

PRODUCT-CATEGORY RULES (PCR)

For preparing an environmental product
declaration (EPD) for

Power Supply

PCR 2008 : 1.2

Environment and Development Foundation

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1. General information

This document is to be used as the product category rules (PCR) for the power supplies. This PCR applies to power supplies manufactured worldwide. 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 July XX, 2010.

This PCR is jointly prepared by the Taiwan Electrical and Electronic Manufacturers' Association (TEEMA) and the Universal Microelectronics Co. Ltd (UMEC). Representatives from major Taiwanese power supply manufacturers and stakeholders were invited to the open consultation meeting on September 11, 2008, which approved this PCR.

For further information concerning this PCR, please contact Mr. 張文銘, Quality Assurance Department, UMEC, (Tel: 886-4-23590096 ext 6000, Fax: 886-4-23590129; E-mail: evan@umec.com.tw).

2. Company and product description

The EPD shall include information about the manufacturing companies/organizations. 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 companies/organization would like to emphasize, such as the product meeting certain environmental criteria, or environmental safety and health related information.

This PCR covers the power supply products. And the products denoted here also include their packaging.

2.1 Product function

The power supplies include the following products: AC to DC Adapter, AC to AC Converter, DC to DC Converter and the DC to AC Inverter. The power supplies are used by the 4C (computer, communication, consumer and car electronics) products to convert AC-DC power, in order to provide appropriate power sources to these products.

The major function of the power supplies is to provide electrical and electronic products with stable power sources with appropriate voltage. Power supply is an indispensable functional device and key upstream component for the electrical and electronics products.

The uninterruptible power supply (UPS) does not include the battery; also the power converter for the solar photovoltaic system does not include the solar cell.

2.2 Product components

The basic component for a power supply includes: active components (including but not limited to semiconductor, and control ICs); passive components (including capacitors, inductors,

transformers, resistors etc.); and wave filters, PWBs, fans, cooling fins, case, connectors, and cables.

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 power supply, but their data quality requirements are different from those of the main components.

2.3 Product technical description

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

- 1 Input Power
- 2 Efficiency vs. Load (may adopt Energy Star 4.0 Specification)
- 3 No-load Power
- 4 Input/Output Voltage range
- 5 Input/Output Frequency
- 6 Inrush Current
- 7 Efficiency
- 8 Voltage Accuracy
- 9 Line Regulation
- 10 Load Regulation
- 11 Over Load Protection
- 12 Short-Protection
- 13 Hi-pot Isolation

3. List of materials and chemical substances

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

- All materials with weigh ratio (material weigh/product weight) $\geq 0.5\%$;
- All materials/substances regulated by legal and customer requirements;
- The following materials in the main components: flame retardants, lead content in solder, lead and flame retardant content in solder mask, substances regulated by RoHS Directive (2002/95/EC).

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

the IEC 62321(Draft).

4. Functional unit

The functional unit is defined as one unit of power supply, as the power supply is marketed and sold in such units.

5. System boundaries

The system boundaries of the product system are presented as follows:

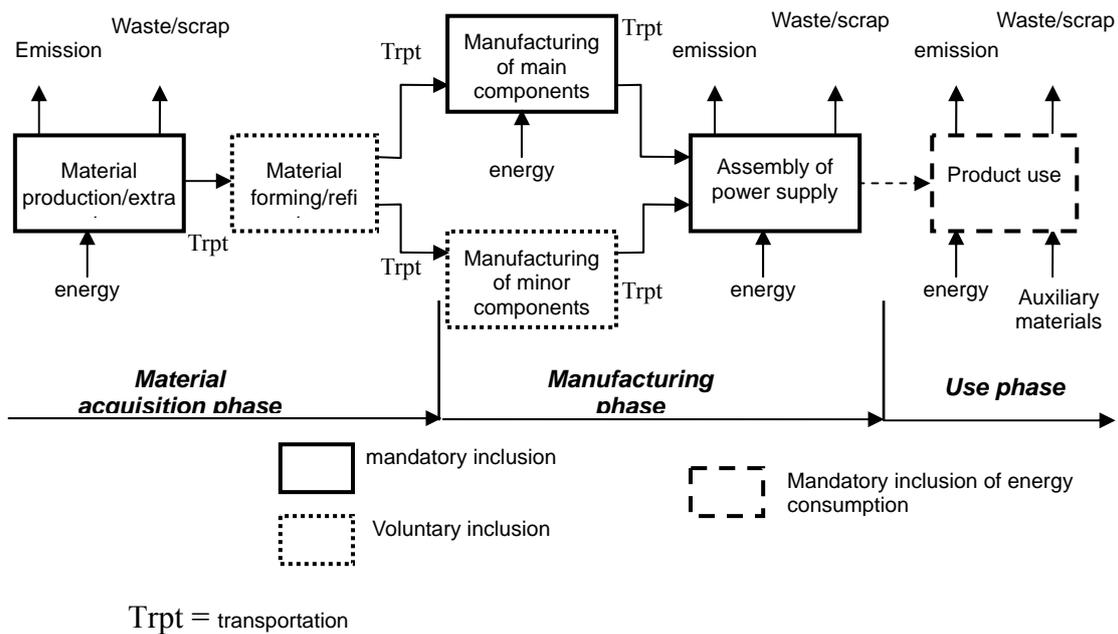


Figure 1 System Boundary of the main product system

As described in Figure 1 above, the life cycle of power supplies cover the manufacturing and use phases. The information for the recycling information is of the voluntary declaration nature (see Section 11).

Manufacturing Phase

The LCA shall include information for the following unit processes:

- Material extraction and production for main components and other smaller parts
- Manufacturing of main components
- Assembly of product
- Transportation of main components to product manufacturers
- Transportation of sub-assemblies to product manufacturers

The inclusion in the LCA the information on the material forming and refining and manufacturing of smaller parts is of the voluntary reporting nature. When voluntarily reported information is included, they shall be explained in the EPD.

Use Phase

If the power supplies are used by the users, the electricity consumption information for the active mode and no-load mode shall be provided and verified in accordance with the test methods (such as ETSI EN 300019-1-3) in use by the product export destination country. If the product is equipped with a main switch, the power consumption for the power supply during the power-off mode should be considered. When feasible, the product's energy use scenarios should be described.

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 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; the landfilling process does not need to be included. If the waste will be treated through water treatment or incineration, these processed need to be included.

Boundaries in the life cycle

The boundaries in the product life cycle are described in the Figure 1. Site and infrastructure constructions, the production of manufacturing equipment and activities of the workers do 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 phase, 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 phase, 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 phase 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 data 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. Parts 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

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 phase 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 phase, the transportation towards the recycling process shall be included.

Notes:

- 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.
- 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 following units shall be used:

- SI units (Système International d’unités)
- Preferentially used power and energy units:
 - power units use kW or W;
 - energy units use kWh.

9. Calculation rules and data quality requirements

- Site-specific data (for example, specific factory data or transportation data for a specific manufacturing process) shall be used for the production of main components and main assembly. If other types of data are used, the data and motives for using them shall be described.
- Generic data may be used in the manufacturing process for the power supplies' smaller (not main) components. Generic data may also be used for the production of bulk materials (see Appendix I for sources of generic data). For example, when bulk materials are purchased in the spot market or while treating waste; or when suppliers refuse to provide specific data; or when the lack of specific data will not greatly affect the final outcome. The general rule is that if that generic data are used in place of specific data, their combined contribution for all life cycle phases shall not greater than 10% of the total impact for any impact category. However, there may be exception for some specific products.
- The data shall be representative for the average of a specific year.

Data quality requirements for the manufacturing phase

- Site-specific data shall be used for the manufacturing of the product's main assembly and main components.
- The electricity mix for the manufacturing phase should be site-specific data. If site-specific data can not 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 should be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- For the transportation from the manufacturers, the transportation modes and distances from the suppliers shall be considered.

10. Parameters to be declared in the EPD

For the manufacturing phase, the following parameter shall be declared:

Resource Use

Use of non-renewable resources:

- without energy content
- with energy content

Use of renewable resources:

- without energy content
- with energy content

Electricity consumption for the main assembly and assembly of main components (optional declaration information, as energy for production of electricity are already listed under renewable and non-renewable resources).

Impact equivalents expressed as potential environmental impacts

-Global warming

kg CO₂ equivalent

- Acidification	kg SO ₂ equivalent
- Ozone depletion	kg CFC-11 equivalent
- Photochemical oxidant formation	kg (ethylene) equivalent
- Eutrophication	kg P ₂ O ₅ equivalent
- Energy	MJ

Use Phase

If the products are used by the users, the power consumption during active and low-power modes shall be provided.

If the product is equipped with a main switch, the power consumption during the power off mode shall be considered.

The following power and energy units shall be preferentially used: power units, kW or W; energy unit, kWh. (Describe mode of usage and any revision.)

Additional information

Recyclable materials (optional)

Information on secondary materials (optional)

Waste (classification):

- Hazardous waste as defined by Taiwan's Waste Disposal Act. Follow host countries' laws for sites outside Taiwan.
- Other waste.

(Note: The declared waste include both solid and semi-solid waste)

11. Recycling information

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

The recycling information shall include information such as dis-assembly instructions, which parts/components are suitable for recycling (such as metal cases) or not suitable for recycling. The information requirements for the final product manufacturers contained in the WEEE Directive may also be included in the power supply's EPD.

Information for the parts which can not be recycled and therefore should be disposed of properly during the end-of-life phase 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. The declaration may also include information which the manufacturers possess and customers are interested in (such as on risk related issues), proper handling of products during usage and maintenance, reduction of environment impacts during product use, and environmental information systems (such as eco-labeling) products are in conformance with.

The decoration shall include most commonly seen emission information. The odor information shall also be included, as customers may request them while purchasing.

13. Information about the certification

The information on PCR review, EPD verification and verification organization shall be included.

<p>The PCR review for Power Supply (PCR 2008 :) was administered by the Environment and Development Foundation and carried by a LCA expert panel chaired by Dr. Ning Yu (ningyu@edf.org.tw)</p> <p>Independent verification of the declaration, according to ISO 14025 : 2006</p> <p style="text-align: center;"><input type="checkbox"/> Internal <input type="checkbox"/> External</p> <p>Third party verifier : accredited by</p> <p>Environmental declarations from different programmes may not be comparable.</p>
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14. References

References shall be made to the following documents:

- Requirements for Environmental Product Declarations, EPD, (MSR 1999:2), published by the Swedish Environmental Management Council, website: 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, the Taiwan generic data or commercial and industrial statistics published by the Republic of China (ROC) government, and the data published by the ROC government's energy competent authority 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 databases are used, the most current and updated data should be used:

Material	Database	Published
Steel	IISI (International Iron and Steel Institute)	1998
Copper	ICA (International Copper Association)	1998
Copper semi products	ICA (International Copper Association) + IME (Institut für Metallhüttenwesen und Elektrometallurgi, Aachen)	1998 1995
Electricity	ETH (Eidgenössische Technische Hochschule) Data combined with IEA (International Energy Agency) statistics 1998	1996
Aluminum	EAA (European Aluminum Association)	2000
Plastics (and some chemicals)	APME (Association of Plastics Manufacturers in Europe)	1993-1998
Electronic components	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 format, 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 application*
- *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*

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, functional units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

Manufacturing phase (see Section 10)

Use phase (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 13)

- *relevant PCR documents*
- *EPD Requirements, MSR 1999 : 2*
- *underlying LCA study*
- *other supporting documents for LCA information*
- *other relevant documents regarding company/organization's environmental activities*