ENERGY BALANCES AND EFICIENCY OF ENERGY USE IN INDONESIA

Sub-directorate of Mining and Energy
Directorate of Industry
BPS Statistics Indonesia

Workshop on Energy Statistics for Eficiency and Renewable energy Uses
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OUTLINE

1. Preliminary
2. Structure of Indonesia Energy Balance
3. Data Collection
4. Analysis
5. The Issues
6. Another Indonesia Energy Statistics Product
7. Solution

1. PRELIMINARY

BPS-Statistics Indonesia since 1980 has been conducting four kinds surveys related to Statistics Energy, namely:

1. Annual Mining survey on Petroleum and Natural Gas
2. Annual Mining survey on Mineral Resources
3. Annual Survey on Electricity
4. Annual Survey on Gas Distribution

1. PRELIMINARY

Since 1988, BPS Statistics Indonesia has been releasing The Indonesia Energy Balances publication. The publication was built use manual book of "Concepts and Methods in Energy Statistics, with Special Reference to Energy Accounts and Balances" published by United Nations, 1982 and ***A Manual for Developing Countries****. published by United Nations, 1991*

The latest publication of The Indonesia Energy Balance is published in 2017 for energy transaction in 2016

2. STRUCTURE OF INDONESIA ENERGY BALANCES

Supply Side

- Production of primary energy
- Import (+) and export (-) of Energy
- Final consumption for energy use and non-energy purposes
- International Aviation/Marine Bunker : domestic fuel data used by airlines abroad and ships carrying out international shipping
- Stock changes
- Total supply: the sum of production, import (+), export (-), stock change, marine / aviation bunker

2. STRUCTURE OF INDONESIA ENERGY BALANCES

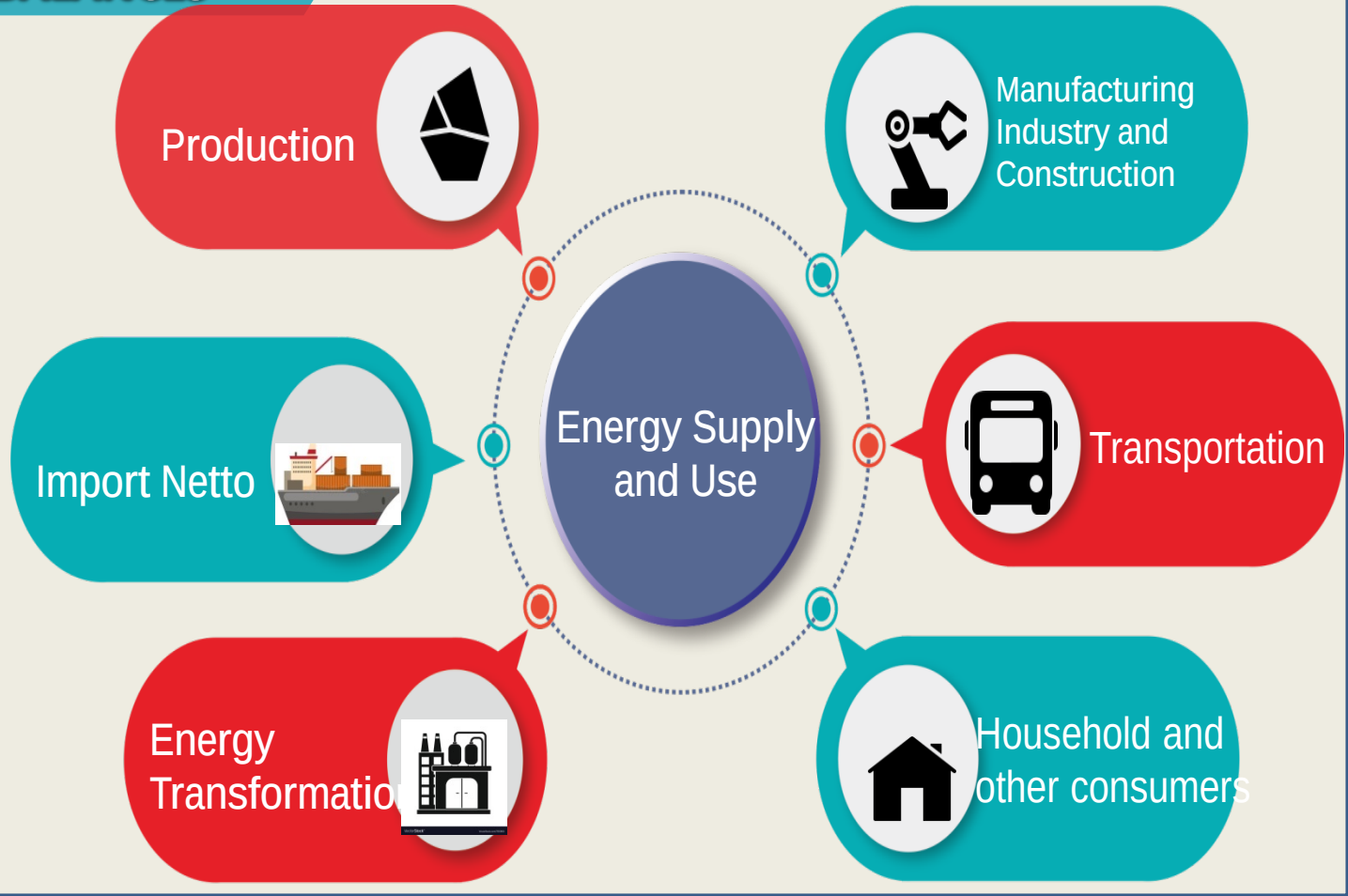
Demand or Use Side

- Transformation, activities that convert primary commodities into forms of energy more suited to use
  - Electricity generation
  - Petroleum refineries
  - Others: consists of light transformation activities which not specifically specified
- The use of the energy industry: the energy consumed by energy extraction industry and energy transformation industry to support the transformation process
- Final consumption: Final energy consumed for energy use and non-energy purposes
- Others sectors: comercials, agricultural

2. STRUKTUR OF INDONESIA ENERRGY BALANCES

Medium and Large Scale of Manufacturing industry: Petrochemical, Steel and Iron, Others

Commercial : Trade, Hotel, Restaurant, Others



3. DATA COLLECTION

COAL and COAL BRIQUETTES

Annual Survey of Non-Oil and Gas Mining, The Directorate General of Mineral and Coal Report, Annual Survey of Medium and Large scale of Manufacturing Industry

Production 1

Stock Changes 2

Annual Surveys of Mining Company, Electricity Survey, Gas Distribution Survey, Manufacturing Survey BPS

3 Export and Import

Foreign Trade Statistics

4 Coal consumption

Annual Survey on Electricity, Survey of Medium and Large scale of Manufacturing Industry

3. DATA COLLECTION

CRUDE OIL, CONDENSATE, AND NATURAL GAS

Annual Survey of Oil and Gas Mining Company and The Directorate General of Oil and Gas Report.

1 Production

2 Stock Changes

Annual Survey of Oil and Gas Mining Companies

3 Export and Import

Foreign Trade Statistics

3. DATA COLLECTION

OIL PRODUCTS, LPG AND REFINERY GAS

Annual Survey of Oil and Gas Refinery Company and The Directorate General of Oil and Gas Report

Production

1

Stock Changes

2

Oil and Gas Refinery Survey

3

Export and Import

Foreign Trade Statistics

3. DATA COLLECTION

ELECTRICITY

Annual Survey of Manufacturing Company, Electricity Survey, Captive Power Survey and The socio-economic survey

Production 1

Consumption 2

Manufacturing Survey, Socio-Economic Survey, and others industrial company survey

3 Export and Import

Foreign Trade Statistics

3. DATA COLLECTION

BIOMASS

Annual Survey of Manufacturing Company and The socio-economic (household) survey

Production

1

Consumption

2

Manufacturing Survey, Electricity Survey, and Socio-Economic Survey

3

Export and Import

Foreign Trade Statistics

3. DATA COLLECTION

GEOTHERMAL

Annual Survey of Geothermal Mining Companies and Directorate Oil and Gas Report

Production

1

2

Consumption

Survey of Electricity Companies, and PLN Electricity Statistics Report

4. ANALYSIS

INDONESIA ENERGY BALANCES 2016

Tera Joules

Energy sources and products Production and utilisation	Hard coal and lignite	Briquettes and cokes	Crude petroleum and Condensate	Light petroleum products	Heavy petroleum products	Other petroleum products	LPG and refinery gas	Natural gas	Electricity	Biomass energy	Other energy resources	Total energi
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)
Production of primary energy	12 227 982	0	2 023 908	0	0	0	0	2 605 595	0	586 729	115 054	17 559 268
Imports	80 345	11 093	840 451	725 399	269 526	66 192	201 995	0	0	15	0	2 195 016
Exports	9 794 374	604	714 232	3 311	77 448	24 131	2 984	751 961	0	10 739	0	11 379 784
Marine/aviation bunkers	0	0	0	34 722	14 969	0	0	0	0	0	0	49 691
Stock change	- 86 376	0	- 11 572	- 5 806	0	0	0	0	0	0	0	- 103 754
Total Primary Energy Supply	**2 427 577**	**10 489**	**2 138 556**	**716 281**	**192 078**	**42 061**	**199 010**	**1 853 634**	**0**	**576 005**	**115 054**	**8 270 745**
Energy converted	**-2 125 611**	**2 369**	**-2 145 891**	**689 183**	**736 929**	**30 078**	**104 862**	**- 704 991**	**994 681**	**- 10 007**	**- 115 054**	**-2 543 452**
Briquetting plants	- 864	2 369	0	0	0	0	0	0	0	- 10 007	0	- 8 502
Gas refineries	0	0	10 825	0	0	0	64 225	- 169 741	0	0	0	- 94 691
Petroleum refineries	0	0	-2 156 716	697 435	900 570	30 078	40 637	- 82 259	0	0	0	- 570 254
Electric power plants	-2 124 747	0	0	- 8 252	- 163 641	0	0	- 452 991	994 681	0	- 115 054	-1 870 005
Net transfers	0	0	0	0	- 20 792	0	0	0	0	0	0	- 20 792
Consumption by energy sector	9 841	187	457	1 788	1 398	2 925	10	185 931	49 098	0	0	251 635
Losses in transport and distribution	103	25	1 758	5	54	0	0	235 653	81 742	0	0	319 339
Statistical Differences	**- 19 116**	**8 041**	**- 9 551**	**66 169**	**- 54 509**	**- 16 754**	**6 209**	**8 766**	**17 297**	**- 31 326**	**0**	**- 24 775**
Final Consumption	**274 009**	**4 149**	**0**	**1 291 338**	**944 549**	**39 521**	**278 146**	**487 527**	**846 544**	**595 625**	**0**	**4 761 408**
Manufactur and Costruction	274 009	4 149	0	39 110	167 001	9 926	44 299	471 794	295 044	419 958	0	1 725 290
Iron and steel industry	21 318	120	0	1 425	9 457	4 375	1 185	128 809	18 223	0	0	184 912
Chemichal industry	1 840	28	0	180	2 680	295	284	33 062	7 919	0	0	46 288
Other industry and construction	250 852	4 001	0	37 505	154 864	5 256	42 830	309 923	268 901	419 958	0	1 494 090
Transportation	0	0	0	597 876	721 962	14 721	0	1 244	727	0	0	1 336 531
Road	0	0	0	475 862	673 149	11 873	0	1 244	0	0	0	1 162 128
Railway	0	0	0	0	7 812	2 493	0	0	727	0	0	11 032
Air	0	0	0	122 014	0	0	0	0	0	0	0	122 014
Inland and coastal waterways	0	0	0	0	41 001	355	0	0	0	0	0	41 356
Households and other consumers	0	0	0	654 352	55 585	14 873	233 847	14 489	550 773	175 667	0	1 699 587
Households	0	0	0	651 203	22 414	14 827	194 855	1 465	339 618	175 667	0	1 400 048
Agriculture	0	0	0	1 005	14 419	46	21	0	1 913	0	0	17 405
Other consumers	0	0	0	2 144	18 752	0	38 971	13 024	209 242	0	0	282 133
Consumption for non-energy uses	36 520	1 064	0	11 442	1 755	46 448	19 507	230 766	0	1 700	0	349 203

4. ANALYSIS

SOURCES OF NATURAL ENERGY , 2011 - 2016

Tera Joules

Natural Energy Inputs	2011	2012	2013	2014	2015	2016
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Renewable Natural Energy	**17.126**	**18.185**	**20.152**	**16.680**	**16.391**	**16.858**
- Coal Resources	12.177	13.247	15.332	12.077	11.842	12.228
- Crude Oil Resources	2.187	2.091	2.001	1.913	1.905	2.024
- Natural Gas Resources	2.762	2.847	2.819	2.690	2.644	2.606
Renewable Natural Energy	**177**	**216**	**667**	**676**	**719**	**702**
- Hydro	37	45	56	53	63	87
- Geothermal	13	34	49	36	31	28
- Biomass	127	137	562	587	625	587
TOTAL OF NATURAL ENERGY INPUTS	**17.303**	**18.401**	**20.819**	**17.356**	**17.110**	**17.560**

Source : Ministry of Energy and Mineral Resources of The Republic of Indonesia

4. ANALYSIS

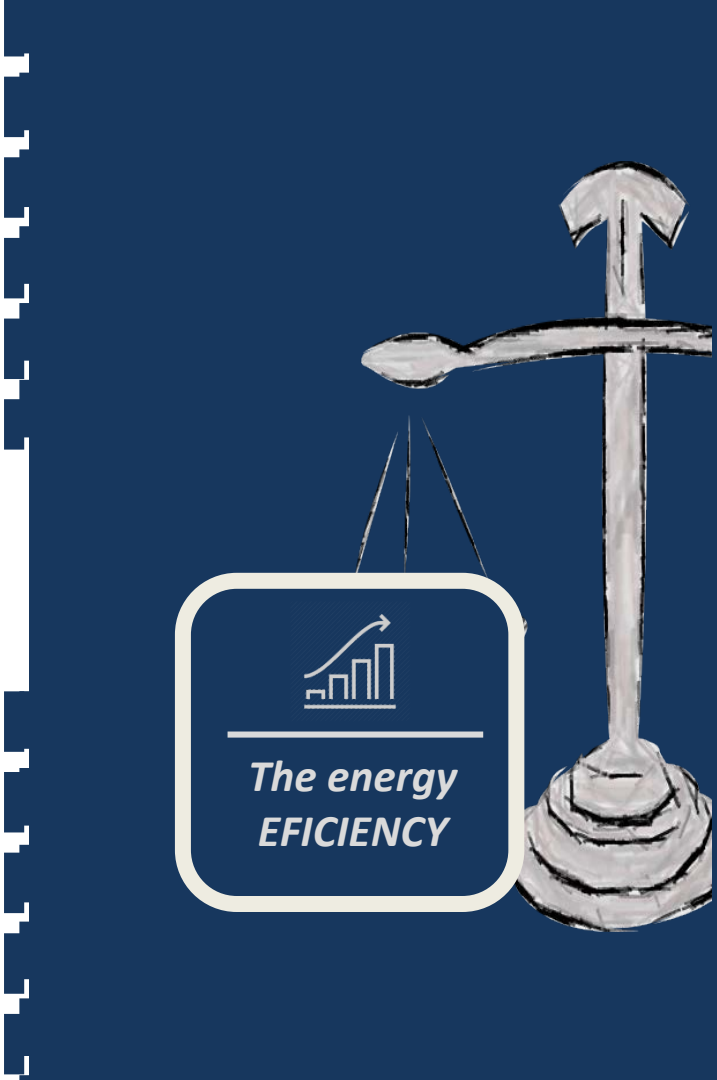
Total Energy Consumption by Kind of User, 2010 - 2016

Tera Joules

Kind of User	2010	2011	2012	2013	2014	2015	2016
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Manufactur and Costruction	451.225	2.220.369	2.448.801	2.282.461	1.078.484	1.659.509	1.725.290
Iron and steel industry	37.319	311.943	302.176	99.225	34.027	136.722	184.912
Petrochemichal industry	37.181	213.571	228.301	168.289	93.908	96.802	46.288
Other industry and construction	193.178	1.694.856	1.918.324	2.014.948	950.550	1.425.985	1.494.090
Transportation	0	887.270	1.303.769	1.744.434	1.868.707	1.308.584	1.336.531
Road	0	781.538	1.101.511	1.547.155	1.693.543	1.169.973	1.162.128
Railway	0	6.970	34.636	6.272	7.237	8.699	11.032
Air	0	75.100	130.993	164.402	142.137	110.951	122.014
Inland and coastal waterways	0	23.663	36.629	26.605	25.790	18.961	41.356
Other modes of transportation	0	0	0	0	0	0	0
Households and other consumers	352.477	1.412.167	1.490.633	1.269.429	1.488.910	1.576.695	1.699.587
Households	216.035	1.114.817	1.122.283	1.064.603	1.268.516	1.362.103	1.400.048
Agriculture	0	8.306	13.509	14.708	18.677	8.578	17.405
Other consumers	136.442	289.043	354.841	190.118	201.718	206.015	282.133

4. ANALYSIS

“The comparison between the energy produced with the energy needed in the energy transformation process derives a value of energy transformation efficiency”



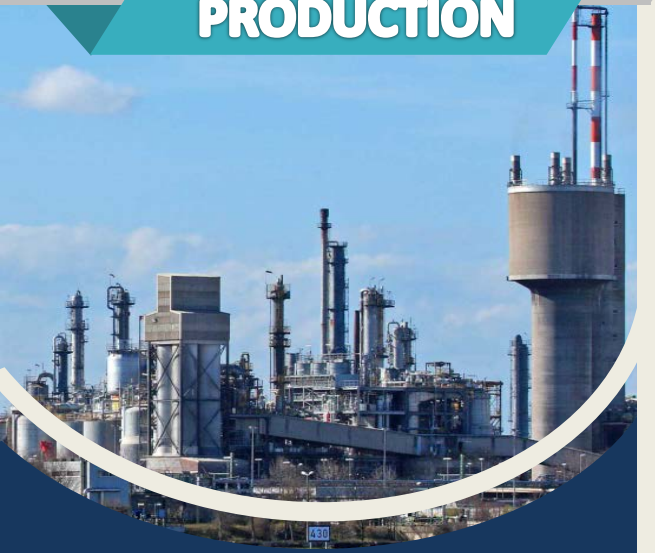
4. ANALYSIS

ENERGY TRANSFORMATION EFFICIENCY, 2011 - 2016

Description	2011	2012	2013	2014	2015	2016
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Manufacturing Industry						
Energy Input (PJ)	3.241	2.858	3.285	3.418	2.907	2.737
Energy Output (PJ)	2.498	2.468	2.682	2.685	2.645	2.467
Transformation Efficiency (percent)	77,07	86,35	81,64	78,55	90,99	90,14
Power Plant						
Energy Input (PJ)	1.900	2.104	2.968	2.818	2.934	2.865
Energy Output (PJ)	682	740	924	908	977	995
Transformation Efficiency (percent)	35,89	35,17	31,13	32,22	33,3	34,73

Source : **Report of Indonesia Experimental Energy Flow Accounts**

5. THE ISSUES ; ENERGY PRODUCTION



Energy production data mainly produced by The Indonesia Ministry of Energy and Mineral Resources.

1. Some types of data products are not detailed as required in the preparation of energy balances, such as coal products not specified by types of coal. Such as hard coal, anthracite, cooking coal, brown coal, lignite.

2. Biomass production data available only charcoal, other biomass such as palm shells, and firewood data is not available.

3. Production of some energy commodities such as briquette and coke of coal is very fluctuate every year. This could be caused by respon in the survey of manufacturing industry companies not yet well.

4. Not all hydroelectric power activities can provide generated electrical energy produced.

5. Blast furnace and steam energy conversion activities have only been done by the manufacturing industry but there is no question to obtain the data in the questionnaire.

5. THE ISSUES; ENERGY CONSUMPTION

1. There are only a few surveys ask about energy consumption in their questionnaire..
2. Manufacturing industry as the largest energy user, however the consumption data recorded tends to be lower than the real use.
3. There is no question about energy consumed in commercial industries surveys.
4. Data energy consumption by household as a result of socio economic survey, particularly for electricity and biomass consumption, tend to underestimate.
5. Biomass cosumed by household small relatively, many biomass uses are not recorded by households because they are free, available in the environment.

Energy consumption data is the main problem in the preparation of Indonesia Energy Balances.

6. ANOTHER ENERGY STATISTIC PRODUCT

In April, 2018 BPS-Statistics Indonesia published another energy statistic named as

"Report of Indonesia Experimental Energy Flow Accounts"

- *The report contains various accounts describing the supply and use of energy by environment and economic units.*
- *In line with 2008 System of National Accounts (SNA), energy flow accounts use the residence principle in classifying the activities in the national boundary.*
- *Energy flow accounts are presented in form of physical supply and use tables (PSUT)*
- *The main data source of Indonesia Energy Flow Accounts is Energy Balance published. There were also other supporting data sources, such as Supply and Use Table (SUT)*

6. ANOTHER ENERGY STATISTIC PRODUCT

Energy Intensity by Economic Activity, 2011-2015 (in PJ per trillion IDR)

Sectors	2011	2012	2013	2014	2015
(1)	(2)	(3)	(4)	(5)	(6)
All Industries	1,26	1,28	1,36	1,18	1,08
Agriculture, Forestry, and Fishery	0,01	0,01	0,01	0,02	0,01
Mining and Quarrying	0,16	0,21	0,19	0,15	0,21
Manufacturing	3,37	3,03	2,87	2,35	2,21
Coal and Refined Oil and GasIndustry	14,75	13,67	14,66	15,79	13,26
Other Manufacturing	1,44	1,38	1,18	0,57	0,83
Electricity and Gas Supply	25,93	26,21	34,35	31,22	31,95
Transportation	3,59	4,84	5,97	5,97	3,91
Other Industries	0,15	0,2	0,19	0,12	0,12
HOusehold	0,28	0,27	0,24	0,27	0,28

Source : **Report of Indonesia Experimental Energy Flow Accounts**

6. ANOTHER ENERGY STATISTIC PRODUCT

Energy Intensity by Industry

The most intensive industry in using energy

1. *Electricity and gas supply industry.*
2. *Manufacture of coke*
3. *Refined petroleum products industry*

The massive use of energy at this industry was caused by the energy transformation process undertaken by this industry as its main activity, transforming primary energy products into secondary energy products, which were ready to be used for final consumption

7. SOLUTION

To obtain data of electricity production by non power companies, BPS since 2011 conducted a Captive Power survey. Due to the limited number of samples, the company covered annually is limited to three service industries. They will be surveyed alternately each year.

Taking into account the time series data for each commodity, if there is a big change in the series, then checking the raw data and justify from various related data sources

Some commodities are unavailable in the current year, if it is believed that the commodity is still produced actually, then use the previous year's data

BPS Statistics Indonesia

THANK YOU

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