinvent
	Monitor	LCI: LCD display production process in Ecoinvent database.	Ecoinvent
	Integrated desktop	LCI: Literature data to which assembly energy input is added.	LCI data source: Subramanian and Young (2017). 'Life cycle assessment study of an integrated desktop device -comparison of two information and communication technologies: Desktop computers versus all-in-ones'. Journal of Cleaner Production 156. Assembly energy input is added to the LCI, value used is the average of assembly energy input for laptops and desktops in ecoinvent database.
	Tablet	LCI: Tablet production process in Ecoinvent database.	Ecoinvent
Mobile Phones	Smartphones	LCI: Literature BOM data + assembly electricity & tap water inputs from smartphone production process in Ecoinvent database	Cordella, M., F. Alfieri, and J. Sanfelix. 2021. Reducing the carbon footprint of ICT products through alternative material efficiency strategies: A life cycle analysis of smartphones. Journal of Industrial Ecology.

Table A3. Product Material Composition and LCI			
Product Categories	Product Type	Notes	Data Source
Servers	Rack Servers	LCI: Server BOM + assembly energy input (desktop assembly energy input from Ecoinvent)	Ecodesign Preparatory Study on Enterprise Servers and Data Equipment. ENTR Lot9," Publications Office of the European Union, Luxembourg, 2015. Accessed: Nov. 21, 2024. [Online]. Available: https://data.europa.eu/doi/10.2873/14639
	Blade Servers	LCI: Server BOM + assembly energy input (desktop assembly energy input from Ecoinvent)	Ecodesign Preparatory Study on Enterprise Servers and Data Equipment. ENTR Lot9," Publications Office of the European Union, Luxembourg, 2015. Accessed: Nov. 21, 2024. [Online]. Available: https://data.europa.eu/doi/10.2873/14639
Imaging Equipment	Printers ≤ 25kg	LCI is built based on Babbitt et al (2020)'s disassembly data on material composition of printers, which is scaled to the average weight of printers in the EPEAT Registry that weigh less than 25 kg. Assembly energy input is added from Ecoinvent LCI for printers.	Babbitt, C.W., Madaka, H., Althaf, S. et al. Disassembly-based bill of materials data for consumer electronic products. Sci Data 7, 251 (2020).
	Printers >25kg	LCI is built based on average BOM estimated from EPDs of printers weighing above 25 kg and scaling it to the average weight of printers in the EPEAT Registry that weigh above 25 kg Assembly energy input is added from Ecoinvent LCI for printers.	https://ecoleaf-label.jp/en/epd/download/2058 https://ecoleaf-label.jp/en/epd/download/1608

Table A3. Product Material Composition and LCI			
Product Categories	Product Type	Notes	Data Source
Imaging Equipment	MFD ≤ 25kg	<p>LCI is built based on Babbitt et al (2020)'s disassembly data on material composition of All-in-one printers, which is scaled to the average weight of MFDs in the EPEAT Registry that weigh less than 25 kg.</p> <p>Assembly energy input is added from Ecoinvent LCI for printers.</p>	Babbitt, C.W., Madaka, H., Althaf, S. et al. Disassembly-based bill of materials data for consumer electronic products. Sci Data 7, 251 (2020).
	MFD > 25kg	<p>LCI is built based on average BOM estimated from EPDs of MFDs weighing above 25 kg and scaling it to the average weight of MFDs in the EPEAT Registry that weigh above 25 kg</p> <p>Assembly energy input is added from Ecoinvent LCI for printers.</p>	<p>https://ecoleaf-label.jp/en/epd/download/2115</p> <p>https://ecoleaf-label.jp/en/epd/download/2011</p>

APPENDIX B: USE PHASE ENERGY CONSUMPTION ASSUMPTIONS

EPEAT Criteria requires Conformance with applicable ENERGY STAR® product eligibility criteria. All products in the calculator except smartphones are covered by ENERGY STAR. Annual use phase electricity consumption assumptions used in modeling computers & displays, servers and imaging equipment are based on ENERGY STAR average TEC/yr. For these products, EPEAT versions assume average ENERGY STAR TEC/yr and non EPEAT versions assume average energy use by baseline/conventional products estimated from ENERGY STAR annual energy savings data. See Table B1 for values used in the calculator use phase energy consumption modeling for these product categories. For mobile phones, the annual energy use data is estimated based on battery charger energy use and external power supply efficiency assumptions for EPEAT and non-EPEAT products. See Table B2 for notes on data sources/assumptions for smartphones

Table B1. Annual use phase electricity consumption assumptions used in modeling EPEAT and non EPEAT computers & displays, servers and imaging equipment. For these products, EPEAT versions assume average ENERGY STAR TEC/yr and non EPEAT versions assume energy use of non-ENERGY STAR products.

Product Categories	Product Type	Notes on data sources/assumptions
Computers & Displays	Notebook	ENERGY STAR TEC value is estimated as the difference between baseline product (non-ENERGY STAR) energy consumption (baseline energy use values used by ENERGY STAR in energy savings calculations) and annual energy savings reported by ENERGY STAR in ENERGY STAR Computers Version 9.0 Final Data Package (1).
	Desktop	ENERGY STAR TEC value is estimated as the difference between baseline product (non-ENERGY STAR) energy consumption (baseline energy use values used by ENERGY STAR in energy savings calculations) and annual energy savings reported by ENERGY STAR in ENERGY STAR Computers Version 9.0 Final Data Package (1).
	Integrated Desktop	ENERGY STAR TEC value is the estimated average of entries in TEC of Model column for Integrated Desktop reported in the ENERGY STAR Computers Version 9.0 Draft 2 Savings and Data Package (tab: 4c). Non-ENERGY STAR or baseline energy consumption value is estimated as the sum of ENERGY STAR TEC and energy savings data reported (source: ENERGY STAR Computers Version 9.0 Draft 2 Savings and Data Package).
	Tablets	ENERGY STAR TEC value is the estimated average of TEC (kwh) reported by ES certified products on their website certified between Sept 2019 & June 2025 - downloaded on 3/15/2025 Non-ENERGY STAR or baseline energy consumption value is estimated based on the assumption that energy use % change in baseline Non-ENERGY STAR Tablet versus ENERGY STAR product is same as baseline notebook versus ENERGY STAR notebook
	Monitors	ENERGY STAR TEC value is the estimated average of TEC (kwh/yr) reported by ES certified products on their website certified between June 2016 & March 2025 - downloaded on 3/15/2025. Non-ENERGY STAR or baseline energy consumption value is estimated based on the energy efficiency % improvement (7% more energy efficient than standard option) reported on ENERGY STAR website (https://www.energystar.gov/products/monitors)

Product Categories	Product Type	Notes on data sources/assumptions
Servers	Rack Servers	Both ENERGY STAR TEC value and non-ENERGY STAR energy consumption data are based on ENERGY STAR datasets.
	Blade Servers	
Imaging Equipment	Printers	ENERGY STAR TEC value is estimated average of TEC (kwh/yr) reported in ENERGY STAR Draft 2 Version 3.0 Imaging Equipment Data & Analysis Package_REVISED (Tab 1. TEC ENERGY STAR Dataset, after removal of outliers). Non-ENERGY STAR or baseline energy consumption value is estimated by averaging TEC of products that met Version 2 but do not meet Version 3, values obtained after removing outliers.
	MFD	

Table B2. Use Phase Energy Calculations For Smart Phones

Product Category	Notes on data sources/assumptions
Smartphone - Baseline (Non-EPEAT)	Estimated as sum of battery charger energy (https://www.regulations.gov/document/EERE-2008-BT-STD-0005-0256) and external power supply energy consumption calculated based on EPS efficiency (0.81)
Smartphone All EPEAT Tiers - Bronze, Silver, Gold	Estimated as sum of battery charger energy (https://www.regulations.gov/document/EERE-2008-BT-STD-0005-0256) and external power supply energy consumption calculated based on EPS efficiency (0.88) . Source: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1782

APPENDIX C: REGIONAL ELECTRICITY GRID MIX (IEA DATA)

Country/Region	Coal	Oil	Natural gas	Hydro	Wind	Biofuels	Solar PV	Solar	Nuclear	Waste	Geothermal	Tide	Other sources
Middle East	0%	26%	69%	1%	0%	0%	1%	0%	2%	0%	0%	0%	0%
Europe	17%	2%	21%	15%	14%	5%	6%	0%	19%	1%	1%	0%	0%
Asia Pacific	56%	1%	10%	13%	6%	2%	5%	0%	5%	0%	0%	0%	0%
Africa	26%	7%	42%	18%	3%	0%	2%	0%	1%	0%	1%	0%	0%
Eurasia	18%	1%	46%	18%	1%	0%	0%	0%	16%	0%	0%	0%	0%
South & Central America	4%	6%	15%	54%	9%	5%	4%	0%	2%	0%	0%	0%	0%
North America	18%	1%	37%	13%	9%	1%	4%	0%	16%	0%	0%	0%	0%

APPENDIX D: RECYCLED CONTENT ASSUMPTIONS IN PRODUCT

Several Sustainable Use of Resources (SUR) criteria require the use of recycled content metals. The tables below show the percentage of recycled content assumptions used in the modeling of the EPEAT tiers for different product types.

Table D1: Plastics Recycled Content Assumptions Used In Modeling EPEAT Tiers Based On SUR Criteria 5.1.3 And 5.1.4

Product Category	Bronze	Silver	Gold
Laptop/Notebook	2%	10%	20%
Desktop	15%	35%	45%
Integrated desktop computer	15%	40%	50%
Tablet/Slate	2%	5%	15%
Monitor/Display	15%	50%	85%
Mobile phone	5%	25%	35%
Server	2%	10%	25%

Table D2: Aluminum Recycled Content Assumptions Used In Modeling EPEAT Tiers Based On SUR Criteria 5.1.5

Product Category	Bronze	Silver	Gold
Laptop/Notebook		50%	50%
Desktop		50%	50%
Integrated desktop computer		50%	50%
Tablet/Slate		50%	50%
Monitor/Display		50%	50%
Mobile phone		50%	50%
Server		50%	50%
Imaging Equipment		N/A	N/A

Table D3: Steel Recycled Content Assumptions Used In Modeling EPEAT tiers based on SUR Criteria 5.1.5

Product Category	Bronze	Silver	Gold
Laptop/Notebook			5%
Desktop		5%	5%
Integrated desktop computer		5%	5%
Tablet/Slate			5%
Monitor/Display		5%	5%
Mobile phone			5%
Server		5%	5%
Imaging Equipment		5%	5%

Table D4: Rare Earth Element (Neodymium) Recycled Content Assumptions Used In Modeling EPEAT Tiers Based On SUR Criteria 5.2.2

Products assumed to contain REE magnets	Assumed recycled content % in total Nd weight in product		
	Bronze	Silver	Gold
Laptops/Notebook	0%	3%	10%
Desktops	0%	3%	10%
Integrated desktop computer	0%	3%	10%
Tablet/Slate	0%	3%	10%
Mobile phones	0%	3%	10%
Server	0%	3%	10%

Table D5: Battery material (cobalt) recycled content assumptions used in modeling EPEAT tiers based on SUR Criteria 5.2.3

	Assumed recycled content % in total Co weight in product			
	Baseline	Bronze	Silver	Gold
Cobalt Recycled Content	0%	0%	10%	10%

Criteria apply to products containing batteries only.

APPENDIX E: EPEAT CRITERIA ASSUMPTIONS

Table E1: Climate Change Mitigation Criteria

EPEAT Criteria	Criteria detail applied in calculations; Data sources & assumptions
4.0 Climate Change Mitigation	
<p>4.3.2 Optional - Energy management system for final assembly and key component facilities</p> <p>4.3.3 Optional - Energy efficiency performance improvement for key component supplier facilities</p>	<p>Criteria 4.3.2 detail: *Final assembly facilities for registered products achieve 3rd party certification to ISO 50001 or demonstrate energy efficiency performance improvement per criterion 4.3.3. * 25% of product spend on key components for registered products have 3rd party certification to ISO 50001.</p> <p>Criteria 4.3.3 detail: *2.5 % facility energy performance improvement in key component facilities (25% of spend in key components - 1 pt, 50% - 2 pts).</p> <p>EPEAT bronze product is assumed not to meet any optional criteria. Silver and gold assume reduction in product assembly energy input based on energy performance improvements from ISO 50001 and reduction in energy input of key components as per criteria specifications. ISO 50001 leads to Energy performance improvements of 5.6% to 30.6% over three years. 18% is estimated as the average (of 5.6% and 30.6%) energy performance improvement. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/ISO_50001_Brochure.pdf</p>
<p>4.4.1 Required – Manufacturer use of renewable electricity</p>	<p>Criteria 4.4.1 detail: Manufacturer shall demonstrate 12.5% renewable energy generation/procurement.</p> <p>A portion of the product assembly energy input is replaced by renewable energy in EPEAT bronze, silver and gold; based on criteria specifications.</p>

<p>4.4.2 Optional – Manufacturer increased use of renewable electricity</p>	<p>Criteria 4.4.2 detail: Replace 40% energy by renewable energy - 1 pt, Replace 85% energy by renewable energy - 2 pt.</p> <p>EPEAT bronze product is assumed not to meet any optional criteria. Silver and gold assume renewable energy use share in product assembly energy input as per criteria specifications, applied after energy reduction based on 4.3.2 criteria calculations.</p>
<p>4.4.3 Optional – Supplier use of renewable electricity</p>	<p>Criteria 4.4.3 detail: Suppliers constituting 50% of production spend on key components demonstrate use of renewable electricity use in at least: 40% of total electricity consumption - 1 pt; 65% of total electricity consumption -2 pt</p> <p>Suppliers constituting 75 % of production spend on key components demonstrate use of renewable electricity use in at least: 40% of total electricity consumption - 3 pt; 65% of total electricity consumption -4 pt.</p> <p>EPEAT bronze product is assumed not to meet any optional criteria. Silver and gold assume renewable energy input in key component manufacturing based on criteria specifications.</p>
<p>4.5.1 Optional - Reduce fluorinated greenhouse gas emissions from flat panel display manufacturing</p>	<p>Criteria 4.5.1 detail : IEEE Std 1680.1a™-2020 (https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=86).</p> <p>EPEAT bronze product is assumed not to meet any optional criteria. Silver assumes reduction in display emissions per m2 by 68% (90% of 75% spend) and gold assumes 90% reduction per m2 as per criteria specifications.</p>
<p>4.5.2 Optional - Reduce fluorinated greenhouse gas emissions from 300mm semiconductor manufacturing</p>	<p>Criteria 4.5.2 detail: IEEE Std 1680.1a™-2020 (https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=86)</p> <p>EPEAT bronze product is assumed not to meet any optional criteria. Silver and gold assume reduction in wafer manufacturing emissions per m2 by 52.5% (75% * 70%) where 75% represents percentage of suppliers by annual spend and 70% represents emissions reduction specified in the criteria.</p>
<p>4.6.1 Required - Conformance with applicable ENERGY STAR® product eligibility criteria</p>	<p>EPEAT bronze, silver and gold assumes ENERGY STAR TEC (Typical Energy Consumption) as annual product energy consumption. See Appendix Table B1 for assumptions for each product category.</p>

<p>4.6.2 Required - External power supply energy efficiency</p>	<p>Criteria 4.6.2 detail: Power supply shall meet, at a minimum, the requirements of US DOE Conservation Standards or equivalent.</p> <p>EPEAT bronze, silver and gold assumes 88% energy efficiency; baseline assumed to be 7% less efficiency based on conversion efficiency savings from eco-design reported by EU commission.</p> <p>Data Sources: External power supplies - Natural Resources Canada, https://energy-efficient-products.ec.europa.eu/product-list/external-power-supplies_en https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1782</p>
<p>4.6.3 Required - Battery charger system energy efficiency</p>	<p>Criteria 4.6.3 detail: The battery charger system shipped with the product shall meet the unit energy consumption requirements of US 10 CFR Part 430.32 subparagraph (z), Energy Conservation Standards for Battery Chargers.</p> <p>https://www.regulations.gov/document/EERE-2008-BT-STD-0005-0256 , https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/battery-chargers</p> <p>Criteria apply to smartphones only. Battery charger annual energy consumption values assigned based on Federal Energy Conservation Standards for Battery Chargers Final Rule for Product Class 2. See Appendix Table B2 for data sources and notes</p>

Table E2: Sustainable Use of Resources

EPEAT Criteria	Criteria detail applied in calculations; Data sources & assumptions
5.0 Sustainable Use of Resources	
<p>5.1.3 Required – Minimum post-consumer recycled and biobased plastic content</p> <p>5.1.4 Optional – Higher post-consumer recycled and biobased plastic content</p>	<p>Recycled plastic content is assigned in EPEAT bronze, silver and gold products as per criteria specifications. See Appendix Table D1 for recycled plastic content assumptions used at different EPEAT tiers for each product category. Biobased plastic use is not considered in calculations.</p>
<p>5.1.5 Optional – Reused / Recycled metals content</p>	<p>EPEAT bronze product is assumed not to meet any optional criteria. Recycled metal (aluminum and steel) content is assigned in EPEAT silver and gold products as per criteria specifications. See Appendix Table D2&D3 for recycled metal content assumptions used at different EPEAT tiers for each product category.</p>
<p>5.2.2 Optional – Post consumer recycled content or direct reuse of rare earth magnets in product</p>	<p>EPEAT bronze product is assumed not to meet any optional criteria. EPEAT silver and gold are assumed to have recycled REE (neodymium only) content in rare earth magnets. The recycled content assumption is based on the estimated average of the range specified in criteria document. Refer Appendix Table D4 for recycled REE (Nd) content assumptions used at different EPEAT tiers for each product category. Rare earth magnet reuse is not considered in calculations.</p>
<p>5.2.3 Optional – Post consumer recycled content metal in lithium-based secondary batteries</p>	<p>EPEAT bronze product is assumed not to meet any optional criteria. EPEAT silver and gold are assumed to have recycled battery material (cobalt only) content in batteries. The recycled content assumption is based on the range specified in criteria document. Refer Appendix Table D5 for recycled battery material (Co) content assumptions used at different EPEAT tiers for each product category.</p>
<p>5.3.3 Required - Long life rechargeable battery for notebook computers, tablets and mobile phones</p>	<p>Assumptions used in calculator 1.0 are maintained. Baseline products assume 2 years battery life. EPEAT bronze, silver and gold assumes 4 years battery life.</p>
<p>5.4.1 Required - Design for repair, reuse, recycling</p>	<p>For all EPEAT tiers, if the user input to the optional data entry ‘How long do you plan to use the products on average (in months)’ is greater than the default/average product lifespan, the lifecycle benefits will be calculated based on the life extension input.</p>
<p>5.8.1 Required – Sustainable packaging content</p>	<p>All EPEAT tiers assume 50% of packaging material to be recycled material as per criteria specifications.</p>

Table E3: Reduction of Chemicals of Concern

EPEAT Criteria	Criteria detail applied in calculations; Data sources & assumptions
6.0 Reduction of Chemicals of Concern	
6.1.5 Required – Reduction of bromine and chlorine content of plastic parts	Bromine and chlorine content in baseline (non EPEAT) products are based on published data. In baseline (non EPEAT) products, bromine content is assumed to be 12% plastics weight and 16% weight of epoxy in printed wiring board (source: Brominated Flame Retardants and the Circular Economy of WEEE Plastics. BESF (2023). In EPEAT bronze and silver, Br content in plastics is assumed to be 0% and Br content in PWB epoxy is kept at 16%. EPEAT gold assumes Br content to be zero in both plastics and PWB epoxy.
6.1.6 Optional – Further reduction of bromine and chlorine content of plastic parts	Chlorine content in non EPEAT product is assumed to be 0.57% of PVC weight. (https://www.rtprototype.com/what-is-pvc/). EPEAT bronze, silver and gold assumes chlorine content to be zero.

Table E4: Imaging Equipment Consumables Criteria

EPEAT Criteria	Criteria detail applied in calculations; Data sources & assumptions
8.0 Imaging Equipment Consumables Criteria	
8.1.1 Required - Equipment allows use of recycled content office paper	EPEAT bronze, silver and gold assumes 18% recycled content in paper used in IE use phase as default. Users have the ability customize the recycled paper use percentage using optional data entry fields. Average recycled use is the estimated average of multiple data points. https://www8.hp.com/h20195/v2/GetPDF.aspx/c06425341.pdf https://www.epa.gov/smm/comprehensive-procurement-guidelines-paper-and-paper-products#01 https://calrecycle.ca.gov/organics/slcp/procurement/RecycledPaper/
8.1.2 Required – Design to reduce paper usage	EPEAT bronze, silver and gold assumes duplexing capability and assumes that duplexing capability reduces paper use by 21%. Paper use reduction assumption is based on the estimated average of multiple data points. https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c08199220 https://sustainability.tufts.edu/wp-content/uploads/BusinessGuidetoPaperReduction.pdf https://www8.hp.com/h20195/v2/GetPDF.aspx/c06425341.pdf
8.1.3 Required - Design to allow use of remanufactured cartridge	EPEAT bronze, silver and gold assumes 13% cartridge use to be remanufactured as default. Users have the ability customize the remanufactured. The default percentage share of remanufactured cartridge use is estimated based on the estimated average market share of remanufactured toner and inkjet cartridges. Data Source: https://www.etira.org/cartridge-remanufacturing/key-facts/ Additional Notes :IE products in the calculator are differentiated based on functionality and weight (The four IE product types are: MFDs ≤ 25 kg, MFDs >25 kg, Printers ≤ 25 kg and Printers > 25 kg) and are not differentiated as inkjet or laser jet printers. Hence the average cartridge consumed in use phase is modeled based on average BOM of an inkjet and toner cartridge.