

Summary Report | year 2017 |



Energy Research Office

Rio de Janeiro, RJ
July, 2018



**FEDERAL GOVERNMENT OF BRAZIL
MINISTRY OF MINES AND ENERGY
MME**

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PRESENTATION



Empresa de Pesquisa Energética

Presentation

In compliance with its creation law, the Energy Research Office (Empresa de Pesquisa Energética - EPE) annually publishes the Brazilian Energy Balance (BEB), keeping a tradition initiated by the Ministry of Mines and Energy. The BEB's objective is to present the accounting for energy supply and consumption in Brazil, including the extraction of primary energy resources, their conversion into secondary forms, imports and exports, distribution and final use of energy.

The BEB is the result of extensive research, constituting itself as a broad and systematized database, updated in annual cycles. Of utmost importance for studies related to national energy planning, the BEB has also been shown as an important research tool for sector studies, giving that it presents reliable energy supply and consumption statistics, that often reveal trends. The document is taken as a reference for the country's energy data.

The 2018 Brazilian Energy Balance Summary Report - Base Year 2017, presents the consolidated information on how much and how energy was used in Brazil in 2017.

Presentation

Supply: in 2017, the domestic energy supply (total energy available in the country) reached 292.1 Mtoe, an increase of 1.3% in relation to the previous year. Part of this increase was influenced by the behavior of natural gas and wind energy domestic supplies, which rose by 6.7% and 26.5% in the period, respectively. Also contributing to the expansion of the gross domestic supply was the resumption of economic activity in 2017, a year in which the national GDP grew by 1.0%, according to the latest data released by IBGE¹.

Regarding electricity, there was a 4.6 TWh (0.7%) increase in the domestic supply, when compared to 2016. Due to the unfavorable hydrological conditions, the available hydraulic energy suffered a reduction of 3.4% in relation to the last year. Despite the lower water supply, the share of renewables in the electricity mix reached 80.4% in 2017, a fact explained by the wind power generation.

Wind generation reached 42.4 TWh - a 26.5% growth compared to 2016. Wind power installed capacity reached 12,283 MW, an increase of 21.3%.

¹ Instituto Brasileiro de Geografia e Estatística - Geography and Statistics Brazilian Institute

Presentation

The **Micro and Mini Distributed Generation**, stimulated by recent regulatory actions that enabled the compensation of the energy surplus produced by smaller metering systems, reached 359.1 GWh with an installed capacity of 246.1 MW. Highlight for the photovoltaic solar energy, with 165.9 GWh and 174.5 MW of generation and installed capacity, respectively.

Presentation

Consumption: following the trend in supply, final energy and non-energy consumption increased by 1.2% compared to the previous year, with a 2.3% and a 1.0% expansion in consumption in the transport and industrial sectors, respectively.

Transport: The transport segment, with an expansion of 1.9 million toe, recorded the largest advance in energy demand in 2017. This was mainly due to the 2.7% increase in the consumption of diesel oil, attributable to the greater activity of the cargo transportation sector. In the light vehicle market, there was a 0.5% growth in automotive gasoline production, while consumption of this fuel expanded by 2.6%. On the other hand, the production and consumption of ethanol had an inverse behavior, with a decrease of 2.0% and 0.2% in relation to the previous year, respectively.

Industry: The industrial segment accounted for an increase of 0.9 million toe in absolute terms, the second largest in energy demand in 2017. This was mainly due to the increase in the consumption of coal (8.4%) in the steel sector and black liquor (3.6%) for paper and pulp production.

The final consumption of electricity in 2017 registered a progression of 0.9%. The commercial (1.5%) and industrial (1.1%) sectors were the ones that contributed more to this increase. Households also had a 0.8% increase in electricity consumption compared to 2016.

Presentation

Emissions: In 2017, the total anthropogenic emissions associated to the Brazilian energy mix reached 435.8 million tons of equivalent carbon dioxide (Mt CO₂-eq). The bigger part (199.7 Mt CO₂-eq) was generated in the transport sector.

In terms of per capita emissions, each Brazilian, producing and consuming energy in 2017, issued 2.1 t CO₂-eq on average, that is, about 7 times less than an American and 3 times less than an European or a Chinese, according to the latest data released by the International Energy Agency (IEA) for the year of 2015.

The carbon intensity in the economy was 0.15 kg CO₂ / US \$ ppp [2010]¹. The Brazilian economy remains, on average, 17% less carbon intensive than the European economy, 50% less intensive than the US economy and 70% less than the Chinese economy, based on the IEA data from 2015.

The Brazilian electricity sector emitted, on average, only 104.4 kg of CO₂ to produce 1 MWh, a very low index when establishing comparisons with countries of the European Union, USA and China.

⁽¹⁾ In the concept of purchasing power parity.

The digital version of this document can be obtained from the EPE website: <<http://www.epe.gov.br>>

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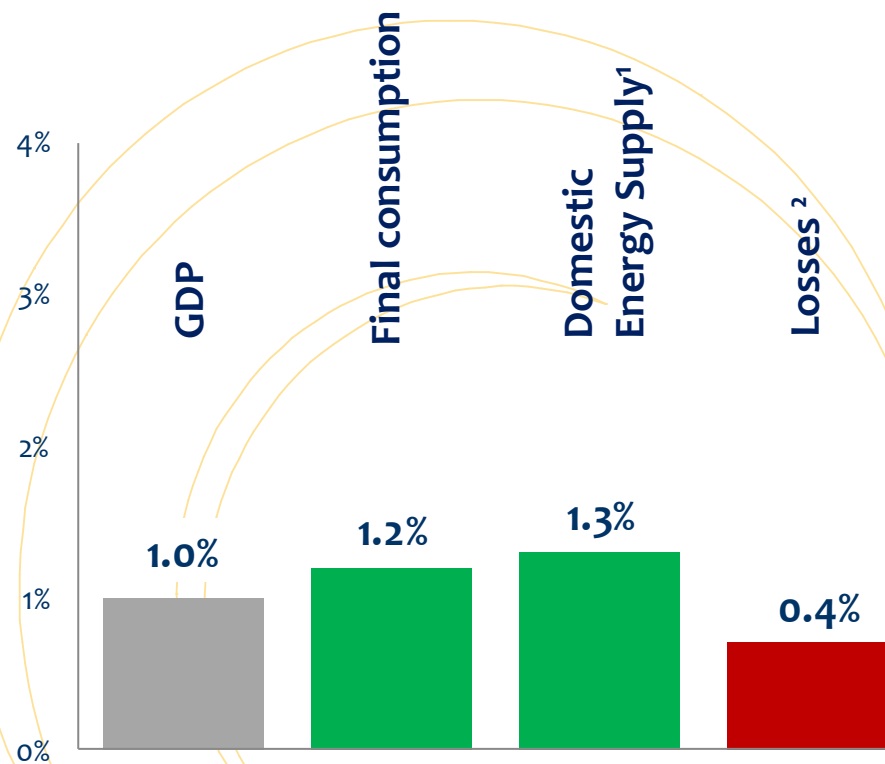


HOW MUCH ENERGY IS USED IN BRAZIL

Energy supply and consumption in Brazil

- Domestic energy supply grows at similar rate as final consumption.

% variation 2017/2016



Values in Mtoe

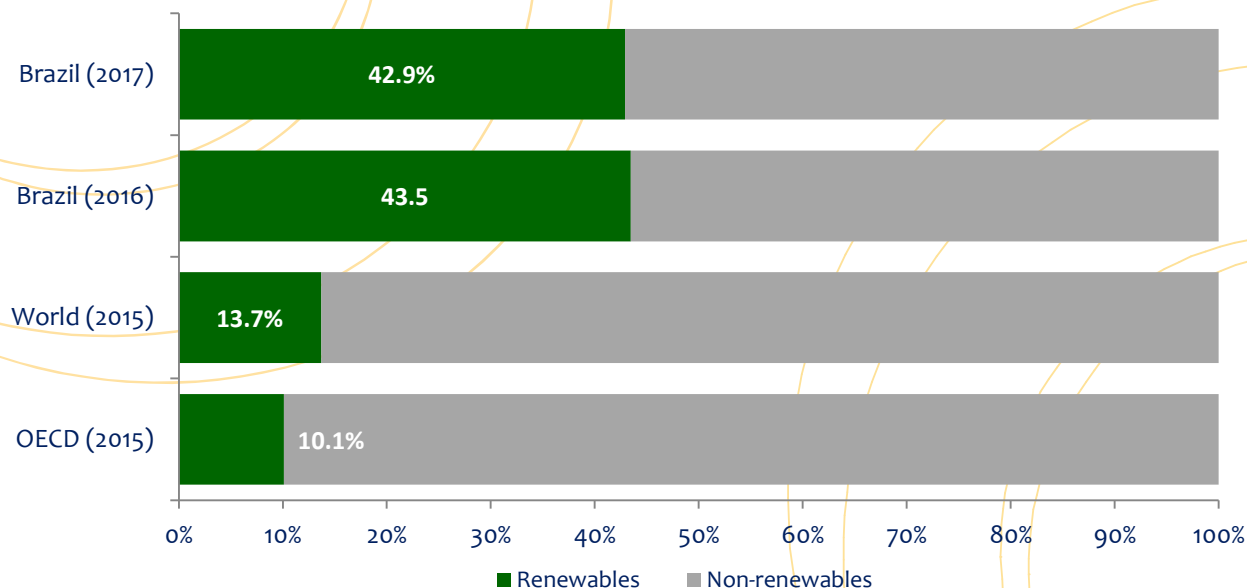
	2016	2017
Domestic energy supply	↑ 288.3	292.1
Final consumption.....	↑ 255.5	258.7
Losses ²	↑ 32.8	33.4
Losses ² (%).....	11.4%	11.4%

¹ DES

² Includes transformation losses

Share of renewables in the energy mix

- In 2017, the contribution of renewables in the Brazilian Energy mix remained among the highest in the world. The advance of natural gas was compensated mainly by wind, black liquor and biodiesel.



Percentage of renewables in the Brazilian energy mix:

2015: 41.3%
2014: 39.4%
2013: 40.4%

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WHAT ENERGY IS USED IN BRAZIL

Domestic energy supply breakdown

RENEWABLES ▶ 42.9%

sugarcane biomass

17.0%



hydraulic¹

12.0%



firewood and charcoal

8.0%



black liquor and other renewables

5.9%



¹ Includes electricity imported from hydraulic source

NON-RENEWABLES ▶ 57.1%

petroleum and oil products

36.4%



Natural gas

13.0%



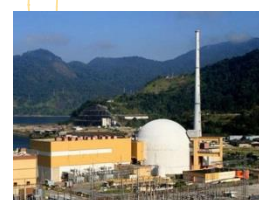
coal

5.7%



uranium

1.4%



other non-renewables

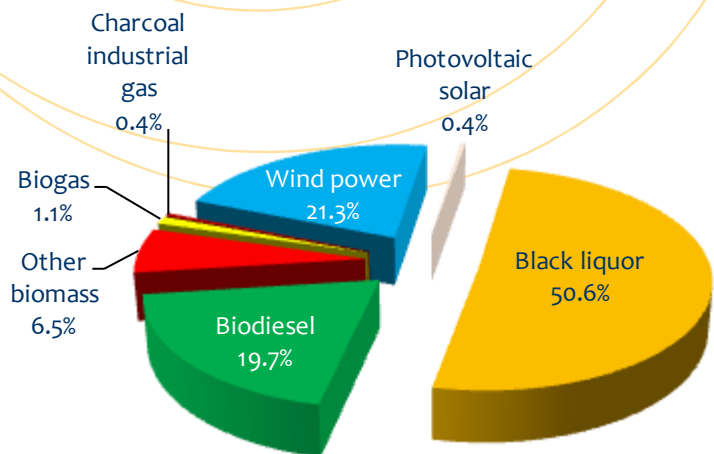
0.6%



'Black liquor and other renewables' breakdown

black liquor and other renewables

5.9%



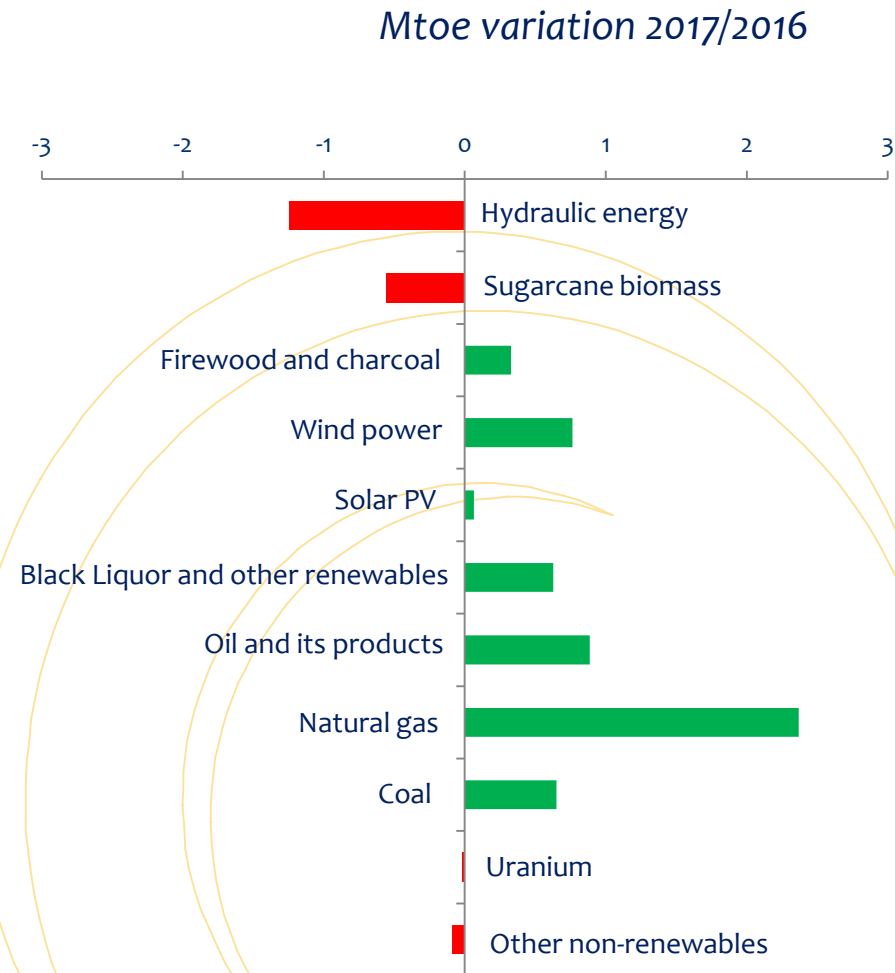
black liquor and other renewables (10 ³ toe)	2016	2017	Δ 17 / 16
Black Liquor	8,447	8,658	2.5%
Biodiesel	3,009	3,366	11.8%
Other biomass ¹	1,103	1,117	1.3%
Biogas	137	191	39.5%
Charcoal industrial gas	83	74	-10.4%
Wind power	2,880	3,644	26.5%
Photovoltaic solar	7	72	875.6%
Total	15,667	17,122	9.3%

¹ Includes rice husk, elephant grass and vegetable oil.

Domestic Energy Supply 2017/2016

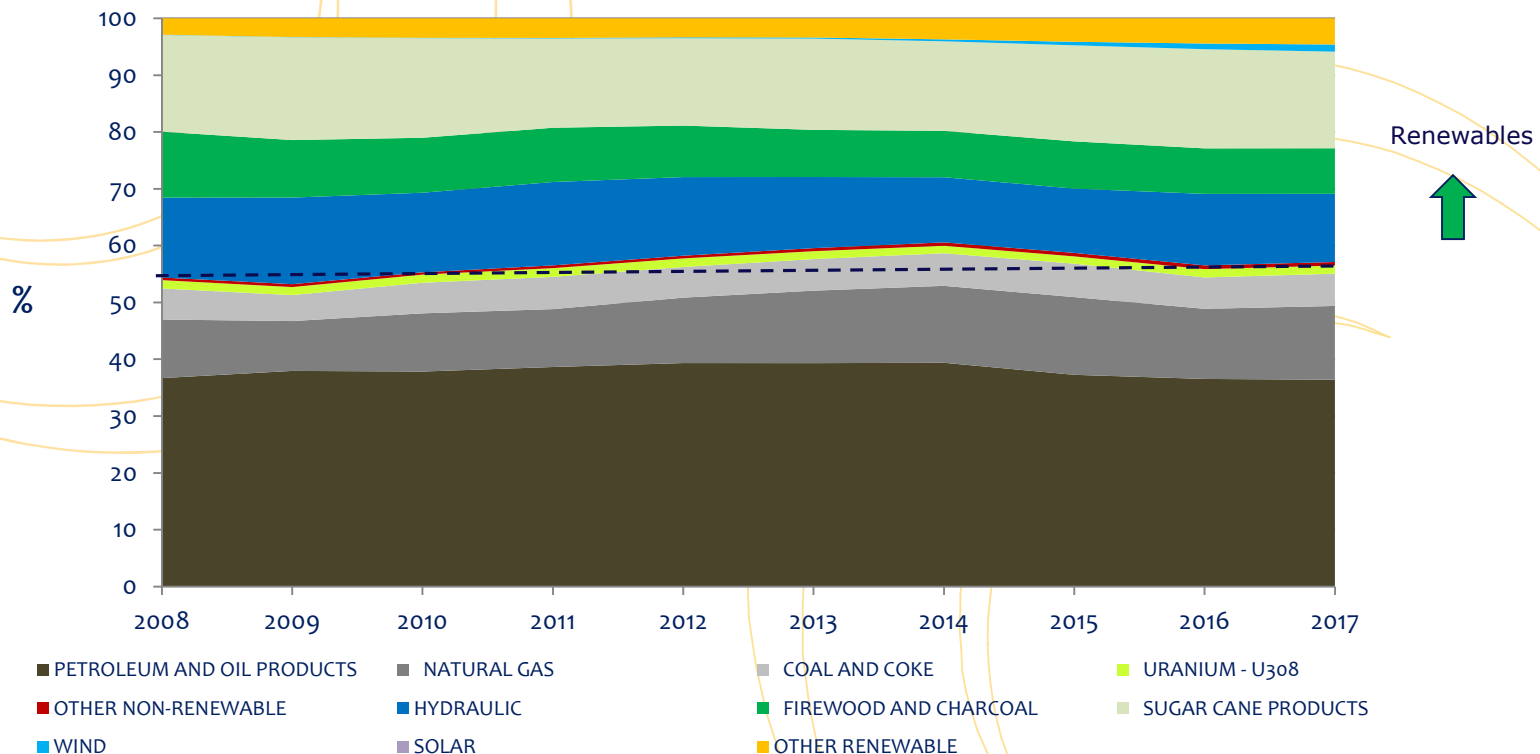
Source (Mtoe)	2016	2017	Δ 17 / 16
RENEWABLES	125.3	125.3	0.0%
Hydraulic energy ¹	36.3	35.0	-3.4%
Sugarcane biomass	50.3	49.8	-1.1%
Firewood and charcoal	23.1	23.4	1.4%
Wind power	2.9	3.6	26.5%
Solar photovoltaic	0.007	0.072	875.6%
Black liquor and other renewables	12.8	13.4	4.9%
NON-RENEWABLES	163.0	166.8	2.3%
Oil and oil products	105.4	106.2	0.8%
Natural gas	35.6	37.9	6.7%
Coal	15.9	16.6	4.1%
Uranium (U ₃ O ₈)	4.2	4.2	-0.4%
Other non-renewables	1.9	1.8	-4.7%

¹ Includes electricity imports originated from hydraulic sources



Domestic energy supply 2008 - 2017

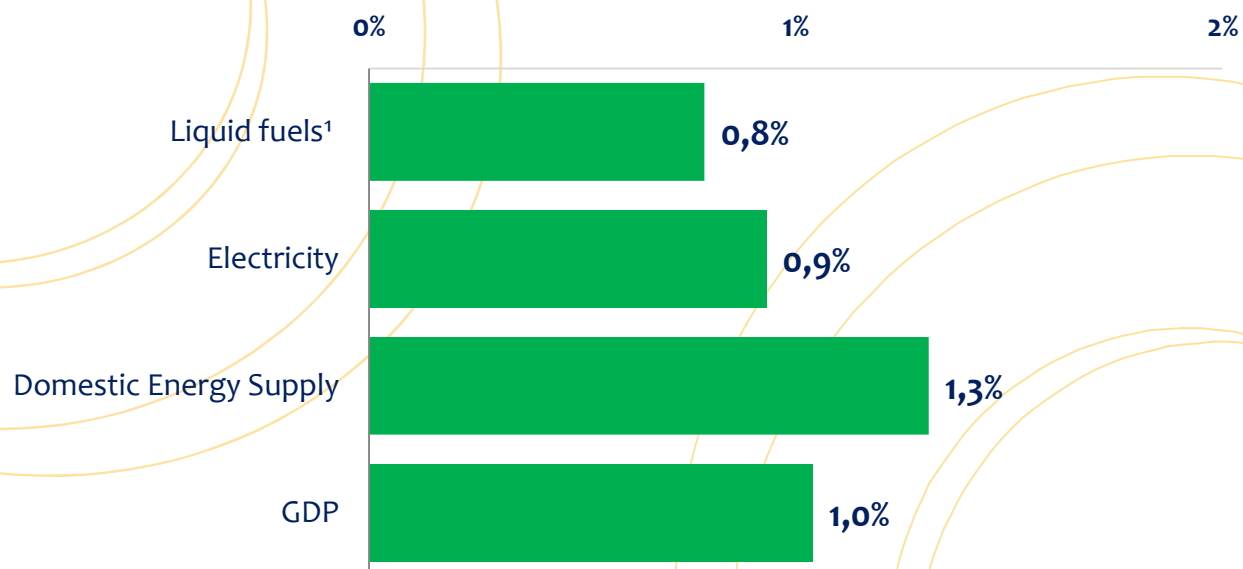
10 ³ toe									
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
251,860	243,110	268,796	272,196	283,257	296,301	305,547	299,574	288,319	292,099



There was a reduction in the share of renewables in the energy mix between 2011 and 2014 due to the drop of the hydraulic energy supply. From 2015, renewable sources resumed their growth trajectory with the expansion of sugarcane biomass, wind and biodiesel, reaching **42.9%** of the total supply in 2017.

Energy consumption variation

% variation 2017/2016

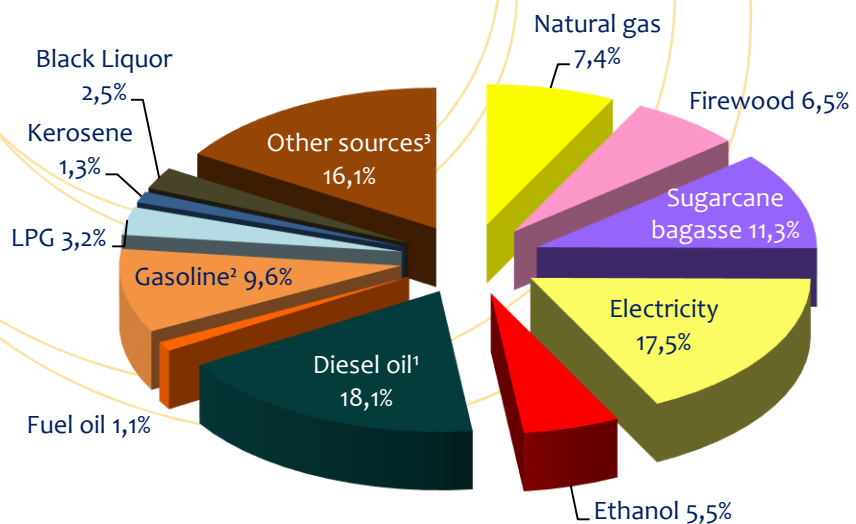


¹ Does not include naphtha, non-energetic use; Includes LPG

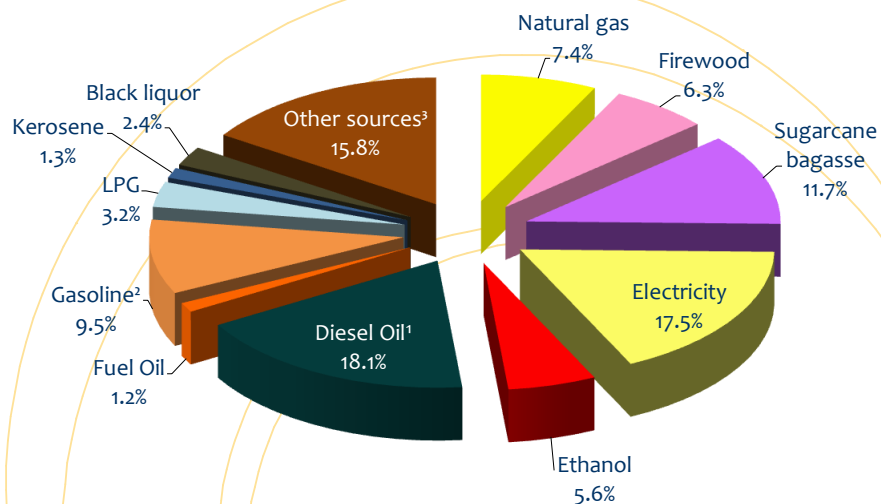
Liquid fuels and electricity account for approximately 56% of final energy consumption.

Final consumption by source

BRAZIL (2017)



BRAZIL (2016)



¹ Includes biodiesel

² Inclui aviation gasoline

³ Includes refinery gas, coal coke, petroleum coke, charcoal, tar, naphta, coal, other oil products, asphalt, lubricants and solvents.

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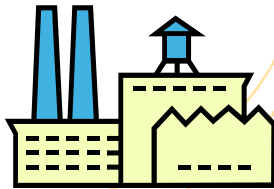


WHO USES ENERGY IN BRAZIL

Who used energy in Brazil

industry

32.9%



transport

32.7%



households

9.7%



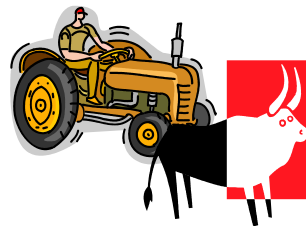
energy sector

10.1%



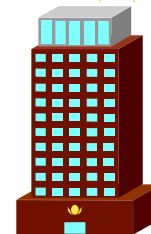
agriculture and livestock

4.0%



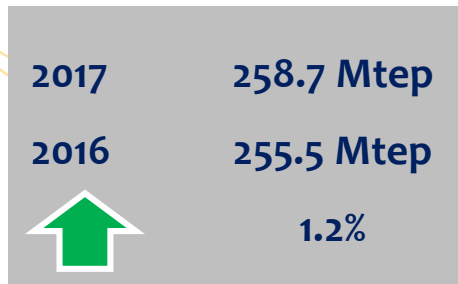
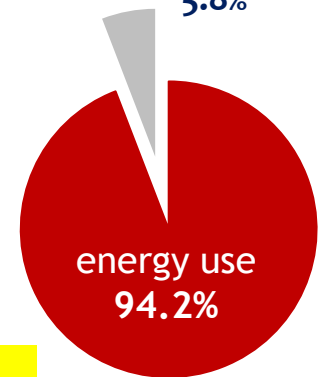
services

4.8%



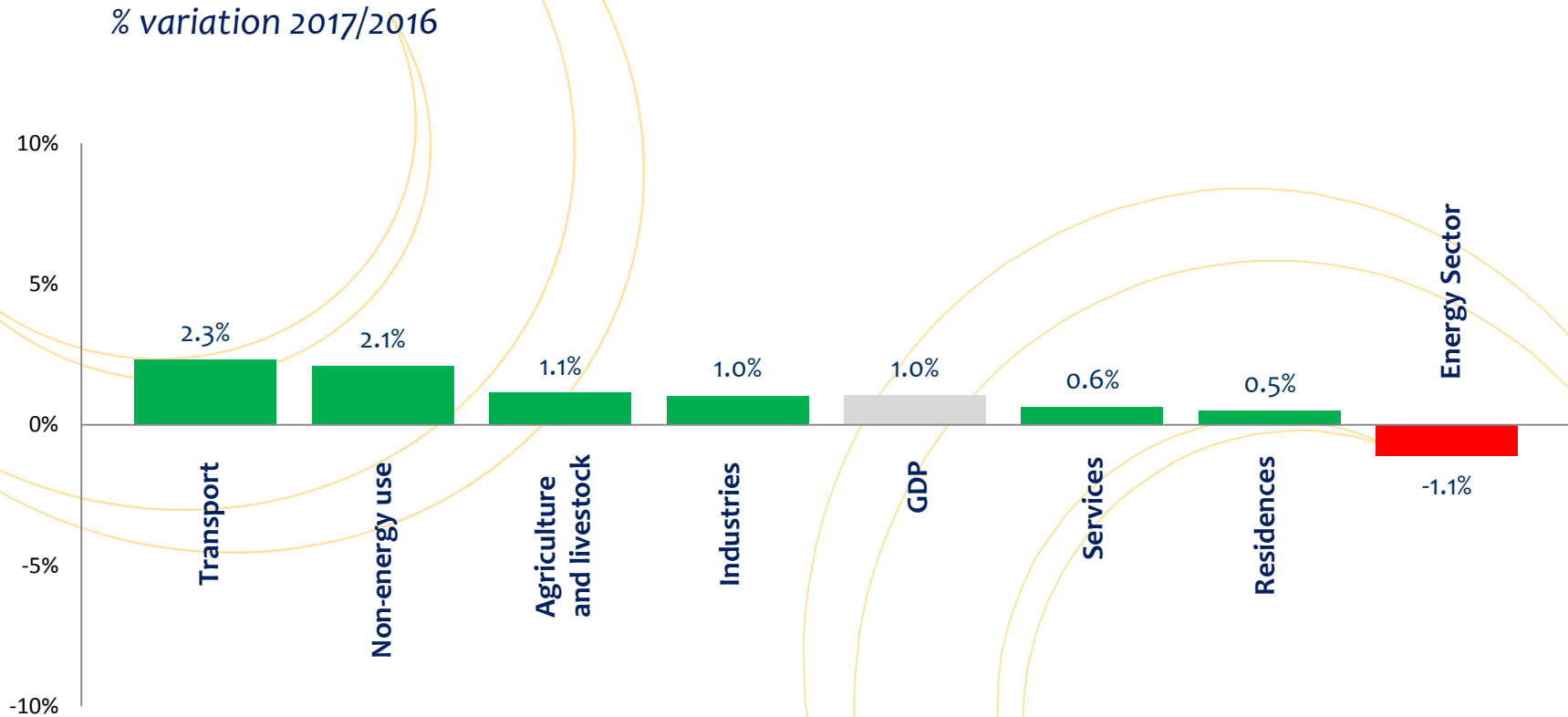
non-energy use

5.8%



Industrial production and cargo / passenger transportation account for approximately 66% of the country's energy consumption.

How the energy consumption in Brazil varied



Energy sector consumption

Source (10 ³ toe)	2016	2017	Δ 17 / 16
NATURAL GAS	6,559	6,542	-0.3%
SUGARCANE BAGASSE	12,237	11,926	-2.5%
OIL PRODUCTS	4,745	4,791	1.0%
ELECTRICITY	2,559	2,548	-0.4%
COKE GAS	206	210	2.0%
TOTAL	26,307	26,018	-1.1%



Sugarcane bagasse 311 ktoe
 Natural gas 17 ktoe
 Electricity 11 ktoe





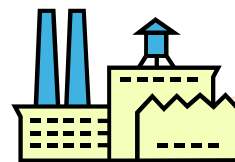
Decrease of sugarcane bagasse due to lower production of ethanol.


Oil products 46 ktoe
 Coke gas 4 ktoe

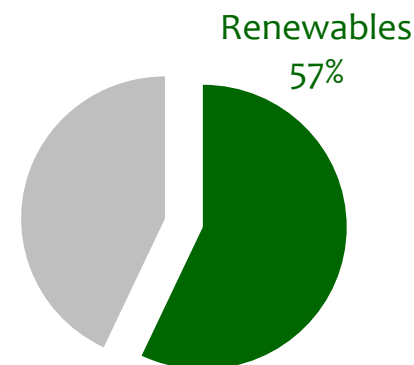
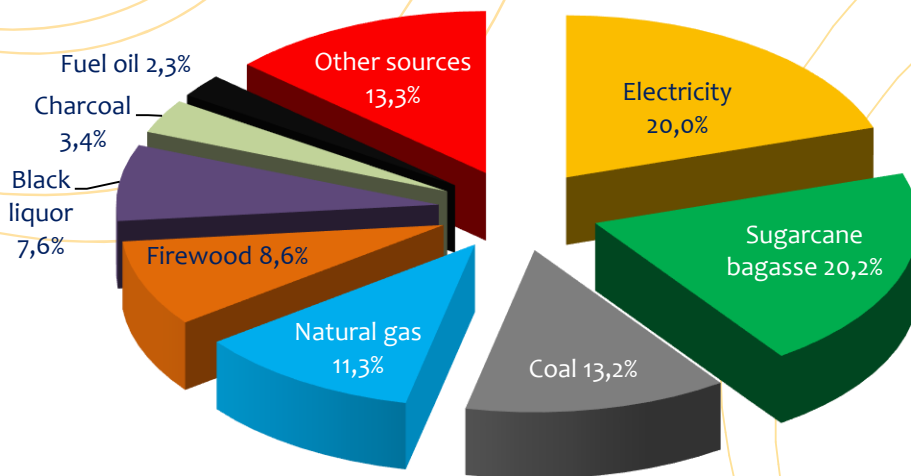


Industries energy consumption

-  Coal +8.4% (coal coke reduction steel)
- Black Liquor +3.6% (cellulose pulp production)
-  Charcoal -4.1% (charcoal reduction steel)
- Sugarcane bagasse -2,0% (sugar)







2017	85.1 Mtoe
2016	84.3 Mtoe
	
	1.0%



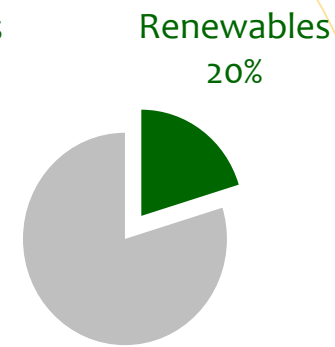
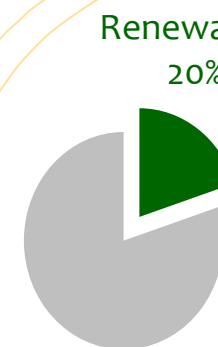
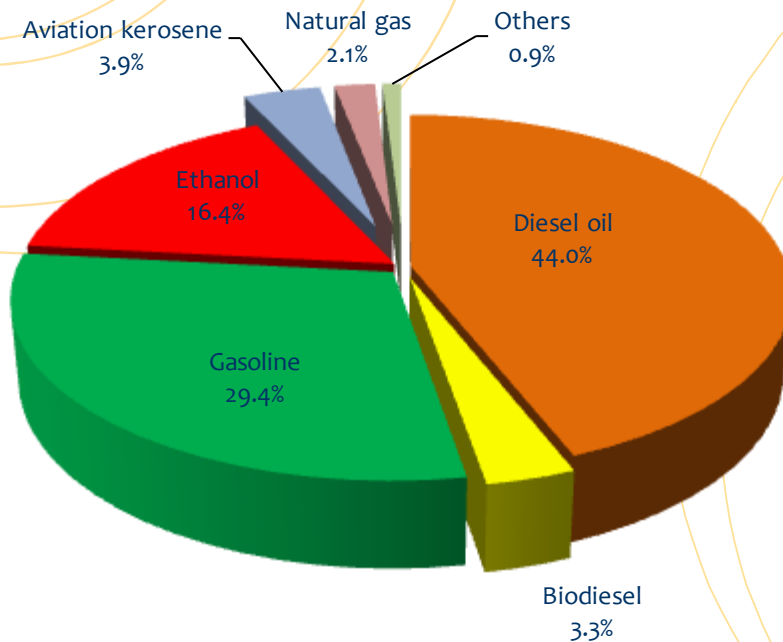
¹ Includes diesel oil, LPG, naphtha, kerosene, coke oven gas, tar, refinery gas, petroleum coke, among other renewables and non-renewables.

Transports energy consumption

-  Gasoline¹ +2.6%
 -  Ethanol -0.2%
 -  Diesel oil +2.7%; biodiesel +2.8%
 -  Natural gas +8.9%
- } Substitutes

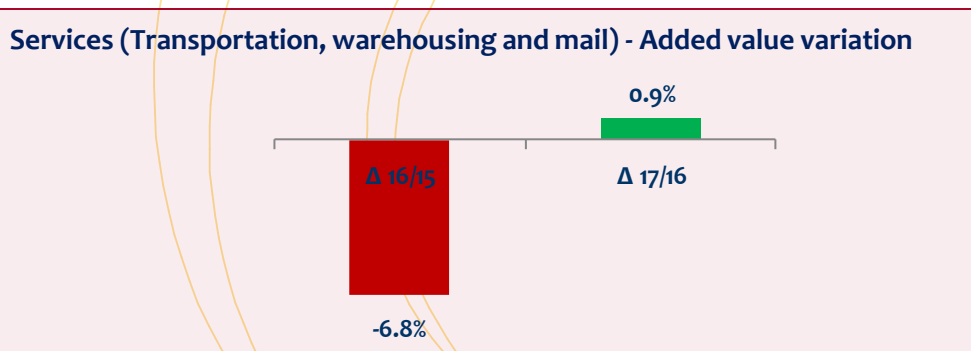
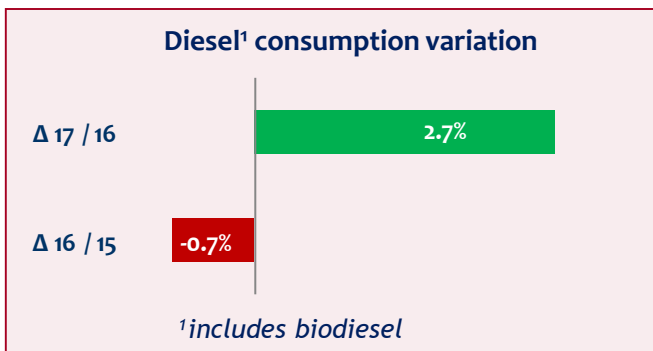
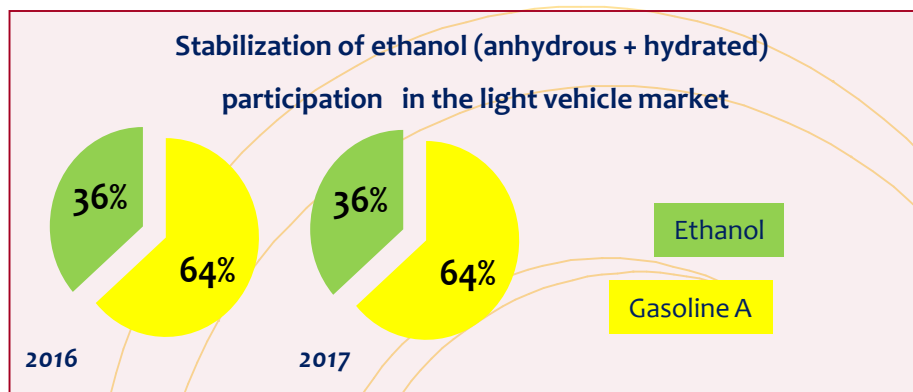
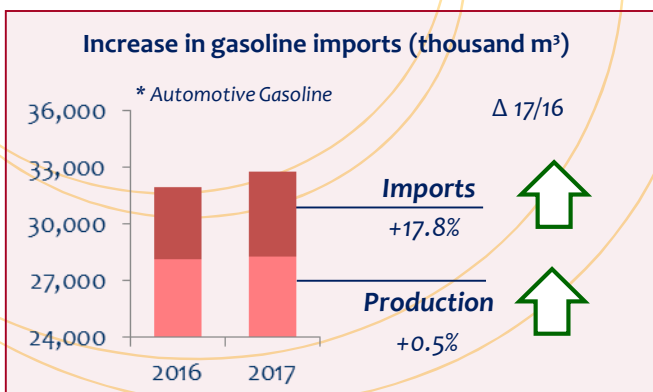
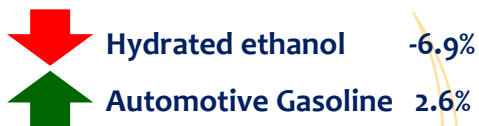


2017	84.6 Mtoe
2016	82.6 Mtoe
	2.3%







¹ Includes aviation gasoline

Transports energy consumption - highlights




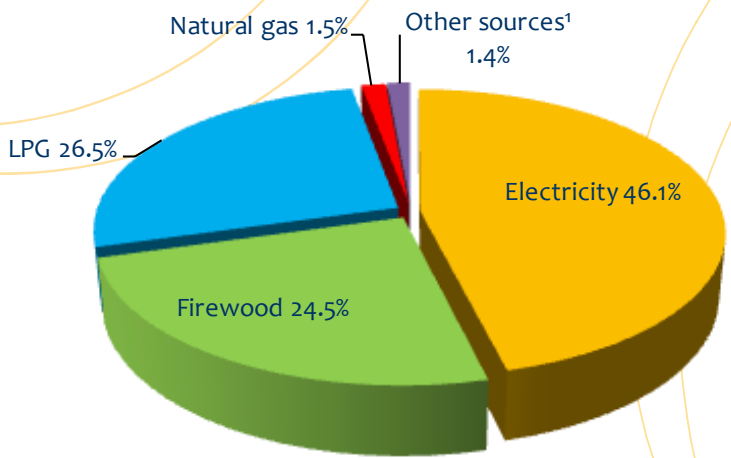
Household energy consumption

-  Natural gas +6.3%
-  Electricity +0.8%
-  Firewood +0.8%
-  LPG +0.5%

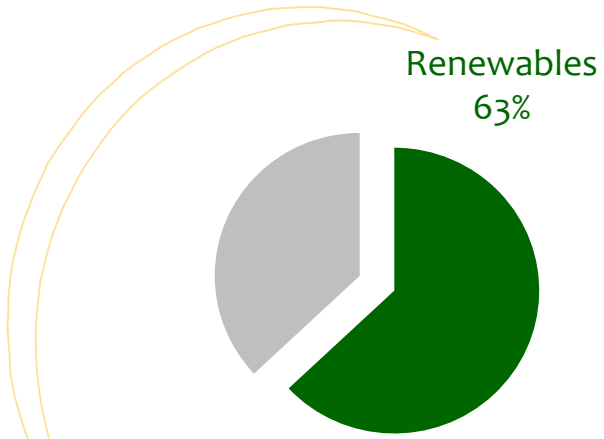
Heterogeneity in household consumption profile. Higher income households have increased consumption of modern sources (LPG and electricity). On the other hand, low-income families, especially in rural areas, are still dependent on traditional biomass.



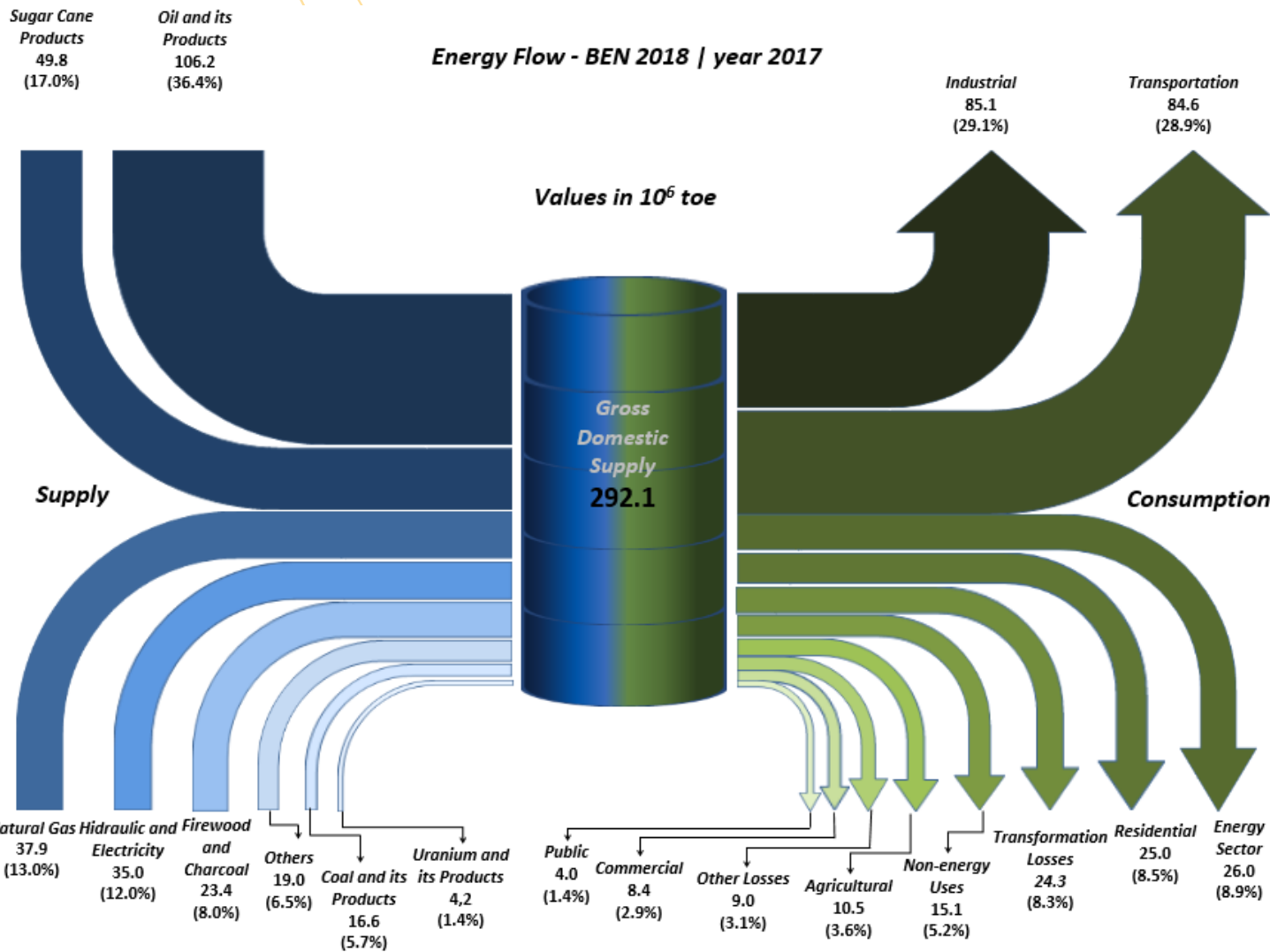
2017	25.0 Mtoe
2016	24.8 Mtoe
	0.5%



¹ Kerosene and charcoal



Energy flow



Percentages were calculated based on the Gross Domestic Supply.

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ELECTRICITY USE

Electricity consumption in Brazil

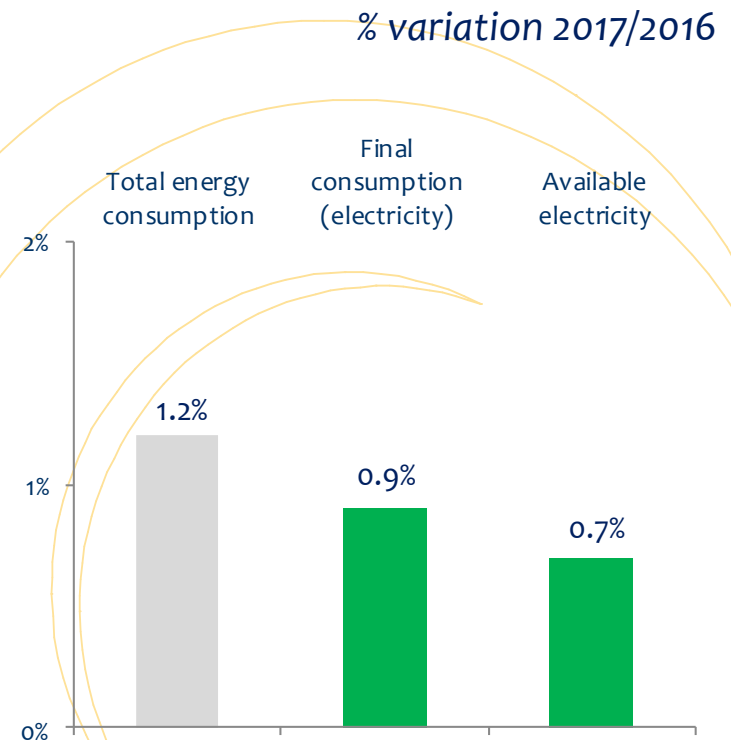
- Reduction of losses in electricity consumption

Values in TWh		2016	2017
Domestic Electricity Supply ¹	↑	619.7	624.3
Public Utility Power Plants	↑	480.4	491.1
Self Producers Power Plants	↓	98.5	96.8
Electricity imports ²	↓	40.8	36.4
Final consumption ³	↑	521.4	526.2
Losses (commercial + technical)		98.3	98.1
Losses (%)	↓	15.9%	15.7%

¹ DEES

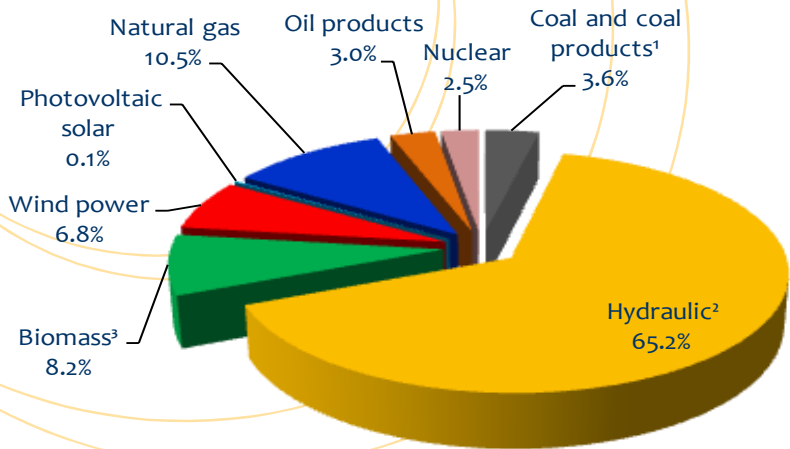
² Imports (-) exports

³ Final consumption refers to : National Interconnected System + Isolated power plants + Self-production



Brazilian electricity mix

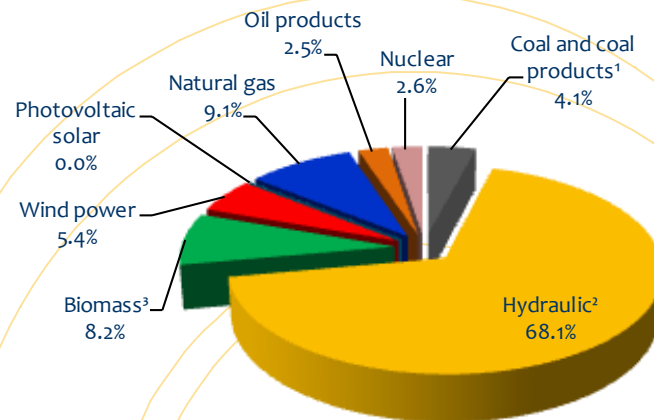
BRAZIL (2017)



Hydraulic² supply in 2017: **407.3 TWh**

Total² supply in 2017: **624.3 TWh**

BRAZIL (2016)



Hydraulic² supply in 2016: **421.7 TWh**

Total² supply in 2016: **619.7 TWh**

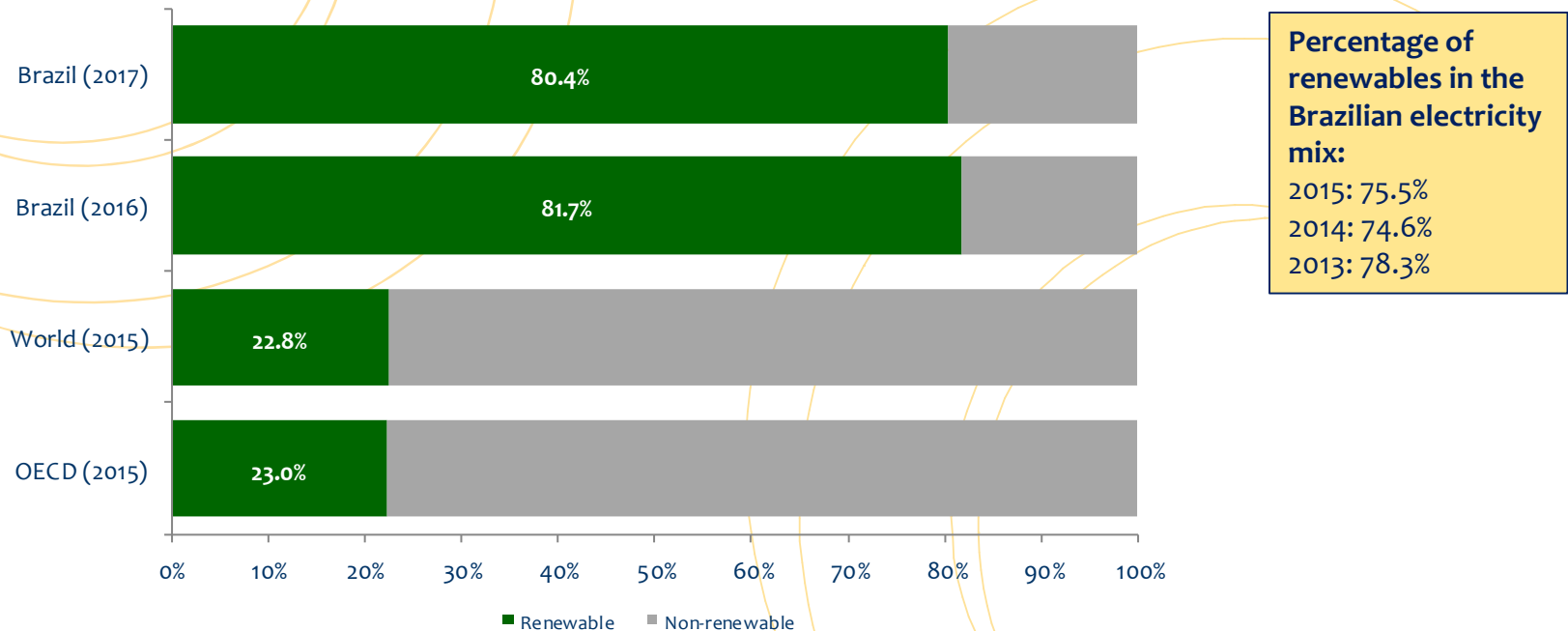
¹ Includes coke oven gas, blast furnace gas, steel gas and tar

² Includes imports

³ Includes firewood, sugarcane bagasse, black liquor and other primary sources.

Share of renewables in the electricity mix

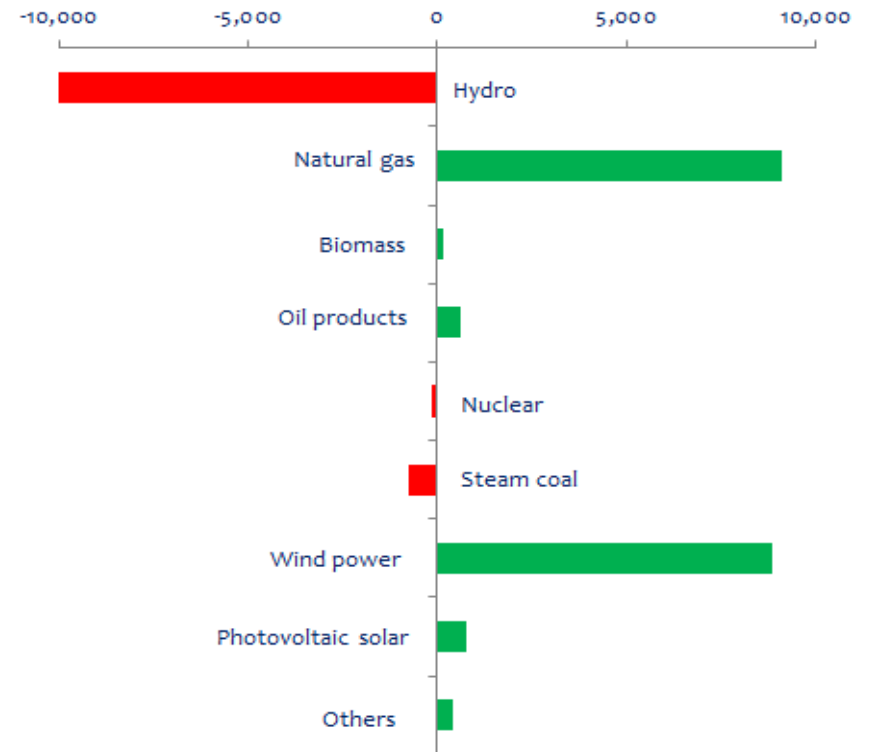
- Decrease in the share of renewables in the electricity mix: despite the fall in hydro generation, wind energy made up for the advancement of thermal generation based on natural gas and oil products.



Power generation¹ (GWh)

Source	2016	2017	Δ 17/16
Hydro	380,911	370,906	-2.6%
Natural gas	56,485	65,593	16.1%
Biomass ²	49,236	49,385	0.3%
Oil products	12,103	12,733	5.2%
Nuclear	15,864	15,739	-0.8%
Steam coal	17,001	16,257	-4.4%
Wind power	33,489	42,373	26.5%
Photovoltaic solar	85	832	875.6%
Others ⁴	13,723	14,144	3.1%
Total generation	578,898	587,962	1.6%

2017/2016 variation in GWh



¹ Includes micro and mini distributed generation

² Includes firewood, sugarcane bagasse and black liquor

³ Includes diesel oil and fuel oil

⁴ Includes other primary sources, coke oven gas and other secondary sources

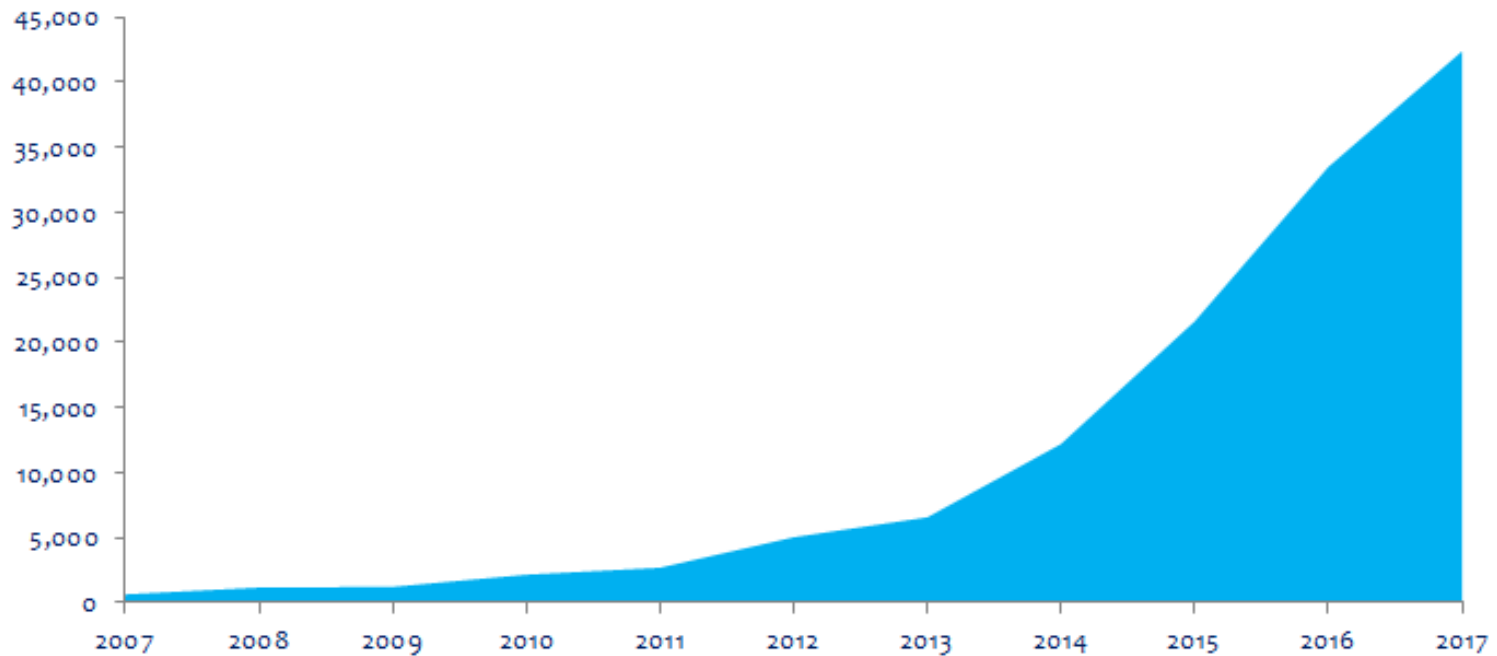


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Wind power generation

in GWh

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Δ 17/16
663	1,183	1,238	2,177	2,705	5,050	6,578	12,210	21,625	33,489	42,373	26.5%



Thermoelectric generation

- In 2017, a 6% increase in thermoelectric generation.
 - Share in the total electricity generation¹:

2016	2017
28.4%	29.6%

- Share of each source in thermoelectric generation in 2017:

Biomass ²	29.5%
Natural gas	37.7%
Nuclear	9.1%
Oil products	10.8%
Coal and coal products	12.9%

¹ Does not include electricity imported from hydraulic source

² Includes sugarcane bagasse, black liquor, firewood and other primary sources

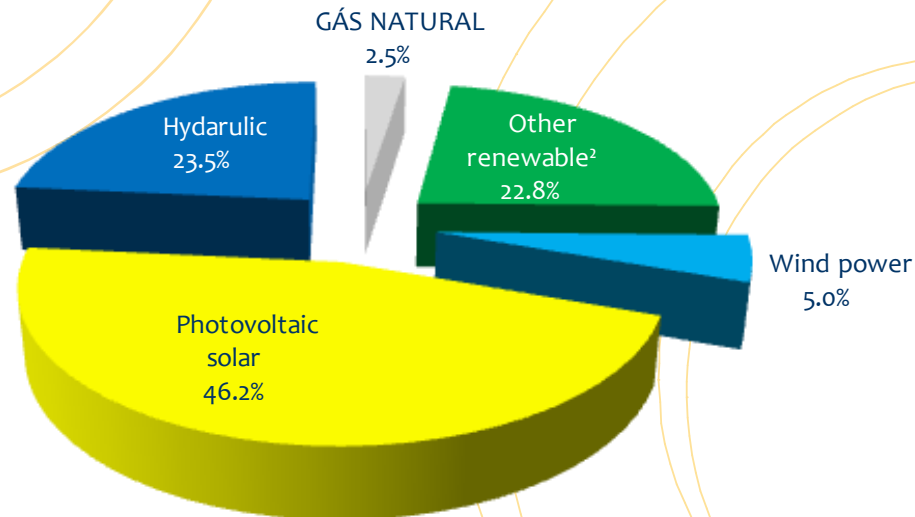
Micro e Mini Distributed Generation¹

- In 2017, a 245% increase in distributed generation.

➤ In GWh:

2016	2017
104	359

➤ Share of each source in distributed generation in 2017 :



¹ ANEEL Normative Resolution nº 482/2012

² Inclui biogás proveniente de resíduos agrícolas e urbanos, casca de arroz, gás de alto-forno (biomassa) e resíduos florestais.

Installed Capacity¹ (MW)

Fonte	2016	2017	Δ 17/16
Hydropower	96,925	100,275	3.5%
Thermoelectric ²	41,275	41,628	0.9%
Nuclear	1,990	1,990	0.0%
Wind power	10,124	12,283	21.3%
Photovoltaic solar	24	935	3,836%
Available capacity	150,338	157,112	4.5%

¹ Does not include micro and mini distributed generation

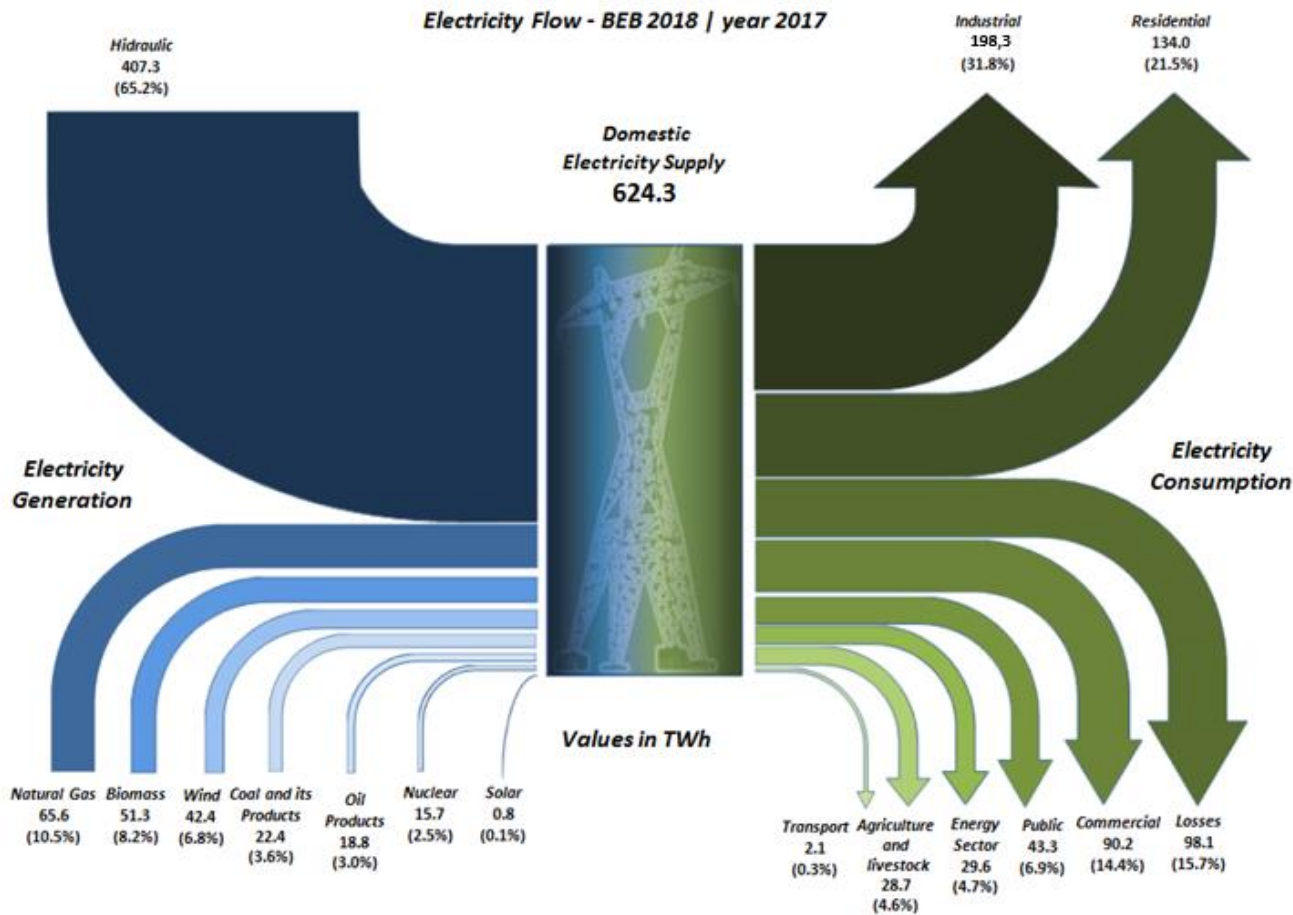
² Includes biomass, gas, oil and coal

Installed Capacity– Micro e Mini distributed generation¹ (MW)

Fonte	2016	2017
Hydropower	4,4	37,3
Thermoelectric	11,0	24,0
Wind power	0,2	10,3
Photovoltaic solar	56,9	174,5
Available capacity	72,5	246,1

¹ ANEEL Normative Resolution n° 482/2012

Energy flow - Electricity



Includes imported energy and self-production.

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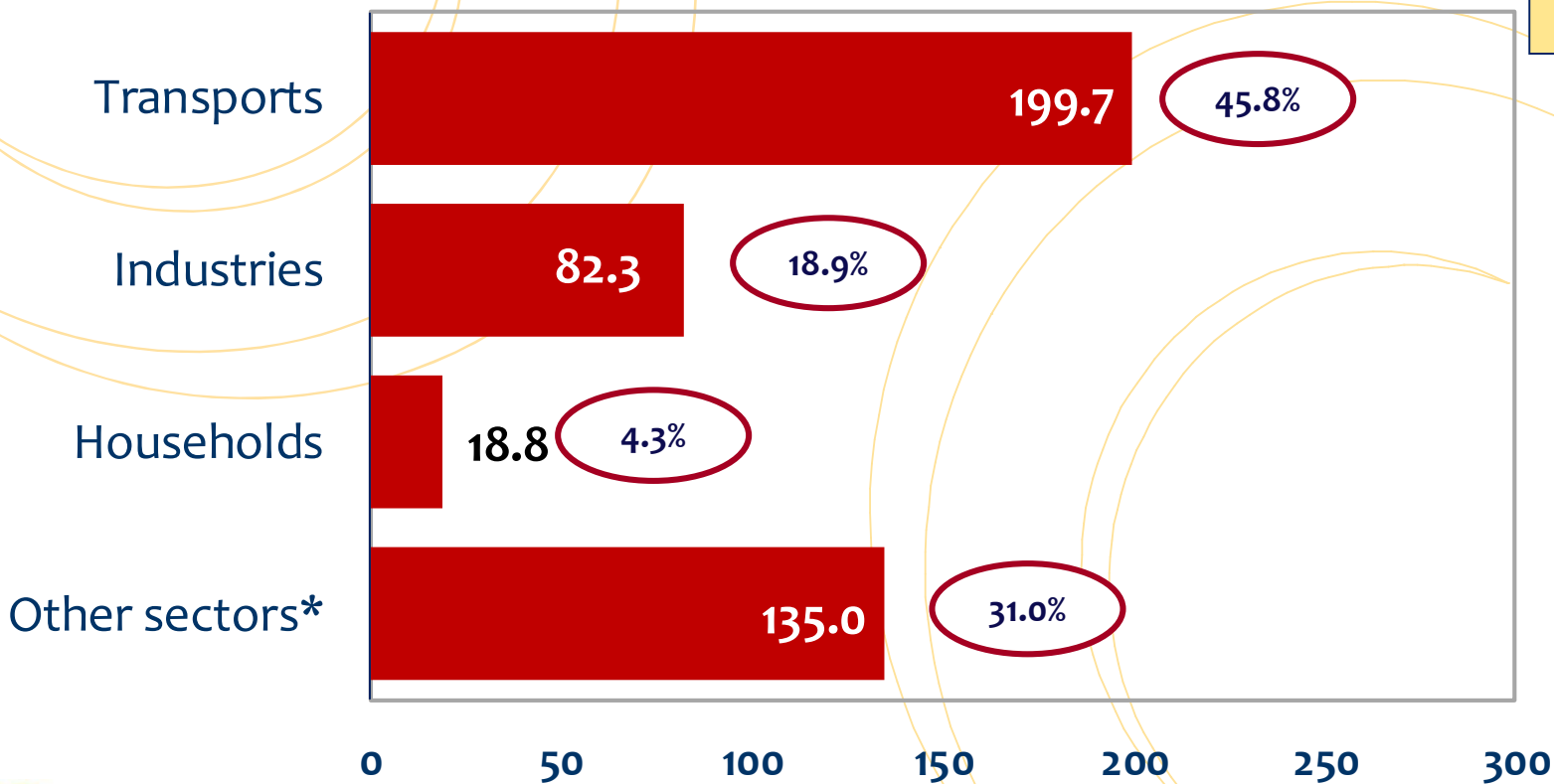
EMISSIONS RELATED TO PRODUCTION AND USE OF ENERGY IN BRAZIL

CO₂ emissions

- In 2017, the total anthropogenic emissions associated to the Brazilian energy mix reached 435.80 MtCO₂-eq.

Total emissions (2017), in Mt CO₂

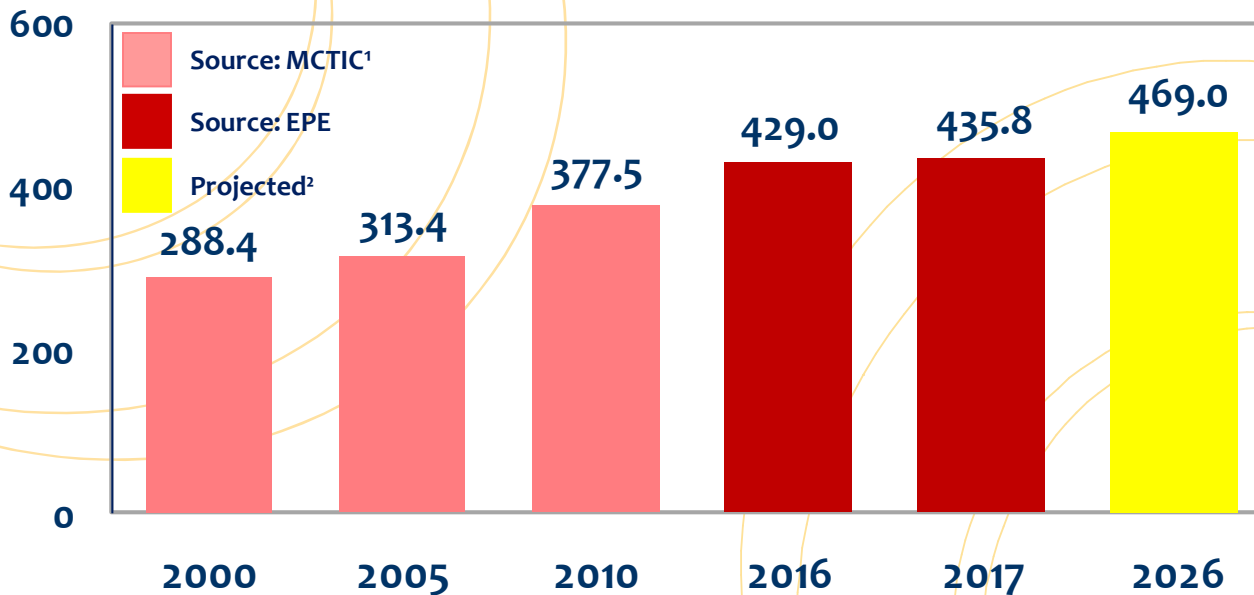
Δ 17/16
1.6% ↑



* includes agriculture and livestock, services, energetic, electrical and fugitive emissions

Evolution of CO₂ emissions

- Evolution of total anthropogenic emissions associated with the Brazilian energy mix in MtCO₂-eq.



Total emissions growth - MtCO ₂ eq		
Indicator	Accomplished	Projected ²
	2000 to 2017	2000 to 2026
Average annual growth rate	2.5%	1.9%

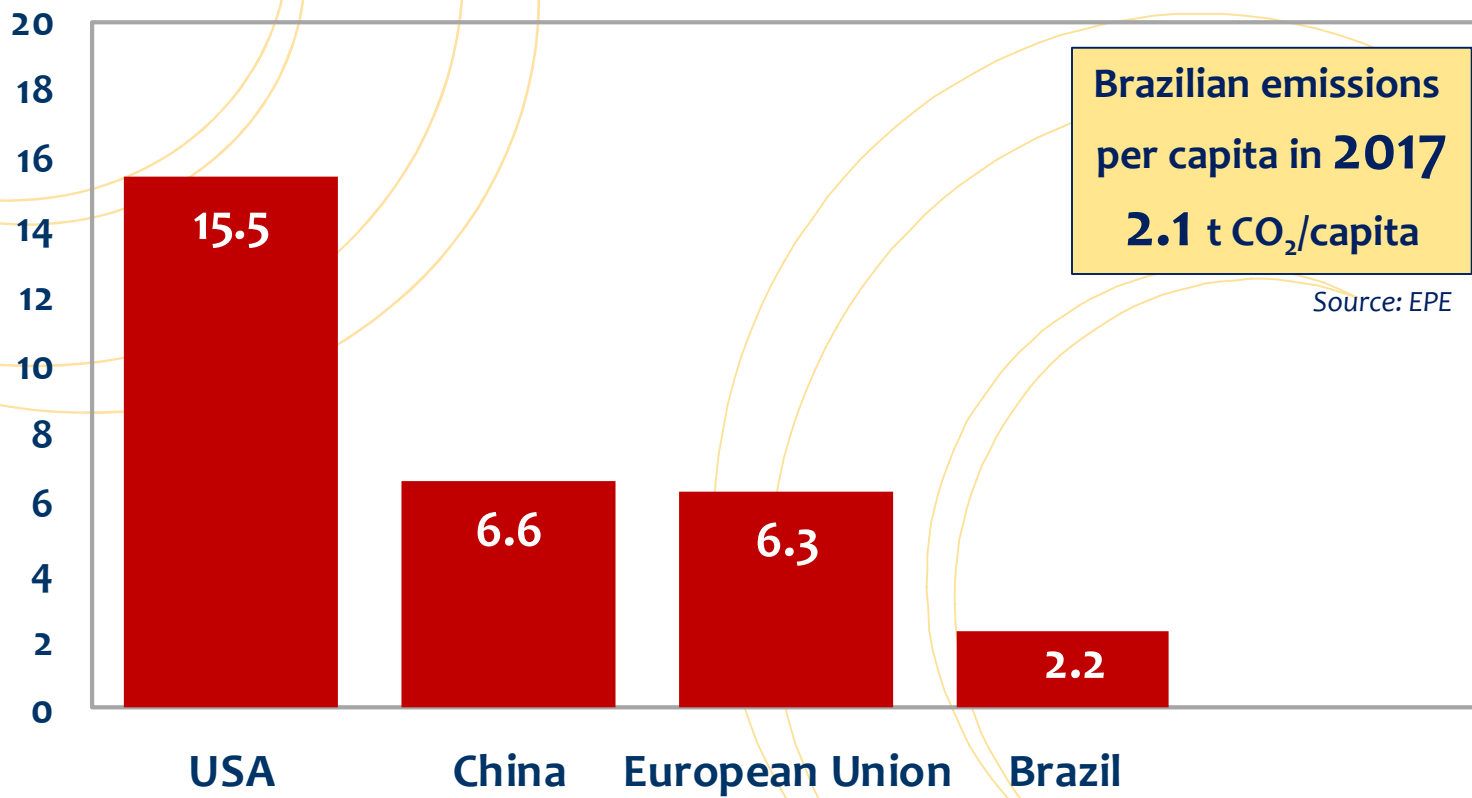
¹ Ministry of Science, Technology, Innovation and Communications

² PDE 2026 - Decennial Energy Plan.

CO₂ emissions per capita

- Producing and consuming energy, each Brazilian emits, on average, 7 times less than an American and 3 times less than a European or a Chinese.

CO₂ emissions per capita (2015), in t CO₂/capita



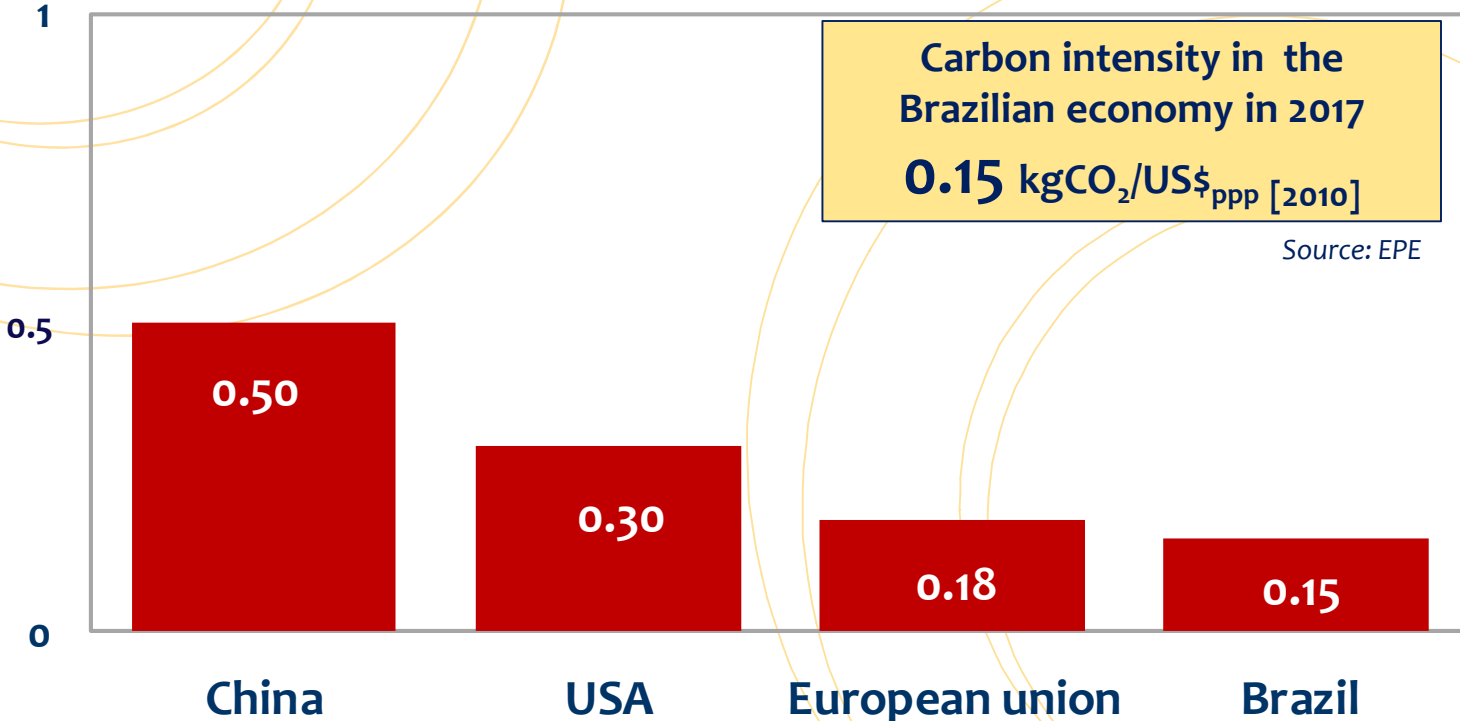
Source: EPE

Source: International Energy Agency
Prepared by EPE

Carbon intensity

- To generate a unit of product, the Brazilian economy issues 17% less than the European economy, 50% less than the U.S. economy and 70% less than the Chinese economy.

Relative emissions (2015), in $\text{kgCO}_2/\text{US}\$_{\text{ppp}} [2010]$



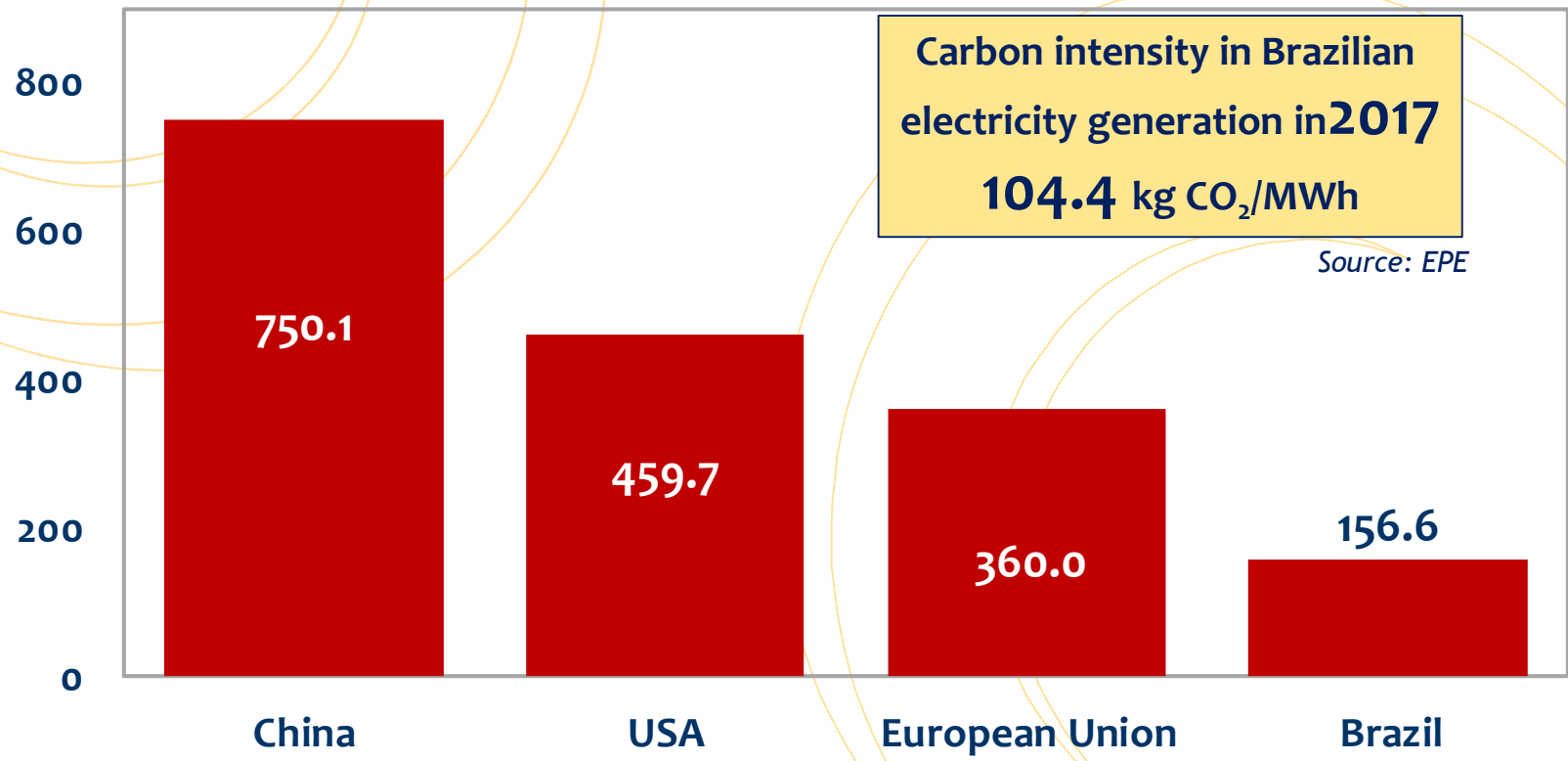
Source: EPE

Source: International Energy Agency
Prepared by EPE

Emissions in the electric power production

- To produce 1 MWh, the Brazilian electrical sector emits 2.3 times less than the European, 2.9 times less than the U.S. electrical sector and 4.8 times less than the Chinese.

CO₂ emissions per MWh (2015)



Source: EPE

Source: International Energy Agency
 Prepared by EPE

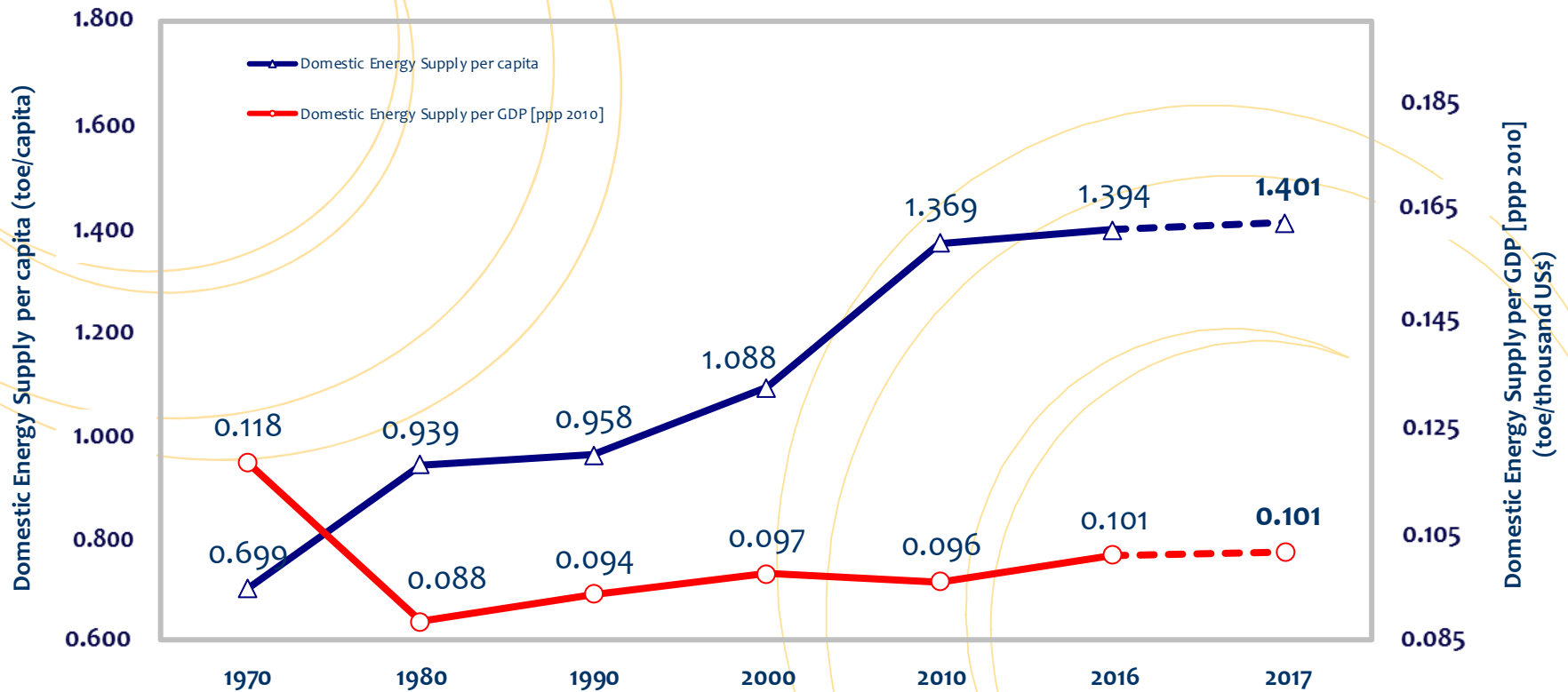


Summary Report | year 2017 |

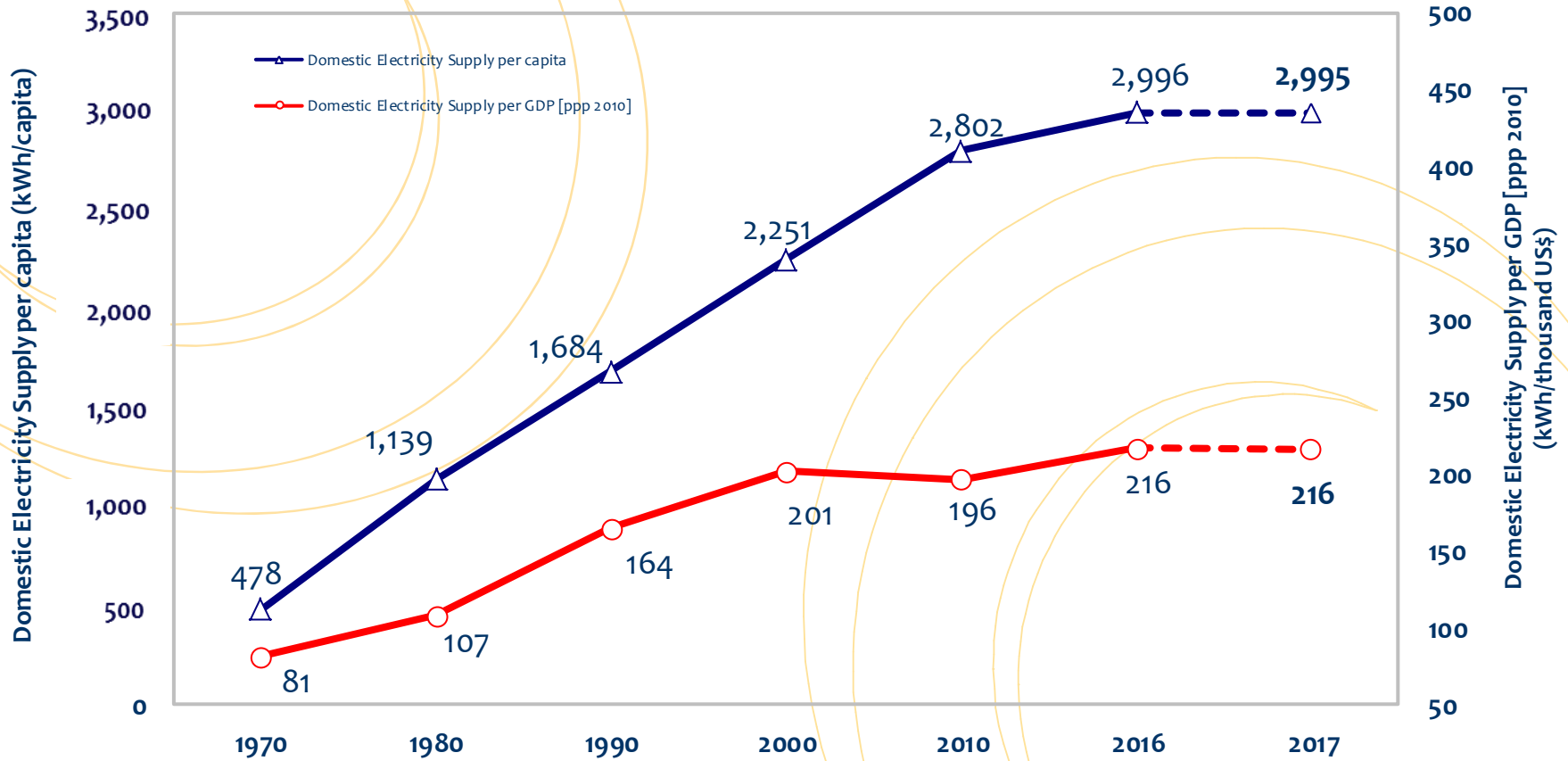


ATTACHMENTS

Indicators evolution: energy

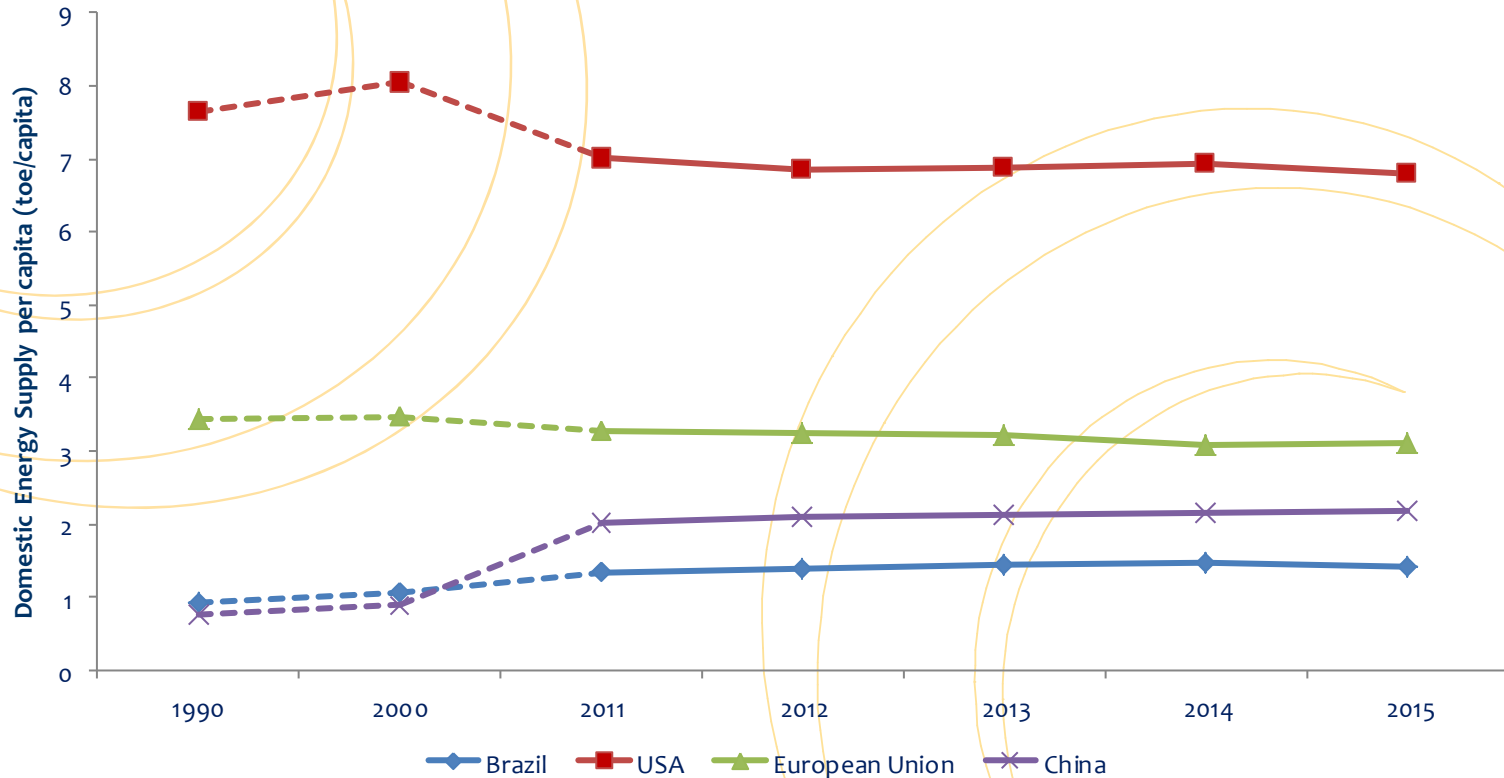


Indicators evolution: electricity



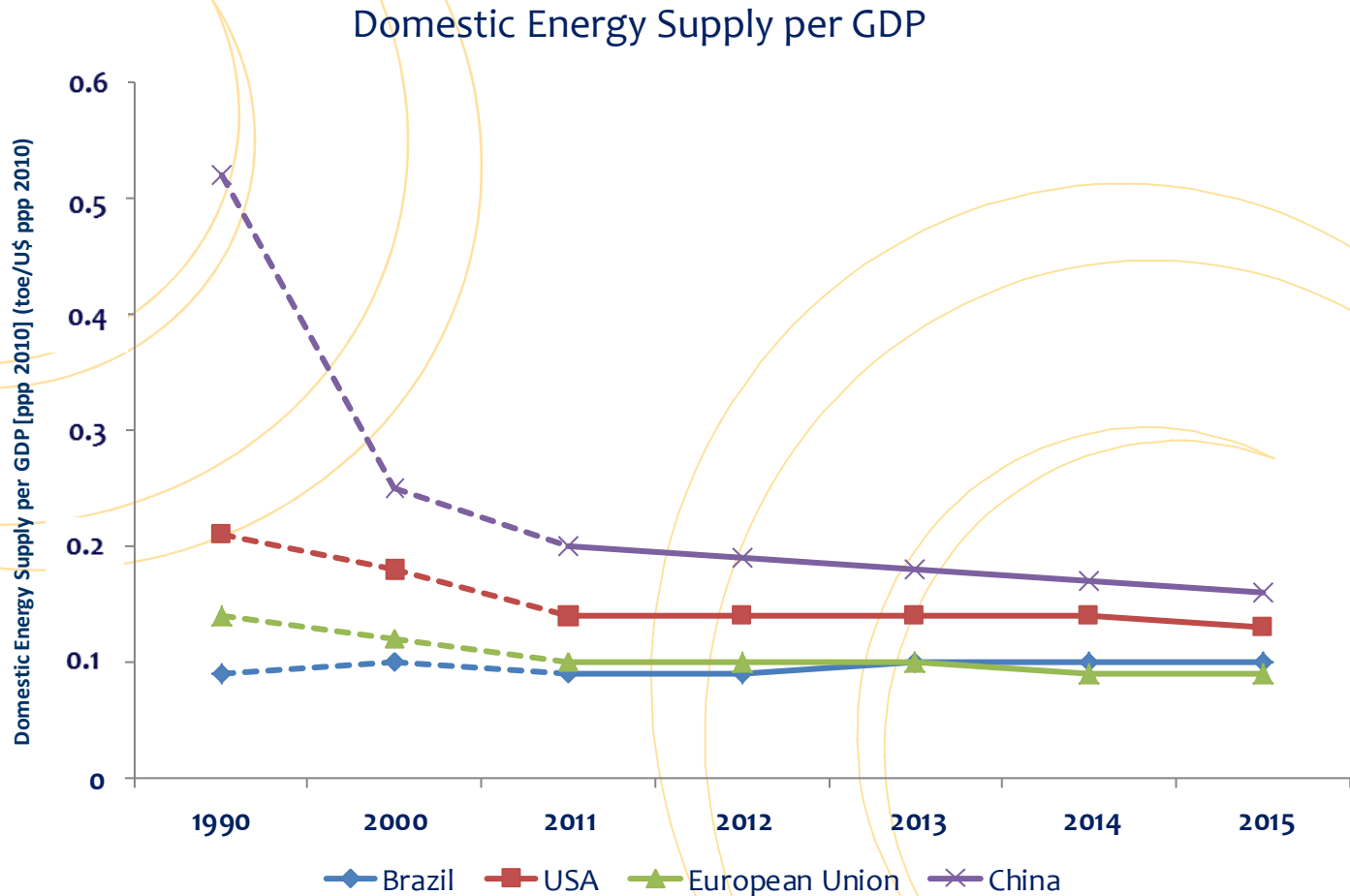
Indicators evolution: Brazil and the World

Domestic Energy Supply per capita



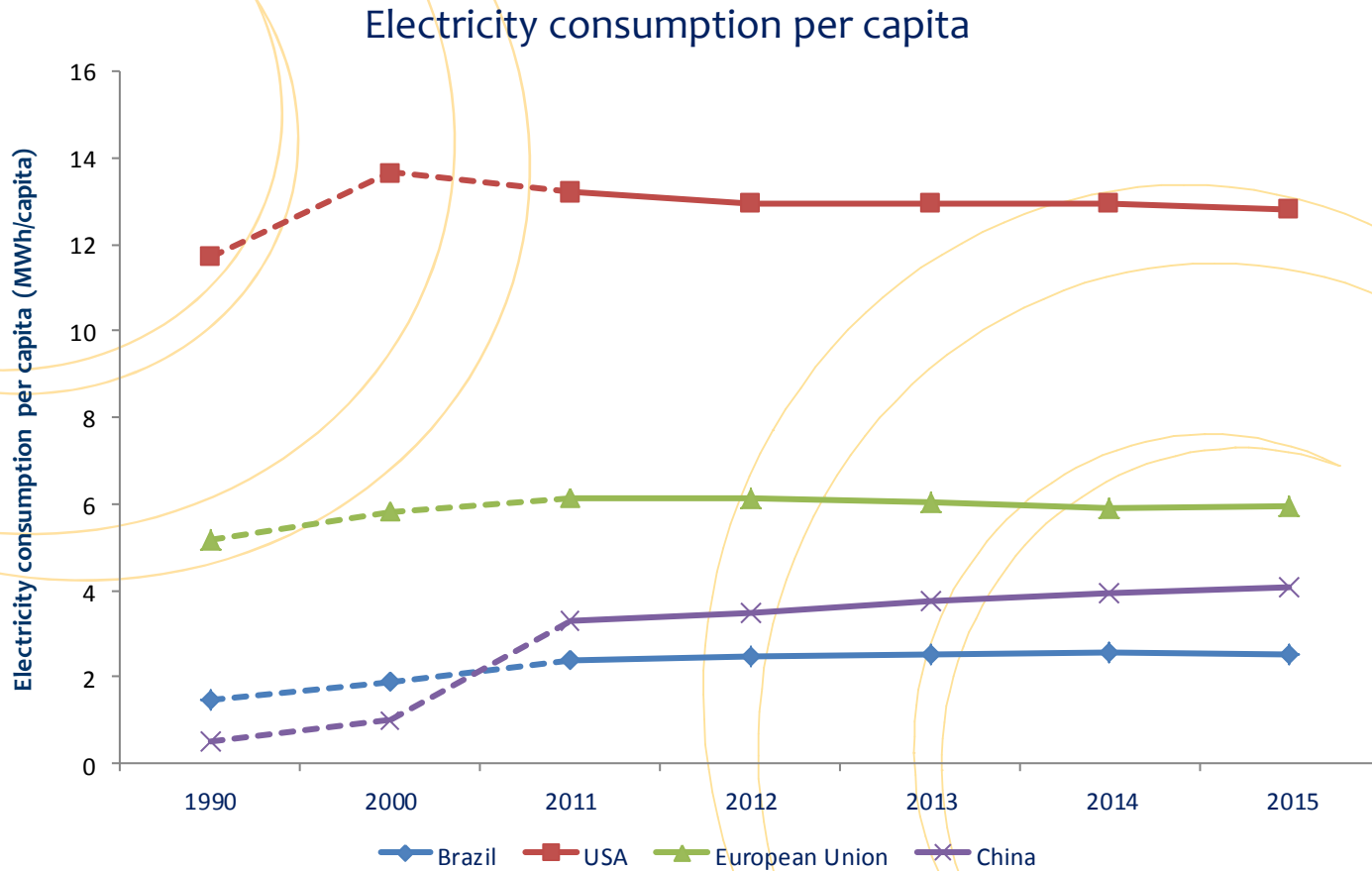
Source: International Energy Agency
Prepared by EPE

Indicators evolution: Brazil and the World



Source: International Energy Agency
Prepared by EPE

Indicators evolution: Brazil and the World



Source: International Energy Agency
Prepared by EPE

Main statistics

Parameters	Unit	2016	2017	Δ 17/16
Oil production ¹	10 ³ bbl/day	2,521.3	2,628.3	4.2%
Natural gas production	10 ⁶ m ³ /day	103.8	109.9	5.8%
Electricity Generation	TWh	578.9	588.0	1.6%
Liquid fuels consumption	10 ⁶ l/day	365.8	368.6	0.8%
Electricity consumption	TWh	521.4	526.2	0.9%
Domestic Energy Supply (DES)	10 ⁶ toe	288.3	292.1	1.3%
Domestic Electricity Supply (DEES) ²	TWh	619.7	624.3	0.7%
Population	10 ⁶ inhabitants	206.9	208.4	0.8%
GDP [2010] ³	10 ⁹ US\$	2,864.0	2,893.8	1.0%

1) bbl = barrel; includes natural gas liquids and LPG

2) Includes electricity imported from hydraulic source and self-production

3) Constant values in reais of 2010 converted to dollars at purchasing power parity (ppp) of 2010.

Final energetic consumption by source¹Unit: 10³ toe

Source	2016	2017	Δ 17/16
Diesel oil ²	46,247	46,738	1.1%
Electricity	44,820	45,238	0.9%
Sugarcane Bagasse	29,791	29,126	-2.2%
Gasoline ³	24,225	24,856	2.6%
Natural gas	18,191	18,426	1.3%
Firewood	15,997	16,687	4.3%
Ethanol	13,889	13,857	-0.2%
LPG	8,267	8,304	0.4%
Black liquor	6,246	6,470	3.6%
Fuel oil	3,100	2,822	-9.0%
Kerosene	3,307	3,299	-0.2%
Other sources ⁴	26,716	27,778	4.0%
TOTAL	240,795	243,600	1.2%

1) Excludes non-energetic final consumption

2) Includes biodiesel

3) Includes gasoline A (automotive) and aviation gasoline

4) Includes refinery gas, coal coke, charcoal, among others

Selected Indicators

Indicators	Unidade	2016	2017	Δ 17/16
GDP per capita	US\$/capita	13,844	13,884	0.3%
DES ¹ per capita	toe/capita	1.394	1.401	0.6%
DES per GDP [2010]	toe/10 ³ US\$	0.101	0.101	0.3%
DEES ² per capita	kWh/capita	2,996	2,995	0.0%
DEES per GDP [2010]	kWh/10 ³ US\$	216	216	-0.3%

¹ DES: Domestic Energy Supply

² DEES: Domestic Electricity Supply

Evolução dos indicadores

Parâmetros	Unidade	1970	1980	1990	2000	2010	2016	2017
Oferta Interna de Energia (OIE)	10 ⁶ tep	66.9	114.7	141.9	190.1	268.8	288.3	292.1
Oferta Interna de Energia Elétrica (OIEE) ¹	TWh	45.7	139.2	249.4	393.2	550.4	619.7	624.3
População	10 ⁶ hab	95.7	122.2	148.1	174.7	196.4	206.9	208.4
PIB [2010] ²	10 ⁹ US\$	567.3	1,297.7	1,517.1	1,953.0	2,803.6	2,864.0	2,893.8
Indicadores	Unidade	1970	1980	1990	2000	2010	2016	2017
PIB per capita	US\$/hab	5,928	10,619	10,244	11,179	14,275	13,844	13,884
OIE per capita	tep/hab	0.699	0.939	0.958	1.088	1.369	1.394	1.401
OIE por PIB [2010]	tep/10 ³ US\$	0.118	0.088	0.094	0.097	0.096	0.101	0.101
OIEE per capita	kWh/hab	478	1,139	1,684	2,251	2,802	2,996	2,995
OIEE por PIB [2010]	kWh/10 ³ US\$	81	107	164	201	196	216	216

Notas: 1) Inclui importação e autoprodução.

2) Valores em reais constantes de 2010 convertidos para dólares em paridade de poder de compra (ppc) de 2010.

Simplified matrix – year 2017 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	135,907	39,810	1,930	49,725	0	31,898	42,376	301,646
imports + exports	-46,391	9,434	5,840	246	16,805	3,125	16,827	5,887
Losses, reinjection and stock variations	225	-11,305	167	-213	-305	0	-4,002	-15,433
Gross Domestic Supply	89,741	37,938	7,937	49,758	16,500	35,023	55,202	292,099
Oil refineries	-87,239	0	0	0	92,321	0	-5,089	-6
Natural gas plants	0	-4,147	0	0	3,172	0	736	-239
Power plants	0	-13,115	-3,818	-6,145	-3,231	18,647	-12,814	-20,477
Distilleries	0	0	0	-50	0	0	0	-50
Other transformations	-2,384	-1,231	7,411	0	1,891	0	-8,936	-3,249
Final consumption	0	19,111	11,499	43,474	110,291	45,238	29,045	258,659
Energy Sector	0	6,542	0	11,926	4,791	2,548	210	26,018
Residential	0	379	0	0	6,608	11,517	6,468	24,972
Commercial + Public	0	135	0	0	694	11,477	174	12,480
Agricultural and livestock	0	0	0	9	4,826	2,470	3,145	10,450
Transportation	0	1,734	0	13,848	68,793	177	0	84,553
Industrial	0	9,635	11,335	17,200	10,861	17,049	19,048	85,127
Non-energy consumption	0	685	164	491	13,718	0	0	15,059
Losses in distribution	0	-385	-12	-56	-96	-8,432	-54	-9,035

Simplified matrix – year 2010 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	106,559	22,771	2,104	48,852	0	34,683	38,204	253,174
imports + exports	-15,135	11,130	12,110	-945	9,418	2,980	4,945	24,503
Losses, reinjection and stock variations	1,185	-6,365	248	-806	-313	0	-2,855	-8,906
Gross Domestic Supply	92,609	27,536	14,463	47,102	9,105	37,663	40,294	268,771
Oil refineries	-92,408	0	0	0	93,462	0	-1,211	-157
Natural gas plants	0	-2,844	0	0	1,975	0	840	-30
Power plants	0	-6,996	-1,905	-4,081	-3,757	9,676	-6,792	-13,855
Distilleries	0	0	0	-264	0	0	0	-264
Other transformations	0	-371	-1,765	0	1,420	0	-3,635	-4,352
Final consumption	0	16,887	10,754	42,694	101,480	39,964	29,414	241,194
Energy Sector	0	3,875	5	12,777	5,115	2,308	184	24,263
Residential	0	255	0	0	6,302	9,220	7,785	23,562
Commercial + Public	0	262	0	0	754	9,176	175	10,366
Agricultural and livestock	0	2	0	8	5,859	1,629	2,531	10,029
Transportation	0	1,767	0	12,033	55,777	143	0	69,720
Industrial	0	9,274	10,749	17,289	12,170	17,488	18,597	85,567
Non-energy consumption	0	1,453	0	587	15,503	0	143	17,686
Losses in distribution	0	-433	-40	-132	-211	-7,374	-120	-8,310

1) Includes coke

2) Includes ethanol

Simplified matrix – year 2000 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	63,849	13,185	2,613	19,895	0	26,168	27,625	153,334
imports + exports	19,574	1,945	10,901	-83	5,349	3,812	624	42,121
Losses, reinjection and stock variations	-1,273	-4,874	57	949	-756	0	1,042	-4,854
Gross Domestic Supply	82,150	10,256	13,571	20,761	4,593	29,980	29,290	190,601
Oil refineries	-82,150	0	0	0	82,169	0	-690	-671
Natural gas plants	0	-1,817	0	0	757	0	606	-453
Power plants	0	-897	-2,310	-735	-3,900	3,826	-3,550	-7,566
Distilleries	0	0	0	-188	0	0	0	-188
Other transformations	0	-160	-1,994	0	-58	0	-2,479	-4,690
Final consumption	0	7,115	9,347	19,838	84,148	28,509	22,991	171,949
Energy Sector	0	2,066	0	5,523	4,039	901	318	12,847
Residential	0	100	0	0	6,361	7,188	7,039	20,688
Commercial + Public	0	76	0	0	1,380	6,594	160	8,210
Agricultural and livestock	0	0	0	0	4,574	1,105	1,643	7,322
Transportation	0	275	0	5,820	41,182	107	0	47,385
Industrial	0	3,867	9,347	7,858	13,828	12,614	13,690	61,204
Non-energy consumption	0	731	0	637	12,783	0	142	14,293
Losses in distribution	0	-232	-74	-9	-71	-5,296	-186	-5,868

Simplified matrix – year 1990 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	32,550	6,233	1,915	18,451	0	17,770	30,714	107,632
imports + exports	29,464	0	7,901	600	-2,028	2,281	0	38,218
Losses, reinjection and stock variations	-1,555	-1,896	-201	-63	-682	0	487	-3,910
Gross Domestic Supply	60,459	4,337	9,615	18,988	-2,710	20,051	31,201	141,940
Oil refineries	-60,579	0	0	0	60,725	0	-130	16
Natural gas plants	0	-779	0	0	720	0	0	-59
Power plants	0	-76	-962	-395	-1,297	1,385	-1,433	-2,778
Distilleries	0	0	0	-899	0	0	-40	-939
Other transformations	0	-303	-2,274	0	-181	0	-4,245	-7,003
Final consumption	0	3,094	6,124	17,612	57,054	18,711	25,001	127,596
Energy Sector	0	814	0	6,707	3,593	588	340	12,042
Residential	0	4	0	0	5,116	4,184	8,743	18,048
Commercial + Public	0	3	0	0	823	3,607	236	4,668
Agricultural and livestock	0	0	0	0	3,273	573	2,181	6,027
Transportation	0	2	5	5,855	26,997	103	2	32,964
Industrial	0	1,376	6,119	4,560	8,423	9,657	13,389	43,523
Non-energy consumption	0	895	0	491	8,519	0	109	10,014
Losses in distribution	0	0	-254	-82	-68	-2,725	-352	-3,481

Simplified matrix – year 1980 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	9,256	2,189	2,484	9,301	0	11,082	32,093	66,404
imports + exports	44,250	0	3,703	-196	410	-18	0	48,149
Losses, reinjection and stock variations	2,122	-1,097	-285	112	-644	0	-40	167
Gross Domestic Supply	55,627	1,092	5,902	9,217	-234	11,063	32,053	114,721
Oil refineries	-55,351	0	0	0	54,753	0	0	-598
Natural gas plants	0	-222	0	0	218	0	0	-5
Power plants	0	0	-708	-208	-1,402	900	-326	-1,744
Distilleries	0	0	0	-354	0	0	-23	-377
Other transformations	0	0	-1,117	0	-524	0	-3,360	-5,000
Final consumption	0	882	3,709	8,485	52,811	10,548	27,946	104,382
Energy Sector	0	165	0	2,013	3,170	359	167	5,873
Residential	0	0	0	0	3,025	2,000	15,932	20,957
Commercial + Public	0	0	0	0	606	2,080	266	2,952
Agricultural and livestock	0	0	0	0	2,335	175	3,242	5,752
Transportation	0	0	22	1,422	24,198	71	3	25,715
Industrial	0	319	3,688	4,799	14,606	5,865	8,215	37,491
Non-energy consumption	0	398	0	252	4,872	0	120	5,641
Losses in distribution	-276	0	-387	-77	0	-1,415	-400	-2,555

Simplified matrix – year 1970 (10³ toe)

Energy flow	Oil	Natural gas	Coal ¹	Sugarcane products ²	Oil products	Hydraulic and electricity	Others	Total
Production	8,161	1,255	1,115	3,601	0	3,422	32,075	49,627
imports + exports	17,780	0	1,526	0	-48	-2	0	19,256
Losses, reinjection and stock variations	-277	-1,085	-204	-7	-365	0	-56	-1,994
Gross Domestic Supply	25,663	170	2,437	3,593	-413	3,420	32,019	66,890
Oil refineries	-25,536	0	0	0	24,942	0	0	-594
Natural gas plants	0	-98	0	0	101	0	0	3
Power plants	0	0	-495	-89	-1,175	511	-103	-1,352
Distilleries	0	0	0	-39	0	0	0	-39
Other transformations	0	0	-589	0	-77	0	-1,201	-1,868
Final consumption	0	70	1,270	3,459	23,378	3,410	30,519	62,106
Energy Sector	0	65	10	89	1,123	179	86	1,551
Residential	0	0	0	0	1,745	719	19,612	22,076
Commercial + Public	0	0	0	0	259	750	258	1,267
Agricultural and livestock	0	0	0	0	404	27	4,920	5,351
Transportation	0	0	16	98	12,979	56	43	13,192
Industrial	0	3	1,244	3,060	5,654	1,679	5,558	17,198
Non-energy consumption	0	3	0	212	1,215	0	42	1,471
Losses in distribution	-128	0	-83	-7	0	-520	-196	-933



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