

Product-Category Rules (PCR)
for Preparing an Environmental Product
Declaration (EPD) for
Slate-Tablet PC
PCR 2011:1.0

Shuttle Inc.

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1. General Information

This document is to be used as the product category rules (PCR) for the global production and manufacturing of slate-tablet PC. The requirements specified in this PCR are intended to be used for EPDs certified in accordance with ISO 14025 standard. This document shall be valid until Sep. 20, 2013.

This PCR was jointly prepared by Shuttle Inc. and Taiwan Green Productivity Foundation. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited by the Taiwan Electrical and Electronic Manufacturers Association (TEEMA) to the open consultation meeting on July 15, 2011, to participate in the discussion and review of this PCR. Environment and Development Foundation (EDF) then reviewed and approved this PCR.

This PCR is applicable to products with the Harmonized System (HS) Code of 847010, 847029, 847141, 847149 and 847150.

For further information and comments concerning this PCR, please contact: Shuttle Inc. : Safety Dept. Section Vice-Manager Money Chien (Tel : +886- 8792-6168 * 4130 , Fax : +886- 2793-6986 , email : money_chien@tw.shuttle.com).

Note: For information regarding HS Codes for products which this PCR is applicable, please refer to Appendix III Table for Classification of Goods by HS Codes.

2. Company and product description

The EPD shall include information about the manufacturing company/organization. The information may include manufacturing process related information, and environmental related information, such as the environmental management system information. The information may also include special issues which the company/organization would like to emphasize, such as the products meeting certain environmental criteria, or environmental safety and health related information.

This PCR is applicable to both business to consumer (B2C) communications, as well as business to business (B2B) communications between original design manufacturer (ODM) or original equipment manufacturer (OEM). While conducting certification of product related environmental impacts, the inventory shall also include product accessories and packaging.

2.1 Product group function

A slate-tablet PC refers to an electronic device which integrates display, computer system, and input/output interface unit into a single body. It has no physical keyboard and relies on a touch panel display as the main input device, but it does have independent wireless network connection units, such as 3G, Wi-Fi, etc.

In addition, the slate-tablet PC's main power source is the built-in battery. When a power supply is connected to the slate-tablet PC, it is only for battery charging purpose, not to serve as the main power source.

The slate-tablet PC is a subset of the tablet PC. It is generally designed as a portable device which can provide functions similar to notebook computers, and can be used in schools, families,

companies, restaurants, businesses or exhibition settings. It is mainly used for word processing, Internet/web browsing, checking/receiving mails, entertainment, and other applications.

2.2 Product components

The slate-tablet PC's basic components may include but not limited to the following:

- CPU
- RAM
- Touch panel display device
- Storage device (e.g., hard disk drive, etc.)
- Motherboard
- Case
- Battery pack
- Power supply unit
- Input/output interface unit (e.g., video equipment, Internet transmission unit)
- Others: e.g., other accessories, user manual, packaging, etc.

2.3 Product technical description

The product technical description part of the EPD shall include the following information:

- Product name
- Product dimensions: L (mm)×W(mm)×H(mm))
- CPU clock rate and memory capacity
- Operating system
- Touch panel display device
- Memory capacity
- Storage device specification and capacity
- Battery specification and capacity
- Power supply specification
- Input/output interface specification
- Others

3. List of materials and chemical substances

The contents of the following materials and substances in the product shall be declared:

- All materials of the product with weight ratio (material weight/product weight) $\geq 1\%$;
- All materials/substances in the product regulated by legal and customer requirements;
- The following materials in the product components: flame retardants, lead content in solder, lead and flame retardant content in solder masking agent, and substances regulated by EU's RoHS Directive (the latest version).

The declaration of halogen-free flame retardants, lead-free solders and no RoHS-regulated substances may only be made when appropriate evidences are available (for example, test reports from accredited laboratories/testing facilities). The following organizations may provide accreditation for testing facilities: Taiwan Accreditation Foundation (TAF), (Asia Pacific Laboratory Accreditation Cooperation (APLAC), International Laboratory Accreditation Cooperation (ILAC) or ILAC Mutual Recognition Arrangement (ILAC MRA). For definitions of testing methodology and

confirmations of regulated hazardous substances based on the accredited laboratories' product testing methods, please refer to IEC 62321 Standard.

4. Declared unit

The declared unit is one unit of slate-tablet PC, and the size of the touch panel display (LxWxH) shall be indicated. This unit is chosen because the slate-tablet PC products are marketed and sold in such a unit.

5. System boundaries

The main system boundaries for the declared product system are presented as follows:

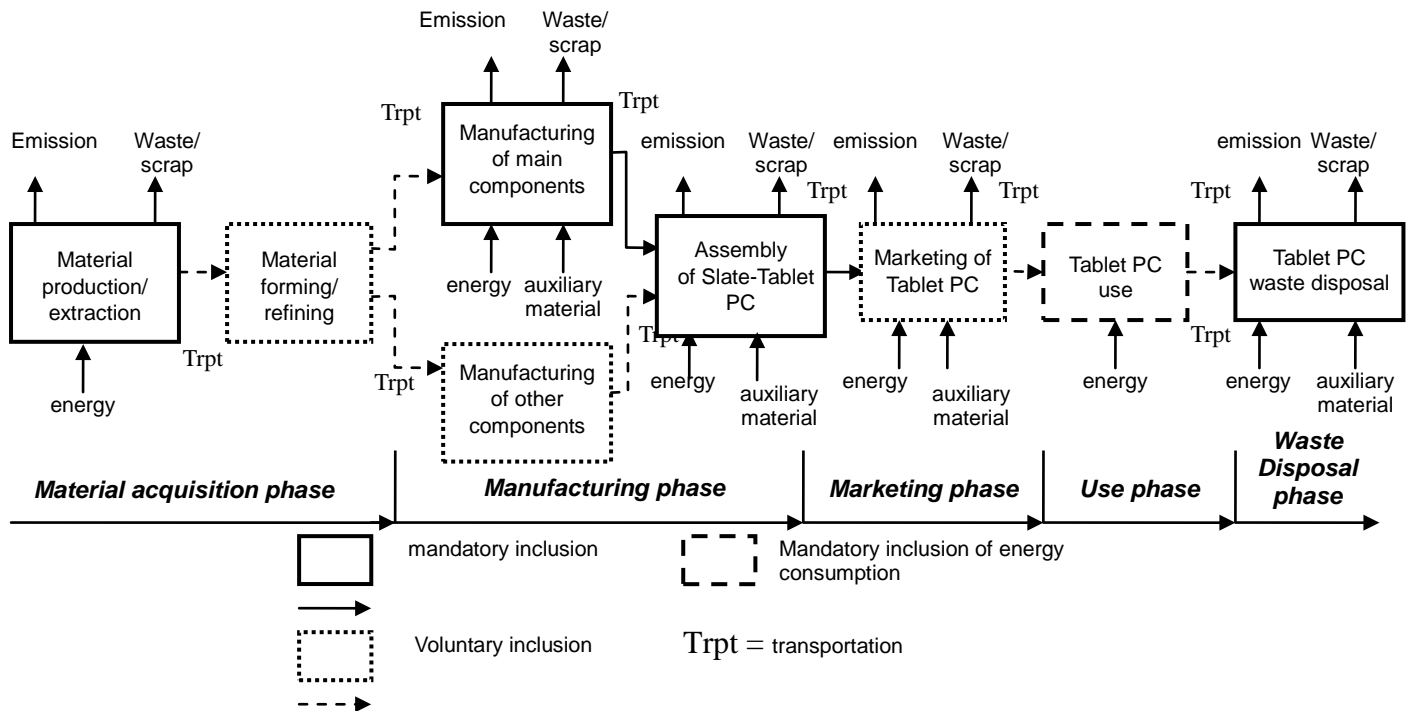


Figure 1 System boundary of the product system

Notes:

(1) Classification of major components and other components

- a. Major components include: CPU, RAM, touch panel display device, storage device, mother board, case, battery pack, power supply unit and input/output interface unit.
- b. Other components include: use manual and packaging.

Distribution Stage

(2) The marketing and distribution stage can be separated into two parts:

- a. Distribution transportation means transportation from the final assembly plant to the customer designated locations, logistics centers and sales offices. Information for this part of transportation should be disclosed mandatorily.
- b. Sales/Marketing transportation means transportation from the end of the distribution stage to when end customers obtain the product, and is of voluntary disclosure nature.

The data quality requirements for the main components are described in Section 9 on calculation rules and data quality requirements. The EPD shall also include the other components of the product, but their data quality requirements are different from those of the main components.

The life cycle of a slate-tablet PC only covers the stages of raw material acquisition, product manufacturing, use and end-of-life. Information regarding the product forming/refining, other component manufacturing, distribution and marketing, and end-of-life recycling and disposal, if included, is of voluntary nature.

Raw Materials Acquisition and Manufacturing Stage

The LCA shall include information for the following unit processes:

- Material extraction and manufacturing of main components and other components;

Manufacturing Stage

- Manufacturing/assembly of main components;
- Transportation of main components to slate-tablet PC manufacturing site.

The inclusion in the LCA the information on forming and refining of raw materials and manufacturing of other components is of voluntary reporting nature. When voluntarily reported information is included, they shall be explained in the EPD.

Distribution and Marketing Stage

The LCA shall include information for the following unit processes:

- Transportation of products to distribution centers or locations designated by retailers;
- The inventory and reporting of information regarding resource/energy input and waste output during marketing stage is voluntary;
- The inventory and reporting of information regarding transportation from distribution centers/retailers to users is voluntary.

Use Stage

If the product is located at the user's site, information regarding the power on and power off modes shall be provided. If the product is equipped with a main power switch, the compliance of power consumption with international legal requirements shall be considered. If feasible, the product's energy usage scenario and estimated stand-by time and number of pages browsed shall be described.

While assessing the energy consumption, if the product is a slate tablet-PC which uses built-in

battery as the main power source, the following scenario may be used as the basis for calculation and evaluation.

(1) Assume the product's time of use and usage scenario after the built-in battery has been fully charged; but when the product's characteristics and user group are different, specific conditions and usage scenario meeting the needs of the declaration shall be declared (the assumption for usage scenario shall include type of wireless access (3G, Wi-Fi, screen brightness, etc.). The usage scenarios and conditions may be assumed for two types of display device as follows:

a. Continuous energy loss type (e.g., use of display device): Declare the hours of stand-by after the product's built-in battery is fully charged. Also the days of product use (U) may be calculated under the usage scenario based on the product status, characteristics, usage scenario and conditions.

b. Other types: Estimate the days of product use (U) based on the display type, product status, characteristics, usage scenario and conditions.

(2) Estimate the annual number of charging product's built-in battery (T)

(3) Energy consumption for each charging (Wh): After the battery is fully discharged, the power consumption required to fully recharge the battery again.

(4) Assume the product's design service life is 2 years.

(5) The equation for calculating the number of battery charges (T):

$$365 \text{ (days)} / (\text{days of product use per battery charge (U)})(\text{day/charge})$$

Total energy consumption during use stage:

Energy consumption during each charge (Wh) X number of charges per year (T) X products design service life (2 years)

Note: for detailed calculation, please refer to Appendix V Example of Product Energy Consumption Calculation.

Recycling/end-of-life Stage

The reporting of recycling information (such as recycling and dis-assembly report and information on recycling channels) is mandatory in the EPD.

5.1 Specification of different boundary settings

Boundary in time

The validity period for the LCA results presented in the LCA report shall be defined.

Boundary towards nature

If the manufacturing processes are located within Taiwan, the solid waste categories as defined in Taiwan's Waste Disposal Act shall be adopted. If the processes are located in other countries, equivalent legal requirements shall be considered.

The natural boundary of the system shall describe the boundary where the materials and energy resources flow from nature into the system, and where the water and air emissions and waste are released out of the system.

Only the waste which is required to be disposed of needs to be considered; landfilling process does

not need to be included. If the waste will be treated through water treatment or incineration, these processes need to be included.

Boundaries in the life cycle

The boundaries in the product life cycle are described in Figure 1. The construction of the site and infrastructure, as well as the production of manufacturing equipment and activities of the workers, does not need to be included.

Boundaries towards other technical systems

Boundaries towards other technical systems describe the inputs of material and other components towards other systems, as well as outputs of materials towards other systems. For the inputs of recycled materials and energy towards the product manufacturing stage, the transportation between the recycling process and use of recycled materials shall be included in the data set. For the production of recyclable products during the manufacturing stage, the transportation towards the recycling process shall be included.

(Note: Further explanations are provided in Section 7 on open-loop recycling)

Boundaries regarding geographical coverage

The manufacturing stage may cover manufacturing processes located on any sites around the world. For processes located in a specific region, the data used should be representative of the region. The data for the main components shall be the specific regional data for the region where the process takes place (see Section 9). For ease of comparison, no matter where the emissions are generated, the same environmental impact parameters should be used for life cycle impact assessment (see Section 10).

6. Cut-off rules

For any impact category, if the sum of various impacts from a specific process/activity is less than 1% of the impact equivalent in that category, such a process/activity may be neglected during the inventory analysis. Nonetheless, the accumulated impact of neglected process/activity may not exceed 5%. Components and materials omitted from the LCA shall be documented.

(Note: This judgment for this “1% Rule” is based on the environment relevance assessment of material input to the system, and does not consider special and exceptional environmental impacts.)

7. Allocation rules

The main allocation rules shall be valid for the entire product system. For other secondary processes, other allocation rules may be defined; however, the use of these rules should be justified.

Product-specific information should be preferentially collected in order to avoid the need for allocation. While selecting allocation rules, the following principles are recommended.

- **Multi-output:** The allocations are based on the changes in the resource consumption and pollutant emissions (for example, adopted quantity allocation for some main component, or surface allocation for some components), following the changes in the studied system’s output product or function or economical relationship.
- **Multi-input:** The allocation is based on actual relationship. For example, the manufacturing

process's emissions may be affected by the change in waste flow input.

- Open loop recycling: For the input of recycled materials or energy during the manufacturing stage of the product system, the transportation between the recycling process and the recycling to material use shall be included in the dataset. For the product which shall be recycled during the manufacturing stage, the transportation towards the recycling process shall be included.

Notes:

- *Allocation may be avoided through avoidance of dividing processes, for example as described in Section 6.3 of ISO/TR 14049; or through expansion of system boundary (for example as described in Section 6.4), so that the amended system shares the same product exchanges as the original system.*

8. Units

The base units and derived units of the International System of Units (SI, *Système International d'unités*) shall be used preferentially.

Power & energy units:

- power unit: W
- energy unit: J

Specification units:

- length unit: m
- capacity unit: m³
- area unit: m²
- weight unit: kg

If necessary, prefixes may be used before the SI units.

- 10⁹ = giga, symbol "G"
- 10⁶ = mega, symbol "M"
- 10³ = kilo, symbol "k"
- 10⁻² = centi, symbol "c"
- 10⁻³ = milli, symbol "m"
- 10⁻⁶ = micro, symbol "μ"
- 10⁻⁹ = nano, symbol "n"

9. Calculation rules and data quality requirements

Date quality requirements for the raw material acquisition and manufacturing stage

- Generic data may be used for the acquisition, production, forming and refining of raw materials used for the components of the slate-tablet PC products. Please refer to Appendix I for the common sources of generic data. The date of the generic data used can not be older than 1990.
- Site specific data (for example, specific data for manufacturing plant or transportation) shall be used for the manufacturing of major components and assembly of the slate-tablet PC products. If other types of information are used, description of the information and rationale for using the information shall be provided.

- Generic data may be used for the manufacturing of other components for the slate-tablet PC products. Please refer to Appendix I for the common sources of generic data. The date of the generic data used can not be older than 1990.
- When generic data are used, the equivalence between the chemical and/or physical process of referred systems shall be considered.
- Generic data may also be used when suppliers refuse to provide specific data, or when even if generic data are used in place of specific data, there is only minor impact to the results. The general rule is that if generic data are used in place of specific data, their combined contribution for all life cycle stages shall not be greater than 20% of total impacts for each impact category. But there may be certain exception to specific products, and such exceptions shall be explained.
- The data shall be representative for the average of a specific year. If the average data for a specific time period of less than one year is used, the reason for using such data shall be provided.
- The electricity mix for the manufacturing stage should be site specific data. If site specific data cannot be obtained, the official electricity mix for the country where the site is located may be used as approximate value. The electricity mix should be documented.
- For the definition of hazardous waste, the definition as defined in Taiwan's Waste Disposal Act shall be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- For the transportation of main components to the manufacturing plant, the actual transportation modes used and distance traveled shall be considered.

Date quality requirements for the distribution and marketing stage

- For the transportation of products to the distribution sites or retailer sites, the actual mode of transportation and distance traveled shall be considered.
- The resource/energy input and waste output during the distribution/marketing stage shall be considered.

Date quality requirements for the use stage

- The energy consumption of the product shall be determined based on testing methodology stipulated in applicable international or industrial standards of the countries/regions the product is marketed.
- For the electricity mix for the use stage, the official electricity mix for the country where the product is exported may be used as approximate value. Please refer to Appendix I for the common sources of generic data. The date of the generic data used can not be older than 1990.

Date quality requirements for the recycling/end-of-life stage

- Generic data may be used during the recycling/end-of-life stage, if for specific reason the site specific data for the recycling/waste disposal system can not be obtained. Then generic data and recycling rate may be used to calculate environmental impact. Please refer to Appendix I for the common sources of generic data. The date of the generic data used can not be older than 1990.

10. Parameters to be declared in the EPD

The following parameters shall be declared in the EPD:

1. Energy use

- The energy consumption during each stage shall be declared. If the EPD is to be used for B2C communication, based on the description of use stage in the system boundary, the energy usage scenario for end-product use and adopted testing methodology as well as applicable industrial or international standards shall be declared.
- The following units shall be used preferentially:
kW or W for power; J or MJ for energy.

2. Resource use

The information on resource input within the system boundary shall be declared.

3. Impact equivalents expressed as potential environmental impacts

-Global warming	kg CO ₂ equivalent
-Acidification	kg SO ₂ equivalent
-Photochemical oxidant formation	kg C ₂ H ₄ equivalent
-Eutrophication	kg PO ₄ ³⁻ equivalent
-Ozone depletion	kg CFC-11 equivalent

Note: For characterization factors of each impact category, please refer to *EPD Supporting Annexes*, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from www.environdec.com.

4. Additional information

- Recyclable materials (optional)
- Information on secondary materials (optional)
- Waste (classification):
 - Hazardous waste as defined in Taiwan's Waste Disposal Act. Follow host countries' laws for sites outside Taiwan.
 - Other waste.

- Plastic parts marking

Where technologically possible, plastic parts of the slate-tablet PC weighing ≥ 25 g shall be marked in accordance with the ISO 11469 and ISO 1043 Part 1/2/3/4, SPI or other international standard label to facilitate their identification and recovery at the end of life.

- Plastic packaging materials marking

The Plastic packaging materials shall be labeled on the parts with SPI or other international standards for ease of sorting.

11. Recycling information

The recycling information shall include information such as dis-assembly instructions, which parts/components are suitable for recycling (such as metals) or not suitable for recycling. The information which the EU WEEE Directive requires the end product manufacturer to provide may also be included in the product declaration information for slate-tablet PC products.

If feasible, information for the parts which can not be recycled and therefore should be disposed of properly during the end-of-life stage may also be included.

12. Other environmental information (Optional)

The EPD may cover information including technology adopted, site of product manufacturing and assembly, as well as information on other working environment, health and risk-related aspects.

If this PCR is to be used for product carbon footprint declaration purpose, in the declaration, information regarding commitment on GHG reduction should be included and shall ensure that the commitment is measurable, reportable and verifiable. The organization may also list environmental and energy management related information, such as awards, commendations and system certifications (e.g., ISO 14001, ISO 14064-1, IECQ HSPM) etc.

14. References

The EPD shall make reference to the following documents:

- EPD General Program Instructions, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from <http://www.environdec.com/>;
- Relevant PCR documents;
- The underlying LCA report.

When available, the following documents shall also be referenced:

- Other documents and recycling instructions which verify and complement the EPD.

Appendix I – Generic Data Sources to Refer to

For processes located within Taiwan, Taiwan generic data or the data published by the commercial, industrial and energy competent authorities of the Republic of China (ROC) government, may be used. However, for other regions (such as EU), if there are more relevant generic data available, these data should be used instead.

When data from the following generic databases are used, the most current and updated data should be used:

Material	Database	Published
Industrial processes	Ecoinvent 2 nd edition	2007
Packing materials, transport, waste treatments	BUWAL 250, 2 nd edition	2004
	Ecoinvent 2 nd edition	2007
Steel, Primary copper, Copper products, Electricity, Fuels, Aluminium, Chemicals, Transports, Waste management,	PE-GaBi	2006
	ELCD version 2.0	2009
	Ecoinvent 2 nd edition	2007
	The Boustead Model 5.0	2007
	EIME (Environmental Information and Management Explorer) EcoBilan	1998-2000
Plastics	PE Plastics Europe (Association of Plastics Manufacturers in Europe)	1993-1998
	PE-GaBi	2006
	ELCD	2009
	Ecoinvent 2 nd edition	2007
	The Boustead Model 5.0	2007
	EIME (Environmental Information and Management Explorer) EcoBilan	1998-2000
Electronic components	PE-GaBi	2006
	ELCD	2009
	Ecoinvent 2 nd edition	2007
	The Boustead Model 5.0	2007
	EIME (Environmental Information and Management Explorer) EcoBilan	1998-2000

Appendix II – Reporting Format for the EPD

This appendix provides guidance information for the titles of sections, types of data and required information to be reported in the mandatory reporting part of the EPD. As a generic reporting template, the following titles and sub-titles are recommended:

(Refer to the PCR manual for the section numbering, the information in Italics are the recommended data/information for inclusion)

Introductory part

Each EPD should have an introduction part on the top part of the EPD which includes the following information:

- *Company/organization name*
- *Product name*
- *EPD registration number*

Description of the company/organization and product/service

Company/Organization

- *Description of company/organization*
- *Description of overall working environment, existing quality system and environmental management system*

Product and services (see Section 2)

- *Product's main applications*
- *Description of product specification, manufacturing process, manufacturing sites (if there are several sites)*
- *For product's environmental performance aspects, characteristics which may improve the usefulness of product*
- *Other types of relevant information, for example, special manufacturing processes with special advantages to the environment*

List of materials and chemical substances

- *Content declaration (see Section 3)*

Presentation of the environmental performance

- *Outline of the LCA methodology, for example, period of LCA, declared units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

Manufacturing stage (see Section 10)

Use stage (see Section 10)

- *Geographical region for product delivery*
- *Transportation data*
- *End-of-life information*

Information about Company and Certification Organization

Recycling information (see Section 11)

Other environmental information (see Section 12)

Information regarding certification

- *Names of certification and verification organizations*

- *Validity of certification certificates*
- *Compliance with legal and relevant requirements*

References (see Section 14)

- *relevant PCR documents*
- *EPD General Program Instructions, Version 1.0 (2008-02-29)*
- *underlying LCA study*
- *other supporting documents for LCA information*
- *other relevant documents regarding company/organization's environmental activities*

Appendix III – Table for Goods Classification by HS Codes

CCC Code		CD	Regulations Description of goods	Regulations	
Tariff NO.				Import	Export
8470.10			Electronic calculators capable of operation without an external source of electric power and pocket-size data recording, reproducing and displaying machines with calculating functions		
8470.10.10			Pocket -size data recording, reproducing and displaying machines with calculating functions		
8470.10.10	00	1	Pocket-size data recording, reproducing and displaying machines with calculating functions		
8470.10.20			Electronic calculators capable of operation without an external source of electric power		
8470.10.20	00	9	Electronic calculators capable of operation without an external source of electric power		
			Other electronic calculating machines:		
8470.29			Other		
8470.29.00			Other electronic calculating machines		
8470.29.00	00	2	Other electronic calculating machines		
8471.41			Comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined		
8471.41.00			Other automatic data processing machines, comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined		

8471.41.00	00	5	Other automatic data processing machines, comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined	C02	S01
8471.49			Other, presented in the form of systems		
8471.49.00			Other automatic data processing machines, presented in the form of systems		
8471.49.00	00	7	Other automatic data processing machines, presented in the form of systems	C02	S01
8471.50			Processing units other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit; storage units, input units, output units		
8471.50.00			Processing units other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit; storage units, input units, output units		
8471.50.00	00	3	Processing units other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit; storage units, input units, output units	C02	S01

Appendix IV Abbreviations

Acronyms	Common Name
APLAC	Asia Laboratory Accreditation Cooperation
CFP	Carbon Footprint of Product
EPD	Environmental Product Declaration
ErP	Energy Related Product
ILAC	International Laboratory Accreditation Cooperation
ILAC MAR	International Laboratory Accreditation Cooperation Mutual Recognition Arrangement
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rule
RoHS	The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
SPI	Society of the Plastics Industry
TAF	Taiwan Accreditation Foundation
TEC	Typical Energy Consumption
Trpt	Transportation
WEEE	The Waste Electrical and Electronic Equipment Directive

Appendix V Example of Product Energy Consumption Calculation

1. If the product is of the type that consumes energy continuously (for example, using the TFT LCD display)

For the slate-tablet PC's usage scenario, assume the device is only conducting web browsing of news articles with the wireless function (Wi-Fi) enabled.

Assume usage scenario: Enabled Wi-Fi function for Internet browsing of news articles

Characteristics of display device:

- Average power consumption: 600 mA
- Suspend power consumption: 100 mA
- Battery capacity: 10,000 mAH
- Operating system: Android
- Maintain screen brightness at 50%
- Assume the product is used for 3 hr/day, while suspend 2 hr/day.

Calculation of energy consumption

Days of product use per battery charge (U) =

$$10,000 \text{ (mAH)} / (600 \text{ mA} \times 3 \text{ hr} + 100 \text{ mA} \times 2 \text{ hr}) = 5 \text{ (day/charge)}$$

Number of battery charging per year (T): $365/5 = 73$ times/year

Designed product service life (year) = 2

Power consumption during battery charging = 50 (Wh)

Total energy consumption during use stage (Wh) = energy consumption during battery charging (Wh) X number of charging per year (T) X product designed service life (year)

$$= 50 \text{ (Wh)} \times 73 \text{ (time/year)} \times 2 \text{ (year)} = 7,300 \text{ (Wh)}$$

Note: Manufacturers may adopt their own product type, operating scenario and time used, or refer to the operating conditions in this example and conduct the calculation directly.