

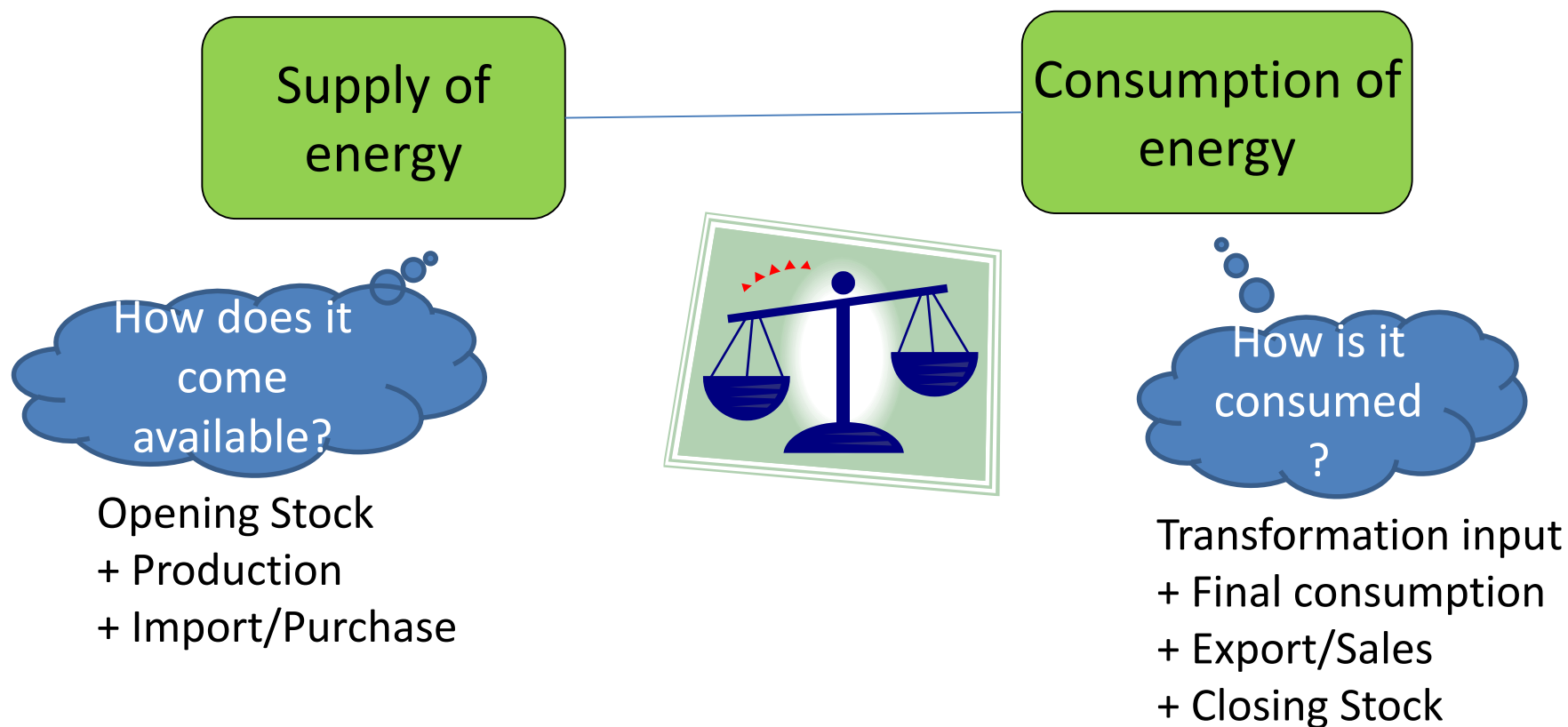


RECENT DEVELOPMENTS AND CHALLENGES IN ENERGY STATISTICS

Miluše Kavěnová
Head of Energy Statistics Unit
Energy Days, September 2018

ENERGY STATISTICS

The basis of energy statistics is the making of an energy balance.



This counts for every level
company, sector, household, region, country

ENERGY BALANCE

Supply

Transformation

Final consumption

		Million tonnes of oil equivalent									
SUPPLY AND CONSUMPTION	Coal ¹	Crude oil ²	Oil products	Natural gas	Nuclear	Hydro	Geotherm. / Solar / etc.	Biofuels / Waste	Electricity	Heat	Total
Production	952.55	933.13	-	1006.80	508.71	119.47	80.00	267.86	-	0.68	3869.21
Imports	387.11	1483.56	565.42	650.40	-	-	-	13.95	38.24	0.00	3138.70
Exports	-319.42	-348.40	-566.58	-316.50	-	-	-	-5.80	-39.47	-0.01	-1596.18
Intl. marine bunkers	-	-	-75.68	-	-	-	-	-0.05	-	-	-75.73
Intl. aviation bunkers	-	-	-87.09	-	-	-	-	-	-	-	-87.09
Stock changes	-0.38	-5.56	2.38	4.32	-	-	-	0.04	-	-	0.80
TPEs	1018.87	2082.72	-181.66	1346.02	608.71	119.47	80.00	278.01	-1.23	0.87	6249.70
Transfers	-	-57.72	82.09	-	-	-	-	-	-	-	24.38
Statistical differences	-9.95	2.16	-8.68	4.81	-	-	-0.05	0.09	0.47	-0.08	-11.24
Electricity plants	-727.20	-11.67	-61.68	-383.80	-505.67	-119.47	-68.63	-43.96	833.30	-0.27	-1089.06
CHP plants	-77.81	-	-13.10	-114.46	-3.04	-	-1.53	-43.36	94.18	57.33	-101.80
Heat plants	-5.07	-	-1.19	-8.22	-	-	-0.29	-6.31	-0.37	16.92	-4.53
Blast furnaces	-53.16	-	-0.44	-0.05	-	-	-	-	-	-	-53.65
Gas works	-2.17	-	-3.45	3.78	-	-	-	-0.04	-	-	-1.88
Coke/peat. fuel/BKBPB plants	-7.45	-	-1.07	-0.00	-	-	-	-0.01	-	-	-8.54
Oil refineries	-	2019.35	1995.20	-0.90	-	-	-	-	-	-	-25.05
Petrochemical plants	-	28.90	-29.41	-	-	-	-	-	-	-	-0.51
Liquefaction plants	-0.90	1.37	-	-2.31	-	-	-	-	-	-	-1.85
Other transformation	0.00	0.73	-	-0.79	-	-	-	-0.45	-	-0.64	-1.16
Energy industry own use	-14.63	-0.07	-99.28	-130.96	-	-	-0.00	-1.17	-68.07	-8.71	-322.89
Losses	-0.86	-	-0.01	-2.96	-	-	-0.20	-0.03	-59.28	-6.10	-69.44
TFC	120.88	7.07	1887.43	708.15	-	-	8.30	180.77	788.00	58.12	3682.48
INDUSTRY	96.61	2.33	88.88	260.82	-	-	0.80	88.88	266.86	24.04	792.82
Iron and steel	38.07	-	3.47	24.26	-	-	-	0.11	28.30	1.19	95.41
Chemical and petrochemical	10.79	2.31	17.61	57.74	-	-	0.00	2.93	38.14	10.47	139.98
Non-ferrous metals	2.04	-	1.62	10.23	-	-	0.00	0.11	24.82	0.28	39.10
Non-metallic minerals	17.74	-	14.92	24.50	-	-	0.00	4.68	13.65	0.22	75.71
Transport equipment	0.20	-	0.80	7.18	-	-	0.00	0.02	10.70	0.88	19.78
Machinery	0.34	-	3.43	17.93	-	-	0.00	0.13	35.58	0.85	58.27
Mining and quarrying	0.44	-	12.06	16.50	-	-	0.00	0.10	11.20	0.10	40.40
Food and tobacco	5.80	0.00	5.27	31.74	-	-	0.00	3.83	20.22	1.75	68.62
Paper, pulp and printing	5.65	-	3.75	19.15	-	-	0.16	43.81	24.66	3.45	100.63
Wood and wood products	0.08	-	0.63	1.61	-	-	-	5.57	3.81	0.77	12.47
Construction	2.58	-	16.19	3.74	-	-	0.00	0.30	6.43	0.05	29.29
Textile and leather	0.33	0.01	0.63	4.17	-	-	0.00	0.08	5.70	0.73	11.64
Non-specified	11.44	-	16.30	32.18	-	-	0.43	5.30	32.63	3.31	101.60
TRANSPORT	0.18	-	1107.84	24.68	-	-	-	42.86	8.97	-	1184.48
Domestic aviation	-	-	65.08	-	-	-	-	-	-	-	65.08
Road	-	-	1000.36	3.33	-	-	-	42.24	0.17	-	1046.09
Rail	0.01	-	18.63	-	-	-	-	0.22	7.07	-	25.93
Pipeline transport	-	-	0.00	21.00	-	-	-	-	0.38	-	21.39
Domestic navigation	0.15	-	22.97	0.07	-	-	-	0.33	-	-	23.51
Non-specified	-	-	0.90	0.16	-	-	-	0.06	1.35	-	2.48
OTHER	22.89	-	201.35	400.98	-	-	8.70	70.84	594.17	95.07	1273.29
Residential	14.63	-	95.03	245.28	-	-	6.83	61.14	251.82	21.63	697.36
Comm. and public services	6.63	-	55.04	145.20	-	-	1.07	6.13	256.81	11.68	482.56
Agriculture/forestry	1.35	-	41.12	6.14	-	-	0.59	2.54	10.21	0.23	62.19
Fishing	0.00	-	4.50	0.05	-	-	0.05	0.00	0.30	0.02	4.92
Non-specified	0.08	-	5.65	2.69	-	-	0.15	1.12	15.03	1.52	26.25
NON-ENERGY USE	2.30	4.74	281.45	83.81	-	-	-	-	-	-	331.80
In industry/transport/energy	2.09	4.74	278.33	33.31	-	-	-	-	-	-	318.47
of which: chem./petrochem.	0.96	4.74	207.09	33.30	-	-	-	-	-	-	246.09
In transport	-	-	7.25	-	-	-	-	-	-	-	7.25
In other	0.21	-	5.87	-	-	-	-	-	-	-	6.08
Electricity and Heat Output											
Eleo. generated - TWh	3477.84	56.84	331.87	2746.33	1861.68	1389.16	620.70	311.89	-	0.70	10784.88
Electricity plants	3184.82	55.84	282.01	2162.83	1940.37	1389.15	517.16	156.65	-	0.31	9689.14
CHP plants	293.02	-	49.65	582.50	11.21	-	3.54	155.25	-	0.39	1095.55
Heat generated - PJ	818.62	-	210.14	1388.24	4.89	-	35.21	864.31	8.82	38.38	3137.80
CHP plants	653.71	-	175.16	1093.09	4.99	-	16.69	456.95	0.36	17.63	2418.57
Heat plants	162.81	-	34.99	276.15	-	-	18.53	197.36	8.46	20.73	719.03

Global picture of energy situation in a country.

Columns present the "commodity balances" for individual products.

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

To convert physical units to energy units, we need calorific values.

Source: IEA 2018

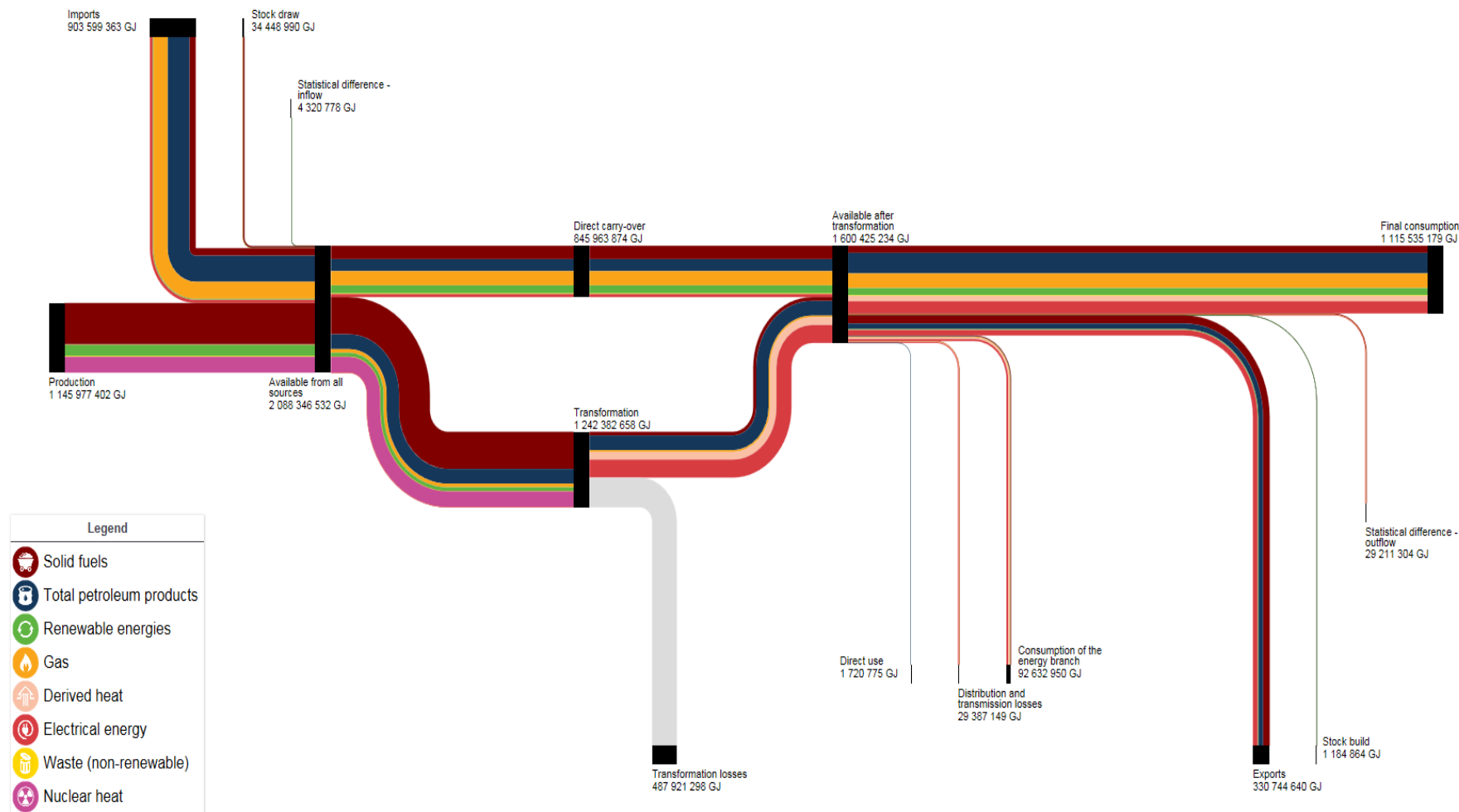
The energy balance is the most used output of energy statistics.

The goal is to make the energy statistics more understandable to public and non-statistics professionals.

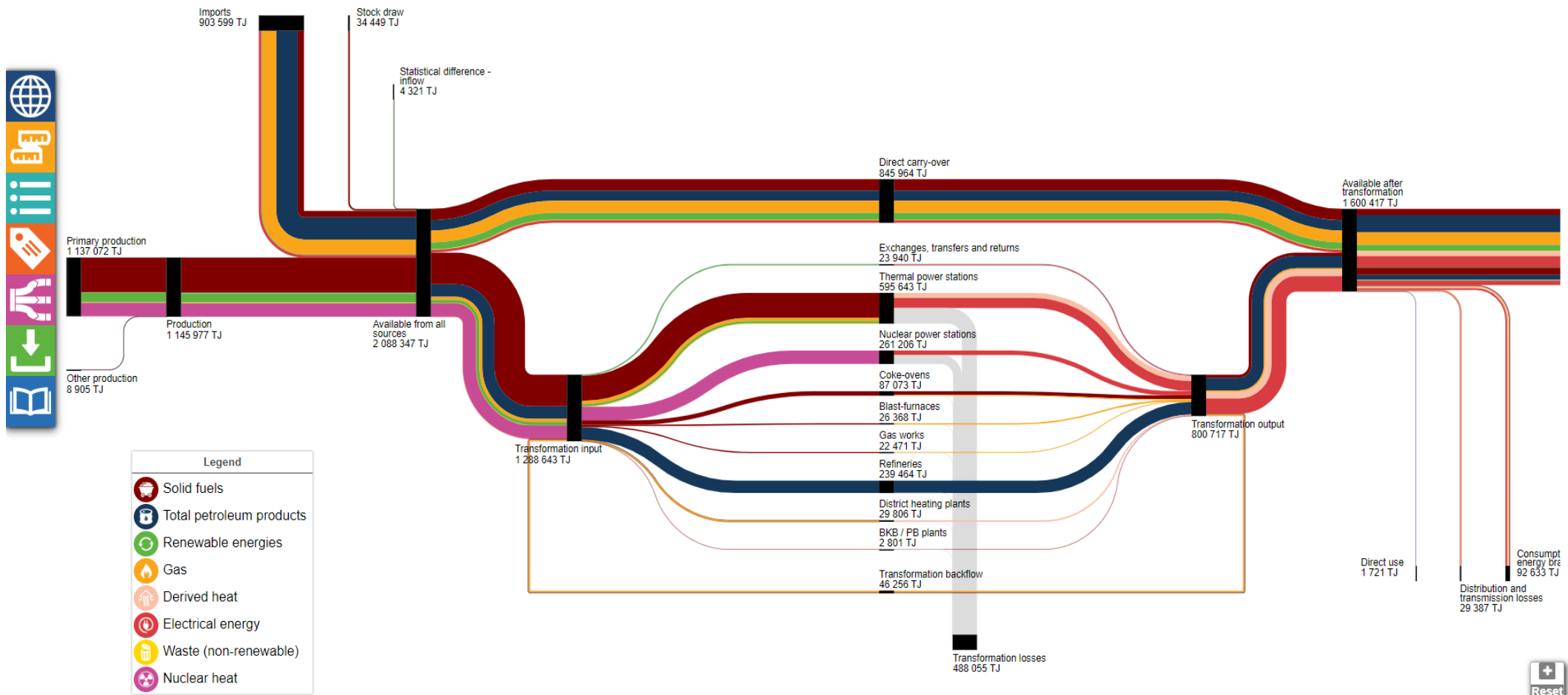
Development in data visualisation of energy statistics:

- infographics
- articles „Statistics explained“
- the first digital publication: Shedding light on energy in the EU
- energy flow diagrams – Sankey diagrams

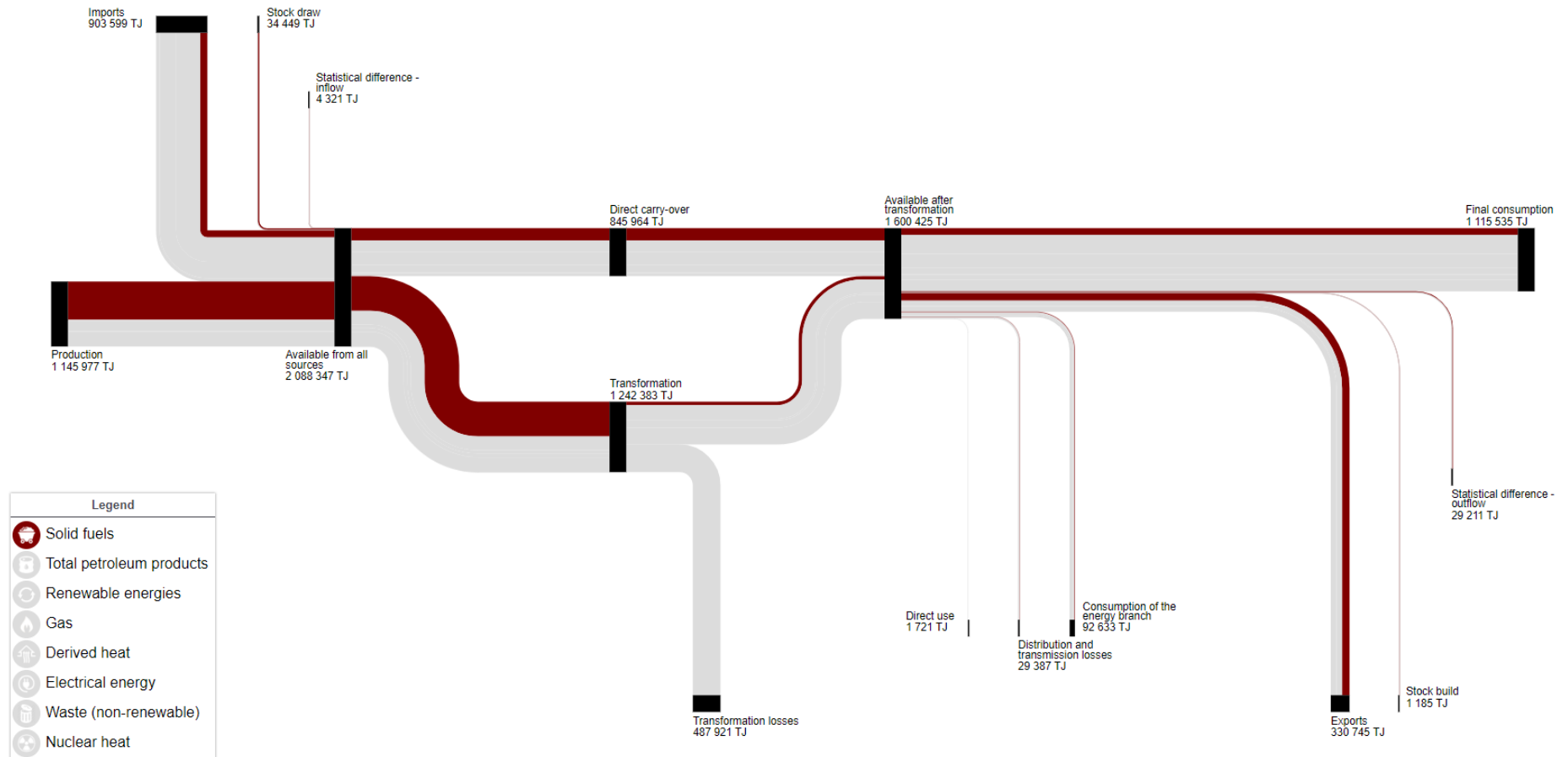
ENERGY FLOWS – SANKEY DIAGRAM



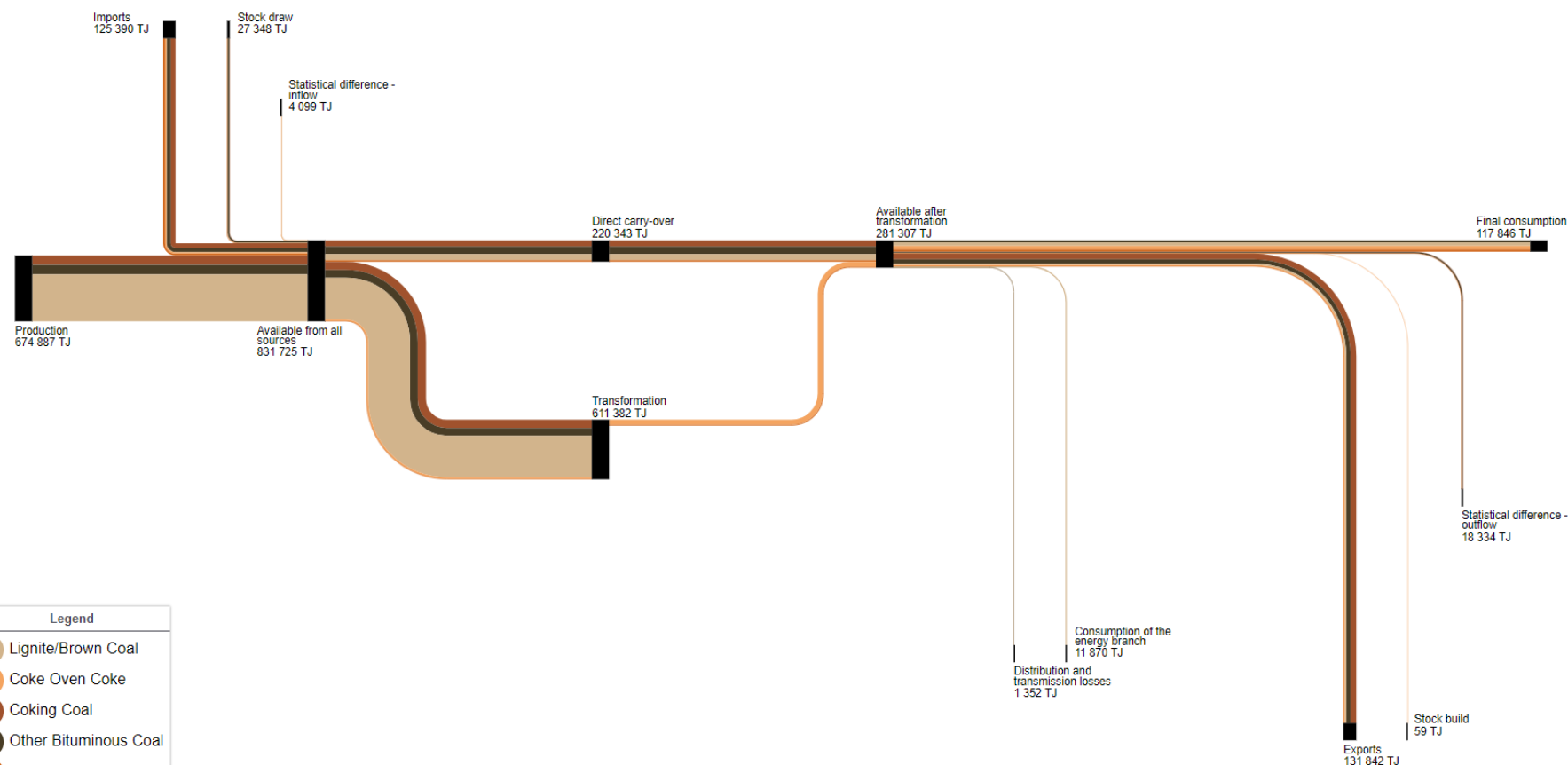
ENERGY FLOWS – SANKEY DIAGRAM



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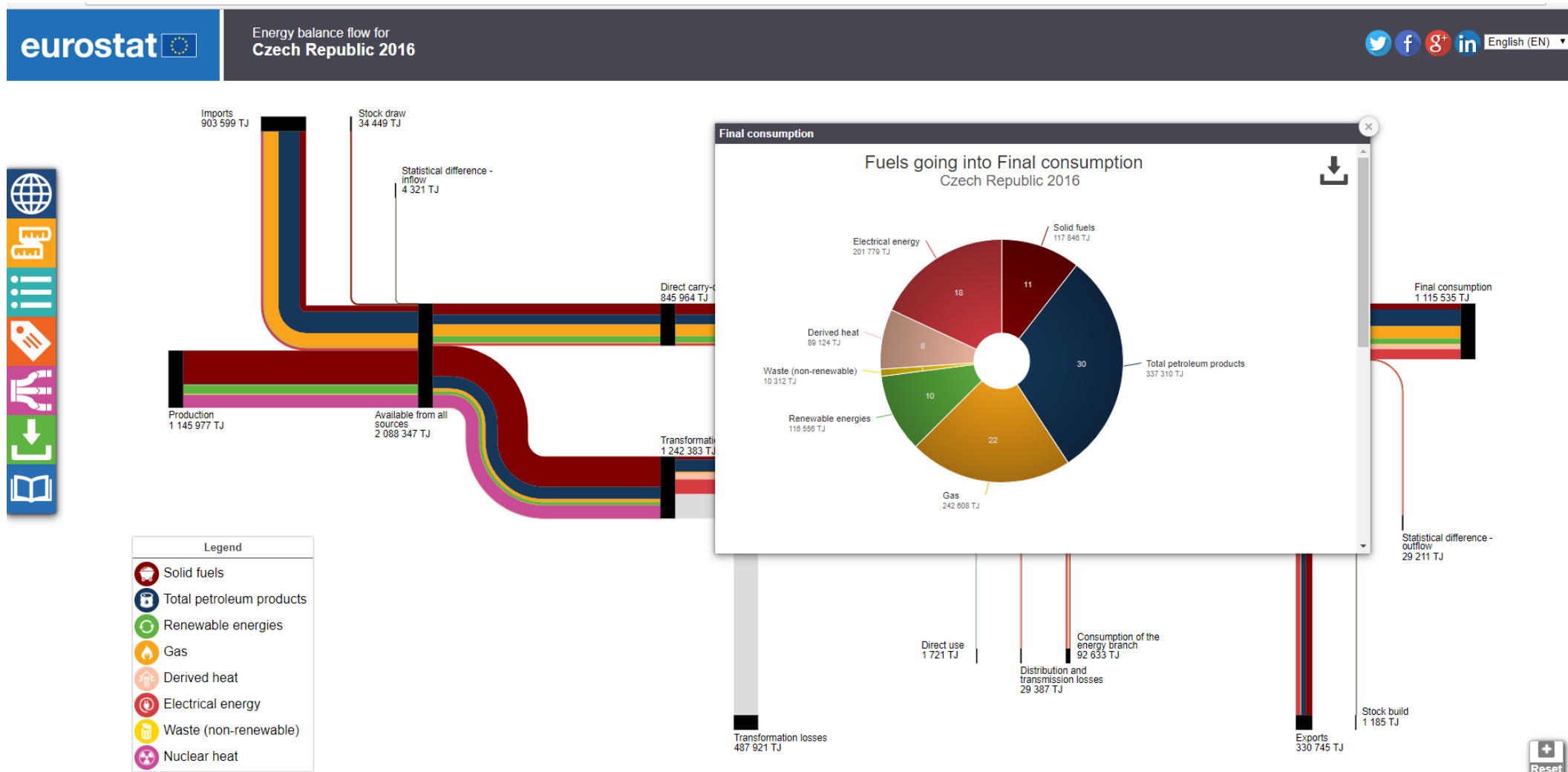
ENERGY FLOWS – SANKEY DIAGRAM



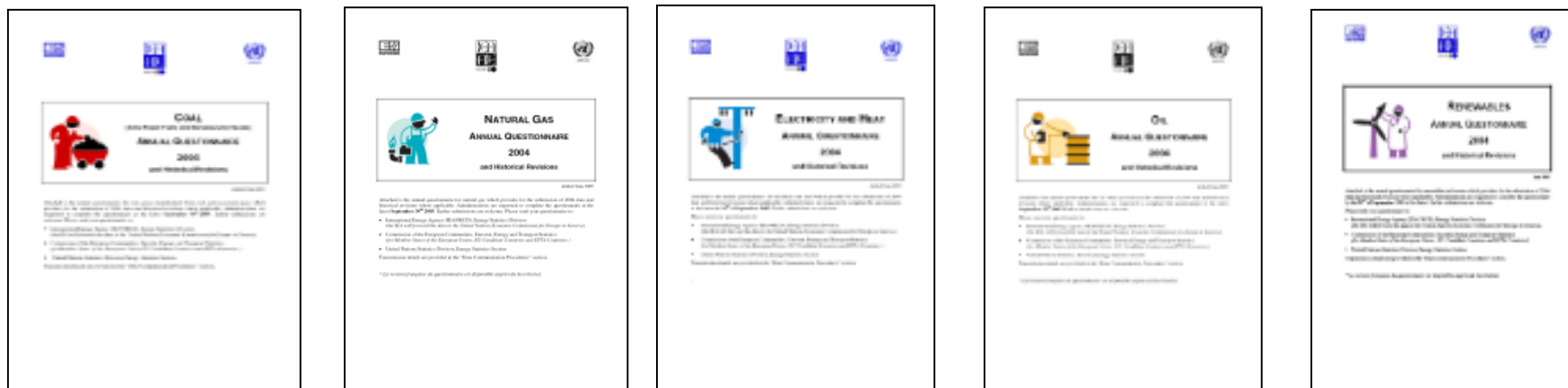
Legend	
	Lignite/Brown Coal
	Coke Oven Coke
	Coking Coal
	Other Bituminous Coal
	Other solid fuels



ENERGY BALANCE – SANKEY DIAGRAM



DATA SOURCES FOR BUILDING ENERGY BALANCE: FIVE JOINT ANNUAL QUESTIONNAIRES



- **Harmonised questionnaires:** many concepts in common, but some details are missing. 40 countries are reporting these questionnaires to international organizations.
- **Recent developments and challenges:**
 - Content is constantly increasing and becoming more detailed, methodology is improving and the development copies the developments in the energy sector.
 - Member countries are pushed by the organizations to transmit data sooner in order to have more timely early estimates of energy balances.

MAIN INTERNATIONAL PLAYERS

ONE SET OF JOINT QUESTIONNAIRES FOR ALL?



© OECD/IEA 2013

TRADITIONAL ENERGY BALANCES PROVIDE INSUFFICIENT DATA

Energy balance in the form we have know so far provides insufficient data for policy makers, analysts, company managers etc.

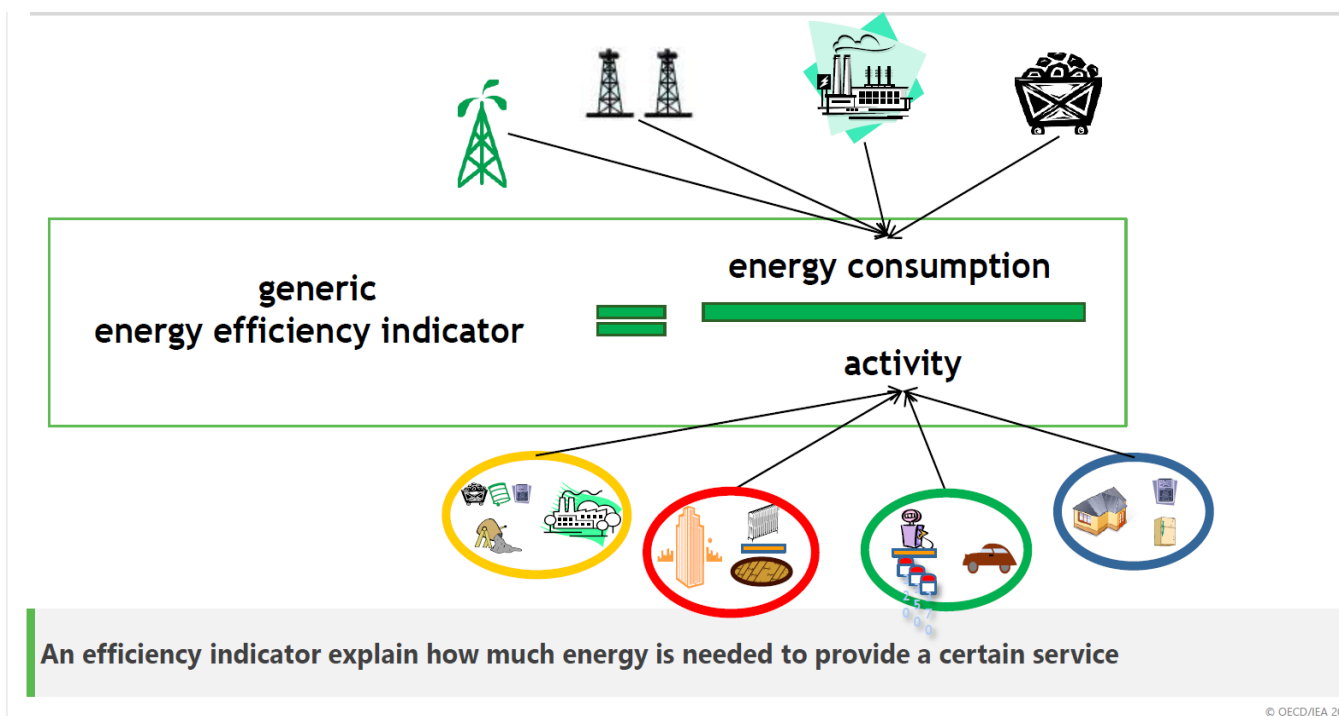
Development of energy statistics is focusing on:

1. more detailed brakedown in final energy consumption in energy balance:

- Households – already available: space heating, space cooling, water heating, lighting, cooking, appliances (ENERGO surevey in the CR in 2015)
- Industry sector – legislative changes in 2019 of the EU regulation and member states will start reporting data
- Transport and services sector – in the proces of preparation (Task Forces)

2. Energy efficiency indicators - serves as

- information for emission savings
- key to set targets and monitor impacts
- information about energy consumption covered by efficiency regulations (only 30 % of global energy consumption is subject to mandatory efficiency targets)



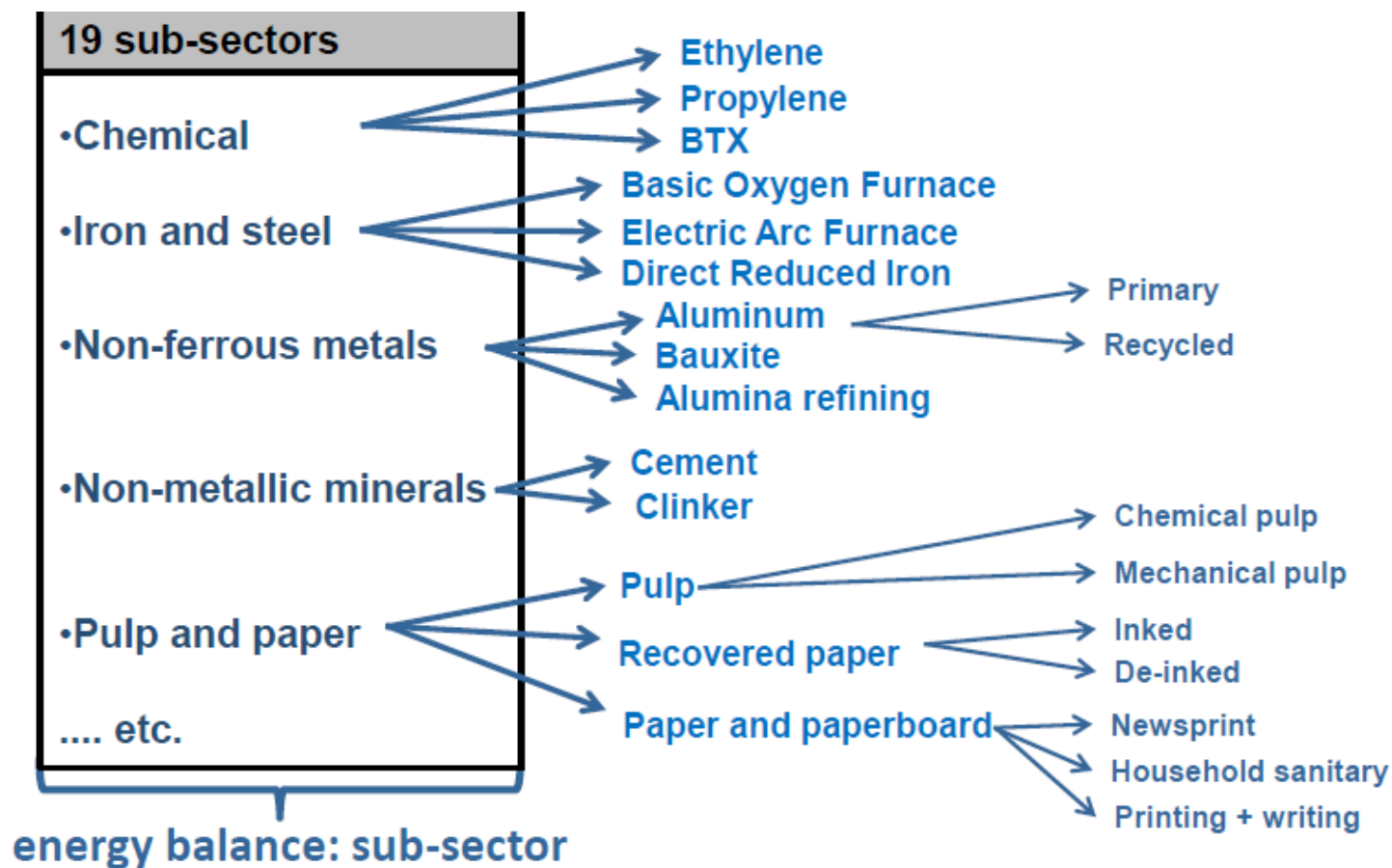
Source: OECD/IEA 2018

STRUCTURE OF REQUESTED DATA ON ENERGY EFFICIENCY BY THE IEA

Sector	End use	Energy product	Energy indicator
Residential	Space heating	Oil	Per capita energy intensity (GJ/cap)
	Space cooling	Natural Gas	Per dwelling energy intensity (GJ/dw)
	Water heating	Renew. & waste	Per floor area energy intensity (GJ/m ²)
	Cooking	Heat	Per unit equipment energy intensity (GJ/unit)
	Lighting	Electricity	Per services employee energy intensity (GJ/employee)
	Appliances	Other	Per VA energy intensity (GJ/USD PPP 2010)
	Other		Per physical output energy intensity (GJ/t)
Services	Space heating	(...)	Fuel intensity (liters/100 vkm)
	Space cooling		Passenger-kilometer energy intensity (MJ/pkm)
	Lighting		Tonne-kilometer energy intensity (MJ/pkm)
	Other		Vehicle-kilometer energy intensity (MJ/pkm)
Industry	Textiles		Other
	Chemicals		
	Paper		
	Textiles		
	Basic metals		
	Other		
Transport	Passenger cars		
	Buses		
	Passeng. trains		
	Trucks		
	Passeng. trains		
	Other		

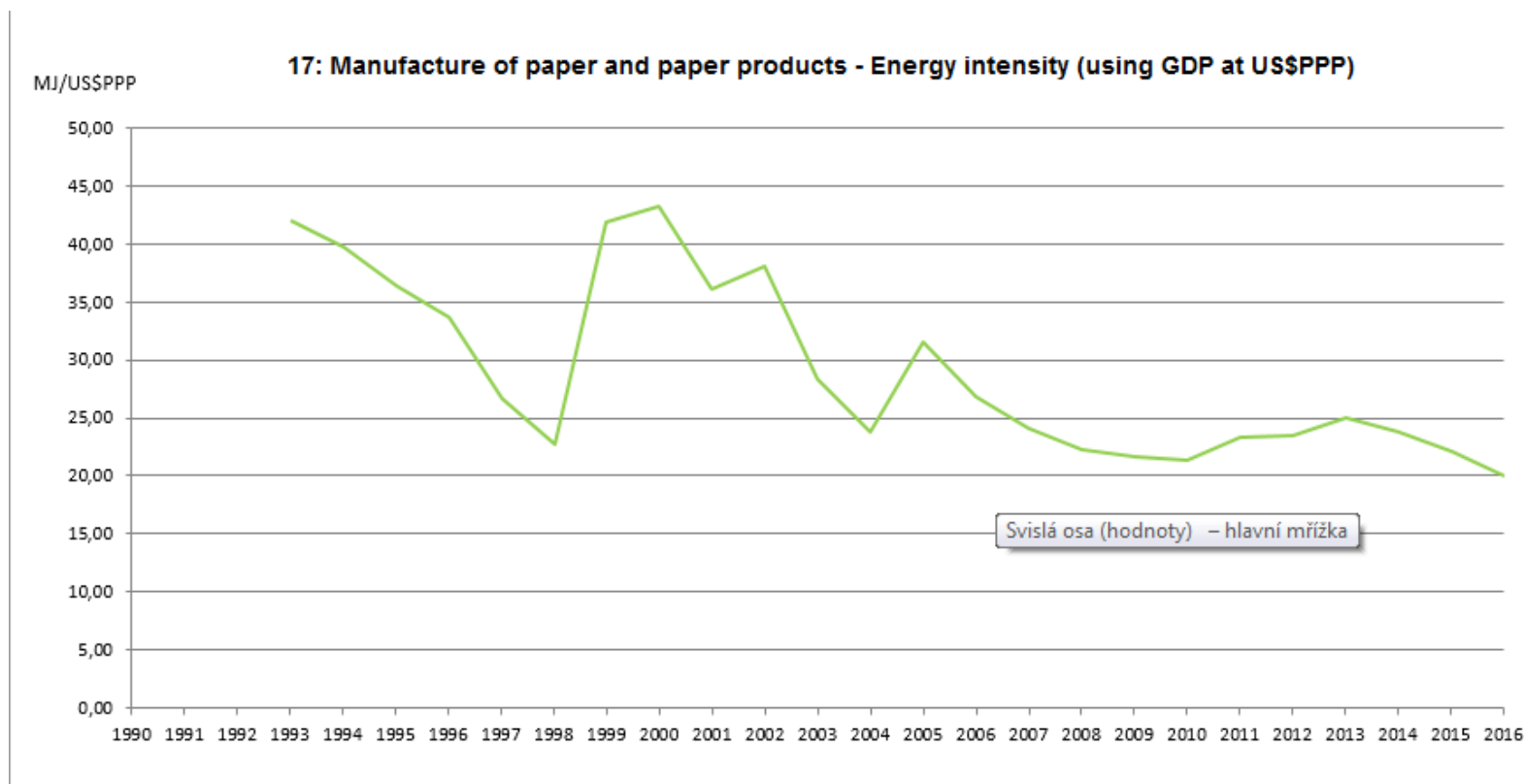
Source: IEA 2018

INDUSTRY SUB-SECTORS



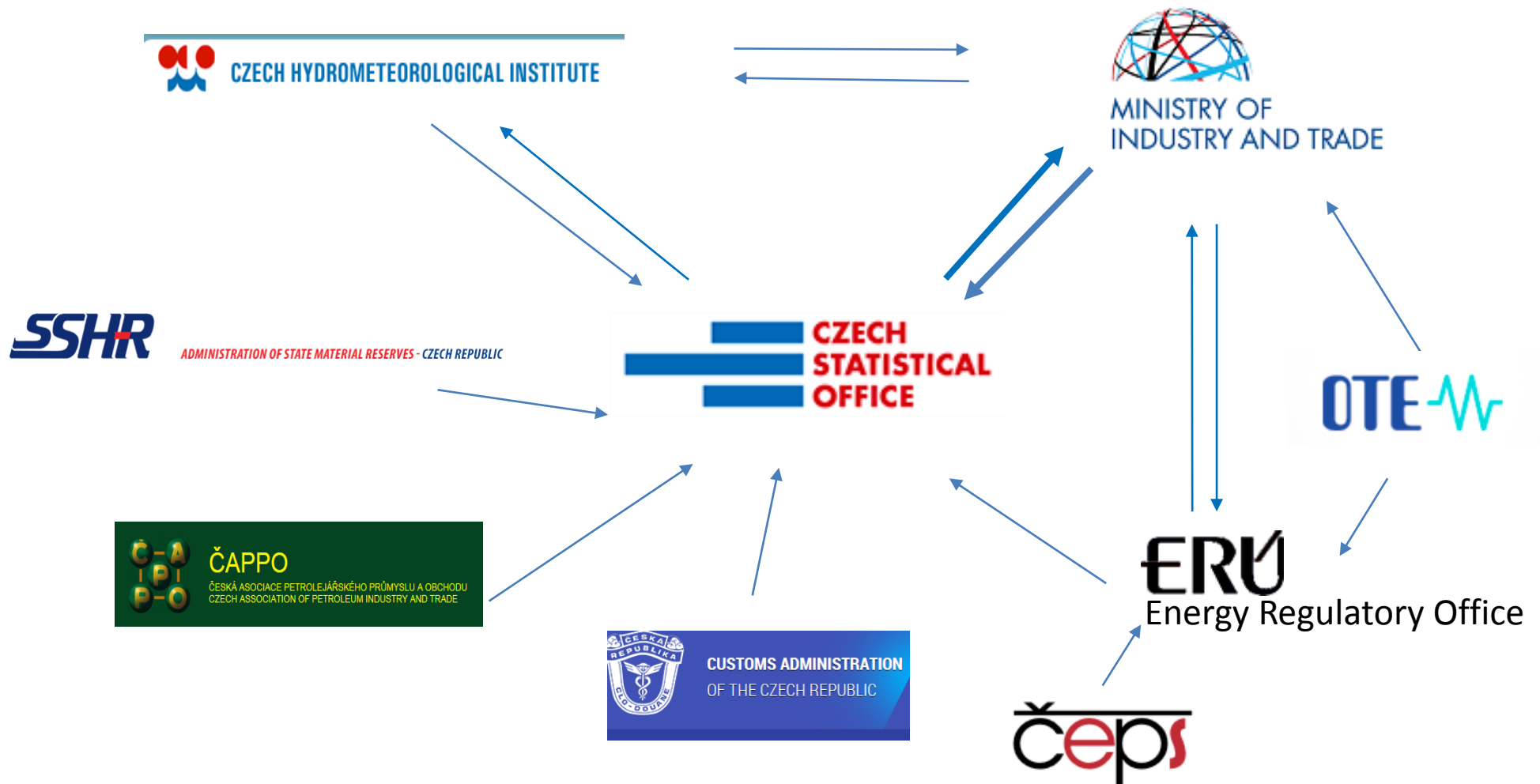
Source: IEA 2018

ENERGY INTENSITY OF MANUFACTURE OF PAPER AND PAPER PRODUCTS IN THE CZECH REPUBLIC



Source: IEA 2018

COOPERATION BETWEEN MAIN PLAYERS OF THE ENERGY STATISTICS IN THE CZECH REPUBLIC



SUBMITTING DATA TO INTERNATIONAL ORGANIZATIONS

	Monthly	Quarterly / Half-yearly	Annual	Preliminary annual data	Other
Oil	CZSO	x	CZSO	CZSO	x
Natural Gas	CZSO	x	CZSO	CZSO	CIGAS: CZSO
Solid fuels (Coal)	MIT	x	CZSO	CZSO	x
Electricity and Heat	MIT	x	CZSO, MIT	CZSO, MIT	CHP: MIT DH/DC: MIT CIELE: CZSO
Renewable Energy Sources	x	x	MIT	MIT	x
Nuclear Energy	x	x	MIT	x	x
SHARES	x	x	MIT	x	x
Households	x	x	CZSO	x	x
Energy Efficiency	x	x	CZSO	x	x
Energy prices	x	CZSO	x	x	x

WHICH DATA SOURCES ARE USED IN THE CZECH REPUBLIC FOR PRODUCING ENERGY STATISTICS

Statistical Surveys:

- ☐ CZSO statistical surveys
- ☐ MIT statistical surveys
- ☐ ERO statistical surveys

These surveys are collected from enterprises on the basis of national laws:

- the law on the state statistical service
- the energy law

CZSO statistical surveys on energy statistics:

- ❑ **2 monthly statistical surveys** on crude oil processing and petroleum products

(EPR 1-12, EPS 1-12)

- ❑ **5 annual statistical surveys**

- 1 on fuels and energy sources (EP 7-01)
- 2 on fuels transformation (EP 8-01, EP 10-01)
- 2 on fuels and energy consumption (EP 5-01, EP 9-01)

- ❑ **Irregular survey:** ENERGO - sample survey on consumption in households

MIT statistical surveys on energy statistics:

- ☐ **Eng (MPO) 1-12** Monthly statistical form on solid fuels sources and distribution of sales of solid fuels
- ☐ **Eng (MPO) 6-12** Monthly statistical form on biofuels
- ☐ **Eng (MPO) 4-01** Annual statistical form on energy production from renewables and other sources
- ☐ **Eng (MPO) 5-01** Annual statistical form on electricity, heat and energy gases supplies and on fuels used for electricity and heat production
- ☐ **Crs (MPO) 1-01** Annual statistical form on operation of service stations, filling and charging stations
- ☐ **Crs (MPO) 2-02** Half-yearly report on the network of service stations, filling and charging stations

ERO statistical surveys:

- ☐ 3 monthly and 1 annual on electricity, 1 quarterly for heat and 9 for natural gas

OTHER SOURCES THAT ARE USED FOR PRODUCING ENERGY STATISTICS

- Natural Gas Balance (Energy Regulatory Office (ERO), The Czech electricity and gas market operator (OTE))
- Electricity Balance (Energy Regulatory Office (ERO))
- Trade between EU Member States and the CR (INTRASTAT CZSO)
- Foreign trade between the CR and third countries (EXTRASTAT CZSO)
- Licenses for business in energy sectors (ERO)
- Emissions – REZZO*) reporting (Czech Hydro-meteorological Institute (CHMI))
- Renewable energy sources (ERO, State Environmental Fund of the CR)
- Liquid Biofuels (State Agricultural Intervention Fund, Crop Research Institute)
- Oil and Petroleum Products (Czech Association of Petroleum Industry and Trade (ČAPPO))

*) Register of Emissions and Air Pollution Sources

CHALLENGES FOR THE CZECH STATISTICAL OFFICE

- Growing demand for more energy data & workload
- Demand for more flexible and earlier outputs

X

- Pressure to reduce administrative burden
- Sources are the same or decreasing (number of workers, budget)

Looking for new sources of data, use of more data from social statistics, macroeconomic statistics, statistics of other sectors.

New requirements takes a long time to include them to the scope of data collected. Participation of all stakeholders is needed.



From statistical surveys to modelling

ENERGY STATISTICS PUBLICATIONS OF THE CZSO

Regularly issued CZSO publications and outputs:

Monthly:

- ☐ Consumption of selected Petroleum Products and Natural Gas

Annual:

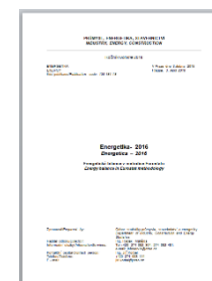
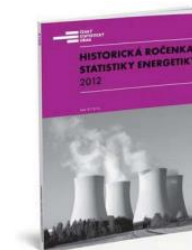
- ☐ Energy Intensity of Manufacture of Selected Products
- ☐ Fuel and Energy Consumption
- ☐ Energy (Energy balance in Eurostat methodology)

Thematic publications:

- ☐ Consumption of Fuels and Energy in Households (2016)
- ☐ Historical Yearbook of the Energy Statistics (2012)

LINK:

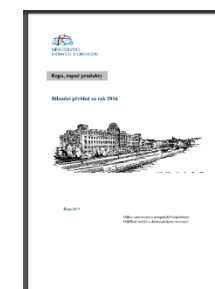
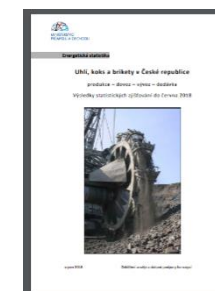
https://www.czso.cz/csu/czso/archiv_publicaci?filtr=true&roky=2017,2016,2015&skupiny=15&vlastnosti=12



STATISTICAL PUBLICATIONS BY THE MINISTRY OF INDUSTRY AND TRADE

- ☐ Development of Gross Electricity Production by Fuels and Technologies 2010-2016
- ☐ Gross Production of Electricity from Renewables and Other Sources
- ☐ Renewable Energy Sources in the year...
- ☐ Share of renewable energy in final energy consumption 2010 – 2015
- ☐ Statistics on the Energy Use of Waste and Alternative Fuels in 1989 –...
- ☐ Coal, coke and briquettes in the year...
- ☐ Small incinerators for solid fuels for households in 2010 - ...
- ☐ Oil and oil products in the year...
- ☐ Liquid biofuels in the year...

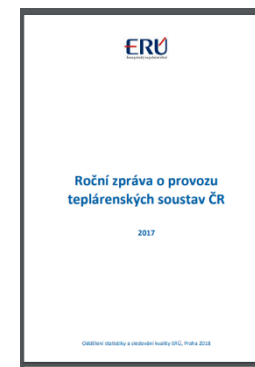
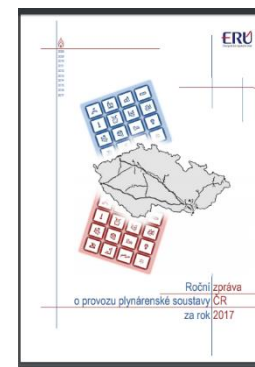
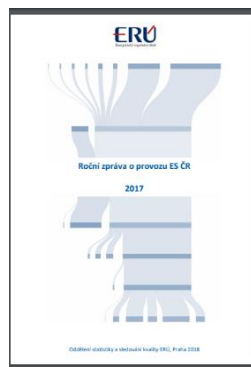
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Source: MPO 2018

STATISTICAL PUBLICATIONS BY THE ENERGY REGULATORY OFFICE

- ❑ **Non-public monthly reports on the operation of systems in the energy sector**
regularly sent to state institutions (MIT, MoE, MFA, CZSO, OTE, etc.) for the purpose of exchanging data and reducing the administrative burden of reporting entities.
- ❑ **Quarterly reports on the operation of the Czech Republic's power systems (electricity, heat and gas)**
public reports, usually published within two months after the end of the quarter
the structure is similar to monthly reports
- ❑ **Annual Report on the Operation of the Czech Energy Systems (Electricity, Heat and Gas)**
generally published in May of the year following the annual data verification
contains refined and supplemented data compared to IV.Q.



Source: ERÚ 2018

WHAT IS THE DATA OF ENERGY STATISTICS USED FOR

- ☐ Ensuring the requirements of international statistics (IEA, Eurostat, OECD, UNO) – Regulation No1099/2008/EC
- ☐ Energy balance compilation
- ☐ Calculation of greenhouse gas emissions
- ☐ Environmental statistics: compilation of accounts of physical energy flows (PEFA energy accounts)
- ☐ Processing of questionnaire on energy efficiency
- ☐ Analyses of situation and development (data for public administration for setting the national goals and strategies in the energy sector, data for business entities, associations/interest groupings)
- ☐ Public information

Thank you for your attention



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