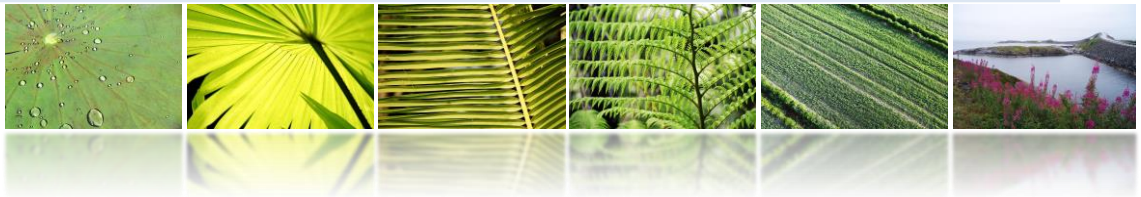
United Nations
Statistics Division

Energy balances



Agnieszka KOSCIELNIAK
Statistician, Energy Statistics Section

Beirut, Lebanon, 2 July 2019
UNSD/ESCWA Technical Assistance to Lebanon

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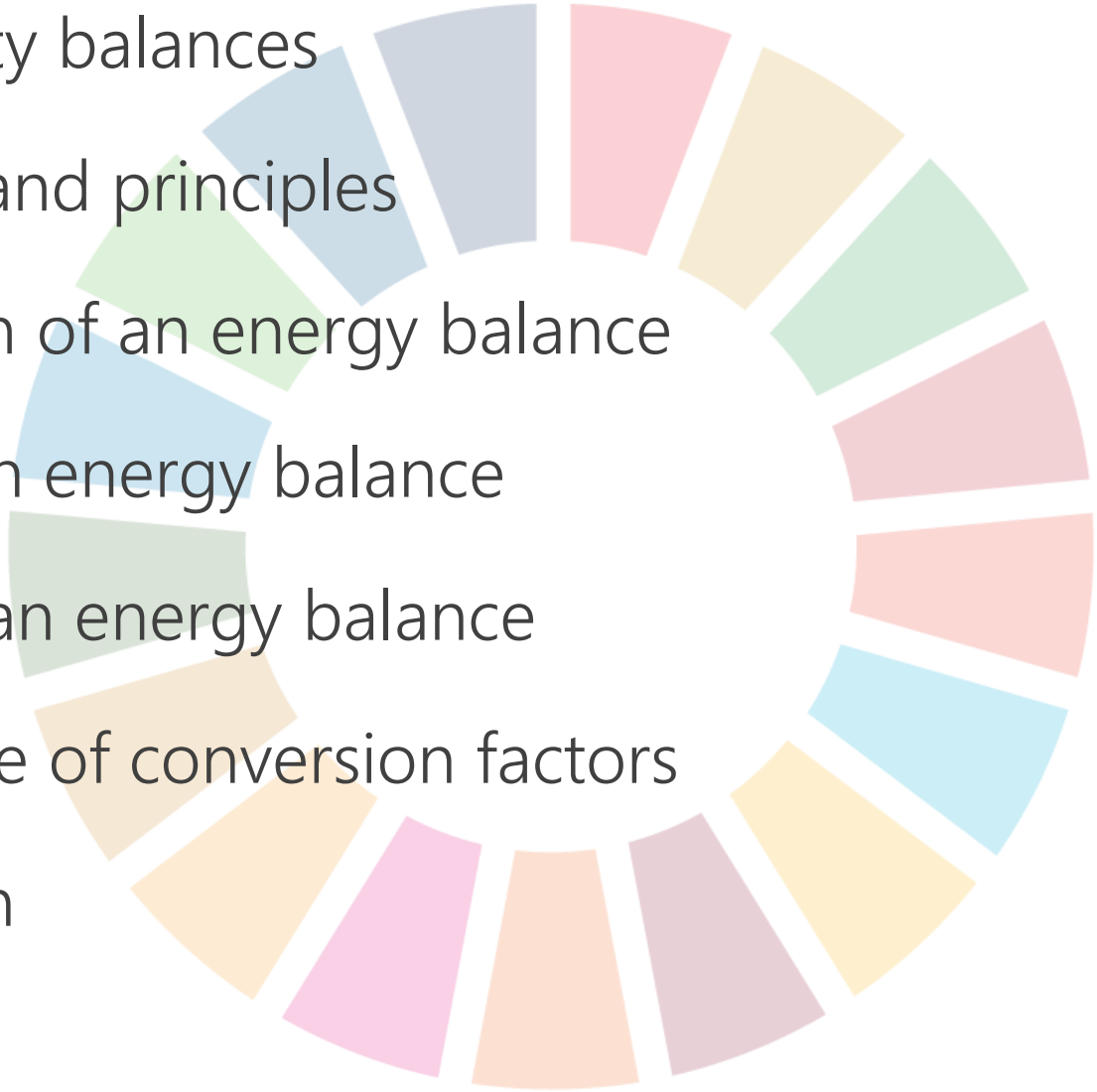
Overview

- Commodity balances
- Structure and principles
- Calculation of an energy balance
- Reading an energy balance
- Checking an energy balance
- Importance of conversion factors
- Conclusion



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Commodity balances

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Why to create commodity balances

- Commodity balances allow all data for all products to be presented in the same way
- Directly comparable concepts of key flows like production, own use, transformation inputs, transfers
- Check on data completeness (product by product)
- A key step in generating energy balances

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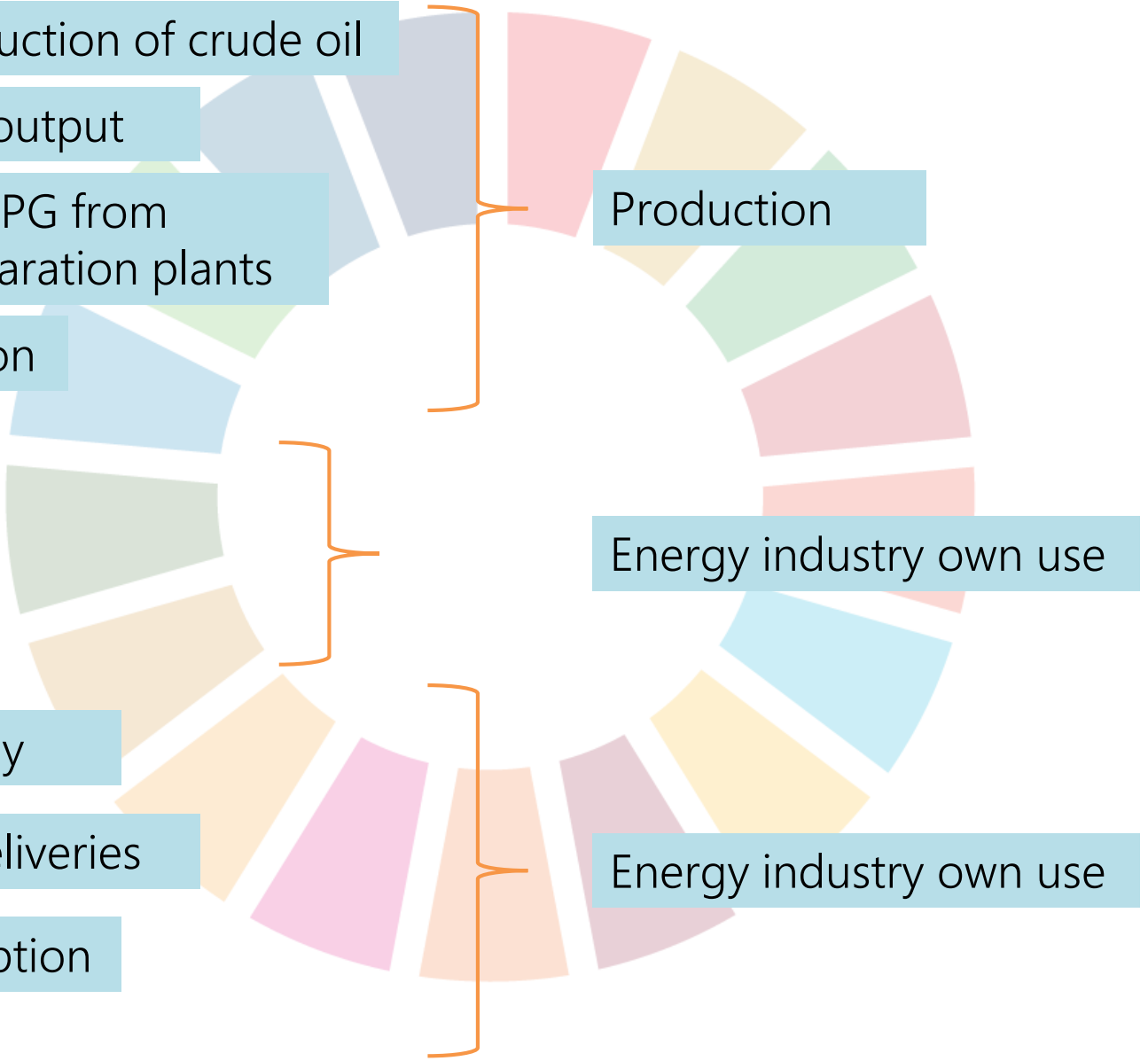
Energy data – commodity balances



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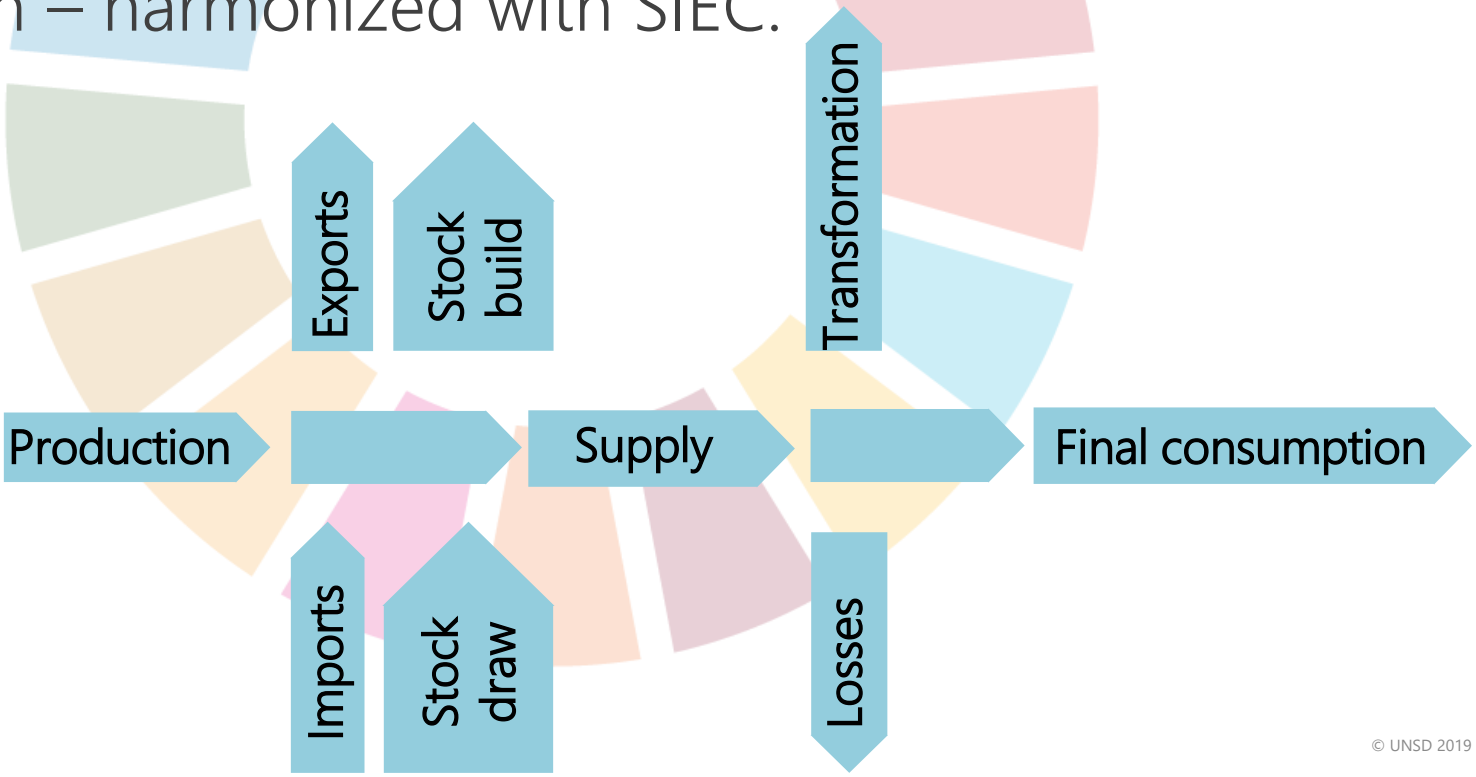
Commodity balances

- A commodity balance describes all flows of a single energy product, where supply and uses can be measured and compared.
- Products are as defined by the current energy product classification – harmonized with SIEC.



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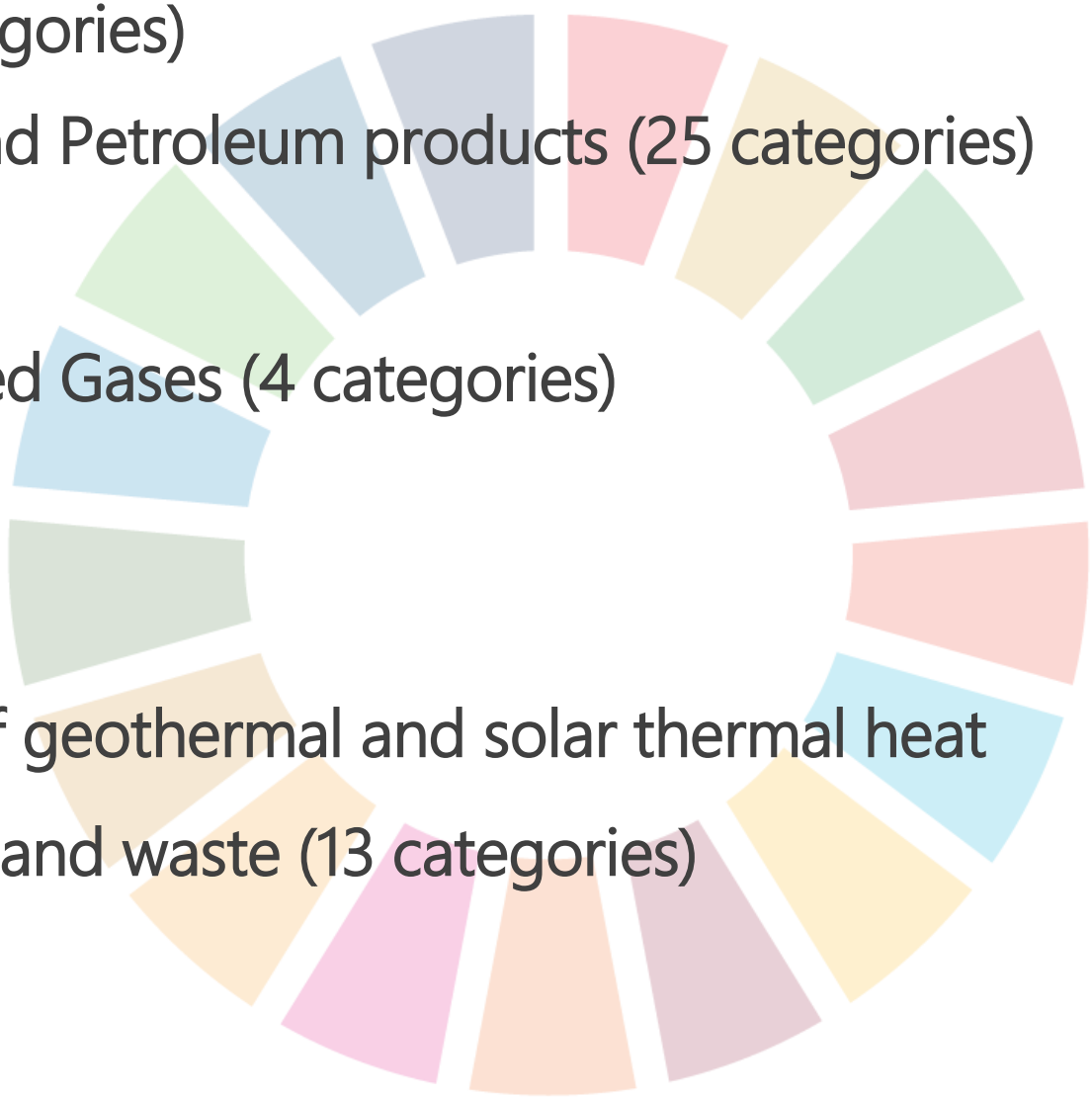
What products are collected annually?

- Coal (11 categories)
- Crude Oil and Petroleum products (25 categories)
- Natural gas
- Manufactured Gases (4 categories)
- Electricity
- Heat
- Direct use of geothermal and solar thermal heat
- Renewables and waste (13 categories)



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What flows are collected annually?

Production
- from plants/from refinery
- electricity and heat by source and type of plants

Receipt from other sources

Import and Export

Marine Bunkers

Stock Changes

=Total Energy Supply

Transfers and recycled products

Statistical Differences

Transformation Sector (21 sub-sectors)

Energy industries own use (17 sub-sectors)

Distribution Losses

Final Consumption =

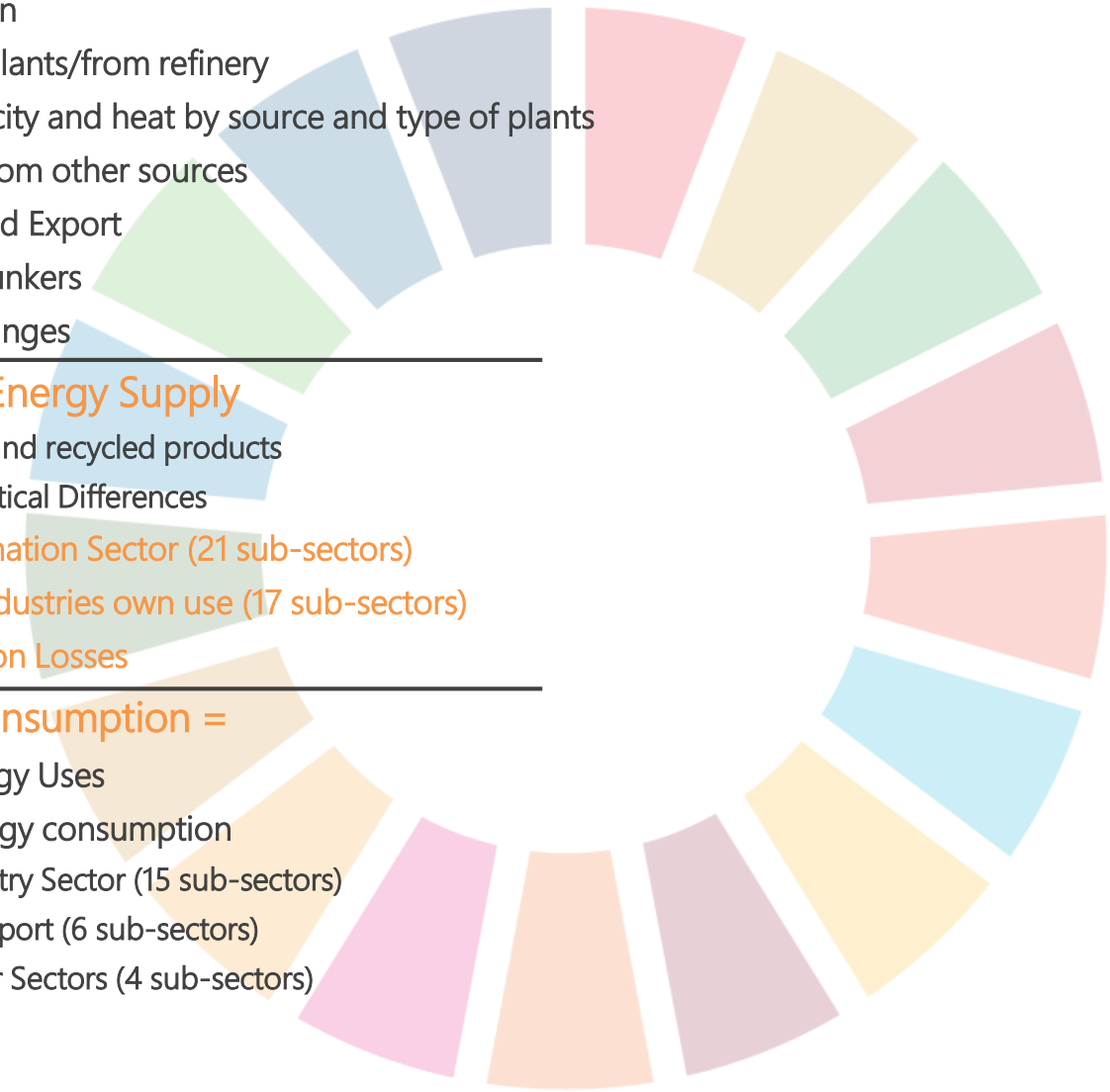
Non Energy Uses

Final energy consumption

Industry Sector (15 sub-sectors)

Transport (6 sub-sectors)

Other Sectors (4 sub-sectors)



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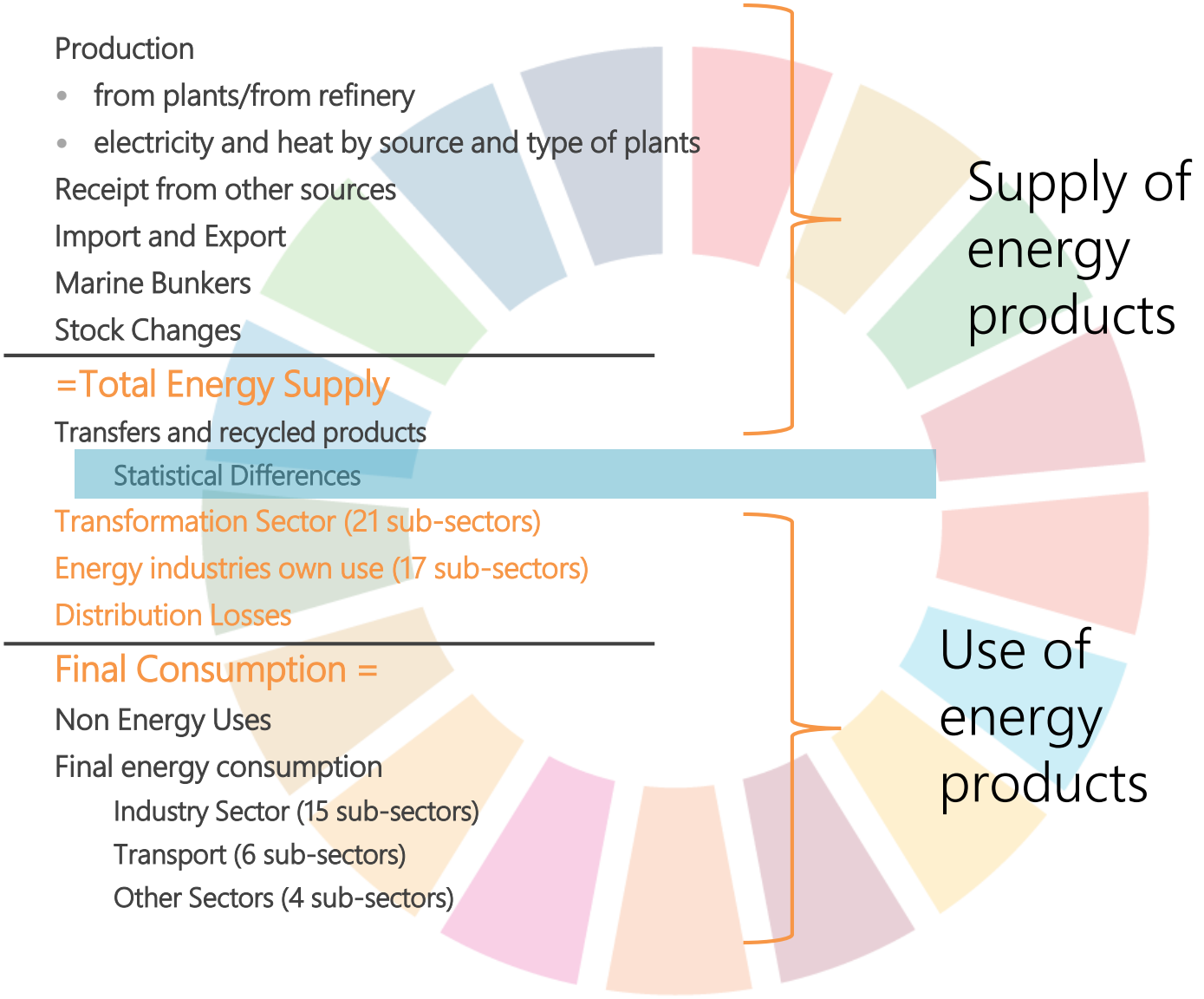
Supply and use of energy products



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Commodity balances

Commodity balances - basic energy statistics

- combinations of products and flows
- flows grouped under the commodity header

Limitations of commodity balances

- different units/calorific values - commodities incomparable
- production double counted

Motor Gasoline; Metric tons, thousand	2014	2015
Production	3627	3939
Receipts from other sources	206	238
Imports	371	363
Exports	672	762
Stock changes	-56	-22
Total energy supply	3588	3800
Final consumption	3577	3800
Final energy consumption	3577	3800
Transport	3572	3796
Road	3572	3796

Natural Gas ; Terajoules	2014	2015
Production	173349	171329
Imports	451673	464842
Exports	2880	2112
Total energy supply	623574	640849
Transformation	83409	96802
Energy industries own use	53212	55607
Losses	1259	1237
Final consumption	484232	493534
Non-energy uses	95888	98600
Final energy consumption	388344	394934

Fuelwood ; Cubic metres, thousand	2014	2015
Production	22044	22388
Total energy supply	22044	22388
Transformation	4657.8	4776.5
Transformation in electricity and heat	4657.8	4776.5
Final consumption	17386	17611
Non-energy uses		
Final energy consumption	17386	17611
Households	11544	11544

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Structure and principles

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Framework

An Energy Balance is an accounting framework that presents :

- country's energy supply and demand;
- all energy products entering, exiting and used within a national territory;
- energy transformation processes (inputs and outputs)

  in one energy unit

  using net calorific values to measure the energy content of energy products.

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Energy balance format

Lebanon

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2016											
Primary production	..	..	..	..	..	4971	..	1375	1017	7363	7363
Imports	7112	..	..	344593	..	413	..	248	..	352367	413
Exports	..	..	..	..	..	..	..	..	..	..	..
International marine bunkers	..	..	..	*-1212	..	..	..	..	..	*-1212	..
International aviation bunkers	..	..	..	*-10758	..	..	..	..	..	*-10758	..
Stock changes	..	..	..	..	..	..	..	..	..	..	..
Total energy supply	7112	..	..	332623	..	5384	..	1624	1017	347760	7776
Statistical difference	0	..	..	513	..	0	..	-4	0	509	1375
Transfers	..	..	..	..	..	..	..	..	..	..	..
Transformation	..	..	..	-188976	..	-585	..	65909	..	-123652	-585
Electricity plants	..	..	..	-188976	..	..	..	65909	..	-123067	..
CHP plants	..	..	..	..	..	..	..	..	..	..	..
Heat plants	..	..	..	..	..	..	..	..	..	..	..
Coke ovens	..	..	..	..	..	..	..	..	..	..	..
Briquetting plants	..	..	..	..	..	..	..	..	..	..	..
Liquefaction plants	..	..	..	..	..	..	..	..	..	..	..
Gas works	..	..	..	..	..	..	..	..	..	..	..
Blast furnaces	..	..	..	..	..	..	..	..	..	..	..
NGL plants & gas blending	..	..	..	..	..	..	..	..	..	..	..
Oil refineries	..	..	..	..	..	..	..	..	..	..	..
Other transformation	..	..	..	..	..	-585	..	..	..	-585	-585
Energy industries own use	..	..	..	..	..	..	..	0	..	0	..
Losses	..	..	..	..	..	..	..	-7042	..	-7042	..
Final consumption	7112	..	..	*143134	..	4799	..	60494	1017	216557	5816
Final energy consumption	7112	..	..	*139442	..	4799	..	60494	1017	212865	5816
Manufacturing, const., mining	7112	..	..	5381	..	..	..	15790	50	28333	50
Iron and steel	..	..	..	..	..	..	..	..	..	..	..
Chemical and petrochemical	..	..	..	..	..	..	..	..	..	..	..
Non-ferrous metals	..	..	..	..	..	..	..	..	..	..	..
Non-metallic minerals	7112	..	..	..	..	..	..	..	..	7112	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	..	..	..	..	..	..	..	..
Mining and quarrying	..	..	..	..	..	..	..	..	..	..	..
Food and tobacco	..	..	..	..	..	..	..	..	..	..	..
Paper, pulp and printing	..	..	..	..	..	..	..	..	..	..	..
Wood and wood products	..	..	..	..	..	..	..	..	..	..	..
Textile and leather	..	..	..	..	..	..	..	..	..	..	..
Construction	..	..	..	..	..	..	..	..	..	..	..
Industries n.e.s	0	..	..	5381	..	..	..	15790	50	21220	50
Transport	..	..	..	*93057	..	..	..	..	..	*93057	..
Road	..	..	..	*93057	..	..	..	..	..	*93057	..
Rail	..	..	..	..	..	..	..	..	..	..	..
Domestic aviation	..	..	..	..	..	..	..	..	..	..	..
Domestic navigation	..	..	..	..	..	..	..	..	..	..	..
Pipeline transport	..	..	..	..	..	..	..	..	..	..	..
Transport, n.e.s	..	..	..	..	..	..	..	..	..	..	..
Other	..	..	..	*41005	..	4799	..	44705	967	91476	5766
Agriculture, forestry, fishing	..	..	..	..	..	..	..	..	..	..	..
Commerce, public services	..	..	..	..	..	..	..	10076	307	10383	307
Households	..	..	..	*41005	..	4091	..	23854	660	*69610	4751
Other consumers	..	..	..	..	..	708	..	*10775	..	*11483	708
Non-energy use	..	..	..	3692	..	..	..	..	..	3692	..

Rows: Flows

Columns: Energy Products

Energy Supply

Transformation
+ Transfers
+ Energy industry own use
+Losses

Final consumption

Total

Renewables

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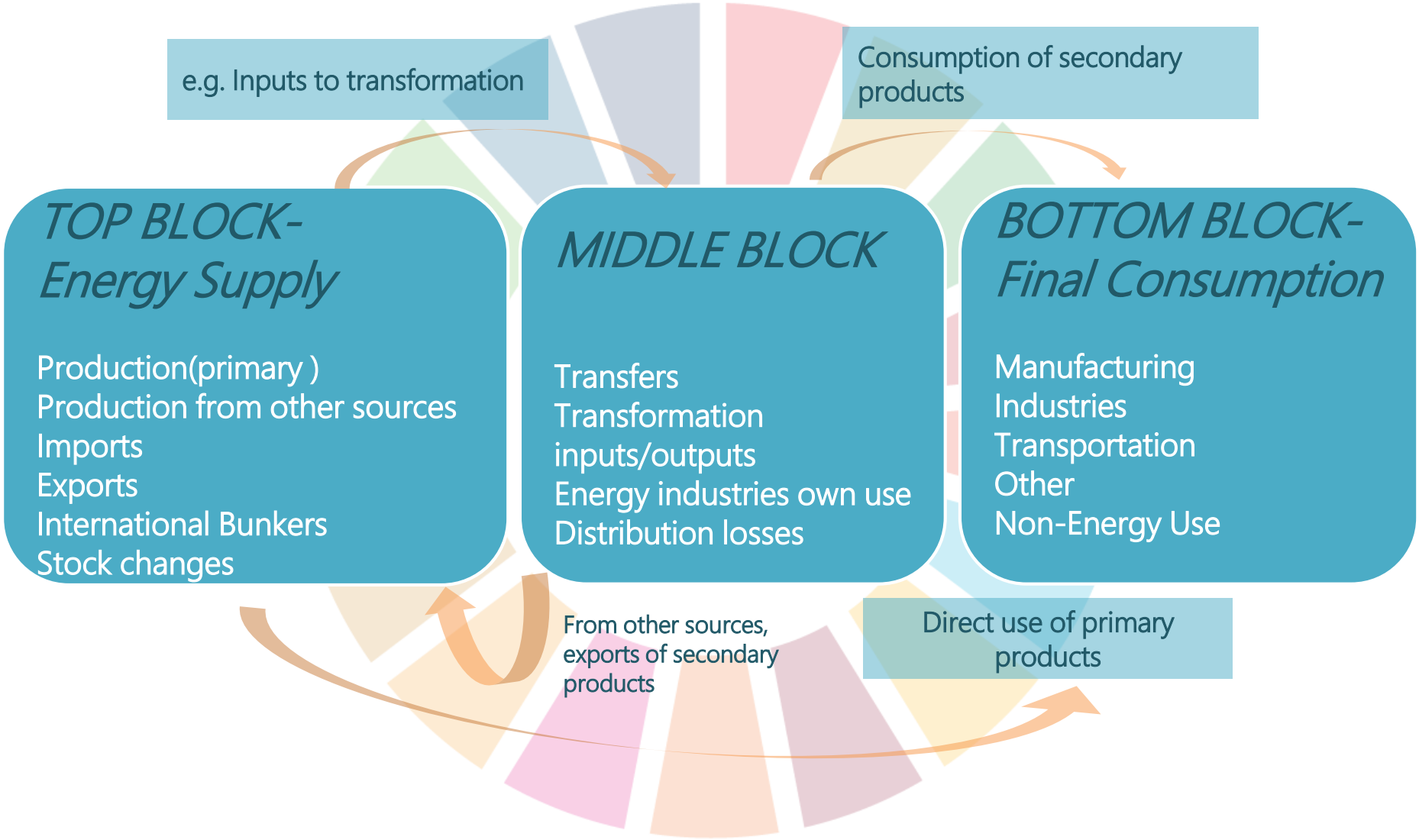
Main blocks



Source: Energy Statistics Compilers Manual, Figure 6.2

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Formats

- An energy balance can be highly detailed or presented in a more aggregated format.
- IRES recommends that countries collect and compile energy balances at a relatively high level of detail.

Table 8.2
Template of an aggregated energy balance

Item code	Flows	Energy products					
		E1	E2	E3	...	Total	of which: Renewables
1.1	Primary production						
1.2	Imports						
1.3	Exports						
1.4	International bunkers						
1.5	Stock change (closing-opening)						
1	Total energy supply						
2	Statistical difference						
3	Transfers						
4	Transformation processes						
5	Energy industries own use						
6	Losses						
7	Final consumption						
7.1	Final energy consumption						
7.1.1	Manufacturing, const. and non-fuel mining industries, total						
7.1.1.1	Iron and steel						
7.1.1.2	Chemical and petrochemical						
7.1.1.X	Other industries						
7.1.2	Transport, total						
7.1.2.1	Road						
7.1.2.2	Rail						
7.1.2.3	Domestic aviation						
7.1.2.4	Domestic navigation						
7.1.2.X	Other Transport						
7.1.3	Other, total						
7.1.3.1	*of which*: Agriculture, forestry and fishing						
7.1.3.2	*of which*: Households						
7.2	Non-energy use						

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Principles

An energy balance shows:

- Production of primary and secondary energy, external trade, stock changes, final energy consumption, and non-energy use.
- Inputs and outputs of transformation processes.
- A common energy unit is required.
  - IRES recommends Joule
- Net calorific values - to measure the energy content of energy products.

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Calculation of an energy balance

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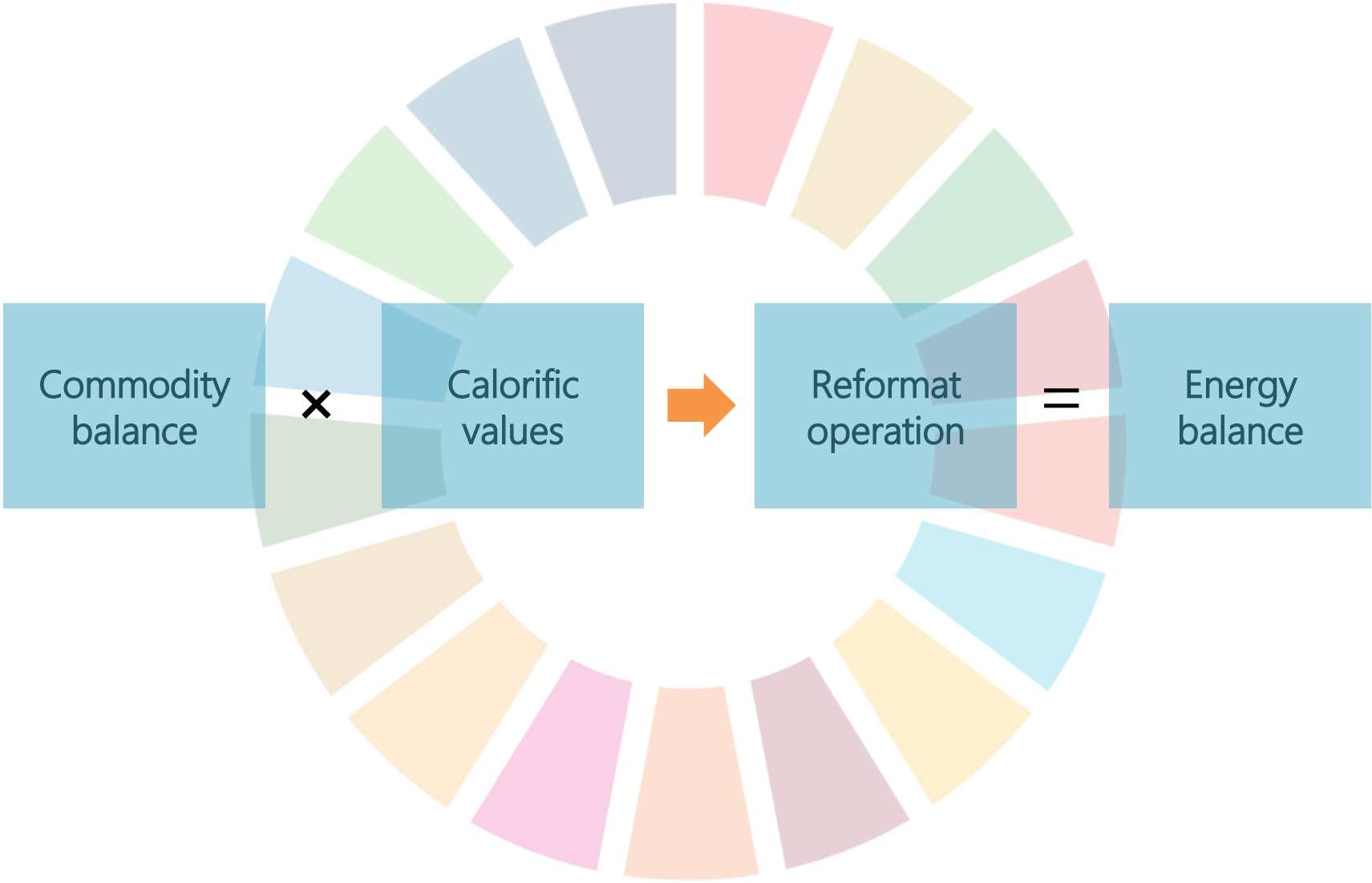
Calculation of an energy balance



Source: International Energy Agency, *Energy Statistics Manual*, Figure 7.1

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Commodity and energy balance

Commodity balance

Energy Supply

Production (primary +second.)
Production from other sources
Imports/Exports
International Bunkers
Stock changes

MIDDLE BLOCK

Transfers
Transformation inputs
Energy industries own use
Distribution losses

Final Consumption

Manufacturing Industries
Transportation
Other
Non-Energy Use

Energy balance

Energy Supply

Production (primary)
Production from other sources
Imports/Exports
International Bunkers
Stock changes

MIDDLE BLOCK

Transfers
Transformation inputs/outputs
Energy industries own use
Distribution losses

Final Consumption

Manufacturing Industries
Transportation
Other
Non-Energy Use

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Reading an energy balance

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Energy supply

Lebanon						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Primary production	..	..	*4971	1375	1017	**7363**
Imports	7112	344593	*413	248	..	**352367**
Exports	..	..	..	..	..	**..**
International marine bunkers	..	*-1212	..	..	..	***-1212**
International aviation bunkers	..	*-10758	..	..	..	***-10758**
Stock changes	..	..	..	..	..	**..**
Total energy supply	**7112**	**332623**	**5384**	**1624**	**1017**	**347760**

Total primary energy production

Total energy supply

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Energy supply

Lebanon						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Primary production	..	..	*4971	1375	1017	**7363**
Imports	7112	344593	*413	248	..	**352367**
Exports	..	..	..		..	**..**
International marine bunkers	..	*-1212	..	..	..	***-1212**
International aviation bunkers	..	*-10758	..	..	..	***-10758**
Stock changes	..	..	..	..	..	**..**
Total energy supply	**7112**	**332623**	**5384**	**1624**	**1017**	**347760**

- Electricity primary production is small, as it accounts only electricity from hydro, solar etc.
- Electricity from gas diesel or fuel oil is counted under transformation.

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Middle block

Lebanon, 2016						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Transfers	..	..	..	..	..	..
Transformation	..	**-188976**	**-585**	**65909**	..	**-123652**
Electricity plants	..	-188976	..	65909	..	**-123067**
Other transformation	..	..	-585	..	..	**-585**
Energy industries own use	..	..	..	**0**	..	**0**
Losses	..	..	..	-7042	..	**-7042**

- **Transfers** – comprise products transferred and interproduct transfers, present changes in use or identity of a product.
- **Transformation** – processes that convert an energy product into another energy product which, in general, is more suitable for specific uses
- **Energy industries own use** – consumption of fuels and energy for the direct support of the production, and preparation for use of fuels and energy
- **Losses** – losses during the transmission, distribution and transport of fuels, heat and electricity

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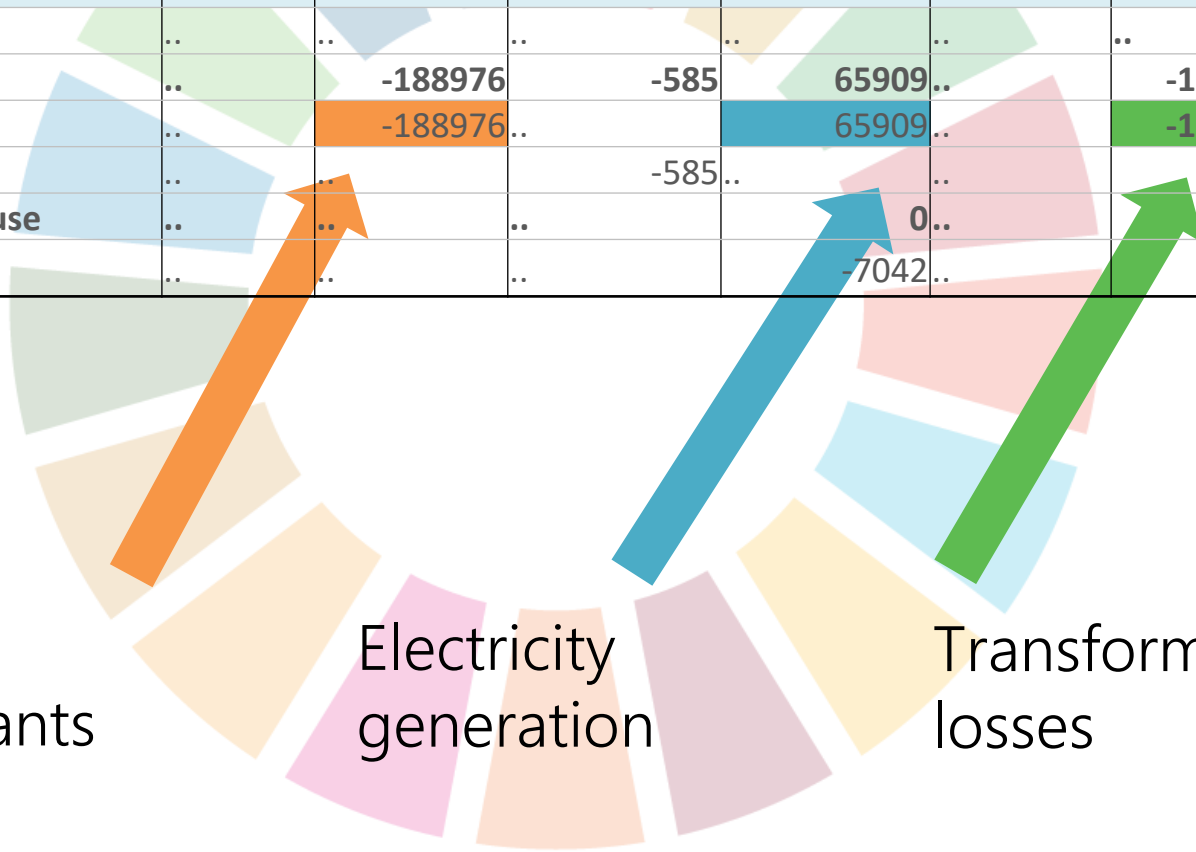
Transformation – electricity plants

Lebanon, 2016						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Transfers	..	..	..	..	..	..
Transformation	..	**-188976**	**-585**	**65909**	..	**-123652**
Electricity plants	..	-188976	..	65909	..	**-123067**
Other transformation	..	..	-585	..	..	**-585**
Energy industries own use	..	..	..	**0**	..	**0**
Losses	..	..	..	-7042	..	**-7042**



Input to electricity plants

Electricity generation

Transformation losses

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Energy balance – refinery flows

Country A	Primary coal	Coal products	Primary oil	Oil products	Natural gas	Biofuels and waste	Nuclear	Electricity	Heat	Total
Primary production	6,313.20	-	15,631.30	-	-7,357.40	14,629.60	162.3	467.6	182.9	44,744.20
Imports	330.3	10.7	1,619.80	5,118.00	-1.1	4.5	-	151.7	-	7,876.10
Exports	-1,879.20	-7.4	-12,134.60	-1,728.30	-3,34	-14.4	-	-134.8	-	-19,241.00
International bunkers	-	-	-	-546.5	-	-	-	-	-	-546.5
Stock changes	94.4	-2.2								
Total energy supply	**4,858.60**	**1.1**	**5**							
Transfers	-	-								
Transformation	**-3,777.90**	**121.4**	**-4**							
Electricity plants	-3,230.80	-	-67.1	-829.3	-2,481.80	-41.9	-162.3	2,446.80	-174.9	-4,541.20
CHP and heat plants	-1.1	-	-	-	-1.5	-21.5	-	3.6	11.6	-9
Coke ovens	-98.6	91	-	-	-	-	-	-	-	-7.6
Oil refineries	-	-	-4,382.30	4,340.60	-	-	-	-	-	-41.8
Other transformation	-447.3	30.4	-301.2	563.7	-154.9	-2,506.30	-	-	-	-2,815.50
Energy industries own use	-501.1	-0.7	-33.9	-124.6	-575.3	-0.01	-	-197.5	0+	-1,433.20
Losses	-		-34.3	-7.5	-21.1	-1.3	-	-371.4	-	-435.6

Refined products are secondary energy products, so oil products primary production is always 0

Refinery intake (negative sign)

Refinery output (positive sign)

Refinery losses

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Consumption

Lebanon, 2016						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Final consumption	**7112**	***143134**	**4799**	**60494**	**1017**	**216557**
Final energy consumption	7112	*139442	4799	60494	1017	**212865**
Manufacturing, const., mining	7112	5381	..	15790	50	**28333**
Non-metallic minerals	*7112*	..	..	..	..	***7112***
Industries n.e.s	*0*	*5381*	..	*15790*	*50*	***21220***
Transport	..	*93057	..	..	..	***93057**
Agriculture, forestry, fishing	..	..	..	..	..	**..**
Commerce, public services	..	..	..	10076	307	**10383**
Households	..	*41005	4091	23854	660	***69610**
Other consumers	..	..	708	*10775	..	***11483**
Non-energy use	..	3692	..	..	..	**3692**

- Breakdown on final energy consumption and non-energy consumption
- Transport consumption of all "on road" vehicles, not depending if it is private passenger car, bus or cargo.

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Checking an energy balance

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Checking an energy balances

- Transformation losses:
  - may highlight problems in either the basic energy data in commodity balances or in the conversion equivalents
- Statistical differences:
  - if much higher than in the commodity balance, could indicate problems with calorific values
  - Example: domestically produced lignite has a different calorific value from imported lignite.
- Generation efficiencies can be used to reconcile inputs and outputs from each transformation activity.

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Relevance of an energy balance

- In an ideal world “Supply” = “Demand”.
- An energy balance is an accounting framework that seeks to reconcile supply with demand. When aggregate supply is different from aggregate demand, the difference is shown as statistical difference.
- Energy balances are a powerful tool for validation and reconciliation.

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Importance of conversion factors

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Conversion to energy units

Physical units are:

- converted to energy units using Net Calorific Values (NCV),
- NCV ideally are measured frequently for different processes and sources and then averaged for the country/flow.

Ideally:

- Specific NCV for different flows, when available (most importantly, Production and Imports)
- Weighted-average NCV for all other flows (if only NCVs for Production and Imports are available).
- Default NCV if no information available (undesirable case)

If commodities are reported in energy units, the appropriate conversion to a common unit must be made.

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Renewable energy supply (% of TES) – NCVs

2016	Primary coal	Biofuels and waste	Total energy	*of which: renewable*	default Coal NCVs	default fuelwood NCVs
Primary production	3400	4567	9881	4835	**25.80**	**9.135**
Imports	748	10	2621	10	**25.80**	**9.135**
Exports	-319	-6	-1616	-6	**25.80**	**9.135**
Stock changes	-14		75		**25.80**	
Total energy supply	**3815**	**4571**	**10855**	**4839**		

Indicator

44.6%

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Renewable energy supply (% of TES) – NCVs

	Primary coal	Biofuels and waste	Total energy	*of which: renewable*
2016				
Primary production	2649	4567	9130	4835
Imports	673	10	2546	10
Exports	-349	-6	-1646	-6
Stock changes	-11		78	
Total energy supply	**2962**	**4571**	**10002**	**4839**

	Specific NCVs	default NCVs
	20.10	**9.135**
	23.20	**9.135**
	28.20	**9.135**
	20.10	

Indicator

48.4%

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Renewable energy supply (% of TES) – NCVs

Indicator

	Primary coal	Biofuels and waste	Total energy	*of which: renewable*		
2016					Specific NCVs	Specific NCVs
Primary production	2649	5749	10312	6017	20.10	11.50
Imports	673	13	2548	13	23.20	11.50
Exports	-349	-8	-1647	-8	28.20	11.50
Stock changes	-11		78		20.10	
Total energy supply	**2962**	5754	**11185**	**6012**		**53.8%**

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Renewable energy supply (% of TES) – NCVs

2016	Primary coal	Biofuels and waste	Total energy	*of which: renewable*	default Coal NCVs	default fuelwood NCVs
Primary production	3400	4567	9881	4835	**25.80**	**9.135**
Imports	748	10	2621	10	**25.80**	**9.135**
Exports	-319	-6	-1616	-6	**25.80**	**9.135**
Stock changes	-14		75		**25.80**	
Total energy supply	**3815**	**4571**	**10855**	**4839**		

Indicator **44.6%**

2016	Primary coal	Biofuels and waste	Total energy	*of which: renewable*	Specific NCVs	default NCVs
Primary production	2649	4567	9130	4835	**20.10**	**9.135**
Imports	673	10	2546	10	**23.20**	**9.135**
Exports	-349	-6	-1646	-6	**28.20**	**9.135**
Stock changes	-11		78		**20.10**	
Total energy supply	**2962**	**4571**	**10002**	**4839**		

48.4%

2016	Primary coal	Biofuels and waste	Total energy	*of which: renewable*	Specific NCVs	Specific NCVs
Primary production	2649	5749	10312	6017	**20.10**	**11.50**
Imports	673	13	2548	13	**23.20**	**11.50**
Exports	-349	-8	-1647	-8	**28.20**	**11.50**
Stock changes	-11		78		**20.10**	
Total energy supply	**2962**	**5754**	**11185**	**6012**		

53.8%

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Consumption data

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Before and after consumption surveys

Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2014											
Primary production	'15	..	..	..	..	14123	26622	7186	..	47945	21308
Imports	30	0	..	15460	82165	'9	..	741	..	98406	'9
Exports	-18	..	..	-18	-637	'-3	..	-4729	..	-5405	'-3
International marine bunkers	..	..	..	..	..	..	..	..	..	..	..
International aviation bunkers	..	..	..	'-1784	..	..	..	..	..	'-1784	..
Stock changes	..	..	..	..	..	..	..	..	..	..	..
Total energy supply	27	0	..	13658	81529	14129	26622	3197	..	139162	21315
Statistical difference	0	0	..	0	0	'6	0	-3	0	3	7192
Transfers	..	..	..	..	..	..	..	..	..	..	..
Transformation	..	..	..	..	'-26089	..	-26622	20714	'127	-31869	..
Electricity plants	..	..	..	..	..	..	-26622	8874	..	-17748	..
CHP plants	..	..	..	..	'-26089	..	..	11840	'127	'-14121	..
Heat plants	..	..	..	..	..	..	..	..	0	0	..
Coke ovens	..	..	..	..	..	..	..	..	..	..	..
Briquetting plants	..	..	..	..	..	..	..	..	..	..	..
Liquefaction plants	..	..	..	..	..	..	..	..	..	..	..
Gas works	..	..	..	..	..	..	..	..	..	..	..
Blast furnaces	..	..	..	..	..	..	..	..	..	..	..
NGL plants & gas blending	..	..	..	..	..	..	..	..	..	..	..
Oil refineries	..	..	..	..	..	..	..	..	..	..	..
Other transformation	..	..	..	..	0	..	..	..	..	0	..
Energy industries own use	..	..	..	..	..	..	..	-1300	0	-1300	..
Losses	..	..	..	..	..	..	..	-3344	..	-3344	..
Final consumption	'27	..	..	'13658	'55440	'14123	..	19271	'127	'102645	'14123
Final energy consumption	'27	..	..	'12173	'55440	'14123	..	19271	'127	'101160	'14123
Manufacturing, const., mining	..	..	..	..	'11914	..	..	5324	'71	'17309	..
Iron and steel	..	..	..	..	..	..	..	61	..	61	..
Chemical and petrochemical	..	..	..	..	..	..	..	72	..	72	..
Non-ferrous metals	..	..	..	..	..	..	..	..	..	..	..
Non-metallic minerals	..	..	..	..	..	..	..	..	..	..	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	..	..	..	..	..	..	..	..
Mining and quarrying	..	..	..	..	..	..	..	..	..	..	..
Food and tobacco	..	..	..	..	..	..	..	..	..	..	..
Paper, pulp and printing	..	..	..	..	..	..	..	..	..	..	..
Wood and wood products	..	..	..	..	..	..	..	..	..	..	..
Textile and leather	..	..	..	..	..	..	..	..	..	..	..
Construction	..	..	..	..	..	..	..	..	..	..	..
Industries n.e.s	..	..	..	..	'11914	..	..	5191	'71	'17176	..
Transport	..	..	..	'5715	'15863	..	..	414	..	'21992	..
Road	..	..	..	'5715	'15863	..	..	..	..	'21578	..
Rail	..	..	..	..	..	..	..	274	..	274	..
Domestic aviation	..	..	..	..	..	..	..	..	..	..	..
Domestic navigation	..	..	..	..	..	..	..	..	..	..	..
Pipeline transport	..	..	..	..	..	..	..	..	..	..	..
Transport, n.e.s	..	..	..	..	..	..	..	140	..	140	..
Other	'27	..	..	'6458	'27663	'14123	..	13532	'56	'61859	'14123
Agriculture, forestry, fishing	..	..	..	..	..	..	..	619	..	619	..
Commerce, public services	..	..	..	..	..	..	..	1177	..	1177	..
Households	'27	..	..	..	'20572	..	..	7229	'56	'27884	..
Other consumers	..	..	..	'6458	'7091	'14123	..	4507	..	'32179	'14123
Non-energy use	..	..	..	'1485	..	..	..	..	..	'1485	..

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Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2016											
Primary production	31	..	..	..	..	10054	25715	8471	..	44271	18525
Imports	48	13	..	15095	77353	263	..	990	..	93762	263
Exports	-31	..	..	0	-665	0	..	-4424	..	-5121	0
International marine bunkers	..	..	..	..	..	..	..	..	..	..	..
International aviation bunkers	..	..	..	-1943	..	..	..	..	..	-1943	..
Stock changes	..	..	..	-286	-66	..	..	..	..	-352	..
Total energy supply	48	13	..	12867	76622	10317	25715	5036	..	130617	18788
Statistical difference	0	0	..	-2	-132	7	0	0	0	-127	8478
Transfers	..	..	..	..	..	..	..	..	..	..	..
Transformation	..	..	..	..	-20912	..	-25715	17863	34	-28729	..
Electricity plants	..	..	..	..	-20727	..	-25715	17798	..	-28643	..
CHP plants	..	..	..	..	-185	..	..	65	34	-86	..
Heat plants	..	..	..	..	..	..	..	..	0	0	..
Coke ovens	..	..	..	..	..	..	..	..	..	..	..
Briquetting plants	..	..	..	..	..	..	..	..	..	..	..
Liquefaction plants	..	..	..	..	..	..	..	..	..	..	..
Gas works	..	..	..	..	..	..	..	..	..	..	..
Blast furnaces	..	..	..	..	..	..	..	..	..	..	..
NGL plants & gas blending	..	..	..	..	..	..	..	..	..	..	..
Oil refineries	..	..	..	..	..	..	..	..	..	..	..
Other transformation	..	..	..	..	0	..	..	..	..	0	..
Energy industries own use	..	..	..	..	-229	..	..	-1177	-2	-1408	..
Losses	..	..	..	..	-4964	..	..	-2542	-21	-7526	..
Final consumption	48	'13	..	12869	50649	10309	..	19181	11	93080	10309
Final energy consumption	47	'13	..	11874	50649	10309	..	19181	11	92084	10309
Manufacturing, const., mining	..	'13	..	881	6625	71	..	5872	0	13461	71
Iron and steel	..	..	..	0	521	..	..	259	..	781	..
Chemical and petrochemical	..	..	..	0	65	..	..	54	..	119	..
Non-ferrous metals	..	..	..	166	512	..	..	842	..	1520	..
Non-metallic minerals	..	..	..	19	2258	..	..	400	..	2676	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	1	32	0	..	76	..	109	0
Mining and quarrying	..	..	..	636	343	..	..	2880	..	3759	..
Food and tobacco	..	..	..	25	2623	..	..	961	..	3609	..
Paper, pulp and printing	..	..	..	..	146	..	..	72	..	218	..
Wood and wood products	..	..	..	..	3	70	..	11	..	84	70
Textile and leather	..	..	..	..	17	..	..	36	..	53	..
Construction	..	..	..	35	151	..	..	112	..	297	..
Industries n.e.s	..	'13	..	0	53	0	..	169	0	235	0
Transport	..	..	..	9536	16187	..	..	360	..	26083	..
Road	..	..	..	9536	16187	..	..	0	..	25723	..
Rail	..	..	..	..	..	..	..	259	..	259	..
Domestic aviation	..	..	..	..	..	..	..	..	..	..	..
Domestic navigation	..	..	..	..	..	..	..	..	..	..	..
Pipeline transport	..	..	..	..	0	..	..	..	..	0	..
Transport, n.e.s	..	..	..	..	..	..	..	101	..	101	..
Other	47	..	..	1457	27838	10239	..	12949	11	52540	10239
Agriculture, forestry, fishing	..	..	..	1391	..	..	..	414	..	1805	..
Commerce, public services	37	..	..	27	7712	..	..	3247	..	11024	..
Households	10	..	..	35	20125	10239	..	6674	11	37095	10239
Other consumers	..	..	..	3	..	..	..	2614	..	2617	..
Non-energy use	1	..	..	995	..	..	..	..	..	996	..

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Data source: ArmStat

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Industry

Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2014											
Final consumption	*27	..	..	*13658	*55440	*14123	..	19271	*127	*102645	*14123
Final energy consumption	*27	..	..	*12173	*55440	*14123	..	19271	*127	*101160	*14123
Manufacturing, const., mining	..	..	..	..	*11914	..	..	5324	*71	*17309	..
Iron and steel	..	..	..	..	..	..	..	61	..	61	..
Chemical and petrochemical	..	..	..	..	..	..	..	72	..	72	..
Non-ferrous metals	..	..	..	..	..	..	..	..	..	..	..
Non-metallic minerals	..	..	..	..	..	..	..	..	..	..	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	..	..	..	..	..	..	..	..
Mining and quarrying	..	..	..	..	..	..	..	..	..	..	..
Food and tobacco	..	..	..	..	..	..	..	..	..	..	..
Paper, pulp and printing	..	..	..	..	..	..	..	..	..	..	..
Wood and wood products	..	..	..	..	..	..	..	..	..	..	..
Textile and leather	..	..	..	..	..	..	..	..	..	..	..
Construction	..	..	..	..	..	..	..	..	..	..	..
Industries n.e.s	..	..	..	..	*11914	..	..	5191	*71	*17176	..

Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2018											
Final consumption	48	*13	..	12869	50649	10309	..	19181	11	93080	10309
Final energy consumption	47	*13	..	11874	50649	10309	..	19181	11	92084	10309
Manufacturing, const., mining	..	*13	..	881	6625	71	..	5872	0	13461	71
Iron and steel	..	..	..	0	521	..	..	259	..	781	..
Chemical and petrochemical	..	..	..	0	65	..	..	54	..	119	..
Non-ferrous metals	..	..	..	166	512	..	..	842	..	1520	..
Non-metallic minerals	..	..	..	19	2258	..	..	400	..	2676	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	1	32	0	..	76	..	109	0
Mining and quarrying	..	..	..	636	243	..	..	2880	..	3759	..
Food and tobacco	..	..	..	25	2623	..	..	961	..	3609	..
Paper, pulp and printing	..	..	..	..	146	..	..	72	..	218	..
Wood and wood products	..	..	..	..	3	70	..	11	..	84	70
Textile and leather	..	..	..	..	17	..	..	36	..	53	..
Construction	..	..	..	35	151	..	..	112	..	297	..
Industries n.e.s	..	*13	..	0	53	0	..	169	0	235	0

Others

Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2014											
Other	*27	..	..	*6458	*27663	*14123	..	13532	*56	*61859	*14123
Agriculture, forestry, fishing	..	..	..	..	..	..	..	619	..	619	..
Commerce, public services	..	..	..	..	..	..	..	1177	..	1177	..
Households	*27	..	..	..	*20572	..	..	7229	*56	*27884	..
Other consumers	..	..	..	*6458	*7091	*14123	..	4507	..	*32179	*14123
Non-energy use	..	..	..	*1485	..	..	..	..	..	*1485	..

Armenia

Terajoules

	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2016											
Other	47	..	..	1457	27838	10239	..	12949	11	52540	10239
Agriculture, forestry, fishing	..	..	..	1391	..	..	..	414	..	1805	..
Commerce, public services	37	..	..	27	7712	..	..	3247	..	11024	..
Households	10	..	..	35	20126	10239	..	6674	11	37095	10239
Other consumers	..	..	..	3	..	..	..	2614	..	2617	..
Non-energy use	1	..	..	995	..	..	..	..	..	996	..

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Conclusion

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Conclusion

While the structure of an energy balance depends on a country's energy production and consumption patterns and the level of detail that the country requires, it is recommended that common approaches be followed to ensure international comparability and consistency.

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Conclusion

To verify if your energy balance follows international recommendations please refer to IRES "recommendations and encouragements".

Table 1.1 Summary of the main recommendations and encouragements contained in IRES

Chapter VIII. Energy balances	
8.1	The energy balance **should be** as complete as possible so that all energy flows are, in principle, accounted for. It **should be** based firmly on the first law of thermodynamics, which states that the amount of energy within any closed system is fixed and can neither be increased nor diminished unless energy is brought into or sent out from that system.
8.5	It is **recommended** that countries collect data at a level of detail that allows for the compilation of a detailed energy balance, as presented in table 8.1. When such a level of detail is not available or practical, it is recommended that countries, at a minimum, follow the template of the aggregated energy balance presented in table 8.2.
8.9 (*a*)	The energy balance is compiled with respect to a clearly defined reference period. In this respect, it is **recommended** that countries, as a minimum, compile and disseminate an energy balance on an annual basis.
8.9(*h*)	All entries in the energy balance **should be** expressed in one energy unit (it is **recommended** that Joule is used for this purpose, although countries could use other energy units, such as toe, tce, etc.). The conversion between energy units should be through the application of appropriate conversion factors (see chapter IV) and the applied factors should be reported with the energy balance to make any conversion from physical units to Joules or other units transparent and comparable.
8.9(*j*)	In the case of electricity generation from primary heat (nuclear, geothermal and concentrating solar), it is **recommended** that an estimate of the heat input be used based on an efficiency of 33 per cent for nuclear and concentrating solar, and 10 per cent for geothermal as a default, unless country- or case-specific information is available.
8.10	While the structuring of an energy balance depends on a country's energy production and consumption patterns and the level of detail that the country requires, it is **recommended** that common approaches be followed to ensure international comparability and consistency (see section 8.C).
8.12	While different columns (except "total") represent various energy products, they might be grouped and sequenced in a way that adds to the analytical value of the balance. In this connection, it is **recommended** that: (*a*) Groups of energy products be mutually exclusive and based on SIEC; (*b*) The column "total" follow the columns for individual energy products (or groups of products); (*c*) The column "total" be followed by supplementary columns containing additional subtotals such as "renewables". The definition of such subtotals and any additional clarification on the column's coverage should be provided in appropriate explanatory notes.
8.14	It is **recommended** that an energy balance contain three main blocks of rows as follows: (*a*) Top block—flows representing energy entering and leaving the national territory, as well as stock changes to provide information on the supply of energy on the national territory during the reference period; (*b*) Middle block—flows showing how energy is transformed, transferred, used by energy industries for own use and lost in distribution and transmission; (*c*) Bottom block—flows reflecting final energy consumption and non-energy use of energy products.

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