PEFA guidelines for data collection 2017

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Important abbreviations

- SNA International System of National Accounts
- ESA European System of National and Regional Accounts
- SEEA System of Environmental Economic Accounting
- IEA International Energy Agency
- IRES International Recommendations for Energy Statistics
- AQ IEA/Eurostat annual questionnaires on energy statistics (coal, natural gas, oil, electricity & heat, renewables & waste)
- NACE Statistical classification of economic activities in the European Community
- CPA Statistical classification of products by activity
- SUT Supply and use tables
- NCV Net calorific value

1 Introduction

Unfortunately, a comprehensive revision of the <u>2014 draft version of the PEFA Manual</u> was not possible in due time for the launch of the PEFA data collection cycle 2017.

The aim of this document is to provide PEFA guidelines going beyond those given in the 2014 draft version of the PEFA Manual. Those became necessary because:

- the PEFA questionnaire has been changed and extended throughout the pilot collection cycles 2015 and 2016;
- the Working Group on Environmental Accounts clarified a number of methodological issues at its meetings in 2015, 2016 and 2017.

The *PEFA guidelines for data collection 2017* at hand have the same structure (main chapters) as the 2014 draft version of the PEFA Manual. This shall facilitate a complementary use of both documents.

2 Conceptual foundations of PEFA

The broad conceptual foundations for PEFA have not changed since the 2014 draft version of the PEFA Manual. The following provides more precise explanations for some of the sub-sections of chapter 2.

2.1 The SEEA physical flow accounting framework

2.1.1 Definition of natural inputs, products, and residuals

Core to the measurement of physical energy flows is SEEA's distinction into three principal types of physical flows. The SEEA makes an important distinction between *natural inputs, products* and *residuals* (which is also reflected in the classification of rows of the PEFA supply and use tables).

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See also:
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- 2014 draft version of PEFA Manual, section 2.2.1, Annex 1
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- SEEA 2012-CF, paras. 3.19-3.23, 3.45-3.108, and 3.143-3.151
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- SEEA-Energy, paras. 3.30-3.34, 3.41-3.43, 3.57-3.63
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It is important that PEFA compilers have a sound understanding of the differences between the three SEEA-types of physical flows. It is recommended to study carefully the respective sections in SEEA 2012-CF and the 2014 draft version of the PEFA Manual.

It is not always straightforward to draw a clear borderline between products and residuals though.

In PEFA, 4 classes of energy residuals are distinguished (see Table 1)

Table 1. Classification of energy residuals in PEFA

PEFA Energy residual name Explanation code

R28	Renewable waste	These two energy residuals correspond to the energy statistics' category 'Waste' (SIEC ¹ -code 6). For the purpose of energy statistics and PEFA, 'waste' refers to the part of waste-materials that is incinerated with heat recovery at installations designed for mixed wastes or co-fired with other fuels (IRES ² , para. 3.19).
		PEFA distinguishes between renewable and non-renewable waste following the delineation applied in the IEA/Eurostat Annual Questionnaires (AQ) ³ . The renewable versus non-renewable distinction is made with a view to the assessment of related emissions to air.
R30	Energy losses all kinds of (during extraction, distribution, storage and transformation, and dissipative heat from end use)	Based on physical law, energy can be neither created nor be destroyed; however, it can change from one form to another. Each transformation process from one form to the other produces so-called losses. These losses are rather low forms of energy which are usually not useable anymore for human purposes. The residual category R30 includes all kinds of losses (during extraction, distribution, storage and transformation, and dissipative heat from end use) – quantitatively most important is dissipative heat from end use (see Box 1), which is released to the surrounding environment (atmosphere) during end use of energy products. E.g. the energy content of electricity used to run a light-bulb or computer is eventually transformed into dissipative heat which is 'lost' (unavailable) for further use by humans.
R31	Energy incorporated in products for non-energy use	Energy products may be used for non-energy purposes, such as e.g. production of lubricants, plastics, asphalt etc. (see IRES paras. 5.21 , 5.83, 5.97, 3.8 – 3.10, 5.5). In the case of non-energy use the energy content is (temporarily) stored in the respective output product. It may be used for energy purposes later (e.g. waste oil and plastics incinerated with heat recovery). The whereabouts of energy produces used for non-energy purposes have to be recorded somewhere in the balanced PEFA physical- supply-use framework (see also section 2.1 of the 2014 draft version of the PEFA Manual). Residual code R31 is used for this recording. When an energy product is used for non- energy purposes it is transformed into residual R31 and stocked in the economy (accumulation).

Box 1: Dissipative heat

Dissipation is the result of an irreversible process that takes place in inhomogeneous thermodynamic systems. A dissipative process is a process in which energy is transformed from some initial form (useful to humans) to some final form; the final form has lower capacity to do mechanical work than the initial form. Dissipative heat is a kind of final form of energy which hardly can be used anymore. It occurs during any energy transformation process, in particular when an energy product is end used the initial energy content of the energy product is completely transformed into dissipative heat and released to the surrounding environment.

2.2 Accounting principles relevant for PEFA

2.2.2 Economic units – and groupings thereof

It is important that PEFA employs the same groupings of elementary economic units as the ESA supply and use tables. This coherence is important with regards to integrated analyses of monetary and physical accounts – one of the main goals of environmental-economic accounting.

¹ Standard International Energy Product Classification (SIEC) developed as part of the preparations of the International Recommendations for Energy Statistics (IRES)

² International Recommendations for Energy Statistics (IRES)

³ See <u>http://ec.europa.eu/eurostat/web/energy/methodology/annual</u>, in particular the reporting instruction for the *Renewables & Waste* annual questionnaire

As an overarching general rule PEFA must apply exactly the same demarcation of productive activities (columns in PEFA supply and use tables) as employed for the compilation of the monetary supply and use tables delivered to Eurostat under the ESA transmission programme. Compilers of PEFA are advised to contact and align with compilers of ESA supply and use tables with the aim to ensure highest coherence between PEFA and ESA supply and use tables.

2.2.3 Principal, secondary, and ancillary production activities

The 2014 version of the PEFA Manual explains the national accounts concepts of principal, secondary, and ancillary production activities. Energy products are frequently produced as a result of secondary production activity by industries (NACE divisions) that are not typically producing the respective energy product as a result of their principal production activity. Examples are e.g. the iron & steel industry that may produce coke for own use; wastewater treatment services or agriculture may produce biogas (fermentation of biomass). In particular the production activity output is recorded off the diagonal in ESA supply tables and the same is to be applied in PEFA Table A; evidently the associated factor inputs have to be recorded accordingly.

In energy statistics the concept of *autoproducers of electricity and heat* has been established (see Box 2). Conceptually it is close to the national accounts' concept of secondary and ancillary activity production – however, the two concepts may not entirely overlap in practice. Autoproducers electricity and heat production as reported in energy statistics might not be entirely consistent with the way it is recorded in ESA supply and use tables! Compilers of PEFA are advised to carefully check this issue and cooperate/consult with compilers of ESA supply and use tables as well as compilers of energy statistics.

Box 2: The energy statistics' concept of 'autoproducer of electricity and heat'

Energy statistics record the production of electricity and heat by type of producer and type of generating plant. Two types of producers are distinguished (see IRES; paras. 5.45 ff.):

- Main Activity Producers: These are enterprises which produce electricity and heat as their principal activity. Formerly known as public utilities, these enterprises may be privately or publicly owned.
- Autoproducers (electricity): These are enterprises which produce electricity (for sale and own use) but for whom the production is not their principal activity.

Autoproducers (heat): These are enterprises which produce heat for sale but for whom the production is not their principal activity. Deliveries of fuels for heat generated by an establishment for its own use are classified within the part of final energy consumption where they are consumed.

While above IRES definitions of **autoproducers** make a clear reference to national accounts' concepts, the reporting instruction for the IEA/Eurostat Annual *Electricity & Heat* Questionnaire do less so; therein the definition is as follows⁴:

- Main activity producer undertakings generate electricity and/or heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid. ... All heat production from Main activity producer should be reported.
- **Autoproducer** undertakings generate electricity and/or heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned. ... Electricity production reported for

⁴ see <u>http://ec.europa.eu/eurostat/web/energy/methodology/annual</u>

Autoproducer should be the total quantity of electricity generated. Heat production reported for Autoproducers should comprise only the heat sold to third parties. Heat consumed by autoproducers should not be included.

2.2.4 Intra-establishment energy flows beyond those recorded in ESA supply and use tables

The SEEA recommends to record separately relevant *intra-establishment energy flows* beyond those recorded in monetary accounts (i.e. ESA supply and use tables). The following cases of own account production and use of energy products (e.g. electricity, heat, and biogas) beyond ESA 'production boundary'⁵ can be distinguished:

Intermediate use of own account production (=ancillary production activity): Energy
products produced by any elementary unit undertaking productive activity and used by the
very same elementary unit as intermediate use; intermediate use means here energy
products used as inputs to a process of production, thereby transformed or used up by the
production process.

This case also includes natural energy inputs extracted by an elementary unit and used by the same elementary unit as intermediate use^{6} .

- <u>Output by households for own final use:</u> In the case of household's production and subsequent own final consumption, ESA 2010 only records this for a small selection of products, namely agricultural products and dwelling services. In fact, however, households increasingly produce a wide range of energy products for own final use, mainly electricity and heat from renewable sources.
- 3. <u>Output by governments & NPISH for own final use:</u> economic units belonging to the governments & NPISH sector may produce energy products for their own final use (i.e. do not provide to other units). It is rather unlikely that ESA records these as output for own final use. Rather, ESA considers these cases as ancillary output and hence do not record them.

At its 2017 meeting, the Working Group on Environmental Accounts agreed to follow SEEA and make those *'intra-establishment energy flows beyond ESA production boundary'* explicit in PEFA. A row has been added to the PEFA supply table (Table A).

See also:

⁻ document ENV/ACC/WG/3.3(2017)

⁻ minutes of the Working Group on Environmental Accounts meeting 2017, day 1, agenda item 3.3

⁵ 'Production boundary' denotes here the scope of recording of production output in ESA supply and use tables. Note that the ESA 'production boundary' – which is the reference for the European Statistical System and hence PEFA – is slightly narrower defined as the SNA 'production boundary'.

⁶ The following recording issue still needs to be clarified by convention: A unit extracts natural gas (=natural input) which it uses for its extractive operations. Here two recording options exist:

A: The natural input is immediately own used without becoming a product. This implies two recordings (1) supply of natural input by environment, and (2) use of natural input by extracting unit.

B: The natural input is transformed into a product before it is own used? This implies four recordings: (1) supply of natural input by environment; (2) use of natural input by extracting unit; (3) supply of product by extracting unit; (4) own use of product by extracting unit.

- 2014 draft version of PEFA Manual, section 2.2.4

- SEEA 2012-CF, paras. 1.41-1.44, 2.91 and 3.162

- SEEA-Energy, paras. 2.65, 3.92, 3.163

3 PEFA-questionnaire

Please use exclusively the most recent 2017 version of the PEFA Questionnaire which is made available on Eurostat's environment website:

http://ec.europa.eu/eurostat/web/environment/methodology .

The PEFA Questionnaire is an Excel Macro-Enabled Workbook (*.xlsm) designed to accommodate just one single year. Please save separate files for each year you are reporting (file format: *.xlsm).

The 2017 PEFA questionnaire has 7 tables for reporting data (see sheet 'scheme' for an overview).





The classifications of rows and columns have not changed since 2014 (see sections 3.3 and 3.4 of the 2014 draft version of the PEFA Manual).

In the following additional guidelines⁷ are provided for each of the 7 reporting tables.

Table A: Physical supply table for energy flows

At its 2017 meeting, the Working Group on Environmental Accounts expressed the wish to show socalled 'intra-establishment flows¹⁸ separately in PEFA-questionnaire. Hereupon Eurostat added an additional row at the bottom of PEFA Table A. This *'of-which-item'* is termed '*supply of energy*

⁷ beyond the explanations provided in the PEFA questionnaire and the 2014 draft version of the PEFA Manual

⁸ Synonym in national accounts: 'own account production and use'

products for own use' and records those own account supplies of energy products that are not recorded in monetary ESA supply and use tables (these *'intra-establishment energy flows beyond ESA production boundary'* are discussed in more detail in <u>section 2.2.4</u>).

In general, own account production and use of products is implicitly recorded in both, the supply and the use table. For reasons of simplification, it was decided to make it explicit only once, and to show it as a separate memo item only in PEFA Table A (supply table).

Please see <u>section 2.2.4</u> to find out exactly which kind of *'intra-establishment energy flows beyond ESA production boundary'* are to be recorded in this of-which-item.

In general, supply tables record products (classified row-wise) by the supplying productive activity (classified column-wise). Also, the of-which-item '*supply of energy products for own use*' is shown by the supplying productive activity. The following special recording conventions are made as far as productive activities by households and government & NPISH are concerned:

- The output (i.e. supply of energy products) from households' own account production is recorded under the column-heading of the NACE division typically (as principal activity) producing the respective energy product. E.g. electricity own produced by households has to be recorded under the column-heading of NACE division D 'electricity, gas, steam and air conditioning supply'.
- The output (i.e. supply of energy products) from own account productive activities by government & NPISH units is recorded under the column-heading of the NACE division which produces the principal activity output of the respective government & NPISH unit (e.g. principal government services are falling under NACE divisions O 'public administration and defence; compulsory social security' and P 'education').

See also:

minutes of the <u>Working Group on Environmental Accounts meeting 2017</u>, day 1, agenda item 3.3
 document <u>ENV/ACC/WG/3.3(2017)</u>

Table B: Physical use table for energy flows

Two sub-layers were added to Table B (B.1 and B.2) in the 2016-version of the PEFA Questionnaire.

See also:

- document ENV/ACC/WG/1.3(2016)
- minutes of the Working Group on Environmental Accounts meeting 2016, day 3, agenda item 1.3
- document <u>ENV/ACC/WG/3.3(2017)</u>
- minutes of the Working Group on Environmental Accounts meeting 2017, day 1, agenda item 3.3

Table B.1: Transformation use of energy flows

Table B.1 is a sub-table of Table B and records the *'transformation use'* of energy flows⁹ (row-wise) by user (column-wise). The definition of *'transformation use'* is based on and derived from principles in energy statistics¹⁰. *'Transformation use'* denotes the input into those transformation processes

⁹ Energy flows = natural energy inputs, energy products, energy residuals

¹⁰ See e.g. IRES, paras. 5.63 ff.

where part or all of the energy content of the entering natural input/product/residual is moved to at least one energy product leaving the process. The difference between the energy amount entering the process and the energy content of the leaving energy products is energy loss. In PEFA the latter is referred to as energy residual. Energy statistics usually refer to it as transformation losses.





'Transformation use' recorded in Table B.1 includes all uses of natural energy inputs to create energy products. 'Transformation use' recorded in Table B.1 further includes the uses of energy products to create other energy products (so-called secondary energy products). Finally, 'transformation use' recorded in Table B.1 includes the uses of certain energy residuals, e.g. waste, to produce other energy products such as e.g. electricity, heat, or biomass based energy products. Table B.1 also records the up-take (use) of transformation losses (energy residual) by the environment.

See also:

- International Recommendations for Energy Statistics – IRES, paras 5.18, 5.68 – 5.74

- Energy Statistics Manual, p. 26

Table B.2: End use of energy flows (including non-energy use)

Table B.2 is a sub-layer of Table B and records the 'end use' of energy flows⁹ (row-wise) by user¹¹ (column-wise). 'End use' is the complementary type of use to 'transformation use'. 'End use' denotes the input (use) of energy flows into those transformation processes where all of the energy content of the entering natural input/product/residual is moved solely to residuals leaving the process.

'*End use*' includes both types of purposes: for energy use, and for non-energy use. For the latter type of purpose PEFA provides a specific residual class 'energy incorporated in products'. In the case of the former type of purpose it dissipative heat leaving the process.

Figure 3: End use (scheme)



Notably, 'end use' includes the 'non-transformative' input of energy flows into the so-called energy sector or energy industry. This is also termed 'energy industry own use'¹² and refers to the consumption of energy flows for the direct support of the production processes of the so-called energy sector or energy industry.

¹¹ industries, households, accumulation (e.g. product inventories), and rest of the world (i.e. exports)

¹² See e.g. International Recommendations for Energy Statistics – IRES, para 5.20

Table C: Physical use table of emission-relevant use of energy flows (related to fuel combustion)

Table C is an 'of-which-sub-layer' of Table B. It is a physical use table too. Table C records the emission-relevant use of natural energy inputs, energy products, and energy residuals (row-wise) by the using and hence emitting unit (column-wise). Table C in general has the same layout/format as Tables A and B.

The Working Group on Environmental Accounts agreed in 2016 to precise the definition of *'emission-relevant use'* by confining it to the process of combustion. As a consequence, the respective explanations and guidelines given in the 2014 draft version of the PEFA Manual (paras. 79 - 83) became obsolete.

More up-to-date explanations and guidelines for Table C are given in the following:

'Emission-relevant' may be the combustive use of all three types of energy flows⁹. The majority concerns uses of *energy products* which are combusted in the context of production and consumption activities of industries and households. There are a few cases where the use of *natural energy inputs* may be emission-relevant, namely the flaring of natural gas by the extracting industry. The use of *energy residuals* may be emission-relevant too, namely in the case of using waste for energy recovery.

The definition of *'emission-relevant use'* is confined to combustion processes and based and derived from guidelines established for the compilation of emission inventories. *'Emission-relevant use'* refers to fossil fuel combustion processes as delineated and recorded in emission inventories under the CRF/NFR¹³ source code 1.A. Notably, fugitive emissions arising from fuel handling (CRF/NFR source code 1.B) are excluded.

In addition to above combustive use of fossil energy products, *'emission-relevant use'* also refers to and includes the combustion of renewable biofuels (not covered by source code CRF/NFR 1.A).

See also:

- document ENV/ACC/WG/1.3(2016)

- minutes of the Working Group on Environmental Accounts meeting 2016, day 3, agenda item 1.3

Table D: Vectors of key energy indicators

PEFA Table D includes seven key energy accounts indicators in a breakdown by production, consumption and accumulation. The PEFA questionnaire calculates these indicator-vectors automatically from other questionnaire tables.

See also: - 2014 PEFA Manual, section 3.5

¹³ CRF/NFR are internationally harmonised classifications for emission sources employed by air emission inventories. Common Reporting Format (CRF) is applied in green house gas inventories under the UN Framework Convention on Climate Change. Nomenclature for Reporting (NFR) is applied in inventories for air pollutants under the UNECE Convention on Long-Range Transboundary Air Pollution.

Table E: Bridge table

PEFA Table E is the so-called bridge table which explicitly presents the differences¹⁴ between two energy key indicators:

- The first one (bridging item 1) is derived from PEFA Table D and termed 'domestic energy use'. Conceptually, it follows the *residence* principle¹⁵ and includes the eventual net use of energy by all resident units for energy and non-energy purposes.
- The second one (bridging item 5) is supposed to derive from energy statistics which follow a *fuel-sales-on-the-territory* principle.

<u>Bridging item 5 'Gross inland energy consumption - territory principle'</u>: received a new label. At its meeting in 2017 the Working Group on Environmental Accounts agreed on clearer guidelines/specifications for this second key indicator. Bridging item 5 must be represented by the internationally harmonised indicator 'gross inland energy consumption (GIEC)' which is produced and disseminated by Eurostat based on data submitted by countries. National key energy indicators derived from national energy balances (which often deviate from the harmonised GIEC) must not be used here.

<u>Bridging item 2.3 'International water transport undertaken by resident units'</u>: received a new label indicating an extended scope. Sub-item 2.3 refers to energy use by resident units undertaking international water transport. Here, the scope is extended insofar that all resident units' energy use for the purpose of international water transport is included (i.e. those bunkered abroad and those bunkered in domestic ports).

<u>Bridging item 4.m 'of which (memo): energy flows not reported in energy statistics but included in</u> <u>PEFA (bridging item 1)':</u> This item has been added following a recommendation by the Working Group on Environmental Accounts. It is an 'of-which-item' of bridging item 4 'Other adjustments and statistical discrepancies'. It is intended to separately present amounts of energy use not recorded in energy statistics (and hence not be included in GIEC) but recorded in PEFA (and hence included in 'domestic energy use' = bridging item 1).

See also:

- document ENV/ACC/WG/3.3(2017), section 3.3

- minutes of the Working Group on Environmental Accounts meeting 2017, day 1, agenda item 3.3

Grey shaded cells in PEFA reporting tables indicate 'not applicable'

The reporting tables A to E in the PEFA questionnaire have a number of grey-shaded cells which must not be filled. Grey shaded cells denote 'not applicable' combinations of dimensions (i.e. are logically not possible).

⁻ explanations/instruction provided at the bottom of Table E in PEFA questionnaire 2017

¹⁴ The quantitative difference between both key indicators is mainly due to different principles underpinning the accounting of transport fuel use

¹⁵ It includes the energy use by resident units, independent of where it takes place; e.g. it includes fuel use by resident units undertaking international navigation and excludes fuel sales to non-resident units

Grey-shading of cells has been changed several times since 2014. The following table provides the current state of grey shaded cells 'not applicable' and their explanations.

PEFA	Column(s)	Row(s)	Explanation
Table			
Table A	Statistical Differences	All	By convention, statistical differences are recorded in the use table
Table A	Industries.	All Natural	By definition, natural inputs can only be provided (supplied) by
(Supply)	Households,	Energy Inputs	the Environment; i.e. cannot be supplied by Industries,
	Accumulation;	(N00, N01-N07)	Households, Accumulation, Rest of the World.
	Rest of the World		
Table A	Households	All Energy	Households do also engage in productive activities. By
(Supply)		Products (P00, P08-P27)	productive activities is not recorded under the household-
		1001277	column. Moreover, it is recorded under the column heading of
			the respective industry (NACE division) which typically produces
			the respective product group as a result of its principal activity.
Table A	Accumulation	All Energy	By convention, changes in product inventories are recorded net in
(Supply)		Products (P00, P08-P27)	the use table (i.e. PEFA Table B)
Table A	Environment	All Energy	By definition. Environment cannot produce products (in national
(Supply)		Products (P00,	accounts the production process as well as any output from
		P08-P27)	production is confined to economic production activities.
Table A	Industries,	R28 and R29	By convention, waste supplied for energy purposes (and hence
(Supply)	Households		recorded in PEFA) can only be provided (supplied) by
			Accumulation (end-or-life goods arising from the stock of numan produced assets) and the Rest of the World (imports)
Table A	Environment	All Energy	By definition, renergy residuals cannot be supplied by the
(Supply)		Residuals (R00,	Environment
		R28-R31)	
Table A	Rest of the World	R30 and R31	By definition, 'energy losses all kinds of' (R30) and 'energy
(Supply)			incorporated in products for non-energy use (R31) cannot be supplied by the rest of the world (imports)
Table B	Households.	All Natural	By convention, natural inputs are only used by industries.
Table B.1	Accumulation,	Energy Inputs	Note: Households do also engage in productive activities. By
Table B.2	Rest of the World,	(N00, N01-N07)	convention, the input into and the output from households'
(Use)	Environment		productive activities is not recorded under the household-
			column. Moreover, it is recorded under the column heading of
			the respective product group as a result of its principal activity.
Table B	Environment	All Energy	By definition, the Environment cannot use (up-take) any energy
Table B.1		Products (P00,	products.
Table B.2		P08-P27)	
(Use)	En des anno 11	D 20 D20 D24	
Table B	Environment	к28, к29; К31	By definition, the Environment cannot use (up-take) any energy residuals other than 'losses'
Table B.2			
(Use)			
Table B	Industries,	R30	By definition, 'energy losses all kinds of' (R30) are used by
Table B.1	Households,		Environment only (cannot be used by Industries, Households
I able B.2	Rest of the World		Accumulation, Kest of the World). Statistical Differences between
(030)			theoretically occur and are recorded net here in the use table.

Table 2: Overview and explanation of grey cells 'not applicable' in PEFA Questionnaire 2017

PEFA	Column(s)	Row(s)	Explanation
Table			
Table B Table B.1 Table B.2 (Use)	Households, Rest of the World	R31	'Energy incorporated in products' (R31) accommodates the amount of energy resulting from the use of energy products for non-energy purposes (e.g. naphtha use to produce plastics). The use table records the destination of these energy amounts which is obviously the stock of goods accumulated in the economy. In general R31 is only used (taken up) by Accumulation. There is one exception: NACE division D may take up some R31 in form of 'heat from chemical sources' (see annual electricity & heat questionnaire table 1). Statistical Differences between supply and use of R31 are rather unlikely but could theoretically occur and are recorded net here in the use table.
Table B.2	Industries	All Natural Energy Inputs (N00, N01-N07)	for end use (only for transformation use, see Table B.1)
Table B.1	Households, Accumulation, Statistical Differences, Rest of the World	All	By convention, transformation use can only be undertaken by industries. By convention, statistical differences are recorded in Table B.2.
Table C	Households, Accumulation, Rest of the World, Environment	All Natural Energy Inputs (N00, N01-N07)	By convention, natural inputs are only used by industries.
Table C	Industries, Statistical Differences	N02-N07	Only the use of N01 may be emission-relevant as it may happen that the extracted natural input is not transformed entirely into a product but combusted on the extraction spot (e.g. flaring of natural gas). The use of other natural energy inputs N02-N07 is not emission-relevant as it is entirely transformed into energy products.
Table C	Accumulation, Rest of the World, Environment	All Energy Products (P00, P08-P27), and all Energy Residuals (R00, R28-R31)	The accumulation of energy products and residual is not emission relevant, per se. Note that emission-relevant is defined to include only the use for combustion. Exports of energy products and residuals is not emission relevant in the reporting country. The uptake of energy residuals by the environment is not emission relevant.
Table C	all	P26 and P28	Per se, the use of these particular energy products (electricity and heat) cannot be emission-relevant.
Table C	all	R30 and R31	Per se, the use of these particular energy residuals (energy losses and energy incorporated in products) cannot be emission- relevant.
Table D	Households, Accumulation, Statistical Differences Rest of the World, Environment	PEFA_IND01 PEFA_IND02 PEFA_IND03	These PEFA indicators are only applied for industries.
Table D	Industries, Accumulation, Statistical Differences Rest of the World, Environment	PEFA_IND04	This indicator is only applicable for households.
Table D	Accumulation, Statistical Differences Rest of the World, Environment	PEFA_IND05	This indicator is only applicable for industries and households.
Table D	Accumulation, Rest of the World, Environment	PEFA_IND06	This indicator is applicable for industries, households, and statistical differences.

PEFA Table	Column(s)	Row(s)	Explanation
Table D	Statistical Differences Rest of the World, Environment	PEFA_IND07	This indicator is applied for industries, households, and accumulation

4 General compilation guidelines

<u>4.2 Important conventions in compiling PEFA</u>

Calorific values

PEFA are recorded in the energy unit terajoule (TJ). Compilers of PEFA may need to convert from other physical units (volume, mass) to terajoule using conversion factors. The latter are called 'calorific values' and provide for each energy product the specific energy content (in Joule) per physical unit (e.g. tonne, cubic metre).

European energy statistics have introduced various conventions with regards to these conversions. In general PEFA employs the same conventions as European energy statistics which are briefly summarised in the following:

Annual Coal Questionnaire:

- Data on solid coal products are reported in thousand metric tonnes (10³t) and are converted to TJ on the basis of net calorific values (NCV). The latter are provided in Table 4 of the Annual Coal Questionnaire.
- Note, default NCVs (TJ/1000 tonnes) are used for the following six secondary coal products:
 - BKB/peat briquettes 20 000
 - o
 Coal tar
 37 700

 o
 Gas coke
 28 000
 - o Coke oven coke 28 500
 - Patent fuel 29 300
 - Peat products
 20 000
- Manufactured gases are already reported in terajoule on the basis of gross calorific values (GCV).

Annual Natural Gas Questionnaire:

• Data are reported in terajoules (TJ) on the basis of gross calorific values (GCV). For PEFA, all quantities need to be re-converted to a net calorific value (NCV) basis using a factor of 0.9.

Annual Oil Questionnaire:

• Data are reported in thousand metric tonnes (10³t) and are to be converted to TJ on the basis of net calorific values (NCV). The latter are provided in Table 1 and 2a of the Annual Oil Questionnaire.

Annual Electricity & Heat Questionnaire:

• Data reported are in gigawatt-hours (GWh) for electricity and terajoules (TJ) for heat. 1 GWh = 3.6 TJ

Annual Renewables & Waste Questionnaire:

- Electricity is reported in MWh: 1 MWh = 0.0036 TJ
- Heat is reported in TJ
- Most data on renewable energy products (except liquid biofuels and charcoal) are reported in terajoule (TJ) on the basis of net calorific values (NCV).
- Liquid biofuels and charcoal are reported in metric tonnes (t) and are to be converted to TJ on the basis of net calorific values (NCV). The latter are provided in Table 3 of the Annual Renewables & Waste Questionnaire.

Non-energy use of peat, wood, etc.

As a general rule PEFA applies the same coverage of energy products as recommended in energy statistics (see IRES, paras. 3.8 - 3.10):

- All fossil fuels are within the scope of energy statistics and PEFA whether or not they are used for energy purposes, but an exception is made for peat used for non-energy purposes, which should be excluded.
- Products derived from fossil fuels are always within the scope of energy statistics and PEFA when used (or intended to be used) for energy purposes, i.e. as fuels.
- Products derived from fossil fuels used (or intended to be used) for non-energy purposes are
 within the scope only if they are the output of energy industries (e.g. refineries, gas plants or
 coal mining, coal manufacturing industries). They are included because they explain how
 much an apparent supply of energy is used for other purposes and allow for a complete
 assessment of the industries involved. One example are lubricants produced during the
 refining of crude oil. Even though they are ordinarily used for non-energy purposes, their
 production and consumption are recorded in energy statistics as this allows for the
 monitoring of the different products obtained from the refinery intake of crude oil and the
 assessment of the part of crude oil used for non-energy purposes.
- Some fuels such as peat, waste¹⁶, agricultural crops or other biomass are not of fossil origin. Such products are within the scope of energy statistics and PEFA only when used for energy purposes. Thus, the inclusion of these products depends on their use, i.e. it is derived from demand-side information.

¹⁶ Although, strictly speaking, part of waste can have a fossil origin, this part has already been accounted for as used (often for non-energy purposes), thus it is treated together with other fuels of non-fossil origin to avoid imbalances in the energy flows.

<u>4.3 PEFA recording conventions for 'primary' energy products...</u>

Nuclear energy

At its 2016 meeting the Working Group on Environmental Accounts discussed and agreed on a PEFA recording convention for nuclear energy. Reporting of nuclear energy flows in the PEFA questionnaire shall be kept as flexible as allowed by the current list of energy products (see up-dated Figure 4 below): The nuclear fuel (P22) used in power plants may originate from imports or product inventories; nuclear fuel may as well originate from the domestic mining industry which extract the corresponding natural input from the domestic environment.



Figure 4 (up-date): The flow of nuclear energy as recorded in PEFA

By convention, a 33%-efficiency is assumed for the nuclear power plant process. The amount of energy entering the nuclear power plant is three times higher than the amount of energy of the electricity/heat output. The difference – i.e. transformation losses – is two times higher than the electricity/heat output.

See also:

- minutes of the Working Group on Environmental Accounts meeting 2016, day 3, agenda item 1.3

⁻ document ENV/ACC/WG/1.3(2016)

Biomass based 'primary' products

At its 2017 meeting the Working Group on Environmental Accounts discussed and agreed on conventions for the recording of biomass based energy flows in PEFA.

Introduction into the issue

PEFA record the supply and use of solid, liquid and gaseous biofuels. Guidelines in the 2014 draft version of the PEFA Manual suggest that biofuels – i.e. any biomass used as a fuel – are recorded in form of supply and use of energy *products*. I.e. it is assumed that the respective biomass is the output of a production process and has become a *product* in the sense of national accounts before it is used as a fuel.

One may raise the question whether this is always the case. The labels of some of the biofuels recorded in IEA/Eurostat Annual Questionnaires (AQ) – which is the main data source for compiling PEFA – suggest that the respective biomass is at least partly rather a *residual* than a *product* in the sense of the SEEA 2012-CF. This yields in particular for the following labels of solid biofuels recorded in Table 4 of the Annual Renewables & Waste Questionnaire:

- <u>Fuelwood, wood residues and by-products:</u> Fuelwood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained.
- <u>Black liquor</u>: Energy from the alkaline-spent liquor obtained from the digesters during the production of sulphate or soda pulp required for paper manufacture.
- <u>Bargasse:</u> Fuel obtained from the fibre which remains after juice extraction in sugar cane processing.
- <u>Animal waste:</u> Energy from excreta of animals, meat and fish residues which, when dry, are used directly as a fuel. This excludes waste used in anaerobic fermentation plants. Fuel gases from these plants are included under biogases.
- <u>Other vegetal materials and residues:</u> Biofuels not specified elsewhere and including straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from the maintenance, cropping and processing of plants

For above cases, drawing the theoretical borderline between *products* and *residuals* seems not always straightforward. In practise it might be very difficult for compilers of PEFA to obtain sufficient information to split above biofuels into products and residuals.

Given this, The Working Group followed Eurostat's recommendation to maintain the current general guideline to record all biomass used as fuel in form of supply and use of *energy products*. Notably, the input into the production of these products needs also to be recorded in PEFA (see below).

Three groupings of energy products are distinguished in PEFA in order to show the supply and use of biofuels:

- P23 'Wood, wood waste and other solid biomass, charcoal' (=solid biofuels),
- P24 'Liquid biofuels',
- P25 'Biogas'.

In the IEA/Eurostat Annual Renewables & Waste Questionnaire – an important data source for PEFA – biofuels are broken down in more detail (see Annex 3 of document ENV/ACC/WG/1.3(2016)).

The following questions related to the recording of biofuels in PEFA are at stake:

- 1. Which economic activities (NACE/HH) produce as output the three biofuel product groupings distinguished in PEFA? This information on the producer is not provided in Annual Renewables & Waste Questionnaire.
- 2. What are the biomass inputs (energy content) to these domestic production processes, and where do these biomass inputs come/originate from? This biomass input is not recorded explicitly in Annual Renewables & Waste Questionnaire. It may originate from 'old' biomass such as e.g. sewage sludge or waste landfilled, or from 'fresh' biomass such as maize. In both cases, it can be imported or stem from domestic sources.

Recording convention recommended

The Working Group agreed in general to establish a flexible recording of biomass based energy flows.

As a principle, biomass used as fuel is in any case recorded in form of supply and use of energy *products*.

The respective production process is assigned to potentially any economic activity (NACE division or private household).

There are three 'pathways' options to record the biomass input into these production processes (see up-dated Figure 6 below):

- 1. In case the biomass input originates from domestic nature = natural energy input, code N06
- 2. In case the biomass input originates from domestic stock = energy residual, code R28
- In case the biomass input originates from rest of the world (imports) = energy residual, code R28



Figure 6 (up-date): 'Primary' produced based on biomass as recorded in PEFA

See also:

- document ENV/ACC/WG/3.3(2017)

- minutes of the Working Group on Environmental Accounts meeting 2017, day 1, agenda item 3.3

'Primary' energy from waste

Figure 7 of the 2014 draft version of the PEFA Manual has been slightly up-dated (see below). The scope of economic activities using waste as a fuel has been extended. Waste may be used potentially by any NACE division and also by private households to produce electricity/heat.

Figure 7 (up-date): PEFA – recommended recording of waste related energy flows



5 References

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