



International
Energy Agency

Energy balances across organisations

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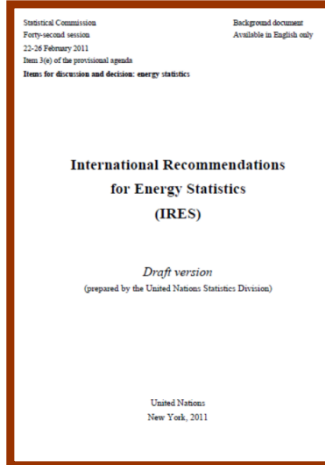
The importance of energy balances: bringing all pieces of information together



« ...An accounting **framework** for compilation of data on **all energy products entering, exiting and used** within the national territory of a given **country** during a reference period. »

Source: International Recommendations on Energy Statistics, UNSD, 2011

IRES Energy balance: key features



- **Scope:**
 - Territory boundary
 - Product boundary (SIEC)
 - Flow boundary (energy flows – Ch. 5)
- **Frequency:**
 - Reference period (annual)
- **Common unit:**
 - Energy (Joule)
- **Energy content:**
 - Based on Net Calorific Value
 - Physical content
- **Matrix:**
 - Flows x Products
 - Variable level of aggregation
 - Flows: 3-block structure
(+ stat. diff. + non-energy)
 - Products: + “Total” + “renewables”

How does an IRES energy balance look like?

Table 8.2: Template of an aggregated energy balance

Item code	Flows	Energy products				
		E1	E2	E3	... Total	<i>of which: Renewables</i>
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	<i>Statistical difference</i>					
3	<i>Transfers</i>					
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					
	Iron and steel					
	Chemical and petrochemical					
	Other Industries					
7.1.2	Transport, total					
	Road					
	Rail					
	Domestic aviation					
	Domestic navigation					
	Other Transport					
7.1.3	Other, total					
	<i>Of which: Agriculture, forestry and fishing</i>					
	Households					
7.2	Non energy use					

A quick comparison of energy balances across organisations



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They are all in matrix format ...

Kuwait

Supplies

	Primary coal and oil	Coal and oil products	Primary Oil	Oil Products	Natural Gas	Refined and waste	Nuclear	Electricity	Heat	Total energy	of which renewables
2011											
Primary production	580284	...	40201	171	...	...	...	636525	171
Imports	118332	39	...	...	...	118371	39
Exports	-3718043	-1322875	...	-3	...	...	...	-6040321	-3
International marine bunkers	-42950	...	...	...	...	...	-42950	...
International aviation bunkers	-30120	...	...	...	...	...	-30120	...
Stock changes	17566	...	...	...	...	...	17566	...
Total energy supply	2164811	-1377569	601133	207	...	...	...	1388161	207
Statistical difference	-42	-3456	19972	0	...	0	...	19473
Transformation	-2154893	173043	-204631	-172	209849	...	-81768	-172
Electricity plants	-112860	-321067	-204631	...	209849	...	-81768	...
CHP plants
Heat plants
Coke ovens
Briquetting plants
Liquefaction plants
Gas works
Steel furnaces
NGV plants & gas blending
Oil refineries
Other transformation
Energy industries own use
Losses
Final consumption
Final energy consumption
Manufacturing, const., mining
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
Industry n.e.s.
Transport
Road
Rail
Domestic aviation
Domestic navigation
Pipeline transport
Transport, n.e.s.
Other
Agriculture, forestry, fishing
Commerce, public services
Household
Other consumers
Non-energy use

Bulgaria, 2013 (ktoe)	Total (all products)	Solid fossil fuels	Crude oil & petroleum products	Gas	Nuclear heat	Renewable energies	Non-
+ Primary production	10 538	4 782	27	224	3 671	1 826	
+ Primary production receipt							
+ Other sources (recovered products)	36	5	31				
+ Recycled products	6		6				
+ Imports	11 796	1 008	8 179	2 226		95	
+ Stock changes	- 107	165	- 204	- 62		- 6	
- Exports	5 421	37	4 463			102	
- Bunkers	90		90				
- Direct use	- 6		- 6				
Gross inland consumption	16 764	5 923	3 492	2 388	3 671	1 814	
Transformation input	18 221	6 831	6 705	964	3 671	45	
+ Conventional thermal power stations	6 787	5 800	177	785		20	
+ Nuclear power stations	3 671				3 671		
+ District heating plants	156	6	4	146		1	
+ Coke ovens							
+ Blast furnaces							
+ Gas works							

		PRIMARY SOURCES									SECONDARY SOURCES											TOTAL		
		NON RENEWABLE SOURCES				RENEWABLE SOURCES					Electricity	L.P.G.	Gasoline / Alcohol	Kerosene	Diesel Oil	Fuel Oil	Coke	Charcoal	Gases	Other Secondary	Non-Energy		Total Secondary	
		Petroleum	Natural Gas	Coal	Fission Fuels	Hydroenergy	Geothermal	Firewood	Sugar Cane Products	Other Primary														Total Primary
		kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe
SUPPLY	PRODUCTION (PP)																							
	IMPORT (IM)																							
	EXPORT (X)																							
	INVENTORIES (IV)																							
	UNUSED (UN)																							
TOTAL SUPPLY																								
TRANSFORMATION	REFINERY																							
	POWER PLANTS																							
	SELF PRODUCERS																							
	GAS TREATM.PLANT																							
	CHARCOAL PLANT																							
	COKE/BLAST FURNAC																							
	DISTILLERY																							
	OTHER CENTERS																							
	TOTAL TRANSFORMATION																							
FINAL CONSUMPTION	OWN CONSUMPTION																							
	LOSSES																							
	ADJUSTMENT																							
	TRANSPORTATION																							
	INDUSTRY																							
	RESIDENTIAL																							
	COMMERC.,SERV,PUB																							
	AGRIC.,FISH,MIN.																							
	CONSTRUCTION,OTH.																							
	ENERGY CONSUMPTION																							
NON ENERGY CONSUM																								
FINAL CONSUMPTION																								



...with a similar three-block structure

Supply

	Coal and peat	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total*
Production	33658	173317	0	132349	24390	32309	901	12106	0	0	409029
Imports	5954	34510	12790	25960	0	0	0	759	1287	0	84260
Exports	-20076	-118761	-19053	-76831	0	0	0	-570	-4430	0	-239722
International marine bunkers**	0	0	-524	0	0	0	0	0	0	0	-524
International aviation bunkers**	0	0	-1214	0	0	0	0	0	0	0	-1214
Stock changes	66	1064	-206	2092	0	0	0	0	0	0	3016
TPES	19603	90130	-8207	83569	24390	32309	901	12295	-3144	0	251845
Transfers	0	-3781	7993	0	0	0	0	0	0	0	4213
Statistical differences	0	0	0	0	0	0	0	0	0	0	13872
Electricity plants											36484
CHP plants											-1047
Heat plants											-28
Gas works											0
Oil refineries											2875
Coal transformation	-1182	0	0	0	0	0	0	0	0	0	-1182
Liquefaction plants	0	802	0	-1940	0	0	0	0	0	0	-1138
Other transformation	0	0	0	0	0	0	0	0	0	0	0
Energy industry own use	-4	0	-7956	-13986	0	0	0	-1	-4019	0	-25966
Losses	0	0	0	0	0	0	0	0	-2984	0	-2984
Total final consumption	3117	0	90009	55912	0	0	0	9766	44625	546	203975
Industry	2450	0	6067	23876	0	0	0	5840	17698	545	56476
Transport	0	0	54404	2436	0	0	0	1637	331	0	58808
Other	33	0	8935	26208	0	0	0	2289	26596	0	64062
Residential	33	0	2647	14661	0	0	0	2279	13161	0	32782
Commercial and public services	0	0	3008	10823	0	0	0	10	12623	0	26464
Agriculture / forestry	0	0	3280	724	0	0	0	0	812	0	4816
Fishing	0	0	0	0	0	0	0	0	0	0	0
Non-specified	0	0	0	0	0	0	0	0	0	0	0
Non-energy use	634	0	20603	3392	0	0	0	0	0	0	24629
-of which petrochemical feedstocks	0	0	12022	3392	0	0	0	0	0	0	15415

Rows present energy flows across the various products

Transformation

Final consumption

High-level IRES principles are generally met across organisations

	APEC	Eurostat	IEA	OLADE	UNSD
Territory	✓	✓	✓	✓	✓
Products SIEC	✓	✓	✓		✓
Energy flows definitions	✓	✓	✓		✓
3-block structure	✓	✓	✓	✓	✓
Non-energy split	✓	✓	✓	✓	✓
Net basis	✓	✓	✓	✓	✓
Unit	✓ Joules	ktoe	ktoe	BOE	✓ TJ

Several layout differences – not substantial

Examples include (not exhaustive):

■ Different units / terminology

■ Different aggregation (based on data availability)

- Limited disaggregation in consumption sectors (OLADE)
- Some differences -e.g. Fishing aggregated with Agriculture (UNSD)
- Peat products not split (all)

■ Transformation

- Negative input and positive output in one row (IEA, UNSD, OLADE)
- Input and output in two different rows (Eurostat)
- Include gas separation for NGLs (UNSD)

■ Treatment of hydro/wind/solar

- Primary, transformed into electricity (IEA, OLADE, APEC)
or transferred (Eurostat)
- Only show total electricity (UNSD)



And more significant differences in figures may depend on...

■ International bunkers treatment, affecting definition of supply and consumption:

- Marine and aviation subtracted from supply (APEC, IEA, UNSD)
- Aviation included in transport (Eurostat)
- Both marine and aviation included in transport (OLADE)

■ Boundaries

- E.g. “Unused” energy included in balance (OLADE): “amount of energy not being used due to feasibility”

■ Choice of calorific values

- by product / flow / time / country

...

For discussion

- **The need for organisations to better understand how energy balances compare to each other and to IRES recommendations**
- **A simple agreed documentation on differences may be beneficial also to users of data – to be published online**

Thank you

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The IEA logo is a circular emblem. It features a thick, light blue outer ring. Inside this ring is a solid dark blue circle. The letters "iea" are written in a white, lowercase, sans-serif font across the center of the dark blue circle. The dot on the "i" is a small white circle.

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