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A suggestion for SEEA energy bridge tables

- The link between energy statistics, energy balances and energy accounts

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Content

1. Introduction

This paper presents some of the differences between conventions and methods applied for energy statistics, energy balances and energy accounts. The differences are naturally related to the character and the purpose of each of these three information systems. While some of the differences might be removed by a better coordination and co-operation, others are more fundamentally related to the purpose and role of the systems. This latter type of differences are thus inherent and instead of trying to remove them it is important to highlight and show the explicitly to the compilers and users so that confusion and misunderstandings are avoided.

Since, at this point, neither of the three fields, energy statistics, energy balances and energy accounts are implemented in exactly the same way in all countries and by all institutions, the description in this paper is based on certain generalisations, and readers who compare with their own systems, might miss some points or find the description of others imprecise[1].

This paper should be seen in relation to the paper "A suggestion for SEEA Standard Tables on Energy" (Gravgård Pedersen, 2008), which also presents the background for the work on the energy tables in relation to the SEEA[2].

Section 3-10 of this paper presents an overall description of some of the differences between energy statistics, energy balances and energy accounts. In section 11 the most important overall differences are highlighted and presented by the use of a so-called bridge table, which shows exactly which additions or subtractions are needed when one goes from the SEEA energy accounts to the energy balances.

2. Question to the London Group

What is your view on the presentation in this paper of the link between energy statistics, energy balances and SEEA energy accounts?

Does the suggested bridge table (Table 3) describe the differences between energy balances and energy accounts in an appropriate way?

[1] The description of the energy balances made here presents the general characteristics of the balances as they are presented in e.g. IEA, Energy Statistics Manual, 2005.

[2] System of Environmental-Economic Accounting, cf. UN (2003)

3. Energy statistics, energy balances and energy accounts

Energy statistics, balances and accounts are three statistical areas which provide information on energy supply and energy use. Energy statistics can be seen as the first level, which collects and compiles information on production, imports, and domestic use of energy products through separate surveys or by using other kind of statistics, e.g. business statistics and foreign trade statistics. Energy balances can be seen as a re-organising of the basic statistics which confronts the supply and use side, and show the transformation of energy within the economy. Similarly, energy accounts, can be seen as a re-organization and supplement to the energy statistics and balances, which consistently uses national accounts classifications and definitions. Both energy balances and the energy accounts apply the principle that supply equals use, but the supply and use are defined in different ways.

The main difference between the energy balances and the energy accounts concerns the classification and the scope with respect to which activities are included (boundary). The energy accounts use the resident principle to determine whether a specific energy transaction should be included as a foreign trade transaction and subsequently whether it is included in the energy use or not. The boundary of the energy balances follows the national territory just as energy statistics normally do.

Energy statistics and balances, in contrast to the energy accounts, do normally include physical data on energy only. One of main purposes of energy accounts is to link physical and monetary data in a consistent way.

Table 1 presents and overview of some main characteristics of the three systems. These characteristics are dealt with in more detail in the following sections.

Table 1: Comparison of Energy Statistics, Energy Balances and Energy Accounts

Energy Statistics	Energy Balances	Energy Accounts
Based on primary statistics (production, foreign trade, business survey)	Based on energy statistics	Based on energy statistics and balances
	Supply and and use balances	Supply and use balances
Specific energy surveys	Various formats (IEA, Eurostat, UN)	Uses national accounts SUT format
No specific format	Sectors and industries (ISIC)	Industries classified by ISIC
	Rearrangement of industries' energy use according to purpose (transport, auto-producers and heat for sale)	No re-arrangement of industries' energy use
	Detailed description of energy sector including technologies	Energy "sector" described by ISIC No description of technologies
	All transport in one separate sector	Own account transportation included in industries' activities
Territory principle	Territory principle	Resident principle
	Statistical differences	No statistical differences
Physical	Physical	Physical and monetary

4. Industries and sectors

The SEEA-E accounts use the classification scheme and supply-use table format of the national accounts, which describes the economic activities of ISIC industries and their interaction with the final demand categories.

In contrast, the energy balances are based on a classification by "sectors" (not to be confused with institutional sectors in the national accounts) such as the agricultural sector, the energy sector, the industry sector and the transport sector. It should be noted that even though the ISIC is used for both the energy accounts and the energy balances, they do *not* include the same activities, since the industries' own-account transportation is included as part of the industries' own energy use in the accounts, while it is allocated to the transport sector in the balances (see section on transport below).

The same goes for the non-energy industries' generation of electricity and generation of heat for sale. In the accounts this is regarded as secondary activities leading to the output of energy from the industries (if the activities do not overshadow other activities). An example is that the production of electricity and heat from the incineration of waste is an activity of the *ISIC 3821 - Treatment and disposal of non-hazardous waste*, unless the value added from the energy production exceeds that of other activities. In the balances the activities are always allocated to the energy sector.

5. Industries' own transport, transport industries and the transport sector.

In the energy balances all energy use related to road, rail, air, sea and pipeline transport are normally placed under one separate item: Transport. The only exception is energy used for fishing vessels, which are allocated to "Agriculture" (agriculture, forestry and fishing). Energy use for tractors and other off-road vehicles is not regarded as transport.

In the SEEA energy accounts the consumption of fuels by transport activities is, as mentioned above, attributed to the industries that is actually using the fuels. Fuel uses for transport service activities carried out by one unit for another unit for pay are allocated to *ISIC H. Transport and Storage*. An industry's energy use for operating its own lorries and cars, etc. is recorded alongside the same industry's other energy use. The use of fuels for private cars, boat, planes, etc. is allocated to the households' private consumption.

6. The energy industries and the energy transformation sector

The energy balances include a part describing the energy transformation (conversion). The energy transformation sector is broken down by various transformation technologies: Power stations, combined heat and power stations, heat plants, auto-producers, gas works, petroleum refineries, coke-oven plants, etc. The inputs for transformation include the energy sectors' own use of energy.

All production of energy, including industries' own generation of electricity and heat for sale, is allocated to the energy sector in the energy balances.

The SEEA accounts are based on ISIC and thus include the following specialised energy producing units:

Mining and quarrying:

05 - Mining of coal and lignite
06 - Extraction of crude petroleum and natural gas
07 - Mining of metal ores
08 - Other mining and quarrying

Energy production:

191 - Manufacture of coke oven products
192 - Manufacture of refined petroleum products
351 - Electric power generation, transmission and distribution
352 - Manufacture of gas; distribution of gaseous fuels through mains
353 - Steam and air conditioning supply

It should be noted that the ISIC classification of the energy production includes a distinction between the activities of producing electricity and heat. This distinction is artificial with regard to the combined production of heat and electricity. The energy balances includes the combined heat and power generation as a separate activity.

7. Supply and use concepts

The term supply is used differently in the energy balances compared to the energy SEEA-E supply and use tables.

The energy balances defines supply in the following way:

Supply (energy balances)
=
Production
+ Imports
+ Stock changes
- Exports
- International marine bunkers

The last item, international marine bunkers, covers the refuelling of ships (domestic and foreign) at the national territory for international voyages.

The supply concept of the energy balances can be characterised as a supply for use at the national territory. As a consequence the use concept of the energy balances excludes exports and fuel for ships undertaking international voyages.

The energy balances includes stock changes (Inventory changes) as part of the supply, i.e. an increase of inventories is decreasing the supply, while a decrease in inventory is increasing the supply.

The SEEA accounts defines, in contrast, supply according to the conventions of the national accounts:

Supply (SEEA)
=
Production
+ imports

The SEEA supply concept is broader than the supply concept of the energy balances, since it includes all energy being available for use, also for exports and international bunkering.

The two different definitions of supply is naturally reflected also on the use side. While the energy balances exclude the items subtracted from production on the supply side, the SEEA energy accounts does explicitly show these items on the use

side. The use concept of SEEA includes all final use as it is defined in the national accounts.

Inventory changes is recorded as a use in the SEEA, i.e. an increase of inventories is a use, while a decrease in inventory is negative use, which make more of the product available for other uses.

International marine bunkering is a use in the SEEA. It is intermediate consumption if the bunkering is undertaken by a ship owned by a resident, while it is recorded as exports if the ship is owned by a non-resident.

8. Products

To the extent possible the products in the SEEA-E accounts should be the same as the products in the energy balances. This is not necessarily the case at the moment, but as results from e.g. the IRES work on product classification becomes available, this should be introduced in the accounts and links to the product classifications used by the national accounts (CPC and HS) should be presented.

9. Statistical discrepancies

Energy balances do normally explicitly include an item for statistical discrepancies which sum up the inconsistencies that inevitable appears when different statistics are confronted and presented within a balance framework.

Following the tradition from national accounting, the SEEA energy accounts do not include an item for statistical discrepancies, and thus it is necessary for the accountant to find ways to avoid the statistical discrepancies. If the initial discrepancies are large it is necessary for the compiler to ensure that the discrepancies are not due to errors in the basic data or to see if additional information can be obtained to clarify the reasons for the discrepancies.

When the discrepancies are of a less magnitude different methods can be applied in order to eliminate them from the accounts. One method, often used in national accounts practice, is to make a proportional distribution. If for example there is a three per cent surplus of supply over use, the surplus of energy can be allocated to users (intermediate consumption, private consumption, inventories) in proportion to the already allocated energy use.

Another method is to adjust the energy product inventories of energy, i.e. to record the statistical discrepancies as part of the inventory changes. Since information on energy stocks is important with regards to national security and national supply of energy as well as including market sensitive information, using such artificial stock adjustments should be considered carefully, and it is suggested that significant adjustments should always be mentioned in a note to the SEEA accounts.

10. Boundaries – residence and territory

Energy statistics and balances use the territory principle, which means that the starting point is the energy flows which take place on the territory. The SEEA-E accounts include all energy flows related to the activities of resident units no matter if the activities take place inside or outside the territory.

The difference between the two principles is in fact a difference with regard to the statement of imports and exports. The energy balances do only regard energy products as imported and exported if the products physically cross the border. In

contrast, according to SEEA, a product is imported or exported if ownership changes between a resident and a non-resident unit.

Table 2 shows which additions that have to be made to the imports and exports of the energy balances in order to obtain the imports and exports of the SEEA accounts.

Table 2: The link between imports and exports of SEEA-E and energy balances

Imports (SEEA)	Exports (SEEA)
= Imports (energy balances)	= Exports (energy balances)
+ Energy products purchased by residents abroad	+ Energy products sold to non-residents on domestic territory
Of which:	*Of which:*
Bunkering of oil abroad for sea transport and fishing vessels	Foreign ships' and fishing vessels' bunkering of oil on territory
Bunkering of jet fuel and kerosene abroad for air transport	Foreign planes bunkering of fuel and kerosene on territory
Refuelling of gasoline and diesel for land transport	Foreign vehicles' refuelling of gasoline and diesel on territory
Tourists' and businessmen's purchase of energy abroad including fuel for private cars	Foreign tourists' and businessmen's purchase of energy on territory including fuel for private cars
Energy purchased by military bases on foreign territories	Energy sold to foreign military bases on national territory
Energy purchased by national embassies abroad	Energy sold to foreign embassies on national territory

11. Bridge table linking energy balances and accounts

In order to show the link between the energy flows presented by the energy balances and the energy flows presented by the SEEA accounts, it is suggested that countries should compile a bridge table along the lines shown in Table 3. The bridge table includes three parts: One part for the primary supply of energy, one for the conversion of energy, and one for the end use of energy.

For the primary supply of energy the table starts with the primary supply as recorded in the suggested SEEA standard table[3]. As explained above, the supply concept of the SEEA accounts is broader than the supply concept of the energy balances. Therefore, it is necessary to reduce the SEEA supply by the parts, which are not included in the supply according to the energy balances. Thus, the exports (according to general trade principles) and energy sold for international marine bunkers are subtracted. Similarly, the imports are reduced by the purchase of energy by residents abroad, since this is included in the SEEA imports concept. Finally, an adjustment is needed for the changes in inventories since these are recorded on the supply side of the balances, but on the use side of the SEEA accounts.

For the transformation of energy, the only adjustment relates to the energy sectors' own use of energy. It is suggested that the SEEA energy accounts records the industries' own use of energy (including energy for processes, transport, heating, and lighting) as end use and not as part of the input for transformation. Since the energy balances generally include the industries' own use of energy for processes as part of

[3] The concepts of primaty supply, transformation of energy and end use of energy are presented in Gravgård Pedersen, O. (2008).

the use for transformation, it is added when going from the SEEA concept to the energy balances concept of use of energy for conversion.

Since the end use per definition is equal to primary supply plus the net use for conversion, the transition from the SEEA end use to the end use (final use) of the energy balances involves adding and subtracting the same transition items as for the primary energy supply and the transformation. Thus, in order to go from the SEEA end use to the end use of the energy balances it is necessary to subtract the exports, and subtract energy bought by residents abroad and energy sold for international marine bunkers. Finally, inventory changes and the energy sector's own use of energy are excluded in order to reach the end use as recorded by the energy balances.

The bridge table, as it is presented here, does not include any items to account for statistical differences between the SEEA energy accounts and the energy balances. In practice it might be useful to include such an item in order to handle differences due to the use of e.g. different statistical sources.

Table 3: Bridge table for primary supply, conversion and end use of energy

		1.1+1.2	1.3+1.4	2,1	2.2-2.15	3	4,1	5,1	6	4	5	
		Hard coal, lignite and peat	Coke and gas	Crude oil	Other oil products	Natural gas	Primary electricity	Primary heat	Waste and renewables	Total electricity	Total heat	**Total**
		petajoules										
	Primary Supply											
S.1	Primary supply (SEEA)	270	20	610	50	230	20	50	70	30		1 350
S.2	- purchases by residents abroad				5							5
S.3	+ Inventory decrease	50			20							70
S.4	- Exports (general trade))				23	20				10		53
S.5	- international marine bunkers				1							1
S.6	= Supply (energy balances)	320	20	610	41	210	20	50	70	20		1 361
	Conversion/Transmission											
T.1	Net use for conversion (SEEA-E)	-320	60	-540	310	-90	-20	-50	-60	330	270	-110
T.2	- energy sectors' own use of energy			3						5		8
T.3	= Net use for conversion (energy balances)	-320	60	-543	310	-90	-20	-50	-60	325	270	-118
	End Use											
U.1 (=S.1-T.1)	End use (SEEA)	-50	80	70	360	140	0	0	10	360	270	1 240
U.2	- purchases by residents abroad				5							5
U.3	+ Inventory decrease	50			20							70
U.4	- Exports (general trade)				23	20				10		53
U.5	- international marine bunkers				1							1
U.6	- energy sectors own use of energy			3						5		8
U.7 (=S.6+T.3)	= End use (energy balances)	0	80	67	351	120	0	0	10	345	270	1243

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