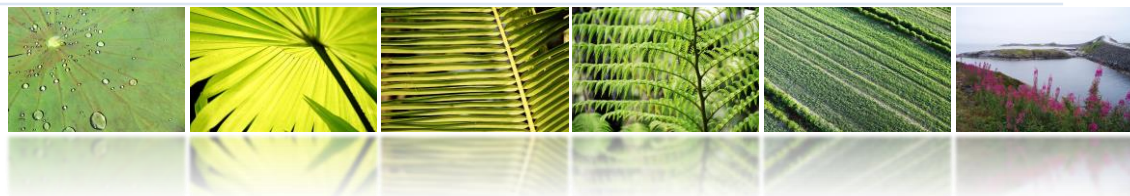




United Nations
Statistics Division

Energy balances

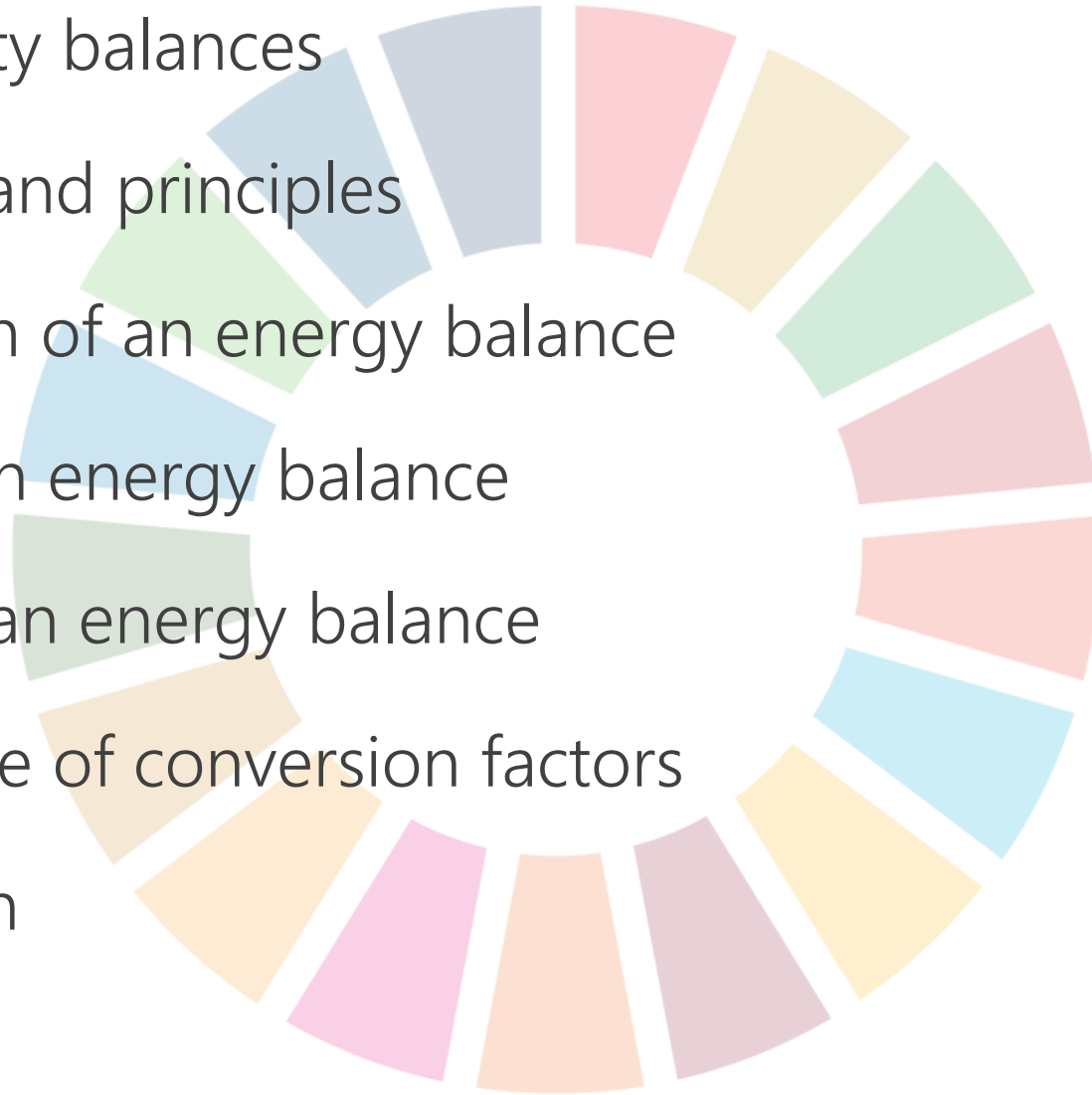


Agnieszka KOSCIELNIAK
Statistician, Energy Statistics Section

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

Overview

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

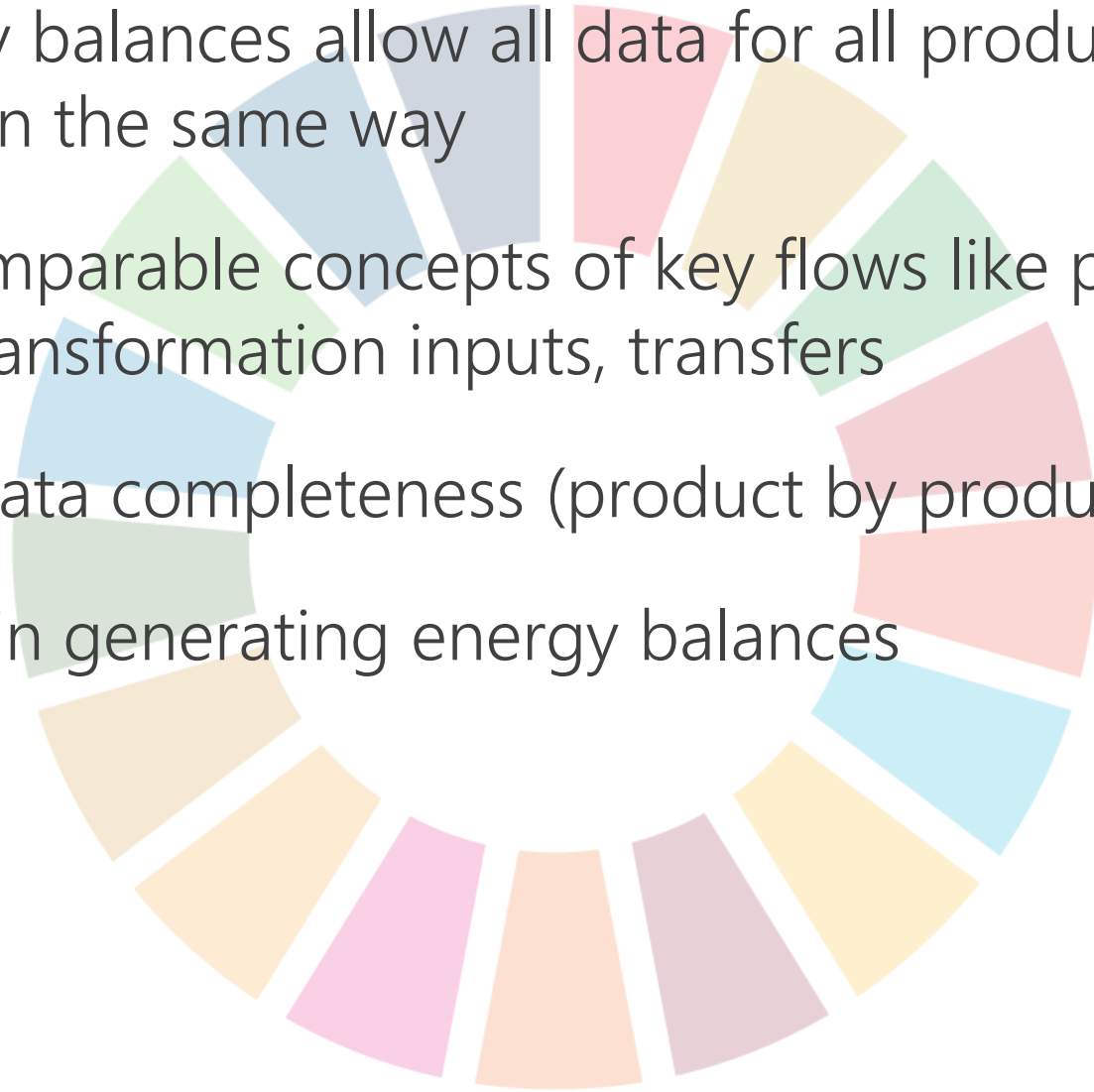




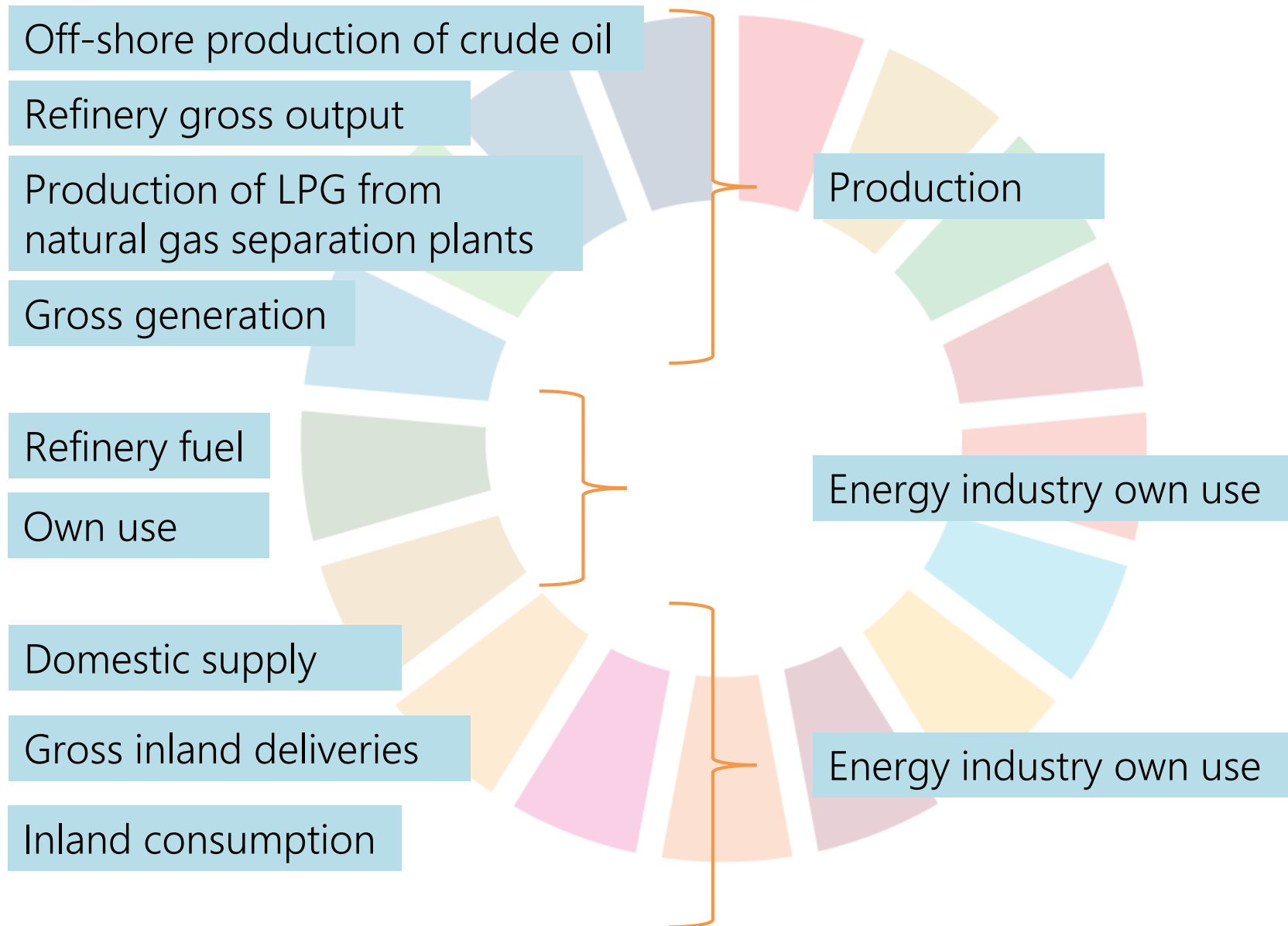
Commodity balances

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

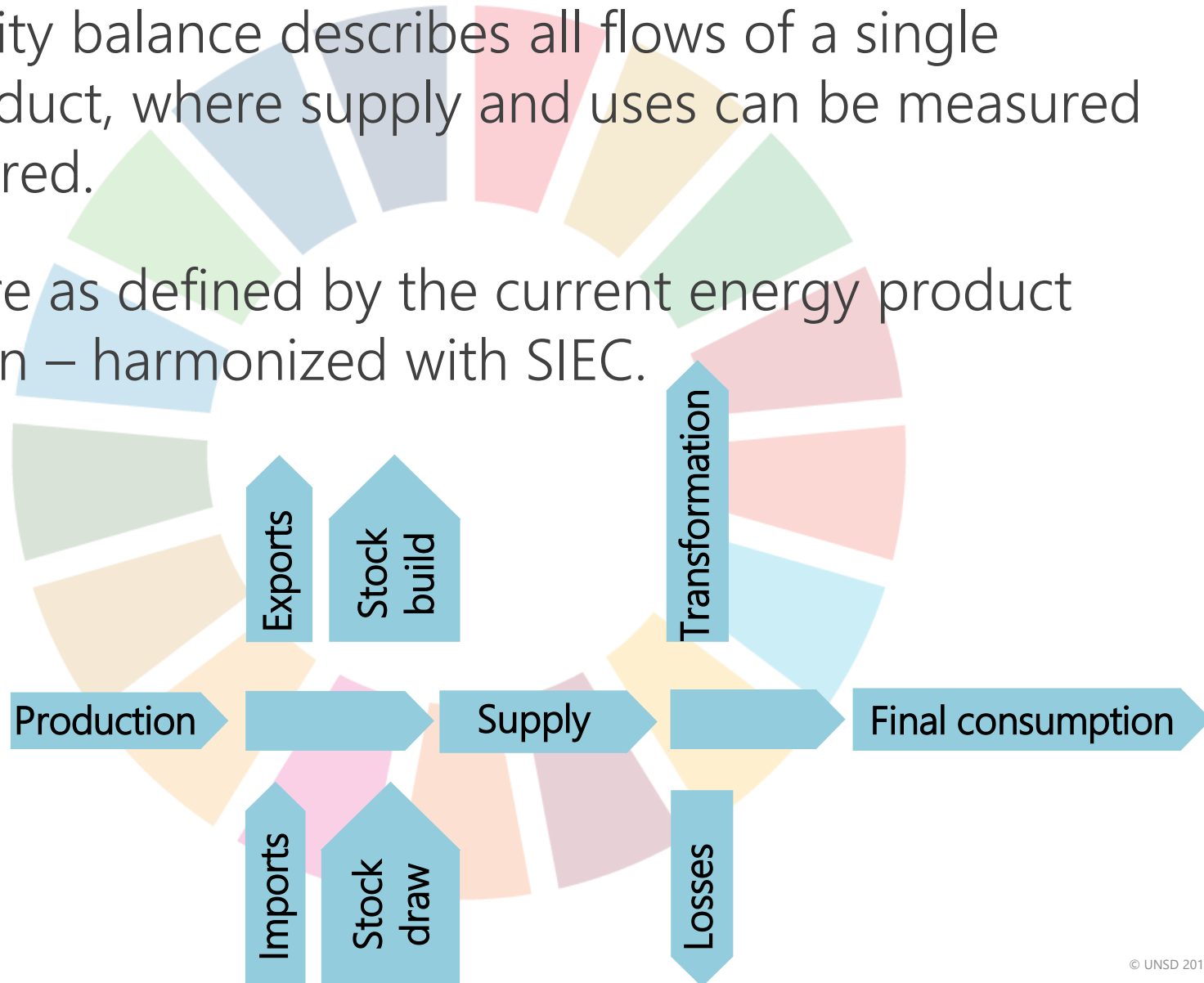


Energy data – commodity balances



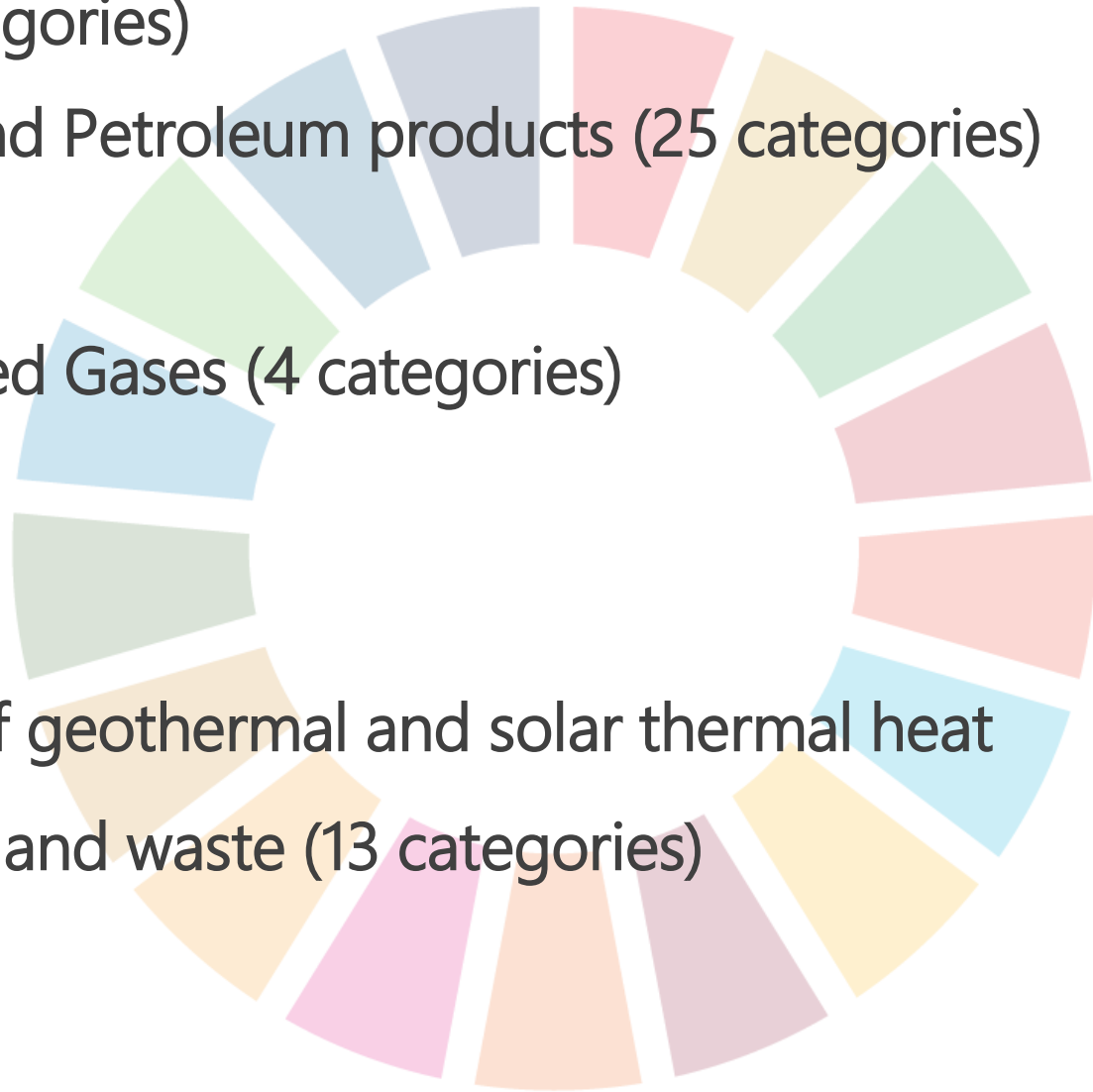
Commodity balances

- 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.



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)



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 =

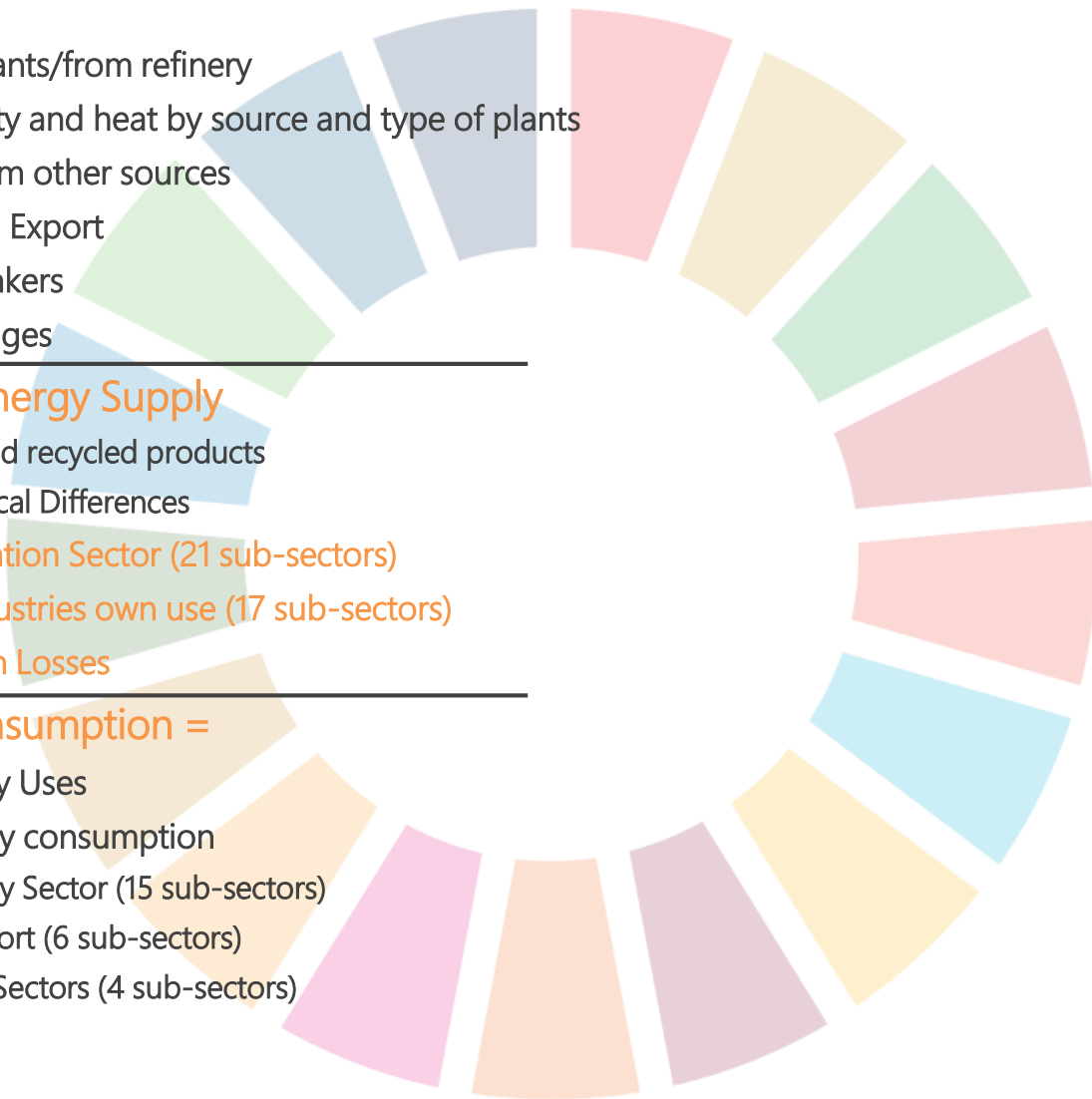
Non Energy Uses

Final energy consumption

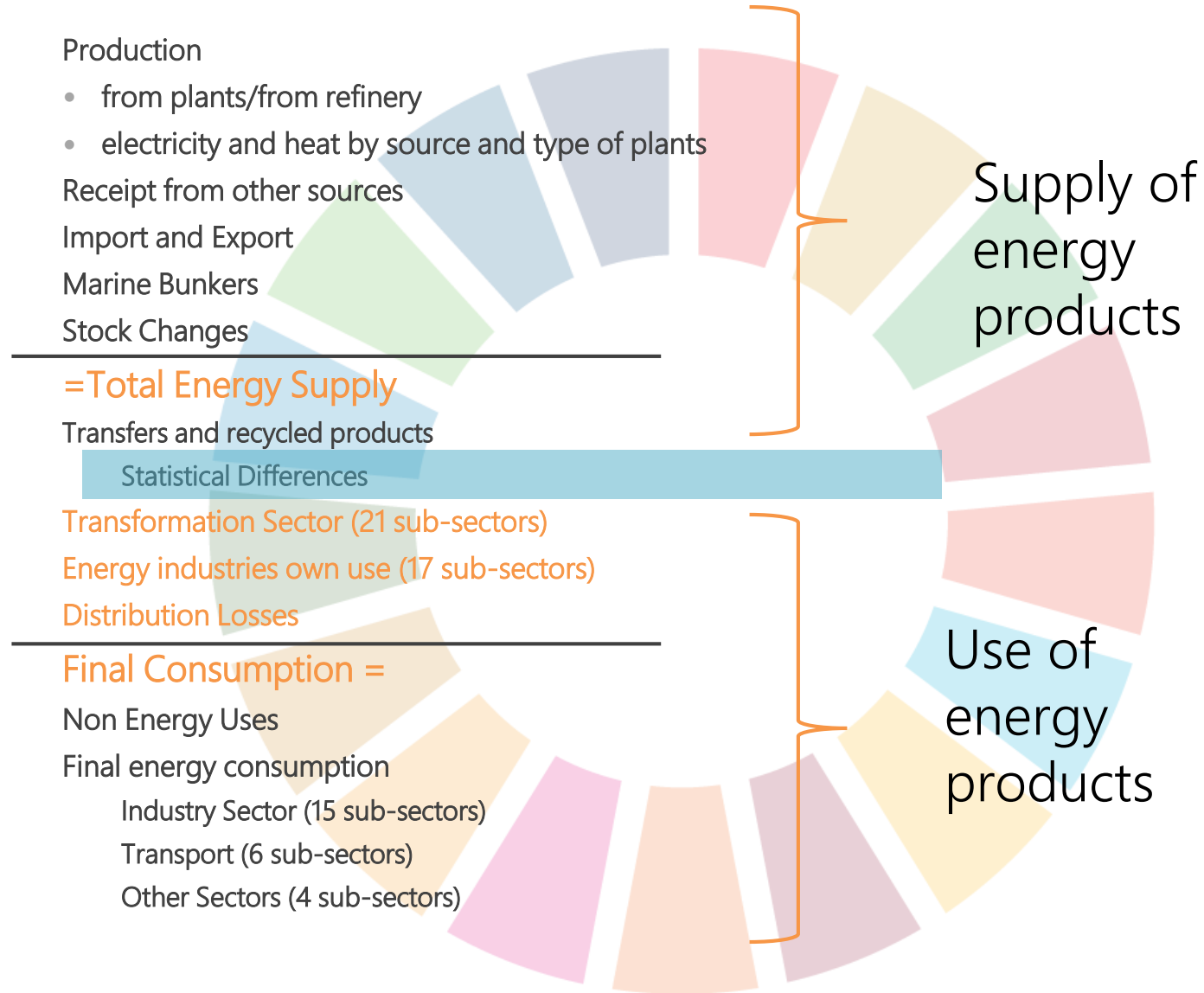
Industry Sector (15 sub-sectors)

Transport (6 sub-sectors)

Other Sectors (4 sub-sectors)



Supply and use of energy products



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 |



Structure and principles

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.

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 | - | 6909 | - | -123652 | -585 | |
| Electricity plants | - | - | - | -188976 | - | - | - | 6909 | - | -123067 | - | |
| CHP plants | - | - | - | - | - | - | - | - | - | - | - | |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - | |
| Coke ovens | - | - | - | - | - | - | - | - | - | - | - | |
| Briquetting plants | - | - | - | - | - | - | - | - | - | - | - | |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - | |
| Gas works | - | - | - | - | - | - | - | - | - | - | - | |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - | |
| NCL 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 | - | - | - | - | - | - | - | - | - | - | - | |
| 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 | - | |
| Road | - | - | - | - | - | - | - | - | - | *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 | *96610 | 4751 | |
| Other consumers | - | - | - | - | - | 708 | - | *10775 | - | *11483 | 708 | |
| Non-energy use | - | - | - | 3692 | - | - | - | - | - | - | 3692 | |

Columns: Energy Products

Energy Supply

ROWS: FLOWS

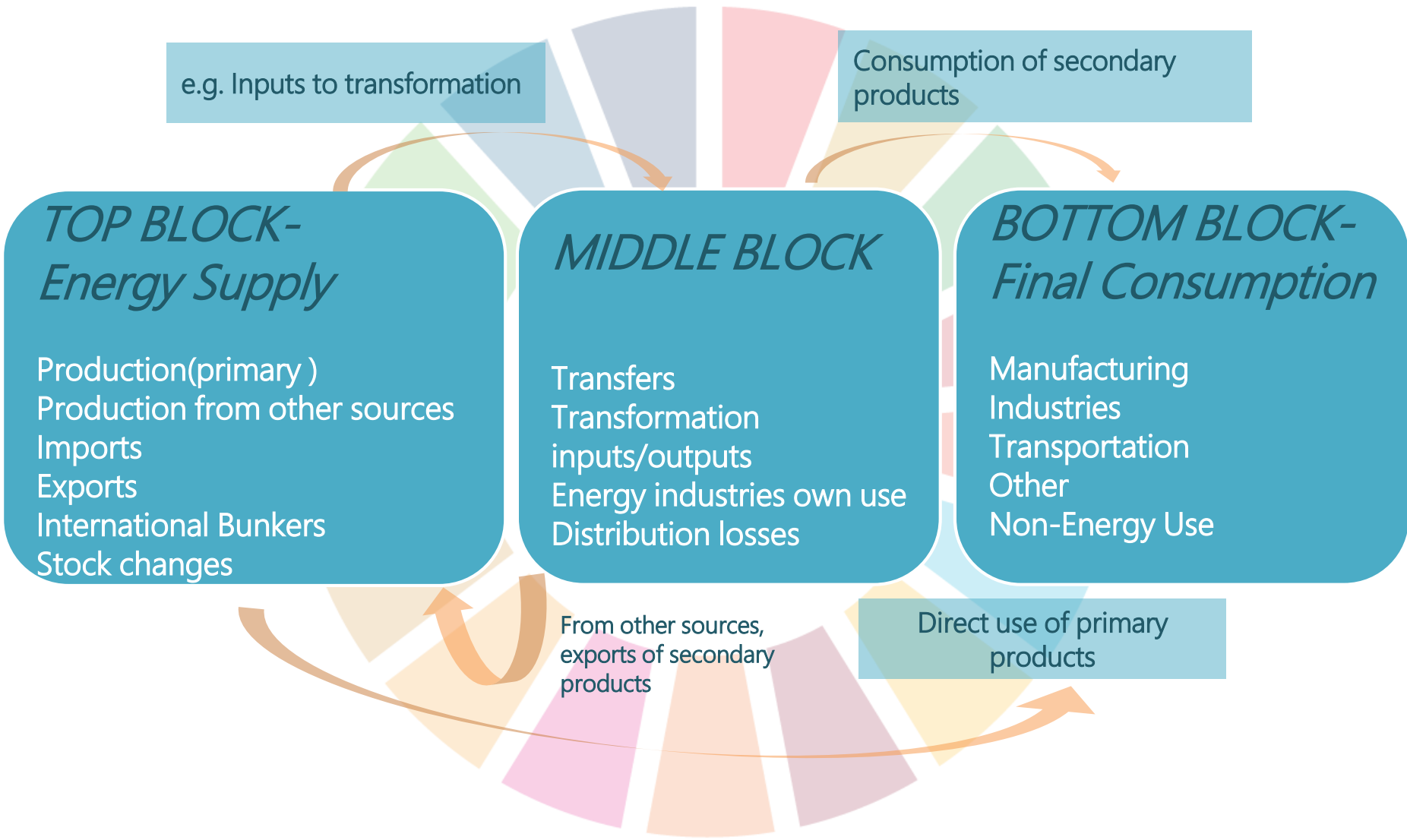
Transformation
+ Transfers
+ Energy industry own use
+ Losses

Total

Renewables

Final consumption

Main blocks



Source: Energy Statistics Compilers Manual, Figure 6.2

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 | <i>of which: Agriculture, forestry and fishing</i> | | | | | | |
| 7.1.3.2 | <i>of which: Households</i> | | | | | | |
| 7.2 | Non-energy use | | | | | | |

Principles

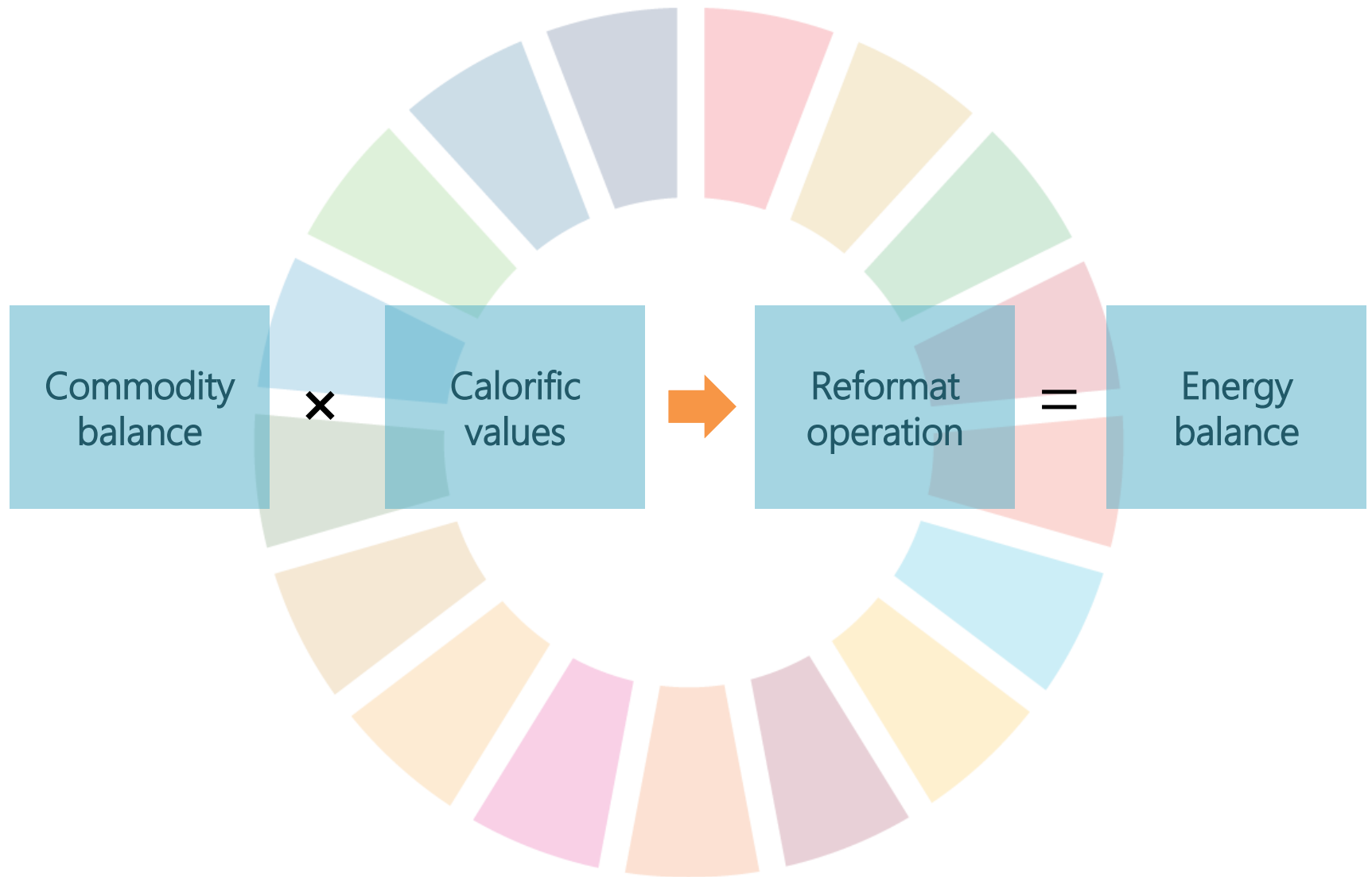
An energy balance shows:

- 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.



Calculation of an energy balance

Calculation of an energy balance



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



Reading an energy balance

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

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.

Middle block

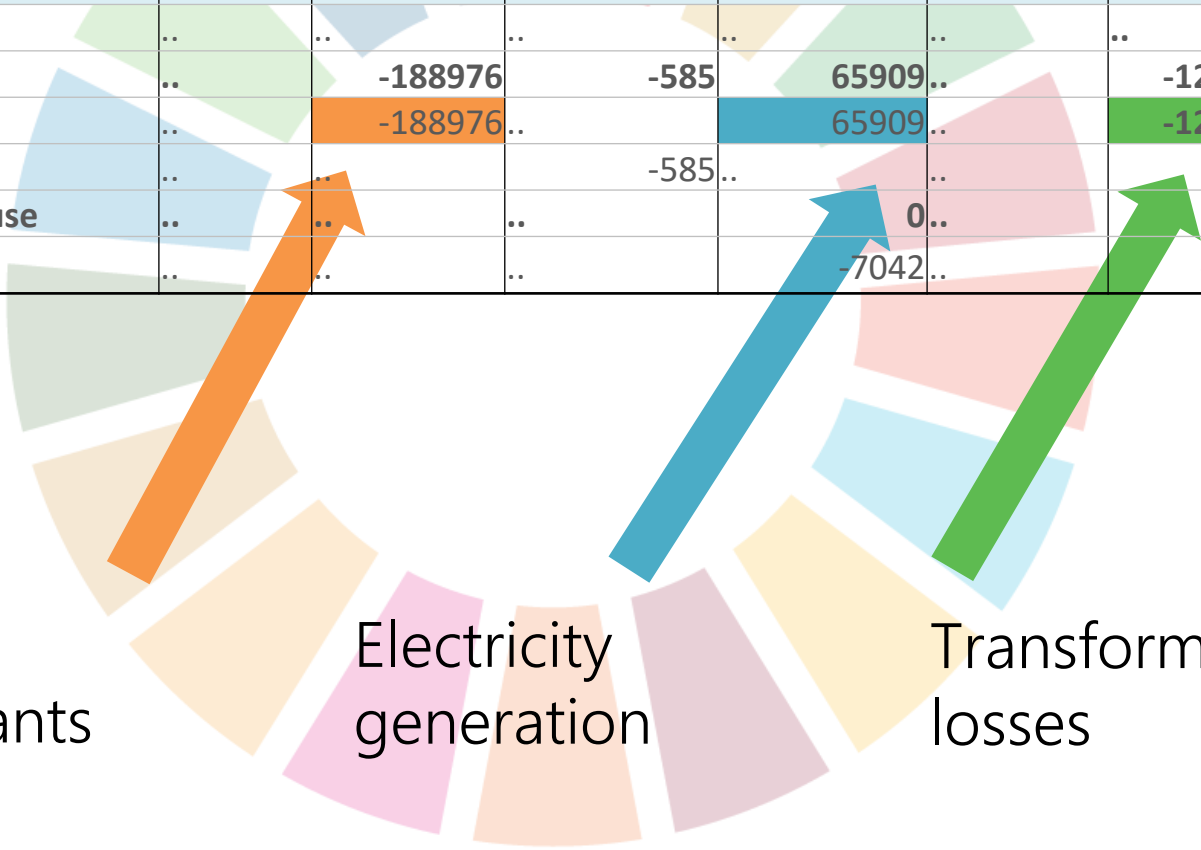
| Lebanon, 2016 | | | | | | |
|----------------------------------|------|----------------|--------------------|--------------|------|----------------|
| | Coal | Oil | Biofuels and waste | Electricity | Heat | Total energy |
| Transfers | .. | .. | .. | .. | .. | .. |
| Transformation | .. | -188976 | -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

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

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 | 0 | 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 | 11.1 | 4.5 | - | 151.7 | - | 7,876.10 |
| Exports | -1,879.20 | -7.4 | -12,134.60 | -1,728.30 | -3,341.1 | -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 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Transfers | - | - | - | - | - | - | - | - | - | - |
| Transformation | -3,777.90 | 121.4 | -4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 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

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 |
| <i>Non-metallic minerals</i> | 7112 | .. | .. | .. | .. | 7112 |
| <i>Industries n.e.s</i> | 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.



Checking an energy balance

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.

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.



Importance of conversion factors

Conversion to energy units

Physical units are:

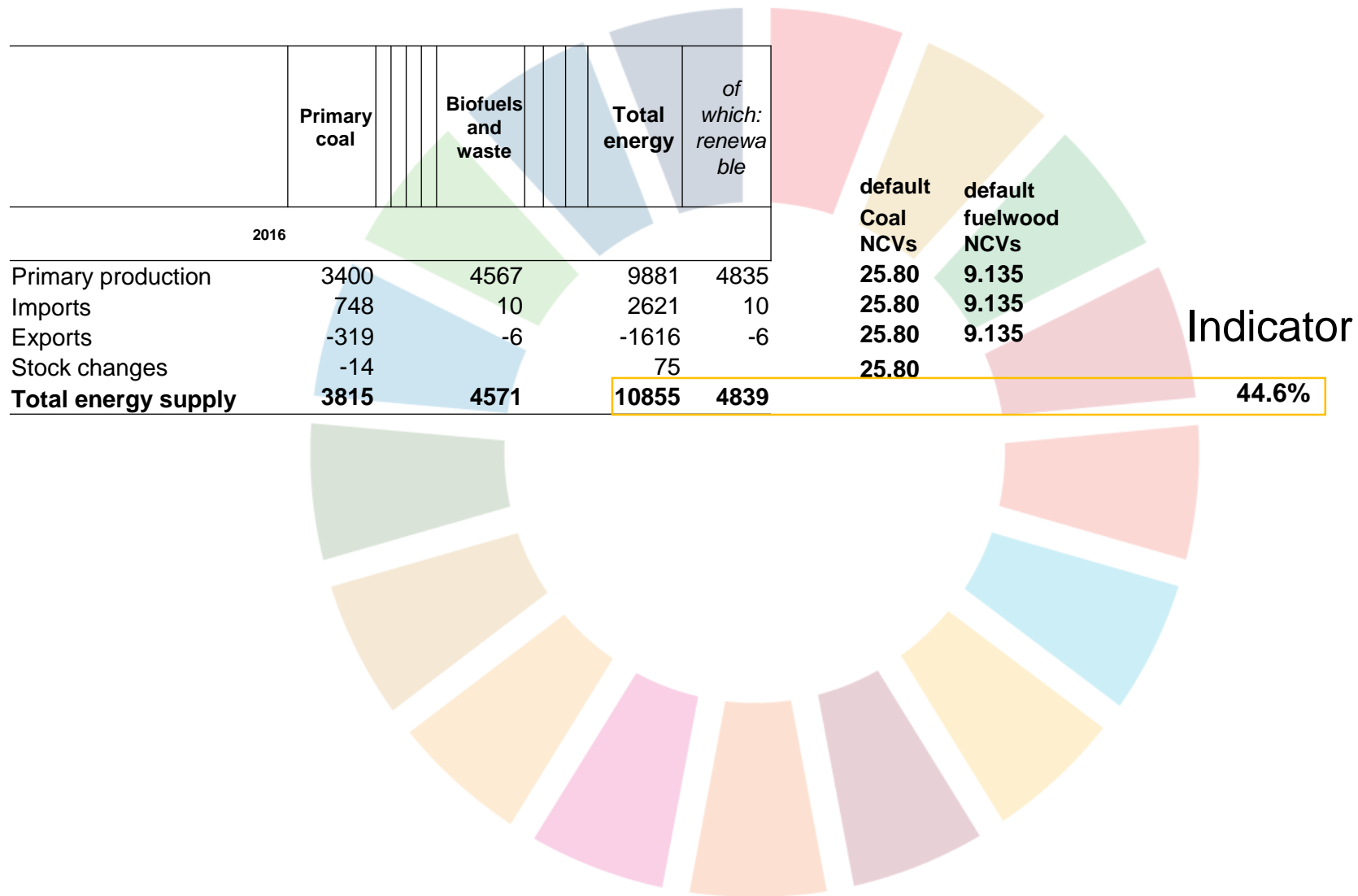
- converted to energy units using Net Calorific Values (NCV),
- NCV ideally are measured frequently for different processes and sources and then averaged for the country/flow.

Ideally:

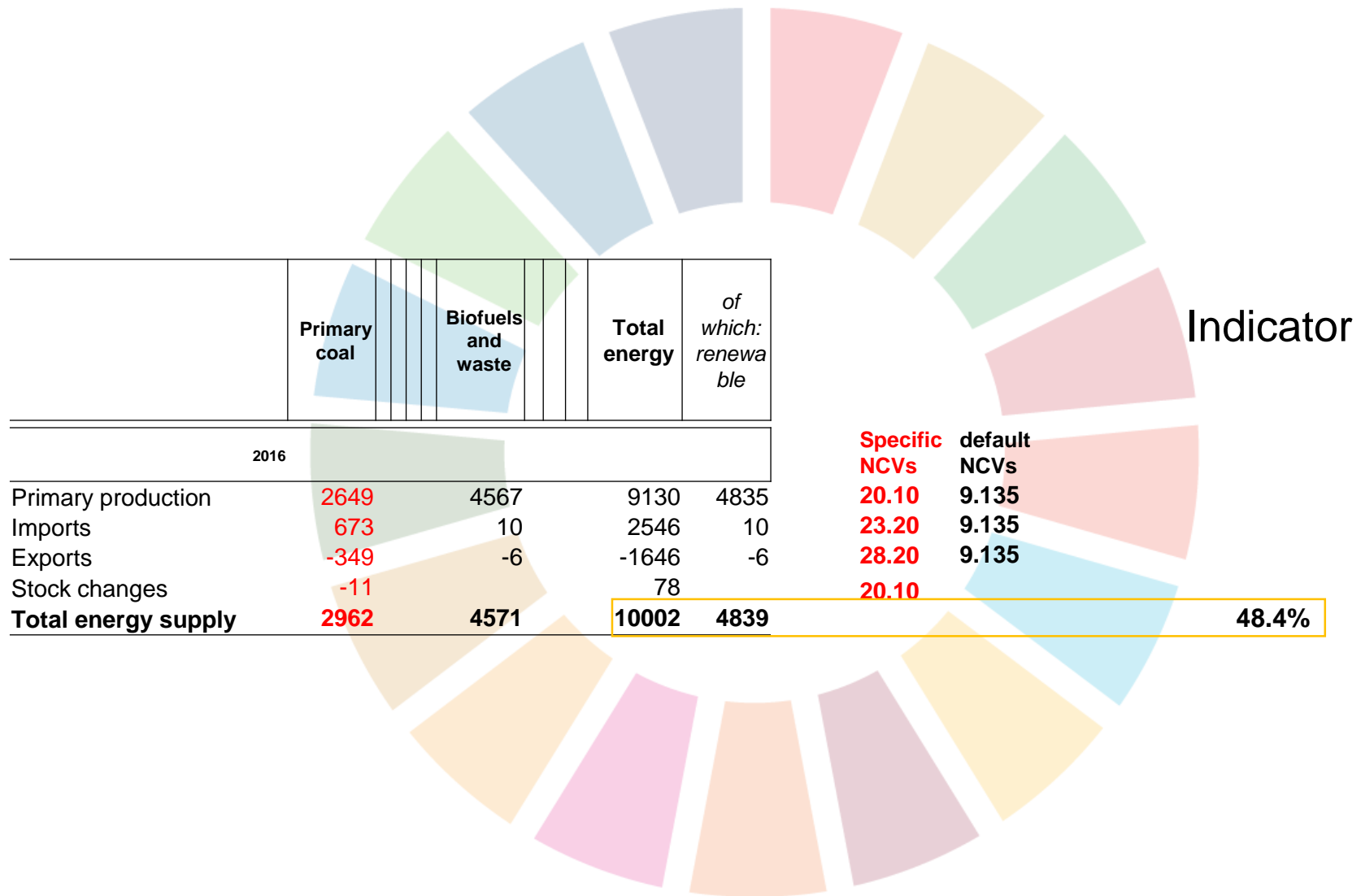
- Specific NCV for different flows, when available (most importantly, Production and Imports)
- Weighted-average NCV for all other flows (if only NCVs for Production and Imports are available).
- Default NCV if no information available (undesirable case)

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

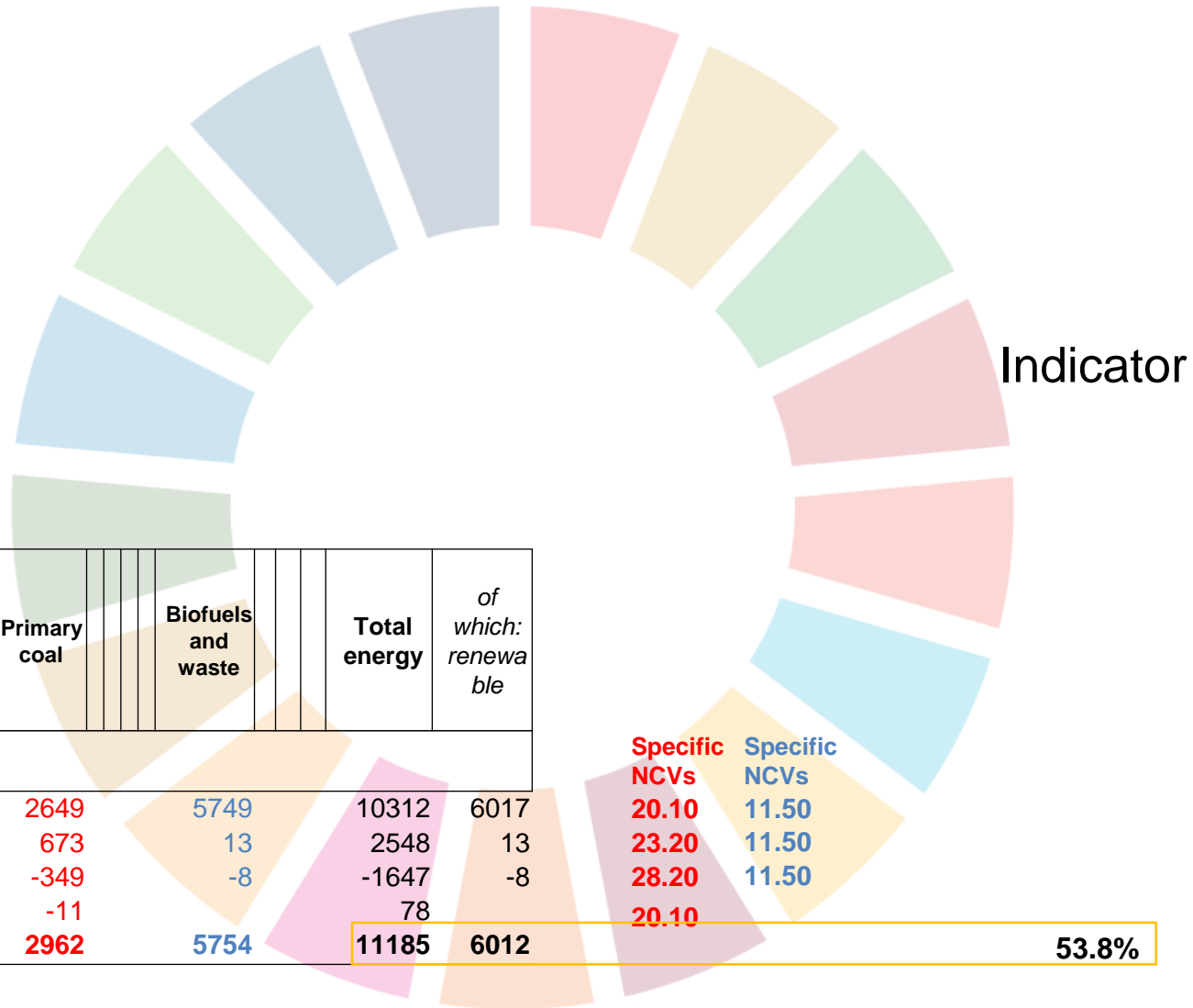
Renewable energy supply (% of TES) – NCVs



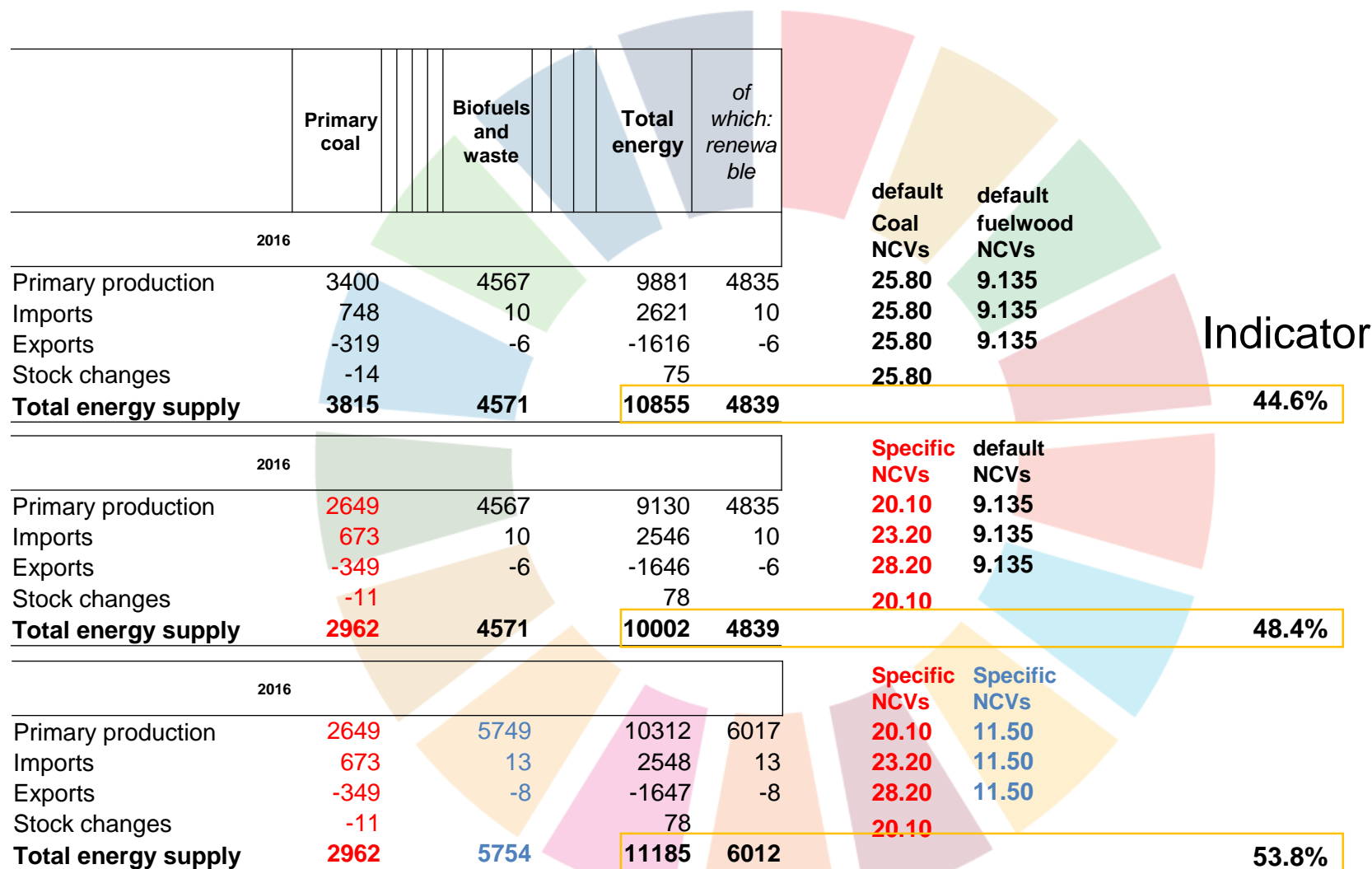
Renewable energy supply (% of TES) – NCVs



Renewable energy supply (% of TES) – NCVs



Renewable energy supply (% of TES) – NCVs





Consumption data

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 | 127 | .. | .. | 16458 | 127663 | 114123 | .. | 13532 | 156 | 161859 | 114123 |
| Agriculture, forestry, fishing | .. | .. | .. | .. | .. | .. | .. | 619 | .. | 619 | .. |
| Commerce, public services | .. | .. | .. | .. | .. | .. | .. | 1177 | .. | 1177 | .. |
| Households | 127 | .. | .. | .. | 120572 | .. | .. | 7229 | 156 | 127884 | .. |
| Other consumers | .. | .. | .. | 16458 | 17091 | 114123 | .. | 4507 | .. | 132179 | 114123 |
| Non-energy use | .. | .. | .. | 1485 | .. | .. | .. | .. | .. | 1485 | .. |

Armenia

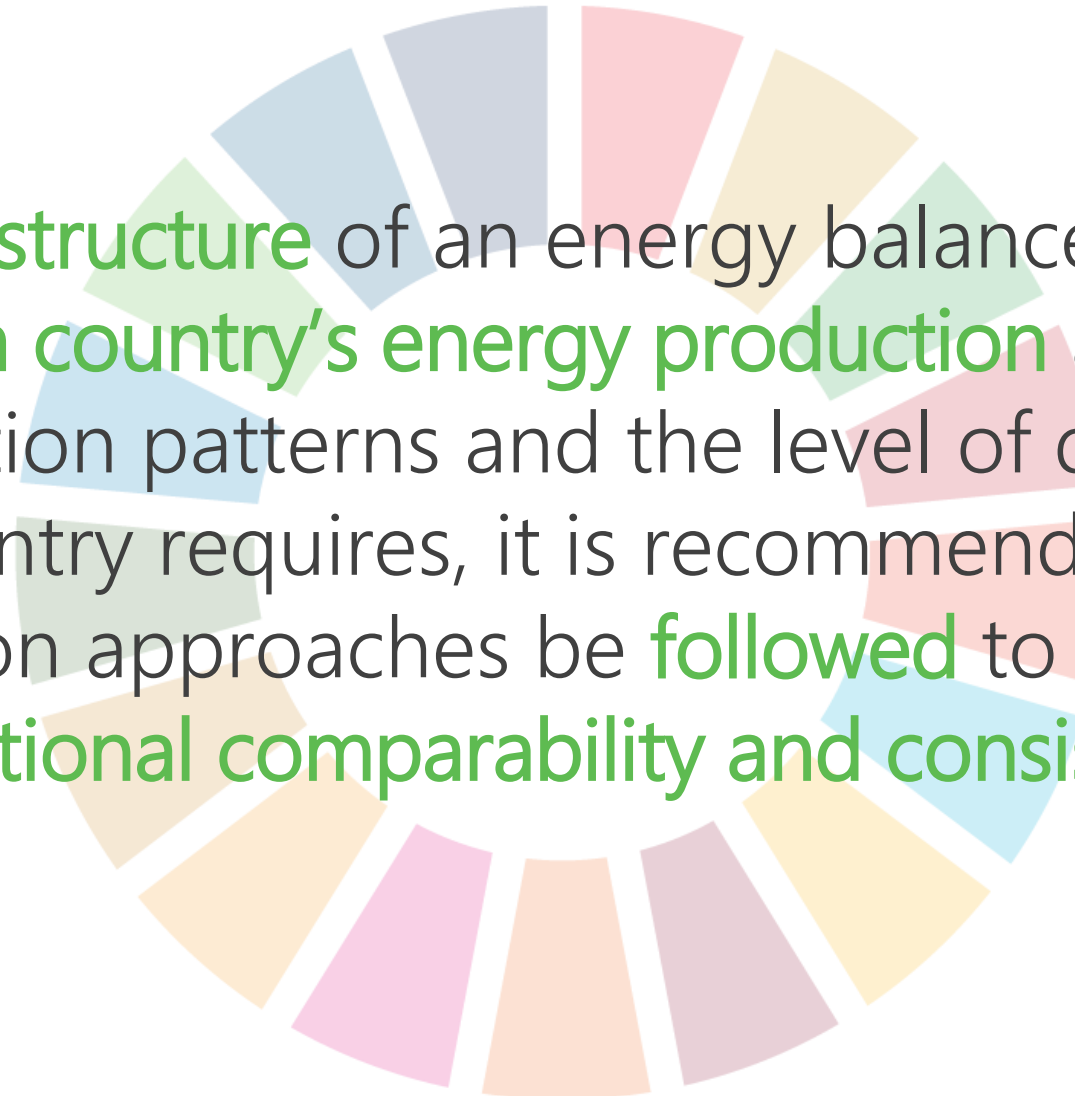
Terajoules

| | 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 |
|--------------------------------|-----------------------|------------------------|-------------|--------------|-------------|--------------------|---------|-------------|------|--------------|----------------------|
| 2018 | | | | | | | | | | | |
| 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 | .. |



Conclusion

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**.

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. |



SUSTAINABLE DEVELOPMENT GOALS

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