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Technical Note

Recording of 'intra-establishment energy flows' in physical energy flow accounts

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Glossary & abbreviations

Establishment	'smallest' economic unit in national accounts; termed <i>local kind-of-activity unit</i> (local KAU) in the European system of accounts ESA
Intra-establishment	energy flow denote energy products that are produced by an economic unit and used by the same economic unit. The term 'intra-establishment' is employed in SEEA-CF 2012 and SEEA-Energy
Production	a physical process which uses inputs to produce outputs; an activity undertaken by or under control of an economic unit,
Output	the result of production
Products	goods and services
Energy statistics	internationally harmonised statistical framework; concept are laid down in the International Recommendations for Energy Statistics (IRES)
AQ	Annual energy statistics questionnaires operated by IEA and Eurostat; = important data collection vehicle for energy statistics
ESA 2010	European System of Accounts, 2010 Edition
NACE	Statistical classification of economic activities in the European Community
NPISH	Non-profit institutions serving households
PEFA	Physical energy flow accounts
SEEA-CF 2012	System of Environmental-Economic Accounting – Central Framework, 2012
SEEA Energy	System of Environmental-Economic Accounting – Energy
SNA 2008	System of National Accounts, 2008
IRES	International Recommendations for Energy Statistic

Summary

The System of Environmental-Economic Accounting – Central Framework (SEEA-CF 2012) recommends to separately record relevant *'intra-establishment energy flows'* in physical flow accounts even if they are not recorded in monetary accounts (SEEA-CF2012, paras. 2.91 and 3.162). The working group environmental accounts agreed to implement this SEEA recommendation for the European physical energy flow accounts (PEFA).

Two decision were taken: (1) As a matter of principle and if data are available, *'intra-establishment energy flows'* shall be included in PEFA supply and use tables together with all other ('inter-establishment') energy flows. (2) The *'intra-establishment energy flows'* beyond those recorded in monetary supply and use tables (ESA) shall be presented as well as an of-which memo-item: i.e. a row presenting supply of energy products for own use by production activities (NACE division) – aggregated over all product groups.

These two recording decisions make the differences between the physical and monetary accounts transparent and enable users to reconcile PEFA with national accounts.

'Intra-establishment energy flows' are defined as energy products produced and used by the same unit. The working group agreed on the following recording conventions for three main cases of 'intra-establishment energy flows' beyond monetary recordings:

1. Production of energy products by households for their own final consumption: The respective supply of energy products is recorded in the PEFA supply table under the column-heading of the NACE division typically producing the respective energy product as its principal activity. E.g. electricity produced by households has to be recorded under the column-heading of NACE division D 'electricity, gas, steam and air conditioning supply'. The use is recorded as final consumption by households.

2. Production by government & NPISH for their own final consumption: The respective supply of energy products 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 defense; compulsory social security' and P 'education'). The use is recorded under the very same column-heading.

3. Production by other producing units (corporations) and subsequent intermediate own use: The respective supply of the energy products is recorded in the PEFA supply table and the use is recorded in the PEFA use table. In both cases, it is recorded under the heading of the productive activity concerned (which is the same).

Energy statistics' annual questionnaires (AQ) form one of the main data source for compilers of PEFA. This technical note gives practical guidelines on how to identify in energy statistics the *'intra-establishment energy flows'* beyond those recorded in monetary accounts.

1 Introduction

1. <u>Physical energy flow accounts (PEFA)</u> record the flows of energy (in terajoules) from the environment to the economy (natural inputs), within the economy (products), and from the economy back to the environment (residuals).

2. PEFA is conceptually embedded in environmental-economic accounts (SEEA-CF). PEFA provide information on energy flows arranged in a way fully compatible with concepts, principles, and classifications of national accounts – thus enabling integrated analyses of environmental, energy and economic issues e.g. through environmental-economic modelling.

3. One of the main features of physical energy flow accounts (PEFA) is its coherence and compatibility with ESA supply and use tables enabling integrated environmental-economic analyses. However, there are possible sources of incoherence. One possible incoherence is, simply expressed, that ESA supply and use tables do not record certain '*intra-establishment energy flows*' (notably in monetary terms) while PEFA may do in physical terms.

4. The reason for this is a recommendation by the System of Environmental-Economic Accounting – Central Framework (SEEA-CF 2012) which suggests to separately record relevant *'intra-establishment flows'* in physical flow accounts even if they are not recorded in monetary accounts (SEEA-CF 2012, paras. 2.91 and 3.162).

5. This technical note further investigates this possible incoherent recording of *'intra-establishment energy flows'* in PEFA and ESA supply and use tables. The note tries to identify the practical implications and suggests guidelines (conventions) for the compilation of PEFA.

6. Chapter 2 further clarifies the SEEA-CF term *'intra-establishment energy flows'*. Chapter 3 provides an overview of relevant PEFA recording conventions that were already discussed and agreed by the European Statistical System (i.e. meetings of the working group environmental accounts). Chapter 4 summarises the suggested guidelines for recording *'intra-establishment energy flows'* in PEFA. Finally, chapter 5 looks at the issue from the compiler perspective, i.e. gives practical guidelines when energy statistics (i.e. IEA/Eurostat annual questionnaires) are used to compile PEFA.

2 Specifying 'intra establishment energy flows'

2.1 Defining 'intra-establishment energy flows'

7. The term *'intra-establishment'* is employed in SEEA-CF 2012 and SEEA-Energy (see Box 1). This term cannot be found exactly in national accounts (SNA or ESA¹). There several terms are employed that denote something related. ESA uses the terms *'intra-unit transactions'* (see Box 2) and *'own account production'*. Furthermore the concept of *ancillary activity* is related as it denotes an activity whose output is intended for use within the undertaking unit (ESA 2010, para 3.12).

8. In general, 'intra-establishment energy flows' denote energy products that are produced by

¹ SNA is the international system of national accounts; ESA is the European system of accounts.

an economic unit and used by the same economic unit. This general description reveals several aspects.

9. First, a transformation exists that converts energy from one into another form. Secondly, the transformation activity falls under the scope of production as defined in national accounts. This is an important aspect; it implies that <u>natural inputs</u> and <u>residuals</u> need to be converted into <u>products</u> before own use can occur². Thirdly, the resulting energy product is utilised by the same unit that undertook the previous transformation activity.

Box 1: Occurrences of the term 'intra-establishment' in SEEA-CF and SEEA-Energy

<u>SEEA-CF para. 1.45:</u> In all cases of own-account and **intra-establishment** production recorded in the SEEA Central Framework, the valuation of flows is consistent with the SNA valuation of own-account and ancillary production.

<u>SEEA-CF para. 2.91:</u> Products are goods and services that result from a process of production in the economy. They are defined consistently with the definition of products in the SNA. Generally, the existence of a product is evidenced by a transaction of positive monetary value between two economic units (e.g., the production of a car and its sale by a manufacturer to a purchaser). For accounting purposes, generally, only flows of products between economic units are recorded and flows internal to the operation of an establishment are ignored. However, depending on the purpose and field of analysis, it may be relevant to record these **intra-establishment** flows. For example, in the analysis of energy flows, it may be relevant to record an establishment's generation of energy by burning its own solid waste.

<u>SEEA-CF para. 3.162:</u> Energy products are produced as secondary production by many establishments and also for use within an establishment (i.e., for own-account production and use). Where it is possible to quantify the own account **intra-establishment** production and use of energy products, these flows should be recorded in the accounts as flows of energy for own use (footnote 22: Generally, these flows are not recorded in monetary supply and use tables) In table 3.5, the flows relating to own-account production and use are not separately identified (footnote 23: ... SEEA-Energy ... provides a more detailed discussion of the recording of own-account production and use of energy products).

<u>SEEA-Energy para. 2.65</u>: In SEEA-Energy own account activities also include **intra-establishment** intermediate production and consumption of energy products. For some purposes of environmental economic accounting, it may be relevant to identify activities undertaken within an establishment but where output is not sold to other units. This is particularly the case in accounting for physical flows of energy where measuring all transformations of energy products are likely to be of interest. Generally, the recording of physical flows internal to establishments is only undertaken in specific circumstances. However, in some cases there may be great interest in these types of flows (for example, here is considerable interest in cogeneration of energy within business sites using heat recovery steam generators).

<u>SEEA-Energy para. 3.92:</u> Energy products are produced as a secondary activity within many establishments, and in some cases as own account production and use. Where it is possible to quantify the own account, **intra-establishment** production and use of energy products, these flows should be recorded separately in the accounts as flows of energy for own use. Own account production and use for each energy product, should be recorded in the "of which for own use" rows of the supply and use tables (footnote 18: Note that the "of which for own use" rows of the supply table are exactly the same as those in the use table. They are included in both tables for completeness).

<u>SEEA-Energy para. 3.163:</u> In the SNA and SEEA-Energy, own use refers to **intra-establishment** production and use of energy products. ...

2.2 'Intra-establishment transactions' recorded in national accounts

10. National accounts distinguish three types of uses of products: intermediate consumption (ESA paras. 3.88ff.), final consumption (ESA paras. 3.93ff.), and gross capital formation (ESA paras. 3.122ff.). These types are important to distinguish when looking at the conventions

 $^{^{2}}$ This is also true for renewable energy sources, such as solar radiation or wind, which need to me transformed into useable forms, i.e. products such as electricity and/or heat.

established for the recording of 'intra-establishment transactions' (see also Box 2). Only a limited number of intra-establishment transactions are actually recorded in monetary supply and use tables³. Per se excluded is the own account production and subsequent <u>intermediate</u> consumption⁴ of products⁵. Also the own account production for final consumption⁶ is widely excluded, however there are some exceptions where it is recorded:

- Private households: own account production of dwelling services by own occupiers; own account production and use of construction goods (i.e. buildings own produced); own production and use of agricultural goods.
- Governments and NPISH: own production and use of services resulting from principal activity; own account production and use of construction goods (i.e. buildings own produced); own production and use of agricultural goods.
- Other producing units (corporations): own production of goods for own gross fixed capital formation.

11. All those exceptions do not apply for energy products. One may **conclude that intra-establishment transactions of energy products are usually not recorded in national accounts.** However, there might be exceptional cases such as e.g. electricity produced and used by private households.

Box 2: Excerpts from SNA2008 and ESA2010 related to 'intra-unit transaction'

SNA2008: see e.g. para 6.27

Note that **establishment** is the term used in SNA to denote the smallest economic unit; while the ESA uses the term **local kind-of-activity unit (local KAU)** for the same thing.

ESA2010: Properties of transactions - Interactions versus intra-unit transactions

ESA2010 para. 1.67: Most transactions are interactions between two or more institutional units. However, the ESA 2010 system records some actions within institutional units as transactions. The purpose of recording these intra-unit transactions is to give a more analytically useful picture of output, final uses and costs.

ESA2010 para. 1.68: Consumption of fixed capital, which is recorded as a cost by the ESA 2010 system, is an intraunit transaction. Most of the other intra-unit transactions are transactions in products, typically recorded when institutional units operating as both producers and final consumers, choose to consume some of the output they have produced. This is often the case for households and general government.

ESA2010 para. 1.69: All own-produced output used for final uses within the same institutional unit shall be recorded. Own-produced output used for intermediate consumption within the same institutional unit shall be recorded only when production and intermediate consumption take place in different local KAUs within the same institutional unit. Output produced and used as intermediate consumption within the same local KAU shall not be recorded.

³ This is because there is no difference for gross value added between gross and net recording and the latter is simpler.

⁴ National accounts make an important distinction between intermediate consumption and final consumption.

⁵ Products are goods and services. Notably energy products belong to the category of goods.

⁶ See footnote 4.

3 General guidelines for the recording of 'intraestablishment energy flows' in PEFA

12. At its 2017 meeting, the Eurostat working group environmental accounts discussed the issue of recording *'intra-establishment energy flows'* in PEFA⁷. Two main decisions were taken:

(1) As a matter of principle and if data are available, *'intra-establishment energy flows'* shall be recorded in PEFA supply and use tables aside all other ('inter-establishment') energy flows. In the following of this chapter this is referred to as 'integrated recording'.

(2) The *'intra-establishment energy flows'* beyond those recorded in monetary supply and use tables⁸ shall be presented as well as an 'of-which' memo-item: i.e. a row presenting supply of energy products⁹ for own use by production activities (NACE division) was added to PEFA Table A (supply of energy).

The conclusions went into the PEFA guidelines for the 2018 data collection¹⁰.

13. In general, PEFA employ the accounting framework of 'supply and use tables (SUT)' as recommended by SEEA. Row-wise the *'intra-establishment energy flow'* is assigned to one and only one energy product class. The columns of the SUT framework represent the origin (supply table) or the destination (use table) of the respective energy product flow. This implies that *'intra-establishment energy flows'* – like all energy flows – are recorded twice: first at its origin (supply table) and secondly at its destination (use table).

14. This 'double-entry-bookkeeping' may suggest that *'intra-establishment energy flows'* assumingly have identical origin and destination, i.e. should be recorded in the supply table as well as in the use table under the very same column-heading representing the establishment in which the *'intra-establishment energy flow'* actually takes place. In principle this is the case because by definition the producer and user of an *'intra-establishment energy flows'* is the same economic unit. However there is one exceptional case¹¹.

3.1 'Integrated recording'

15. In general, *'intra-establishment energy flows'* are recorded together with all other ('inter') energy flows in the various PEFA tables. The way of recording is referred to as 'integrated recording'. Specific recording guidelines are given below distinguishing the three main cases of *'intra-establishment energy flows'* as identified earlier (see <u>PEFA guidelines 2018</u>).

Case A: Production of energy products by households for their own final use:

16. When households engage in production for own final use the production (supply table) is recorded under a different column than the consumption (use table). The output (i.e. supply of

⁷ See document <u>ENV/ACC/WG/03.3(2017)</u> and the minutes of this meeting (<u>https://circabc.europa.eu/w/browse/a91e3e19-b2cf-4ea1-9a75-16b95a7f939e</u>). Note that the <u>PEFA Manual draft version 2014</u> does not address in sufficient detail the issue.

⁸ One may assume that 'intra-establishment energy flows' are per senot recorded in monetary supply and use tables; see para. 11.

⁹One row aggregating all product groups

¹⁰ See <u>Eurostat website</u>.

¹¹ Production for own account by private households: supply and use are recorded under different column-headings.

energy products) is recorded in the PEFA supply table under the column-heading of the NACE division producing the respective energy product typically as principal activity.

17. This exceptional way of recording *'intra-establishment energy flows'* in households is due to specific recording conventions established in national accounts (more specifically the recording conventions established for supply and use tables (SUT)). Commonly, private households only appear as consumers in the SUT framework (i.e. columns for private households' final consumption). However, households may also engage in production activities. If private households engage in production activities this is considered and recorded as a separate activity similar to other production units. All transactions related to the households' productive activity, i.e. inputs and outputs, are recorded under the column-heading of the production activity which typically produces the respective product as a principal production activity.

18. Production of electricity (using photovoltaic cells) is nowadays one of the most common cases for household's *'intra-establishment energy flows'*. Electricity produced by households has to be recorded under the column-heading of NACE division D 'electricity, gas, steam and air conditioning supply' and the row dedicated for electricity¹². The use is recorded under the final consumption column heading (final consumption expenditure) by households, again in the electricity row.

19. Other examples of household's *'intra-establishment energy flows'* are own account production of fuel wood, heat, or biogas for which specific row classes exist¹³. Notably, the necessary energy input¹⁴ into household production processes (e.g. natural energy inputs in form of solar radiation or energy residuals in form of vegetal waste) is recorded as a use into the NACE division under the heading of which the supply of the own used product is recorded.

Case B: Production of energy products by government & NPISH for their own final use:

20. Governments and non-profit organisations serving households (NPISH) may engage in production of energy products (e.g. electricity and heat) for their own use. Governments and NPISHs do produce services as their principal activity. If they produce energy products for own use it is considered an ancillary activity supporting their principal activity.

21. In monetary supply and use tables specific recording conventions were established for the recording of activities by governments and NPISHs. The production (supply) of public services and goods is recorded in the monetary supply table under the column-headings of the respective service industries, such as e.g. NACE O 'public administration and defence, compulsory social security' or NACE P 'education'; while the own use is recorded in the use table under the respective final consumption columns.

22. The basic underlying reasoning is that governments and NPISH produce services (and to a lesser extend goods) for the benefit of the entire society, e.g. defence. The final user of these services is hardly to be identified or anonymous. Hence the use of these public services is conventionally recorded as consumed by governments and NPISHs themselves. Specific columns (final consumption expenditures by governments and NPISHs) have been added to the monetary use table.

¹² In PEFA, row code P26

¹³ Fuel wood is included in PEFA row code P23; Heat is P27; and biogas is P25.

¹⁴ Energy has to come from somewhere; also in the case of households' own account production for own final consumption. E.g. in the case of PV-electricity produced by a household the respective energy input comes from the environment in form of solar radiation which is of a natural input type of energy flow. Households may also use waste (a residual type of energy flow originating from stock/accumulation) to own-produce electricity and heat for own use.

23. PEFA physical supply and use tables do not have final consumption columns for governments and NPISHs (as is the case in monetary SUTs). The reason is simple: services typically produced by governments and NPISHs are non-physical and the respective columns become obsolete in physical SUTs.

24. In case governments and NPISHs produce energy products for own use this is considered an ancillary activity. This implies that the associated *'intra-establishment energy flow'* is recorded under the same column-heading in the physical supply as in the physical use table. The output (i.e. supply of energy products) 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'). The use is recorded under the very same heading.

Case C: Production of energy products by corporations and subsequent own intermediate consumption:

25. The third case is the most common case and concerns producing units other than households, government or NPISHs (corporations). These units (also called *establishments* or *local kind of activity units*) may produce certain energy products (i.e. transform certain inputs into an output that is considered an energy product). All or parts of the energy product may be used by the very same unit for the purpose of supporting/facilitating the unit's production activity, i.e. the creating of some output to be sold to other units. A common example is the own account production of electricity and heat which is subsequently used as an intermediate input to enable the principal productive activity.

26. Recording in a physical supply and use framework is straightforward: The origin and the destination of such an *'intra-establishment energy flow'* is the same. The supply of the energy product is recorded in the PEFA supply table and the use is recorded in the PEFA use table. In both cases, it is recorded under the same heading of the respective activity concerned. Evidently, the row to which the energy product is assigned remains the same in both tables

3.2 Recording of *'intra-establishment energy flows'* as aggregated memo-item row

27. In addition to the 'integrated recording' the working group agreed that '*intra-establishment energy flows*' should be shown as well separately, however in aggregated/summarised form (i.e. for all groupings of energy products) and as a voluntary 'memo-item'. This would enable reconciliation between PEFA and the monetary accounts; more specifically between PEFA physical supply table and monetary supply table at least column-wise, i.e. for each of the 64 productive activities¹⁵.

28. The 2018 version of the PEFA questionnaire includes for the first time an additional memoitem row (see Figure 1) showing separately the *'intra-establishment energy flows'* that go beyond what is recorded in ESA supply use tables. This memo-item row is added at the bottom of PEFA

¹⁵ Note that the rows in PEFA and ESA supply use tables are not aligned anyway. The classification of energy products in PEFA is based on the <u>standard international energy product classification (SIEC)</u> and much more detailed than the <u>CPA</u> <u>classification</u> employed in ESA supply use tables.

Table A¹⁶ and is a typical 'of-which' item. It records the supply of energy products for own use which is an 'of-which' from total supply. As for all rows in PEFA Table A, the suppliers (columnwise) are classified by 64 groupings of production activities (based on NACE classification).

Figure 1: Memo-item row added to PEFA Table A (supply of energy)

37	2w	P00w	of which (memo): Supply of ENERGY PRODUCTS for own use
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29. In the 2018 version of the PEFA questionnaire the memo-item row was added only in Table A. This was based on the assumption that the supplier and the user is always the same and hence a single-recording would be sufficient. However, the columns for supply and use can be different in the case of 'intra-establishment energy flows' related to households own account production and own final consumption (see above). Therefore, the working group environmental accounts¹⁷ agreed to insert a second memo-item row at the bottom of PEFA Table B (physical energy use table).

4 Overview of 'intra-establishment energy flows' recorded in energy statistics

Eurostat and the international energy agency (IEA) jointly operate five annual 30. questionnaires for energy statistics (AQ). Beside primary data sources which may be very specific and heterogeneous at national level, AQ prepared by national authorities form a standardised and harmonised data source for compilers of PEFA.

31. Eurostat has developed a method to convert the energy statistics collected via AQ into the PEFA framework. This method is implemented in an IT-tool ('PEFA-Builder'). Notably, the user has to provide additional data input because the AQ content is in certain areas not sufficiently detailed e.g. energy uses of the transport or service sectors.

32. Some items included in the AQ constitute partly or entirely 'intra-establishment energy flows' - most of which beyond those recorded in monetary supply an use tables. This chapter provides an overview.

Own use by producers of electricity and heat 4.1

33. Electricity and heat are two important energy products. Both products have separate codes in energy statistics as well as in $PEFA^{18}$.

34. The annual questionnaire on 'electricity and heat' (one of the five AQ) includes two tables recording the generation of electricity and heat in a breakdown by type of producer-plants and

¹⁶ PEFA Table A 'Physical supply of energy flows' records the supply of energy flows (row-wise) by supplier (column-

wise). Row-wise 20 groupings of energy products are distinguished. ¹⁷ At its meeting on 14 May 2019; see document <u>ENV/EA/WG/03.3(2019)</u>

¹⁸ PEFA: electricity has the code P26 and heat has the code P27.

groupings of primary energy carriers. Table 1 records the <u>gross</u> generation of electricity and heat while Table 2 records the <u>net</u> generation. The difference between <u>gross</u> and <u>net</u> generation is defined as¹⁹ 'the electricity and heat used by the power station auxiliaries directly related to generation and including that [electricity and heat] used in fuel handling plant, cooling water plant, power station services, heating, lightning, workshops and administrative buildings directly associated with the power station during both on-load and off-load periods'. These differences between gross and net can be considered 'own use' and constitute definitely *'intra-establishment energy flows'* in the sense of SEEA.

35. Energy statistics distinguish two types of producing units (producer) and three types of plants. This leads to 6 combinations for the generation of electricity and heat. Table 1 provides an overview.

Table 1:	Electricity	and	heat	generation	data	as	recorded	in	annual	questionnaire	on
electricity	and heat										

Type of producing unit	Type of plant	Energy product (output)	Gross vs. net	What is it in terms of national accounts and PEFA?	Beyond what is recorded in ESA supply and use tables?	
	Electricity plants	Electricity		The difference between gross		
Main ativity	CHP	Electricity	gross – net	and net is own account production and use by NACE D35	yes	
producer	plants	Heat	= own use			
	Heat plants	Heat				
	Electricity plants	Electricity	aross – net	The difference between gross and net is own account		
	CHP plants	Electricity	= own use	production and use by potentially any NACE division (excl. households)	yes	
Autoproducer	F	Heat	gross = net			
	Heat plants	Heat	= sold to third; own use is not recorded	No difference between gross and net; i.e. own account production not recorded	not applicable	

36. 'Main activity producer' are units that produce heat and electricity as its principal production activity (usually grouped under the heading of NACE code D35). In the case of 'main activity producers' (for all types of plants and output) the difference between gross and net generation constitutes *'intra-establishment energy flow'*. The use of the own-produced electricity and heat can be regarded as supporting the principal production activity and hence is an *intermediate consumption* in the sense of national accounts.

37. In the case of 'autoproducers' one has to differentiate. In energy statistics the term 'autoproducer' denotes units that generate electricity and heat not as their principal activity. These units may belong to all NACE divisions except D35. Notably the AQ does not provide the NACE

¹⁹ See <u>Eurostat's reporting instructions for the Annual Questionnaire 'Electricity & Heat'</u>, p. 8; see also International Recommendations for Energy Statistics (IRES), para. 6.60.

grouping to which the 'autoproducer' belongs. PEFA compilers have to employ other data sources to identify the NACE assignment of 'autoproducers'.

38. Another most important point to note is that AQ do not record all **heat** generated by 'autoproducers' – only heat sold to third parties is recorded in AQ. This implies that the difference between gross and net is zero (or gross equals net)! This implies that heat produced by 'autoproducer' for own use is excluded from AQ and so are possible *'intra-establishment'* flows of heat.

39. In the case of 'autoproducers' generating electricity one can derive 'own use' by deducting net from gross generation. It is likely that these are *'intra-establishment energy flow'* within the producing units.

4.2 Own use by the energy sector

40. In addition to the generation of electricity and heat (see above) the following four AQ record use of energy products by the 'energy sector':

- Annual coal questionnaire Table 1
- Annual oil questionnaire Table 3 (3a, 3b)
- Annual gas questionnaire Table 2a
- Annual questionnaire on renewables and wastes Table 2a

41. In energy statistics (AQ) the 'energy sector' denotes more than 10 groupings of economic activities - beyond those generating electricity and heat - involving energy extraction and transformation. These 10 activities are termed 'energy industries'. Table 2 lists the 10 'energy industries' included in the 'energy sector'.

42. Energy statistics (AQ) record under the heading of 'energy sector' exclusively the use of energy products for non-transformation purposes²⁰. These are energy products used for the support of the extraction (mining, oil and gas extraction) or plant operations of energy transformation activities (e.g. refinery, coke oven plant). For example, energy products used for heating, lightning, or operating pumps/compressors.

43. Some of the energy product uses recorded under 'energy sector' may be own produced and hence constitute *'intra-establishment energy flows'* in the sense of SEEA. In order to identify those own produced energy products one needs to know the typical outputs for each 'energy industry'. Table 2 provides for each 'energy industry' its typical output products.

44. For instance, the energy industry 'coke oven' typically produces coke as its output product. In case the AQ records the use of coke by the 'coke oven' industry one may assume an *'intra-establishment energy flow*', i.e. an internal flow within the very same coke oven plant. This is a crude assumption. The use of coke by the coke oven industry recorded in AQ may possibly include also <u>inter</u>-establishment flows from one coke oven plant to another coke oven plant. This possible distinction between intra- and inter-flows cannot be derived from AQ.

45. In conclusion: based on a crude assumption (see para. 44) one may identify *'intra-establishment energy flows'* from the AQ by looking at certain combinations of energy products and

²⁰ The transformation use of energy products is excluded here and reported elsewhere in the AQ under the heading of 'transformation sector'.

consuming 'energy industries'. The general idea to identify *'intra-establishment energy flows'* among the energy industries' use of energy products is to look after the use of those energy products which the respective 'energy industry' produces itself. Table 2 is supposed to facilitate this analysis. E.g. coke oven coke and coke oven gas (energy products) are produced by coke oven plants ('energy industry'). In case these energy products (coke oven gas, coke oven coke) are recorded as being used by coke oven plants one may assume an *'intra-establishment energy flow'*.

Table 2: Overview of 'energy industries' – included in energy statistics (AQ) under the heading of 'energy sector' – and the typical energy products produced by those 'energy industries'

	'Energy in	dustries'	NACE	Products typically produced			
Label	Code	Description	Rev.2 code	Product labels as in AQ	Product labels (codes) as in PEFA		
1	2	4	3	5	6		
Own use of electricity, CHP and beat plants	EPOWERPL T	Quantities of fuels consumed as energy for support operations at plants with electricity only, heat	D35	Electricity	Electricity (P26)		
		only and CHP units.		пеа	Derived heat (P27)		
Coal mines	EMINES	Quantities of fuels consumed as energy to support the extraction and preparation of coal within the coal mining industry. Coal burned in pithead power stations should be reported in the 'transformation sector'.	B05	Anthracite Coking Coal Other Bituminous Coal Sub-bituminous Coal Lignite	Hard coal (P08) Lignite & Peat (P09)		
Patent fuel plants	EPATFUEL	Quantities of fuels consumed as energy for support operations at patent fuel plants.	C19	Patent Fuel	Secondary coal products (coke, coal tar, patent fuel, BKB and peat products) (P11)		
Coke ovens	ECOKEOVS	Quantities of fuels consumed as energy for support operations in coke ovens (coking plants).	C19	Coke Oven Coke Coke Oven Gas	Secondary coal products (coke, coal tar, patent fuel, BKB and peat products) (P11)		
BKB/PB plants	ЕВКВ	Quantities of fuels used as energy for support operations in BKP/PB plants (briquetting plant)		BKB Peat Products	Secondary coal products (coke, coal tar, patent fuel, BKB and peat products) (P11)		
Gas works/ gasification works	EGASWKS	Quantities of fuels consumed as energy for support operations at gas works and coal gasification plants.	D35	Gas Works Gas Gas Coke	Derived gases (= manufactured gases excl. biogas) (P10) Secondary coal products (coke, coal tar, patent fuel, BKB and peat products) (P11)		
Blast furnaces	EBLASTFUR	Quantities of fuels consumed as energy for support operations at blast furnaces	C24	Blast Furnace Gas Other recovered gases	Derived gases (= manufactured gases excl. biogas) (P10)		
Coal liquefaction	ECOALLIQ	Quantities of fuels consumed as energy for support operations at coal liquefaction plants.	C19	Coal Tar	Coal tar (P11)		

'Energy industries'				Products typically produced			
Label	Code	Description	Rev.2 code	Product labels as in AQ	Product labels (codes) as in PEFA		
1	2	4	3	5	6		
Liquefaction (LNG)/ regasification	ELNG	Quantities of fuels consumed as energy for support operations in natural gas liquefaction and regasification plants.	B09	Natural gas	Natural gas (P13)		
Gasification plants for biogas	EBIOGAS	Quantities of fuels consumed as energy for support operations in biogas gasification plants.		Biogas	Biogas (P25)		
Gas-to-liquid (GTL) plants EGTL		Quantities of fuels consumed as energy for support operations in gas-to-liquid conversion plants.	C19	Additives and oxygenates (without biofuels) Other hydrocarbons	Other petroleum products incl. additives/oxygenates and refinery feedstocks (P21) Crude oil, NGL, and other hydrocarbons (excl. bio) (P12)		
Charcoal production plants	ECHARCOAL	Quantities of fuels consumed as energy for support operations in charcoal production plants.	C20	Charcoal	Charcoal (P23)		
Oil refineries	EREFINER	Quantities of fuels consumed as energy for support operations at petroleum refineries.	C19	Refinery Gas Ethane LPG Naphtha Biogasoline Non-biogasoline Aviation Gasoline Gasoline Type Jet Fuel Bio Jet Kerosene Non-bio Jet Kerosene Other Kerosene Bio Road Diesel Bio Heating and Other Gas Oil NonBio Road Diesel NonBio Heating and Other Gas Oil Fuel oil-low Sulphur (< 1%) Fuel oil – high sulphur (>= 1%) White Spirit and SBP Lubricants Bitumen Paraffin Waxes Petroleum Coke Other Oil Products	Motor spirit (without bio) (P14) Kerosenes & jet fuels (without bio) (P15) Naphtha (P16) Transport diesel (without bio) (P17) Heating and other gasoil (without bio) (P18) Residual Fuel Oil (P19) Refinery gas, ethane & LPG (P20) Other petroleum products incl. additives/oxygenates and refinery feedstocks (P21)		
Oil and gas extraction	EOILGASEX	Quantities of fuels consumed in the oil and natural gas extraction facilities. Excludes pipeline losses (to be reported as distribution losses) and energy quantities used to operate pipelines (to be reported in the 'transport sector').	B06	Crude Oil Natural Gas Liquids Oil shale and oil sands Other hydrocarbons	Crude oil, NGL, and other hydrocarbons incl. oil shale/sands(excl. bio) P12 Natural gas (P13)		

	'Energy in	dustries'	NACE	Products typically produced			
Label Code Descriptio		Description	Rev.2 code	Product labels as in AQ	Product labels (codes) as in PEFA		
1 2		4	3	5	6		
				Natural gas			
Not elsewhere specified - Energy	ENONSPEC	Quantities of fuels related to energy activities not included elsewhere. If used, what is included under this heading should be explained in the report.		Not applicable			

4.3 Own account production of biofuels (e.g. fuel wood, black liquor)

The PEFA guidelines for the data collection 2017^{21} provide general instruction on how to 46. record supply and use of biofuels in PEFA which is not subject to this technical note on 'intraestablishment energy flows'. Moreover, the following paragraphs focus on how biofuels are recorded in AQ and in how far one may identify 'intra-establishment flows' of biofuels from the AQ.

47. AQ record the production (supply) of a wide range of solid, gaseous and liquid biofuels which may partly constitute 'intra-establishment. Notably, the producers of these biofuels are not included in the 'energy sector' addressed in the previous section²². Moreover, the AQ does not allow clearly identifying the economic activities producing these biofuels.

48. Some of the biofuels could potentially be own used by their producers and hence constitute 'intra-establishment energy flows'. For example, fuel wood produced and own used by private households or biogas produced and own used by waste water treatment plants.

49. As mentioned, AQ do not provide sufficient information on the producers of biofuels. Only the users of biofuels are recorded in sufficient detail. Hence, it is impossible to find out from the AQ whether these users use their own-produced biofuels.

Black liquor²³ is another example for a biofuel produced and used potentially by the same 50. economic activity; whereby the latter is not included in the 'energy sector' addressed in the previous section²². In this specific case the producer can be identified by the nature of the fuel: it is NACE C17 'Manufacture of paper and paper products' because black liquor is a by-product of the pulp and paper manufacturing. Due to its energy richness it is used as a biofuel; often by the producing paper manufacturer in order to obtain electricity and heat used for internal processes. In this latter case the supply and use of black liquor constitutes an 'intra-establishment energy flow'. The Annual Questionnaire 'renewables & waste' (Table 4) records the indigenous production of black liquor which may be entirely attributed to NACE C17.

²¹ See section 4.3, p. 17ff. 'Biomass based primary product' (downloadable from

https://ec.europa.eu/eurostat/web/environment/methodology) 22 PEFA guidelines provide an overview on possible NACE activities producing these biofuels.

²³ Black liquor is included in PEFA energy product grouping P23 'Wood, wood waste and other solid biomass, charcoal'.