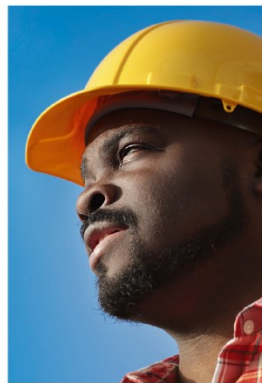


Energy Efficiency Finance II

Task 1 Energy Efficiency Potential

FINAL Country Report: Serbia

Vienna, June 2015



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Content

1	EXECUTIVE SUMMARY	6
2	AIM AND SCOPE OF THIS REPORT.....	7
3	STUDIES AVAILABLE.....	7
3.1	OVERVIEW.....	7
3.2	MAIN RESULTS OF EXISTING STUDIES	11
4	STATUS OF ENERGY EFFICIENCY	12
4.1	OVERVIEW.....	12
4.2	ENERGY SUPPLY.....	14
4.2.1	Domestic sources	14
4.2.2	Electricity generation	16
4.3	ENERGY DEMAND.....	19
4.3.1	Final energy consumption by energy source.....	19
4.3.2	Final energy consumption by sector.....	21
4.3.3	Trends in energy consumption	23
4.3.4	Trends in electricity consumption	24
4.4	GREENHOUSE GAS EMISSIONS.....	26
4.5	ENERGY EFFICIENCY OVERVIEW	28
4.6	ENERGY EFFICIENCY IN THE INDUSTRIAL SECTOR.....	30
4.7	ENERGY EFFICIENCY IN THE RESIDENTIAL SECTOR.....	33
4.8	ENERGY EFFICIENCY IN THE AGRICULTURAL SECTOR.....	34
4.9	ENERGY EFFICIENCY OF MSMEs.....	35
5	ENERGY EFFICIENCY FRAMEWORK	37
5.1	LEGAL AND POLICY FRAMEWORK.....	37
5.2	SUMMARY INFORMATION ON THE KEY LAWS AND POLICIES:	39
5.3	PUBLIC SUPPORT SYSTEM (INCENTIVES).....	41
5.4	TECHNICAL FRAMEWORK	43
5.5	ECONOMIC FRAMEWORK	43
5.6	AWARENESS AND INFORMATION LEVEL	45
6	CONCLUSIONS	46
7	RELEVANT INSTITUTIONS	47
	LITERATURE	53
	ANNEX	55

List of Figures

Figure 1: Energy Flow – Balance Serbia 2012 (PJ)	13
Figure 2: Installed Power Plant Capacity (MW), 2013	16
Figure 3: Input to power stations in Serbia 350 PJ, 2012	17
Figure 4: Share of energy sources in final consumption 360 PJ, 2012.....	19
Figure 5: Energy Flow – final consumption by fuel and by sector (PJ), 2012	20
Figure 6: Share of final energy consumption by sector (PJ), 2013	21
Figure 7: Share of final consumption in the industrial sector (102.4 PJ, 2013).....	22
Figure 8: Final energy consumption by industrial sub-sectors in Serbia (PJ), 2007&2013	22
Figure 9: Share of final consumption in other sectors by energy carrier 173 PJ, 2012	23
Figure 10: Energy Consumption in Serbia by sectors (PJ), 1990 – 2012	24
Figure 11: Share of final electricity consumption (total 97 PJ), 2013	25
Figure 12: Share by sector of final electricity consumption (PJ), 1990 – 2012	25
Figure 13: CO ₂ emissions by sector (million metric tons).....	27
Figure 14: Final Energy Consumption	29
Figure 15: Share of Final Energy Consumption by Sector (BAU scenario)	29
Figure 16: Share of Final Energy Consumption by Sector (EE measures applied)	30
Figure 17: Gas price for medium size industries EU-28 & Serbia (EUR/GJ) 2013 – 2014	43
Figure 18: Electricity price for medium sized industry EU-28 & Serbia, 2013 – 2014.....	44

List of Tables

Table 1: Overview of available reports	8
Table 2: Production and consumption of electrical energy (PJ), 2005 – 2013.....	18
Table 3: Final consumption of natural gas (million m ³) by sector, 2013-2015.....	21
Table 4: CO ₂ Emissions by sector in Serbia	28
Table 5: Planned energy savings according to NEEAP 2 (PJ)	28
Table 6: Industrial sectors with greatest energy savings potentials	31
Table 7: Estimation of heating cost for 2014/2015 heating season in households (EUR).....	34
Table 8: Energy and EE laws and policies	37
Table 9: Secondary regulations and by-laws	38
Table 10: Current feed-in tariffs.....	42
Table 11: Simple payback period for different project types	45
Table 12: Institutions relevant for EE in Serbia	47
Table 13: Energy Balance for Serbia 2013, TJ	55
Table 14: Electricity Balance for Serbia 2013, GWh/TJ	56

Abbreviations

AERS	Agency for Energy of the Republic of Serbia
BAT	Best Available Technologies
BPE	Best Practices for the Environment
CHP	Heating Thermal Power Plant
CP	Contracting Parties (of the Energy Community)
DAI	Development Alternatives, Inc.
EE	Energy Efficiency
EED	Energy Efficiency Directive (2012/27/EU)
EIA	Energy Information Administration (US)
EMS	Elektromreze Srbije (Power Transmission Company)
EPS	Elektroprivreda Srbije (Electrical Power Company of Serbia)
EUR	Euro
TFC	Final Energy Consumption
HPP	Hydro Power Plants
IEA	International Energy Agency
IPPC	Integrated Pollution Prevention and Control
Mtoe	million tons of oil equivalent
ME	Medium Enterprise
MSME	Micro, Small and Medium Enterprise
NEEAP	National Energy Efficiency Action Plan
NIS	Naftna Industrija Srbije a.d. (Oil Industry of Serbia j.s.c.)
OeEB	Development Bank of Austria
P	Power
PJ	Peta Joules
RE	Renewable Energy
RES	Renewable Energy Sources
RSD	Serbian Dinar
RS-EB	Energy Balance of the Republic of Serbia
SME	Small and Medium Enterprises
SHPP	Small Hydropower Plant
SPP	Simple Payback Period
TFC	Total Final Consumption
TPP	Thermal Power Plant
USD	United States Dollar

General Remarks

For this report the exchange rate used to convert the local currency Serbian Dinar (RSD) to EUR is:
1 EUR = 120.33 RSD (February 2015, Oesterreichische Nationalbank www.oenb.at).

1 Executive Summary

The objective of this report is to present the current status and potentials in the field of energy efficiency and renewable energy sources in Serbia. It also gives a short analysis of the legal framework and coherence of Serbian policy with the policy of the European Union in energy efficiency improvements and RES application.

The **most important laws** in the field of energy efficiency are the *Law on Rational Use of Energy* and the *Energy Law*. The policy acts which also support energy efficiency are the *National Renewable Energy Action Plan*, *Law on Environmental Protection*, and the *Second Action Plan for Energy Efficiency of the Republic of Serbia* for the period from 2013 to 2015.

The **Serbian market for energy efficient equipment** and materials represents an emerging market. The Republic of Serbia imports a large share of energy-efficient equipment and materials from the European Union, the United States, and China. Domestic production and export is negligible compared to imports. Current framework conditions are considered not to be favourable enough for the development of domestic energy efficient equipment and materials.

There are efforts by the Government of the Republic of Serbia to develop **new energy capacities** in coal fired power plants (PP), as well as in renewable energy (RE) plants. It is expected that a new thermal power plant (TPP) of 350 MW and considerable capacities in small hydropower plants (SHPP) and wind power plants will come online in the next five years. Available capacity offered to private investors amounts to approximately 500 MW in hydro energy and 500 MW in wind energy.

Serbia's energy system in general **relies heavily on coal**, whereas the supply of natural gas for industry and households **shows high import dependence**. Some progress was made towards EE in industry by the companies in the most energy intensive sectors, which undertook steps towards certification, best available technology introduction, as well as measurement and monitoring of CO₂ emissions at their operations. The overall energy framework in Serbia, both from legal/ policy and market perspective, is well-developed and positively assessed by the Energy Community, to which Serbia is a Contracting Party. Following requirements from the Energy Community, an overall TFC reduction of 9% should be realised by 2018.

Current shares of TFC show a **clear dominance of the residential sector**, followed by the industrial sector, which currently account for 122 PJ (32% of TFC) and 102.4 PJ (27% of TFC) respectively. Energy efficiency potentials are estimated in the range of **15-25% in the industrial sector** and **between 25-70%** (depending on the degree of refurbishment) in the residential sector. **Measures relating to households** focus on rehabilitation of heating systems, including both district heating systems, which are common for all cities and major municipalities, as well as via better insulation of buildings.

In the industrial sector **most important and also economically reasonable measures** include the exchange of machines and components as well as the use of waste heat and the introduction of CHP plants. From among the sub-sectors, the **food industry** especially shows considerable saving and replication potential, followed by machinery and paper.

2 Aim and Scope of this Report

The Development Bank of Austria (OeEB) aims to increase its activities in the field of energy efficiency in selected countries via dedicated credit lines, but also via supportive programmes for selected financial institutions and project developers and by analysing options for direct financing. The present study is part of the overall study, which analyses the status of energy efficiency in the countries of Serbia, Bosnia and Herzegovina, Albania, Montenegro and Georgia.

The Study is carried out in cooperation with ALLPLAN GmbH and the Frankfurt School and is based on the latest available information collected directly in the country by local experts in March 2015.

This report focuses on Task 1, “Potential of the Energy Efficiency Market” in Serbia and analyses the following questions:

- What is the Status of Energy Efficiency in each economic sector?
- In which sectors is the potential for energy efficiency the highest and which companies are active in these sectors?
- What is the country’s framework for energy efficiency - in terms of legal, economic, and technical aspects?

3 Studies Available

3.1 Overview

There are a limited number of studies prepared by international and national institutions with high relevance to energy efficiency in Serbia. The more up-to-date and comprehensive ones, which were largely referred to in the preparation of this study, are presented in the table below.

Table 1: Overview of available reports

Name/author/date/link	Purpose/scope	Brief description
<p>Evaluation of energy efficiency measures Applied in public buildings (schools & hospitals) in Serbia Stanković, s. Et al. Bdsp partnership ltd Summit house, London, UK http://goo.gl/lepZCJ</p>	<p>The Serbian Energy Efficiency Project 1 (SEEP 1 – design and supervision support for implementation of the energy efficiency improvements in public buildings in Serbia) was funded by a credit from the World Bank, which resulted in energy efficient refurbishment of 28 public buildings in Serbia (12 hospitals and 16 schools).</p>	<ul style="list-style-type: none"> ■ This paper summarises outcomes of SEEP 1 in terms of energy and carbon savings as well as investment payback period. Energy efficiency measures, applications, buildings, energy consumption savings, CO₂ emission reduction, energy performance "before" and "after" monitoring, and verification.
<p>Energy efficiency programmes in Serbia Bojan Kovacic, MSc, acting Director of the Serbian Energy Efficiency Agency (SEEA) http://www.osce.org/secretariat/75427</p>	<p>Prepared for the 19th OSCE Economic and Environmental Forum "Promotion of common actions and co-operation in the OSCE area in the fields of development of sustainable energy and transport" First preparatory meeting in Vienna, 7-8 February 2011</p>	<ul style="list-style-type: none"> ■ The presentation provides an overview of Energy Efficiency programmes and projects in Serbia.
<p>Report on the Security of Energy Supply in the Republic of Serbia in the period from 2011 to 2013 Republic of Serbia Ministry of Energy, Development and Environmental Protection http://goo.gl/KVhg1K</p>	<p>Report on natural gas, oil and oil derivatives, and electricity supply in Serbia with data, measurements, and predictions for the period up to 2030</p>	<p>The report analyses, among other things, the following items: The electricity market, security assessment of transmission and distribution system operations, data on planned electricity consumption and production, forecast of the security of electricity supply in the Republic of Serbia, data on measures for covering peak demand, transmission system investment plan for the next five to fifteen years, including the construction of interconnection transmission lines; regional, national, and European goals for sustainable development, including international projects, report on the security of natural gas supply, natural gas market, security assessment of transport and distribution system operations, report on the security of supply of oil and oil derivatives, overview of the diversity of supply sources of crude oil / oil derivatives.</p>
<p>Indicative strategy paper for Republic of Serbia (2014-2020) European Commission Instrument for Pre-accession Assistance (IPA II) □ http://goo.gl/4Eujvl</p>	<p>Adopted on August 18th, 2014, the Indicative strategy paper sets out the priorities for EU financial assistance for the period 2014-2020 to support Serbia on its path to EU accession.</p>	<ul style="list-style-type: none"> ■ The objective of EU assistance is to increase energy efficiency and competitiveness of the Serbian energy market, to improve security of supply (also in the regional context), and develop renewable energy sources. The document translates the political priorities, set out in the enlargement policy framework into key areas where financial assistance is most useful to meet the accession criteria. It provides an overview of activities in the field of environmental and climate action, greenhouse gas emission reduction activities, and energy efficiency.
<p>Status of energy efficiency in the Western Balkans, A stocktaking report June 15th, 2010 Sustainable development department (ECSSD) Europe and Central Asia Region (ECA), Document of the World Bank http://goo.gl/dHLBtl</p>		<ul style="list-style-type: none"> ■ The report documents the energy intensity, high energy savings potential among energy end-users, and heavy dependence on imported hydrocarbons across the Western Balkans region. Energy markets would benefit from enhanced demand-side efforts and integrated energy efficiency measures across all sectors. This study examines the status of the enabling environment for demand-side EE across the Western Balkans, evaluates developments in each country, and offers recommendations on the way forward.

<p>Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Enlargement strategy and main challenges 2014-2015: Serbia 2014 progress report http://goo.gl/BRozj6</p>		<ul style="list-style-type: none"> ■ Within Chapter 15: Energy, the report addresses Serbia's security of supply, internal energy market, renewable energy, energy efficiency, nuclear energy, nuclear safety, and radiation protection. With regard to energy efficiency, it reports on the second action plan for energy efficiency, for 2013-2015, adopted in October 2013. The energy efficiency Fund was established by the Law on Energy Efficiency and became operational in January 2014. Implementation legislation has yet to be adopted. Administrative capacity in this area needs to be strengthened.
<p>The First Energy Efficiency Plan of the Republic of Serbia for the Period from 2010 to 2012 Republic of Serbia Ministry of Energy, Development and Environment http://goo.gl/osN7vu</p>	<p>This Action Plan was drawn up on the basis of requirements of the Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services following the recommended template prepared by the EE Task Force of the Energy Community Secretariat.</p>	<ul style="list-style-type: none"> ■ In the case of the Republic of Serbia, pursuant to the Energy Community Ministerial Council Decision 2009/05/MC-Enc of 18 December 2009, the first Action Plan covers the 2010 – 2012 period and sets the mean indicative target for this period at 1.5% of the final domestic energy consumption in 2008 or the final target of at least 9% of final energy consumption in the ninth year of implementation. The targeted final energy savings of 1.5% will be achieved with the implementation of the EE measures in the household, public, commercial activity, industrial, and transportation sectors. The method and specific features of assessment of the total and intermediate indicative targets are described in detail in this document.
<p>Report on implementation of the First National energy efficiency Action plan for the period 2010-2011, Republic of Serbia Ministry of energy, development and environmental protection of the Republic of Serbia http://goo.gl/MiOzKc</p>	<p>This document was prepared based on the guide and template for the preparation of the 2nd National energy efficiency action plans prepared by the European Commission (EC) joint research Centre (JRC) in November 2010. It was produced as a part of the project "Capacity building for monitoring, verification and evaluation system of the energy efficiency policy in SEE countries in terms of the EU accession process" (pn 08.2016.7-005.00) implemented by ORF-EE/GIZ on behalf of the German Federal Ministry for economic cooperation and development (BMZ).</p>	<ul style="list-style-type: none"> ■ The document focuses on reporting principles for the evaluation of: total energy end-use savings achieved in a country and per end-use sectors (top-down approach), and individual energy efficiency measures defined in the 1st NEEAP and ex-ante evaluation of new, planned measures (bottom-up approach).
<p>The Second EE National Action Plan 2013 - 2015 Republic of Serbia, Ministry of Energy, development and environment http://goo.gl/6JAZsz</p>	<p>2. NEEAP of the Republic of Serbia for the period 2013-2015 was prepared based on requirements by EC, in accordance with the model prepared by the EE Task Force of the Energy Community Secretariat.</p>	<ul style="list-style-type: none"> ■ The 2nd NEEAP covers the period 2013 to 2015, and defines the indicative final energy consumption targets for the reporting period, while at the same time considers the level of fulfilment of the indicative targets for the first reporting period and problems in the implementation of the 1st NEEAP implementation.
<p>Second EE action plans (EEAPs) of the Contracting Parties (CP) Assessment by the Energy Community Secretariat http://goo.gl/tl5FXz</p>	<p>This assessment is required by the Energy Community Ministerial Council Decision D/2009/05/MC-EnC of 18 December 2009 on the implementation of certain Directives on Energy Efficiency, with respect to the Directive 2006/32/EC on energy end-use efficiency and energy services. This report is based on a single evaluation framework</p>	<ul style="list-style-type: none"> ■ This report addresses the minimum reporting requirements as set out in the Energy Services Directive 2006/32/EC (ESD), and covers developments in improving energy efficiency in energy supply, evaluation of efforts to improve energy efficiency in energy end-use, including in buildings, industry and SMEs, and the transportation sector, as well as horizontal, public sector, and information and awareness raising measures. Final energy savings achieved up to 2012 and those targeted until 2018 are evaluated. Additional measures in energy community were proposed, with the aim to strengthen the implementation of energy efficiency measures and achievement of the energy savings targets.

	<p>for all EEAPs, and it is similar to the one used by the European Commission when assessing the EU Member States' 2 EEAPs.</p>	
<p>Impact Assessment of the Energy Efficiency Directive (2012/27/EU) for the Energy Community DecisionWare Group http://goo.gl/TV74HF</p>	<p>This study was commissioned to assess the costs and benefits of implementing four specific elements of the Energy Efficiency Directive (EED) as modified for the Energy Community (EnC) Contracting Parties (CPs) and to provide a basis for justification of proposed changes to particular articles within the Directive as it relates to the CPs.</p>	<ul style="list-style-type: none"> ■ The study assessed the following four articles of the Directive: ■ Task 1 - National Targets – Article 3 ■ Task 2 - Exemplary role of the buildings of public bodies – Article 5 ■ Task 3 - Energy efficiency obligation schemes – Article 7 ■ Task 4 - Promotion of efficiency in heating and cooling – Article 14 of the Energy Efficiency Directive.
<p>The report on the status of environment in Serbia for 2012 (in Serbian) Ministry of energy, development and environment of the Republic of Serbia http://goo.gl/YBFXYW</p>		<ul style="list-style-type: none"> ■ Under Chapter 9: Economic and social potential and activities, this report considers Industry and Energy. The report uses data available from the National registry of pollution sources (sr. Nacionalni registar izvora zagađivanja (NRIZ)) which has as a basic function the collection and assessment of data and updating of a number of databases related to industrial and utility pollution. http://www.sepa.gov.rs/download/NRIZ_podaci/SpisakPRTR.pdf (SR) http://80.93.233.117:8080/nriz/prtr/form/form_main.xhtml (SR)
<p>Progress Report on Implementation of the National Renewable Energy Action Plan of the Republic of Serbia REPUBLIC OF SERBIA, Ministry of Mining and Energy http://goo.gl/eAiUjV</p>	<p>In line with Directive 2009/28/EC and Energy Community Ministerial Council Decision of 18 October 2012 (D/2012/04/MC-EnC) required preparation of the National Renewable Energy Action Plan of the Republic of Serbia in line with the approved template for preparation of this document (Decision 2009/548/EC) and its submission to the Energy Community Secretariat.</p>	<ul style="list-style-type: none"> ■ The same Decision stipulates a 27% share of renewable energy sources in gross final energy consumption in 2020 for the Republic of Serbia. Moreover, in line with Article 15 of the Energy Community Ministerial Council Decision (D/2012/04/MCEnC), TEEnC signatories shall provide the EnC Secretariat with a report on progress made in the promotion and utilisation of energy from renewable sources every other year. The balancing of energy from renewable energy sources includes production and consumption of electricity from small and large watercourses, wind and solar energy, as well as the production and consumption of heat energy from geothermal energy and solid biomass (firewood, pellet, and briquette).

3.2 Main results of existing studies

The Serbian Energy Efficiency Project 1 (SEEP1 – Design and Supervision Support for Implementation of the Energy Efficiency Improvements in Public Buildings in Serbia), funded by a loan from The World Bank, carried out energy efficient refurbishments of 28 public buildings in Serbia (12 hospitals and 16 schools). The major goal of the project was to implement energy efficiency improvements in public buildings in Serbia and to verify the energy and cost savings as well as CO₂ emission reductions. Significant energy consumption savings have been achieved for all refurbished buildings, with annual savings in the range of 15% to 63% and an average of 40% over entire project. The average annual specific space heating consumption was reduced in hospitals from ~339 kWh/m² to ~205 kWh/m² and in schools from ~243 kWh/m² to ~144 kWh/m² after refurbishment. The simple payback period (SPP) on investments across all buildings was found to be about 7.5 years. For hospitals, due to their 24/7 operation, the average SPP was calculated at 5.3 years and for schools 12.8 years.

Impact Assessment of the Energy Efficiency Directive (2012/27/EU) for the Energy Community, compiled by the Decision Ware Group in July 2014, states as one of the three key findings that the 18-25% EE savings target case (compared to a 19-27% and to a 20-30% target) is recommended for adoption because it is the most cost-effective of the three options.

Adoption of cost-effective combined heat and power (CHP) options will be beneficial in the long run, while the number of eligible projects may be up to ten times greater when applying a 20MW threshold in comparison to a 50MW threshold. The 50MW threshold, if applied, would limit their applicability to only large cities, power plants, and very large industries.

Progress Report on Implementation of the National Renewable Energy Action Plan of the Republic of Serbia found that energy consumption is considerably influenced by the operation of the steel plant in Smederevo, that is, by the import and consumption of coke and electricity used in the steel production process.

The Preparation of Second Energy Efficiency Action Plan and Development of Energy Indicators project implemented by DAI for the European Commission aims to create an action plan and build capacities to advance energy savings and energy-efficiency measures that will contribute to a reduction of energy consumption and carbon dioxide emissions.

The Second EE Action Plan of the Republic of Serbia 2013 – 2015 states that the new distribution of targets is in line with the realisation of the First NEEAP and the revised assessment of the potential for savings of individual measures.

Status of energy efficiency in the Western Balkans, A stocktaking report's key finding is that most countries lack even the most basic data, including reliable energy balances and EE indicators by sector, rendering themselves unable to prepare high-quality National Energy Efficiency Action Plans (NEEAPs) with monitor-able and realistic interim targets. Directive 2006/32/EC of the European Parliament and the Council on energy end-use efficiency and energy services requires Members States to prepare three National Energy Efficiency Action Plans for the period 2008 - 2016 and report them to the European Commission. The aim is for all Member States of the European Union to achieve an energy savings target of 9% of their average final inland energy consumption during 2001-2005 by the end of 2016 (recently updated to 2018). As members of the Energy Community, the Western Balkans countries have the same obligations.

4 Status of Energy Efficiency

4.1 Overview

Although it is not fully in accordance with the Energy Balance of Serbia, the Energy flow diagram of the International Energy Agency is shown here, as it provides a good overview of the energy situation of the country. The Energy and Electricity Balance overviews of the Republic of Serbia, which are used as a first source for all data in this section, are included in the Annex to this report.

Primary Energy Supply amounted to 654 PJ and showed the following characteristics:

- **Coal is the primary source** of energy in Serbia. In 2012, its share amounted to 49%, or 321.9 PJ. Around 95% of coal used comes from sources within the Serbian territory. The largest share is used for electricity generation.
- **Oil and oil products** from domestic production and import make up 152.8 PJ, or 23.4% of the energy supply. In 2012, Serbia imported almost the same quantity of oil as it had at its disposal from internal resources, and another 57.7 PJ of oil products. From the 152.8 PJ total, after use in power stations, stock changes, exports of oil products, oil products in international bunkers, and internal use are deducted, the total of oil and oil derivatives for consumption was 143.5 PJ, of which the biggest portion, 71.6 PJ (60%), was used in transportation and 23.5 PJ (16%) in industry.
- **Natural gas** available in Serbia is largely imported, and only about 1/5 is derived from internal production. Of the total 69.7 PJ (10.5% of energy supply), 27.5 PJ (39.5%) serves as input to power stations and almost the same amount is used for industrial purposes (25.3 PJ).
- **Biofuel and waste** amount to 43.8 PJ (7% of energy supply) and account for the biggest share of renewable energy.
- The **total primary energy input to power stations** amounts to 350 PJ, of which 80% is from coal, 10% from hydro power, and 8% from natural gas. The reported losses are as high as 184.7 PJ or 53%. Electricity output is 130.2 PJ and 35.2 PJ of heat. Electricity imports are in the same range as electricity exports (approximately 20 PJ).

When compared to the structure of energy sources in the EU-28, the biggest difference is in the share of coal, which is almost half of primary energy supply in Serbia compared to only 21% in the EU-28 (Eurostat, 2014). An additional difference is the share of nuclear energy, which is 28.7% in the EU-28 (Eurostat, 2014) and nonexistent in Serbia.

Serbia
FINAL CONSUMPTION (2012)

Petajoules

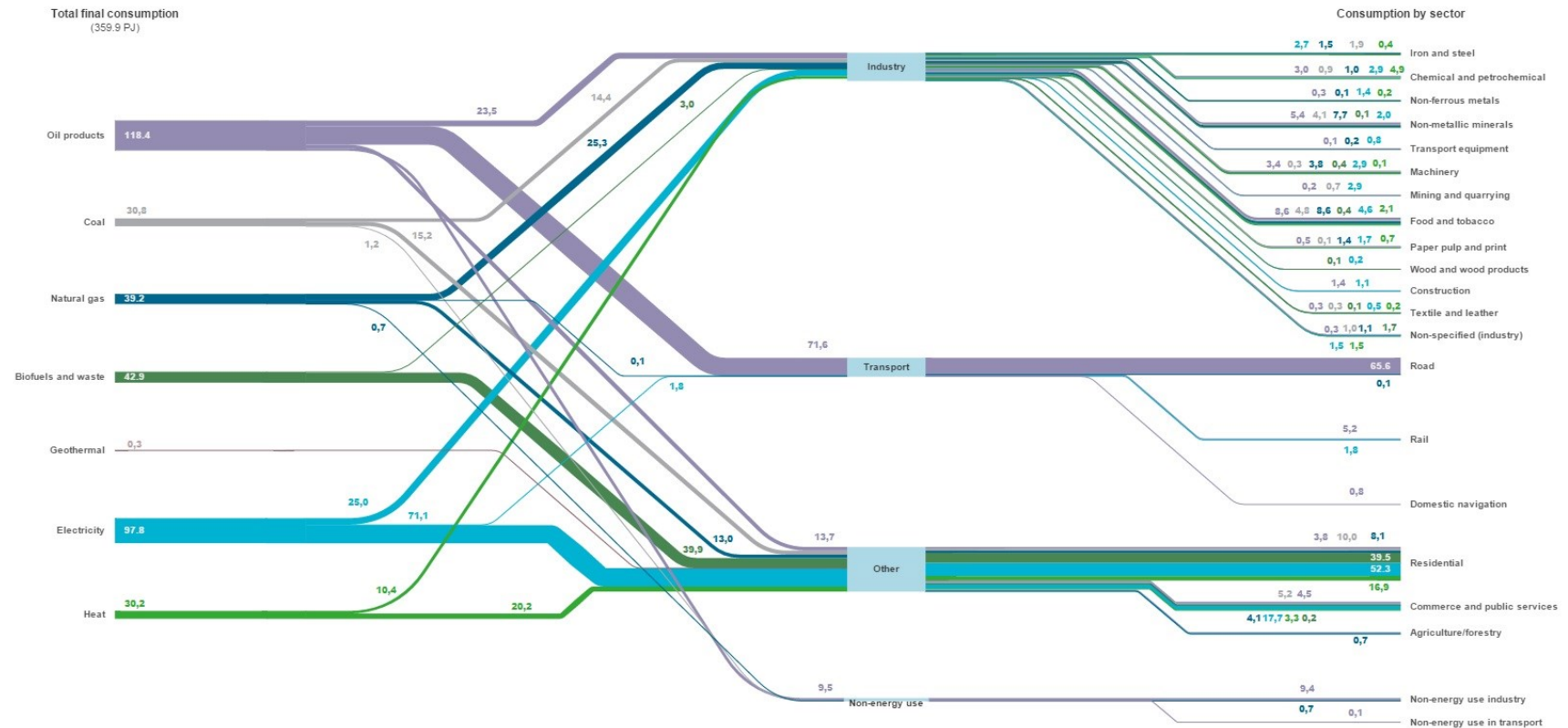


Figure 1: Energy Flow – Balance Serbia 2012 (PJ)
Source: International Energy Agency (figures inserted by Allplan)

4.2 Energy supply

4.2.1 Domestic sources

Energy resources and potentials in the Republic of Serbia include fossil fuel sources, both conventional (coal, oil, and natural gas) and non-conventional (shale gas), as well as renewable energy sources.

Coal plays the dominant role in energy production from domestic sources. The structure of gross inland production of Serbia is as follows:

- Coal (51%)
- Oil (22%)
- Natural gas (11%)
- Biomass (7.5%)
- Hydropower (6.5%)

Serbia covers around **30% of its primary energy supply from imports**. The import of high quality fossil fuels, oil, and natural gas accounts for around $\frac{3}{4}$ of the total primary consumption of these energy sources in Serbia. Primary energy demand and imports are **expected to rise by about 10%** in 2015 compared to 2014.

Coal balance includes the production, processing, import, export, and consumption of coal, as well as the production and consumption of high-furnace gas. In the makeup of domestic coal, lignite accounts for 98% and 2% is hard coals and brown coals. Production capacities include:

- underground mining at Resavica – hard coal, brown coal, and lignite
- open-pit mines of the mining basins at Kolubara (75% of total lignite production in Serbia), and Kostolac (25% of lignite production and Serbia) with an average calorific value of 7,500 kJ/kg, and
- underwater coal mining (Kovin and Vojvodina) that produces lignite.

EPS is the largest producer of lignite in the country, with a potential annual production of around 38 million tons of coal. 99% of the total production of coal in EPS will be used for the generation of electricity in thermal power stations in TPP Kolubara, Nikola Tesla, Morava, and Kostolac in 2015. According to the reserves balance for 2010, more than 76% of coal reserves in the Republic of Serbia are located in the territory of Kosovo, which is an important fact in the energy strategy of Serbia given the heavy dependence on coal and the plans to invest in thermal power plants.

Around **92% of coal is used in thermal power plants** for the production of electrical energy. This includes centralised heat and electricity production in the amount of approximately 300 PJ. A significant increase, by 75%, in consumption of coal is expected in 2015 in comparison to 2014, due to the restarting of operations at the steel company “Železara Smederevo”.

Oil and Oil products The total crude oil and semi-refined products in the refineries come from

- a) domestic production, that is 43% (51 PJ) from 42 oil sites (650 drilling sites), and
- b) import 57% (66 PJ) according to the RS-EB for 2015.

Oil Industry of Serbia - NIS is the only company in Serbia involved in exploration and production of oil and gas in two refineries, with a total refining capacity of 7.3 million tons of crude oil, in Pančevo and Novi Sad. NIS presented a significant increase of almost 83% in domestic oil and gas production volume from 2009 to 2013. Public company “Transnafta” is the only company in charge of pipeline transport in Serbia.

Natural gas The largest deposits of natural gas are located in Vojvodina, and the capacity of these sites is sufficient to meet about **20% of the current need of the Republic of Serbia**. The remaining amount of gas is mainly imported from Russia, from “Gazprom Neft”, which arrives to Serbia via Ukraine and Hungary. The project “South Stream”, which was intended to enlarge the capacity and serve to secure supply of natural gas to the citizens and industry of Serbia, is currently on hold. It was planned that the project would start by the end of 2015, with total investment in the Republic of Serbia of around 1.7 billion EUR. Transport of natural gas is conducted through the high-pressure pipeline, of which the public company “Srbijagas” owns almost exclusively the total length.

According to the RS-EB, an increase of 18% in the total estimated quantity of natural gas consumption is expected for 2015.

The reserves of **shale gas** are considerable, however the conditions for and technology of its exploitation are yet to be defined. Serbia also has a geological reserve of uranium in the amount of around 9 million tons, yet nuclear energy is forbidden by the Law on banning the construction of nuclear power plants of the Federal Republic of Yugoslavia (1995).

Renewable Energy Sources – RES Total **technical potential of RES in Serbia is estimated at 166 PJ** annually, of which 31 PJ of biomass (firewood) and 27 PJ of hydropower is already being used.

The Republic of Serbia has adopted the National action plan for RES stipulating a **binding share of RES in gross final energy consumption of 27% by 2020**. The current share of RES in the gross final consumption is around 20%, with most of it coming from the traditional ways of using biomass (59%) and hydropower (40%), and all other sources accounting for less than 1%.

Planned production of solar energy in 2015 is 0.02 PJ (5.8 GWh), or 17% more than estimated in 2014. A considerable increase, almost 90%, is planned in the use of biofuels, however at a very low level (0.1 PJ/35 GWh). The planned wind energy use is approximately 0.001 PJ (0.3 GWh).

According to the Energy Strategy, it will be necessary for Serbia to invest in 1,500 MW of new conventional fuel capacity, besides shutting down 1,370 MW of old facilities. Another 2,400 MW of capacity for the production of energy from RES will be needed, with 1,440 MW expected by 2020. To date, 857 locations (with potential total capacity of around 500 MW) for small hydropower plants were offered to private investors in two public calls. According to the Energy Strategy of the Republic of Serbia, it can be expected that considerable investment of private capital will flow into this sector in the coming years (around 500 million EUR).

Heat The capacities for production of heat in Serbia are installed primarily in district heating systems as heating plants, with an installed capacity of about 6,100 MW, and the corresponding distribution network with a total length of about 2,100 km, and around 23,042 substations. District heating is also provided by thermal power plants, which produce thermal energy used to heat the City of Belgrade, the Municipalities of Lazarevac and Obrenovac, the Kostolac Municipality, and the City of Pozarevac. Three thermal power plants of “Panonske” produce heat for the cities of Novi Sad, Zrenjanin, and Sremska Mitrovica. There are 55 heating plants within the **district heating system, which exists in all cities and major municipalities in Serbia**, while a total of 59 business entities are engaged in the activities of production, distribution, and supply of thermal energy within this centralized heating system (taking into account the territory of Kosovo and Metohija).

Heat production capacity also includes **industrial power plants** with a capacity of about 6,300 MW installed in industrial enterprises to produce steam used in production and thermal energy for technical processes, as well as to heat work spaces. There are also autoproducers in around 30 industrial enterprises that produce heat and electricity. If operational, they are used to produce heat for

production processes and work space heating in industrial enterprises. They mainly use brown coal or lignite (81%). Individual boilers are not included in the energy balance of the Republic of Serbia.

The biggest share in the production of thermal energy in terms of energy sources is natural gas (74%), followed by fossil fuels, that is, oil derivatives (15%) and coal (11%). Biofuels make up for less than 1%. In heat production, heating plants have the greatest share with 59%, followed by industrial energy power plants with 31%, thermal power plants - TPP with 6% and CHP with 3.3%. The planned heat production in 2015 is set at 37 PJ, which is 9% more than in 2014.

4.2.2 Electricity generation

In terms of installed capacity (total 7,177 MW), thermal power plants (coal) make up for 54%, followed closely by hydropower stations with 2,835 MW or 40%.

Most of the plants for the production of electricity are owned by EPS.

According to their annual reports, EPS's own production of electricity was 135 PJ in 2013, 71% (95.53 PJ) of which come from coal-powered Thermal power plants, and then 28.6% (38.6 PJ) from hydropower plants within EPS's system. In the structure of electrical energy produced by hydro PP, the biggest share belongs to run-of-river HPP 88%, with reservoir 6.5%, and pumped storage 4%, and SHPP 1.5% also available for production.

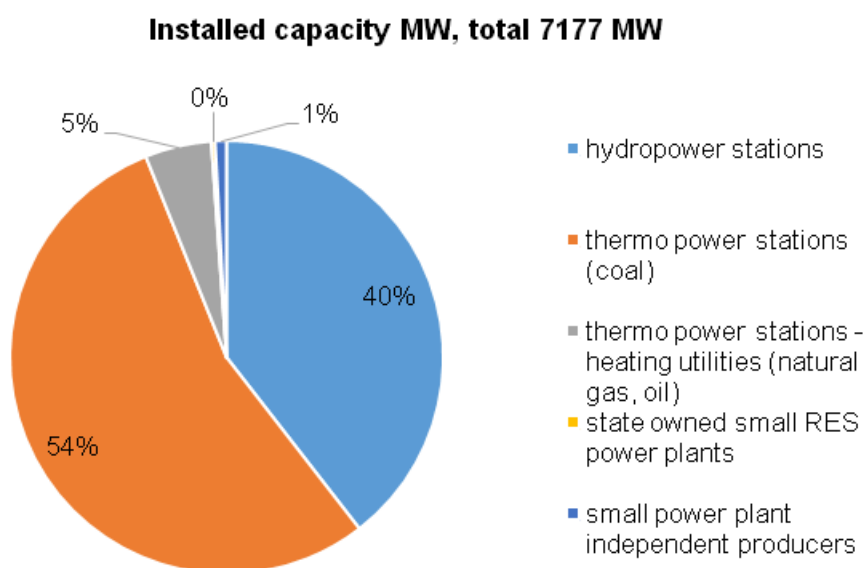


Figure 2: Installed Power Plant Capacity (MW), 2013

Source: Agency for Energy of the Republic of Serbia

In its 2014 annual report, EPS accounts for a total of 8,359 MW of the installed capacity of their power plants, divided as follows: 5,171 MW in lignite-fired thermal power plants, 353 MW in gas-fired and liquid fuel-fired combined heat and power plants, and 2,835 MW in hydro power plants. EPS operates but does not own three power plants with a total capacity of 461 MW.

In 2012, input to power stations was 350 PJ. The share of coal in this input is as high as 80%, followed by hydropower and natural gas (10% and 8% respectively), and oil with only 2%.

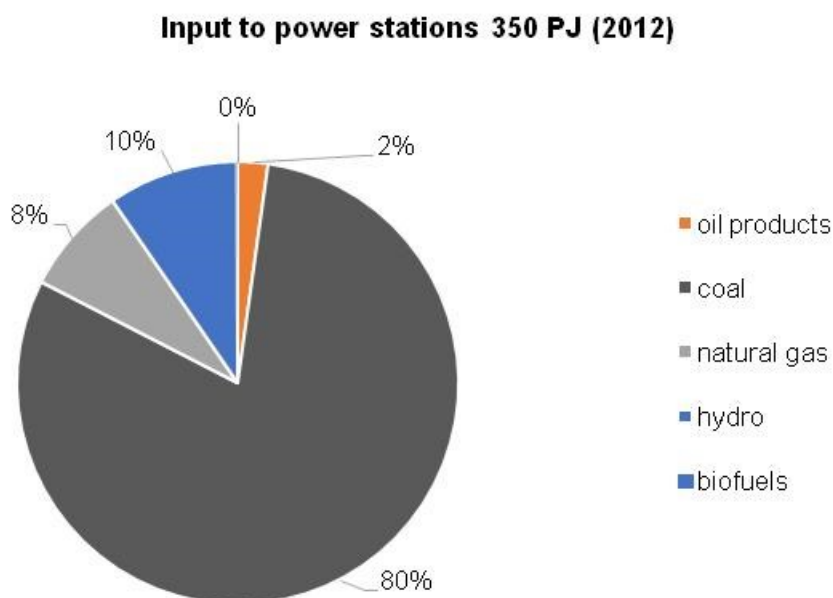


Figure 3: Input to power stations in Serbia 350 PJ, 2012

Source: International Energy Agency

According to RS-EB, planned gross production of electricity in 2015 is set at 139 PJ, or 13% higher than was estimated in 2014. TPP will have the biggest share of planned electrical energy production with 104 PJ (75%); followed by HPP with 33 PJ (24%), and CHP with 0.75 PJ (less than 1%).

Electricity and Heat transmission and distribution losses

Electricity The share of losses in distribution rose from 15.21 PJ in 2005, to 16.15 PJ in 2013, or by 6.18%, but relative to gross consumption, this is a marginal increase of 0.26% (from 12.93% in 2005 to 13.19% in 2013). However, this is two times higher than the average electricity transmission and distribution losses in the EU (5.8%). On the other hand, the share of losses in transmission decreased in the same period by almost 29%. The total losses in transmission and distribution increased further in 2014 and 2015.

Heat According to the Energy balance of the Republic of Serbia, the heat distribution losses were stable at around 3 PJ in 2013 and 2014, but show a trend that will increase by 9% in 2015.

Table 2: Production and consumption of electrical energy (PJ), 2005 – 2013

Source: Agency for Energy of the Republic of Serbia

	2005	2006	2007	2008	2009	2010	2011	2012	2013
PRODUCTION									
Hydropower plants	42.93	39.06	35.75	36.04	39.76	44.71	32.92	35.31	38.62
Thermal power plants (coal)	79.70	84.10	86.46	88.78	89.57	83.38	95.26	87.39	95.53
CHP	1.38	0.65	1.74	1.32	0.50	0.80	1.47	1.40	0.60
Other	0.21	0.19	0.14	0.14	0.17	0.22	0.17	0.26	0.37
Total Production	124.20	124.00	124.09	126.28	130.00	129.11	129.82	124.37	135.13
Other (UNMIK)	0.00	0.08	0.32	0.00	0.16	0.33	0.66	0.52	0.00
IMPORT									
Commercial import	2.38	3.07	2.85	2.22	0.44	2.72	3.98	4.21	2.30
Long-term Montenegro	3.69	3.57	2.33	2.87	4.02	5.27	2.27	2.65	4.66
Annual agreements	0.01	0.00	0.90	0.44	0.31	0.31	0.23	0.45	0.78
Total Import	6.08	6.65	6.08	5.52	4.76	8.29	6.48	7.32	7.75
TOTAL AT DISPOSAL	130.29	130.72	130.48	131.81	134.92	137.74	136.96	132.20	142.88
EPS sales for exports	3.87	2.92	0.90	0.62	5.19	4.63	2.75	0.90	11.30
Long-term Montenegro	4.63	4.32	4.45	4.39	4.26	4.33	4.36	4.37	4.45
Annual agreements	0.06	0.08	0.89	0.41	0.34	0.25	0.32	0.46	0.36
Total exports	8.56	7.33	6.23	5.43	9.79	9.21	7.43	5.73	16.11
Pumping	3.46	3.07	3.11	3.16	3.25	3.78	3.10	3.15	3.63
Other (UNMIK)	0.61	0.36	0.48	0.21	0.26	0.52	0.72	0.71	0.75
Gross consumption	117.66	119.97	120.66	123.00	121.62	124.23	125.72	122.61	122.40
Loss in transmission	5.12	4.66	4.63	4.41	3.98	3.83	3.95	3.68	3.65
Loss in distribution	15.21	15.96	16.50	16.82	17.51	17.85	17.09	16.49	16.15
Total loss	20.33	20.62	21.13	21.22	21.49	21.68	21.03	20.17	19.80
Loss to Gross consumption (%)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Final consumption	97.33	99.34	99.54	101.78	100.13	102.55	104.68	102.45	102.60

In the structure of electricity consumption, industry accounts for 23%, transport 2%, households for 54%, public and commercial activities for 19%, and agriculture 1%.

4.3 Energy demand

4.3.1 Final energy consumption by energy source

An overview of the total final energy consumption of Serbia for 2012 (360 PJ) according to the IEA is presented in Figure 5. Two main characteristics stand out:

- The biggest share lies with oil and oil products, followed by electricity.
- The biggest consumer is the sector of households, followed by industry.

Final energy at the disposal of consumption for energy purposes has increased from 404 PJ in 2014 to an envisaged 432 PJ in 2015.

Figure 4 shows the share of energy carriers in final consumption.

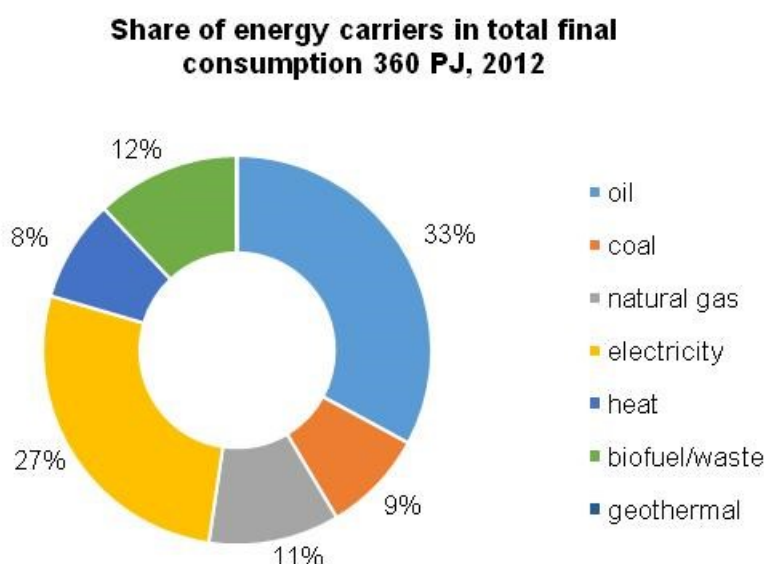


Figure 4: Share of energy sources in final consumption 360 PJ, 2012

Source: International Energy Agency

Coal The final consumption of coal is expected to rise by 10% compared to 2014. The biggest share in coal use belongs to households (41%), followed by industry (38%).

Oil products Final consumption of oil derivatives in 2015 is planned in the amount of 3,385,000t, of which 2,785,000t is for energy purposes. In 2015, it is planned that industry will account for 17%, transportation for 72%, and other sectors for 11%.

Natural gas According to the RS-EB, it is expected that after a rise in 2014, the consumption of natural gas shall decrease in volume, yet the share will remain relatively stable.

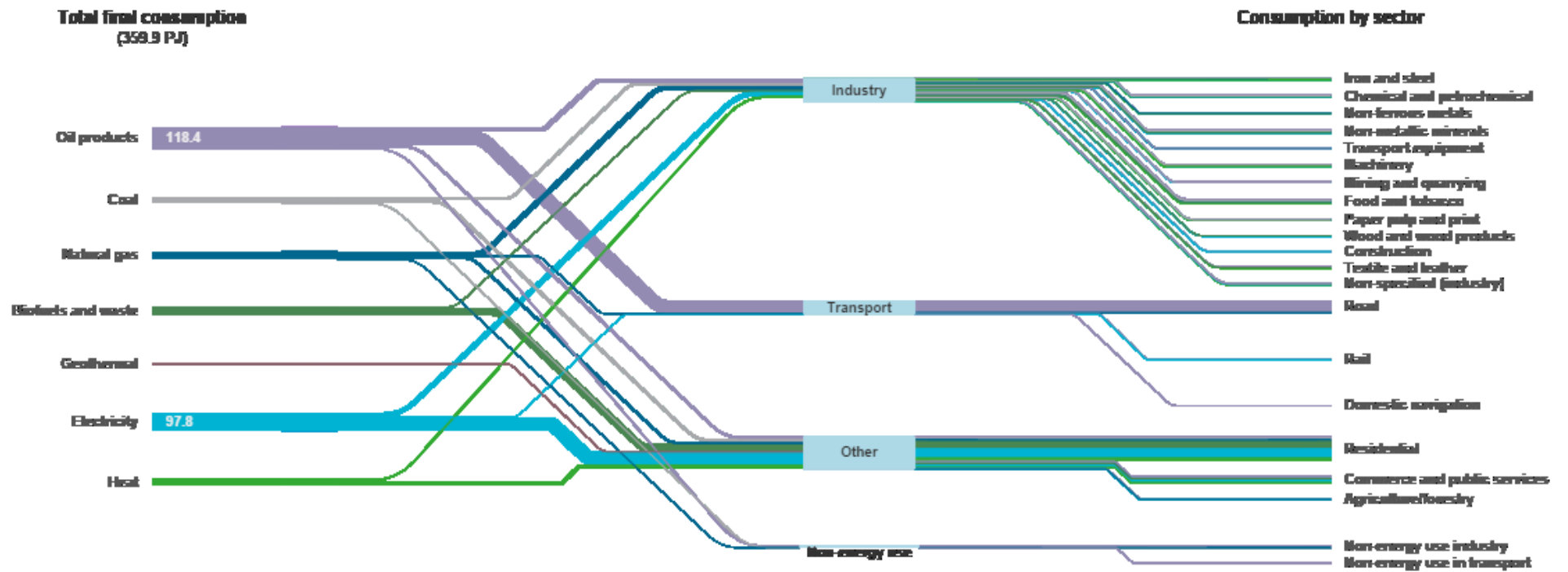


Figure 5: Energy Flow – final consumption by fuel and by sector (PJ), 2012

Source: International Energy Agency

Table 3: Final consumption of natural gas (million m3) by sector, 2013-2015

Source: Statistical Office of the Republic of Serbia

Natural gas (million m3)	Realised 2013	Share (%)	Estimated 2014	Share (%)	Planned 2015	Share (%)
Industry	889	70	1,250	65	1,190	64
Transportation	9	1	36	2	14	1
Households	219	17	407	21	292	17
Public and commercial	122	10	207	11	292	17
Agriculture	20	2	24	1	22	1
Total	1,259		1,925		1,681	

Electricity In the structure of electricity consumption, the industrial sector accounts for 25%, transportation less than 1%, the public and commercial sector for 19%, and agriculture for 1.2%. The predominant consumer is the household sector with 53 - 55%.

Heat Final consumption of 32 PJ is expected in 2015, which is 9% higher than the consumption in 2014. Industry accounts for 37%, and households and other sectors for 63% of the consumption.

4.3.2 Final energy consumption by sector

Figure 6 shows the breakdown of final energy consumption (total TFC 381 PJ) for energy use in sectors according to the RS-EB for 2013. The **biggest consumer of energy is the household sector** with 32%, followed by the industrial sector with 27%, and transportation with 22%. Other uses make up for 9%, while agriculture and construction do not exceed 2%.

Share of final energy consumption by sector 381 PJ, 2013

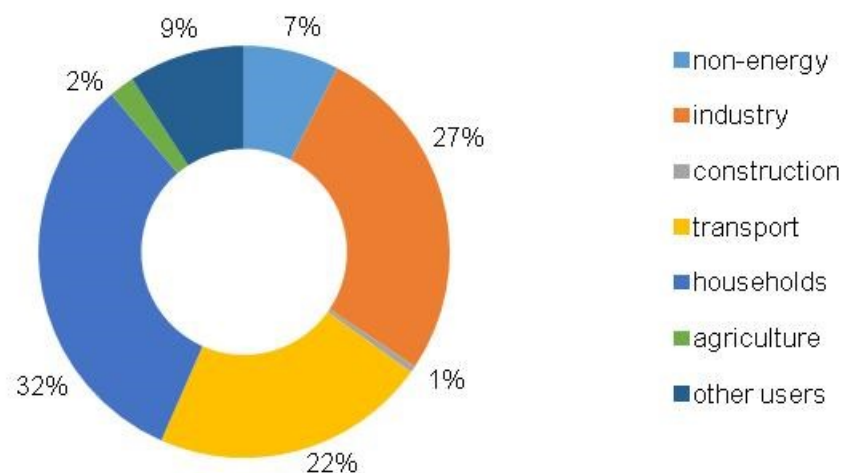


Figure 6: Share of final energy consumption by sector (PJ), 2013

Source: Statistical Office of the Republic of Serbia

According to the chart below, the structure of **final consumption in industry** is divided equally among electricity and natural gas (25%, that is 25 PJ each), followed by 23.5 PJ or 23% in oil products.

Energy consumption in industry by fuel (102.4 PJ) in 2013

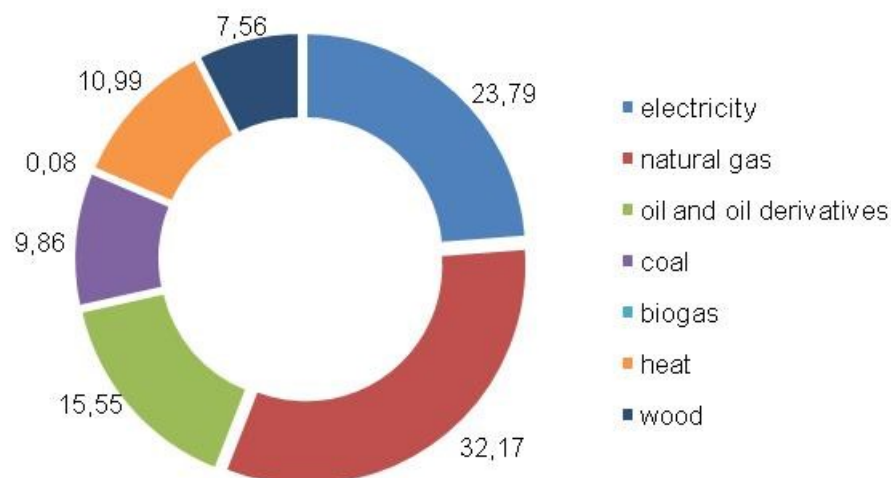


Figure 7: Share of final consumption in the industrial sector (102.4 PJ, 2013)

Source: Statistical Office of the Republic of Serbia

Figure 8 shows the distribution among industrial sub-sectors.

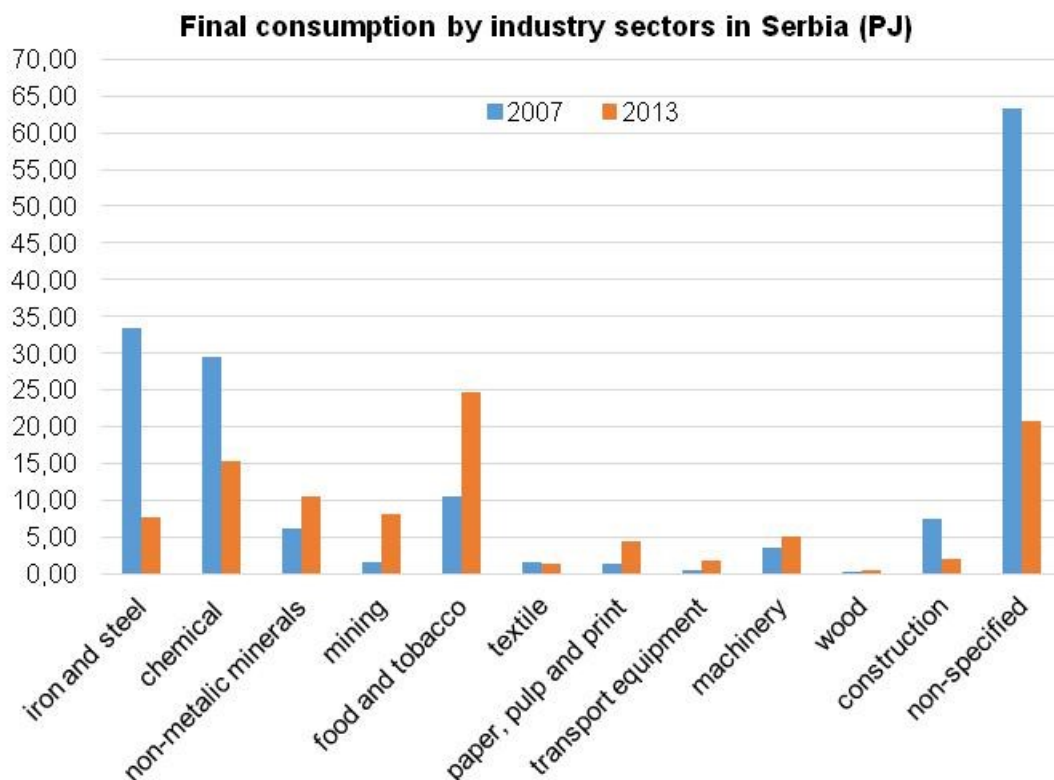


Figure 8: Final energy consumption by industrial sub-sectors in Serbia (PJ), 2007&2013

Source: EUROSTAT

The substantial decrease in the iron and steel sector of industry relates mostly to the production history of the steel company “Železara Smederevo”. The company was privatized by US Steel in 2003 and saw the peak of production in the period from 2006 – 2008, while 2007 was the best year in the history of the company, reaching the designed peak capacity of 2.2 million tons of steel annually.

However, as a consequence of the crisis at the global level, the US Steel sold the “Železara Smederevo” back to the Republic of Serbia for \$1 USD in 2012. The company received the new management appointed by the Government of Serbia in March 2015.

In 2012, ‘other sectors’ in Serbia consumed 173PJ, which was the largest share of the total consumption of 381 PJ and comprised:

- the residential sector with 130.6 PJ
- the commercial and public sector with 35 PJ
- and 7.3 PJ in agriculture and forestry

Final consumption in other sectors 173 PJ, in 2012

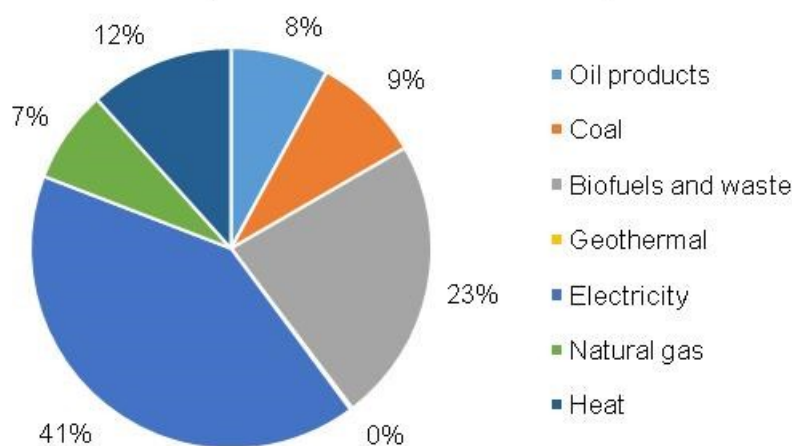


Figure 9: Share of final consumption in other sectors by energy carrier 173 PJ, 2012

Source: International Energy Agency

Similar to the distribution of all “other sectors” as shown above, the residential sector (130.6 PJ) mainly used electricity (40%) as its source of energy, followed by biofuels and waste (30%), heat (13%), coal (7.5%), and natural gas (3%) in 2012.

4.3.3 Trends in energy consumption

As envisaged by the Energy Strategy of the Republic of Serbia, there will be an increase of the final energy consumption of 10.1% by 2020, and 18% by 2025. This is based on the business-as-usual scenario with respect to 2010. The historical overview of energy consumption by sectors in Serbia is given below:

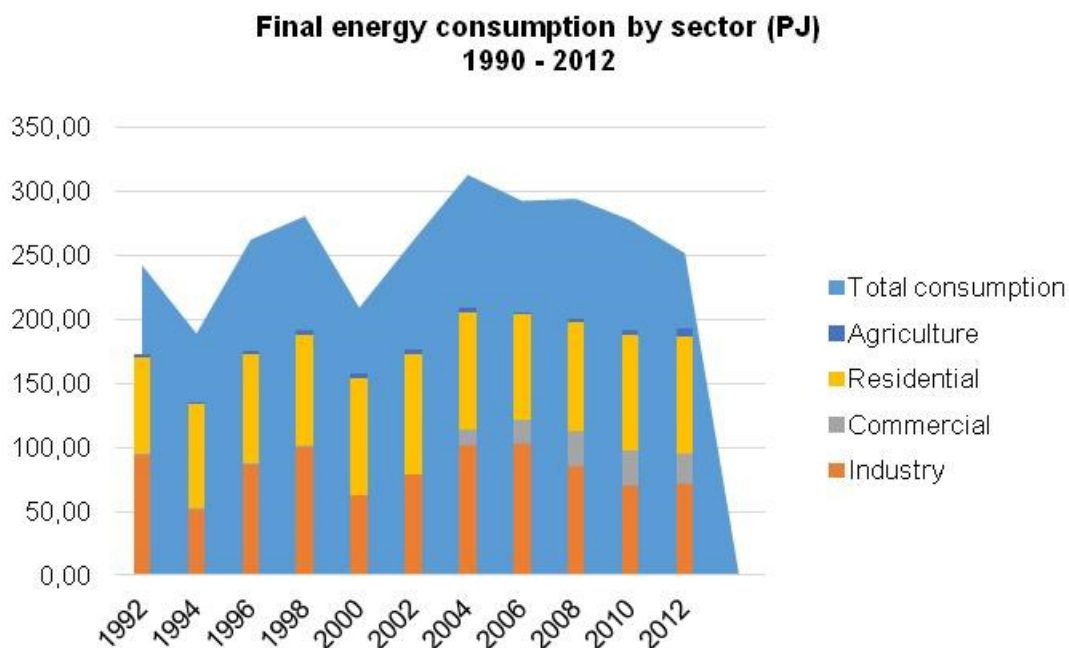


Figure 10: Energy Consumption in Serbia by sectors (PJ), 1990 – 2012

Source: International Energy Agency

The fluctuations in consumption in the industrial sector are mainly due to the economic and political situation in the country, as well as industrial developments of the respective sector on a global level. In particular, steel, petrochemicals, and the oil industry were affected by developments such as sanctions, destruction, and privatisations (some successful and some less so). Currently, all three sectors are operational and more positive developments and investment are expected in the coming years.

4.3.4 Trends in electricity consumption

Current final electricity consumption amounted to 97 PJ. The Energy Strategy of RS envisages a raise of 18% before 2030 in the business as usual scenario and by 7.5 % in case energy efficiency measures are applied.

The breakdown of the 97 PJ of final electricity consumption in Serbia in 2013 is shown in the figure below:

Share in final electricity consumption by sector 97 PJ, 2013

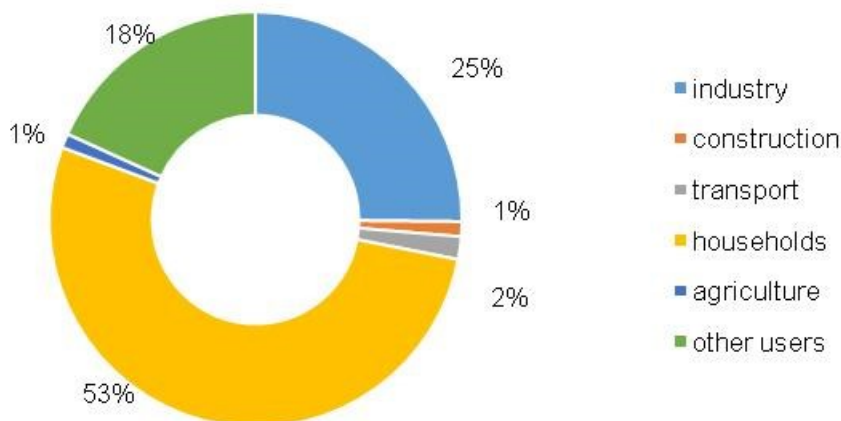


Figure 11: Share of final electricity consumption (total 97 PJ), 2013

Source: Statistical Office of the Republic of Serbia

If a longer period is analysed, Serbia’s energy-related development is characterised by a peak in 1990 and a historical low during the early 1990s in the era of war and sanctions. Otherwise, the consumption is relatively steady, with an increasing share of the commercial sector. A marginal decrease in this sector can be attributed to the relative decline of the construction industry since 2012, with a below average total of 724 m² of newly constructed non-residential buildings in 2013 (the total of 9,732 m² was constructed from 2003 – 2013). In order to overcome this trend in the construction industry, a new law on land and construction was passed in December 2014 with the by-laws effective as of April 1st, 2015.

Electricity Consumption by sector (PJ) 1990-2012

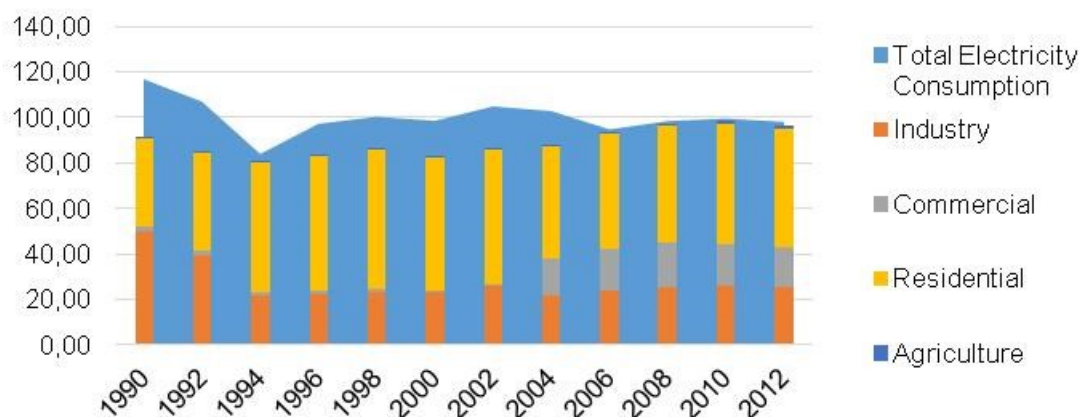


Figure 12: Share by sector of final electricity consumption (PJ), 1990 – 2012

Source: International Energy Agency

4.4 Greenhouse gas emissions

Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during the consumption of solid, liquid, and gas fuels, and gas flaring. The World Bank, in its World Development Indicators 2014 edition, reports 45.962 million tons of total CO₂ emissions for Serbia in 2010 and 6.3 metric tons of CO₂ emissions per capita (8 metric tons CO₂ per capita in Austria). In terms of carbon intensity, the value for Serbia (1.53 t CO₂/thousand USD) is considerably higher than the corresponding Austrian value (0.2 t CO₂/thousand USD).¹

In the process of accession to the EU, the Republic of Serbia's energy sector will face binding and financially intensive costs related to SO₂ emissions. The Republic of Serbia as a developing country (in the status of non-Annex I member of the Kyoto Protocol) does not have international obligations (including obligations under EU legislation) to reduce emissions of greenhouse gases (GHG), but at the time of EU accession, will be obliged to accept those commitments.

RES The National plan for RES of the Republic of Serbia envisages a 27% share of RES in the final energy consumption by 2020. The existing share of RES is around 20%, however this is mostly the traditional technology of harvesting energy from biomass and hydropower. Total RES potentials in Serbia are considerable (167 PJ annually): 60% of this amount is biomass, which has been used up to 30%, while the hydropower potential accounts for 30% of total RES potential (50% already in use). The envisaged measures to promote RES include using RES in thermal plants, shifting away from fossil fuels in heating, introducing RES in the public building and transportation sectors, developing a distribution grid to connect small electrical energy producers, and applying the best available technologies in using RES.

By ratifying the Contract on founding the Energy Community, the Republic of Serbia took over the obligations stemming from Directive 2009/28/EC on promoting electrical energy from RES, to which end incentives were introduced (feed-in tariff and guaranteed purchase for 12 years). The funds for subsidising energy from RES are collected through monthly energy bills from end-users.

In the heating sector, the Energy Strategy of RS envisages a shift from fossil fuels (coal and oil) to RES (biomass and natural gas). In this respect, the share of oil in 2010 (baseline year) should decrease from 28.7% to 14.6% in 2030, the share of coal should decrease from 23% to 16.5%, while the share of natural gas should increase from 48.3% to 56.4%, as well as biomass from 3.2% to 12.5% in 2030. According to the Energy Strategy, it is estimated that 196 million EUR of investment would be needed to reconstruct and modernize the district heating system.

¹ Own calculation based on World bank figures taken from <http://databank.worldbank.org/data/views/reports/tableview.aspx>. Carbon intensity is defined as a country's annual carbon dioxide emissions divided by the country's gross domestic product. National incomes are calculated using market exchange rates (MER) and purchasing power parities (PPP). Units are metric tons of carbon dioxide per thousand year 2005 US dollars.

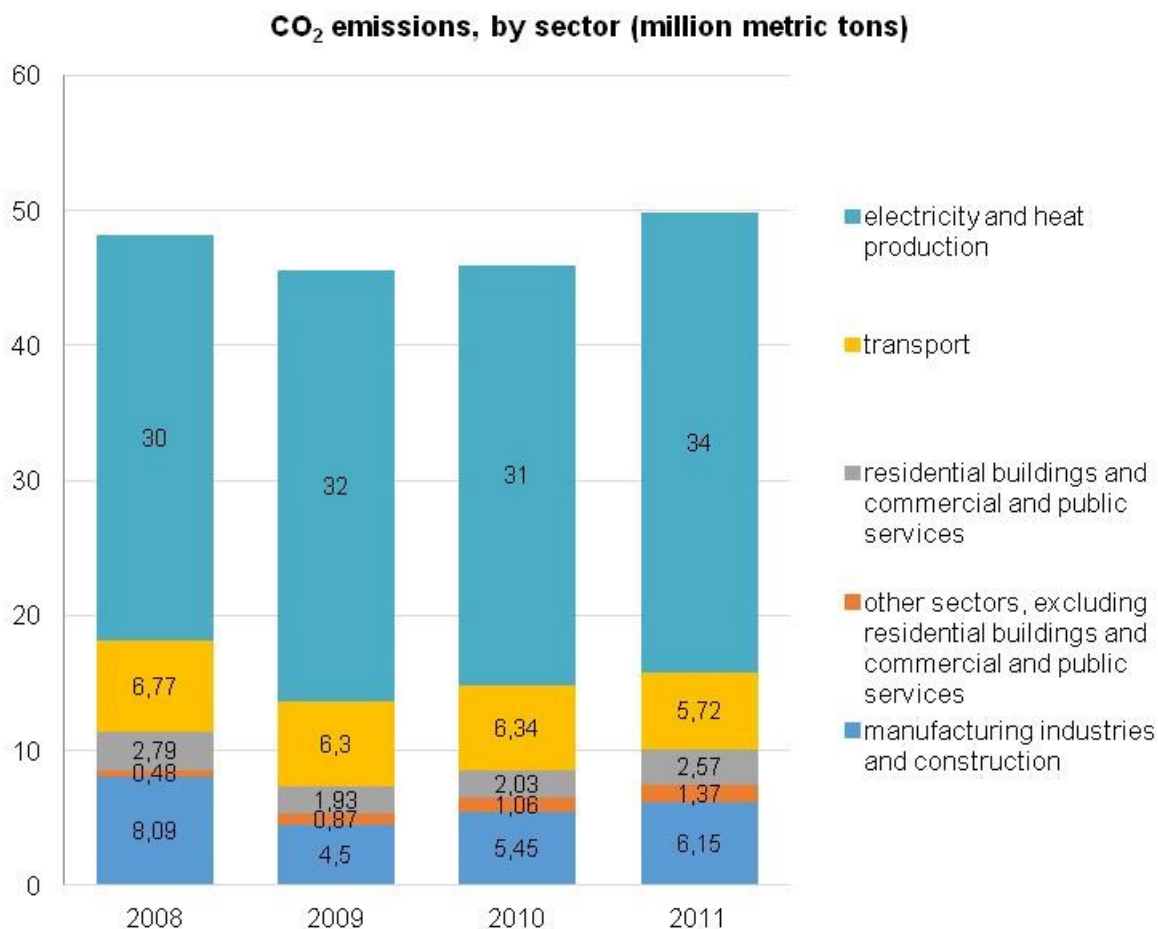


Figure 13: CO₂ emissions by sector (million metric tons)

Source: Worldbank (2012) <http://databank.worldbank.org/data/views/reports/tableview.aspx#>

Figure 13 provides an overview of the development of CO₂ emissions per sector. The latest figures for CO₂ emissions by sector in Serbia compiled by UNEP and published in 2013 are shown in Table 4. The largest share of CO₂ emissions is attributable to electricity and heat production (30.93 million metric tons (mmt)), which is almost five times more than the emissions from transportation (6.47 mmt) or manufacturing and construction (5.53 mmt).

Table 4: CO₂ Emissions by sector in Serbia

Source: UNEP, Green Economy Scoping Study: Serbia, 2013

Sector	Emissions (million metric tons CO ₂)
Electricity and Heat Production	30.93
Gaseous fuel consumption	0.32*
Liquid fuel consumption	1.03*
Solid fuel consumption	3.13*
Manufacturing and construction	5.53
Residential buildings and commercial and public services	2.04
Transport	6.47
Other sectors	1.07
Agriculture (methane and nitrous oxide)	0.89
Total (est.)	~50

The Report on the status of the environment of the Republic of Serbia for 2012 by the Ministry of Energy, Development and Environment attributes this decrease in GHG emissions to the decrease in industrial production. The most significant amounts of sulphur oxides emitted in 2012 originated from thermal power plants, metal production and processing plants, and the food and chemical industries.

4.5 Energy efficiency Overview

The Republic of Serbia is a signatory to the contract on the establishment of the **Energy Community**, and a party thereof. Thus, it is bound by the aim of realising a 9% average savings of final energy consumption for the period from 2001 to 2005 in the ninth year of the application of the Directive (2018). Overall savings targets are shown in the below table.

Table 5: Planned energy savings according to NEEAP 2 (PJ)

Source: National EE Action Plan 2

Sector	Planned savings by 2018 in PJ	Share in savings %
Households, public, and commercial	11.50	36.51
Industrial	11.17	35.46
Transportation	8.82	28.03
Total	31.5	100

The stipulated measures in NEEAP 2 and the Energy Strategy of the Republic of Serbia should lead to savings in the final energy consumption as given below:

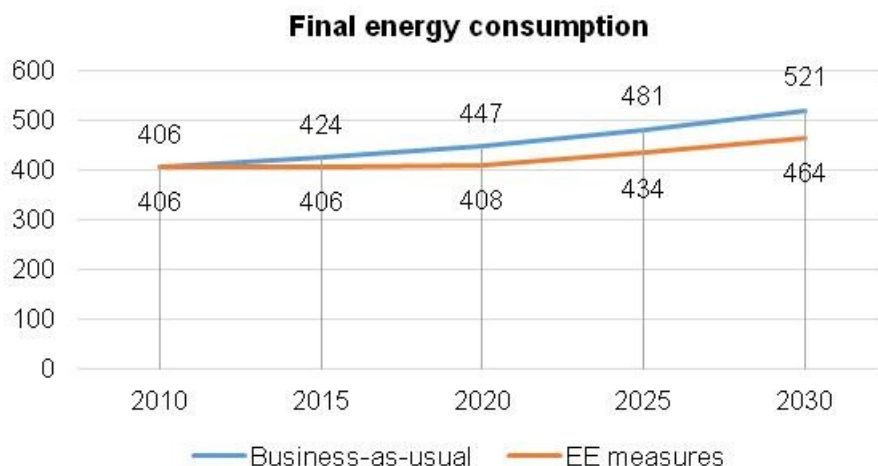


Figure 14: Final Energy Consumption
 Source: Energy Strategy of the Republic of Serbia

The estimated final energy consumption increases in both scenarios due to economic growth. Compared to 2010, TFC is expected to increase by 10% in the BAU case and by only 0.5% if EE measures are applied until 2020; until 2030, the TFC increase would amount to 28% in the BAU case and 14% in the energy efficiency scenario.

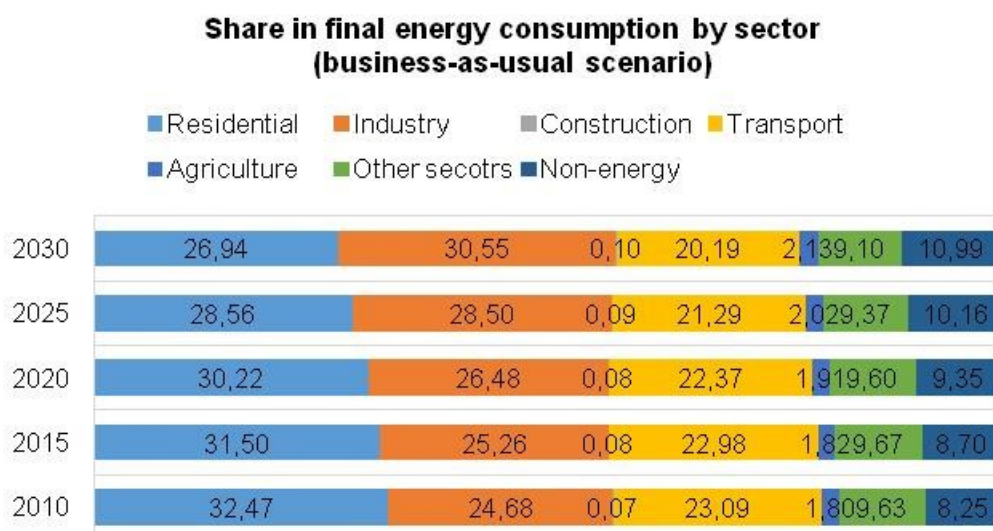


Figure 15: Share of Final Energy Consumption by Sector (BAU scenario)
 Source: Energy Strategy of the Republic of Serbia

It is expected that the structure of the TFC will change, with a decreasing share of the residential sector and an increase of the industrial sector.

According to the Energy Strategy, the full application of EE measures could lead to a 7.2% decrease in the residential sector (10 PJ in 2030), an 11% decrease in the industrial sector (17.21 PJ in 2030), and a 19% decrease in the transportation sector (20.43 PJ in 2030), compared to the same year in the business-as-usual scenario.

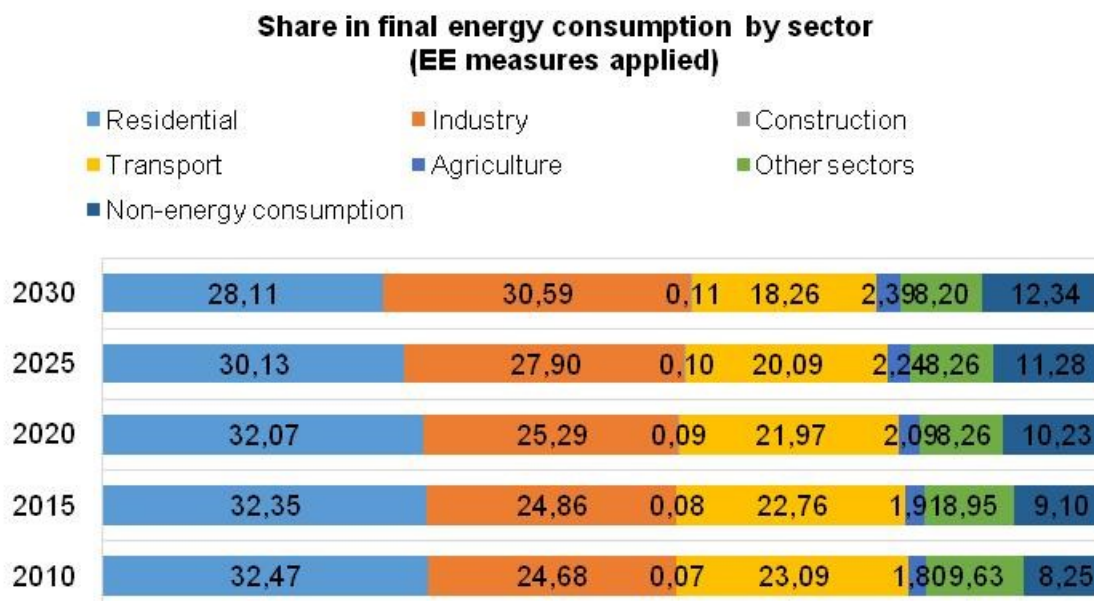


Figure 16: Share of Final Energy Consumption by Sector (EE measures applied)

Source: Energy Strategy of the Republic of Serbia

4.6 Energy efficiency in the industrial sector

The Energy Strategy of RS states that a decrease of 15-25% in the energy consumption of the industrial sector by 2025 is possible by improving the combustion process, using waste thermal energy from technical processes, changing engines, and introducing regulations and measures of energy management.

The NEEAP II stipulates those measures and respective savings:

- Using waste heat – the estimate by the NEEAP is that this measure alone could save more than 20% of the necessary heat in technological processes
- Through improved control and regulation, as well as exchanging the old 4,000 MW engines with new, more efficient ones, 5 – 10 % of energy consumption could be saved
- Energy integration of the production processes, especially in the chemical sector, could improve efficiency by 5%

The physical volume of industrial production in 2014 shows a decline of 6.5% - even higher in the mining (16.7%) and energy (20.1%) sectors. The manufacturing industry shows a decline of 1.4%. Growth in production and exports was recorded in 2014 in the **largest and most important sector of the manufacturing industry – the production of food** (its share of total manufacturing industry consumption is 23.6%) which recorded growth of 4.4%.

So far, most industrial enterprises have not applied the concepts of Best Available Techniques (BAT) and Best Practices for the Environment (BPE), which are the basis to be awarded the integrated environmental permit. Based on the preliminary list of Integrated Pollution Prevention and Control (IPPC) installations for which the integrated permit is issued, there are 182 plants in Serbia which have been identified as eligible for IPPC permit. 29 of which are in the energy sector, 26 in the production and processing of metals, 36 in the mineral industry, 19 in the chemical industry, four plants for waste management, and 68 plants from other activities (paper, textiles, leather, food processing, poultry, and pig farming). Given that all companies that do not meet European regulations on environmental protection (in accordance with their commitments) should be closed, insufficient implementation of BAT represents a major problem.

As defined in Article 9 of the IPPC Law, one of the necessary documents that operators must submit with the application for an integrated permit is an energy efficiency plan. There are no rules on the structure of the energy efficiency plan, but in general it should include necessary data and information on the type of energy and consumption, performed measurements, specific energy consumption and targets, comparison of specific energy consumption in the company within one period (usually for the last 3 years) and comparison with BAT levels, procedures for regulatory checking of equipment, etc. Plans should also include a description of energy efficiency measures applicable to their production sector and general measures related to auxiliary facilities (such as boiler houses, compressor stations, cooling systems, etc).

The following table summarises relative size and savings potential of industrial sub-sectors in Serbia.

Table 6: Industrial sectors with greatest energy savings potentials

Source: energy consumption based on IEA statistics. Savings potential: based on CEEFOR's expertise and realized projects

Industrial Sub Sector	Percentage of Industrial Energy Consumption (%)	Estimated Energy Saving (technical potential) (%)	Energy Saving Potential on whole Industrial Energy Consumption (%)
Iron and steel, basic metals	6.4	12	0.768
Chemicals, oil, rubber, plastics	12	30	3.6
Non-metallic minerals (cement, ceramic, glass)	19	25	4.75
Non-ferrous metals	2	15	0.3
Food	28.6	35	10
Textile, clothing, leather	1.4	40	0.56
Machinery	10.73	25	2.68
Mining	3.74	15	0.561
Wood	0.2	30	0.06
Construction	2.5	15	0.375
Paper, pulp, print	4.33	30	1.3

Sub-Sectors with the **highest energy consumption shares** are:

- Food
- Machinery
- Chemicals
- Paper.

The highest savings potentials can be expected in the food industry, followed by machinery and paper. Biggest potentials in terms of percentile reductions can be found in the textile industry, followed by the food industry (dairy and ice-cream, confectionary and biscuit, edible oils and breweries). However, the textile industry is neither so big, nor does it have such a high energy demand than other subsectors.

Due to the importance of the food industry for energy efficiency efforts, details for this sub-industry are presented here.

The dairy industry is characterised by simultaneous use of both electrical and thermal energy. Thus, up to 60% of electricity is used for cooling. Specific energy consumption (amount of energy used to produce one ton of recycled milk) differs greatly among different companies, depending on the product mix, enterprise workload performance, and technical condition of the equipment. In dairy production, cost expenditures for energy in the European Union is around 0.8-2%. In order to reduce power consumption and consequently the cost of dairy products, more efficient alternative energy technology is required. Currently, cogeneration and trigeneration are the most effective technologies to produce

thermal and electric energy from fossil fuels. Today, cogeneration systems based on gas piston engines have the highest conversion efficiency in turning fuel energy into electricity. For example, in modern installations of General Electric Jenbacher (world leader in the manufacture of piston engines and power plants), electrical efficiency (efficiency) is 43%, but with heat recovery, the rate of fuel consumption reaches 90%.

Primary production is extremely fragmented in the region, leading to high costs of production, collection, and quality control. Productivity per cow is slowly increasing in all countries; however, the milk production per cow is still 50% below the EU average. Local dairies are often relatively small. During recent years, restructuring has been observed in this subsector, with more and more international companies taking over local dairies, e.g. Meggle, Danone, and Lactalis (GFA 1010: South Eastern Europe).

Serbia produces about 1.5 billion litres of milk per year, which is 1% of European production.

Beer production requires significant amounts of energy. Energy is needed for all intermediate stages of production and bottling of the finished drink. Electrical, thermal, and compressed air energy are used in production.

Thermal energy in beer production is required to prepare hot water, heat dryers, heat mash and boil wort with hops, wash bottles, bottle beer, pasteurise beer in a stream and tunnel pasteuriser, wash equipment, steam filters and pouring devices, pipe liquid, and heat buildings and ancillary facilities. Thermal energy consumption in beer production makes up for a significant share of production costs of breweries and an important factor for cost optimization. Most breweries possess the following power equipment: steam boiler units and refrigeration equipment. In general, boiler equipment has substantial requirements for water, namely the greatest attention is paid to the hardness, the content of carbon dioxide, oxygen, pH level, the presence of silica, and total iron.

The total capacity of Serbian breweries is about 6.5 million hectolitres per year. Consumption of beer in Serbia in the last 7-8 years has varied from 60 to 80 litres per capita. In 2010, Serbia adopted a law on beer, becoming the only country in South Eastern Europe which has such a legal document regulating the manufacture, packaging, labelling, and quality of beer.

Malted barley and hops are the primary raw materials in beer production. The largest domestic beer producers in Serbia are subsidiaries of large multinational companies. Changes in ownership and industry privatisation after 2004 caused Serbia to adopt global brands in the premium beer segment, which opened the door wide to world markets. To produce quality beer, the quality of raw materials had to be adapted to global standards and raw materials of adequate quality were imported. Global quality standards have nearly made malted barley from Serbian plowed land irrelevant, while the production of hops in Serbia is also negligible.

Other food production Daily washing and blanching processes account for the majority of energy consumption in this sector. While the blanching process is energy intensive by nature, the daily process of cleaning machinery, processing equipment, vessels, and facilities could be optimised. Freezing equipment is the main electricity consumer, and it provides cold for freezing vegetables, ice cream and pastries, as well as for storage. This system uses the ammonia refrigeration cycle, with a large number of compressors that consume large amounts of electricity. Moreover, the waste heat of the compressors is not recovered.

Sunflower, soy, and rapeseed oil are predominantly used in vegetable oil production in Serbia. Sunflower production in 2012 enabled the manufacture of 130,000 to 150,000 tons of edible oil. Annual consumption of edible oil in Serbia is about 100,000 tons.

4.7 Energy efficiency in the residential sector

The current population of the Republic of Serbia totals 7,146,759 (January 2014, Statistical Office). The overall population growth rate for the period 2010 – 2015 forecasted by the UN Statistics Department is negative 0.5%, while the urban population growth rate for the same period is estimated at 0.5%. There are 2,487,886 households in Serbia.

Households have a **steady share of around one third of final energy consumption (381 PJ - 2013)**, of which **two thirds is used for space heating**. In order to achieve EE Targets for this sector, two measures are most important:

- **Thermal insulation** of buildings: the residential buildings constructed in the 1970s and 1980s are characterised by a considerable share of energy consumption, especially for heating. It is estimated that for heating and sanitary hot water, the average energy consumption is 220 kWh/m². Depending on the extent of refurbishments, 25%-70% of heating energy could be saved. All new buildings have to comply with the energy grade “C” or a maximum of 75 kWh/m².
- **District heating**: Around 21% of households are connected to the district heating systems in Serbia, and a majority of them are located in Belgrade and Novi Sad (over 50% of households). The average age of this heating capacity is around 25 years, making the revitalisation and modernisation a priority in this sector. The targeted shift of the energy makeup in this sector is aimed at decreasing the share of coal and oil derivatives, and increasing the share of biomass and natural gas.

Currently, the system of payment is based on m² of the estimated heating surface. The Energy Strategy of the Republic of Serbia and the Law on Energy Efficiency stipulated that the heat metering and payment system to be delivered will be introduced by 2015, however only Subotica, Šabac, Bečej, Sombor, Čačak, Niš, and Pirot have implemented this system, while in Belgrade only 3% of the households have this system of payment per cubic meter.

Heating is realised from the following sources (Source: Statistical office of the Republic of Serbia, 2013):

District central heating	21.2%
Electricity	10.5%
Wood, pellets, coal	56.1%
Liquid fuels	0.1%
Combinations	6.6%
Gas	5.5%

Current practices of using low-efficiency wood-burning appliances and burning higher quality wood that could be used in other industrial processes have to be seen critically from an energy efficiency point of view. However, the share of poorest households using firewood for generation of heat is 90%.

According to the Agency for Energy, it takes around 9,000 kWh of energy to heat an average apartment for one season. The table below shows the annual cost of providing this energy from different sources, depending on the efficiency of the furnace and price. The highest energy costs are expected for households that use heating oil, propane, butane gas, and electricity. Heating with natural gas is two to three times cheaper. Similar costs can be expected for households using pellets if they are burned in furnaces designed for this fuel, as well as citizens who use firewood for the price of 48 EUR/m³ and have low efficiency furnaces.

The cheapest heating solution is biomass heating for those households, which have access to wood in areas of Serbia where it is cheaper (eg. 33 EUR per m³); especially if they own a newer furnace with approximately 70% efficiency.

Table 7: Estimation of heating cost for 2014/2015 heating season in households (EUR)

Source: AERS

	Furnace efficiency %	Quant.	Unit	Price per unit EUR/unit	Total EUR
Wood, cheaper	70	7.7	m ³	33.24	255.95
Wood, more expensive	55	9.7	m ³	48.2	467.54
Pellets	80	2.5	t	181.17	452.93
Coal raw lignite	55	6.4	t	55.68	356.35
Coal dry "Vreoci"	55	3.4	t	102.22	347.55
Coal "Banovići"	55	3.2	t	118.84	380.29
Natural gas	90	1080	m ³	0.43	464.40
Propane butane	85	829	kg	1.25	1,036.25
Oil	80	1149	lit	1.51	1,734.99
Electricity (thermo-accumulative units) - night work	91	9900	kWh	0.033	327.43
Electricity (thermo-accumulative units) – supplementary heating by day	93	9720	kWh	0.049	474.53
Electricity – heating units and boilers	100	9000	kWh	0.099	888.39

Households using electricity, oil, or propane butane for heating have the highest motivation to shift to other energy sources, such as wood, pellets, or natural gas. In Vojvodina, where wood is more expensive than in Central and Southern Serbia, households with furnaces of lower efficiency will also benefit from upgrading equipment and thus lowering their heating costs by using less wood. Generally, investments to improve the energy efficiency of buildings and purchase more efficient stoves, lower costs and can be considered cost-effective.

Also, the Impact assessment study of the energy efficiency directive (Decision Ware Group for the Energy community, 2013) emphasizes the importance of high-efficiency space heating and cooling, with high-efficiency water heaters and thermal insulation as the most cost-effective measures to pursue in the residential sector. Additionally, heat pump technology and residential building insulation are singled out as priority areas for incentives.

4.8 Energy efficiency in the agricultural sector

In autumn 2014, total agricultural area in Serbia amounted to 730,790 ha, of which wheat represented the largest share. In agricultural production, energy and lubricants account for 12% of the price of agricultural outputs.

Serbia has very favourable natural conditions for the development of diversified agriculture: crops, industrial crops, grapes, fruits and vegetables, seeds and seedlings, herbs, oxen, and sheep. The development of primary agricultural production enabled the development of the food industry: confectionery, industrial oils, sugar, beer, juice, vegetable processing, flour, meat, and others.

Publicly available reports do not contain an updated value of the above-mentioned energy efficiency potential, or a description of specific EE measures and their savings potentials. However, typical EE measures within the agricultural sector are:

- processing equipment
- efficient refrigeration
- thermal insulation for storage facilities
- efficient irrigation systems.

4.9 Energy efficiency of MSMEs

MSMEs constitute 99.8% of the total number of business entities, generate about 2/3 of employment and turnover, 54.1% of gross value added and accounted for 43.2% of exports of the non-financial sector. It is estimated that in 2013 the MSME sector accounted for about 34% of GDP in the Republic of Serbia (source: Ministry of Economy, Report on SMEs for 2013).

The definition of micro, small and medium enterprises is provided by the new Law on Accounting and Auditing, which was adopted on July 2013. The Law defines Micro Enterprises as firms not exceeding two of the following criteria:

- average number of employees is 10;
- gross income of EUR 700,000;
- average value of total assets EUR 350,000.

Small Enterprises are legal entities which exceed the two previously defined criteria but do not exceed two of the following criteria:

- average number of employees is 50;
- gross income of EUR 8,800,000;
- average value of total assets EUR 4,400,000.

And the Medium Enterprises are defined as legal entities which exceed the two previously defined criteria but do not exceed two of the following criteria:

- average number of employees is 250;
- gross income of EUR 35,000,000;
- average value of total assets EUR 17,500,000.

In terms of size and structure of MSMEs, most of them are micro enterprises and entrepreneurs, which account for 96.3% of the total number of MSMEs. The low average number of just 2.4 employees per business entity marks a weak starting point for the improvement of competitiveness, achieving economies of scale and entering new markets.

The sectoral concentration of MSMEs has not changed significantly over the years: every third company or entrepreneur from the MSME sector operates in the **wholesale and retail trade, followed by services and manufacturing industry.**

MSMEs are **concentrated in labor-intensive and service industries** with faster capital turnover and shorter production cycle, so that about 2/3 of the profits are realized in the wholesale and retail trade (30.4%), manufacturing (26.3%) and construction (9.0%) sector.

Within manufacturing, medium enterprises dominate the 16 subsectors and generate 54.1% of the profits of MSMEs. The most profitable micro enterprises come from **clothes production**, and **repair and installation of machinery and equipment**. The most profitable small enterprises come from the **wood** and **wood production** and electrical equipment. The most profitable medium enterprises belong to **food and beverage** production, **leather, metal, basic pharmaceuticals, motor vehicles** and trailers.

As there is no specific data on energy efficiency potential of MSMEs in Serbia, it can be concluded that the estimations on energy efficiency potentials of the above mentioned sub-sectors also refer to industrial MSMEs.

5 Energy Efficiency Framework

In terms of legal and institutional framework, the harmonisation in the energy sector is positively assessed by the Energy Community Secretariat in terms of the Second and the Third regulatory packages, full implementation of which is expected in 2015. The preparations to unbundle the public companies Srbijagas and EPS is underway.

In terms of economic framework, the liberalisation of the natural gas and electricity markets are the highlights, in accordance with the Law on energy. Since January 1st 2015, besides the full liberalization of the electrical energy market, which came into effect on that date, the gas market began to liberalize, starting with the large consumers. Households and small consumers shall be entitled to the guaranteed gas supply until 2016, when they shall be able to choose their suppliers on the fully liberalized market.

5.1 Legal and policy framework

The following table provides an overview of the current energy and EE policies in Serbia:

Table 8: Energy and EE laws and policies

2004	Law on Environmental Impact Assessment 135/04
	Law on Environmental Protection 135/04
	Law on Integrated Environmental Pollution Prevention and Control 135/04
	Law on Strategic Environmental Impact Assessment 135/04
	Energy Law 84/04
	Law on integrated prevention and control of pollution of environment ("Official Gazette of the RoS", No.135/04)
2005	Energy Sector Development Strategy of the Republic of Serbia until 2015. ("Official Gazette of the RoS", No. 44/05)
2006	Law on Ratification of the Treaty Establishing Energy Community between the European Community and the Republic of Albania, Republic of Bulgaria, Bosnia and Herzegovina, Republic of Croatia, Former Yugoslav Republic of Macedonia, Republic of Montenegro, Romania, Republic of Serbia and United Nation Interim Administration Mission on Kosovo in compliance with the Resolution 1244 of the UN Security Council ("Official Gazette of the RoS" No. 62/06)".
	Forestry Development Strategy of the Republic of Serbia Forests ("Official Gayette of the RoS" No. 59/06
2008	National Strategy of Sustainable Development ("Official Gazette of the RoS", No. 57/08)
2009	Law on Environmental Protection 36/09
	Law on Planning and Construction 72/09
	Law on ratification of the Kyoto Protocol ("Official Gazette of the RoS", No. 88/07 and 38/09)
	Strategy for Cleaner Production in the Republic of Serbia ("Official Gazette of the RoS", No. 17/09)
	Law on Protection of Air („Official Gazette of the RoS", broj 36/09)
2010	Law on Waste Management („Official Gazette of the RoS ", No. 36/09 and 88/10)
	Strategy of the Science and Technological Development of the Republic of Serbia for the period from 2010 to 2015 ("Official Gazette of the RoS", No. 13/10)
	Law on Environmental Impact Assessment ("Official Gazette of the RoS", No.135/04 and 88/10)
	Law on Strategic Environmental Impact Assessment („Official Gazette of the RoS", No.135/04 and 88/10)
	Law on Protection of Nature ("Official Gazette of the RoS", No. 36/09 and 88/10)
	Law on Waters ("Official Gazette of the RoS", No. 30/10)
2011	Law on Environmental Protection No 135/2004,36/2009, 36/2009 as amended, 72/2009 as amended, 43/2011

	Energy Law No 57/11
	Law on Planning and Construction 24/011
	Law on Mining and Geological Explorations ("Official Gazette of the RoS", No. 88/11)
	Law on private-public partnership and concessions ("Official Gazette of the RoS", No. 88/11)
2012	Energy Law ("Official Gazette of the RoS", No. 57/11, 80/11 – correction, 93/12 и 124/12)
	Strategy of sustainable use of natural resources and assets ("Official Gazette of the RoS", No. 33/12)
	Law on Forests ("Official Gazette of the RoS" No. 30/10 and 93/12)
2013	Law on Rational Use of Energy ("Official Gayette of the RoS" No. 25/13)
	Law on Incentives in Agriculture and Rural Development ("Official Gazette of the RoS", No. 10/13)
2014	Energy Law No 145/2014
	Law on planning and construction 72/2009, 81/2009 corrected, 64/2010 – decision of the Constitutional Court, 24/2011, 121/2012, 42/2013 – decision of the Constitutional Court, 50/2013 – decision of the Constitutional Court, 98/2013 – decision of the Constitutional Court; 132/2014)

Table 9: Secondary regulations and by-laws

The secondary regulations and by-laws of the EE Law	
2005	Decree on the kinds of activities and facilities for which the integrated permit is issued("Official Gazette of the RoS", No. 84/05)
2006	Rulebook on technical and other requirements for liquid fuels of bioorigin ("Official Journal of the Serbia and Montenegro" No. 26/06)
2008	Decree on establishing the list of projects for which EIA is mandatory and the list of projects for which the EIA may be requested ("Official Gazette of the RoS", No. 114/08)
2009	Energy Sector Development Strategy Implementation Programme of the Republic of Serbia until 2015 for the period 2007 -2012. ("Official Gazette of the RoS", No. 99/09)
2010	The First Action Plan for Energy Efficiency of the Republic of Serbia for the period from 2010 to 2012
2010	National Program of Environmental Protection ("Official Gazette of the RoS", No. 12/10)
2010	Rulebook on categories, testing and classification of waste ("Official Gazette of the RoS", No. 56/10)
2010	Rulebook on conditions and manner of collection, transport, storing and treatment of waste used as secondary raw material or for producing energy("Official Gazette of the RoS", No. 98/10)
2010	Decree on the types of waste for which heat treatment is to be performed, conditions and criteria for determining the location, technical and technological conditions for designing, construction, equipping and operation of installations for heat treatment of waste and handling of residues after combustion ("Official Gazette of the RoS", No. 102/10)
2010	Rulebook on conditions, manner and procedure of management of waste oils ("Official Gazette of the RoS", No. 71/10)
2010	Decree on limit values of emissions of polluting matters into the air ("Official Gazette of the RoS", No. 71/10)
2010	Action plan for biomass 2010-2012. ("Official Gazette of the RoS", No. 56/10)
2010	Rulebook on the content and the template of the application for issuance of water-related acts and the contents of opinions within the procedure of issuance of water conditions ("Official Gazette of the RoS", No. 74/10)
2011	Rulebook on Energy Efficiency in Buildings No. 61/11
2011	Action plan for the implementation of the national strategy of sustainable development for the period from 2011 to 2017 ("Official Gazette of the RoS", No. 62/11)
2012	Rulebook on conditions, content and manner of issuing certificates on the energy performance of buildings No. 69/12
	Decree on incentive measures for privileged Power Producers
2012	Decision 2012/04/MC - EnC on the implementation of Directive 2009/28/EC and amending Article 20 of the Energy Community Treaty
2012	Decree in Conditions and procedure for Aquiring the Status for Privileged Producers
2012	Decree on protection regimes ("Official Gazette of the RoS", No. 31/12)
2013	NATIONAL RENEWABLE ENERGY ACTION PLAN OF THE REPUBLIC OF SERBIA (In accordance with the template foreseen in the Directive 2008/29/EC- Decision 2009/548/EC)

2013	Decree on conditions and procedure for acquiring the status of privileged power producer ("Official Gazette of the RoS", No. 8/13)
2013	Decree on incentive measures for privileged power producers ("Official Gazette of the RoS", No. 8/13)
2013	Decree on the method of calculation and allocation of funds collected for the purpose of incentive remunerations for privileged power producers ("Official Gazette of the RoS", No. 8/13)
2013	Decree on the amount of special feed -in tariff in 2013. ("Official Gazette of the RoS", No. 8/13)
2013	Decree on the method of determining the highest and lowest average price of thermal energy („Official Gazette RS", No. 37/2013)
2013	The Second Action Plan for Energy Efficiency of the Republic of Serbia for the period from 2013 to 2015 No. 98/13
2013	Rulebook on detailed conditions for the issuing of energy permit, content and procedure of issuing energy permits, as well as on the conditions for approval of energy facilities for which the Energy Permit is not issued No. 60/13
2013	By-Law on the types of products that affect energy consumption for which labelling of energy consumption and other resources is necessary No 92/13
2014	By-Law on the Amount of Fee for Incentive in 2014.
2014	By-Law on conditions and procedure of acquiring the status of privileged producers of electrical energy No. 8/13, 70/14
2014	Rulebook on the guarantee of the origin of the electrical energy produced from renewable energy sources No 24/14
2014	By-Law on the Determination Program of Financing Activities and Measures of Improving Efficient Use of Energy in 2014 No 4/14, 27/14
2014	Rulebook on conditions for the allocation and use of funds of the Budget Fund for the improving of energy efficiency of the Republic of Serbia and the criteria for the exemption from the obligation of carrying out an energy audit No 08/14
2014	The decision on the allocation of the funds from the Budget Fund for Improving of Energy Efficiency of the Republic of Serbia No. 401-00-393 / 2014-06
2014	Decision of the amending and supplementing the Decision of the Minister of Energy, on Development and Environmental Protection No 312-01-372/2014-04
2014	Energy Balance of the Republic of Serbia for 2014
2014	Rulebook on labelling energy efficiency for dishwasher in the household No 24/14
2014	Rulebook on labelling energy efficiency for washing machines in the household No 24/14
2014	Rulebook on labelling energy efficiency for electric oven No 24/14
2014	Rulebook on labelling energy efficiency for electric light bulbs and lamps No 24/14
2014	Rulebook on labelling energy efficiency for refrigeration appliances in the household No 17/14
2014	Rulebook on labelling energy efficiency for TV set No 24/14
2014	Rulebook on labelling energy efficiency for air conditioning No 24/14
2015	The rulebook on energy permits No 15/15
2015	Rulebook on the establishing of the free capacity increased for the value of the installed capacity of power plants for which the temporary status of privileged producer has stopped No 24/15

* Please note that important EE regulations are marked by bold letters.

5.2 Summary Information on the Key Laws and Policies:

Law on the Efficient Use of Energy – This law regulates the conditions and manner of the efficient use of energy and energy sources in production, transmission, distribution, and consumption of energy; policies of efficient use of energy; energy management systems; labelling the level of energy efficiency for products which affect energy consumption; minimal requirements of energy efficiency in production, transmission, and distribution of electrical energy and heat energy and delivery of natural gas; funding, incentives, and other measures in this area, as well as other important issues concerning rights and obligations of natural and legal persons concerning the efficient use of energy.

Energy Law -The present Law regulates energy policy objectives and the method of their implementation, conditions for a reliable, secure, and quality supply of energy and energy-generating products, conditions for safe supply to customers, conditions for the protection of energy and customers of energy-generating products, conditions and manner of performing energy-related

activities, conditions for the construction of new energy facilities, the status and scope of activities of the Energy Agency of the Republic of Serbia, the use of renewable energy sources, incentive measures, and guarantee of origin, the manner of organising and functioning of the electricity, natural gas, oil, and oil derivatives market, rights and obligations of market participants, establishment of ownership over system operator networks, as well as monitoring of this law's implementation. This Law shall regulate the generation, distribution, and supply of thermal energy as an energy-related activity.

Law on Planning and Construction – This law regulates the conditions and manner of spatial planning, development, and the use of construction land and building of facilities; monitoring the implementation of the provisions of this Act and inspection; other important issues that are relevant for spatial planning, development, and use of construction land and for building of facilities. The Law on planning and construction includes the field of energy efficiency in the building of facilities. Improvement of energy efficiency is done through the reduction of all types of energy consumption, savings of energy, and providing sustainable construction by applying technical measures, standards, and requirements for planning, designing, construction, and the use of buildings and space.

There are two important documents regarding the EE sector in Serbia. The first is The Energy Development Strategy of the Republic of Serbia by 2015, approved in 2005, and the other is the National Renewable Energy Action Plan, approved in 2013. These documents define government preferences and approach to energy policy. Drafting of a new Energy Development Strategy of the Republic of Serbia for the period until 2025 with projections until 2030 is in development. There are also some other decrees, rulebooks, laws, and strategies that are planned, but still haven't been drafted. They are: Decree/Recommendation on conditions for obtaining the status of privileged heat producer, Decree /Recommendation on Incentives for the production of heat from RES, Decree on mandatory placing of a certain percentage of biofuel on the market, Decree on sustainability criteria for biofuels, Rulebook on licenses, Rulebook on incentives for growing raw materials and production of biofuel, Rulebook on the Guarantee of Origin for the production of energy from RES, the Law on renewable energy sources, Strategy of Water Management in the Republic of Serbia, and Legislation on the system of fuel quality monitoring.

The Energy Development Strategy of the Republic of Serbia by 2015 – is the document made to recommend the basic objectives of new energy policy, according to the adopted Energy Law, to the Government/ Parliament of the Republic of Serbia; as well as to determine priority directions for development in the energy sector and to approve the program to adopt appropriate instruments, which enable the realisation of key work priorities; business and development of the whole energy system (in the production and energy consumption) of Serbia. The basic premise in determining goals, priorities, and appropriate instruments is based on the country's political orientation in terms of rational harmonisation and development of the energy resources and considered the commercial and economic development of the country and its integration into Europe.

National Renewable Energy Action Plan (NREAP) is the document setting the targets of use of renewable energy sources until 2020, as well as the manner of their achievement. Among other things, its aim is to enhance investment into the field of renewable energy sources.

Preparation of the NREAP in the presented form of questions and answers resulted from the international commitment undertaken by the Republic of Serbia in 2006, by the "Law on Ratification of the Treaty Establishing Energy Community between the European Community and the Republic of Albania, Republic of Bulgaria, Bosnia and Herzegovina, Republic of Croatia, Former Yugoslav Republic of Macedonia, Republic of Montenegro, Romania, Republic of Serbia and United Nation Interim Administration Mission on Kosovo in compliance with the Resolution 1244 of the UN Security Council ("Official Gazette of the RoS" No. 62/06)".

In addition, the increase of energy efficiency is a key task in achieving the 20% improvement in energy efficiency before 2020 at the EU level. The Directive envisages that every EU member country prepares its NREAP in line with the adopted template for the preparation of that document (Decision 2009/548/EC). The National Action Plan sets national goals for the share of energy sourced from RES in the transportation, electricity, and heating and cooling sectors before 2020, taking into account effects of energy efficiency measures on GTFC. National goals and the plan to utilise the renewable energy sources of the Republic of Serbia were set by the Energy Law ("Official Gazette of the RoS", No. 57/11, 80/11 – correction and 93/12), Chapter VI-Energy from RES and incentives, title 1. National goals and the plan of utilisation of RES. Thus, among other things, Article 52 of the Law envisages that the Government, on the proposal of the Ministry in charge of energy, shall prepare the National Action Plan, which sets targets for the use of RES for a period of 10 years minimum. Targets are set on the basis of energy needs, economic capabilities, and commitments of the Republic of Serbia undertaken in ratified international agreements.

According to the Decision on setting the Energy Balance of the Republic of Serbia for 2013 ("Official Gazette of the RoS" No. 122/12), the dependence of Serbia on energy imports in 2011 amounted to 30.28%. In the future, the most important task for the Republic of Serbia will be to provide a safe, quality, and reliable supply of energy and energy sources, and reduce the energy dependence of the country.

5.3 Public Support System (Incentives)

The Law on the efficient use of energy provides the establishment of the Budget Fund for energy efficiency that will represent an efficient way to collect and place funds in order to finance or co-finance projects, programmes, and activities aimed at efficient energy use. The Fund was established at the end of 2014. At the moment, the right to file an application is limited to local municipalities. In allocating resources, priority will be given to the projects of local municipalities in devastated areas. Projects concerning modernisation of public lighting are financed up to 30% of the total available funds. The Ministry of mining and energy has announced the first public call to allocate funds from the Budget Fund. The subject of the Public Call is to fund projects for improvement of energy efficiency that are specified in Article 4 of the Rulebook on conditions for the allocation and use of funds of the Budget Fund to improve the energy efficiency of the Republic of Serbia and the criteria for the exemption from the obligation of carrying out an energy audit No 08/14.

The maximum amount of funds per project that is paid out of the Budget Fund to improve energy efficiency is as follows:

- Up to 100%, that is 149.6 million EUR, for projects in local municipalities that are in devastated areas;
- Up to 70%, that is 124.7 million EUR, for projects in other local municipalities.

The maximum amount of funds that is paid out of the Budget Fund per project for improvement of public lighting can amount to 20% of the total value of the project that is 16.6 million EUR.

The conditions of minimum energy savings according to the category of projects are:

- Improvement of the thermal envelope – minimum 20% compared to the annual energy consumption for heating;
- Replacement of the heating system or part of it with a more efficient system – minimum 10% compared to the annual energy consumption for heating;
- Improvement that is modernisation of the interior lighting system – minimum 10% compared to the annual energy consumption;

- Improvement of the thermal envelope and energy systems through combined measures – minimum 30% compared to annual energy consumption for heating;
- Modernisation of public lighting system in cities and municipalities – minimum 20% compared to annual energy consumption;
- Insulation of solar collectors for heating domestic hot water – minimum 20% compared to the annual energy consumption for heating domestic hot water.

The minimum requirements for energy efficiency do not apply to projects for installing biomass boilers. The condition for project funding is that the simple pay-back period of the investment must be shorter or equal to 15 years.

Another key aspect of incentives are feed-in tariffs related to the purchase of produced electrical energy from renewable energy sources. The first regulation on feed-in tariffs in the Republic of Serbia was applied from January 2010 until 31 December 2012. In January 2013, the Government of Serbia adopted new regulation on incentive prices for the purchase of electricity produced from renewable sources. According to the new Energy Law adopted in December 2014, a new feed-in tariff regulation should be prepared by the end of 2015.

Table 10: Current feed-in tariffs

“P” stands for corrective factor and equals the price of the energy sources.

Plant Type with feed in tariff		Installed Power (MW) - P	Purchase Price (EURcent/kWh)
1.	Hydropower Plant		
1.1		≤ 0.2	12.40
1.2		0.2 – 0.5	13.727-6.633* P
1.3		0.5 – 1	10.41
1.4		1 – 10	10.747-0.337* P
1.5		10 – 30	7.38
1.6	On the existing infrastructure	≤30	5.9
2.	Biomass power plants		
2.1		≤ 1	13.26
2.2		1 – 10	13.82 – 0.56*P
2.3		> 10	8.22
3.	Biogas Power Plant		
3.1		≤ 0.2	15.66
3.2		0.2 – 1	16.498 – 4.188*P
3.3		> 1	12.31
3.4	On biogas from animal origin		12.31
4.	Landfill Gas Power Plant and gas from wastewater		6.91
5.	Wind Power Plants		9.20
6.	Solar Power Plants		
6.1		On the facility up to 0.03	20.66
6.2		On the facility 0.03 – 0.5	20.941 – 9.383*P
6.3		On land	16.25
7.	Geothermal Power Plants		
7.1		≤1	9.67
7.2		1 – 5	10.358-0.688*P
7.3		> 5	6.92
8.	Waste Power Plants		8.57
9.	CHP plants using coal	≤10	8.04
10.	CHP using natural gas	≤ 10	8.89

Currently, there are no further incentives available to private investors, nor to companies.

5.4 Technical framework

The Serbian market of energy efficient equipment and materials represents an emerging market. The Republic of Serbia imports a large percentage of energy-efficient equipment and materials from the European Union, the United States, and China. When it comes to domestic production and export, the percentage is negligible compared to imports. The variety of equipment and materials available to consumers is wide (very high variation of models and efficiencies as well as prices), and they often need support in deciding on the proper equipment.

The Serbian market of energy efficient equipment has a good assortment of: HVAC equipment (boilers and air-conditioning units), fuel preparation, or transportation facilities and equipment, heat exchangers, electro-drives, fuel solar water heaters, efficient windows and insulation materials, PV systems, efficient motors and pumps, LED technologies, etc. The majority of this equipment is imported, but the domestic production of energy efficient equipment and materials is in progress (industrial boilers- Minel, Kirka, Timcop, Alfa, heat exchangers - Termovent, climatisation units – Termovent, industrial heat pumps – Geotermika, Bosch, Viessmann, windows – Roloplast, and insulation materials - Knauf). Besides insulation materials there are energy efficient construction materials (thermobricks manufactured in Zorka opeka Novi Sad, panels made from recycled waste materials manufactured in Feplo, Cacak).

There are several companies producing PVC window frames. The market is well developed with a large number of distributors and installers. There are no producers of LEDs, but a very large number of companies assembling LEDs into final products.

High efficiency heat pumps (mainly water-to-water types) are becoming popular for heating and cooling demands. This equipment is replacing many boilers and electrical chillers used for area heating and cooling. This system is mainly used in public buildings because of its high investment costs. There are few companies currently involved in PV distribution. The biggest one is ABB. The market is very young due to the relatively high investment costs, regulatory difficulties in grid connections, and low feed-in-tariffs, until recently.

5.5 Economic framework

Indicative current prices of electricity and gas for the industrial and household sectors in Serbia, and the EU-28 as comparison, are shown in the tables below:

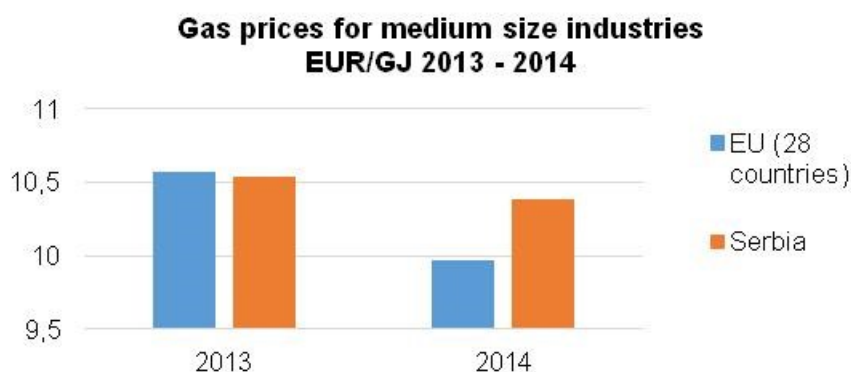


Figure 17: Gas price for medium size industries EU-28 & Serbia (EUR/GJ) 2013 – 2014
 Source: EUROSTAT

It is estimated that the consumption of natural gas will have an increasing long-term trend until 2030, which is significant in terms of the security of supply, since 80% of natural gas is imported.

Since 2008, all buyers of electrical energy, except households, can choose their supplier, however no changes occurred. Since January 1, 2013, as part of the liberalization of the electrical energy market, 10% of end-users could not any longer purchase electricity at regulated prices, but needed to buy the electricity at the liberalized market. This was further extended to include all end-users except households and small buyers. Finally, the market was fully liberated as of January 1st, 2015 for all end-users.

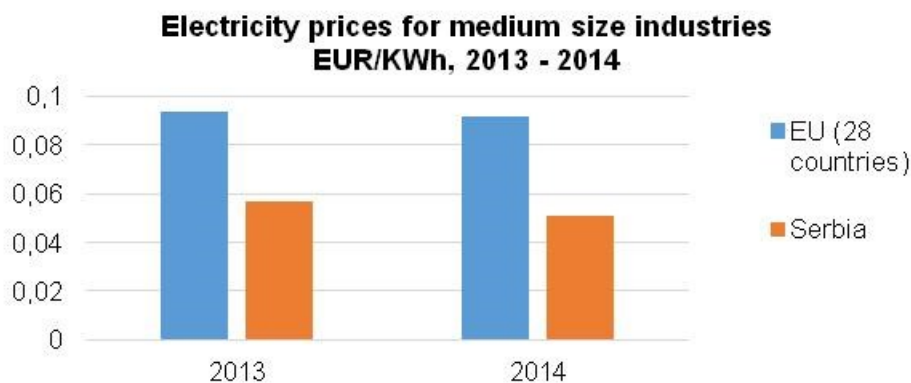


Figure 18: Electricity price for medium sized industry EU-28 & Serbia, 2013 – 2014

Source: EUROSTAT

The **price of coal** used in electricity production does not follow the market, but is rather determined by EPS. On the other hand, the price of coal of better quality, which is mostly imported, used in households **for heating purposes**, or in industry, is determined by the **prices on the world market**. The coal from Kolubara, Serbia (2,000 – 2,500 kcal) costs 49 EUR per ton, while “Vreoci” and “Obilić” (4150 kcal) cost 108 EUR. The imported coals from Bosnia and Herzegovina, such as “Breza” from Sarajevo (around 6200 kcal) cost 125 EUR, while the coal imported from Russia (6800 kcal) costs between 150 and 165 EUR.

Compared to the cost of other energy carriers for heating, coal is more expensive than cheaper firewood and electrical appliances working in night regime. All other sources of heat, such as natural gas, oil, quality firewood and pellet, as well as electricity if used during the day, are more expensive than coal.

Refer to the table below for the overview of the simple payback period for investment when exchanging equipment. These data are the result of the long-term experience and expertise of the Center for Energy Efficiency and Sustainable Development CEEFOR.

Table 11: Simple payback period for different project types

Source: Center for Energy Efficiency and Sustainable Development CEEFOR

Type of project	Simple pay-back period (years)	Remarks
Thermal insulation for high temperature equipment and utilities	0.5 – 1.5	Low payback period due to the very low investment costs and high operating hours.
VSD systems, high efficiency production machines, heat recovery for medium and high temperature heat sources	1 – 1.5	---
Co-generation of Heat and Power (CHP) and tri- generation systems	5 - 8	The relatively high cost of natural gas (compared to lignite) and the even higher cost of electricity are the main drivers for this market. These systems are less popular among companies located in industrial organised zones where the unit thermal and electrical energy costs are significantly lower than elsewhere.
Utility equipment replacements, like boilers, air compressors, pumps, electrical motors etc.	> 5	Depending on the condition of the existing equipment.
Building envelope improvements	8 - 10	Depending on the extent of refurbishment. For upgrading of one level on the scale of the energy efficiency, the payback period is longer than for full application of all EE measures.
Wind turbines	10 – 12	If designed to meet the consumption of an existing plant or building. Investments planning to sell or exchange energy with the grid are less attractive due to the losses introduced by the grid, and the low feed-in-prices compared to final user energy costs.
PV systems	5 - 7	

5.6 Awareness and information level

Previously, great attention was dedicated to the process of raising public awareness about the importance and effects of the implementation of energy efficiency measures. A strong, ongoing, and overall public campaign was conducted.

The Republic of Serbia has received funding from IPA Funds to organise seminars on the topics of energy efficiency, renewable energy sources, and sustainable development, as well as for making accompanying documents in the form of brochures and case studies. At first, the main organisation to raise awareness in the Republic of Serbia was the Agency for Energy Efficiency, which has ceased to exist as an entity, but its staff and jurisdiction were transferred and integrated into the Ministry of Mining and Energy. During its operation, the Agency organised:

- two national conferences with international participation, 14 round tables during eight days, around 100 lecturers, including 35 speakers from 15 countries, and 900 participants
- Seminars for industry: eight seminars with 1000 participants; one international forum with 200 participants
- Seminars for Municipal Administration, the use of biomass, the use of geothermal energy, energy planning, and more than 100 presentations during the six years

Further seminars/conferences in the field of energy efficiency comprise the following:

- "Industrial Energy and Environmental Protection in South-East Europe", 2008 at Zlatibor; 2010 at Zlatibor, 2011 at Kopaonik, with 150 - 200 participants, from over 15 countries
- 4th International Conference "Environment for Europe", 4th and 5th June 2008 in Belgrade
- Large numbers of specialised seminars (public street lighting, water supply systems, heat pumps, solar energy, etc.)

- Accompanying program dedicated to energy efficiency to the Belgrade Building Expo in 2010
- Many lectures held within the framework of Serbian Chamber of Engineers.
- International fair of Ecology, Energy Efficiency, and Renewable Energy Sources in Belgrade, Novi Sad, Nis, and Vrsac.

In addition, through public media (daily newspapers, TV, radio, internet, etc.) a large volume of promotional material was distributed in various forms (brochures, TV promotional films and video, advertisements, articles, promotional exhibitions, etc.). There are some TV programmes concerning energy efficiency and the protection of the environment, one of which is Eco guerrilla on Prva. There is also one programme on national television called Eco caravan.

Some municipalities in Serbia have introduced the day of energy efficiency, which has been held on March 5th for several years now. The PALGO Centre has published a collection of good practices called The Rational Use of Energy in function of development of local communities. It was supported by the Ministry of Energy and Mining, Agency for Energy Efficiency of the republic of Serbia, the US Embassy, Kfw, and many others.

In general, information and awareness campaigns form a set of horizontal measures of the Energy Strategy of RS. These measures are not fully applied, and the present activities in this respect still need to be enlarged.

6 Conclusions

Serbia's energy system in general relies heavily on coal, and the supply of natural gas for industry and households shows high import dependence. Some progress was made towards EE in industry by the companies in the most energy intensive sectors which undertook steps towards certification, best available technology introduction, as well as measurement and monitoring of CO₂ emissions of their operations. The overall energy framework (legal and policy, market) in Serbia is well-developed and positively assessed by the Energy Community, to which Serbia is a Contracting Party. The requirements from the Energy Community (overall TFC reduction of 9%) should be realised by 2018.

Current shares of TFC show a clear dominance of the residential sector, followed by the industrial sector, which currently account for 122 PJ (32% of TFC) and 102.4 PJ (27% of TFC) respectively. Savings potentials are estimated in the range of 15-25% in the industrial sector and between 25-70% (depending on the degree of refurbishment) in the residential sector. Measures relating to households focus on the rehabilitation of heating systems, including both district heating systems, which are common for all cities and major municipalities, as well as via better insulation of buildings.

In the industrial sector, the most important and economic measures comprise exchange of machines and components as well as the use of waste heat and the introduction of CHP plants. From among the sub-sectors, especially the food industry shows considerable savings and replication potential.

The Energy Strategy estimates that the full refurbishment of buildings would require financing of 8.8 billion EU, of which 73% would be needed in the residential sector. Additionally, in terms of the focus of new credit lines and financial mechanisms, the estimate is that in order to fully achieve the NEEAP 2 targets, it would require a 6 times higher rehabilitation rate of buildings than today. A considerable share of savings is expected due to further urban development and the associated increasing share of new, more efficient buildings, and due to the change towards individual unit consumption metering and payment.

7 Relevant Institutions

The following table provides an overview of institutions relevant for EE in Serbia.

Table 12: Institutions relevant for EE in Serbia

State bodies	
Ministry of Mining and Energy http://www.mre.gov.rs/	<p>The Ministry of Mining and Energy is the primary organisation responsible for implementing energy policy, including energy efficiency. It coordinates/supervises developing and implementing national energy policies, plans and programmes, including EE, and is responsible for determining the energy and natural resource requirements of Serbia, conducting surveys to improve the utilisation of energy and natural resources and also for the preparation and approval of energy legislation and regulations.</p> <p>The Ministry of Mining and Energy has the following departments concerning EE:</p> <ul style="list-style-type: none"> ● Department for Energy Efficiency and Renewable Energy ● Department for Strategic Planning in the energy sector <ul style="list-style-type: none"> ○ Group for making strategies and plans in the field of developing energy sectors ○ Group for local energetics ● Department for improving energy efficiency <ul style="list-style-type: none"> ○ Group for creating conditions for improving energy efficiency ○ Group for implementing and monitoring the system of organised power management ● Department for Renewable Energy Sources ● Department for Sustainable Development and Climate Change in the energy sector
Energy Agency for the Republic of Serbia	<p>The Agency was established by the Energy Law as a regulatory body with competences covering electricity, natural gas, oil and oil products, and CHP heat energy sectors. By executing tasks assigned to it by the Energy Law, the Agency contributes to the creation of a stable regulatory framework for the development of an efficient and sustainable energy sector that will be a strong backbone of the country's economic development. The Agency is a legal entity that is functionally independent of any state body, energy entity, or user of its products and services, and of any other legal or physical entity. The Agency commenced its operation on June 16, 2005 at the day of its registration at the Trade Court. In accordance with the Energy Law and international agreements the Agency carries out the following tasks: price regulation, licensing of energy entities to conduct energy activities, deciding appeals, energy market supervision, and international agreement implementation.</p>
Agency for Environmental Protection	<p>Agency for Environmental Protection (AEP), as a body within the Ministry of Agriculture and Environmental Protection, as a legal entity, performs professional tasks related to: the development, coordination, and management of the national information system for environmental protection (monitoring the status of the environmental factors through environmental indicators, the registry of pollutants, etc.);The implementation of national monitoring of air and water quality, including the implementation of prescribed and harmonised programmes for the control of air quality, surface water and groundwater aquifer, and precipitation.</p> <p>AEP is in cooperation with the European Environment Agency (EEA) and the</p>

	European Network for Information and Observation Network (EIONET), as well as other duties prescribed by law.
Elektromreze Srbije	EMS is a public enterprise that secures reliable power transmission; efficient control of the power system interconnected with the power systems of other countries; optimum and sustainable development of the transmission system aimed at satisfying the needs of customers and of the entire society; ensuring the functioning and development of the Serbian electricity market as well as its integration in the regional and European power markets.
Electric Power Industry of Serbia	<p>Electric Power Industry of Serbia is vertically organised enterprise that has founder's rights in 13 subsidiaries and three public enterprises in Kosovo and Metohija. Prevailing activity of PE EPS is electricity supply whereas electricity generation, electricity distribution and distribution system management, production, processing and transport of coal, generation of steam and hot water in combined processes are performed in subsidiaries founded by PE EPS for performing of the stated activities.</p> <p>Electric Power Industry of Serbia mission is secure electricity supply to all customers, under the most favourable market conditions, with continuous upgrading of the services, improvement of environmental protection and welfare of the community.</p> <p>Electric Power Industry of Serbia vision is socially responsible, market-oriented and profitable company, competitive on the European market with a major impact in the region, recognised as a reliable partner among local and international companies.</p>
Belgrade District Heating Plant	Their vision is to attain a leading position in the production and distribution of heat energy in the region, based on the principles of energy efficiency and concern for the environment, which is achievable by dedicated work and investments made by technology – modern contemporary systems. It has also organised some projects, one of which was co-financed by the European Commission, to reduce greenhouse gas emissions on behalf of a significant reduction in energy consumption of urban housing - BECA (BECA)
Other related institutions	
KfW	KfW works with Serbia to create a more energy efficient economy with fewer emissions. The focus is to ensure more efficient use of energy in micro, small and medium-sized companies (MSMEs) and private households. KfW has made 133 million EUR available to the Serbian banking sector on behalf of the German Federal Government. The Serbian banks use these funds to develop credit lines for energy efficiency measures for MSMEs and private households, but also public and large companies.
EBRD	EBRD has started working in Serbia in 2001. They focus on: enhancing the role and competitiveness of the private sector. Serbia's level of private sector engagement in the economy is modest even by regional standards. Small and medium sized enterprises (SMEs), which form the backbone of the Serbian private sector, face limited access to finance. Their other focus is Bolstering the banking sector and deepening the financial intermediation. While the financial sector has survived the crisis, its role as a driver of economic growth has been significantly diminished. Credit growth is weak, the share of non-performing loans is significant and the level of euroisation is high. In line with the Joint IFI Action Plan for Growth in Central and South-Eastern Europe, we will seek to help stabilise the financial sector. They also focus on Developing sustainable

	<p>and efficient public utilities. Large transition gaps remain in the energy and infrastructure sectors. Other transition challenges include: adjusting tariffs to cost recovery levels, strengthening the regulators' capacity, commercialising and restructuring public enterprises, and increasing private sector participation. The EBRD will focus its efforts on accelerating the implementation of its already financed projects and, given the limited fiscal space, will carefully select new investments. In the energy sector in particular, we will aim to continue to play a key role in promoting energy efficiency and renewable energy, while assisting with replacing the aging electricity generation capacity and bringing power generation into compliance with EU environmental standards.</p>
<p>IFC</p>	<p>International Finance Corporation (IFC), as a member of the World Bank Group, is the largest global institution that is focused exclusively on the private sector in developing countries. Its offerings are designed to meet the specific needs of their clients in different industries, with a special focus on infrastructure, manufacturing, agribusiness, services, and financial markets. Its financial products enable companies to manage risk and broaden their access to foreign and domestic capital markets. Its advice helps unlock private sector investment, which is essential for expanding businesses, creating jobs, and growing economies. They work with the private sector to encourage entrepreneurship and build sustainable businesses—advising them on a wide range of issues, including environmental, social and governance standards, energy and efficiency, and supply chains. They help expand access to critical finance for individuals and micro, small, and medium enterprises through our work with financial intermediary clients.</p>
<p>ACES</p>	<p>Association of Consulting Engineers of Serbia (ACES) is a professional and non-profit association established in April 2009 with the aim to: promote the role and importance of FIDIC standards in Serbia, affirm the highest ethical standards that could be applied in the work of consulting engineers to ensure that members adhere to FIDIC (International Federation of Consulting Engineers) standards and with those standards to effectively participate in the fight against corruption in the construction industry, contribute to the promotion of procedures that ensure transparency, collect information of interest for the work of consulting engineers, encourage development and innovation of technical knowledge of ACES members by organising seminars, workshops and consultations, monitor and provide necessary information for its members related to law regulations, policies and programmes of the relevant institutions in Serbia that are of interest to the Association. Activities of the Association are: Support implementation of FIDIC standards by encouraging and monitoring compliance of relevant Serbian regulations with the regulations and standards of EU, and informing members about it, organisation of FIDIC trainings, sales of FIDIC publications, organisation of educational and informative events - seminars, workshops, panel discussions, and professional lectures, introduction of new trends in construction sector, promotion of the role that the consulting engineer has in investment ventures, informing members about relevant developments in the construction sector and other areas important for providing quality consulting engineering services, exchange experiences between members and relevant international companies, establishment of new business opportunities in Serbia and abroad, improving the business climate in Serbia, and promotion of the profession.</p> <p>ACES members can be consulting-engineering firms in Serbia, as well as architectural companies, contractors, banks, insurance companies, law firms, and other firms that are interested in promoting the objectives of the Association.</p>
	<p>GIZ offers customised solutions to complex challenges. They are an</p>

GIZ	experienced service provider and assist the German Government in achieving its objectives in the field of international cooperation. They offer demand-driven, tailor-made, and effective services for sustainable development. GIZ sees close and trusting cooperation with organisations operating in the field of international cooperation and sustainable development as absolutely pivotal. Cooperation with a number of different partners enables GIZ to ensure that its contribution to realising international cooperation objectives complies with the German Government's standards in terms of coherence, efficiency, and effectiveness.
WBIF	The Western Balkans Investment Framework (WBIF) supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic investments, particularly in infrastructure, energy efficiency, and private sector development. It is a joint initiative of the EU, International Financial institutions, bilateral donors, and the governments of the Western Balkans.
IPA FUND	The Instrument for Pre-accession Assistance (IPA) is the means by which the EU supports reforms in the 'enlargement countries' with financial and technical help. The IPA funds build up the capacities of the countries throughout the accession process, resulting in progressive, positive developments in the region. For the period 2007-2013, IPA had a budget of some 11.5 billion EUR; its successor, IPA II, will build on the results already achieved by dedicating EUR 11.7 billion for the period 2014-2020. Current beneficiaries are: Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Iceland, Montenegro, Serbia, and Turkey.
GGF	The Green for Growth Fund, Southeast Europe is the first specialised fund to advance energy efficiency (EE) and renewable energy (RE) in Southeast Europe, including Turkey, as well as in the nearby European Eastern Neighbourhood region. Initiated by the European Investment Bank and KfW Entwicklungsbank, GGF is an innovative public-private partnership established to reduce energy consumption and CO2 emissions. GGF provides refinancing to Financial Institutions to enhance their participation in the EE and RE sectors and also makes direct investments in Non-Financial Institutions with projects in these areas. The activities of GGF are supported by a Technical Assistance Facility.
GEF	The Global Environment Facility is a partnership for international cooperation where 183 countries work together with international institutions, civil society organisations and the private sector, to address global environmental issues. This independent organisation funds projects related to climate change, permanent organic pollutants, and other things, out of which support for the development of biomass is important for Serbia.
WeBSEFF	WeBSEFF - the Western Balkans Sustainable Financing Facility - is a financing facility under which the European Bank for Reconstruction and Development (EBRD) provides credit lines to partner banks in the Western Balkans to on-lend to businesses and municipalities wanting to invest in energy efficiency and small-scale renewable energy projects. WeBSEFF is part of the <u>EBRD's Sustainable Energy Financing Facility (SEFF) family</u> . To date, SEFFs have made available 2 billion EUR for financing projects through more than 80 local participating financing institutions in 20 different countries in the world. WeBSEFF is part of the Regional Energy Efficiency Programme for the Western Balkans (REEPWB). REEPWB uses a combination of financing instruments (such as WeBSEFF), technical assistance, and policy support to create a sustainable market for energy efficiency in the region. The programme supports energy efficiency for both private and public sectors.
USAID	USAID carries out U.S. foreign policy by promoting broad-scale human progress at the same time it expands stable, free societies, creates markets and trade

	<p>partners for the United States, and fosters good will abroad. Spending less than 1 percent of the total federal budget, USAID works in over 100 countries to: promote broadly shared economic prosperity; strengthen democracy and good governance; improve global health, advance food security and agriculture; improve environmental sustainability; further education; and provide humanitarian assistance in the wake of natural and man-made disasters</p>
Chamber of Commerce and Industry of Serbia	<p>The Serbian Chamber of Commerce is an independent, non-governmental, business-expert interest association of legal subjects and individuals who work in registered economic activity. Chamber functions are, among others, development harmonisation - playing a role in the creation and realisation of the development strategy, regional policy development, infrastructure, and new projects; public powers-issuing of certificates, attestations, permissions, and licenses necessary for international trade, company state of solvency, registry keeping, etc.</p>
Serbian Chamber of Engineers	<p>The Chamber was established to improve the conditions for performance of professional work in the field of spatial and city planning, design and construction, and in other fields of relevance for planning and construction; protect the general and individual interests in these fields; organise rendering of services in these fields. Engineers take a professional exam and SCOE issues the licenses, conducts trainings, and holds seminars on energy efficiency.</p>
NALED	<p>NALED is the only business association bringing together representatives of all three sectors of society – companies, municipalities, and NGOs, who work together on improving conditions for LED and doing business in Serbia. NALED’s uniqueness is reflected not only in the diversified structure of its members, but also in the fact that in addition to being a membership association, NALED is simultaneously a civil society organisation (NGO). NALED implements various projects and thus provides valued added services to its members by covering each dollar from membership fees with a dollar earned from the sale of services and implementation of donor-funded projects.</p>
SKGO	<p>The Standing Conference of Towns and Municipalities (SCTM) is the association of Serbian towns and municipalities. Founded in 1953, it was modelled in the tradition of national and international associations of local governments around the world and pre-war Alliance of Yugoslav Municipalities. The main mission of SCTM is to advocate interests, provide high-quality services to and support the development and improvement of local self-governments through joint action of its members in accordance with European standards. Discharging its function, SCTM represents the interests of its members in the process of drafting national legislation and policies; it advocates, promotes, and supports their effective implementation in local self-governments by disseminating information, knowledge and experience regarding the implementation of public policies and regulations, by preparing manuals, guides, and models local regulations. SCTM provides consultancy and technical assistance in the formulation of strategic goals and implementation of the projects undertaken by local self-government units and supports its members in their efforts to access donor funding.</p>
PALGO CENTER	<p>The PALGO Centre is an independent, non-profit and non-governmental organisation, which was established in Belgrade in 1998. The PALGO Centre is active in the field of public administration, local government, and public policies, and it represents one of the most relevant civil society organisations in this field of expert action in Serbia. PALGO’s main objectives, as a think tank organisation, are promotion of research activities, expertise, education, and professional publishing and PALGO’s activities are focused at: implementation of interdisciplinary studies and research work; organisation of international and regional conferences and round tables, summer schools, specialised courses,</p>

	<p>trainings and workshops; publishing and dissemination of specialised literature; supporting local authorities in the transfer of knowledge, exchange of experiences, best practises, policy recommendations, as well as professional networking. PALGO has 15 years of experience in advancing public policies related to sustainable local development issues and building capacities of local governments for effective implementation of these policies. As an independent policy organisation and one of the oldest think tanks in the region, PALGO Center actively promotes responsible, innovative, and sustainable local policies.</p>
<p>CEDEF</p>	<p>Central European Development Forum - CEDEF is the leading regional independent expert organisation, which advocates active implementation of energy efficiency (EE), renewable energy sources (RES), and environmental protection in Serbia and the region. In accordance with the directives of the European Union, under the institutional auspices of the relevant ministries for energy and environmental protection, and in cooperation with the relevant decision makers, CEDEF's activities are:</p> <ul style="list-style-type: none"> - Implementation of specific measures to increase energy efficiency and the use of renewable energy sources - Connecting and representation of all stakeholders involved in projects in the field of sustainable development and green energy - Advocating the adoption of necessary legislation - Providing vocational training in technical, legal, and financial aspects of projects in the field of sustainable development and green energy - Research - Creating and publishing research studies, white papers, and publications - Comprehensive representation in the mass media - Organising meetings with experts and regulators.
<p>CEEFOR</p>	<p>CEEFOR was established in October 2010 to pursue commercial opportunities for project development and financing of sustainable energy projects in the Balkans Region. The company is registered in Serbia and has been active in developing sustainable energy projects in Western Balkans countries. CEEFOR provides well-tailored technical assistance for partner institutions and for setting up EE and RE lending operations, as well as support for companies in the form of energy audits or EE and RE project implementation and main project design. CEEFOR is composed of different energy efficiency experts with significant experience in energy efficiency, process optimisation, energy benchmarking, promotion of energy efficiency and RES projects, project preparation management and design, and trainings in energy efficiency (including energy audits).</p> <p>Skills are wide diffused in different industrial sectors and buildings. CEEFOR is focused on the final energy consumption in order to facilitate improvement of energy efficiency and environment protection in industry and buildings. Type of services that CEEFOR can offer is the following unique benefits: Information services in energy saving and environmental friendly technologies, presentation and recognition of good projects and project proposals, technology transfer and related consultancy, project preparation management and design, experience in energy management training - they have trained facility managers in energy management and energy efficiency project requirements, including monitoring, assessment, and verification of energy efficiency measures implemented at their facilities, consultancy in energy efficiency, energy management and energy audit are the particular activities offered to the clients in industry and building sector, efficiency from lessons learned. CEEFOR has an excellent outsourcing database and network of experts in all fields of energy efficiency, environment, and RES application who are available to join any EE or RE project.</p>

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Central European Development Forum http://cedeforum.org/en/index.html
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Annex

Table 13: Energy Balance for Serbia 2013, TJ

Source: Statistical Office of the Republic of Serbia

	Укупно Total	Природни гас Natural gas	Нафта и деривати нафте Oil and Oil products	Хидро- електрична енергија Hydro Energy	Укупна електрична енергија Electricity	Топлотна енергија Heat	Угаљ и производи од угља Coal and Coal products	Геотермална енергија Geothermal Energy	Дрвна горива ²⁾ Wood Fuels ²⁾	Биогаз Biogas
	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Примарна производња / Primary production	479877	19676	52899	39071	-	-	321168	188	46691	184
Увоз / Import	209013	69916	111258	-	14677	-	12966	-	196	-
Извоз / Export	51537	-	23553	-	23810	-	1484	-	2690	-
Салдо залиха / Stock changes	-1803	-2760	3409	-	-	-	-1796	-	-456	-
Међународна складишта / Bunkers	405	-	405	-	-	-	-	-	-	-
Статистичка разлика / Statistical difference	-	-	-	-	-	-	-	-	-	-
Укупно расположива енергија Gross inland consumption	635345	86832	143608	39071	-9133	-	330854	188	43741	184
Утрошак за производњу енергије Transformation input	496290	28707	149288	-	-	-	314812	-	3383	100
Термоелектране / Thermal power plants	292868	-	-	-	-	-	292868	-	-	-
Термоелектране - топлане (ТЕ-ТО) / CHP	2609	2609	0	-	-	-	-	-	-	-
Енергане / Autoproducers	15135	7623	2226	-	-	-	5186	-	-	100
Топлане / District heating plants	24736	18475	3293	-	-	-	2889	-	79	-
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-	-	-	-	-	-	-
Рафинерије / Refineries	135979	-	135979	-	-	-	-	-	-	-
Петрохемија / Petrochemical refinery	6586	-	6586	-	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	6124	-	-	-	-	-	6124	-	-	-
Рудници угља / Coal mines	-	-	-	-	-	-	-	-	-	-
Прерада угља / Coal transformation	7745	-	-	-	-	-	7745	-	-	-
Ћумуране и реторте / Charcoal kilns and retorts	391	-	-	-	-	-	-	-	391	-
Произв. дрвених пелета / Producers of wood pellets	2740	-	-	-	-	-	-	-	2740	-
Произв. дрвених брикета / Prod. of wood briquettes	173	-	-	-	-	-	-	-	173	-
Остали / Other	1204	-	1204	-	-	-	-	-	-	-
Производња енергије трансформацијом Transformation output	291825	-	138061	-	104486	34313	12317	-	2648	-
Хидроелектране / Hydro power plants	-	-	-	-	-	-	-	-	-	-
Термоелектране / Thermal power plants	105091	-	-	-	103032	2059	-	-	-	-
Термоелектране - топлане (ТЕ-ТО) / CHP	1869	-	-	-	727	1142	-	-	-	-
Енергане / Autoproducers	11386	-	-	-	727	10659	-	-	-	-
Топлане / District heating plants	20453	-	-	-	-	20453	-	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-	-	-	-	-	-	-
Рафинерије / Refineries	131242	-	131242	-	-	-	-	-	-	-
Петрохемија / Petrochemical refinery	2586	-	2586	-	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	3183	-	-	-	-	-	3183	-	-	-
Рудници угља / Coal mines	-	-	-	-	-	-	-	-	-	-
Прерада угља / Coal transformation	9134	-	-	-	-	-	9134	-	-	-
Ћумуране и реторте / Charcoal kilns and retorts	326	-	-	-	-	-	-	-	326	-
Произв. дрвених пелета / Producers of wood pellets	2011	-	-	-	-	-	-	-	2011	-
Произв. дрвених брикета / Prod. of wood briquettes	311	-	-	-	-	-	-	-	311	-
Остали / Other	4233	-	4233	-	-	-	-	-	-	-
Размена / Exchanges and transfers, returns	-	-	-	-39071	39071	-	-	-	-	-
Размењени производи / Products transferred	-	-	-	-39071	39071	-	-	-	-	-
Интерна размена производа / Interproduct transfers	-	-	-	-	-	-	-	-	-	-
Враћено из петрохемије/Returns from petroch. ind.	-	-	-	-	-	-	-	-	-	-
Сопствена потрошња у енергетском сектору Consumption in the energy sector	29683	5924	4766	-	17770	1223	-	-	-	-
Хидроелектране / Hydro power plants	220	-	-	-	220	-	-	-	-	-
Пумпање / Pump storage	3625	-	-	-	3625	-	-	-	-	-
Термоелектране / Thermal power plants	10192	-	893	-	9288	11	-	-	-	-
Термоелектране - топлане (ТЕ-ТО) / CHP	149	-	-	-	148	1	-	-	-	-
Енергане / Autoproducers	90	-	-	-	90	-	-	-	-	-
Топлане / District heating plants	1823	-	-	-	612	1211	-	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	2757	2757	-	-	-	-	-	-	-	-
Рафинерије / Refineries	7870	3154	3873	-	843	-	-	-	-	-
Петрохемија / Petrochemical refinery	-	-	-	-	-	-	-	-	-	-
Високе пећи / Blast Furnace plants	13	13	-	-	-	-	-	-	-	-
Рудници угља / Coal mines	2174	-	-	-	2174	-	-	-	-	-
Прерада угља / Coal transformation	770	-	-	-	770	-	-	-	-	-
Ћумуране и реторте / Charcoal kilns and retorts	-	-	-	-	-	-	-	-	-	-
Произв. дрвених пелета / Producers of wood pellets	-	-	-	-	-	-	-	-	-	-
Произв. дрвених брикета / Prod. of wood briquettes	-	-	-	-	-	-	-	-	-	-
Остали / Other	-	-	-	-	-	-	-	-	-	-
Губици / Losses	25092	605	934	-	19804	3044	678	1	26	-
Енергија расположива за финалну потрошњу Energy available for final consumption	380613	51596	131189	-	96850	30046	27681	187	42980	84
Финална потрошња / Final consumption	380613	51596	131189	-	96850	30046	27681	187	42980	84
Финална потрошња за неенергетске сврхе Final Non-Energy consumption	28533	4977	22343	-	-	-	1213	-	-	-
од тога за хемијску индустрију of wich. Chemical industry	15026	-	15026	-	-	-	0	-	-	-
Финална потрошња за енергетске сврхе Final Energy consumption	352080	46619	108846	-	96850	30046	26468	187	42980	84
Индустрија ¹⁾ / Industry ¹⁾	102422	32947	15923	-	24368	11260	10096	-	7744	84
Грађевинарство / Construction	1982	-	832	-	1116	-	33	-	1	-
Саобраћај / Transport	82497	351	80425	-	1721	-	-	-	-	-
Домаћинства / Households	122686	8095	3089	-	50925	15766	10846	-	33965	-
Пољопривреда / Agriculture	7612	724	5598	-	1084	-	5	108	93	-
Остали потрошачи / Other users	34881	4520	2979	-	17636	3020	5488	79	1177	-

¹⁾ Индустрија, осим енергетског сектора и финалне потрошње у неенергетске сврхе / Industry, excluding energy sector and final non-energy consumption.

²⁾ Финална потрошња огрев дрвета за домаћинства преузета је од Министарства рударства и енергетике./Final households consumption of firewood is taken from Ministry of Mining and Energy.

Table 14: Electricity Balance for Serbia 2013, GWh/TJ

Source: Statistical Office of the Republic of Serbia

	Хидроелектрична енергија	Укупна електрична енергија	Хидроелектрична енергија	Укупна електрична енергија
	<i>Hydro Energy</i>	<i>Electricity</i>	<i>Hydro Energy</i>	<i>Electricity</i>
	GWh		TJ	
Примарна производња / Primary production	10853	-	39071	-
Увоз / Import	-	4077	-	14677
Извоз / Export	-	6614	-	23810
Салдо залиха / Stock changes	-	-	-	-
Међународна складишта / Bunkers	-	-	-	-
Статистичка разлика / Statistical difference	-	-	-	-
Укупно расположива енергија / Gross inland consumption	10853	-2637	39071	-9133
Утрошак за производњу енергије / Transformation input	-	-	-	-
Термоелектране / Thermal power plants	-	-	-	-
Термоелектране - топлане (TE-TO) / CHP	-	-	-	-
Енергане / Autoproducers	-	-	-	-
Топлане / District heating plants	-	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-
Рафинерије / Refineries	-	-	-	-
Петрохемија / Petrochemical refinery	-	-	-	-
Високе пећи / Blast Furnace plants	-	-	-	-
Рудници угља / Coal mines	-	-	-	-
Прерада угља / Coal transformation	-	-	-	-
Тумуране и реторте / Charcoal kilns and retorts	-	-	-	-
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-
Остали / Other	-	-	-	-
Производња енергије трансформацијом / Transformation output	-	29024	-	104486
Хидроелектране / Hydro power plants	-	-	-	-
Термоелектране / Thermal power plants	-	28620	-	103032
Термоелектране - топлане (TE-TO) / CHP	-	202	-	727
Енергане / Autoproducers	-	202	-	727
Топлане / District heating plants	-	-	-	-
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-
Рафинерије / Refineries	-	-	-	-
Петрохемија / Petrochemical refinery	-	-	-	-
Високе пећи / Blast Furnace plants	-	-	-	-
Рудници угља / Coal mines	-	-	-	-
Прерада угља / Coal transformation	-	-	-	-
Тумуране и реторте / Charcoal kilns and retorts	-	-	-	-
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-
Остали / Other	-	-	-	-
Размена / Exchanges and transfers, returns	-10853	10853	-39071	39071
Размена производа / Products transferred	-10853	10853	-39071	39071
Интерна размена производа / Interproduct transfers	-	-	-	-
Враћено из петрохемије / Returns from petrochemical industry	-	-	-	-
Сопствена потрошња у енергетском сектору¹⁾	-	4936	-	17770
Consumption in the energy sector¹⁾	-	4936	-	17770
Хидроелектране / Hydro power plants	-	61	-	220
Пумпање / Pump storage	-	1007	-	3625
Термоелектране / Thermal power plants	-	2580	-	9288
Термоелектране - топлане (TE-TO) / CHP	-	41	-	148
Енергане / Autoproducers	-	25	-	90
Топлане / District heating plants	-	170	-	612
Екстракција нафте и гаса / Oil and gas extraction	-	-	-	-
Рафинерије / Refineries	-	234	-	843
Петрохемија / Petrochemical refinery	-	-	-	-
Високе пећи / Blast Furnace plants	-	-	-	-
Рудници угља / Coal mines	-	604	-	2174
Прерада угља / Coal transformation	-	214	-	770
Тумуране и реторте / Charcoal kilns and retorts	-	-	-	-
Произвођачи дрвних пелета / Producers of wood pellets	-	-	-	-
Произвођачи дрвних брикета / Producers of wood briquettes	-	-	-	-
Остали / Other	-	-	-	-
Губици / Losses	-	5501	-	19804
Енергија расположива за финалну потрошњу	-	26903	-	96850
Energy available for final consumption	-	26903	-	96850
Финална потрошња / Final consumption	-	26903	-	96850
Final Non-Energy consumption	-	-	-	-
од тога за хемијску индустрију / of wich: Chemical industry	-	-	-	-
Финална потрошња за енергетске сврхе / Final Energy consumption	-	26903	-	96850
Индустрија ²⁾ / Industry ²⁾	-	6769	-	24368
Грађевинарство / Construction	-	310	-	1116
Саобраћај / Transport	-	478	-	1721
Домаћинства / Households	-	14146	-	50925
Пољопривреда / Agriculture	-	301	-	1084
Остали потрошачи / Other users	-	4699	-	17636

¹⁾ Укључена и енергија која кружи у систему. / Energy which circulates in the system is included.

²⁾ Индустрија, осим енергетског сектора. / Industry, excluding energy sector.



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