ENERGY STATISTICS

Building Commodity and Energy Balances

Energy Statistics Workshop

Bàku, Azerbaijan, Sept, 2011

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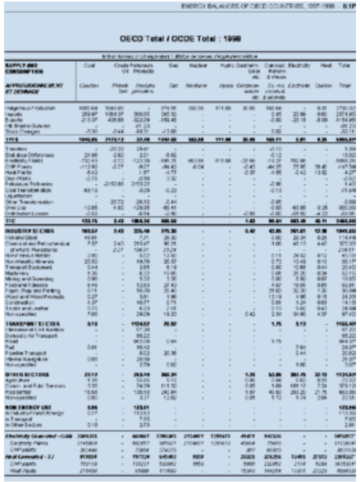
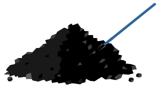
International Energy Agency

Energy balances


OECD Total / OCDE Total : 1998

- Why calculate an energy balance?
- Energy balance principles
- IEA energy balance layout
- Using the energy balance with economic indicators
- Harmonisation
- Balance builder



Why calculate an energy balance?

The energy balance is a way of reporting energy data in a common unit and with products aggregated by category: coal, crude oil, oil products, gas, biofuels, hydro etc.

Advantages:

- **It allows comparison of the shares of each source in the energy supply of a country and in each sector of economic activity**
- **With an energy balance it is possible to analyse energy efficiency**
- **A country can determine its dependence on energy imports or exports**
- **Different countries can be compared when they are calculated with the same methodology**
- **Good for quality control: can check inputs/outputs in the transformation sector, and discrepancies can be queried**

Messages can differ

Which data to use/trust when assessing legally binding commitments?

- **What is the importance of renewables in the energy mix?**
- **What is happening with CO_2 emissions (Kyoto targets)?**
- **General confusion by users**

  - this could pave the way to speculation

What is the importance of renewables in the energy mix?

Answer will depend on:

- **Principles:**
  calculation of the primary energy equivalent of electricity from non-combustion processes (physical energy content vs. substitution)

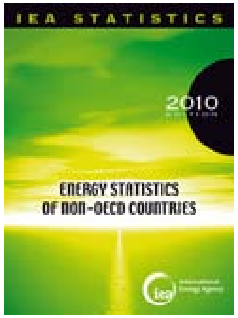
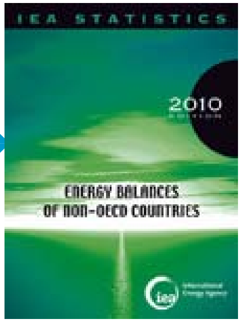
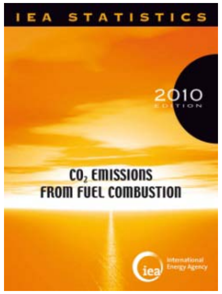
- **Classification / definitions:**
  what is renewable? peat is sometimes included with fossil and sometimes with renewables

- **Presentation:**
  how is supply calculated? (e.g. bunkers in or out, statistical difference above or below)

IEA non-member country energy balance system

5 IEA/Eurostat/UNECE Annual Questionnaires **OR** **National publications, websites**

- Coal
- Oil
- Gas
- Renewables + Waste
- Electricity + Heat

Original Units	Mtoe	Mt of CO_2
		

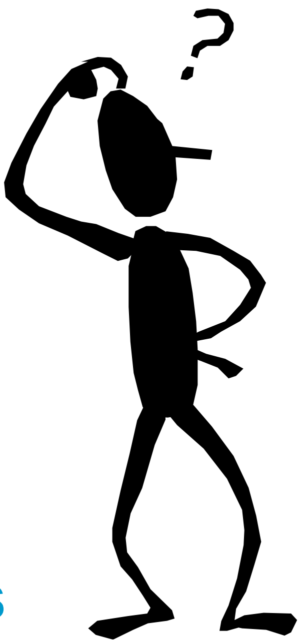
Energy balance principles

- choice of unit
- net vs. gross calorific values
- choice of conversion factors
- choice of primary energy form for energy that is not combusted
- physical energy content vs. substitution method
- temperature adjustments
- fiscal year vs. calendar year

What units?

MBtu

kilowatt-hours



Mtoe

Mtce

terajoules

ENERGY BALANCES OF OECD COUNTRIES, 1997-1998 - **II.17**

OECD Total / OCDE Total : 1998

Million tonnes of oil equivalent / *Million de tonnes d'équivalent pétrole*

SUPPLY AND CONSUMPTION / ***APPROVISIONNEMENT ET DEMANDE***	Coal / *Charbon*	Crude Oil / *Pétrole brut*	Petroleum Products / *Produits pétroliers*	Gas / *Gaz*	Nuclear / *Nucléaire*	Hydro / *Hydro*	Geotherm. Solar etc. / *Géotherm. solaire etc.*	Combust. Renew. & Waste / *En. ren. combust. & déchets*	Electricity / *Electricité*	Heat / *Chaleur*	Total / *Total*
Indigenous Production	1005.64	1046.05	-	874.91	553.58	111.08	30.05	168.64	-	0.35	3790.32
Imports	259.97	1564.37	380.85	345.32	-	-	-	0.45	23.99	0.00	2574.95
Exports	-213.37	-436.86	-322.09	-159.46	-	-	-	-0.00	-23.18	-0.00	-1154.95
Intl. Marine Bunkers	-	-	-81.23	-	-	-	-	-	-	-	-81.23
Stock Changes	-5.30	-3.44	-10.31	-13.08	-	-	-	0.02	-	-	-32.11
TPES	**1046.95**	**2170.13**	**-32.78**	**1047.69**	**553.58**	**111.08**	**30.05**	**169.11**	**0.81**	**0.35**	**5096.97**
Transfers	-	-28.22	29.41	-	-	-	-	-0.10	-	-	1.09
Statistical Differences	21.96	-2.82	2.01	-8.02	-	-	-	-0.12	-	-	13.02
Electricity Plants	-732.43	-9.72	-122.39	-185.21	-553.55	-111.08	-27.56	-19.27	702.95	-	-1058.25
CHP Plants	-112.92	-0.77	-9.07	-94.42	-0.04	-	-0.43	-44.25	75.95	38.40	-147.54
Heat Plants	-6.42	-	-1.57	-4.77	-	-	-0.37	-4.55	-0.42	13.82	-4.27
Gas Works	-2.76	-	-3.18	3.32	-	-	-	-	-	-	-2.62
Petroleum Refineries	-	-2150.86	2153.22	-	-	-	-	-0.96	-	-	1.40
Coal Transformation	-68.19	-	-3.09	-0.23	-	-	-	-0.13	-	-	-71.64
Liquefaction	-	-	-	-	-	-	-	-	-	-	-
Other Transformation	-	25.72	-26.12	-0.44	-	-	-	-0.05	-	-	-0.89
Own Use	-12.85	-1.02	-129.95	-89.41	-	-	-	-0.03	-63.88	-3.25	-300.39
Distribution Losses	-0.59	-	-0.14	-2.96	-	-	-0.08	-0.00	-51.92	-4.22	-59.91
TFC	**132.75**	**2.43**	**1856.36**	**665.56**	**-**	**-**	**1.62**	**99.64**	**663.49**	**45.11**	**3466.96**
INDUSTRY SECTOR	**109.57**	**2.43**	**335.40**	**275.30**	**-**	**-**	**0.42**	**43.95**	**261.61**	**12.98**	**1041.66**
Iron and Steel	48.81	-	7.71	28.30	-	-	-	0.00	29.34	0.28	114.44
Chemical and Petrochemical	7.57	2.43	215.47	96.21	-	-	-	1.06	48.13	4.47	375.33
of which: Feedstocks	-	*2.27*	*196.01*	*21.24*	-	-	-	-	-	-	*219.51*
Non-Ferrous Metals	2.90	-	5.02	12.50	-	-	-	0.11	24.52	0.12	45.18
Non-Metallic Minerals	25.50	-	19.78	26.57	-	-	-	0.73	13.49	0.10	86.17
Transport Equipment	0.44	-	2.65	6.19	-	-	-	0.00	10.68	0.44	20.40
Machinery	1.36	-	6.32	18.85	-	-	-	0.01	25.26	0.34	52.15
Mining and Quarrying	0.96	-	5.32	3.38	-	-	-	0.00	8.92	0.07	18.65
Food and Tobacco	6.46	-	12.53	27.43	-	-	-	4.57	18.01	0.81	69.81
Paper, Pulp and Printing	6.11	-	10.70	26.46	-	-	-	21.83	32.39	1.36	98.84
Wood and Wood Products	0.27	-	3.81	1.96	-	-	-	13.19	4.95	0.15	24.33
Construction	1.37	-	10.77	0.71	-	-	-	0.01	1.24	0.03	14.13
Textile and Leather	0.75	-	6.23	7.51	-	-	-	0.10	9.82	0.43	24.84
Non-specified	7.08	-	29.09	19.23	-	-	0.42	2.34	34.86	4.37	97.40
TRANSPORT SECTOR	**0.10**	**-**	**1134.52**	**20.92**	**-**	**-**	**-**	**1.75**	**9.13**	**-**	**1166.42**
International Civil Aviation	-	-	67.20	-	-	-	-	-	-	-	67.20
Domestic Air Transport	-	-	85.22	-	-	-	-	-	-	-	85.22
Road	-	-	942.09	0.54	-	-	-	1.75	-	-	944.37
Rail	0.01	-	16.42	-	-	-	-	-	7.64	-	24.07
Pipeline Transport	-	-	0.02	20.36	-	-	-	-	0.44	-	20.82
Internal Navigation	0.09	-	20.98	-	-	-	-	-	-	-	21.07
Non-specified	-	-	2.59	0.02	-	-	-	-	1.06	-	3.67
OTHER SECTORS	**22.12**	**-**	**263.44**	**369.34**	**-**	**-**	**1.20**	**53.95**	**392.75**	**32.13**	**1134.92**
Agriculture	1.39	-	55.85	5.16	-	-	0.06	0.84	6.63	0.29	70.22
Comm. and Publ. Services	3.35	-	74.09	111.32	-	-	0.05	1.89	181.17	7.24	379.12
Residential	16.58	-	130.13	240.84	-	-	1.07	49.50	203.20	21.75	663.06
Non-specified	0.80	-	3.37	12.02	-	-	0.01	1.72	1.74	2.84	22.51
NON-ENERGY USE	**0.95**	**-**	**123.01**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**123.96**
in Industry/Transf./Energy	0.77	-	112.62	-	-	-	-	-	-	-	113.39
in Transport	-	-	7.65	-	-	-	-	-	-	-	7.65
in Other Sectors	0.18	-	2.73	-	-	-	-	-	-	-	2.91
Electricity Generated - GWh	***3508315***	**-**	***660661***	***1280305***	***2124071***	***1291618***	***49471***	***142536***	**-**	**-**	***9056977***
Electricity Plants	*3145869*	-	*582057*	*905927*	*2124071*	*1291618*	*48664*	*75608*	-	-	*8173814*
CHP plants	*362446*	-	*78604*	*374378*	-	-	*807*	*66928*	-	-	*883163*
Heat Generated - TJ	***918598***	**-**	***197120***	***645482***	***1558***	**-**	***21325***	***376256***	***13485***	***27513***	***2201337***
CHP plants	*703118*	-	*131231*	*533902*	*1558*	-	*5985*	*232052*	*2174*	*5284*	*1615304*
Heat Plants	*215480*	-	*65889*	*111580*	-	-	*15340*	*144204*	*11311*	*22229*	*586033*

IEA opted for Mtoe and TJ

Eurostat and UNSD opted for TJ

Net vs. Gross Calorific Values?

Difference between NCV and GCV is the latent heat of vaporisation of the water produced during combustion

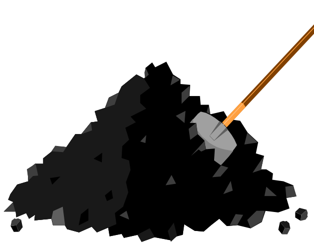
5%

5%

10%

IEA/Eurostat/UNSD uses Net Calorific Values

Conversion to energy units (1)



COAL

Physical units (tonnes) are converted to energy units using NCV [kJ/kg], reported in the questionnaires (varies over time)

Specific NCV for Production, Imports, Exports, Inputs to Public Power Plants, Coal used in Coke Ovens, Blast Furnaces and Industry

Average NCV for all other flows

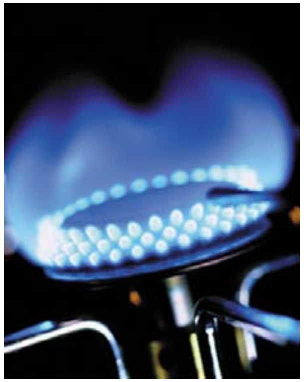
CRUDE OIL AND OIL PRODUCTS

Using NCV [kJ/kg]

Primary oil - Specific NCV for Production, Imports and Exports, reported in the questionnaires (varies over time)

Oil products - region specific default values

Conversion to energy units (2)



NATURAL GAS

Figures collected in Mm^3 and gross TJ (energy unit). They are converted to net TJ (0.9·gross TJ) and then to Mtoe (1 PJ = 0.02388 Mtoe)

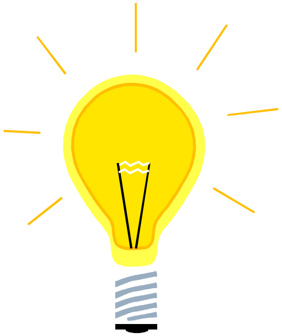
OTHER GASES

Data collected in gross TJ, then converted to net TJ (0.9·gross TJ) and then to Mtoe (1 PJ = 0.02388 Mtoe)

ELECTRICITY

Figures collected in TWh, then electricity production is converted to Mtoe (1 TWh = 0.086 Mtoe)

Gross electricity production is shown and the own use and losses are shown separately



Latest developments concerning NCVs

- The IPCC analysed country submissions to the UNFCCC and suggested new default NCVs for the 2006 IPCC Guidelines.
- The IEA decided to remove double rounding errors by keeping NCVs in kJ/kg instead of toe/tonne (affects all the fuels).
- The IEA and Eurostat were using different NCVs for oil products – we have agreed to use the same values for Europe
- For the last 3 years, the IEA has used region-specific values for the oil products in OECD countries (also revised NCVs for some non-OECD countries)

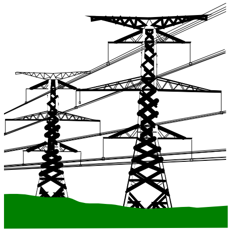
Choice of primary energy form

First energy form downstream for which multiple energy uses are practical

Heat

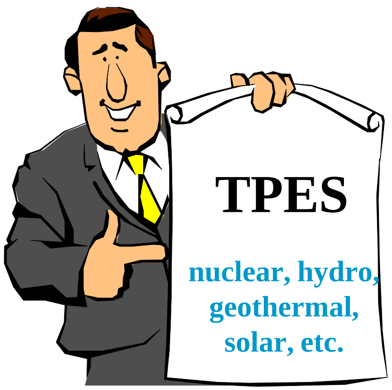
- nuclear heat and electricity production
- geothermal heat and electricity production
- solar heat production

Electricity



- hydro
- wind
- wave/ocean
- photovoltaic solar electricity production

Choice of method for calculating primary energy equivalent



IEA/Eurostat/UNSD opted for

Partial substitution method

- represents the amount of energy necessary in conventional thermal plants
- difficult to choose efficiency
- not relevant for countries with a high share of hydro

Physical energy content method

- uses physical energy content of the primary energy source
- nuclear 33%
- geothermal 10%
- solar, wind, etc. 100%

Physical energy content vs. partial substitution

2008 Energy Balance of Sweden

Using physical energy content method

Nuclear Hydro Wind

SUPPLY	Coal & peat	Crude oil	Petroleum products	Gas	Nuclear	Hydro	Geotherm. solar etc.	Combust. renew. & waste	Electricity	Heat	Total
	Million tonnes of oil equivalent / *Million de tonnes d'équivalent pétrole*										
Production	0.21	-	-	-	16.63	5.92	0.18	10.12	-	0.27	33.33
Imports	2.32	21.73	7.42	0.83	-	-	-	-	1.10	-	33.39
Exports	-0.03	-0.47	-12.07	-	-			-	-1.27	-	-13.84
Intl. marine bunkers	-	-	-2.01	-	-			-	-	-	-2.01
Intl. aviation bunkers	-	-	-0.68	-	-	-	-	-	-	-	-0.68
Stock changes	0.04	-0.44	-0.07	-				-	-	-	-0.47
TPES	**2.54**	**20.82**	**-7.41**	**0.83**	16.63	5.92	0.18	**10.12**	**-0.17**	**0.27**	**49.73**
Electricity and Heat Output											
Elec. generated - TWh	3.01	-	1.07	0.78	63.82	68.80	1.97	10.03	-	-	149.49
Heat generated - PJ	16.09	-	4.77	6.00	-	-	-	140.36	0.76	19.98	187.95

Using partial substitution method

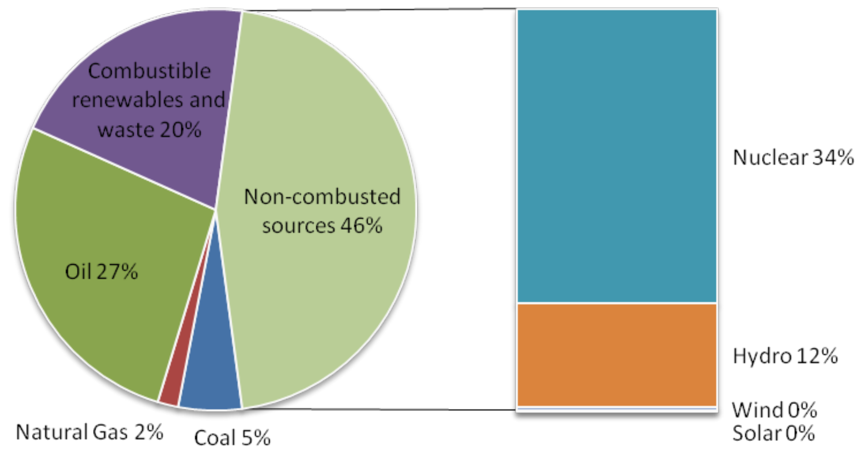
Nuclear Hydro Wind

SUPPLY	Coal & peat	Crude oil	Petroleum products	Gas	Nuclear	Hydro	Geotherm. solar etc.	Combust. renew. & waste	Electricity	Heat	Total
	Million tonnes of oil equivalent / *Million de tonnes d'équivalent pétrole*										
Production	0.21	-	-	-	14.26	15.37	0.44	10.12	-	0.27	40.67
Imports	2.32	21.73	7.42	0.83	-	-	-	-	1.10	-	33.39
Exports	-0.03	-0.47	-12.07	-		-	-	-	-1.27	-	-13.84
Intl. marine bunkers	-	-	-2.01	-					-	-	-2.01
Intl. aviation bunkers	-	-	-0.68	-	-	-	-	-	-	-	-0.68
Stock changes	0.04	-0.44	-0.07	-	-	-	-	-	-	-	-0.47
TPES	**2.54**	**20.82**	**-7.41**	**0.83**	14.26	15.37	0.44	**10.12**	**-0.17**	**0.27**	**57.07**
Electricity and Heat Output											
Elec. generated - TWh	3.01	-	1.07	0.78	63.82	68.80	1.97	10.03	-	-	149.49
Heat generated - PJ	16.09	-	4.77	6.00	-	-	-	140.36	0.76	19.98	187.95

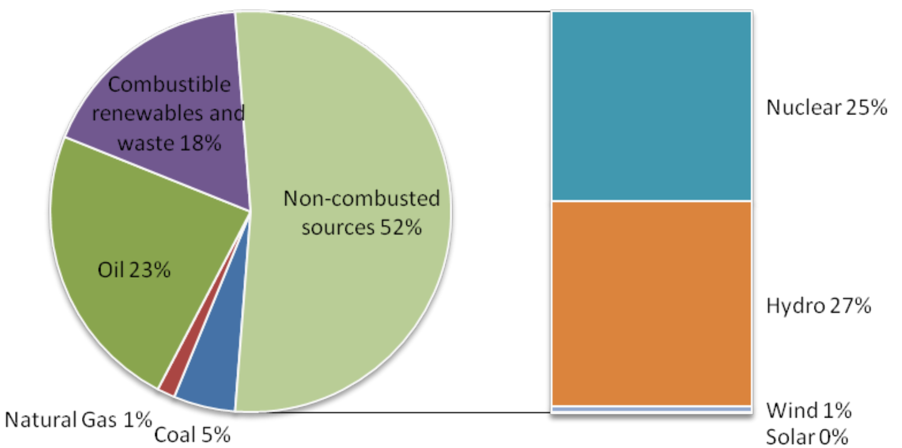
Physical energy content vs. partial substitution

2008 Supply of Sweden

Using physical energy content method



Using partial substitution method



Non-combusted sources can have very different shares!

Physical energy content vs. partial substitution

2008 Energy Balance of Georgia

Using physical energy content method

Hydro= 20.6%

SUPPLY AND CONSUMPTION	Coal & peat	Crude oil	Oil products	Gas	Nuclear	Hydro	Geotherm. solar etc.	Combust. renew. & waste	Electricity	Heat	Total
Production	5	53	-	11	-	616	14	378	-	-	1077
Imports	48	43	839	1063	-	-	-	-	48	-	2042
Exports	-	-35	-	-	-	Hydro	-	-	-58	-	-93
Intl. marine bunkers	-	-	-	-	-		-	-	-	-	-
Intl. aviation bunkers	-	-	-41	-	-	-	-	-	-	-	-41
	-	-3	-	7	-		-	-	-	-	4
TPES	53	58	798	1081	-	616	14	378	-10	-	2988
				Electricity and Heat Out...							
Electricity generated - GWh	-	-	-	1279	-	7162	-	-	-	-	8441
Heat generated - TJ	-	-	-	2052	-	-	-	-	-	-	2052

Using partial substitution method

Hydro = 40.3%

SUPPLY AND CONSUMPTION	Coal & peat	Crude oil	Oil products	Gas	Nuclear	Hydro	Geotherm. solar etc.	Combust. renew. & waste	Electricity	Heat	Total
Production	5	53	-	11	-	1600	14	378	-	-	2061
Imports	48	43	839	1063	-	-	-	-	48	-	2042
Exports	-	-35	-	-	-	Hydro	-	-	-58	-	-93
Intl. marine bunkers	-	-	-	-	-	-	-	-	-	-	-
Intl. aviation bunkers	-	-	-41	-	-	-	-	-	-	-	-41
	-	-3	-	7	-		-	-	-	-	4
TPES	53	58	798	1081	-	1600	14	378	-10	-	3972
				Electricity and Heat O...							
Electricity generated - GWh	-	-	-	1279	-	7162	-	-	-	-	8441
Heat generated - TJ	-	-	-	2052	-	-	-	-	-	-	2052

IEA energy balance layout: compact source of information

Flows

Totals

Turkey : 2008

Million tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal & peat	Crude oil	Oil products	Gas	Nuclear	Hydro	Geotherm. solar etc.	Combust. renew. & waste	Electricity	Heat	Total
Production	16.67	2.13	-	0.84	-	2.86	1.64	4.83	-	-	28.98
Imports	12.86	21.57	14.41	30.60	-	-	-	-	0.07	-	79.50
Exports	-	-	-6.53	-0.36	-	-	-	-	-0.10	-	-6.98
Intl. marine bunkers	-	-	-0.65	-	-	-	-	-	-	-	-0.65
Intl. aviation bunkers	-	-	-1.30	-	-	-	-	-	-	-	-1.30
Stock changes	-0.07	-0.14	0.07	-0.90	-	-	-	-	-	-	-1.04
TPES	**29.46**	**23.56**	**5.99**	**30.18**	[illegible]	**2.86**	**1.64**	**4.83**	**-0.03**	-	**98.50**
Transfers	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-
Statistical differences	0.20	0.70	-0.02	-	-	-	-	-	-	-	0.88
Electricity plants	-14.18	-	-1.58	-14.51	-	-2.86	-0.21	-0.05	16.35	-	-17.05
CHP plants	-0.16	-	-0.13	[illegible]	-	-	[illegible]	-0.01	0.72	1.02	-0.50
Heat plants	-	-	-	-	-	-	-	-	-	-	-
Blast furnaces	-1.24 e	-	-	-	-	-	-	-	-	-	-1.24
Gas works	-	-	-	-	-	-	-	-	-	-	-
Coke/pat. fuel/BKB plants	-0.65	-	-	-	-	-	-	-	-	-	-0.65
Oil refineries	-	-24.42	24.60	-	-	-	-	-	-	-	0.19
Petrochemical plants	-	0.15	-0.16	-	-	-	-	-	-	-	-0.01
Liquefaction plants	-	-	-	-	-	-	-	-	-	-	-
Other transformation	-	-	-	-	-	-	-	-	-	-	-
Energy ind. own use	-0.60	-	-1.26	[illegible]	-	-	-	-	-0.96	-	-3.26
Losses	-0.05	-	-	-0.06	-	-	-	-	-2.36	-	-2.47
TFC	**12.78**	-	**27.45**	[illegible]	[illegible]	[illegible]	[illegible]	**4.77**	**13.71**	**1.02**	**74.38**
INDUSTRY	**6.12**	-	**1.33**	**3.19**	-	-	**0.13**	-	**6.22**	**1.02**	**18.01**
Iron and steel	1.21 e	-	0.10	0.65	-	-	-	-	1.36	-	3.33
Chemical and petrochem.	0.01	-	0.13	0.61	-	-	-	-	0.32	-	1.07
Non-ferrous metals	-	-	0.05	0.10	-	-	-	-	0.21	-	0.36
Non-metallic minerals	-	-	0.50	0.82	-	-	-	-	0.77	-	2.10
Transport equipment	-	-	-	0.04	-	-	-	-	-	-	0.04
Machinery	0.00	-	-	0.13	-	-	-	-	0.31	-	0.44
Mining and quarrying	-	-	-	-	-	-	-	-	0.12	-	0.12
Food and tobacco	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.02
Paper, pulp and printing	[illegible]	-	0.05	0.11	-	-	-	-	0.17	-	0.36
Wood and wood products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.14
Construction	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.04
Textile and leather	[illegible]	-	-	0.09	-	-	-	-	0.99	-	1.17
Non-specified	[illegible]	-	0.16	0.49	-	-	0.13	-	1.20	1.02	4.81
TRANSPORT	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	**15.07**
Domestic aviation	[illegible]	-	0.79	-	-	-	-	-	-	-	0.79
Road	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13.40
Rail	-	-	0.15	-	-	-	-	-	0.02	-	0.17
Pipeline transport	-	-	-	0.16	-	-	-	-	0.01	-	0.17
Domestic navigation	-	-	0.50	-	-	-	-	-	-	-	0.50
Non-specified	-	-	-	-	-	-	-	-	0.05	-	0.05
OTHER	**6.66**	-	**6.22**	**9.59**	-	-	**1.30**	**4.75**	**7.41**	-	**35.93**
Residential	4.93	-	1.69	6.52	-	-	1.30	4.75	3.40	-	22.60
Comm. and public service	1.06	-	-	3.07	-	-	-	-	3.50	-	7.63
Agriculture/forestry	-	-	4.53	-	-	-	-	-	0.49	-	5.02
Fishing	-	-	-	-	-	-	-	-	0.01	-	0.01
Non-specified	0.66	-	-	-	-	-	-	-	-	-	0.66
NON-ENERGY USE	-	-	**5.11**	**0.26**	-	-	-	-	-	-	**5.37**
in industry/transf./energy	-	-	4.53	0.26	-	-	-	-	-	-	4.79
of which: feedstocks	-	-	*1.11*	*0.26*	-	-	-	-	-	-	*1.37*
in transport	-	-	0.58	-	-	-	-	-	-	-	0.58
in other	-	-	-	-	-	-	-	-	-	-	-
Electricity and Heat Output											
Elec. generated - TWh	**57.72**	-	**7.52**	**98.69**	-	**33.27**	**1.01**	**0.22**	-	-	**198.42**
Electricity plants	57.15	-	6.90	91.55	-	33.27	1.01	0.20	-	-	190.08
CHP plants	0.57	-	0.62	7.14	-	-	-	0.02	-	-	8.34
Heat generated - PJ	**0.58**	-	**0.56**	**41.40**	-	-	-	-	-	-	**42.54**
CHP plants	0.58	-	0.56	41.40	-	-	-	-	-	-	42.54
Heat plants	-	-	-	-	-	-	-	-	-	-	-

Supply

Transformation and energy industries own use

Final consumption

Industry

Transport

Other final consumption

Non-energy use

Electricity and heat output

Comparable information for all products

Comparable energy units (Mtoe)

Global picture of energy situation in a country

Energy balance of Serbia 2008

SUPPLY AND CONSUMPTION	Coal & peat	Crude oil	Oil products				m. etc.	Combust. renew. & waste	Electricity	Heat	Total
Production	7371				-	823	48	806	-	-	9922
Imports	945				-	-	-	1	763	-	7440
Exports	-57				-	-	-	-4	-757	-	-1056
Intl. marine bunkers	-				-	-	-	-	-	-	-
Intl. aviation bunkers	-				-	-	-	-	-	-	-48
Stock changes	-136				-	-	-	1	-	-	-227
TPES	**8122**				**-**	**823**	**48**	**804**	**6**	**-**	**16032**
Transfers	-	51	-47	-	-	-	-	-	-	-	4
Statistical differences	303	59	-48	-	-	-	-	-	5	10	329
Electricity plants	-6785	-	-17	-17	-	-823	-	-	3127	-	-4515
CHP plants	-	-	-33	-99	-	-	-	-	36	39	-58
Heat plants	-104	-	-349	-389	-	-	-42	-1	-	778	-106
Blast furnaces	-247	-	-	-				-	-	-	-247
Gas works	-	-	-	-				-	-	-	-
Coke/pat.fuel/BKB plants	-99	-	-	-				-	-	-	-99
Oil refineries	-	-3457	3160	-				-	-	-	-297
Petrochemical plants	-	99	-103	-				-	-	-	-4
Liquefaction plants	-	-	-	-				-	-	-	-
Other transformation	-	-	-	-				-	-	-	-
Energy industry own use	-	-	-	-45				-	-322	-20	-387
Losses	-76	-	-	-31				-	-508	-81	-696
TFC	**1115**	**-**	**3541**	**1420**				**804**	**2344**	**727**	**9956**
INDUSTRY	**582**	**-**	**498**	**1002**				**22**	**608**	**296**	**3007**
TRANSPORT	**1**	**-**	**2178**	**4**				**-**	**23**	**-**	**2206**
OTHER	**511**	**-**	**176**	**281**	**-**	**-**	**6**	**781**	**1714**	**431**	**3901**
NON-ENERGY USE	**21**	**-**	**689**	**132**	**-**	**-**	**-**	**-**	**-**	**-**	**842**

Supply

Refined products and electricity are secondary energy: production = 0

Coal-to-coal transformation

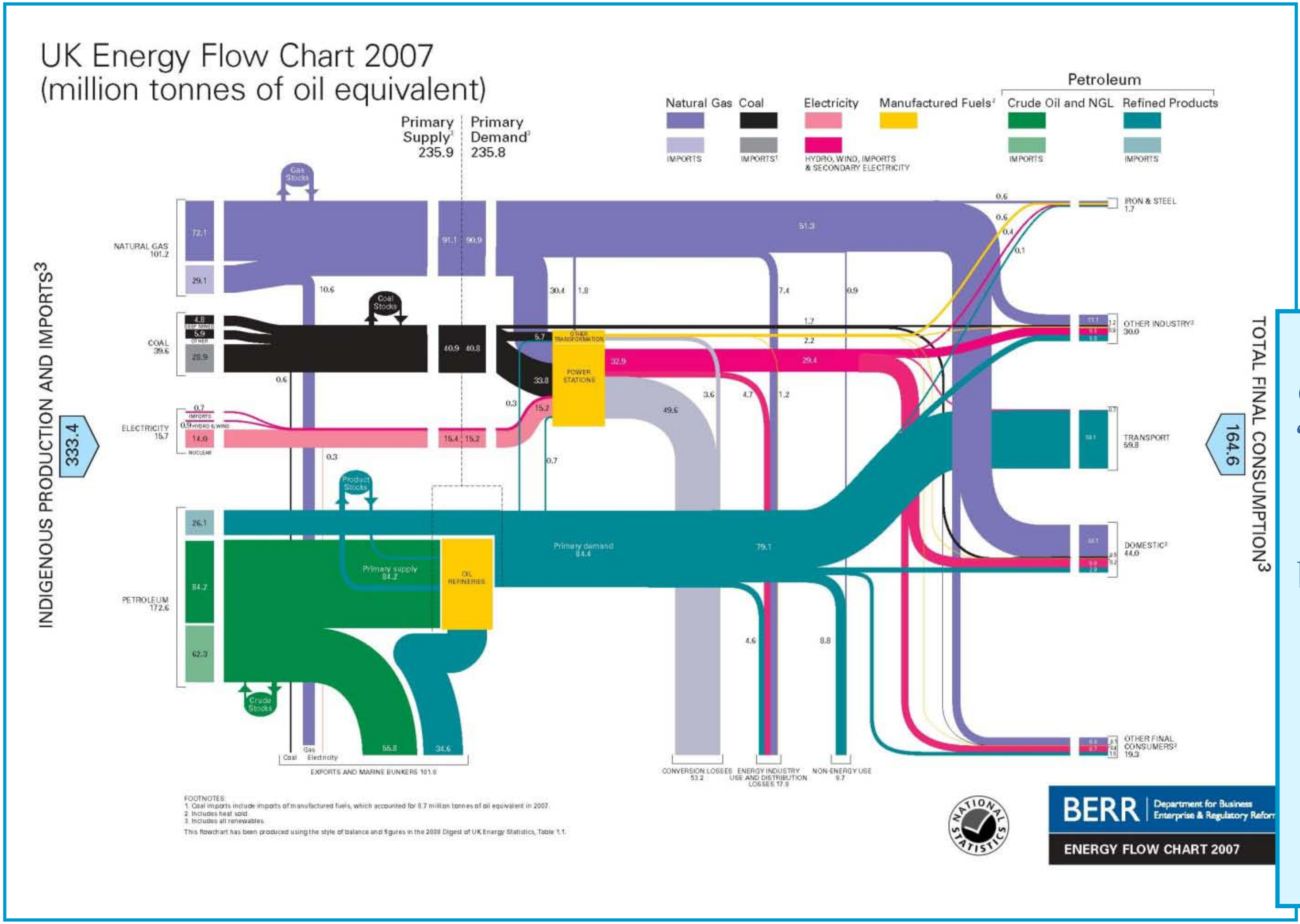
Value represents transformation losses; further detail available in BIGBAL

Transformation

- Negative value represents an input, positive value represents an output

- Transformation **losses** appear in the **Total** column as negative figures

Alternative presentations



Some countries use “flow” charts to visualise their energy balances - no confusion as long as similar principles have been used

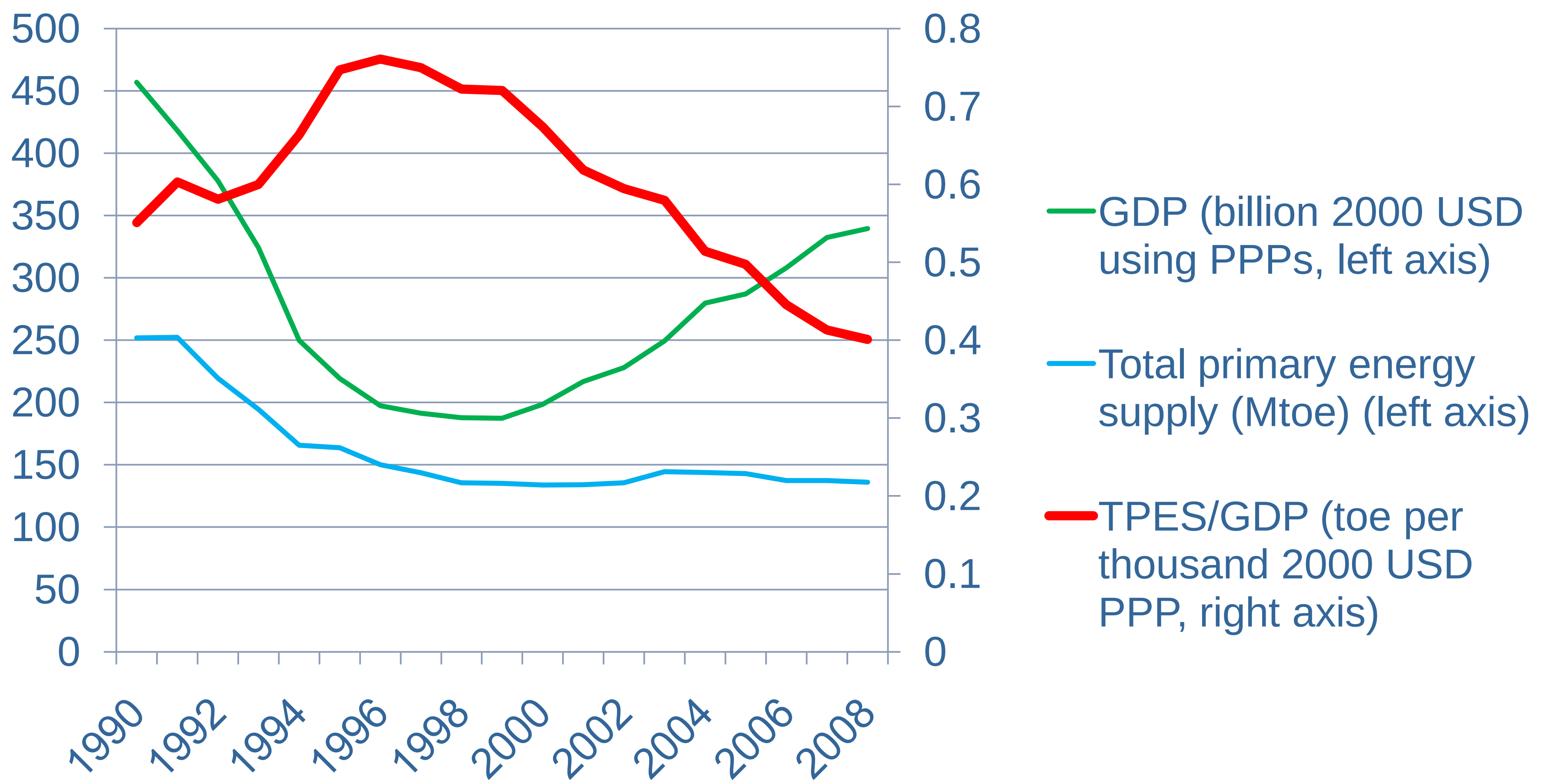
Using the energy balance with economic indicators

Using:

- Population
- GDP (using 2000 exchange rates to US dollars)
- GDP-PPP (using 2000 PPPs to US dollars)

- Energy Production/TPES
- Net Oil Imports/GDP
- TPES/GDP
- TPES/Population
- Oil Supply/GDP
- Oil Supply/Population
- Electricity Consumption/GDP
- Electricity Consumption/Population

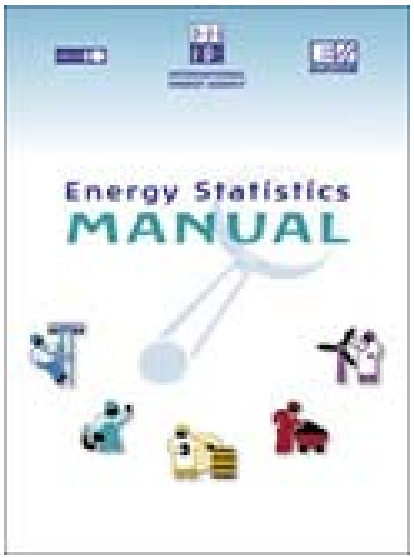
TPES & GDP in the Ukraine



Need for additional harmonisation

- There are at least 3 levels for harmonisation:
- country - organisation
- organisation – organisation (InterEnerStat)
- energy – economic – environmental (Oslo City Group, London City Group)

Joint manuals allow countries to see what international organisations are doing



- **In 2004/2005 the IEA and Eurostat have prepared a joint manual to help countries collect and submit energy data**

- **The UN is currently working on International Recommendations on Energy Statistics (IRES) to update the previous UN manuals from the 1980s/1990s**

InterEnerStat has harmonised definitions across organisations

- APEC and Eurostat/IEA: Crude oil is a mineral oil of natural origin comprising a mixture of hydrocarbons and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperature and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. This category includes field or lease condensate recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream.

- OLADE: This is a complex mixture of hydrocarbons of different molecular weights, with a fraction (generally small) of compounds containing sulphur and nitrogen. The composition of petroleum is variable and may be divided into three classes according to the residues that are formed during distillation: paraffins, asphalts or a mixture of the two. Crude oil is used as a raw material for refineries where it is processed to obtain products.

- OPEC: Crude oil is technically defined as a mixture of hydrocarbons that exists in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Production volumes reported as crude oil include:
  - 1. Liquids technically defined as crude oil
  - 2. Small amounts of hydrocarbons that exist in the gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being recovered from oil well (casing head) gas in lease separators.
  - 3. Small amounts of non-hydrocarbons produced and remaining with oil.

- UNSD: Crude Oil/Petroleum: A mixture of pentanes and heavy hydrocarbons that may be contaminated with sulphur compounds which is recovered at a well from an underground reservoir and is liquid when its volume is measured. Excludes raw gas and condensate.

Benefits of harmonisation is felt at all levels

In general, harmonisation :

- helps policy makers take informed decisions
- reduces the workload on administrations collecting and supplying data
- reduces the need for organisations to explain differences between different data sets to inexperienced users
- helps the general public understand the energy situation of their own country as well as other countries
- Statistics for the Caspian region are published by several organisations (UNSD, IEA, Eurostat etc.) Harmonisation in the definitions helps comparability and reduce reporting burdens

Although harmonisation is the way to go, we all know that it is a lengthy process.

IEA Balance Builder

- **Available at http://www.iea.org/stats/questionnaire/balancebuildertemplate.xls**
- **Two options:**
  - **1) Shows links from basic energy statistics ("commodity balances") to the energy balance**
  - **2) shows links from the five annual questionnaires to the energy balance (via the basic energy statistics)**

IEA balance builder (2)

What is it for?

- Shows a country what their data will look like in the IEA format (so no surprises on publication day)
- Shows the country's statisticians how to construct an energy balance (and what data they need to do so)
- Highlights the importance of accurate NCVs

International Energy Agency

In conclusion, good (hopefully harmonised) energy balances:

- Require good quality statistics (data, calorific values)
- Are a compact source of energy information (convenient!)
- Enable accurate checks of energy statistics (efficiencies…)
- Are the foundation for basic energy indicators, energy accounts and for CO_2 emissions estimates
- …Are not essential, but highly recommended!

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Thank you