



MONSTAT



# STATISTICAL ENERGY BALANCES

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*2005-2011*

PODGORICA, DECEMBER 2012

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## 1 Introductory notes

The Publication „Statistical Energy balances“ contains annual data about production, import, export, transformation, consumption and distribution of coal, electricity, oil products and firewood in Montenegro, for 2005-2011 year.

In Energy statistics complexed energy balance is composed from annual report on production and consumption of electricity, balance of coal production and consumption, balance of export, import and consumption of oil products, and balance of production and consumption of firewood, which covers all manufacturers and all those involved in import and export of all energy commodities. For each energy data are given in the natural unit of measure and in TJ (tera joules)

Methodology for making of energy balances, defining and grouping of energents and types of energy , as well as statistical terminology, are harmonized with internationally established standards IEA/OECD and Eurostat.

All energy balances which were created for 2005 to 2011 are regular statistical surveys.

All data about energy statistics are regularly published in the Statistical Yearbook, which can be found on the website of the Statistical Office of Montenegro<sup>1</sup>.

Every suggestion referred from users will be accepted with pleasure.

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<sup>1</sup> [www.monstat.org](http://www.monstat.org)

## 2 Methodological notes

### 2.1 Data sources

Data necessary for compilation of energy balances are provided from:

- a) Regular statistical surveys from the field of energy statistics,
- b) Regular statistical surveys of industry, transport, external trade, agriculture and forestry, and households.

### 2.2 Reporting units of energy statistics

Reporting units for energy balance sheets are companies engaged in the production of electricity, heat and distribution of electricity and in the production of coal, regarding to appropriate activities in these divisions from Classification of activity.

### 2.3 Contents of rows in energy balance sheet

**Primary production** is a form of energy that has not been converted or transformed (coal, oil, natural gas, biomass, firewood, hydro power energy, geothermal energy, wind energy and solar energy).

**Recovered products** are rare and they are present to cover sources of fuels which are recovered from fuels already produced but not counted or saved. For example, waste coal may be later recovered for use.

**Imports and exports** cover quantities that crossed the national border.

**Stock changes** is the difference between stocks at the beginning of the year (initial stocks) and those at the end of the year (final stocks).

**Marine bunkers** cover the quantities delivered for international navigation purposes.

**Statistical differences** is a category that includes the sum of unknown statistical differences between the production and consumption of selected fuels.

**Gross inland energy consumption** is calculated as follows:

Primary production  
+ Imports  
– Exports  
+ Stock changes  
– Marine bunkers

**Transformation - input** is the consumption of fuels as raw materials for energy production in thermal power plants, CHP, auto producers, district heating plants, refineries, blast furnace plants and coal transformation.

**Transformation - output** covers the production of transformed energy forms (thermoelectricity, heat, petroleum products, blast furnace gas and oxygen steel furnace gas).

**Exchange and transfers** include inter product transferred (distillates), products transferred (hydro energy) and recycled products (naphtha, fuel oil and lubricants).

**Own consumption in energy sector** covers the energy used for energy sector running.

**Distribution losses** cover losses occurred:

- for electricity: during transmission and distribution;
- for solid fuels: during transport;
- for liquid fuels: during transport and distribution;
- for fire wood: during transport.

**Energy available for final consumption** is the energy intended for final consumers.

**Final consumption for non-energy purposes** covers final energy consumption as raw material for production of non-energy products in technological process, while consumption in chemical industry is separated from total consumption.

**Final consumption** for energy purposes covers final consumption of available energy for energy purposes in:

- industry (iron and steel, non-ferrous metal, chemical industry, non-metal minerals, mining and quarrying, food, drink and tobacco industry, textile, leather and clothing, paper and printing, engineering and other metal industry, other industries ),
- transport (rail, road, air, inland, other),
- households, agriculture and other sectors (total households, included those with employees, agriculture and other consumers, e.g. education, health, administration, etc.).

## 2.4 Explanations of energy commodities

**Electricity** – generated in: hydroelectric power stations, auto producers and thermal power plants.

**Coal:**

- hard coal – refers to non-agglomeration coal of gross calorific value (GCV) greater than 23865 kJ/kg; comprises: coking coal, anthracite and other bituminous coal;
- sub-bituminous coal – refers to nonagglomeration coal with a GCV between 17435 kJ/kg and 23865 kJ/kg;
- brown coal / lignite – non-agglomeration coal with a GCV less than 17435 kJ/ kg.

**Oil products:**

- Refinery gas includes a mixture of non-condensable gases mainly consisting of hydrogen, methane, ethane and olefins obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries. This also includes gases which are returned from the petrochemical industry
- Liquefied Petroleum Gases (LPG) are light paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane (C<sub>3</sub>H<sub>8</sub>) and butane (C<sub>4</sub>H<sub>10</sub>) or a combination of the two.
- Motor gasoline consists of a mixture of light hydrocarbons distilling between 35°C and 215°C. It is used as a fuel for land based spark ignition engines.
- Kerosene Type Jet Fuel is a distillate used for aviation turbine power units. It has the same distillation characteristics between 150°C and 300°C (generally not above 250°C) and flash point as kerosene.
- Gas/diesel oil is primarily a medium distillate distilling between 180°C and 380°C. Several grades are available depending on:
  - Transport Diesel- on road diesel oil for diesel compression ignition (cars, trucks etc.), usually of low sulphur content, and
  - Heating and other - light heating oil for industrial and commercial uses, marine diesel and diesel used in rail traffic; other gas oil including heavy gas oils which distil between 380°C and 540°C
- Mazut: heavy fuel oil with sulphur content lower than 1% and of 1% or higher,
- Other Oil Products, like bitumen, petroleum coke, lubricants and other.

**Fire-wood:** Covers a multitude of woody materials generated by an industrial process (wood/paper industry in particular) or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, black liquor etc.) as well as wastes such as straw, rice husks, nut shells, poultry litter, crushed grape dregs, etc.

### 3 Conversion Equivalents between Units of Energy

#### 3.1 3.1 Conversion factors

	TJ	Gcal	Mtoe	GWh
TJ	1	238,8	2,388 x 10 <sup>-5</sup>	0.2778
Gcal	4,1868 x 10 <sup>-3</sup>	1	10 <sup>-7</sup>	1,163 x 10 <sup>-3</sup>
Mtoe	4,1868 x 10 <sup>4</sup>	107	1	11630
GWh	3,6	860	8,6 x 10 <sup>-5</sup>	1

Unit of measure:

TJ – terajoule

Gcal – gigacalorie

Mtoe – milion tones of oil equivalent

GWh – gigawatt - hour

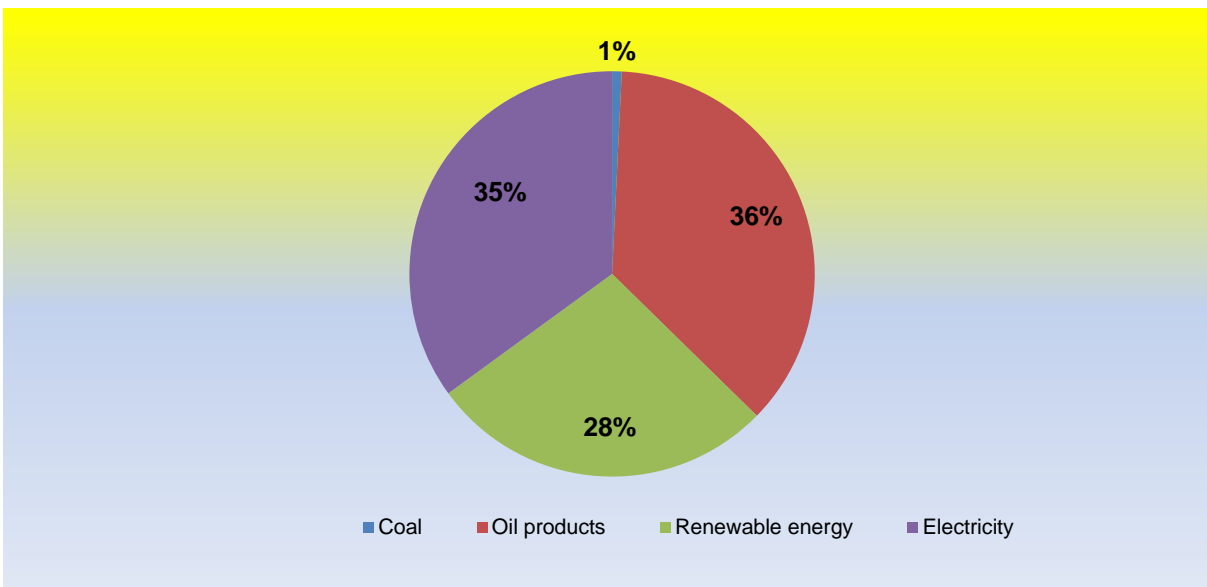
### 4 Realized energy balance for 2011

	Total energy	Coal	Oil products	Renewable energy	Electricity energy
Primary production	33 099	18 171	-	14 927	-
Recovered products	2 196	-	-	-	2 196
Import	18 838	-	13 535	324	4 979
Stock changes	83	83	-	-	-
Export	- 3 927	- 488	- 663	- 1 224	- 1 552
<b>Gross inland energy consumption</b>	<b>50 289</b>	<b>17 766</b>	<b>12 872</b>	<b>14 027</b>	<b>5 623</b>
Transformation - input	17 499	17 499	-	-	-
Transformation - output	5 227	-	-	-	5 227
Exchange and transfers	-	-	-	- 4 334	4 334
Own consumption in energy sector	590	-	40	-	550
Losses	2 344	-	-	-	2 344
<b>Final energy consumption</b>	<b>35 083</b>	<b>268</b>	<b>12 832</b>	<b>9 693</b>	<b>12 290</b>
Industry	14 096	138	6 175	-	7 783
Transport	6 518	-	6 446	-	72
Households, trade and other sectors	14 468	129	211	9 693	4 435
<b>Statistical differences</b>	-	-	-	-	-

In the gross domestic consumption of energy the largest share takes coal with 35% (17 766 TJ) of which about 98% is spent for producing electricity (17 499 TJ), and the rest for final consumers, for industry and households.

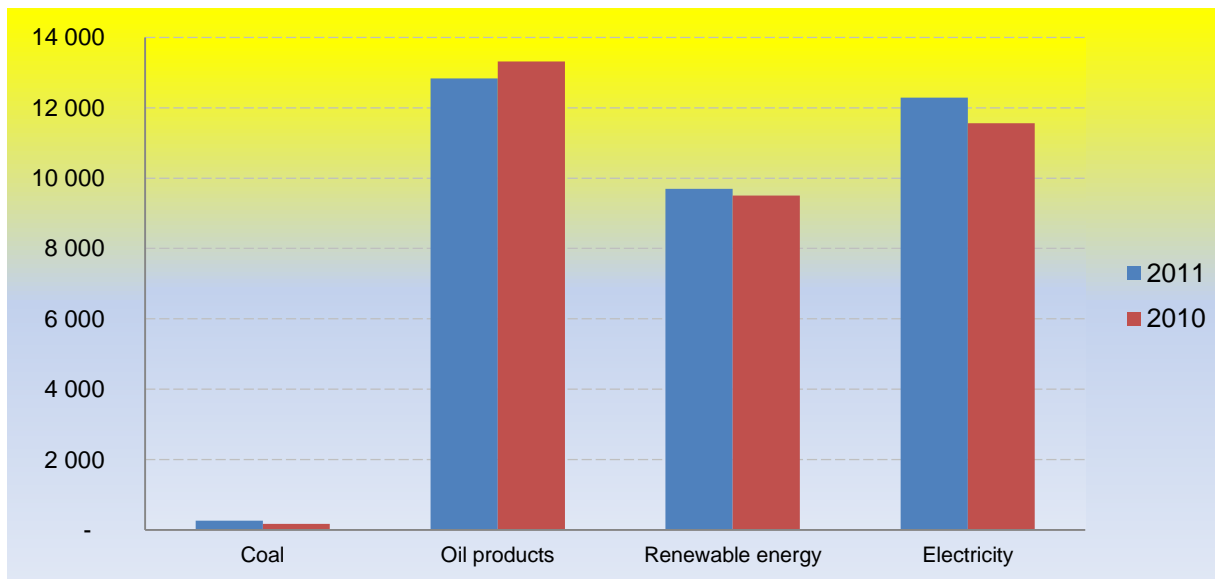
Final consumption of energy consists mainly from consumption of petroleum products (36%) and consumption of electricity (35%), followed by energy from renewable resources (firewood with 28%) and coal (1%).

### 4.1 Available energy for final consumption



Final consumption is increased by 2% than in 2010 (34 554 TJ). Coal consumption has increased by 54%, electricity by 6%, wood fuel by 3%, while the consumption of petroleum products decreased by 4%.

### 4.2 Final consumption of energy commodities, in TJ





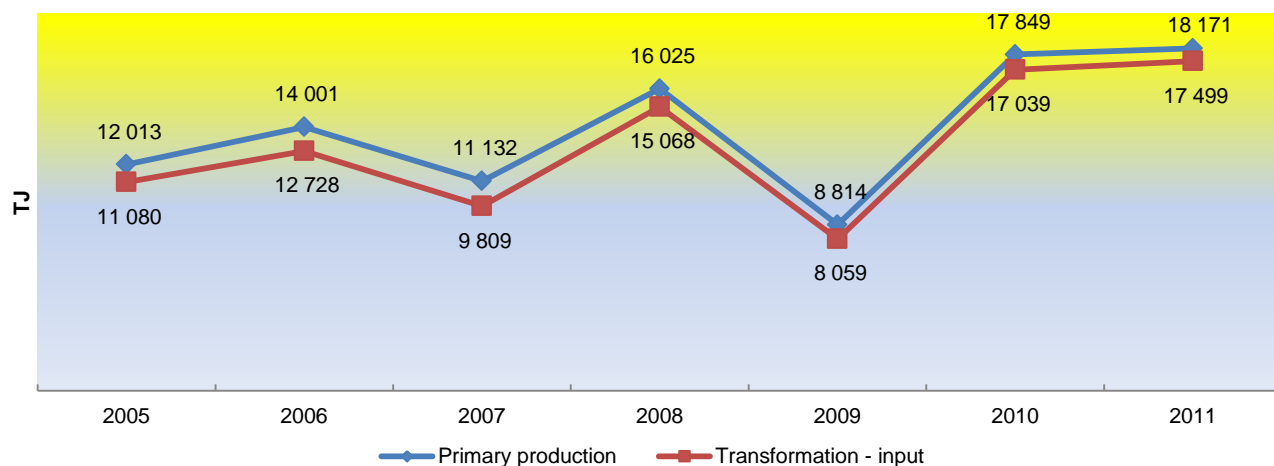
## 5 Balance of coal

### 5.1 Balance of coal, in TJ

	2005	2006	2007	2008	2009	2010	2011
Primary production	12 013	14 001	11 132	16 025	8 814	17 849	18 171
Recovered products	-	-	-	-	-	-	-
Import	424	111	265	371	373	-	-
Stock changes	-	-	-	-	-	-	83
Export	- 672	- 787	- 558	- 378	- 534	- 636	- 488
<b>Gross inland energy consumption</b>	<b>11 765</b>	<b>13 319</b>	<b>10 839</b>	<b>16 019</b>	<b>8 652</b>	<b>17 213</b>	<b>17 766</b>
Transformation - input	11 080	12 728	9 809	15 068	8 059	17 039	17 499
Transformation - output	-	-	-	-	-	-	-
Own consumption in energy sector	9	50	67	67	-	-	-
<b>Final energy consumption</b>	<b>676</b>	<b>541</b>	<b>981</b>	<b>884</b>	<b>593</b>	<b>174</b>	<b>267</b>
Industry	630	327	667	443	428	88	138
Transport	-	-	-	97	-	-	-
Households, trade and other sectors	46	214	313	344	166	86	129
<b>Statistical differences</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Coal production in 2011 compared to 2010 is increased by 2%, while the share of final consumption increased by 53% compared to the share in 2010.

### 5.2 Production of coal and energy transformation



The proportion of coal in power plants for electricity production has trend over the period 2005. - 2011., which ranges from 92% to 96% of the gross domestic consumption. The remaining amount is allocated in final consumption of the consumers, in industry and households.

## 6 Balance of oil products

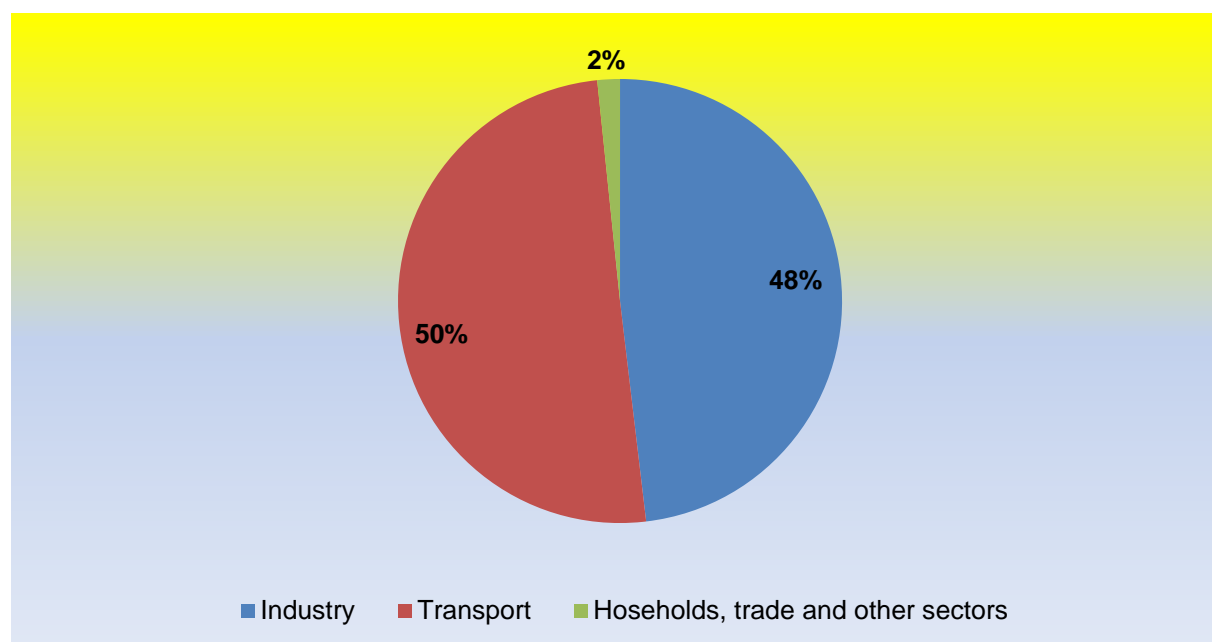
### 6.1 Balance of oil products in 2011

	Total oil products	LPG	Motor gasoline	Kerosene – jet fuel	Gas/diesel oil	Mazut	Other oil products
Primary production	-	-	-	-	-	-	-
Recovered products	-	-	-	-	-	-	-
Import	13 535	891	2452	528	7 133	402	2 130
Stock changes	-	-	-	-	-	-	-
Export	- 663	-	- 535	- 88	-	- 40	-
<b>Gross inland energy consumption</b>	<b>12 872</b>	<b>891</b>	<b>1 917</b>	<b>440</b>	<b>7 133</b>	<b>362</b>	<b>2 130</b>
Own consumption in energy sector	40	-	-	-	-	40	-
<b>Final energy consumption</b>	<b>12 832</b>	<b>891</b>	<b>1 917</b>	<b>440</b>	<b>7 133</b>	<b>322</b>	<b>2 130</b>
<b>Industry</b>	6 175	891	45	-	2 990	281	1 969
<b>Transport</b>	6 446	-	1 828	440	4 057	41	80
Rail	-	-	-	-	-	-	-
Road	5 881	-	1 784	-	4 057	-	40
Air	440	-	-	440	-	-	-
Inland navigations	44	-	44	-	-	-	-
Other transport	81	-	-	-	-	41	40
<b>Households, trade and other sectors</b>	211	-	44	-	86	-	81
<b>Statistical differences</b>	-	-	-	-	-	-	-

Gross domestic consumption of oil products refers to the imported amount, with the majority of diesel fuel and gasoline. In 2011 decreased by 4% than 2010 (13,437 TJ).

The final energy consumption diesel fuel participate with 56%, gasoline with 15%, liquefied petroleum gas by 7%, jet fuel and heating oil by 3%. The rest 17% of final consumption relates to other petroleum products.

## 6.2 Final consumption of oil products



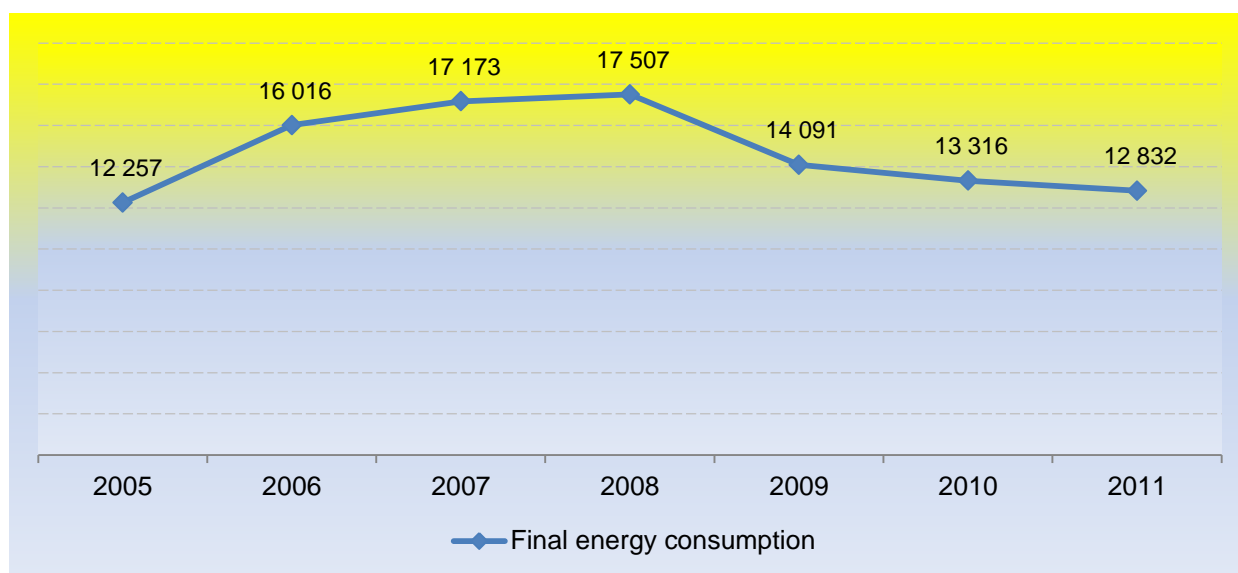
In total final energy consumption transport sector and other sectors for transport purposes consumed (50%). Industry consumed 48% and households and commerce and the public sector consumed 2% of the total available energy of oil products.

## 6.3 Balance of oil products in u TJ

	2005	2006	2007	2008	2009	2010	2011
Primary production	-	-	-	-	-	-	-
Recovered products	-	-	-	-	-	-	-
Import	12 421	16 140	17 695	18 203	14 615	14 184	13 535
Stock changes	-	-	-	-	-	-	-
Export	- 84	- 84	- 401	- 575	- 524	- 747	- 663
<b>Gross inland energy consumption</b>	<b>12 337</b>	<b>16 056</b>	<b>17 293</b>	<b>17 628</b>	<b>14 091</b>	<b>13 437</b>	<b>12 872</b>
Own consumption in energy sector	80	40	121	120	-	121	40
<b>Final energy consumption</b>	<b>12 257</b>	<b>16 016</b>	<b>17 173</b>	<b>17 507</b>	<b>14 091</b>	<b>13 316</b>	<b>12 832</b>
<b>Industry</b>	4 855	8 164	8 058	8 349	3 364	3 559	6 175
<b>Transport</b>	7 199	7 165	8 911	8 993	10 642	9 674	6 446
Rail	85	83	83	-	83	43	-
Road	6 462	6 038	8 345	8 377	8 703	9 544	5 881
Air	571	659	484	615	88	88	440
Inland navigations	-	384	-	-	-	-	44
Other transport	80	-	-	-	1 768	-	81
<b>Households, trade and other sectors</b>	203	688	204	166	86	84	211
<b>Statistical differences</b>	-	-	-	-	-	-	-

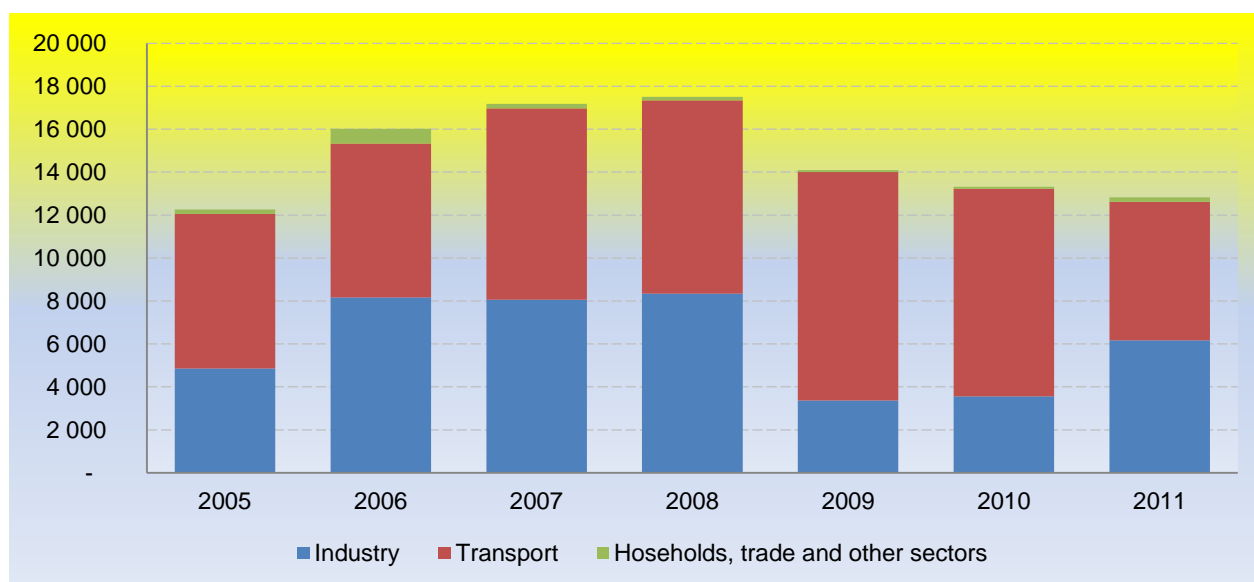
Final consumption of oil products in 2011 was reduced by 4% compared to 2010. year. The downward trend of consumption of oil products is shown in the graph:

### 6.4 Oil products available for final consumption



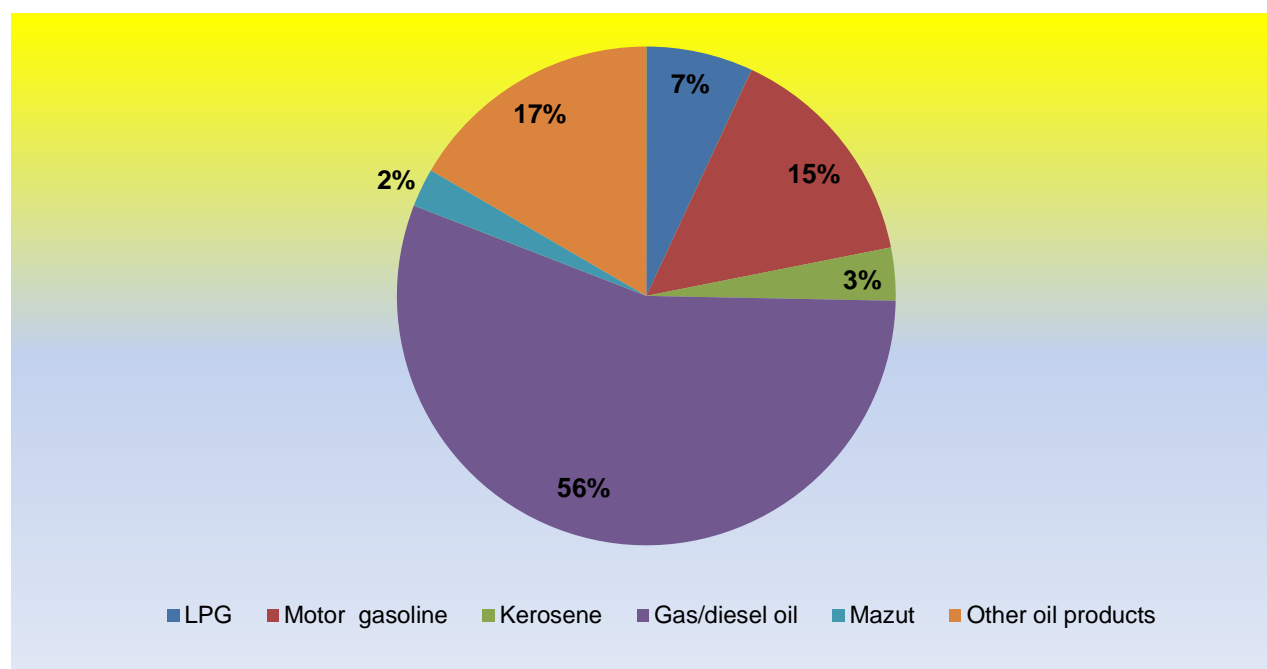
The structure of the distribution of the final energy consumption of oil products is shown in the following graph:

### 6.5 Final consumption of oil products in TJ



The consumption of oil products occupy the largest share of diesel fuel (56%), and gasoline (15%) and liquefied petroleum gas (7%). Other petroleum products (bitumen, lubricants, etc.) make up 17% of total final consumption.

## 6.6 Final consumption of oil products



## 7 Balance of renewable energy

Balance of renewable resources is regarding to availability of data related to the balance of biomass (firewood) and water consumed in the process of transformation of energy (hydro power plants).

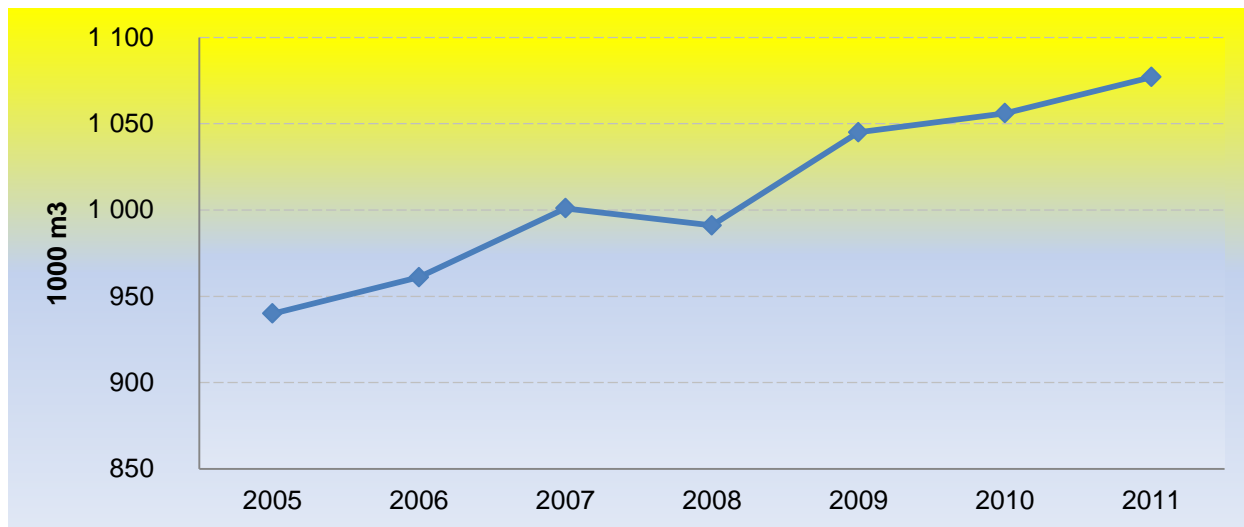
### 7.1 Balance of firewood in 1000m<sup>3</sup>

	2005	2006	2007	2008	2009	2010	2011
Primary production	950	968	1 005	993	1 049	1 063	1 177
Import	1	2	3	3	2	2	36
Export	- 11	- 9	- 7	- 5	- 6	- 9	- 136
<b>Gross inland energy consumption</b>	<b>940</b>	<b>961</b>	<b>1 001</b>	<b>991</b>	<b>1 045</b>	<b>1 056</b>	<b>1 077</b>
<b>Final energy consumption</b>	<b>940</b>	<b>961</b>	<b>1 001</b>	<b>991</b>	<b>1 045</b>	<b>1 056</b>	<b>1 077</b>
<b>Industry</b>	-	-	-	-	-	-	-
<b>Transport</b>	-	-	-	-	-	-	-
<b>Households , trade and other sectors</b>	940	961	1 001	991	1 045	1 056	1 077
Households	936	950	967	988	1 013	1 048	1 076
Agriculture	-	-	-	-	-	-	-
Other sectors	4	11	34	3	32	8	1
<b>Statistical differences</b>	-	-	-	-	-	-	-

Consumption of firewood has increased compared to 2010. year (1056 hilj.m3) by 2%. Most of the wood fuel is consumed in households.

Firewood consumption for the period 2005 to 2011 has been increasing and is shown by the following graphic:

## 7.2 Final energy consumption



## 8 Balance of electricity energy

Total power production of electricity in 2011. amounted to 2 656 GWh, which is 1 366 GWh (49%) less than in 2010. year.

Production in TE Pljevlja was 1452 GWh, which is 14% (180 GWh) more than last year.

Due to unfavorable weather conditions, hydropower production is significantly decreased compared to last year. Achieved production in HE in 2011 amounted to 1 204 GWh, while in 2010 was produced 2750 GWh, which is 56% less in 2011

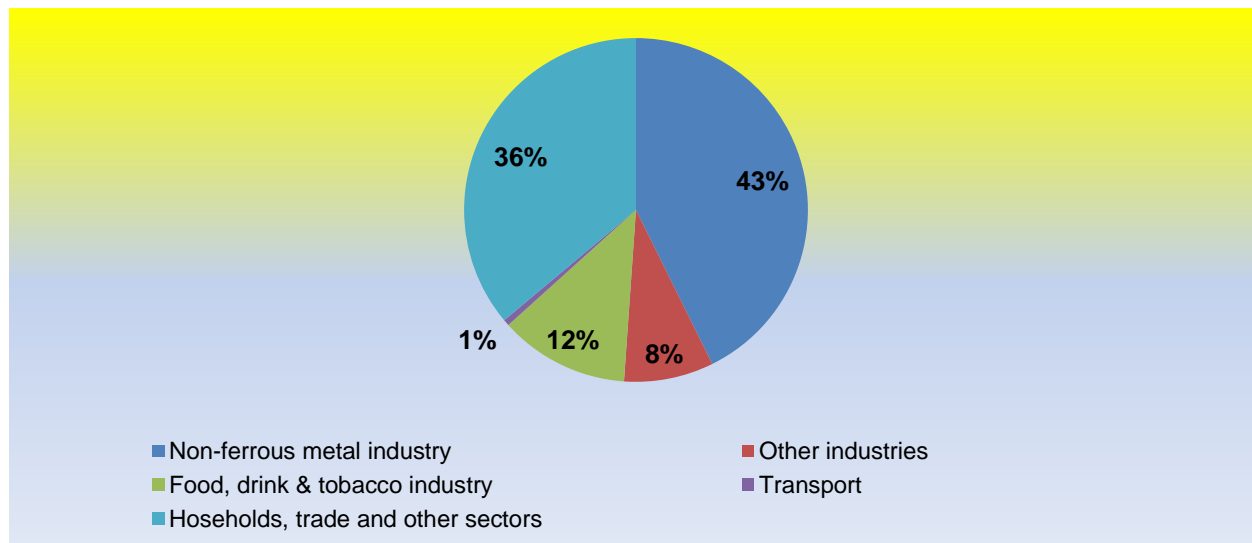
## 8.1 Balance of electricity energy in GWh

	2005	2006	2007	2008	2009	2010	2011
Primary production	-	-	-	-	-	-	-
Recovery products	247	210	528	313	76	- 247	610
Import	1 587	1 728	2 167	1 571	1 151	732	1 383
Export	- 44	- 72	- 108	- 108	- 172	- 483	- 431
<b>Gross inland energy consumption</b>	<b>1 790</b>	<b>1 866</b>	<b>2 587</b>	<b>1 776</b>	<b>1 055</b>	<b>2</b>	<b>1 562</b>
Transformation -input	-	-	-	-	-	-	-
Transformation -output	998	1 202	860	1 289	689	1 272	1 452
Exchange and transfers	1 866	1 750	1 284	1 539	2 071	2 750	1 204
Own consumption in energy sector	114	112	105	141	81	146	153
Losses	775	850	688	725	717	667	651
<b>Final energy consumption</b>	<b>3 765</b>	<b>3 856</b>	<b>3 938</b>	<b>3 738</b>	<b>3 017</b>	<b>3 211</b>	<b>3 414</b>
<b>Industry</b>	<b>2 607</b>	<b>2 709</b>	<b>2 758</b>	<b>2 502</b>	<b>1 694</b>	<b>1 581</b>	<b>2 162</b>
Iron and steel industry	142	202	182	228	123	82	86
Non-ferrous metal industry	1 894	1 912	1 942	1 676	966	1 241	1 457
Chemical industry	2	12	-	-	380	1	3
Non-metallic minerals	3	1	-	-	1	-	3
Mining and Quarrying	7	10	34	35	6	5	6
Food, drink & tobacco industry	15	14	12	20	28	28	417
Textile, leather & clothing industry	2	1	-	-	-	-	1
Paper, pulp and print	3	2	-	1	1	1	1
Engineering & other metal industry	5	-	-	4	9	-	3
Other industries	534	555	588	537	180	223	185
<b>Transport</b>	<b>23</b>	<b>23</b>	<b>24</b>	<b>22</b>	<b>18</b>	<b>22</b>	<b>20</b>
<b>Hoseholds , trade and other sectors</b>	<b>1 135</b>	<b>1 124</b>	<b>1 156</b>	<b>1 214</b>	<b>1 305</b>	<b>1 608</b>	<b>1 232</b>
Hoseholds	1 109	1 097	1 128	1 178	1 268	1 280	1 200
Agriculture	26	27	28	36	37	38	12
Other sectors	-	-	-	-	-	290	20
<b>Statistical differences</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Final energy consumption in 2011. amounted to 3414 GWh, 203 GWh, or 6% more than in 2010. year.

Consumption in industrial sector in 2011. amounted to 2 162 GWh, which is 37% more than last year. Participation in final consumption was 63%. In industry, the largest share in the consumption sector has a non-ferrous metal industry by 67% (1457 GWh). Compared to last year, spending in this sector is higher by 216 GWh, or 17%.

## 8.2 Final consumption of electricity energy



Consumption in household sector amounted to 1200 GWh. Compared to last year achieved a decline of 6%. In final consumption its share is 35%.

Energy balances are in line with the regulations prescribed by Eurostat and the International Energy Agency (IEA).



**Izdaje i štampa Zavod za statistiku Crne Gore (MONSTAT)**

81000 Podgorica IV Proleterske br.2

Tel. (+382) 20 230 811; tel/fax (+382) 20 230 814

*Bilten pripremila:*

Dijana Ristović

E-mail: [contact@monstat.org](mailto:contact@monstat.org)Web Site: [www.monstat.org](http://www.monstat.org)