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eurostat

Physical Energy Flow Accounts (PEFA)

Eurostat – Unit E2

Working Group Environmental Accounts

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Physical energy flow accounts (PEFA)

This paper provides information about progress in developing physical energy flow accounts (PEFA), with a particular focus on an IT tool (the 'PEFA-builder') facilitating the compilation of PEFA.

An overview is given on what has been done so far and what is planned in the future. In particular the Working Group is invited to discuss Eurostat's proposal to establish a voluntary annual data collection for PEFA in preparation of the future legal act.

Delegates are asked to express their views and preferences with regards to the following questions:

1. Do you agree to start an annual voluntary PEFA data collection in 2014 by establishing a production cycle in parallel to the air emissions accounts (see section 3.1)?

2. Do you agree with the proposed set of tables for a PEFA questionnaire (see section 3.2 and Annex 1)?

3. Do you agree with the proposed classification of rows (Annex 2) as a basis for the 'list of energy products' required by the draft legal act (see section 4)?

1. **INTRODUCTION**

Mandated by the ESEA 2008 and the Working Group on Environmental Accounts the development of energy accounts started in 2009. The Working Group agreed to start with physical energy flow accounts; the development of monetary and asset accounts could follow at a later stage.

Between 2010 and 2012 a task force on energy accounts developed the conceptual basis for PEFA resulting in a draft manual and a set of PEFA tables. Conceptually the PEFA tables are based on the framework of physical supply and use tables as recommended in the UN System of Environmental-Economic Accounting – Central Framework (SEEA-CF).

In 2012 a selected number of countries tested the PEFA tables. The testing revealed that 'populating' the PEFA tables constitutes a compilation challenge to most of the countries. The conclusion was that – although the PEFA tables are conceptually mature – the actual compilation would benefit greatly from some supporting tools.

The Working Group agreed in March 2012 that Eurostat should develop an IT-tool to facilitate the compilation of PEFA tables (the 'PEFA-Builder'). Eurostat (with the help of external contractors) developed this IT tool. A prototype version of the IT tool is being tested with selected countries since September 2013. The IT tool will be discussed at the fourth meeting of the task force on energy accounts on 18 February 2014.

An ESTP training introducing and practicing the application of the IT tool will take place 29-30 April 2014.

PEFA is one of three modules which soon will be added to EU Regulation 691/2011. The first mandatory reporting is expected to take place in 2017 collecting data for reference years 2014 and 2015.

Since 2011, 14 pilot projects have been granted to national statistical institutes in order to build up capacities for compiling PEFA (2013: BE, EL, NO; 2012: BG, DK, LT, NL, PT, SI; 2011: FI, LU, LV, MT, NO).

Eurostat proposes to start data collection this year in order to establish step-by-step a routine PEFA production cycle.

2. **DEVELOPMENT OF AN IT TOOL ('PEFA-BUILDER')**

In spring 2012 Eurostat started to develop an IT tool facilitating the compilation of PEFA based on the five annual energy questionnaires jointly used by IEA and Eurostat. The aim is to provide practical support to countries in compiling PEFA and to harmonise compilation approaches leading to enhanced data quality and comparability.

The IT tool is made for use by countries and not by Eurostat[1]. Usage of the IT tool by individual NSIs is voluntary. Some more advanced countries have already established compilation procedures based on other data sources than the annual energy questionnaires. The PEFA-builder seems to be of more interest for those countries who have not yet established PEFA compilation routines and intent to employ the annual energy questionnaires as the main data source.

The application of the IT tool can also be seen as a means to improve data quality as it ensures a standardised compilation of PEFA based on internationally harmonised data sources (annual energy questionnaires).

In brief, the PEFA-builder imports the annual energy questionnaires (flat files), undertakes various manipulations (e.g. transformation to one common unit, namely Terajoules), and assigns the processed values to a pair of physical supply and use tables (presented in a multidimensional EXCEL 'pivot table'). The resulting physical supply and use table represent more or less PEFA tables A and B, but are actually more detailed in the classification of rows and columns.

Technically, the 'PEFA-builder' is an EXCEL workbook with a number of macros. Although other platforms may be more suitable (e.g. SQL), Microsoft EXCEL was chosen as it is available to all NSIs.

The core of the EXCEL workbook is a sheet with more than 10000 'definition-rows' instructing where to place single annual energy questionnaire items in the physical supply and use tables. A macro reads the 'definitions' row by row and treats accordingly the data exported from the annual energy questionnaires. This 'open architecture' makes it quite easy for the user to change the definitions without touching the macros.

Some additional EXCEL workbooks have been developed for undertaking auxiliary calculations and 'exporting' results to the core workbook; e.g. the module on transports-resident-adjustments and a module on industry detailing (1toN cases).

The PEFA-builder remains an expert tool although it is intended to improve its user-friendliness in future. The application of the IT tool requires profound expert knowledge of the annual energy questionnaires and the conceptual foundations of PEFA.

A technical documentation is currently being developed and will be available in April 2014. An ESTP training course will introduce into the application of the IT tool (29-30 April 2014).

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[1] Once a full production cycle is established Eurostat might use it for gap-filling ex post but not for filling the questionnaire a priori.

3. STARTING DATA COLLECTION

Eurostat proposes to start establishing a production cycle for PEFA. Its schedule is suggested to be in parallel to the air emissions accounts (AEA) production cycle. An electronic questionnaire (EXCEL) is proposed to be the central reporting vehicle of the suggested PEFA production cycle.

3.1. Proposed schedule for a PEFA production cycle

PEFA are expected to significantly improve the quality of air emissions accounts (AEA) and will ease their compilation. Currently, most countries employ the 'inventory-first-approach' for compiling AEA. This approach attributes CRF/NFR sources/processes to NACE industries with the help of correspondence keys.

More than 80% of air emissions are resulting from fuel combustion. If the fuel combustion by NACE industry is known (see PEFA table C) the attribution of emissions to NACE industries can be made in a more standardised way (e.g. using fuel-specific emission factors). In the mid-term Eurostat recommends to 'switch' AEA compilation to the 'energy-first-approach' to ensure better data quality and comparability.

The draft legal act related to PEFA proposes a reporting deadline of T-21 months. This is exactly the same deadline as prescribed for AEA for which a 12-month-production-cycle has been established (see document ENV/ACC/WG/03(2014).

This suggests synchronising the PEFA production cycle with the AEA annual production cycle.

The Working Group is invited to express their views on the following proposal for a preliminary PEFA production cycle in 2014:

30 April 2014	Launching PEFA questionnaire
30 Sep 2014	Deadline
Oct-Dec 2014	Validation in consultation with NSIs
Jan-Feb 2015	Preparing assessment report for Working Group

3.2. PEFA questionnaire

Based on earlier developments of the task force on energy accounts and the testing in 2012, Eurostat is currently developing a draft electronic questionnaire in EXCEL. The draft PEFA questionnaire will be made available to the Working Group delegates in due time on CIRCABC[2]. The draft will also be discussed by the task force on energy accounts at its meeting on 18 February 2014.

Eurostat proposes that the PEFA questionnaire includes five tables (see Annex 1) some parts or elements of which might go beyond the legal act:

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[2] https://circabc.europa.eu/w/browse/1545c6d6-1dc9-47f5-b903-d9c291299bae

A. <u>Supply table for energy flows</u>. This table records the supply of natural energy inputs, energy products, and energy residuals (row-wise) by origin, i.e. 'supplier' (column-wise).

B. <u>Use table for energy flows</u>. This table records the use of natural energy inputs, energy products, and energy residuals (row-wise) by destination, i.e. 'user' (column-wise).

C. <u>Table of emission-relevant use of energy flows</u>. This table records the emission-relevant use of natural energy inputs and energy products (row-wise) by the using and emitting unit (column-wise).

D. <u>Key energy indicators.</u> The legal act will probably not cover this table. It is suggested to include a range of indicators including an aggregate representing 'total energy use by resident units'. In the EXCEL questionnaire all indicators will automatically be derived from tables A, B and C. The range of indicators derivable has been developed in a pilot study by Statistics Netherlands[3].

E. <u>Bridge table:</u> This table presents the following elements which make up the difference between the energy accounts' indicator 'total energy use by resident units' and the common key energy indicator as presented by European energy statistics 'gross inland energy consumption':

   total energy use by resident units
– energy use by resident units abroad
+ energy use by non-residents on the territory
+ statistical differences
= gross inland energy consumption (territory based).

The supply and use tables of energy flows (tables A, B, and C) have a common layout in terms of rows and columns.

The <u>columns</u> denote the origins (supply table) and destinations (use tables) of the physical energy flows. The columns are grouped into five categories:

1) '<u>Production</u>' relates to the production of goods and services. Production activities are classified according to NACE Rev. 2 A*64 aggregation level.

2) '<u>Consumption</u>' activities are presented in total and also divided into three sub-classes (transport, heating/cooling, other) for private households' final consumption.

3) '<u>Accumulation</u>' refers to the changes in stocks of energy products within the economy.

4) '<u>Rest of the world</u>' records the flows of imported and exported products.

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[3] See chapter 5.1 in Statistics Netherlands, Sjoerd Schenau (2012): Compilation of physical energy flow accounts (PEFA) for the Netherlands, Project and report commissioned by the European Union, Grant Agreement Number 50904.2011.005-2011.299 https://circabc.europa.eu/sd/d/b573e1e1-c4ef-489e-89ab-9e8cd6da5be7/ares_Final_Report_Dutch_PEFA_2012.pdf

5) 'Environment' records the origin of natural input flows and the destination of residual flows.

The rows describe the flows of energy grouped into three generic categories following SEEA-CF: (i) natural energy inputs, (ii) energy products, and (iii) energy residuals.

The classification of rows in the proposed PEFA questionnaire tables A, B, and C is as follows (for detail see Annex 2):

- Natural energy inputs grouped into non-renewable natural energy inputs and renewable natural energy inputs.

- Energy products based on the classification used in European energy statistics grouped at a level of detail that allows correspondence to the CPA 2008 (statistical classification of products by activity in the European Economic Community, 2008 version).

- Energy residuals include waste (without monetary value); losses during extraction/abstraction, distribution/transport, transformation/conversion and storage; as well as balancing items to balance the supply and use tables.

Note that the classification used in the PEFA-builder is **more detailed** than the proposal in Annex 2; it is the most detailed breakdown derivable from the annual energy questionnaires.

4. ESTABLISHING A 'LIST OF ENERGY PRODUCTS'

The current draft Council proposal for the legal act foresees that the European Commission establishes a 'list of energy products':

[…] by 31 December 2015, the Commission shall […] establish […] the list of Energy products in Annex VI based on the lists set out in Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics and shall regularly update these lists.

Eurostat proposes that the row classification for the PEFA questionnaire tables A, B, and C (Annex 2) could serve as the 'list of energy products' referred to above.

This Eurostat proposal is based on a synopsis which is available as a separate file (ENV_ACC_WG_05.2(2014).xls). The synopsis takes into account the following classifications (in brackets the column letters of the afore mentioned separate EXCEL document):

- IEA's classification of energy products (columns I to K);

- Eurostat's classification of energy products as used in energy statistics (columns L to O);

- CPA 2008 – Statistical Classification of Products by Activity in the European Economic Community, 2008 version (columns P and Q);

Columns E to G in the separate ECEL document present the most detailed classification of natural inputs, products, and residuals as developed and implemented for the IT tool ('PEFA builder').

Columns A to E in the separate EXCEL document show various possible aggregation levels. For use in the electronic PEFA questionnaire, Eurostat proposes aggregation level 1 with 35 items (column C).

ANNEX 1: OVERVIEW PEFA QUESTIONNAIRE

Table A: Physical Supply Table for Energy Flows

	origins of energy flows					
	production activities (industries)	consumption activities (households)	accumulation activities (stocks)	rest of world (imports)	environment	Total
natural energy inputs					A.	TSNI
energy products	C.			D.		TSP
energy residuals	I.	J.	K.	L.	M.	TSR

Table B: Physical Use Table for Energy Flows

	destinations of energy flows					
	production activities (industries)	consumption activities (households)	accumulation activities (stocks)	rest of world (exports)	environment	Total
natural energy inputs	B.					TUNI
energy products	E.	F.	G.	H.		TUP
energy residuals	N.		O.	P.	Q.	TUR

Table D: Derived key indicators

	destinations of energy flows					
	production activities (industries)	consumption activities (households)	accumulation activities (stocks)	rest of world (exports)	environment	Total
energy key indicator(s)						
...						
...						
...						

Table C: Physical Table of Emission-relevant Use of Energy Flows

	destinations of energy flows					
	production activities (industries)	consumption activities (households)	accumulation activities (stocks)	rest of world (exports)	environment	Total
natural energy inputs	B.er					
energy products	E.er	F.er	G.er			
energy residuals						

Table E: Bridge Table

total energy use by resident units (resident principle)
- energy use by resident units abroad
+ energy use by non-residents on territory
+ statistical differences
= gross inland energy consumption (territory based)

Legend:

(grey shaded)	grey shaded cells do not contain anything
(white)	white cells: numbers or symbols '-' (not applicable), ':' (not available)
R.	capital letters denote sub-matrices (cells) in accordance with chapter 3 of revised SEEA-CF

ANNEX 2: PROPOSAL FOR A CLASSIFICATION OF NATURAL ENERGY INPUTS, ENERGY PRODUCTS, AND ENERGY RESIDUALS (ROWS) TO BE INCLUDED IN THE PEFA QUESTIONNAIRE (TABLES A, B, C)

labels	codes
Natural Energy Inputs	
1 Non Renewables	AA
2 Renewables	AB
Energy Products	
3 Wood, wood waste & other solid biomass	B_5541_CPA_01_02_10_16_17
4 Hard coal	B_2111_CPA_05
5 Lignite, Peat and Derivatives	B_2200_CPA_05_08_19
6 Crude oil	B_3105_CPA_06
7 Natural Gas Liguids	B_3106_CPA_06
8 Other hydrocarbons (excl. bio)	B_3193_CPA_06
9 Natural gas	B_4100_CPA_06
10 Uranium and thorium ores (energy content of nuclear fuels, i.e. equivalent to nuclear heat)	B_5100a_CPA_07
11 Coke	B_2120_CPA_19_1
12 Coal tar	B_2130_CPA_19_1
13 Refinery Feedstocks	B_3191_CPA_19_20
14 Patent fuel	B_2112_CPA_19_2
15 Motor spirit	B_3230_CPA_19_2
16 Kerosenes & jet fuels	B_3240_CPA_19_2
17 Naphtha	B_3250_CPA_19_2
18 Gas/Diesel Oil	B_3260A_CPA_19_2
19 Residual Fuel Oil	B_3270A_CPA_19_2
20 Refinery gas & Ethane	B_3210_CPA_19_2
21 LPG	B_3220_CPA_19_2
22 Other Petroleum Products	B_3280_CPA_19_2
23 Charcoal	B_5544_CPA_20
24 Additives / Oxygenates	B_3192_CPA_20
25 Liquid biofuels (= Biofuels)	B_5545_CPA_20
26 Electrical energy	B_6000_CPA_35_1
27 Derived gases (= Manufactured gases excl. biogas)	B_4200_CPA_35_2
28 Biogas	B_5542_CPA_35_2
29 Derived heat	B_5200_CPA_35_3
30 Municipal wastes (renewables)	B_55431_CPA_38
31 Municipal wastes (non-renewables)	B_55432_CPA_38
32 Industrial wastes	B_7100_CPA_38
Energy Residuals	
33 Waste (without monetary value)	CA
34 Losses	C1
35 Balancing item: Energy incorporated in products for non-energy use	CG