Introduction to Energy Statistics: the core importance of good energy balances

Nikolaos Kordevas, Senior Energy Statistician, Energy Data Centre, IEA

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IEA

The importance of energy balances: bringing all 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 (IRES), UNSD, 2011

Energy Balances

People's Republic of China

2015

Million tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude oil[1]	Oil products	Natural gas	Nuclear	Hydro	Geotherm./ Solar/ etc.	Biofuels/ Waste	Electricity	Heat	Total
Production	1868.16	214.76	-	112.62	44.51	95.84	46.24	113.51	-	-	2496.63
Imports	108.75	335.48	53.57	48.64	-	-	-	-	0.53	-	546.98
Exports	-9.60	-2.87	-41.22	-2.71	-	-	-	-	-1.60	-	-58.01
Intl. marine bunkers	-	-	-9.23	-	-	-	-	-	-	-	-9.23
Intl. aviation bunkers	-	-	-7.80	-	-	-	-	-	-	-	-7.80
Stock changes	14.64	-6.24	-2.73	-	-	-	-	-	-	-	5.67
TPES	**1981.95**	**541.14**	**-7.41**	**158.54**	**44.51**	**95.84**	**46.24**	**113.51**	**-1.07**	**-**	**2973.25**
Transfers	-0.97	-1.09	2.49	-	-	-	-	-	-	-	0.43
Statistical differences	-9.24	-0.05	2.20	0.69	-	-	0.00	0.02	-0.01	-	-6.41
Electricity plants	-920.05	-0.13	-2.25	-26.07	-44.51	-95.84	-19.98	-21.92	502.60	-	-628.15
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat plants	-121.45	-0.07	-4.63	-5.26	-	-	-	-1.47	-	95.90	-36.98
Blast furnaces	-103.84	-	-	-	-	-	-	-	-	-	-103.84
Gas works	-4.78	-	-	1.08	-	-	-	-	-	-	-3.70
Coke/pat. fuel/BKB/PB plants	-61.14	-	-	-	-	-	-	-	-	-	-61.14
Oil refineries	-	-533.29	517.38	-	-	-	-	-	-	-	-15.91
Petrochemical plants	-	-	-	-	-	-	-	-	-	-	-
Liquefaction plants	-3.64	2.19	-	-	-	-	-	-	-	-	-1.46
Other transformation	-	-	-	-	-	-	-	-	-	-	-
Energy industry own use	-56.07	-4.40	-30.77	-21.72	-	-	-	-	-56.42	-11.47	-180.86
Losses	-	-0.87	-0.00	-1.84	-	-	-	-	-25.70	-1.15	-29.56
TFC	**700.75**	**3.42**	**477.01**	**105.42**	**-**	**-**	**26.26**	**90.14**	**419.40**	**83.28**	**1905.68**
INDUSTRY	**538.62**	**2.07**	**54.76**	**38.51**	**-**	**-**	**0.21**	**-**	**276.25**	**55.72**	**966.13**
Iron and steel	191.78	-	0.96	3.59	-	-	-	-	45.86	5.66	247.85
Chemical and petrochemical	90.58	-	12.45	11.51	-	-	-	-	46.71	26.89	188.14
Non-ferrous metals	16.57	-	1.04	3.33	-	-	-	-	47.35	3.50	71.79
Non-metallic minerals	161.98	-	6.13	6.66	-	-	-	-	26.71	0.26	201.73
Transport equipment	2.90	-	0.75	2.54	-	-	-	-	8.19	1.10	15.48
Machinery	12.78	-	2.09	3.82	-	-	-	-	35.38	1.05	55.13
Mining and quarrying	7.17	-	2.87	0.87	-	-	-	-	8.90	0.89	20.69
Food and tobacco	23.48	-	0.89	1.89	-	-	-	-	9.42	3.62	39.31
Paper, pulp and printing	8.76	-	0.33	0.85	-	-	-	-	6.42	4.88	21.25
Wood and wood products	2.76	-	0.27	0.18	-	-	-	-	2.99	0.16	6.35
Construction	4.51	-	7.25	0.18	-	-	-	-	6.01	0.22	18.16
Textile and leather	9.89	-	0.49	0.66	-	-	-	-	16.66	6.89	34.59
Non-specified	5.45	2.07	19.24	2.42	-	-	0.21	-	15.66	0.60	45.65
TRANSPORT	**2.44**	**-**	**262.06**	**16.60**	**-**	**-**	**-**	**2.05**	**15.45**	**-**	**298.60**
Domestic aviation	-	-	18.00	-	-	-	-	-	-	-	18.00
Road	-	-	218.03	16.29	-	-	-	2.05	10.10	-	246.47
Rail	2.44	-	3.23	-	-	-	-	-	5.35	-	11.01
Pipeline transport	-	-	0.00	0.31	-	-	-	-	-	-	0.31
Domestic navigation	-	-	20.94	-	-	-	-	-	-	-	20.94
Non-specified	0.00	-	1.86	-	-	-	-	-	-	-	1.87
OTHER	**104.10**	**-**	**69.39**	**40.33**	**-**	**-**	**26.05**	**88.09**	**127.71**	**27.56**	**483.22**
Residential	49.18	-	35.94	30.10	-	-	21.81	88.09	65.06	22.41	312.60
Comm. and public services	20.18	-	16.73	10.15	-	-	3.56	-	26.20	2.16	78.00
Agriculture/forestry	13.64	-	17.72	0.08	-	-	0.64	-	8.94	0.03	41.04
Fishing	-	-	-	-	-	-	-	-	-	-	-
Non-specified	21.09	-	-	-	-	-	0.04	-	27.50	2.96	51.59
NON-ENERGY USE	**55.59**	**1.36**	**90.80**	**9.98**	**-**	**-**	**-**	**-**	**-**	**-**	**157.73**
In industry/transf./energy	55.59	1.36	66.74	9.98	-	-	-	-	-	-	133.67
of which: chem./petrochem.	-	*1.36*	*55.38*	*9.98*	-	-	-	-	-	-	66.72
In transport	-	-	1.23	-	-	-	-	-	-	-	1.23
In other	-	-	22.83	-	-	-	-	-	-	-	22.83
Electricity and Heat Output											
Electr. generated - TWh	**4108.99**	**-**	**9.68**	**145.35**	**170.79**	**1114.47**	**231.15**	**63.73**	**-**	**-**	**5844.16**
Electricity plants	4108.99	-	9.68	145.35	170.79	1114.47	231.15	63.73	-	-	5844.16
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat generated - PJ	**3605.29**	**-**	**166.98**	**198.37**	**-**	**-**	**-**	**45.40**	**-**	**-**	**4016.05**
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat plants	3605.29	-	166.98	198.37	-	-	-	45.40	-	-	4016.05

1. Includes crude oil, NGL, refinery feedstocks, additives and other hydrocarbons.

- What is an energy balance?
- Why do we develop energy balances?
- From energy statistics to energy balances
- Understanding the flows of energy
- Benefits of energy balances
- Beyond energy balances

What is an energy balance?

Energy balances are a compact source of information

Supply

Transformation and energy industries own use

Final consumption

Industry

Transport

Other final consumption

Non-energy use

Electricity and heat output

Totals

Comparable information for all products

Comparable energy units (Mtoe)

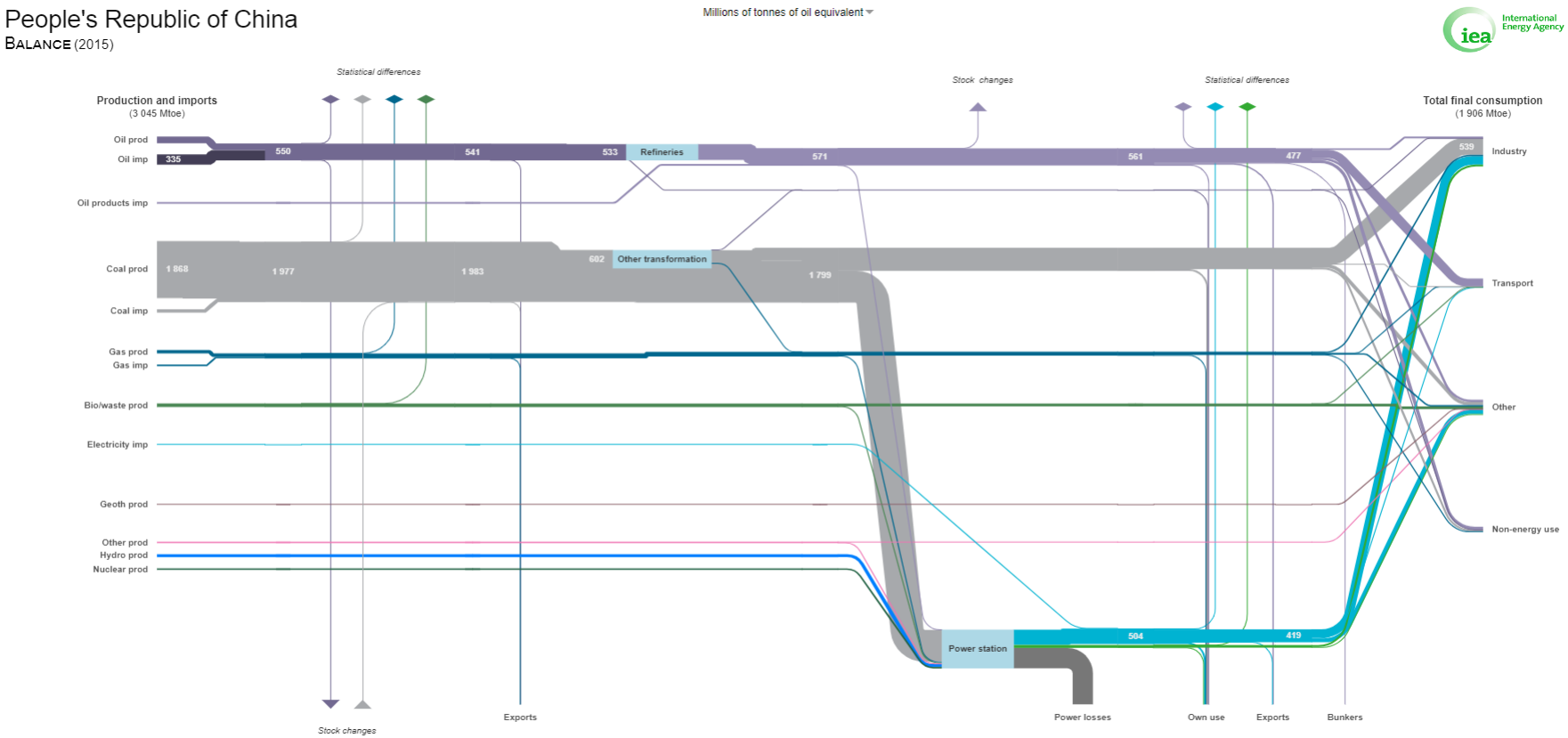
Global picture of energy situation in a country

Million tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude oil[1]	Oil products	Natural gas	Nuclear	Hydro	Geotherm./ Solar/ etc.	Biofuels/ Waste	Electricity	Heat	Total
Production	1868.16	214.76	-	112.62	44.51	95.84	46.24	113.51	-	-	2495.63
Imports	108.75	335.48	53.57	48.64	-	-	-	-	0.53	-	546.98
Exports	-9.60	-2.87	-41.22	-2.71	-	-	-	-	-1.60	-	-58.01
Intl. marine bunkers	-	-	-9.23	-	-	-	-	-	-	-	-9.23
Intl. aviation bunkers	[illegible]	[illegible]	-7.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-7.80
Stock changes	14.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	5.67
TPES	**1981.95**	**541.14**	**-7.41**	**158.54**	**44.51**	**95.84**	**46.24**	**113.51**	**-1.07**	**-**	**2973.25**
Transfers	-0.97	-1.09	[illegible]	-	-	[illegible]	-	-	-	-	0.43
Statistical differences	-9.24	-0.05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.02	-0.01	-	-6.41
Electricity plants	-920.05	-0.13	-2.25	-26.07	-44.51	-95.84	-19.98	-21.92	502.60	-	-628.15
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat plants	-121.45	-0.07	-4.63	-5.26	-	-	-	-1.47	-	95.90	-36.98
Blast furnaces	-103.84	-	-	-	-	-	-	-	-	-	-103.84
Gas works	-4.78	-	-	1.08	-	-	-	-	-	-	-3.70
Coke/pat. fuel/BKB/PB plants	-61.14	-	-	-	-	-	-	-	-	-	-61.14
Oil refineries	-	-533.29	517.38	-	-	-	-	-	-	-	-15.91
Petrochemical plants	-	-	-	-	-	-	-	-	-	-	-
Liquefaction plants	-3.64	2.19	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	-	-	-1.46
Other transformation	-	-	-	-	-	-	-	-	-	-	-
Energy industry own use	-56.07	-4.40	-30.71	-21.72	[illegible]	[illegible]	[illegible]	[illegible]	-56.42	-11.47	-180.86
Losses	-	-0.87	-0.00	-1.84	[illegible]	[illegible]	[illegible]	[illegible]	-25.70	-1.15	-29.56
TFC	**700.75**	**3.42**	**477.01**	[illegible]	[illegible]	[illegible]	**26.26**	**90.14**	**419.40**	[illegible]	**1905.68**
INDUSTRY	**538.62**	**2.07**	**54.76**	[illegible]	[illegible]	[illegible]	[illegible]	**-**	**276.25**	[illegible]	**966.13**
Iron and steel	191.78	-	0.96	3.59	-	-	-	-	45.86	5.66	247.85
Chemical and petrochemical	90.58	-	12.45	11.51	-	-	-	-	46.71	26.89	188.14
Non-ferrous metals	16.57	-	1.04	3.33	-	-	-	-	47.35	3.50	71.79
Non-metallic minerals	161.98	-	6.13	6.66	-	-	-	-	26.71	0.26	201.73
Transport equipment	2.90	-	0.75	2.54	-	-	-	-	8.19	1.10	15.48
Machinery	12.78	-	2.09	3.82	-	-	-	-	35.38	1.05	55.13
Mining and quarrying	7.17	-	2.87	0.87	-	-	-	-	8.90	0.89	20.69
Food and tobacco	23.48	-	0.89	1.89	-	-	-	-	9.42	3.62	39.31
Paper, pulp and printing	8.76	-	0.33	0.85	-	-	-	-	6.42	4.88	21.25
Wood and wood products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.16	6.35
Construction	[illegible]	-	7.25	0.18	-	-	-	-	6.01	0.22	18.16
Textile and leather	[illegible]	-	0.49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.66	[illegible]	34.59
Non-specified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.60	45.65
TRANSPORT	[illegible]	[illegible]	**262.06**	**16.60**	[illegible]	[illegible]	[illegible]	**2.05**	[illegible]	**-**	**298.60**
Domestic aviation	-	-	18.00	-	-	-	-	-	-	-	18.00
Road	-	[illegible]	218.03	16.29	[illegible]	[illegible]	[illegible]	2.05	10.10	-	246.47
Rail	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.35	-	11.01
Pipeline transport	-	[illegible]	[illegible]	0.31	[illegible]	[illegible]	[illegible]	[illegible]	-	-	0.31
Domestic navigation	[illegible]	[illegible]	20.94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	20.94
Non-specified	0.00	-	1.86	-	-	-	-	-	-	-	1.87
OTHER	**104.10**	**-**	**69.39**	**40.33**	**-**	**-**	**26.05**	**88.09**	**127.71**	**27.56**	**483.22**
Residential	49.18	-	35.94	30.10	-	-	21.81	88.09	65.06	22.41	312.60
Comm. and public services	20.18	-	15.73	10.15	-	-	3.56	-	26.20	2.16	78.00
Agriculture/forestry	13.64	-	17.72	0.08	-	-	0.64	-	8.94	0.03	41.04
Fishing	-	-	-	-	-	-	-	-	-	-	-
Non-specified	21.09	-	-	-	-	-	0.04	-	27.50	2.96	51.59
NON-ENERGY USE	**55.59**	**1.36**	**90.80**	**9.98**	**-**	**-**	**-**	**-**	**-**	**-**	**157.73**
in industry/transf./energy	55.59	1.36	66.74	9.98	-	-	-	-	-	-	133.67
of which: chem./petrochem	*-*	*1.36*	*55.38*	*9.98*	-	-	-	-	-	-	*66.72*
in transport	-	-	1.23	-	-	-	-	-	-	-	1.23
in other	-	-	22.83	-	-	-	-	-	-	-	22.83
Electricity and Heat Output											
Electr. generated - TWh	**4108.99**	**-**	**9.68**	**145.35**	**170.79**	**1114.47**	**231.15**	**63.73**	**-**	**-**	**5844.16**
Electricity plants	4108.99	-	9.68	145.35	170.79	1114.47	231.15	63.73	-	-	5844.16
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat generated - PJ	**3605.29**	**-**	**166.98**	**198.37**	**-**	**-**	**-**	**45.40**	**-**	**-**	**4016.05**
CHP plants	-	-	-	-	-	-	-	-	-	-	-
Heat plants	3605.29	-	166.98	198.37	-	-	-	45.40	-	-	4016.05

1. Includes crude oil, NGL, refinery feedstocks, additives and other hydrocarbons.

Energy balance can be depicted as a Sankey chart



http://www.iea.org/Sankey/#?c=People's%20Republic%20of%20China&s=Balance

Why do we develop energy balances?

Why do we develop energy balances?

- To understand overall energy use in country, e.g.
  - compute the total energy use
  - assess relative contribution of different sources in energy mix / different sectors in energy demand
  - compute efficiencies of various transformation processes (e.g. electricity generation)

- To estimate high-level indicators (self-sufficiency, intensity, ..) and CO_2 emissions from fuel combustion

- To assess data completeness and check quality of the various energy commodity balances

The energy balance matrix

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Production	1868159	214760	0	112618	44509	95844	46236	113508	0	0	2495635
Imports	108753	335483	53573	48640	0	0	0	0	534	0	546982
Exports	-9602	-2866	-41220	-2715	0	0	0	0	-1604	0	-58007
International marine bunkers***	0	0	-9228	0	0	0	0	0	0	0	-9228
International aviation bunkers***	0	0	-7799	0	0	0	0	0	0	0	-7799
Stock changes	14642	-6238	-2734	0	0	0	0	0	0	0	5670
TPES	**1981952**	**541139**	**-7407**	**158543**	**44509**	**95844**	**46236**	**113508**	**-1070**	**0**	**2973254**
Transfers	-971	-1090	2490	0	0	0	0	0	0	0	429
Statistical differences	-9244	-52	2198	689	0	0	0	16	-14	0	-6407
Electricity plants	-920053	-125	-2253	-26070	-44509	-95844	-19980	-21917	502598	0	-628154
CHP plants	0	0	0	0	0	0	0	0	0	0	0
Heat plants	-121455	-67	-4625	-5263	0	0	0	-1468	0	95903	-36975
Gas works	-4777	0	0	1078	0	0	0	0	0	0	-3699
Oil refineries	0	-533291	517383	0	0	0	0	0	0	0	-15908
Coal transformation	-164982	0	0	0	0	0	0	0	0	0	-164982
Liquefication plants	-3642	2185	0	0	0	0	0	0	0	0	-1457
Other transformation	0	0	0	0	0	0	0	0	0	0	0
Energy industry own use	-56075	-4404	-30773	-21719	0	0	0	0	-56417	-11472	-180860
Losses	0	-872	-4	-1839	0	0	0	0	-25696	-1152	-29562

- Columns present the "commodity balances" for all products
- IEA methodology uses **ktoe**

All data are comparable thanks to a common energy unit - Total energy can be defined

From energy statistics to energy balances

Give your opinion by voting

- To convert mass to energy units, we need…

  - **Specific gravity**

  - **Calorific value**

  - **Emission factor**

Answer

- To convert mass to energy units, we need

  - **Specific gravity**
  - **Calorific value**
  - **Emission factor**

Typically in units of energy per mass or per volume

From energy statistics to energy balance – how?

Statistics by product —x→ Calorific values → Format change = Energy balance

A calorific value -

- is the amount of heat obtained from one unit (mass or volume) of the fuel,
- and is the only way to convert a fuel quantity from natural units (mass or volume) into energy units (e.g. ktoe).

Calorific values – the key to data quality

Commodity balances	Bituminous coal kt	Product 2 m3	…
Production	100		
Import	20		
Export	40		
Supply	**80**		
Statistical differences	*0*		
Input to Electricity	50		
…			
Final consumption	30		

Net Calorific Values	Bituminous coal TJ/kt	Product 2 TJ/m3	…
Production	23		
Import	25		
Export	22.5		
Input to Electricity	22		
…			
Final consumption	20		

Energy balance (excerpt)	Bituminous coal TJ	Product 2 TJ	…
Production	2300		
Import	500		
Export	900		
Supply	**1900**		
Statistical differences	*200*		
Input to Electricity	1100		
…			
Final consumption	600		
….			

Need to collect good data for physical quantities AND calorific values

Understanding the flows of energy

Understanding the flows of energy

2015 ▼ | Indicators | Balances | Coal | Electricity and Heat | Natural Gas | Oil | Renewables and Waste

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Production	1868159	214760	0	112618	44509	95844	46236	113508	0	0	2495635
Imports	108753	335483	53573	48640	0	0	0	0	534	0	546982
Exports	-9602	-2866	-41220	-2715	0	0	0	0	-1604	0	-58007
International marine bunkers***	0	0	-9228	0	0	0	0	0	0	0	-9228
International aviation bunkers***	0	0	-7799	0	0	0	0	0	0	0	-7799
Stock changes	14642	-6238	-2734	0	0	0	0	0	0	0	5670
TPES	**1981952**	**541139**	**-7407**	**158543**	**44509**	**95844**	**46236**	**113508**	**-1070**	**0**	**2973254**
Transfers	-971	-1090	2490	0	0	0	0	0	0	0	429
Statistical differences											07
Electricity plants											4
CHP plants											0
Heat plants											5
Gas works											9
Oil refineries											08
Coal transformation	-164982	0	0	0	0	0	0	0	0	0	-164982
Liquefaction plants	-3642	2185	0	0	0	0	0	0	0	0	-1457
Other transformation	0	0	0	0	0	0	0	0	0	0	0
Energy industry own use	-56075	-4404	-30773	-21719	0	0	0	0	-56417	-11472	-180860
Losses	0	-872	-4	-1839	0	0	0	0	-25896	-1152	-29562
Total final consumption	**700754**	**3423**	**477009**	**105420**	**0**	**0**	**26256**	**90138**	**419401**	**83279**	**1905679**
Industry	**538623**	**2066**	**54758**	**38506**	**0**	**0**	**210**	**0**	**276246**	**55722**	**966131**
Transport											
Other											2
Residential											9
Commercial and public services											6
Agriculture / forestry	13637	0	17717	79	0	0	640	0	8943	25	41041
Fishing	0	0	0	0	0	0	0	0	0	0	0
Non-specified	21093	0	0	0	0	0	36	0	27499	2959	51586
Non-energy use	**55589**	**1357**	**90804**	**9980**	**0**	**0**	**0**	**0**	**0**	**0**	**157730**
-of which chemical/petrochemical	*0*	*1357*	*55381*	*9980*	*0*	*0*	*0*	*0*	*0*	*0*	*66718*

Supply

Transformation

Final consumption

Rows present energy flows across the various products

Three main "blocks" of flows

1: Energy supply

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Production	1868159	214760	0	112618	44509	95844	46236	113508	0	0	2495635
Imports	108753	335483	53573	48640	0	0	0	0	534	0	546982
Exports	-9602	-2866	-41220	-2715	0	0	0	0	-1604	0	-58007
International marine bunkers***	0	0	-9228	0	0	0	0	0	0	0	-9228
International aviation bunkers***	0	0	-7799	0	0	0	0	0	0	0	-7799
Stock changes				0	0	0	0	0	0	0	5670
TPES				**158543**	**44509**	**95844**	**46236**	**113508**	**-1070**	**0**	**2973254**

Producers	Mt	% of world total
Saudi Arabia	583	13.5
Russian Federation	546	12.6
United States	537	12.4
Canada	220	5.1
Islamic Rep. of Iran	200	4.6
People's Rep. of China	200	4.6
Iraq	191	4.4
United Arab Emirates	182	4.2
Kuwait	159	3.7
Brazil	135	3.1
Rest of the world	1 368	31.8
World	**4 321**	**100.0**

2016 provisional data

Net exporters	Mt
Saudi Arabia	369
Russian Federation	243
Iraq	148
United Arab Emirates	125
Canada	116
Nigeria	104
Kuwait	100
Venezuela	98
Angola	86
Islamic Rep. of Iran	64
Others	539
Total	**1 992**

2015 data

Net importers	Mt
United States	348
People's Rep. of China	333
India	203
Japan	165
Korea	139
Germany	91
Italy	67
Spain	65
Netherlands	59
France	57
Others	514
Total	**2 041**

2015 data

Source: IEA, Key World Energy Statistics, 2017

"High-level" information: **TPES, Totals, etc…**

1: Energy supply

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Production	1868159	214760	0	112618	44509	95844	46236	113508	0	0	2495635
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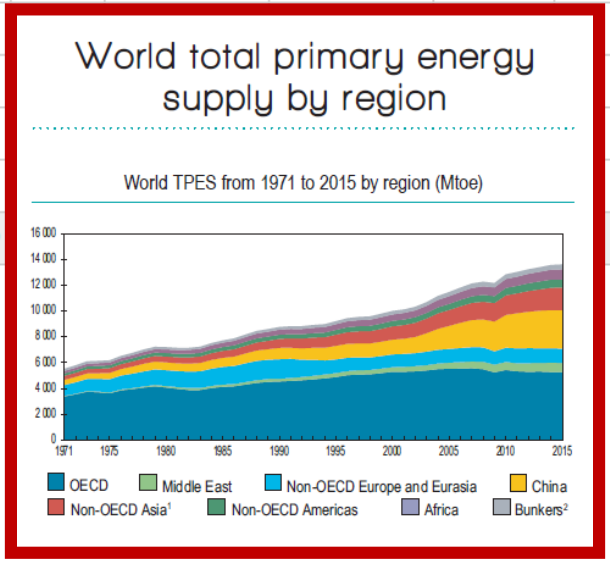
2015 data



Source: IEA, Key World Energy Statistics, 2017

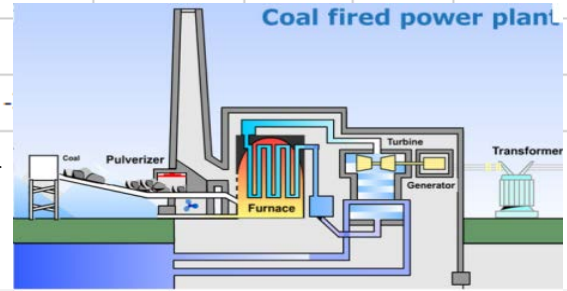
"High-level" information: **Total primary energy supply, production, trade, etc…**

2: Transformation and energy sectors

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Electricity plants	-920053	-125	-2253	-26070	-44509	-95844	-19980	-21917	502598	0	-628154
CHP plants	0	0	0	0	0	0	0	0	0	0	0
Heat plants	-121455	-67	-4625	-5263	0	0	0	-1468	0	95903	-36975
Gas works	-4777	0							0	0	-3699
Oil refineries	0	-533291							0	0	-15908
Coal transformation	-164982	0	0	0	0	0	0	0	0	0	-164982
Liquefication plants	-3642	2185	0	0	0	0	0	0	0	0	-1457
Other transformation	0	0							0	0	0
Energy industry own use			4						0		

Transforming energy sources

Input (coal)



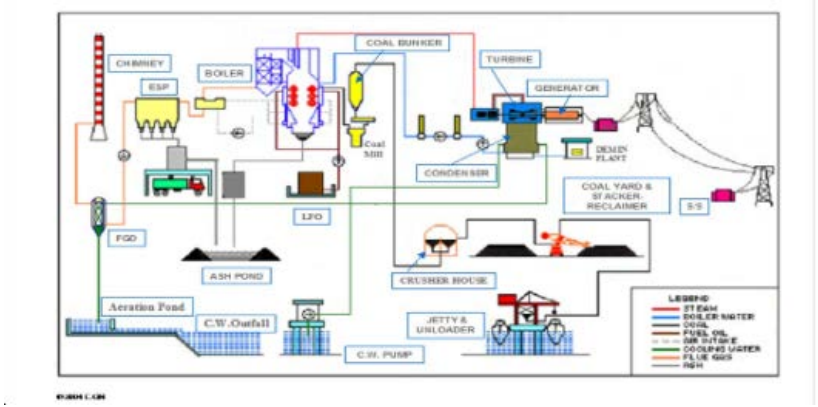
Output (electricity)

The concept of efficiency = output / input

Give your opinion by voting…

- What is the average efficiency for a **coal electricity-only** power plant?

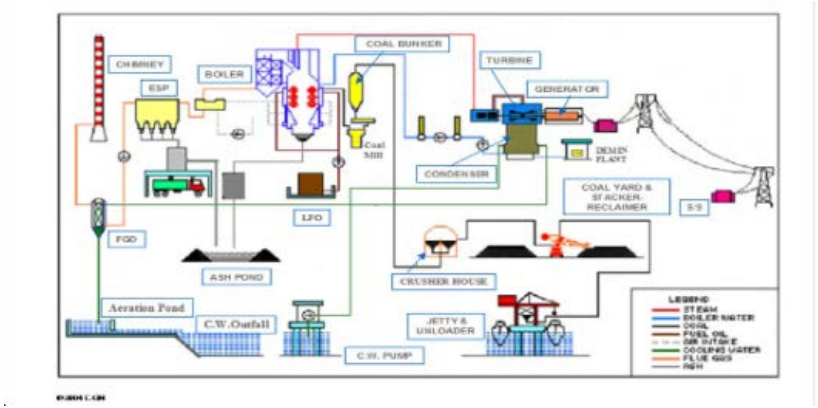
  - **37%**
  - **52%**
  - **65%**



Answer

➢ What is the average efficiency for a **coal electricity-only** power plant?

- **37%**
- **52%**
- **65%**



Source: IEA, World Energy Balances, 2017

3: Final consumption

	Coal*	Crude oil*	Oil products	Natural gas	Nuclear	Hydro	Geothermal, solar, etc.	Biofuels and waste	Electricity	Heat	Total**
Total final consumption	**700754**	**3423**	**477009**	**105420**	**0**	**0**	**26256**	**90138**	**419401**	**83279**	**1905679**
Industry	**538623**	**2066**	**54758**	**38506**	**0**	**0**	**210**	**0**	**276246**	**55722**	**966131**
Transport	**2442**	**0**	**262056**	**16602**	**0**	**0**	**0**	**2047**	**15449**	**0**	**298596**
Other	**104100**	**0**	**69391**	**40332**	**0**	**0**	**26046**	**88091**	**127706**	**27556**	**483222**
Residential	49185	0	35944	30102	0	0	21807	88091	65061	22409	312599
Commercial and public services	20185	0	15731	10150	0	0	3564	0	26204	2163	77996
Agriculture / forestry	13637	0	17717	79	0	0	640	0	8943	25	41041
Fishing	0	0	0	0	0	0	0	0	0	0	0
Non-specified	21093	0	0	0	0	0	36	0	27499	2959	51586
Non-energy use	**55589**	**1357**	**90804**	**9980**	**0**	**0**	**0**	**0**	**0**	**0**	**157730**
-of which chemical/petrochemical	*0*	*1357*	*55381*	*9980*	*0*	*0*	*0*	*0*	*0*	*0*	*66718*

Deliveries of energy products to all final consumers

And finally

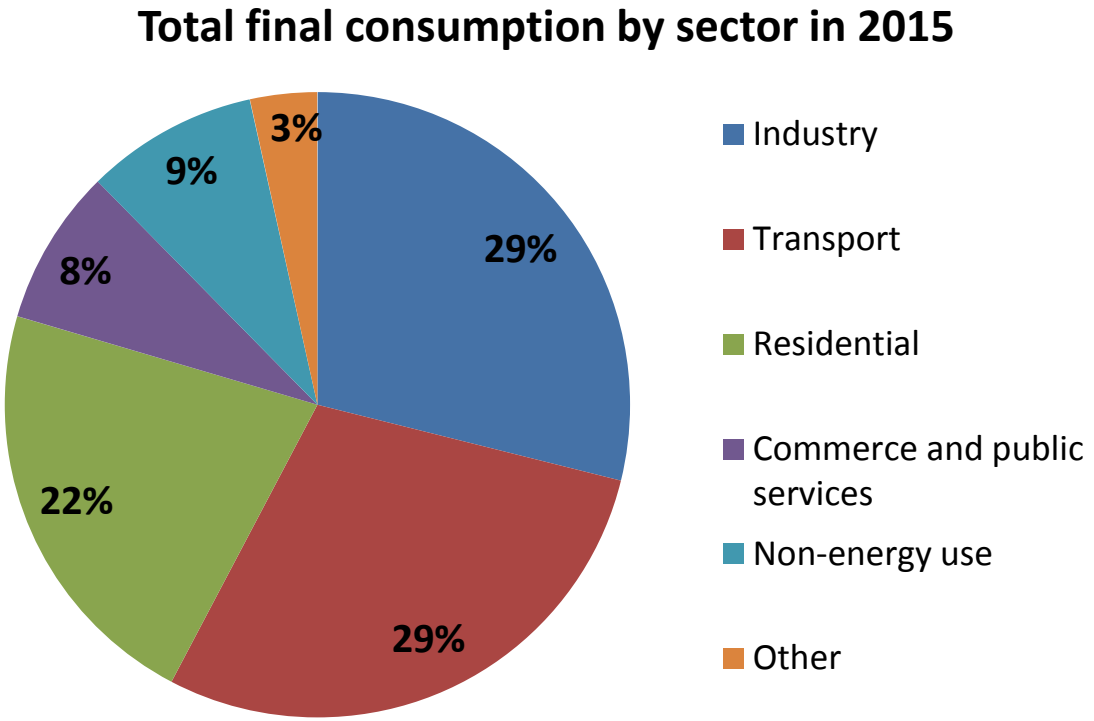
- What is the largest energy-consuming sector in the world?

  - **Residential**
  - **Transport**
  - **Industry**

Answer

➢ What is the largest energy-consuming sector in the world?

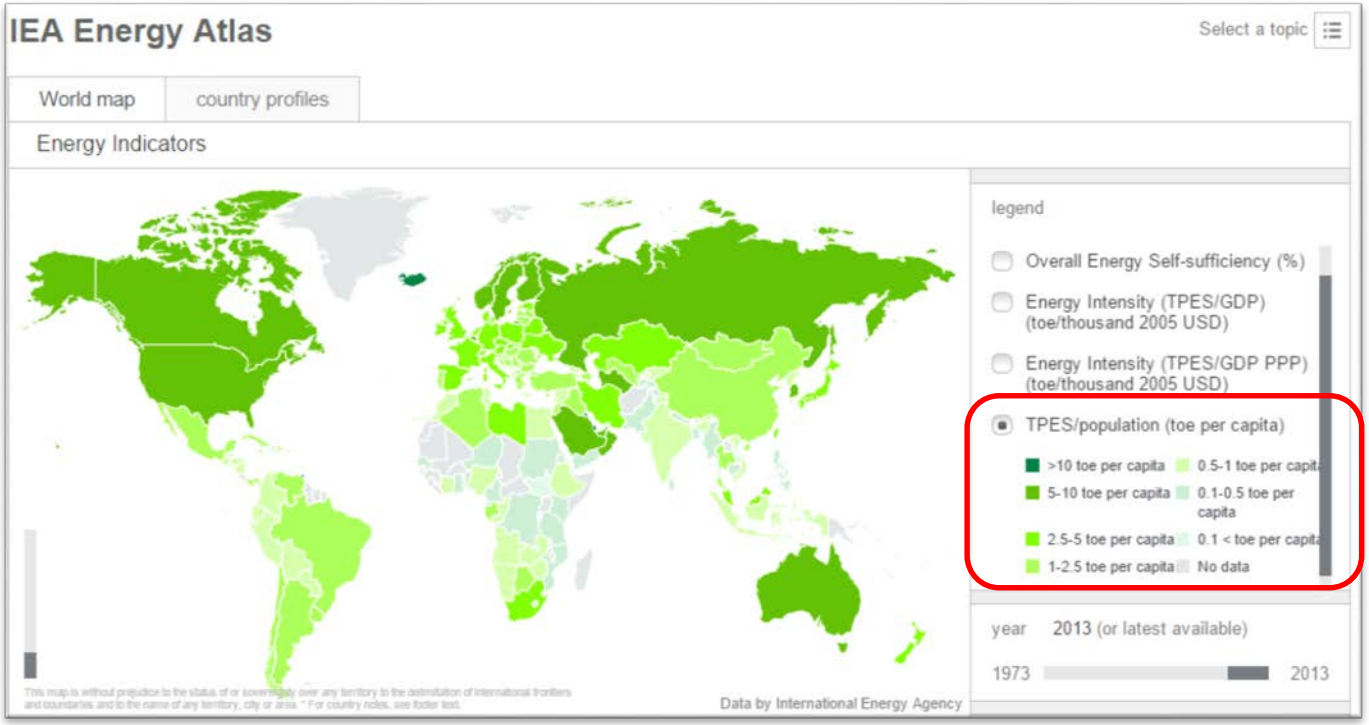
- **Residential**
- **Transport**
- **Industry**



Source: IEA, World Energy Balances, 2017

Benefits of energy balances

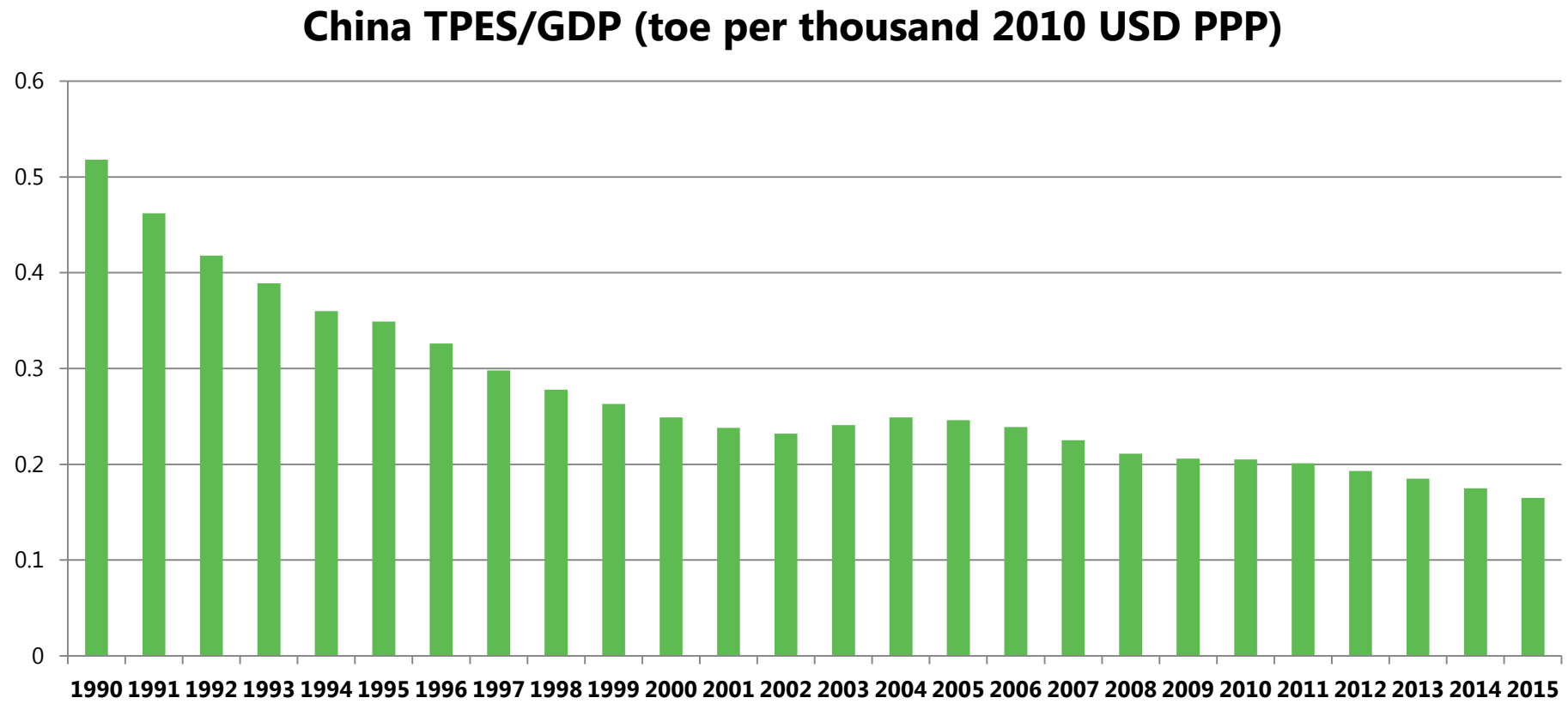
Developing high-level indicators



Source: IEA, World Energy Balances, 2017

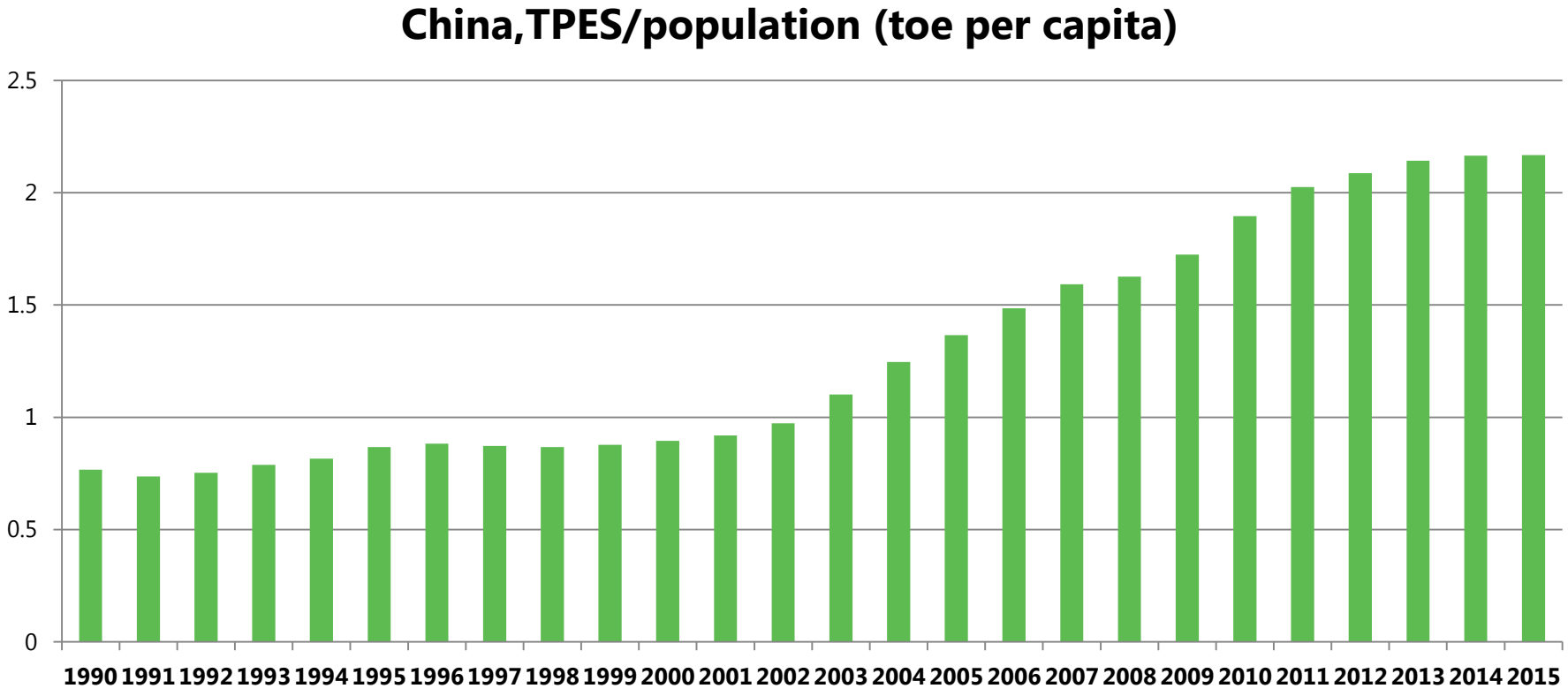
Coupling energy balances data with various macro-economic variables

TPES/GDP, 1990-2015 (toe/thousand 2010 USD PPP)



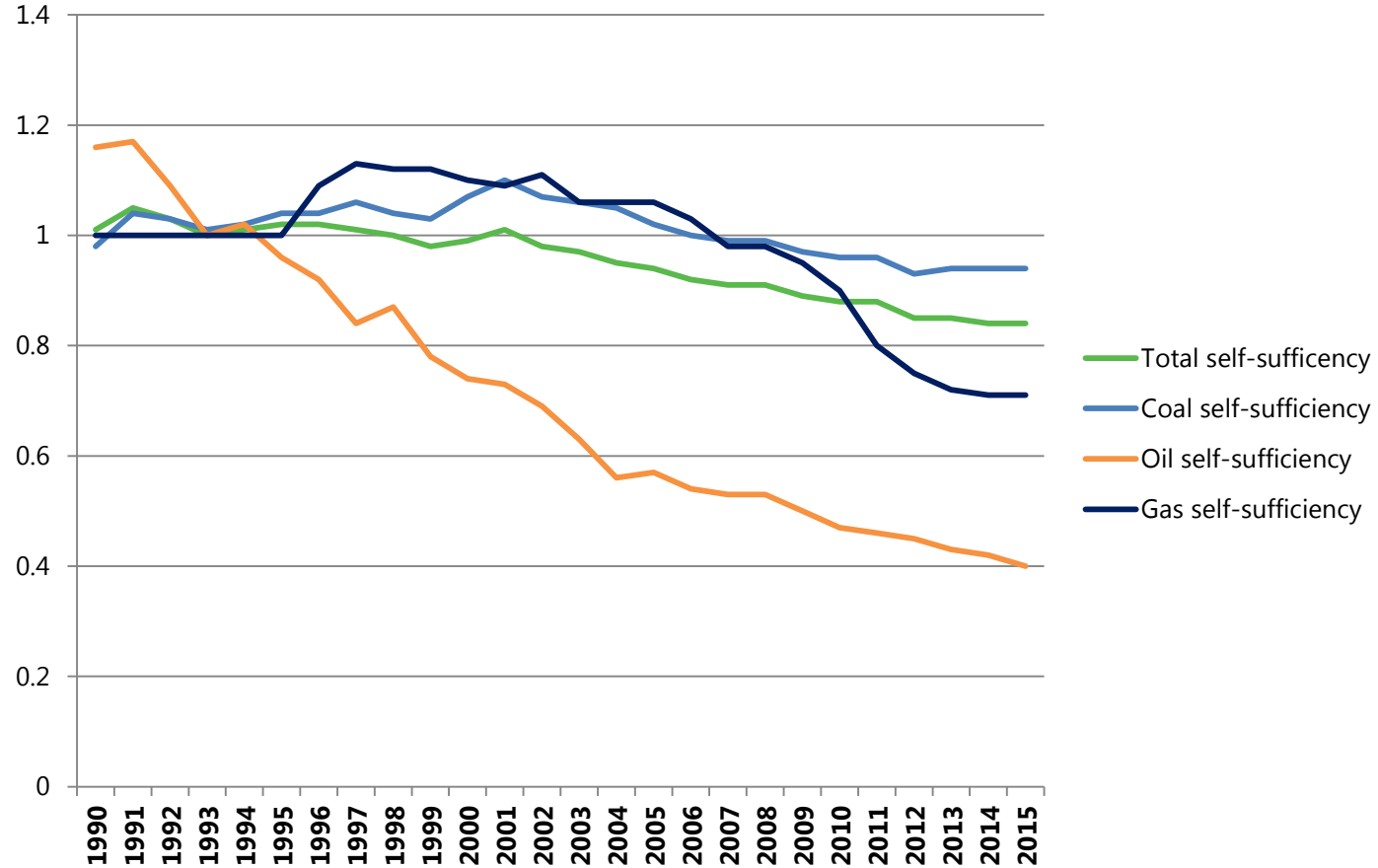
Source: IEA World Energy Balances (2017 edition)

TPES/Population, 1990-2015 (toe/capita)



Source: IEA World Energy Balances (2017 edition)

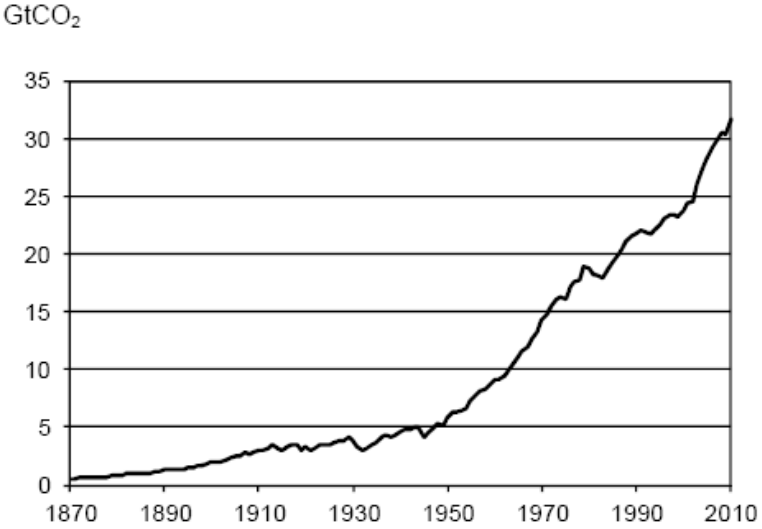
Self-sufficiency – Production/TPES



Source: IEA World Energy Balances (2017 edition)

Estimating CO_2 emissions from fuel combustion

Figure 3. Trend in CO_2 emissions from fossil fuel combustion

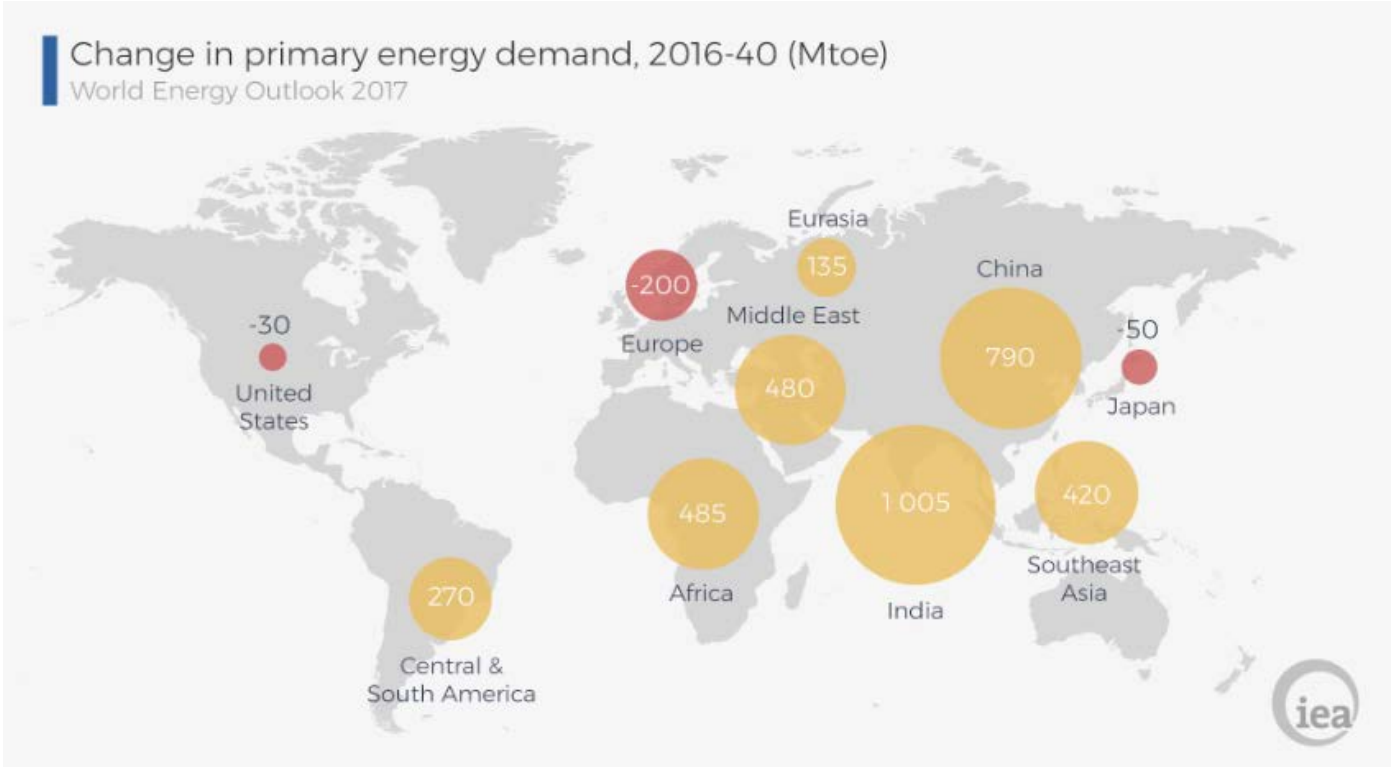


Source: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US Department of Energy, Oak Ridge, Tenn., United States.

Source: IEA, World CO_2 Emissions from Fuel Combustion, 2016

Based on energy balances and IPCC methodologies

Projecting energy demand across countries



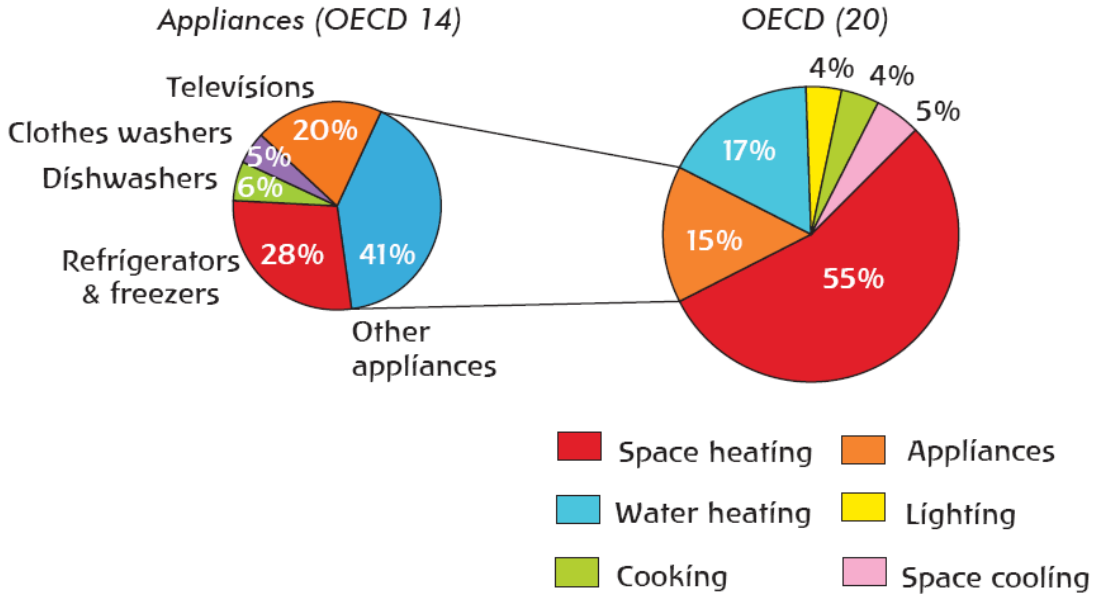
Source: IEA, World Energy Outlook, 2017

Comparability of energy statistics across countries is key

Beyond energy balances

Beyond energy balances: monitoring energy efficiency

Figure 4.4 • *Breakdown of residential consumption by end use in 2010 for 20 selected OECD countries*



Note: The breakdown into individual appliances is available only for 14 countries.

Source: IEA, Energy Efficiency Indicators: Fundamentals on Statistics, 2014

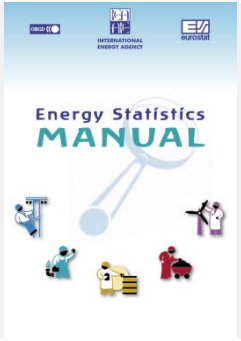
Starting from energy balances and getting more insights in energy efficiency

Learn more about Energy Statistics

The IEA produced a comprehensive Energy Statistics Manual covering most of our data collection methodologies, consistently with the IRES framework.

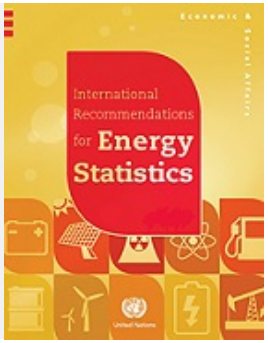
A comprehensive Energy Statistics Manual available in 10 languages.

Click on the manual to download it free of charge!



*Visit the **IEA's Statistics website** to access additional resources, including our questionnaires, glossary and documentation related to our data collection methodologies.*

To learn more about the international framework for energy statistics, please refer to the United Nations' International Recommendations for Energy Statistics (IRES).



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