IEC TC111 WG4 Activity

Developing the IEC TR 62725 - Analysis of quantification methodologies for greenhouse gas emissions for EE products (electrical and electronic products and systems)

Progress Report

11th October, 2012

IEC/TC 111 WG4 Convenor

Kiyoshi SAITO

The Japan Electrical manufacturers' Association (JEMA)

Liaison (IEC TC111 and ITU-T SG5)

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Activity of IEC TC111 WG4 - GHG

- Two projects to develop;

  TR 62725 Analysis of quantification methodologies for greenhouse gas emissions for electrical and electronic products and systems

  DTR 62725 (111/266/DTR) Distributed on 2012-07-13

  Voting terminates on 2012-09-14

  TR 62726 Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems

  DC 62726 (111/269/DC) Distributed on 2012-08-03

  Commenting period 2012-09-28

- Member: 41 (BE,BR,CA,CN,DE,EC,ECMA,FR,GB,IT,JP,KR,NL,SE,US)
- Convenor: Kiyoshi Saito (Japan)
- Objective: To give guidance to those in electrical and electronics industries on quantification of GHG emission across the product life cycle, and its “GHG emission” in reducing it.

DTR 62725 (111/266/DTR)

111/266/DTR

DRAFT TECHNICAL REPORT

Project number	IEC 62725/Ed.1
IEC/TC or SC: 111	Secretariat: Italy
Distributed on: 2012-07-13	Voting terminates on: 2012-09-14
Also of interest to the following committees: All IEC/TCs/SCs; ISO/TC 61, ISO/TC 207	Supersedes document: 111/246/DC, 111/265/INF

Functions concerned

☐ Safety ☐ EMC ☒ Environment ☐ Quality assurance

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Title

IEC 62725: Analysis of quantification methodologies for greenhouse gas emissions for electrical and electronic products and systems

Please note that the document quotes in a box requirements in relevant International Standards and
Draft International Standards under ISO/TC 207 and the industry standards published by GHG Protocol.
Such way of quotations were allowed by the TPM of ISO/TC 207 and the Secretariat of GHG Protocol.

INTERNATIONAL TELECOMMUNICATION UNION

STUDY GROUP 5

TELECOMMUNICATION STANDARDIZATION SECTOR

TD 1214 (GEN/5)

STUDY PERIOD 2009-2012

English only

Original: English

Question(s): 18/5 Geneva, 8-12 October 2012

TEMPORARY DOCUMENT

Source: Liaison rapporteur

Title: IEC 62725: Analysis of quantification methodologies for greenhouse gas emissions for electrical and electronic products and systems

ITU-T SG5 input

- 12 technical comments on March 2012
- 2 technical comments on September 2012

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Development of TR 62725 - Present schedule

1. Current DTR document (111/266/DTR)
   - Distributed on 2012-07-13
   - Voting terminates on 2012-09-14
     *Circulation to NCs for two-month voting and commenting

2. When approved DTR document (111/266/DTR), it will be progress about the preparing - Issue of TR 62725
   - Next WG4 MTG ---> 16th-18th October, Fortaleza (Brazil)
     - Confirmation of voting result and refining the texts considering comments submitted by NCs
   - Additional TEL/WEB MTG ---> November - December
     - Submitting a finalized draft of TR 62725 to IEC Central Office ---> end of December (before the Xmas)

Issue (Target) Schedule:

End of 2012 - First of 2013

Current status of IEC TC111 WG4 activity - developing the IEC TR 62725 (Analysis of quantification methodologies for greenhouse gas emissions for EE product）

Relation to Existing Std. - TR 62725

WBCSD/WRI GHG Protocol	Scope 3 Accounting Report standard Product Life Cycle Accounting & Report standard	Issued Oct, 2011

ISO TC207 SC7 GHG Management

ISO 14067 : Carbon footprint of products – Quantification & Communication	Issue (Target) Schedule: 2013 (Mid term ?)

Liaison

Reference / Sector specific

IEC TC111	TR 62725 Analysis of quantification methodologies for GHG emissions for "EE products"	Issue (Target) Schedule: End of 2012 - First of 2013
Subject	GHG Assessment methodology for "EE products and service sector"	✓*CO2e emissions for Product's Life cycle*

(a) Guidance document - Quantification methodology of GHG emissions for EE products
(b) Guidance document - Making of PCR according to each product category for EE products

IEC Product TCs

Liaison

ICT Sector specific

ITU-T SG-5
L.1400: Overview and general principles
- Environmental impacts for ICT.
(Issued 2010)
L.1410:ICT goods, networks and services.
(Issued 2011)

Development of TR 62725 - Overview

Analysis of existing relevant documents

1. Intended to provide users with guidance to understand methodologies and to evaluate carbon footprint of products by quantifying the GHG emissions (CFP study) for EE products.
2. Based on comparative study on the existing standards (e.g. ISO/DIS 14067, ISO 14040/44, etc.), regional and national CFP initiatives, etc.
3. Quoting in a box requirements in relevant documents e.g. ISO/DIS 14067 and describing guidance for their application to EE products.

NOTE The document quotes in a box requirements in relevant International Standards and Draft International Standards under ISO/TC 207 and the industry standards published by GHG protocol. Such way of quotations were allowed by the TPM of ISO/TC 207 and the Secretariat of GHG Protocol.

CFP study

1. Clarifying workable basic steps for CFP studies on EE products;
2. Providing guidance for each step;
3. Mainly focused on quantification methodologies.

Development of TR 62725 – data collection

Hurdles of CFP study

1. Product system is not visible due to its complexity and large scale.
2. Due to above, difficulty of appropriate boundary setting and cutting off .
3. Difficulty for having cooperation from all the actors in the supply chain which makes impossible to collect primary data of every unit process.

Potential solutions (to be discussed)

Provide practical and implementable guidance for

- ✓ boundary setting
- ✓ data collection including effective use of secondary data

Development of TR 62725 – many components

Hurdles of CFP study

1. Electrical and electronic product is composed of a large number of parts and materials.
2. Overall uncertainly, which is a cumulative of each component becomes very large.

Potential solutions (to be discussed)

Provide practical and implementable guidance for

- ✓ cut off rules for screening insignificant components
- ✓ addressing uncertainty and accuracy

Development of TR 62725 – using stage

Hurdles of CFP study

1. Electrical and electronic products emit significant amount of CO_2 in the "use stage" in contrast to other industry.
2. The use profile or scenario may largely vary and lead to a large difference in results.

Potential solutions (to be discussed)

Provide practical and implementable guidance for

- ✓setting an appropriate use profile for energy-using products
- ✓avoiding inappropriate comparison or misleading use of the results.

DTR 62725(111/266/DTR) - Contents

- Document Type: Technical Report (TR)
- Title: Analysis of quantification methodologies for greenhouse gas emissions for electrical and electronic products and systems

INTRODUCTION
1. Scope
2. Normative reference
3. Terms and definitions
4. Principles
5. Comparative study on the existing relevant documents
6. Quantification framework
6.1 General
6.2 Goal and scope definition
6.3 Unit of analysis
6.4 System boundary
6.4.1 Life cycle stage and process map
6.4.2 Attributional and consequential approach
6.4.3 Time boundary
6.4.4 Specific GHG sources and sinks
6.4.5 Cut-off criteria
6.5 Trial estimation and decision on boundary to be cut-off
6.6 Data collection and quality assessment
6.6.1 General
6.6.2 Primary Data
6.6.3 Secondary Data
6.6.4 Data quality
6.7 Calculating GHG emissions
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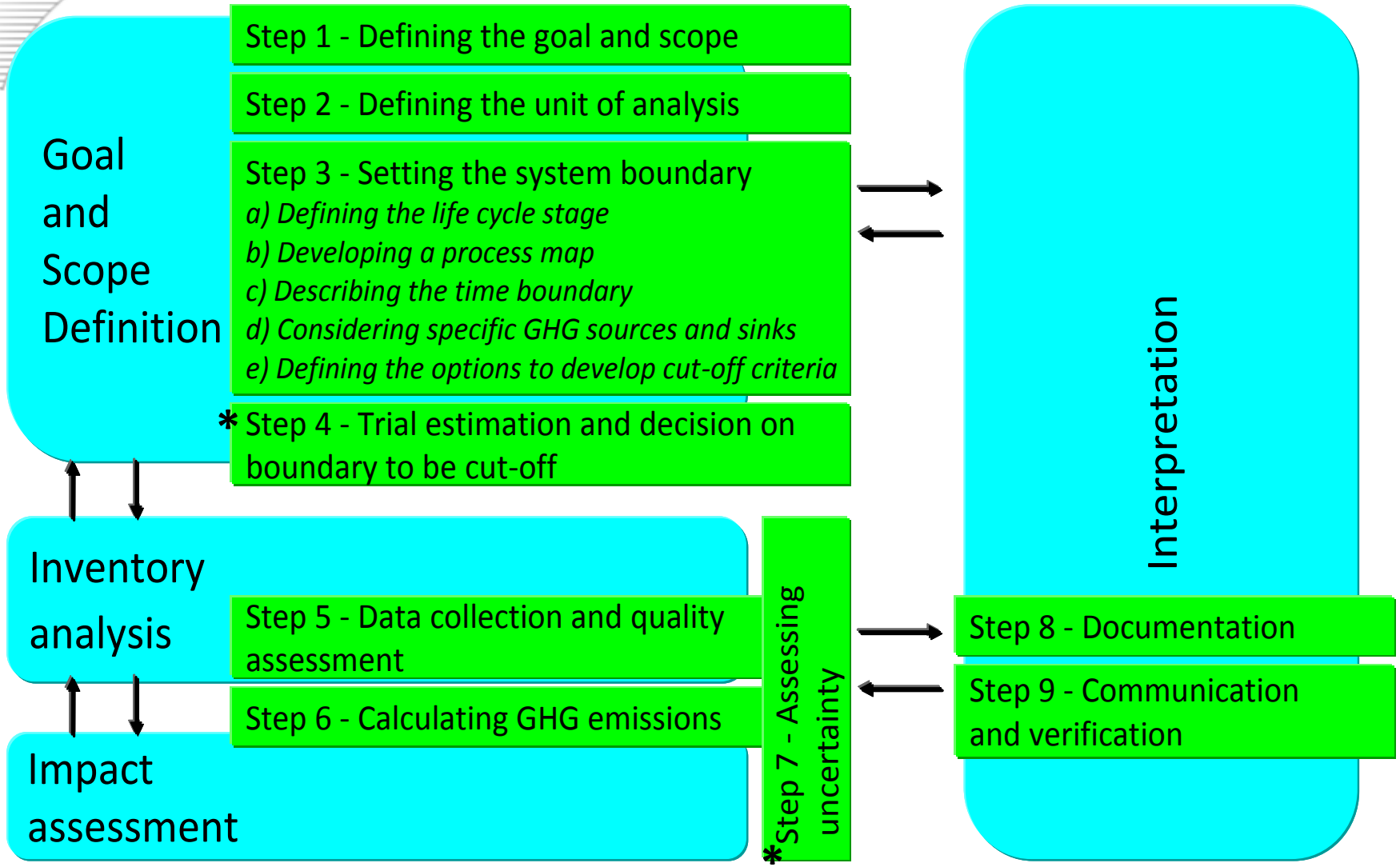
6.8 Uncertainty
6.9 Use and maintenance scenario
6.10 End-of-life stage scenario
7. CFP-PCR
8. Documentation
9. Communication and verification
9.1 General
9.2 Options of communication
9.3 Verification and assurance
Annex A (informative) Example of existing databases which can be used for quantification as secondary data
Annex B (informative) Study results of comparison analysis on selected existing relevant documents including International Standards and regional and national initiatives
Annex C (informative) Examples of PCRs/Sector Specific Rules
Annex D (informative) Additional information on trial estimation approach and uncertainty
Bibliography

DTR 62725(111/266/DTR) - Quantification framework
Guidance for basic steps of CFP study for EE products (1)



*Step 4 & Step 7 : Further detail and useful guidance to describe “informative Annex”

TR 62725 clarified basic step of “CFP study” relation to LCA framework

DTR 62725(111/266/DTR) - Quantification framework
Guidance for basic steps of CFP study for EE products (2)

Step 1 - Defining the goal and scope

- Illustrate performance of the product In terms of GHG emissions for decision making;
- Provide CFP results to the customer upon request;
- Include CFP results into the product declaration on the web page disclosed to the public

Step 2 - Defining the unit of analysis

- Functional unit is applicable to a product whose function can be uniformly identified.
- "Product unit" is applicable to many EE products that perform multiple or complex functions, whether it is a final product or an intermediate product (e.g. one laptop computer, one LED luminaire, one functional semiconductor device, etc.).

Step 3 - Setting the system boundary

Examples of aspects when setting the system boundary

- *These items are considered as useful for system boundary setting, but it is not required to structure data or reporting based on these categories (e.g. many studies prefer to structure the reported emissions based on life cycle stages).*

•Hardware •Software

•Consumables, peripherals and other support products

•Packing/Shipping Materials

•Storage of Goods •Transport (movement of goods)

Step 3 - Setting the system boundary

a) Defining the life cycle stage

- The whole life cycle (cradle to grave) is applicable to final products, e.g. a household refrigerator, etc.
- The partial life cycle (cradle to gate) is applicable to intermediate products, e.g. a transformer, etc. Downstream customers may better understand the full life-cycle impacts of intermediate products, especially as energy consumed in the use phase of EE often predominates the lifecycle GHG footprint calculation.

b) Developing a process map

- Include in the process map only attributable processes (identify the processes under the organizations' ownership or control) by each life cycle stage. When BOM is available it may be the easiest index to direct you to determine the attributable processes relevant to the product.

Example - an example of BOM

Process	Parts	Material	Number	Weight	
				Kg/number	Kg/unit
Process A	WWWW	Steel (plated sheet steel)	1		
	XXXXXX	Stainless steel	1		
	YYYYYY	Stainless steel	2		
	ZZZZZZ	Copper	1		
Process B	WWWW	Aluminum	1		
	XXXXXX	Aluminum	1		
	YYYYYY	Stainless steel	1		
	ZZZZZZ	Other metals	2		
Process C	WWWW	Stainless steel	1		
	XXXXXX	PP	1		
	YYYYYY	ABS	1		
	ZZZZZZ	ABS	2		
Process D	WWWW	Glass	1		
	XXXXXX	Other material	1		
	YYYYYY	Circuit boards/ electronic parts	1		
Process ...		...	...	...	...
Total weight per one unit of product X					

DTR 62725(111/266/DTR) - Quantification framework
Guidance for basic steps of CFP study for EE products (4)

Step 3 - Setting the system boundary

c) Describing the time boundary

- The time boundary for CFP study is usually determined by summing up the production period from cradle to gate, use stage period based on the design specification and actual experience, and an estimated end-of-life treatment period.

d) Considering specific GHG sources and sinks

- This consideration is not needed for EE products except for some special cases.

e) Defining the options to develop cut-off criteria

- Cutting-off based on qualitative constraints - e.g. All Printed Circuit Boards cannot be excluded.
- Cutting-off based on quantitative thresholds
  - Quantitative threshold for outputs - e.g. Less than 5% of the total estimated emission can be excluded.
  - Quantitative threshold for inputs - e.g. Less than 5% of the total mass or amount input to the process map can be excluded.

Step 4 - Trial estimation and decision on boundary to be cut-off

Further detail/useful guidance to describe "informative Annex"

- Check the availability of data and feasibility of data collection;
- Then, estimate GHG emissions and define the cut-off criteria and identify the unit processes or product system to be cut-off.

DTR 62725(111/266/DTR) - Quantification framework
Guidance for basic steps of CFP study for EE products (5)

Step 5 - Data collection and quality assessment

- Primary data for all the processes under organisation's ownership or control should be collected while secondary data may be collected if their data quality is satisfactory. One common approach for an organization dealing with supplier data for the purposes of CFP studies would include the Identification of a BOMs by the organization (Requesting material declarations from suppliers based on the BOM).

Step 6 - Calculating GHG emissions

- Primary data
  - Reference flow of the studied product (e.g., mass of finished product) may be used as primary data to be multiplied by emission factors when the yield ratio of the EE product is high.
- Secondary data & Emission factors
  - The LC DB (public database – see Informative ANNEX) currently utilized in each country may be used.

Example of applicable data types/emission factor

Stage	Activity	Applicable data types	Emission Factor
a) Raw material acquisition	Quantity of material consumption	Secondary data	GHG emission factor to produce material/kg
b) Production and Component manufacturing	Weight of assembly	Secondary data	GHG emission factor to assemble material and component/kg
	Consumption of electricity	Primary data	GHG emission factor to generate electricity/kWh
c) Distribution (retail)	Vehicle loadings(kg・km) = transport distance x load ratio x loading capacity	Primary or secondary data	GHG emission factor to product transport/kg・km
d) Use and maintenance	Electricity consumption of usage	Primary or product's specific secondary data	GHG emission factor to generate electricity/kWh
e) End-of-life (recycling and disposal)	Reclaimed mass/recycled mass	Primary or product's specific secondary data	GHG emission to reclaim/kg GHG emission factor to recycle/kg

Step 6 - Calculating GHG emissions

- Use and maintenance scenario/End-of-life stage scenario
  - Identify the scenario regarding with each EE product categories

    Use and maintenance scenario

    For EE products, including supportive equipment (e.g. data centre cooling), at least the following items should be considered for the use stage when relevant for the product category and the goal and scope of the CFP study:

    - *Product energy consumption during service life considering*
      - *Use profile based on the actual or estimated usage patterns;*
      - *Energy consumption corresponding to the different modes;*
      - *External conditions influencing power consumption (e.g. temperature, etc)*
    - *Use of consumables - Consumption of consumables e.g. tonner, paper, battery, etc.*
    - *Operation and maintenance, including installation*
      - *Frequency of repair/maintenance;*
      - *Use of a spare part;*
      - *Associated service personnel (e.g. travelling, etc.)*

  - Where "recycling" is already being carried out, it can be deemed that the amount of material or energy recovered and dissipated in the recycling process may also be taken into consideration and included in the calculation.

DTR 62725(111/266/DTR) - Quantification framework
Guidance for basic steps of CFP study for EE products (7)

Further detail/useful guidance to describe "informative Annex"

Step 7 - Assessing uncertainty

- Data (parameter) uncertainty;
  - Identify the data which have a significant effect on the calculation result. Then, consider the uncertainty of the final result, taking the quality of the data into account.
- Methodological (scenario) uncertainty;
  - TR recommends considering the effect which the uncertainty of the use stage profile has on the final result, as the use stage profile can have a significant effect on the final result of a CFP study for many EE products.

Step 8 - Documentation

- Document procedures, methodologies, evidences of all data, etc. for each step of CFP Study. Compile the calculation results as a record, including at least the items required in the standards with which the calculation is intended to be compliant.
- When a management system exists in an organization, the principles found in that management system may be used as guidance for addressing data traceability and evidence management.

Step 9 - Communication and verification

- The result may be verified by an independent 1st party in the organization.
- Third-party verification or assurance can increase credibility of a CFP study but can be unaffordable for EE products (usually have a long and complex supply chain).

DTR 62725(111/266/DTR) - Annex B (informative) Study results of comparison analysis on selected existing relevant documents

	ISO 14040/44 (Jul 2006)	ISO 14067 (DIS)	GHG Protocol Product Standard [WBCSD/WRI]	ITU-T L.1410	ETSI EE TS 103 199	PAS 2050 [UK]	TS-Q-0010 [Japan]	CFP [Korea]	BP X30-323 [France]	EC Product Environmental Footprint Guide, 2nd draft	PAIA (U.S. and international)	IEC TR 62725
Life cycle approach	Basis	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted	Adapted
Environmental Issues	Broad, i.e. GHG and many others	Only GHG	Only GHG	Mainly Energy consumption / GHG emissions for current version	Multi-criterion, i.e. GHG (mandatory) and many others (selection depending on goal and scope)	Only GHG	Only GHG	Only GHG	Multi criterion - GHG - Water consumption - Biodiversity - Soil sealing	14 Default Categories and other impacts might be added voluntarily	GHG and lifecycle energy; soon to include water footprint	Only GHG
Unit of analysis	Functional unit - consistent with Goal & Scope.	Functional unit - preference for PCR; or Product unit may be used, exceptionally	Final product: Functional unit, consistent with Goal & Scope Intermediate product: Reference flow or amount of product (where the eventual function is unknown)	Consistent with Goal & Scope	Functional unit - Consistent with Goal & Scope	Functional unit - PCR, if available Supplementary requirements can establish a preferred unit of analysis	Unit of sales basis - Preference for PCR	Sales unit	Preference for PCR	shall be defined according to the following aspects: - function(s)/ service(s) provided: "what" - magnitude of the function or service: "how much" - duration of the service provided or service life time: "how long" - expected level of quality: "how well" Further details to be provided by PFCR	A standard laptop was used as the functional unit in this study (Other products under study)	Functional unit; - Applicable to a product whose function can be uniformly identified Product unit; - Applicable to many EE products whose function is too complicated to be identified uniformly, whether they are final or intermediate products
Cut-off rules	Consistent with Goal & Scope	Consistent with Goal & Scope in terms of omitting certain processes of minor importance	No cut-off rule: all Attributable processes included (estimated/proxy data Allowed to reach 100%)	Cut-off criteria include mass, energy and environmental significance - only acceptable if allowed by all the above mentioned criteria	Cut-off criteria include mass, energy and environmental significance – only acceptable if allowed by all the above mentioned criteria	Specific rules; 1% of GHG Emissions; 95% complete	95% cut-off criteria based on GHG emissions	95% cut-off criteria based on mass	95% cut-off criteria based on mass, energy, environmental significance of material input	90% per impact category PFCR might specify more stringent cut-off rules		Qualitative constraint and Quantitative threshold; - outputs (e.g. Less than 5% of the total estimated emission can be excluded) - inputs(e.g. Less than 5% of the total mass or amount input to the process map can be excluded)
Use phase	Obligatory according to principle, but cradle-to-gate possible	Consistent with Goal & Scope	Cradle-to-Grave obligatory for all products is unknown, then Cradle-to-Gate allowed	Obligatory according to principle, but cradle-to-gate possible	Obligatory according to principle The cradle-to-gate option is not mentioned	Obligatory for final goods; disclose use profile - Inclusion in B to B measurement depended on boundary	Included	Setting the guidance	Included	Use phase to be specified by PFCR Setting the guidance	Based on information in the Energy Star PC specification - There are several elements, including power, duty cycle, location, and lifetime - The location of the grid was assumed to be US and the lifetime of the product was 4 years with a standard	Identify the scenario with each EE product categories - Energy efficiency and consumption, each consumables and other supportive product, repair and maintenance, etc

DTR 62725(111/266/DTR) - Annex C (informative)
Examples of PCRs/Sector Specific Rules

Example - IT equipment (Japanese CFP programme)

Main items and the contents are extracted, and it summed up briefly.

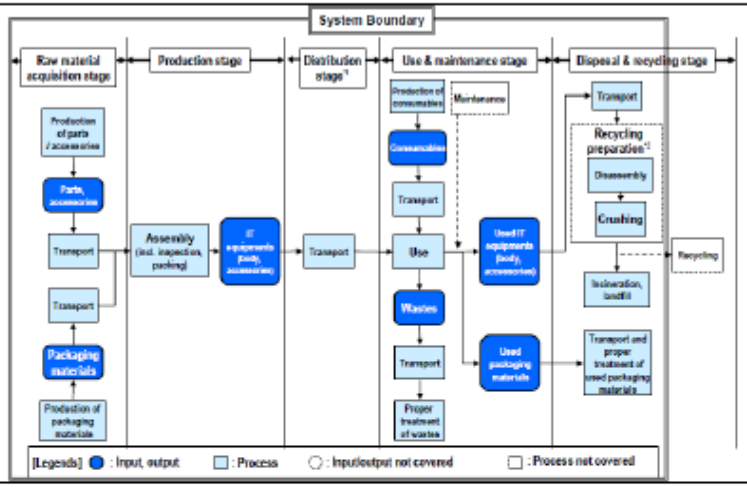
Title	Product Category Rules (PCR) - IT equipments
URL	http://www.cfp-japan.jp/english/pcr/pcrs.html
Scope	This PCR prescribes rules, requirements and instructions for calculation and communication applicable to "IT equipments" under the CFP Pilot Project
Definitions of products	• "IT equipments" covered by this PCR are machinery and equipment categorized into "Electronic computers and related equipment" and "Communication and related equipment " as following; - Electronic computers (server computers excluding blade system), Magnetic disk units (subsystem), Switching equipment (L2 switch), PON equipment (ONU) • Components of products - IT equipment itself, bundled accessories, packaging materials, and consumables.
Defining the unit of analysis - Calculation unit	Sales unit (per machinery or per equipment)

System boundary

life cycle stage

- Raw material acquisition
- Production
- Distribution
- Use and maintenance
- Disposal and recycling

Process map (life cycle flow)



*1 the "sales process" in the distribution stage is provisionally excluded from the assessment until its proper calculation method is finally established.

*2 As for recycling, up to and including recycling processes shall be calculated. In this PCR, "disassembly" and "crushing" processes are applied.

Data collection and period

(i) General

- Indirect department (e.g., clerical department, research department, etc.) and, capital goods such as facilities used for manufacturing/transporting products shall be excluded.
- Primary data shall be collected over the most recent one year. The data is regarded as averaged value of those annual data.

(ii) Data collection items

Stage	Subject of process	Input data (Primary data collection)	
Raw material acquisition	• Production of parts/accessories • Production of packaging materials • Transport	• Weight of parts/accessories by material • Weight of packaging materials • Amount of part/accessories and packaging materials to be transported	NOTE If there are so many suppliers and the collection of the data is difficult, however, primary data shall be collected for 50% or more of the respective total procurement amount by part. To cover the rest of it, the averaged value of the primary data which could be collected may be used.
Production	Assembly (including inspection and packing) of IT equipments (body, accessories)	Amount of energy related to assembly (including inspection and packing) of IT equipments (body, accessories)	
Distribution	Transport from production site to user	Transported amount of IT equipments (body, accessories), packaging materials	NOTE As for transport, if primary data collection is difficult, the scenario in Annex (normative) may be used.
Use and maintenance	• Electricity consumption when using IT equipments • Production of consumables • Proper treatment of consumables (wastes) to be disposed • Transport	• Electricity consumption when using IT equipments [unit: kW] • Weight of consumables • Mass of consumables (waste) to be disposed of • Amount of consumables to be transported use stage, transported amount of consumables (waste) to be disposed of	NOTE 1 As for transport scenario of consumables, if primary data collection is difficult, the scenario in Annex (normative) may be used. NOTE 2 As for transport scenario of consumables (waste), if primary data collection is difficult, the scenario in Annex (normative) may be used.
Disposal and recycling	• Recycling preparation (disassembly, crushing) of used IT equipments (body, accessories) • Landfill of materials not to be recycled • Incineration of materials not to be recycled • Proper treatment of used packaging materials • Transport	• Weight of used IT equipments (body, accessories) • Weight of used IT equipments to be disassembled and crushed • Weight of landfilled materials not be recycled • Weight of incineration materials not be recycled	NOTE As for transport of used IT equipments (body, accessories), if primary data collection is difficult, the scenario in Annex (normative) may be used.