P R O P O S A L

Pursuant to Article 5 and 6 of the Energy Law (" Official Gazette of the Republic of Serbia " , number 145/14) and Article 42 , Paragraph 1 of the Law on Government (" Official Gazette of the Republic of Serbia " , no . 55/05, 71 / 05 - correction , 101/07, 65/08, 16/11, 68/12 - US , 72/12, 7/14 - US and 44/14),

The Goverment makes

DECREE
ON ESTABLISHMENT OF IMPLEMENTATION PROGRAM OF THE ENERGY SECTOR DEVELOPMENT STRATEGY OF THE REPUBLIC OF SERBIA FOR THE PERIOD TO 2025 YEAR WITH PROJECTIONS TO 2030, THE YEAR OF THE PERIOD 2017 TO 2023 YEAR

1. This regulation establishes the program for implementation of Energy Sector Development Strategy of the Republic of Serbia until 2025 for the period from 2017 to 2023 year , which is attached hereto as its integral part .

2. This Regulation shall enter into force on the eighth day of its publication in the " Official Gazette of the Republic of Serbia " .

05 No:
In Belgrade,

The Goverment

President

1. INTRODUCTION

On the basis of the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) energy policy of the Republic of Serbia shall be determined by the Energy Development Strategy of the Republic of Serbia until 2025 with projections to 2030 ("Official Gazette of the Republic of Serbia", no. 101/2015) (hereinafter referred to as Energy Strategy), and the conditions, manner, dynamics and measures to achieve the Energy Strategy defines the Strategy Implementation Program (hereinafter referred to as Program). The annual demand for energy sources, which is necessary to provide the reliable, secure and quality supply to final customers, sources for the provision of the necessary amount of energy or energy sources, as well as the required level of stock and spare capacity of facilities for the secure supply of energy and energy are all determined by the Energy Balance of the Republic of Serbia (hereinafter referred to as Energy Balance).

Energy Strategy (adopted on December 4, 2015) defines the strategic priorities of development of energy sector of the Republic of Serbia (hereinafter referred to as RS) for the aforementioned period. Those priorities are:

- Provision of energy security, through:
  1. reliable, safe, effective and quality supply of energy and energy sources;
  2. the establishment of conditions for reliable and safe operation of all systems in the energy sector and for their sustainable development.

  In order to enable safe, reliable and quality energy supply it is necessary to promote the rational use of energy, to ensure adequate reserves of oil and natural gas, to provide various sources of supply of these fuels and then to start building new capacities for the production of electricity (from renewable energy sources, as well as with conventional sources of energy, with high energy efficiency) and new capacities for the transmission and distribution of electrical energy and energy sources that will provide a secure supply at the lowest total cost.
- The development of the energy market, through:
  1. the provision of competitiveness in the energy market on the principles of non-discrimination, publicity and transparency;
  2. the protection of customers of energy and energy sources;
  3. the development of the electricity and natural gas markets and their connection to the unique EU energy market;
  4. the increasing connectivity of the energy system of RS with power systems of other countries, particularly with those in the immediate surroundings.

  In accordance with the Treaty establishing the Energy Community, the Republic of Serbia has set the establishment of a regional energy market as one of its the priorities. This market should be integrated into the EU energy market and to allow more investment in the sector and contribute to its development.
- The transition to sustainable energy, through:
  1. the provision of conditions for energy efficiency improvement in performing energy activities and energy consumption;
  2. the creation of economic, commercial and financial conditions to increase the share of energy from renewable sources of energy, as well as for the combined production of electricity and heat;
  3. the creation of institutional, financial and technical conditions for the use of new energy sources (wind, solar, biomass, biogas, etc.);
  4. the improvement of the situation and the system of environmental protection in all areas of the energy industry;
  5. establishing a more favourable legislative, institutional and logistical conditions for dynamic investment in the energy sector.

The Republic of Serbia's Energy Strategy, the National Action Plan for Energy Efficiency ("Official Gazette of the Republic of Serbia", no. 1/2017), the National Action Plan for Renewable Energy Sources ("Official Gazette of the Republic of Serbia", no. 53/2013), the Action Plan for Implementation of National Strategy for Sustainable Development ("Official Gazette of the Republic of Serbia", no. 62/2011), the National Emission Reduction Plan and the National program for integration of Serbia into the European Union [7], define goals, measures and activities that should contribute to increasing energy efficiency, increasing energy production from renewable energy sources, reducing emissions of greenhouse effect one garden as well as the reorganization and restructuring of companies in the energy sector, the creation of new national regulations and standards and harmonization of the existing regulations and standards applied in the EU. Specific measurable objectives for each energy sector are presented in the chapter related to the sector.

Note: National Emission Reduction Plan is currently in the process of adoption. National Program for Integration of Serbia into the European Union is a document containing a precise plan for how to achieve all the criteria necessary for the country to become a member of the EU, and was approved by the Government of the Republic of Serbia on October 9, 2008.

Measures, activities and projects that contribute to the realization of defined measurable goals within the individual sector are all directed towards the overall transition to a sustainable energy in Serbia. Sustainability of development arises from the universal improvement of energy efficiency, the increase of use of renewable energy and improvement of the environment, with the latter being partly a result of from the previous two factors. Energy efficiency is regulated by the Law on Efficient Use of Energy ("Official Gazette of the Republic of Serbia", no. 25/2013), while both the umbrella law for the energy sector: the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) and the Law on efficient use of energy ("Official Gazette of the Republic of Serbia", no. 25/2013) regulate the field of renewable energy.

In addition to the energy efficiency level (i.e. indicators indicative of the energy efficiency) and the share of the renewable sources in the final energy consumption, there is a third important indicator of the level of sustainable development which is the improvement of environmental state in the field of environmental protection. The legal basis for environmental protection are the following acts:

- Law on Environmental Protection ("Official Gazette of the Republic of Serbia", no. 135/2004, 36/2009, 36/2009, sec. law, 72/2009, sec. law, 43/2011, the decision of the Constitutional Court and 14/2016),
- Law on Soil Protection ("Official Gazette of the Republic of Serbia", no. 112/2015),
- Water Law ("Official Gazette of the Republic of Serbia", no. 30/2010 and no. 93/2012),
- Law on the Protection of Environmental Noise ("Official Gazette of the Republic of Serbia", no. 112/2015),
- Law on Protection against Non-ionizing Radiation ("Official Gazette of the Republic of Serbia", no. 36/2009),
- Law on Waste Management ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010 and 14/2016),
- Law on Air Protection ("Official Gazette of the Republic of Serbia", no. 36/2009 and 10/2013),
- Law on Strategic Environmental Impact Assessment ("Official Gazette of the Republic of Serbia", no. 135/2004 and 88/2010),
- Law on Environmental Impact Assessment ("Official Gazette of the Republic of Serbia", no. 135/2004 and 36/2009),
- Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the Republic of Serbia", no. 135/2004 and 25/2015),

- Law on Chemicals ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010, 92/2011, 93/2012 and 25/2015),
- Law on Nature Protection ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010, 91/2010 - correction and 14/2016).

In addition, the legal basis is made by laws and regulations and accepted international treaties and agreements (Kyoto Protocol, the United Nations Framework Convention on Climate Change, Parma Declaration on Environment and Health, the Paris Agreement, the European Landscape Convention, Podgorica Initiatives / Regional Approach to Protection Issues Environment and Climate Change in South-Eastern Europe, the Protocol on Water and Health to the Convention on the Use of Transboundary Watercourses and International Lakes, Treaty establishing the Energy community (Law on ratification of the Treaty establishing the Energy Community between the European Community and the Republic of Albania, Bulgaria, Bosnia and Herzegovina, the Republic of Croatia, the former Yugoslav Republic of Macedonia, Republic of Montenegro, Romania, Serbia and the United Nations Interim Administration Mission in Kosovo in accordance with United Nations Security Council Resolution 1244, "Official Gazette of the Republic of Serbia", no. 62/2006), the Convention on Cooperation for the Protection and Sustainable Use of the Danube River, the Framework Agreement on the Sava River Basin).

The inventory of greenhouse gases for the period 2010-2013 and projections to 2020, i.e. the part of the period covered by the Program, is given in the "First Biennial Update Report to the United Nations Framework Convention on Climate Change" [21]. Projections of emissions of greenhouse gases by 2030 and a contribution to national emissions reduction of 9.8% compared to emissions in the base year, 1990, are given in "Intended Nationally Determined Contribution of the Republic of Serbia" [22]. The special significance of measures, activities and projects mentioned in the Program has the "Regulation on limit values of air emissions from combustion plants" ("Official Gazette of the Republic of Serbia", no. 6/16), which stipulates the implementation of a range of projects in the fields of electrical energy, thermal energy, oil and industry, which contain combustion plants. Twenty heating plants within the district heating system, NIS and PE Electric Power Industry of Serbia (hereinafter referred to as EPS), were identified as the operators that are subject to the Law on integrated prevention and control of the pollution of the environment ("Official Gazette", no. 135/2004 and 25/2015) and are required to submit an application to the relevant ministry in order to obtain an integrated permit.

Also a series of measures and activities is planned that should provide sustainable energy sector in line with international commitments and best practice.

This document includes below the following sections, or chapters:

2. The manner of defining strategic energy projects and necessary activities related to the decision about projects being strategic and the basic obligations of the Government of the Republic of Serbia, its ministries and the Energy Agency of the Republic of Serbia in relation to the strategic energy projects;
3. Overview of measurable goals and indicators to be achieved through the implementation of the Program and a list of measures, activities and projects by areas within the Program to achieve the set objectives, taking into account environmental protection and energy efficiency for each of the sectors:
    - Sector of Electrical Energy;
    - Sector of Thermal Energy
    - Sector of Renewable Energy Sources
    - Sector of Oil
    - Sector of Natural Gas
    - Sector of Coil
    - Sector of Energy Efficiency in Energy Consumption

Within the Program a group of projects is separated, with main characteristics, current status and schedule for implementation of each project being shown in detail. These projects are uniquely numbered throughout the Program, they are key to the achievement of the sector targets and their realization, in addition to the realization of the proposed measures and activities, will be subject to the reporting during the implementation period of the Program.

4. The prioritization of projects defines within the Chapter 3, which is carried out using a specific methodology for the selection and prioritization infrastructure projects approved by the Government of the Republic of Serbia. On the basis of valorised strategic relevance of each of the projects, an amendment was proposed to the Unified list of priority infrastructure projects in the energy sector - a document adopted by the Government of the Republic of Serbia and whose revision is expected in 2018. After the analysis, it was estimated that some strategic objectives are underestimated in the rating system which is defined by criteria of the strategic relevance of the projects that have been used for the formation of a Unified list of priority infrastructure projects in the energy sector. In this sense, rating system and the parameters for the assessment are redefined, as well as the weighting factors of particular mark in order to adequately comprehend the impact projects to the realization of the goals defined by the Energy Strategy and formed in a special ranking list of actions defined within the Program, which better reflects their valued influence on the achievement of the targets whose overview is given in Chapter 3.
5. Literature

2. STRATEGIC ENERGY PROJECTS

2.1. Basic Concepts Related to Strategic Energy Projects

In order to define the notion of strategic energy project, ways of promoting a project into a strategic one and liabilities and activities of the relevant institutions in monitoring of the implementation of strategic energy projects, terms with the following meanings are used:

1) energy infrastructure - represents parts of the energy system, which are located in the Republic of Serbia or connecting the Republic of Serbia with one or more countries;
2) decision to build the facility - represents all the decisions made in the process of obtaining permits for construction, not including court decisions and decisions made on appeal;
3) project - represents one or more parts of the energy infrastructure;
4) project of the Energy Community interest - a strategic energy project which is part of the list of projects of interest to the Energy Community;
5) energy infrastructure bottleneck - means limitation of physical flows in an energy system due to insufficient transmission capacity, which includes inter alia the absence of infrastructure;
6) project promoter - means one of the following:
   (a) the transmission system operator (TSO), the system operator for transportation (SOT), the distribution system operator (DSO), or other operator, or investor developing a project of common interest;
   (b) legal entity that is authorized by contract to accept legal obligations and bear the financial responsibility on behalf of parties to the contract, in the event that there are multiple system operators, investors, or groups of interested parties;
7) smart grid - means an electricity network that can integrate in a cost efficient manner the behaviour and actions of all users connected to it, including generators, consumers and those that both generate and consume, in order to ensure an economically efficient and sustainable power system with low losses and high levels of quality, security of supply and safety
8) works - the construction of the facility in terms of the law governing the planning and construction of facilities and procurement of equipment and services;
9) studies - activities necessary to prepare the execution of the project, in terms of the law governing the planning and construction of facilities and the law governing the protection of the environment;
10) commissioning - means the process of bringing a project into operation once it has been constructed.

2.2. Categories of Strategic Energy Projects

1) Sector of Electrical Energy:

(1) high-voltage overhead transmission lines, if they have been designed for a voltage of 110 kV or more, and underground and submarine transmission cables, if they have been designed for a voltage of 110 kV or more;

(2) electricity storage facilities used for storing electricity on a permanent or temporary basis in above-ground or underground infrastructure or geological sites, provided they are directly connected to high-voltage transmission lines designed for a voltage of 110 kV or more;

(3) any equipment or installation essential for the systems defined in (1) and (2) to operate safely, securely and efficiently, including protection, monitoring and control systems at all voltage levels and substations;;

(4) any equipment or installation, both at transmission and medium voltage distribution level, aiming at two-way digital communication, real-time or close to real-time, interactive and intelligent monitoring and management of electricity generation,

transmission, distribution and consumption within an electricity network in view of developing a network efficiently integrating the behaviour and actions of all users connected to it — generators, consumers and those that do both — in order to ensure an economically efficient, sustainable electricity system with low losses and high quality and security of supply and safety;

2) Sector of Natural Gas:

(1) pipelines for transport of natural gas and biogas, which are part of the transportation system;

(2) underground reservoirs of natural gas connected to the gas pipeline mentioned under (1);

(3) facilities for admission, storage, regasification or decompression of liquefied natural gas or compressed natural gas;

(4) equipment or installations which are important for safe, secure and efficient operation of the system, or allow bidirectional flow of natural gas, including compressor stations;

3) Sector of Oil:

(1) pipelines to transport crude oil;

(2) pumping stations and storage facilities required for the operation of the pipeline;

(3) any equipment or installation that is essential for the safe, reliable and efficient operation of the aforementioned system, including systems for security, control and management, as well as devices for reversible flow;

4) Priority thematic areas to be developed:

the introduction of the smart grid: smart grid technology implementation in the Republic of Serbia, with the aim of effective integration of behaviour and actions of all users connected to the electricity network, in particular the production of large amounts of electricity from renewable or distributed energy sources and controllable consumption;

2.3. Criteria and Assessment of Criteria

In order to be designated as a strategic one, the energy project must meet the general and specific criteria.

The general criteria are:

1) the project has to belong to one of the categories from Chapter 2.2;
2) overall potential benefit of the project, assessed according to specific criteria, exceeds the long-term total cost of the project;
3) that the project meets at least one of the following criteria:
   - it includes (besides the Republic of Serbia) at least one neighbouring country, a signatory of the Treaty establishing the Energy Community or an EU member,
   - it is located on the territory of the Republic of Serbia, and has a significant cross-border impact on some of the countries with which the Republic of Serbia borders.

In order to have significant cross-border impact in accordance with point 3), line 2 of the general criteria, the project must meet the following requirements:

(1) for electricity transmission, the project increases the grid transfer capacity, or the capacity available for commercial flows, at the border of Republic of Serbia with one or several other states, or at any other relevant cross-section of the same transmission corridor having the effect of increasing this cross-border grid transfer capacity, by at least 500 Megawatt compared to the situation without commissioning of the project;

(2) for electricity storage, the project provides at least 225 MW installed capacity and has a storage capacity that allows a net annual electricity generation of 250 Gigawatt-hours/year;

(3) for gas transmission, the project concerns investment in reverse flow capacities or changes the capability to transmit gas across the borders of the Republic of Serbia concerned by at least 10% compared to the situation prior to the commissioning of the project;

(4) for gas storage or liquefied/compressed natural gas, the project aims at supplying directly or indirectly at least two countries signatory to the Treaty establishing the Energy Community or the EU Member or at fulfilling the infrastructure standard (N-1 rule);

(5) for smart grids, the project is designed for equipment and installations at high-voltage and medium-voltage level designed for a voltage of 10 kV or more. It involves transmission and distribution system operators from at least two countries signatory to the Treaty establishing the Energy Community, which cover at least 50 000 users that generate or consume electricity or do both in a consumption area of at least 300 Gigawatthours/year, of which at least 20% originate from renewable sources that are variable in nature.

Specific criteria are the contributions of the project as follows:

1. For projects of transmission and electricity storage:

(1) market integration, and reducing the energy infrastructure bottlenecks, the competition and system flexibility;

This criterion shall be measured by calculating and assessing the impact.

For cross-border projects, the impact on the grid transfer capability in both power flow directions is calculated, measured in terms of amount of power (in megawatt), and their contribution to reaching the minimum interconnection capacity of 10% installed production capacity

For projects with significant cross-border impact, calculation is made for the impact on grid transfer capability at borders between the Republic of Serbia and the countries signatory to the Treaty establishing the Energy Community and EU member states, or within the Republic of Serbia and on demand-supply balancing and network operations in in the Republic of Serbia.

Impact assessment is being done for each individual project that includes all contracting parties and the Member States on whose territory the project will be built, all neighbouring parties and Member States and other contracting parties and the Member States to project a significant impact.

Particularly assessed is the impact in relation to the cost of production and transmission of electricity, evolution and convergence of market prices provided by a project under different planning scenarios, notably taking into account the variations induced on the merit order.

(2) sustainability, inter alia through the integration of renewable energy into the grid and the transmission of renewable generation to major consumption centres and storage sites;

This criterion shall be measured in line with the analysis made in the latest available 10-year network development plan in electricity by estimating the amount of generation capacity from renewable energy sources (by technology, in megawatts), which is connected and transmitted due to the project, compared to the amount of planned total generation capacity from these types of renewable energy sources in the concerned Member State in 2020 according to the National Renewable Energy Action Plan of the Republic of Serbia.

For electricity storage, the assessment is made by comparing new capacity provided by the project with total existing capacity for the same storage technology in the area that includes all the contracting parties and the Member State in whose territory the project will

be built, all neighbouring parties and Member States and other contracting parties and the Member States to project a significant impact.

(3) security of supply, inter alia through interoperability, appropriate connections and secure and reliable system operation;

Security of supply, interoperability and secure system operation shall be measured in line with the analysis made in the latest available 10-year network development plan in electricity, notably by assessing the impact of the project on the loss of load expectation for the area that includes all the contracting parties and the Member State in whose territory the project will be built, all neighbouring Parties and Member States and other contracting parties and the Member States to which the project significantly, in terms of generation and transmission adequacy for a set of characteristic load periods, taking into account expected changes in climate-related extreme weather events and their impact on infrastructure resilience. Where applicable, the impact of the project on independent and reliable control of system operation and services shall be measured.

2. For projects in priority thematic areas to be developed:

(1) Integration and involvement of network users with new technical requirements with regard to their electricity supply and demand;

This criterion shall be measured by assessing the methods adopted to calculate charges and tariffs, as well as their structure, for generators, consumers and those that do both, and the operational flexibility provided for dynamic balancing of electricity in the network.

(2) Efficiency and interoperability of electricity transmission and distribution in day-to-day network operation;

This criterion shall be measured by assessing the level of losses in transmission and in distribution networks, the ratio between minimum and maximum electricity demand within a defined time period, the demand side participation in electricity markets and in energy efficiency measures, the percentage utilisation (i.e. average loading) of electricity network components, the availability of network components (related to planned and unplanned maintenance) and its impact on network performances, and the actual availability of network capacity with respect to its standard value.

(3) Network security, system control and quality of supply;

This criterion shall be measured by assessing the ratio of reliably available generation capacity and peak demand, the share of electricity generated from renewable sources, the stability of the electricity system, the duration and frequency of interruptions per customer, including climate related disruptions, and the voltage quality performance.

(4) Optimised planning of future cost-efficient network investments;

This criterion shall be measured by assessing the reduction of greenhouse gas emissions, and the environmental impact of electricity grid infrastructure.

(5) Market operation and customer services, and contribution to cross-border electricity markets by load-flow control to alleviate loop-flows and increase interconnection capacities;

This criterion shall be estimated by assessing the ratio between interconnection capacity of a contracting party and its electricity demand, the exploitation of interconnection capacities, and the congestion rents across interconnections.

In addition, the following shall be valued - installed capacity of distributed energy sources in distribution networks, maximum allowable placement of electricity without congestion risks in transmission networks and energy that is not included in renewable energy because of the risk of congestion or security risks.

3. Concerning projects falling under the sectors of natural gas transportation:

(1) **Market integration, reducing energy infrastructure bottlenecks, system interoperability and flexibility;**

This criterion shall be measured by calculating the additional value of the project to the integration of market areas and price convergence, to the overall flexibility of the system, including the capacity level offered for reverse flows under various scenarios.

(2) **Competition, on the basis of diversification of sources counterparts and routes;**

This criterion shall be measured on the basis of diversification, including the facilitation of access to indigenous sources of supply, taking into account, successively: diversification of sources; diversification of counterparts; diversification of routes; the impact of new capacity on the Herfindahl-Hirschmann index (HHI) calculated at capacity level for the area that includes all the contracting parties and the Member State in whose territory the project will be built, all neighbouring parties and Member States and other contracting parties and the Member States to project a significant impact.

(3) **Security of gas supply, on the basis of, among others, diversification of sources counterparts and routes;**

This criterion shall be measured by calculating the additional value of the project to the short and long- term resilience of the Union's gas system and to enhancing the remaining flexibility of the system to cope with supply disruptions to countries signatory to the Treaty establishing the Energy Community under various scenarios as well as the additional capacity provided by the project measured in relation to the infrastructure standard (N-1 rule) at regional level.

(4) **Sustainability on the basis of, among others, emissions reduction, supporting the back-up of renewable electricity generation and increasing usage of biogas;**

This criterion shall be measured as the contribution of a project to reduce emissions, to support the back-up of renewable electricity generation or power-to-gas and biogas transportation, taking into account expected changes in climatic conditions.

4. **Concerning projects falling under the sectors of oil transportation:**

(1) **Security of supply and reducing the dependency on one single source or route of supply**

This criterion shall be measured by assessing the additional value of the new capacity offered by a project for the short and long-term resilience of the system and the remaining flexibility of the system to cope with supply disruptions under various scenarios.

(2) **Efficient and sustainable use of sources by minimising environmental risks;**

This criterion shall be measured by assessing the extent to which the project makes use of already existing infrastructure and contributes to minimising environmental and climate change burden and risks.

(3) **Interoperability;**

This criterion shall be measured by assessing to what extent the project improves the operation of the oil network, in particular by providing the possibility of reverse flows

The strategic energy projects from Chapter 2.2 can be candidates for the projects of interest for the Energy Community in accordance with the decision of the Ministerial Council of the Energy Community code D/2015/09/MC-ENC.

2.4. Working Group on Strategic Energy Projects

The government, on a proposal from the Ministry in charge of energy, forms a standing working group for strategic energy projects consisting of, in addition to representatives of the ministry in charge of energy sector, the following representatives: Ministry in charge of planning and construction of buildings, Ministry in charge of agriculture, Ministry in charge of environmental protection, Ministry in charge of finance, the Energy Agency of the Republic of Serbia (hereinafter

referred to as AERS), PE Electric Power Industry of Serbia (hereinafter referred to as EPS), Elektromreža Srbije a.d. (hereinafter referred to as EMS a.d), PE Srbijagas, Transport gas Srbija d.o.o., Yugorosgaz, Yugorosgaz - transport ad, PE Transnafta. The working group can include other institutions and project promoters.

The main tasks of the Working Group are:

- specifying a pattern for making a decision on the facility construction;
- discussing project promoter's requirements;
- evaluating projects in accordance with section 2.2;
- to propose to the Minister in charge of energy lists of candidates for strategic energy projects. The decision on the proclamation of a project to be a strategic one is made by the Government of the Republic of Serbia at the proposal of the Minister in charge of energy.
- to propose to the Ministry in charge of energy draft of the law that will regulate issues related to strategic energy projects;
- following the implementation of strategic energy projects;
- preparation of an annual report for each of the strategic energy projects in the sectors of electrical energy and natural gas which should be delivered to the Energy Community Secretariat in accordance with the decision of the Ministerial Council of the Energy Community code D/2015/09/MC-ENC;
- co-operation with the coordinator for the project of interest to Energy Community, who is designated by regular high-level group (PECI coordinator);
- following the activities of the competent authorities in connection with the decision on the construction of the facility in order to meet the deadline.

The main tasks of the promoter:

1. Needs to act in compliance with the regulations governing the energy sector, spatial planning and construction, environmental protection.

2. At the request of the Working Group, the Energy Agency and the Energy Community Secretariat shall submit the necessary data and information related to the project.

3. To deliver to the Working Group data and information referred to previous line and the report submitted to the Energy Agency and the Energy Community Secretariat.

4. To draft a special web page presenting strategic energy projects.

2.5. Implementation and Monitoring

Working group on strategic energy projects shall monitor the implementation of projects under implementation plan (realization) submitted by the project promoter. As part of the implementation plan, it is necessary to precisely define the schedule for:

- preparation of spatial planning and technical documents in accordance with the requirements of the Planning and Construction Law;
- granting of all necessary approvals from the competent authorities and institutions;
- construction and commissioning;
- issuance of all necessary permits.

The process of resolving administrative and legal issues relating to the acquisition or expropriation of land on which a project is built, shall be regulated in accordance with a special regulation.

Deadlines for issuing acts specified under paragraph 1 shall be prescribed by a special regulation and the total deadline cannot exceed 3.5 years.

A special regulation referred to in paragraph 3 shall regulate:

- a project which is declared by the Decision of strategic energy projects, project description, priority status and the determination of the public interest;

- the obligation of the project promoter, particularly in terms of deadlines for completion of individual phases;
- way of reporting on the project implementation on an annual basis, for each year of implementation, including deadlines for reporting the status of permits and procedures for consultation, reporting on project implementation delays, etc.;
- deadlines for issuance of acts specified under paragraph 1.

In order to complete transmission of Regulation 347/2013 of the European Parliament and of the Council on guidelines for trans-European energy infrastructure it is necessary (by regulations governing environmental protection, spatial planning and construction)to prescribe that limits for strategic energy projects should be determined by a special regulation.

2.6. The role of the Energy Agency of the Republic of Serbia

In the process of determining and monitoring the implementation of strategic energy projects Energy Agency of the Republic of Serbia also participate and it will, by June 30, 2018, establish and publish indicators and the corresponding reference value to compare unit investment costs for comparable projects in the infrastructure category shown in Chapter 2.2, under 1) and 2), which project promoters can use for cost analysis and projects they promote.

3. SUMMARY OF GOALS, INDICATORS, MEASURES, ACTIVITIES AND PROJECTS OF THE PROGRAM OF REALIZATION OF ENERGY STRATEGY BY SECTORS

3.1. Sector of Electrical Energy

Strategic goals of Republic of Serbia in sector of electrical energy are defined in Energy Strategy. Indicators of goal realization are defined for each goal.

G.E.1. Providing secure supply of electricity for domestic market;

This indicator is measured through possibility of supply of electricity to all consumers during Program's realization period according to Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) [1], regulation on conditions of electricity delivery and supply, distribution grid code, transmission grid code, regulation on monitoring of technical and commercial indicators and regulation of quality of delivery and supply of electricity and natural gas.
Indicators of continuity of supply in transmission network which should be monitored and calculated are:

- non supplied power due to outage [MW] - total power due to outage for all metering spots without supply,
- ENS [MWh] - total electricity not supplied, which is total electricity that is not supplied during all interruptions of supply,
- ENS [%] - share of total not supplied electricity in total delivered electricity,
- AIT [min] - average interruption time in minutes, which is ratio between not supplied electricity and average power.

Continuity of supply in distribution network is evaluated according to following indicators:

- SAIFI [no. of interruptions/user] - average frequency of interruption per user, which is calculated as quotient of accumulated number of interruptions of supply of consumers and total number of consumers, and
- SAIDI [minutes/user] - average duration of interruption in minutes per user, which is calculated as quotient of accumulated duration of interruptions of supply of consumers and total number of consumers.

Since there are not internationally established standards of satisfactory continuity of supply in transmission and distribution networks, transmission and distribution system operators cannot properly define targeted values of these indicators. All listed indicators heavily depend on annual weather conditions, and especially on occurrence of unusual events (vis major) - natural disaster of catastrophic proportions. In this sense, it is necessary to critically evaluate achievement of targets defined in Table 1 per years during reporting, based on analysis of historic data and expert experience.

Table 1: Indicators of continuity of supply in transmission and distribution networks

Target	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Non supplied power due to outage (MW)	2000	1960	1920	1880	1840	1800	1760
ENS (MWh)	1600	1500	1400	1300	1200	1100	1000
ENS (%)	0.005	0.004	0.004	0.004	0.003	0.003	0.003
AIT (minutes)	30	29	28	27	25	23	21
SAIFI (no of interruptions/user)	8.5	8.2	7.9	7.6	7.3	7.0	6.7
SAIDI (minutes/user)	850	800	750	700	650	600	550

Ministry in charge for mining and energy reports on security of supply every year [39]. Values of indicators of continuity of supply in transmission and distribution networks are presented in this Report. These values are collected, systemized and published by Energy Agency in its Annual Report (Serbian Energy Sector Report part) which is submitted to National Assembly and published every year.

G.E.2. Development of electricity market at national and regional level;

In order to measure development of wholesale electricity market two parameters are used: (1) share of market of three biggest suppliers and (2) level of market concentration. Both parameters are calculated according to following activities:

- sales of electricity to EPS;
- purchase of electricity from EPS;
- sales of electricity among suppliers;
- purchase of electricity among suppliers;
- import of electricity;
- export of electricity;
- transit of electricity.

Calculation of market concentration is performed by Energy Agency of Republic of Serbia and presented in Annual Report [40]. Calculated values from Report [40] are used as base for indicators calculation whose targeted values are presented in Table 2, except for the fifth indicator whose value is provided by SEEPEX and EMS, wherein the indicators are calculated in the following way:

- The level of market concentration, as the highest value of the calculated levels of market concentration;
- The maximum share of three suppliers with the biggest share of wholesale market (%), as the highest value of the calculated values;
- The number of active suppliers in the wholesale electricity market is presented as direct data in Report [40];
- The number of active suppliers in the retail sale electricity market is presented as direct data in Report [40];
- Data on ratio of annual market sale of electricity and total electricity consumption in Serbia provides SEEPEX (about annual sale of electricity in market) and EMS (about annual electricity consumption).

At the national level, open electricity market functions partially (about 37% of the total consumption of end consumers in 2015), and the rest of the customers has provided guaranteed supply of electricity at regulated prices (about 63% of the total consumption of end customers in 2015). Further development of the market should lead regulated electricity prices to market levels.

Table 2: Indicators of electricity market development

Target	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Level of market concentration	moderately high	moderately high	medium	medium	low	low	low
Maximum share of three suppliers with the biggest share of wholesale market (%)	≤50	≤50	≤45	≤45	≤45	≤40	≤40

Target	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Number of active suppliers in the wholesale electricity market	>40	>40	>40	>40	>40	>40	>40
Number of active suppliers in the retail sale electricity market	>10	>10	>10	>10	>10	>10	>10
Ratio of annual sale of electricity in market and total electricity consumption in Serbia	>5%	>6%	>7%	>8%	>9%	>10%	>11%

G.E.3. Increase of transmission capacity/corridors via Republic of Serbia, which have regional and pan-European significance;

This goal is in connection with the implementation of "Trans-Balkan corridor", and in that sense can be defined as an increase in capacity/corridor via the Republic of Serbia, with regional and pan-European nature, to 500 MW in a north-south in the period to 2023. Report on the annual increase in capacity submits EMS.

G.E.4. Reduction of losses in distribution networks;

This goal is defined in strategic documents of EPS, it is the responsibility of the distribution system operator and displayed as a percentage value of electricity losses in the distribution system compared to the total energy to be supplied at the threshold of the distribution system, in order to supply customers connected to the distribution system.

Table 3: Indicator of losses reduction in distribution sector

Target	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Losses of energy (%)	12.8	11.9	10.8	10.4	10.1	9.8	9.6

Annual losses of electricity in distribution system and their percentage compared to total annual energy provided at the threshold of distribution system for supplying of consumers connected to distribution system are part of information on realized energy balance of distribution utilities of Republic of Serbia, which will be provided by distribution system operator in the future.

G.E.5. Enabling net export of electricity;

Possibility for net export of electricity is provided if total electricity consumption of consumers and users of transmission and distribution systems in the Republic of Serbia, increased for losses in transmission and distribution system and consumption for RHPP pumping regime less than total electricity production at the threshold of transmission network in the Republic of Serbia. In other words, difference between export and import of electricity during one year should be positive in that case. Accordingly goal is defined that difference between export and import of electricity in the annual balance of electricity in the period of implementation of Program is greater than zero.

3.1.1. Overview of Policies and Activities in the Field of Electricity

To achieve the objectives set out in section 3.1, in the period of implementation of Program, the following activities will be carried out: ensuring the smooth and transparent functioning of the electricity market and non-discriminatory access for all market participants and harmonizing bylaws with the Energy Law (primarily adoption of the new regulations on conditions for delivery and supply of electricity). Taking into account the uncertainty of market trends in the electricity market (increased production of electricity from renewable energy sources in some European

countries and the expected increased possibility of placing surplus on the market of the Republic of Serbia due to market integration in the future, uncertainty about CO_2 certificates trade, etc.), energy operators will in future pay special attention to measures to mitigate market risk and predict the resources for the implementation of the activities for which they are responsible, within the framework of their commercial policy and in the framework of strategic and planning documents.

In addition, the Ministry in charge of mining and energy shall take all measures for the implementation of activities under the authority and for this purpose shall provide funds from the Budget of the Republic of Serbia for the corresponding year.

Table 4: Overview of activities in electricity sector

Activity	Realization period	Responsible entities	Indicators of realization
Adoption of bylows according to Energy Law	2017.	Ministry in charge of mining and energy	Adopted Regulation on conditions for delivery and supply of electricity
Providing a legal framework for carrying out the process of certification of transmission system operators through the amendment of the Law on Ministries, the Law on Government, the Law on Public Enterprises and the Law on Companies	2018.	The Government of the Republic of Serbia, the National Assembly of the Republic of Serbia, the Ministry responsible for economic affairs, the Ministry in charge of energy and mining	Carried out certification process by Energy Agency and provided the certification of transmission system operator
Takeover of metering spots and equipment by the distribution system operator and the improvement of metering infrastructure to ensure smooth functioning of the electricity market and to ensure a better offer on the electricity market	2017-2020.	DSO EPS Distribution, Energy Agency of the Republic of Serbia, the Ministry in charge of energy and mining	The enforcement of obligations under the Energy Law (Articles 136 and 404)
Ensuring the smooth, transparent and non-discriminatory allocation of cross-border transmission capacity through the coordinated allocation of transmission capacity and joining the Auction Office	2017.	TSO EMS, Energy Agency of the Republic of Serbia	Indicators of electricity market development presented in Table 2

Activity	Realization period	Responsible entities	Indicators of realization
Harmonization of network codes of the transmission and distribution systems in accordance with the Energy Law	2017-2020.	TSO EMS, DSO EPS Distribution, Energy Agency of the Republic of Serbia	Indicators of electricity market development presented in Table 2
Electricity market coupling with Montenegrin market (1. phase), 4MMC (Hungarian, Romanian, Czech and Slovakian markets) (2. phase), Italian (3. phase) and Croatian, Bulgarian and Albanian markets (4. phase)	2017. - Montenegro 2018. - 4MMC 2020. - Italy 2023. - Croatia, Bulgaria and Albania	SEEPEX	Indicators of electricity market development presented in Table 2 and completed market coupling processes
Adoption of bylaws in accordance with the Law on the efficient use of energy in the field of electrical energy	2017.	Ministry in charge of mining and energy	Adoption of the Regulation and the Rules prescribing minimum energy efficiency requirements for new and reconstructed facilities for the generation, transmission and distribution of electricity and heat
Improving energy efficiency in the electricity generation sector through improving technical efficiency of steam boilers and turbo-plants and other facilities in accordance with the measures stipulated in the Action Plan for Energy Efficiency	2017-2023.	EPS	The values of efficiency of new and reconstructed thermal power plants in line with the future Regulation on the minimum requirements for energy efficiency
The inclusion of the procedure for issuing energy permits for construction of facilities for the production of 1 MW or more, or power less than 1 MW that use water as a primary energy resource, facilities for combined production of electricity and heat and direct OHL at the E-administration portal	2018.	Ministry in charge of mining and energy, the Ministry responsible for public administration and local government, Chamber of Commerce of Serbia	Established service at the E-administration portal

Activity	Realization period	Responsible entities	Indicators of realization
Preparation of a study which would comprehend the need to introduce a model of capacitive mechanism and to define further steps and activities for its eventual implementation	2019.	Ministry in charge of mining and energy	Prepared study in which different models of application of capacitive mechanism are presented, an optimal solution is selected and further actions and the steps of its application are defined

In accordance with the provisions of the Energy Law the preparation and adoption of regulations is planned, whose review, dates of adoption and responsible institutions is presented in the following table.

Table 5: Plan of the adoption of future regulations in the electricity sector

Name of future regulation	Name of EU regulation by which to synchronize	Deadline for adoption	Responsible institutions
Regulation on conditions for delivery and supply of electricity	Directive 2009/72/ EC in the text implemented according to the Decision of the Ministerial Council EZ D/2011/02/MC-ENC from October 6, 2011.	II quarter 2017	Ministry in charge of mining and energy (Electricity Department)
Technical regulations in the field of electricity	-	IV quarter 2019	

3.1.2. The List of Projects in the Electricity Sector

3.1.2.1 Projects in the Field of Electricity Generation

In the field of electricity production, the construction and entry into operation of several major production facilities is planned during implementation of Program, as well as withdrawing of thermal power plants that are at the end of their life cycle from operation.

Listed significant production facilities should be put into operation during Program implementation:

1) Wind Farm Alibunar, by the end of February 2018, installed capacity of 42 MW, estimated annual production of 100.8 GWh;

   Note: The annual production of all wind farms is estimated based on an installed (maximum) power and the estimated equivalent of effective annual operation time of 2400 hours.
2) Wind Farm Malibunar, by the end of April 2018, installed capacity of 8 MW, estimated annual production of 19.2 GWh;
3) Wind Farm Plandište 1, by the end of November 2018, installed capacity of 102 MW, estimated annual production of 244.8 GWh;
4) Wind Farm Kovačica, by the end of November 2018, installed capacity of 104.5 MW, estimated annual production of 250.8 GWh;
5) Wind Farm Čibuk, by the end of November 2018, installed capacity of 158.46 MW, estimated annual production of 380.3 GWh;
6) Wind Farm Košava, by the end of April 2019, installed capacity of 68 MW, estimated annual production of 163.2 GWh;
7) Wind Farm Kostolac, by the end of 2020, installed capacity of 66 MW, estimated annual production of 145 GWh (this project is included in the list of priority infrastructure projects in the field of energy - Single Project Pipeline with the solar power plant Petka in Kostolac, installed capacity of 9.9 MW, estimated annual production of 13 GWh);
8) The steam-gas CHP Pančevo, by the end of I quarter 2019, installed capacity of 140 MW, estimated annual production of 910 GWh [41]. There is the possibility of delaying the deadline presented by the investor if the connection conditions are subject to the completion of the first stage TS Pančevo 7, due to the investment status of this substation;
9) Thermal-Block B3 in TPP Kostolac B, by the end 2020, installed capacity of 350 MW, estimated annual production of 2,200 GWh

Therefore, the total electricity production from new capacities should be increased by 4,427 GWh. This would be a successful substitute of energy produced by capacities whose withdrawal from operation is planned due to the end of their service life.

Projects of wind farms construction, which were prompted by the introduction of the status of a privileged producer and incentives provided to this type of electricity production, will be for these reasons presented in the chapter relating to the field of renewable energy.

During implementation of the Program it is planned to continue revitalization of HPP, wherein it is planned to increase the power which is injected to the transmission system with the following schedule:

1) The unit G1 in HPP Đerdap 1, new installed capacity of 205 MW, will be in operation from 2017.

   Note: Permission for the exploitation of new installed power supplier provides after completion of the warranty tests - applies to each of these aggregates.
2) The unit G2 in HPP Đerdap 1, new installed capacity of 205 MW, will be in operation from 2018.

3) The unit G3 in HPP Đerdap 1, new installed capacity of 205 MW, will be in operation from 2019.
4) The unit G2 in HPP Zvornik, new installed capacity of 31.4 MW (instead of 24 MW) will be in operation from 2017.
5) The unit G3 in HPP Zvornik, new installed capacity of 31.4 MW (instead of 24 MW) will be in operation from 2018.
6) The unit G4 in HPP Zvornik, new installed capacity of 31.4 MW (instead of 24 MW) will be in operation from 2019.
7) The unit G1 in HPP Potpeć, new installed capacity of 19 MW (instead of 17 MW) will be in operation from 2021.
8) The unit G2 in HPP Potpeć, new installed capacity of 19 MW (instead of 17 MW) will be in operation from 2022.
9) The unit G3 in HPP Potpeć, new installed capacity of 19 MW (instead of 17 MW) will be in operation from 2023.
10) New G4 unit in HPP Potpeć, installed capacity of 13 MW, will be in operation from 2020.

In addition to increased power of HPP generators/turbine units, the production of electricity from hydro power plants will still mostly depend on hydrology (water inflow).

During the period of implementation of the Program it is planned to revitalize the thermal block A4 in TPP Nikola Tesla A, where it is planned to increase the installed capacity to 308.5 MW to 335.3 MW by 2018.

By the end of 2023 it is planned to withdraw from operation eight thermo-blocks (for TPP Kostolac A1 additional analysis on the feasibility of withdrawal/rehabilitation will be performed) overall balance of power 622 MW and production of about 1,717 GWh. This means that by the end of the Program implementation additional electricity production of about 2.71 TWh would be provided from domestic sources, whereby the output from new TPP and CHP would completely replace the production of withdrawn TPP and CHP, which would secure fulfilling two strategic objectives in the field of electrical energy:

G.E.1. Providing secure supply of electricity for domestic market;

G.E.5. Enabling net export of electricity;

Note: Numbers of goals correspond to numbered targets of Chapter 3.1. This way of numbering of the goals is kept in the sections relating to projects in the areas of transmission and distribution of electricity. The goals are listed by relevance of the project to achieve them (the first is listed the goal for which the fulfilment of the project is the most important).

Although the units A1 and A2 in TPP Nikola Tesla A will come to the end of their life cycle during the implementation of the Program, the preliminary analysis shows that the most economical solution is reconstruction of units A1 and A2 in TPP Nikola Tesla A with the implementation of measures for environmental protection and for this the estimated investments of about € 230 million are needed. The final solution for the status of these thermal units will be known after the preparation of detailed investment and technical documentation, which is on-going.

Investments required to withdraw five thermo-blocks from the operation are estimated at 26 million €.

The preparation of investment and technical documentation for status of location TE Kostolac A is on-going. Preliminary analysis shows that thermal block A1 should be withdrawn from the operation, and block A2 should be reconstructed with the application of measures to protect the environment, with the necessary investment of 187 million €. Final solution for status of these thermal blocks will be available after preparation of investment and technical documentation.

It is planned that reconstructed and new production thermal blocks are implemented using modern technology that provides an optimal level of energy efficiency in the electricity generation sector. They would replace old, energy-inefficient thermo-blocks that are withdrawn from the operation.

Improving energy efficiency in electricity production is planned by improving the technical efficiency of steam boilers and turbo-plants. Plan of activities to improve and targeted values of indicators of realization (degree of usefulness of certain thermo-blocks) will define EPS through its ten-year development plan.

Ministry in charge of mining and energy has prepared the decree and the rules that prescribe minimum requirements for new and revitalized facilities for the generation, transmission and distribution of heat and electricity, which will be a condition for obtaining the energy and/or a building permit, and whose application start in 2017.

In addition to wind turbines, which are particularly important in order to meet goals related to renewable energy sources under various scenarios, Energy Strategy considered a number of potential projects for the construction of production facilities in the electricity sector, as shown in Table 6.

Table 6: Potential projects for the construction of new generating capacity in the electricity sector

Name of project	Estimated power (MW)	Estimated annual generation (GWh)
TPPNT B3	750	5400
TPP Kolubara B	750	5100
CHP on gas	860 [a]	3000
HPP Velika Morava	147.7 [b]	650
HPP Zapadna Morava	66.45 [b]	297.14
HPP Ibar [c]	117 [b]	451
HPP Srednja Drina [c]	321 [b]	1445
RHPP Bistrica	680	-
RHPP Đerdap 3 (I phase)	600	-

a - Total power of several CHP (Pančevo, Beograd, Niš, etc.)

b - Total power of several cascade HPP

c - Law on Ratification of the Agreement between the Government of the Republic of Serbia and the Republic of Italy on cooperation in the field of energy ("Official Gazette of the Republic of Serbia" - International Agreements, no. 7/12)

In addition, it is considered the launch of the project of construction of facilities for the production of electricity from waste in the Republic of Serbia.

P.1. The project of construction of new thermo-block in TPP Kostolac B3

The project of construction of a new thermo-block in Kostolac B3 (TPPKO B3 350 MW) contributes to increasing the production capacity, and thereby improve security of energy supply in Serbia. The project includes expansion of open pit mine Drmno and increase of coal production from 9 to 12 million tons per year. The value of the project TPP Kostolac B3 is $715.6 million (about 81,100 million RSD). The project is financed from two sources: 85% of the project will be funded by a loan from the Chinese EKSIM bank under preferential conditions approved by the government guarantee, and the residue is provided from the EPS (15%). The completion period is 58 months. Block TPP Kostolac B3 meets all environmental standards prescribed by the laws of the Republic of Serbia. The construction is of great importance for the development of energy sector of the Republic of Serbia, for a reliable and secure supply of energy and establishing the

conditions for reliable and safe operation and sustainable development of the energy sector in general, which directly affects the competitiveness and export capacity of the Serbian economy.

From the aspect of energy efficiency improvement, detailed assessment will be known after preparation of study on energy efficiency. Since the production of the new thermo-block will replace the production of old thermo-blocks with low efficiency level, the assumption is that the efficiency of electricity generation of the new block will increase by at least 3 percentage points. So, based on assumption that the existing thermo-blocks which will be replaced by a new thermo-block have efficiency of 35% (which is a conservative assumption because in 2015, the average efficiency of thermal blocks without the consumption of electricity for own consumption amounted to 34.9%), and that the new thermo-block has efficiency of 38% (characteristics of individual elements of thermo-blocks are unknown, because the block is still subject to planning), for every kWh of energy produced from the new thermo-block saving will be around 225 Wh of primary energy. This means that the annual production of 2,200 GWh corresponds to an annual primary energy savings of 495 GWh, which represents about 0.4% of primary energy production in 2015.

Table 7: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
TPP Kostolac B3 350 MW	715.6 million $ (85% of the loan of Chinese EKSIM Bank, and 15% from EPS's own funds)	The increase in installed capacity of thermal power plants of EPS for 350 MW and increase of annual generation injected the transmission system of approximately 2,200 GWh. Production of thermal block will replace the production capacity that are planned for withdrawal by 2023, which will, in addition to building new RES capacities, ensure security of electricity supply of customers in the Republic of Serbia.	Annual production of electricity that is injected into the transmission system: 2,200 GWh; The value of injected electricity according to the regulated prices of electricity in 2015: RSD 14,762 million ($135.5 million according to the regulated prices of electricity in 2015).

Table 8: Lacking planning and technical documentation

Project	Status of the project during the preparation of the Program	Lacking planning and technical documentation
The project of construction of new thermo-block in TPP Kostolac B3	Preliminary design is completed and approved by the National Review Committee in 2014. The amendment of preliminary design is on-going, due to the changed conditions by the Chinese partner. The drafting and review of the Project for a building permit is on-going.	Environmental impact assessment study, the project for the building permit, energy permit, report on energy efficiency, building permit, the project for works (construction, mechanical, electrical and information-communication section), as built design, usage permit.

Indicator of this project realization is the percentage of realization of term plan harmonized with the contractor by quarters (and years).

Table 9: The dynamics of the implementation of activities during implementation of the Program

Project: The project of construction of new thermo-block in TPP Kostolac B3	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EPS, Ministry in charge of mining and energy	x	x	x	x			
Preparation of technical documentation		x	x					
Study of the impact on the environment and society		x						
Permits		x	x					
Construction and commissioning			x	x	x			

3.1.2.2 Projects in the Field of Electricity Transmission

Projects in the field of electricity transmission can be divided into two groups:

1) Projects of reinforcement of lines that connect Serbian transmission system with neighbouring transmission systems and further integration of the transmission system of the Republic of Serbia in regional interconnection. These projects enable the implementation of the following strategic goals in the field of electrical energy (goals are listed in the order of magnitude of the effects of the project to the goal):

   G.E.2. Development of electricity market at national and regional level;

   G.E.3. Increase of transmission capacity/corridors via Republic of Serbia, which have regional and pan-European significance;

   G.E.5. Enabling net export of electricity;

   G.E.1. Providing secure supply of electricity for domestic market;

2) Projects for further development and reconstruction of the existing 110 kV network in order to ensure a secure supply of transmission system users. These projects enable the implementation of the following strategic goals in the field of electrical energy:

   G.E.1. Providing secure supply of electricity for domestic market;

   G.E.2. Development of electricity market at national and regional level;

The first group of projects includes the project "Trans-Balkan corridor", which implementation is on-going and it has predominantly regional character. The second group consists of projects of the reconstruction of existing 110 kV lines which are at the end of their life cycle, as well as the construction of new lines which solve the problems of unsecure, a radial supply of individual substations 110/X kV.

P.2. The "Trans-Balkan corridor" project

The "Trans-Balkan corridor" project is included in Single Project Pipeline, Projects of Energy Community Interest (PECI), Projects of Common Interest (PCI) (section Resita - Pančevo), Western Balkan Investment Framework project list (WBIF) and list of project within investment framework of Western Balkan Six (WB6 list) (section Kragujevac 2 - Kraljevo 3 and upgrade of Kraljevo 3 substation) and it consists of two phases.

The "Trans-Balkan Corridor - Phase 1" consists of four sections:

1. Construction of double 400 kV overhead line (OHL) TS Pančevo 2 - TS Resita;
2. Construction of single 400 kV OHL TS Kragujevac 2 - TS Kraljevo 3;
3. Construction of double 400 kV OHL TS Obrenovac - TS Bajina Bašta;
4. Construction of regional 400 kV interconnection Serbia - Bosnia and Herzegovina - Montenegro through construction of double 400 kV OHL TS Bajina Bašta - TPP Pljevlja - HPP Višegrad with possible prospective connection of RHPP Bistrica;

The "Trans-Balkan corridor - Phase 2" includes a number of projects for construction of new 400 kV power lines. Only after the completion of the first phase, based on the completed planning and technical documentation, decision will be made on the priorities of projects under Phase 2.

It is planned to complete the construction of the sections 1, 2 and 4, within the phase 1 of the project, to begin construction of a section 3 of the phase 1, to complete the project planning and technical documentation and to provide permission for the construction of phase 2 of the project, during the implementation of the program.

For phase 2 of the project, the preparation of prefeasibility study is on-going, therefore there are still no available data on the final technical characteristics and effects of power line construction.

The summary effect of reducing losses due to the implementation of all projects amounts to 202.3 GWh per year, which accounts for about 0.2% of final energy consumption (energy and non-energy use) in 2015. However, the cumulative effect of implementation of all projects is lower due

to changes in the baseline against which calculations are made. In any case, the cumulative effect is not less than 130.4 GWh per year (maximum effect of a particular project), which represents about 0.13% of final energy consumption (energy and non-energy use) in 2015.

The change from the previously perceived value of the "Trans-Balkan Corridor - Phase 1" in Single Project Pipeline, or Table 129 of Program, was caused by the conclusion of the contract for credit and donation for the construction of the section 2, which is determined by the final value of the investment, as well as a more precise understanding of the costs for sections 3 and 4, for purposes of completing the application for the preparation of investment grant.

Table 10: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation (values are taken over from corresponding studies)
Double 400 kV OHL TS Pančevo 2 - TS Rešica - 65 km	25.6 million € (own funds of EMS)	Improving the overall net transfer capacity interconnection between Serbia and Romania, facilitating the connection of future large-scale wind farm in southern Banat and the future connection of the 400/110 kV Vršac, upgrading transmission network in western Serbia to the 400 kV by gradually taking over the function of over 500 km of 220 kV lines in this zone, whose age is more than 50 years and which should be withdrawn from service, while reducing losses, increasing the capacity of lines that allow the pumping regime of RHPP Bajina Bašta, increasing the transmission capacity of the transmission network in the Republic of Serbia in the east-west and north-south directions and facilitating transfer of cheaper electricity from Southeast Europe to Italy. All of this will increase security of electricity supply in Republic of Serbia, allow the connection of renewable energy sources, and provide better integration of the electricity market, and provide the conditions for connection of future RHPP Bistrica to the 400 kV network.	5.1 million € (reduction of losses € 0.6 million and an increase in transmission capacity 4.5 million €); Reduction of losses: 13.3 GWh per annum (about 1.4% compared to the present value of losses in the transmission system); Reducing CO_2 emissions ≈ 11000 t per year (estimate).
Single 400 kV OHL TS Kragujevac 2 - TS Kraljevo 3 - 60 km	29.6 million € (Of which: 8 million € own funds of EMS, € 6.6 million donation through the WBIF, € 15 million loan KfW)		0.38 million € (reduction of losses); Reduction of losses: 7 GWh per annum (about 0.8% compared to the present value of losses in the transmission system); Reducing CO_2 emissions ≈ 4,077 t per year (estimate).
Double 400 kV OHL TS Obrenovac - TS Bajina Bašta - 111 km	62 million € (EU pre-accession funds)		9.8 million € (reduction of losses € 7.8 million, reduction of CO_2 emissions € 1.3 million, and an increase in transmission capacity 0.7 million €); Reduction of losses: 130.4 GWh per annum (about 14% compared to the present value of losses in the transmission system); Reducing CO_2 emissions ≈ 108,500 t per year (estimate).
Double 400 kV OHL TS Bajina Bašta - TPP Pljevlja - HPP Višegrad - 84 km	39 million € (EU pre-accession funds)		6.4 million € (individual effects are not presented in available documents); Reduction of losses: 51.6 GWh per annum (about 5.5% compared to the present value of losses in the transmission system); Reducing CO_2 emissions ≈ 42,900 t per year (estimate).

Table 11: Lacking planning and technical documentation

Project	Status of the project during the preparation of the Program	Lacking planning and technical documentation
Double 400 kV OHL TS Pančevo 2 - TS Rešica - 65 km	Construction started in 2016	As-built design
Single 400 kV OHL TS Kragujevac 2 - TS Kraljevo 3 - 60 km	Completed a complete planning documents, adopted the detailed regulation plan for the territory of three municipalities through which passes the transmission line (Kragujevac, Knić and Kraljevo), provided the location conditions issued by the Ministry of Construction, Transport and Infrastructure. Feasibility study and preliminary design is completed and the Audit commission of the Ministry of Construction, Transport and Infrastructure issued a positive opinion on the study. Completed a complete EIA procedure: prepared Study on environmental impact assessment, provided public debate and public insight, and then the expert review of the Ministry of Agriculture and Environmental Protection. Preparation of technical documentation and technical control of the same is in the final stage. The resolution of property issues, i.e. expropriation of land for the pillar locations is in final stage. The building permit for the works in TS Kraljevo 3 is issued.	It is expected that the issuance of a building permit for the power line and the launch of the tender for the construction begin during 2017, and the construction of transmission line during 2018.
Double 400 kV OHL TS Obrenovac - TS Bajina Bašta - 111 km	The preparation of the elaborate on general route selection and of the Spatial plan for special purpose area are on-going. Also, preparation of the documentation for the tender is on-going for the feasibility study, preliminary design study and environmental impact assessment in accordance with the requirements of the Law on planning and construction. The documents which have been prepared in the previous procedure do not meet the requirements of the Law on planning and construction so they need to be adjusted.	Elaborate on general route selection, Spatial plan for special purpose area, conceptual solution, location conditions, the final versions of the feasibility study, preliminary design and study of environmental impact assessment in accordance with the requirements of the Law on planning and construction, the project for building permit, building permit, the project for execution of works, tender documents for the construction, as-built design.

Project	Status of the project during the preparation of the Program	Lacking planning and technical documentation
Double 400 kV OHL TS Bajina Bašta - TPP Pljevlja - HPP Višegrad - 84 km	The preparation of the Spatial plan for special purposes area (SPSPA) under the Ministry of construction, transport and infrastructure is on-going, in parallel to the preparation of feasibility studies, preliminary project study and environmental impact assessment in accordance with the requirements of the Law on planning and construction, and they will be submitted to the audit after adopting SPSPA and conceptual solution and obtaining location conditions.	Spatial plan for special purpose area, conceptual solution, location conditions, the final versions of the feasibility study, preliminary design and study of environmental impact assessment in accordance with the requirements of the Law on planning and construction, the project for building permit, building permit, the project for execution of works, tender documents for the construction, as-built design.

Indicator of this project realization is implementation of activities per years presented in following table. Numbers in table mark sections of project and number 5 correspond to the second phase of project.

Table 12: The dynamics of the implementation of activities during implementation of the Program

Project: The "Trans-Balkan corridor" project	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EMS	1-4	2-4	2-4	3-5	3-5	3-5	3, 5
Preparation of spatial planning documentation		4	4	3-4	3, 5	3, 5	5	
Preparation of technical documentation		4	3-4	3-4	3, 5	3, 5	5	
Study of the impact on the environment and society		3						
Permits		2	4	4	3-5	3, 5	3, 5	5
Construction and commissioning		1	2	2		4	4	3

P.3. The project of reconstruction of 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level.

Over 2000 km of 110 kV OHL of transmission network was built more than 50 years ago. Although in the meantime, some of them were reconstructed, these are the replacement of worn conductors, a very rarely replacement of pillars. A large number of power lines is built on concrete pillars and passes affected routes, which results in a reduction of indicators of supply reliability. To ensure a satisfactory level of reliability of the 110 kV power transmission grid it is necessary to implement phases reconstruction of this network in the future. It is planned to reconstruct annually about 40 kilometres of 110 kV OHL, that is, a total of 280 kilometres during Program implementation.

Each individual line requires a separate analysis of the effects of the energy efficiency, depending on its role in the network (i.e., the maximum load and the annual equivalent time of its duration) and of cross sections before and after reconstruction. Assuming that the average maximum loading of the reconstructed lines is 20 MW and 6 MVAr, and that all of the reconstructed lines change the cross-section from AlFe 3x150 mm^2 to AlFe 3x240 mm^2, wherein the equivalent duration of the maximum power is 4500 hours per year, expected annual energy cost savings per 1 km of line is about 6700 kWh (335 €/km with estimated cost of the energy losses of 0.05 €/kWh). From the aspect of energy efficiency, estimated effect of the entire project implementation is losses reduction of about 1.88 GWh per year after 2023, which is about 0.002% of final energy consumption (energy and non-energy use) in 2015.

Table 13: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
40 km per year	About € 4 million per year (own funds of EMS)	Reduction in annual maintenance costs, increased security of supply, reduced losses.	The reduction of annual costs by about € 52 thousand (adopted assessment from study of about 1300 €/km, while the individual effects of the reduction are not separated into maintenance costs, losses, ...)

Indicator of this project realization is percentage of implementation of activities per years presented in following table. Number of kilometres in table marks total length of lines for which specified activity should be implemented.

Table 14: The dynamics of the implementation of activities during implementation of the Program

Project: Reconstruction of 110 kV network	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EMS	x	x	x	x	x	x	x
Preparation of spatial planning documentation		40 km	40 km	40 km	40 km	40 km	40 km	40 km
Preparation of technical documentation		40 km	40 km	40 km	40 km	40 km	40 km	40 km
Study of the impact on the environment and society		40 km	40 km	40 km	40 km	40 km	40 km	40 km
Permits		40 km	40 km	40 km	40 km	40 km	40 km	40 km
Construction		40 km	40 km	40 km	40 km	40 km	40 km	40 km

P.4. The project reinforcement of overhead and underground (cable) 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level.

Twenty substations that are under jurisdiction of DSO do not have provided secure power supply. These are: Novi Sad 7, Senta 2, Ada, Temerin, Žabalj, Bela Crkva, Veliko Gradište, Kovin, Rudnik Kovin, Krupanj, Ljubovija, Knić, Stenjevac, Prijepolje, Arilje, Ivanjica, Novi Pazar 1 i 2, Raška, Sjenica, Jablanica, Vlasotince, Dimitrovgrad, Preševo. Namely, a loss of the single supply line causes that TS are left without power supply at 110 kV level, wherein for only a fraction of its consumption backup power supply can be provided on lower voltage levels from the neighbouring 110/X kV substations. Also, some 110 kV lines require reinforcement in order to increase the efficiency of 110 kV transmission network. In this regard, during the period of Program implementation it is anticipated entry into operation of the following 110 kV overhead and underground (cable) lines:

1. 110 kV cable TS 110/35/20 kV Novi Sad 7 - TS 110/20/10 kV Novi Sad 5 (Al 1,000 mm^2, 3.98 km);
2. Single 110 kV OHL TS 110/20 kV Bela Crkva - TS 110/35 kV Veliko Gradište (AlFe 240 mm^2, 34.13 km);
3. Single 110 kV OHL TS 110/35 kV Ljubovija - TS Srebrenica (B&H - AlFe 240 mm^2, total 8.62 km, and part under Republic of Serbia jurisdiction - 2.5 km);
4. Single 110 kV OHL TS 110/20 kV Ada - TS 110/20 kV Kikinda 2 (AlFe 240 mm^2, 29.56 km);
5. Single 110 kV OHL TS 110/35 kV Guča - TS 110/35 kV Ivanjica (AlFe 240 mm^2, 23 km);
6. Double 110 kV OHL TS 220/110 kV Kraljevo 3 - TS 110/35 kV Novi Pazar 1 (2xAlFe 240 mm^2, 63.37 km).

Preparation of spatial-planning and technical documentation for listed lines will be realized successively during Program implementation.

For these subprojects there is no available study about the effects of reducing losses in the current state of the network. Therefore, an impact assessment on the improvement of energy efficiency is made on the basis of available models of the transmission network:

1. Cable 110 kV TS 110/35/20 kV Novi Sad 7 - TS 110/20/10 kV Novi Sad 5: 1.9 GWh per year (≈0.002% of final energy consumption (energy and non-energy use) in 2015);
2. Single 110 kV OHL TS 110/20 kV Bela Crkva - TS 110/35 kV Veliko Gradište: 1.48 GWh per year (≈0.0014% of final energy consumption (energy and non-energy use) in 2015);
3. Single 110 kV OHL TS 110/35 kV Ljubovija - TS Srebrenica: almost without effects;
4. Single 110 kV OHL TS 110/20 kV Ada - TS 110/20 kV Kikinda 2: almost without effects;
5. Single 110 kV OHL TS 110/35 kV Guča - TS 110/35 kV Ivanjica: almost without effects;
6. Double 110 kV OHL TS 220/110 kV Kraljevo 3 - TS 110/35 kV Novi Pazar 1: 13.6 GWh per year (≈0.013% of final energy consumption (energy and non-energy use) in 2015).

Table 15: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
1. 110 kV cable TS Novi Sad 7 - TS Novi Sad 5, Al 1000 mm^2, 3.98 km	3.2 million € (Own funds of EMS)	Improvement of security of supply, losses reduction	Reduction of non-supplied energy for about 37 MWh.
2. Single 110 kV OHL TS Bela Crkva - TS Veliko Gradište, AlFe 240 mm^2, 34.13 km	2.8 million € (Own funds of EMS)		Reduction of non-supplied energy for about 166 MWh.
3. Single 110 kV OHL TS 110/35 kV Ljubovija - TS Srebrenica (B&H), AlFe 240 mm^2, total 8.62 km, and part under Republic of Serbia jurisdiction - 2.5 km	0.7 million € (Own funds of EMS)		Reduction of non-supplied energy for about 262 MWh.
4. Single 110 kV OHL TS Ada - TS Kikinda 2, AlFe 240 mm^2, 29.56 km	2.2 million € (Own funds of EMS)		Reduction of non-supplied energy for about 233 MWh.
5. Single 110 kV OHL TS Guča - TS Ivanjica, AlFe 240 mm^2, 23 km	2.4 million € (Own funds of EMS)		Reduction of non-supplied energy for about 340 MWh.
6. Double 110 kV OHL TS Kraljevo 3 - TS Novi Pazar 1, 2xAlFe 240 mm^2, 63.37 km	9.6 million € (Own funds of EMS)		Reduction of non-supplied energy for about 157 MWh.

Table 16: Lacking planning and technical documentation

Project	Status of the project during the preparation of the Program	Lacking planning and technical documentation
1. 110 kV cable TS Novi Sad 7 - TS Novi Sad 5	Complete urban planning documentation is prepared.	The process of completing the technical documentation, securing the necessary permits and resolving property issues is on-going.
2. Single 110 kV OHL TS Bela Crkva - TS Veliko Gradište	Complete urban planning and technical documentation is prepared.	The process of securing the necessary permits and resolving property issues is on-going.
3. Single 110 kV OHL TS 110/35 kV Ljubovija - TS Srebrenica (B&H), AlFe 240 mm^2	Project is in development stage.	Complete urban planning and technical documentation is missing, process of securing the necessary permits and resolving property issues did not start yet.
4. Single 110 kV OHL TS Ada - TS Kikinda 2	Complete urban planning and technical documentation is prepared.	The process of securing the necessary permits and resolving property issues is on-going.
5. Single 110 kV OHL TS Guča - TS Ivanjica	Complete urban planning documentation is prepared.	The process of completing the technical documentation, securing the necessary permits and resolving property issues did not start yet.
6. Double 110 kV OHL TS Kraljevo 3 - TS Novi Pazar 1	Complete urban planning documentation is prepared.	The process of completing the technical documentation and securing the necessary permits is on-going. Process of resolving property issues did not start yet.

Indicator of this project realization is implementation of activities per years presented in following table. Numbers in table correspond to numbers of subprojects from Table 16.

Table 17: The dynamics of the implementation of activities during implementation of the Program

Project: Reinforcement of overhead and underground (cable) 110 kV lines	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EMS	1-6	1-6	2-6	4-6	5-6		
Preparation of spatial planning documentation		3						
Preparation of technical documentation		1, 5-6	3					
Permits		1, 2, 4	1-6	3, 5-6				
Construction			1-2	2-6	4-6	5-6		

3.1.2.3 Projects in the Field of Electricity Distribution

The main functions of projects in the field of electricity distribution are to increase the level of reliability of supply of electricity, to reduce energy losses and optimize the capacity utilization of the distribution network. Therefore, these projects provide the implementation of the following strategic objectives in the field of electrical engineering:

G.E.1. Providing secure supply of electricity for domestic market;

G.E.4. Reduction of losses in distribution networks;

Projects can be divided into two groups: projects that introduce modern technologies that enable the improvement of operation and the reduction of losses in the distribution system and projects of reconstruction and reinforcement of the distribution network in order to improve the reliability of supply and reduce electricity losses in the distribution network.

The first group of projects includes "Improving metering infrastructure" and "Distribution network automation". The second group of projects consists of the "Project of reconstruction of TS 110/X kV at the end of their life cycle" and "Project of construction of new TS 110/X kV".

The total investment value of the four projects is around € 277 million.

P.5. Project "Improvement of metering infrastructure"

The aim of the project "Improvement of metering infrastructure" is the replacement of worn-out metering infrastructure and implementation of modern systems for remote reading and load management, and information systems that allow the use of the data collected. The project is being implemented in phases, through the replacement of electric meters and implementing the system in areas where advance preparation and screening of the existing situation is carried out. Currently, documentation has been prepared and made available for replacing indirect, semi-indirect and direct metering groups in the area of a complete DSO (130 indirect metering groups class 02, 4087 indirect metering groups class 05, 29830 semi-indirect metering groups and 24295 direct metering groups) and the replacement of the meters for a total of about 50000 households and 25343 indirect metering group that will be incorporated into the TS X/0.4 kV. Also, the documentation was prepared for the implementation of an information system that will allow remote reading, load management and use of data obtained in this way.

Table 19 presents an indicative plan of the project. The final plan of the project will be defined at the beginning of its implementation and will be established on the basis of an assessment of the possibility of delivery of equipment and available technical documentation for its installation.

From the point of view of energy efficiency, estimated effect of the project is losses reduction of 96 GWh per year, which represents about 0.09% of final energy consumption (energy and non-energy use) in 2015.

Table 18: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Replacement of 83685 indirect, semi-indirect and direct metering groups and 330,000 meters in domestic and industrial customers and implementation of AMI/MDM system in accordance with the technical specifications	80 million € (50% from the loan from the European Bank for Reconstruction and Development (EBRD) and 50% from the loan from the European Investment Bank (EIB))	Monitoring the flow of electricity through the distribution system, from its entry to exit and optimization of flows. Reducing costs and time required for reading, switching off and on of consumers, reducing commercial losses as a result of displacement of the metering points, increasing degree of collection (discipline in the payment of electricity), the possibility of rapid deployment of new tariffs for customers, increase opportunities for demand management, reducing the number of complaints to the reading accuracy (calculation of consumption), quality control and optimization of the operation of the distribution system, reducing maintenance costs, providing a cost-effective and timely investment in the power grid, better and faster resolution of new users requests for connection, creating preconditions for a better functioning of the electricity market, simpler procedures for changing of supplier and flexibility in the supply of electricity, provision of data and information in real-time to authorized entities (end customer, the current supplier and potential supplier), monitoring the voltage quality and continuity of supply.	6.4 million € (€ 4.8 million - reduction of costs of losses - ≈96 GWh per year, € 1.6 million - reduction of reading costs)

Indicator of this project realization is percentage of implementation of activities per years presented in following table.

Table 19: The dynamics of the implementation of activities during implementation of the Program (number of meters that are processed)

Project "Improvement of metering infrastructure"	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EPS, DSO	x	x	x	x	x	x	
Preparation of technical documentation		16,000	66,000	66,000	66,000	66,000		
Project implementation		25,343 IMG for TC X/0.4 kV, 4,217 IMG, 29,830 S-IMG, 24,295 DMG	66,000	66,000	66,000	66,000	66,000	

Note: IMG - indirect metering group, S-IMG - semi-indirect metering group, DMG - direct metering group.

P.6. Project "Distribution network automation"

The aims of project "Distribution network automation" are: improving the reliability of supply of customers, shortening the duration of interruptions, the protection of vulnerable customers (public services, hospitals, processing industry, which are sensitive to power failure), increasing the level of manipulation of medium voltage networks, improving the utilization of existing equipment through equalization of annual load diagram by remote control of load, i.e., changing the way of supply through the use of remote control in the medium voltage network. The project will be implemented through the installation of new disconnection elements in the medium-voltage network (reclosers and disconnectors) to be controlled remotely, by installing software for remote control of the existing disconnection equipment, by installing new TS X/0.4 kV with ring main unit switching equipment, by installation of ring main unit switchgear equipment in the existing TS X/0.4 kV, by installation of SCADA systems and their integration into existing dispatch control centres.

This project has no significant impact on the improvement of energy efficiency.

Table 20: Main characteristics and effects of the project

Technical characteristics	Project value and funding source	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Automation of medium voltage network through the installation and equipping equipment for remote monitoring and control of 1050 points in the network and automation of TS 35/X kV through the installation of SCADA system at TS	€ 10.5 million (1.3 billion RSD)	Shortening of the interruption time of consumers (especially of vulnerable consumers), quickly establishing post-accident regime after the failure of TS 110/X kV and 35/X kV, equalizing the load diagram of 110/X kV and 35/10 kV substations (better utilization and postponing of investments in the same), improve the operational network control and protection of power lines.	360000 € (exclusive of any effects on the reduction of the load of 110/X kV and 35/X kV substations and the effects of reducing the number of power failure of sensitive customer)

Indicator of this project realization is percentage of implementation of activities per years presented in following table.

Table 21: The dynamics of the implementation of activities during implementation of the Program (number of automated points in medium voltage network)

Project "Distribution network automation"	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	EPS, DSO	x	x	x	x	x	x	x
Preparation of technical documentation		150	150	150	150	150	150	150
Permits		150	150	150	150	150	150	150
Project implementation		150	150	150	150	150	150	150

P.7. The project of reconstruction of TS 110/X kV at the end of their service life in order to increase safety of operation and security of supply and increase the efficiency of the distribution of electricity at 110 kV voltage level.

More than 50 TS 110/X kV in the area of energy subjects for distribution of electricity in Serbia are 40 years old or older. Although in the meantime replacement of faulty equipment and smaller reconstructions were performed in some substations, in order to provide their safe operation, most of these TS has old and uneven equipment, and their role in the network has significantly changed since the moment of their entry into operation (these TS were mostly built outside of urban zones, and today they are in completely urban areas with different structure of network which is supplied from these TS or nearby 110 kV network). Also, the structure and function of 100 kV supply network have changed, which requires possible changes in ways of connection of these objects. For these reasons, and in order to ensure a secure supply of consumers that are supplied through these TS, urgent reconstruction of a large number of TS 110/X kV in distribution network is necessary. The project of reconstruction includes the following set of sub-projects for reconstruction of specific TS 110/X kV that should be realized during the implementation period of the Program:

1. Reconstruction of TS 110/35 kV Požarevac 1 (installed capacity of 20+31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.5 million € - 309 million RSD);
2. Reconstruction of TS 110/35 kV Petrovac (installed capacity of 20+31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.3 million € - 408 million RSD);
3. Reconstruction of TS 110/35/10 kV Lapovo (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.35 million € - 290 million RSD);
4. Reconstruction of TS 110/10 kV Kragujevac 5 (Divlje Polje) (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.142 million € - 388 million RSD);
5. Reconstruction of TS 110/35 kV Raška (installed capacity of 31.5+20 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.5 million € - 309 million RSD);
6. Reconstruction of TS 110/10 kV Novi Pazar 2 (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 1.6 million € - 198 million RSD);
7. Reconstruction of TS 110/10 kV Paraćin 3 (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 0.68 million € - 84 million RSD);
8. Reconstruction of TS 110/35 kV Ćićevac (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 0.68 million € - 84 million RSD);
9. Reconstruction of TS 110/35/10 kV Lešnica (installed and designed capacity of 2x20 MVA, estimated reconstruction value of 3 million € - 371 million RSD);
10. Reconstruction of TS 110/35 kV Užice 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 0.72 million € - 89 million RSD);
11. Reconstruction of TS 110/20 kV Šabac 5 (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 1.2 million € - 148 million RSD);
12. Reconstruction of TS 110/35/6.3 kV Šabac 1 (installed capacity of 3x31.5+20 MVA, designed capacity of 4x31.5 MVA, estimated reconstruction value of 2.8 million € - 346 million RSD);
13. Reconstruction of TS 110/35 kV Gornji Milanovac 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.7 million € - 333 million RSD);
14. Reconstruction of TS 110/10 kV Niš 5 (installed capacity of 20 MVA, designed capacity of 2x20 MVA, estimated reconstruction value of 0.5 million € - 62 million RSD);
15. Reconstruction of TS 110/35 kV Aleksinac (installed capacity of 31.5+20 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.3 million € - 408 million RSD);

16. Reconstruction of TS 110/35 kV Niš 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 2 million € - 247 million RSD);
17. Reconstruction of TS 110/10 kV Ristovac (installed capacity of 10 MVA, designed capacity of 2x16 MVA, estimated reconstruction value of 1 million € - 124 million RSD);
18. Reconstruction of TS 110/35 kV Pirot 2 (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 1 million € - 124 million RSD);
19. Reconstruction of TS 110/35 kV Vlasotince (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 1 million € - 124 million RSD);
20. Reconstruction of TS 110/35 kV Bor 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.5 million € - 309 million RSD);
21. Reconstruction of TS 110/35 kV Vranje 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.5 million € - 309 million RSD);
22. Reconstruction of TS 110/35 kV Kuršumlija (installed capacity of 31.5 MVA, designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.5 million € - 309 million RSD);
23. Reconstruction of TS 110/35 kV Zrenjanin 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 2.59 million € - 320 million RSD);
24. Reconstruction of TS 110/35 kV Novi Sad 4 (installed and designed capacity of 2x63 MVA, estimated reconstruction value of 2.45 million € - 303 million RSD);
25. Reconstruction of TS 110/20 kV Novi Sad 5 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.2 million € - 395 million RSD);
26. Reconstruction of TS 110/35/20 kV Subotica 1 (installed and designed capacity of 2x31.5+20 MVA, estimated reconstruction value of 1.676 million € - 207 million RSD);
27. Reconstruction of TS 110/35 kV Kikinda 1 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.03 million € - 374 million RSD);
28. Reconstruction of TS 110/10 kV FOB (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.17 million € - 391 million RSD);
29. Reconstruction of TS 110/35/10 kV Beograd 1 (installed capacity of 2x40+31.5+30 MVA, designed capacity of 2x40+2x31.5 MVA, estimated reconstruction value of 3.17 million € - 391 million RSD);
30. Reconstruction of TS 110/35 kV Beograd 6 (installed capacity of 63+60 MVA, designed capacity of 2x63 MVA, estimated reconstruction value of 4.891 million € - 604 million RSD);
31. Reconstruction of TS 110/35 kV Beograd 2 (installed capacity of 2x31.5 MVA, designed capacity of 2x63 MVA, estimated reconstruction value of 3.17 million € - 391 million RSD);
32. Reconstruction of TS 110/35 kV Beograd 9 (installed and designed capacity of 2x63 MVA, estimated reconstruction value of 3.17 million € - 391 million RSD);
33. Reconstruction of TS 110/35 kV Beograd 7 (installed and designed capacity of 2x63 MVA, estimated reconstruction value of 3.17 million € - 391 million RSD);
34. Reconstruction of TS 110/35 kV Beograd 10 (installed and designed capacity of 2x31.5 MVA, estimated reconstruction value of 3.25 million € - 401 million RSD).

During the implementation of the Program, the reconstruction of 28 TS 110/X kV is planned to be completed, the reconstruction of three TS 110/X kV (Paraćin 3, Ćićevac and Kuršumlija) is planned to be underway and necessary spatial planning and technical documentation for three TS 110/X kV (Ristovac, Pirot 2 and Vlasotince) is planned to be prepared.

The reconstruction of other mentioned TS (older than 40 years), which is necessary in order to increase safety of operation and security of supply and increase the efficiency of the distribution of electricity at 110 kV voltage level, will start after 2023.

From the aspect of energy efficiency the estimated impact of the project is reduced losses by 1.5 GWh per year, which represents about 0.0015% final energy consumption (for electrical and

non-electrical purposes) in 2015. The estimation is formed based on the data on the increase in installed capacity of substations and the assumption of average load of transformers which are being replaced or which are being joined by a new transformer in substation.

Table 22: Main characteristics and effects of the project

Technical characteristics	Value of project and source of finance	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Reconstruction of 34 TS 110/X kV with total installed capacity of 2,368 MVA in the planned period	80.409 million € (9,931 million RSD) (EPS resources and credits from foreign financial institutions: World Bank, EBRD, EIB, etc.)	Increasing the level of security supply, optimal development of medium-voltage network.	Increase in security supply of total delivered energy: 6,621 GWh Number of counsumers for which the security of supply is ensured: ≈920,000;

Table 23: Missing planning and technical documentation

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Požarevac 1	Replacing complete power equipment of all voltage levels with an expired service life (except transformers) and construction of a new 35 kV control building. Implementation of new technologies.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Petrovac	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	Previous feasibility study and preliminary project are prepared, property relations are resolved, the specification of equipment and works and tender documents is formed.	Project for building permit, building permit, project for construction, usage permit

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35/10 kV Lapovo	Installation and connection of the second transformer that has already been purchased, with complete equipping of the primary, secondary and tertiary side of transformer and replacement of equipment with an expired service life at the connection bays of the current transformer.	Investment and technical documentations are prepared. Preparation of tender documents for equipment and work is in progress.	The procedure for obtaining a decision on approval for the works is in progress. The existing facility has a building and usage permit for the project documentation with two transformers.
TS 110/10 kV Kragujevac 5 (Divlje Polje)	Installation and connection of the second transformer that has already been purchased, with complete equipping of the primary, secondary and tertiary side of transformer and replacement of equipment with an expired service life at the connection bays of the current transformer.	Investment and technical documentations are prepared. Preparation of tender documents for equipment and work is in progress.	The procedure for obtaining a decision on approval for the works is in progress. The existing facility has a building and usage permit for the project documentation with two transformers.
TS 110/35 kV Raška	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	Spatial planning and technical documentations are prepared. The specification of equipment and works and tender documents are being prepared.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit
TS 110/10 kV Novi Pazar 2	Installation of the second 110/10 kV transformer and equipping of the 110 kV and 10 kV connection bays.	Spatial planning and technical documentations are prepared. The specification of equipment and works and tender documents are being prepared.	The project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/10 kV Paraćin 3	Installation of the second 110/10 kV transformer and equipping of the 110 kV and 10 kV connection bays.	Investment and technical documentations are not available.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Ćićevac	Installation of the second 110/35 kV transformer and equipping of the 110 kV and 35 kV connection bays.	Investment and technical documentations are not available.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35/10 kV kV Lešnica	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	There are previous feasibility study and preliminary project, property relations are resolved, the specification of equipment and works and tender documents are established.	The project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Užice 1	110 kV facility: replacement of existing equipment in transformer bays, dismantling of existing equipment and foundations in transmission bays and the construction of new transmission lines according to "H" - scheme, complete reconstruction of the protection and management, construction of roads and expansion of the fence around the facility; 35 kV facility: dismantling of the foundations and switching station equipment and complete construction of the substation with the system of protection and management.	110 kV facility: building permit has been obtained, contractor is selected, works are in progress; 35 kV facility: it is necessary to make the required investment-technical documentation, based on which will be formed and provide specifications for equipment and works and to obtain all necessary permits.	110 kV facility: usage permit; 35 kV facility: preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/20 kV Šabac 5	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side, installation of a new 110/20 kV transformer (31.5 MVA), equipping of 20 kV feeder cells, building reconstruction (retain the existing dimensions of the facility).	Complete project and building permits are prepared in 2011. The documents need to adapt to the new Law on Planning and Construction.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35/6.3 kV Šabac 1 (the future TS 110/35/20 kV)	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side, replacement of an existing 110/6 kV transformer with 110/20 kV transformer, installation of a new 20 kV substation and building reconstruction (retains the existing facility dimensions).	Conceptual design and feasibility study have been adopted, tender procedure of equipment procurement has been completed.	The project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Gornji Milanovac 1	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	So far the following documents are collected: preliminary feasibility study, conceptual solution, feasibility study, preliminary project, resolution of property relations are in progress, the specification of equipment and works and tender documents are established.	The project for building permit, building permit, project for construction, usage permit.
TS 110/10 kV Niš 5	The equipping two 110 kV transmission bays, replacement of primary equipment and software protection and management.	Complete investment and technical documentation are collected. The specification of equipment and works and tender documents are established. Tender has been completed and part of the purchase of equipment has been contracted.	Building permit, project for construction, usage permit.
TS 110/35 kV Aleksinac	Complete replacement of equipment at the end of their life cycle on high-voltage and medium-voltage side and upgrading bay for connection of the 110 kV transmission line to substation Soko Banja.	So far the following documents are collected: preliminary feasibility study, conceptual solution, feasibility study, preliminary project, resolution of property relations are in progress, the specification of equipment and works and tender documents are established.	The project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Niš 1	Reconstruction of the substation, which is the nodal, and which is connected to the 110 kV grid with four 110 kV lines and is equipped with two power transformers. The existing 110 kV facility will be replaced by full busbars, busbar portals, etc.	The feasibility study with preliminary project is made, the specification of equipment and works and tender documents are prepared, resolution of property relations is in progress, due to the fact that the substation is taken by EMS.	The project for building permit, project for construction, building permit/licence for construction works.
TS 110/10 kV Ristovac	Detailed description of reconstruction has not been established - equipment at the end of their life cycle in the high-voltage and medium-voltage side will probably be replaced.	Investment and technical documentations are not available. Preparation of documentation will start in 2017.	No availability based on of investment and technical documentation.
TS 110/35 kV Pirot 2	Detailed description of reconstruction has not been established - equipment at the end of their life cycle in the high-voltage and medium-voltage side will probably be replaced.	Investment and technical documentations are not available. Preparation of documentation will start in 2020.	No availability based on of investment and technical documentation.
TS 110/35 kV Vlasotince	Detailed description of reconstruction has not been established - equipment at the end of their life cycle in the high-voltage and medium-voltage side will probably be replaced.	Investment and technical documentations are not available. Preparation of documentation will start in 2020.	No availability based on of investment and technical documentation.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Bor 1	In the first stage of reconstruction is planned: - replacement of a 31.5 MVA transformer with a power transformer of 63 MVA; - installation of new primary and secondary equipment of the 110 kV and 35 kV bays; - reconstruction of the substation construction work and a carrier apparatus in the 110 kV bays according to the construction project. In the second stage of reconstruction is planned: - replacement of the second 31.5 MVA transformer with a power transformer of 63 MVA; - equipping four new 35 kV feeder cells.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Vranje 1	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Kuršumlija	Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Preliminary solution, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Zrenjanin 1	Construction of TS 110/35/20 kV "Zrenjanin 1" at the existing TS 110/35 kV. Reconstruction of a new 110 kV switching station, reconstruction of a 35 kV switching station, installation of the 110/20 kV transformer, construction of a new 20 kV switching station, etc.	The spatial planning documentation is prepared. Feasibility studies and preliminary project are made	The specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Novi Sad 4	Upgrading of the 110 kV switching station, reconstruction of the 35 kV switching station, installation of 110/20 kV transformer, construction of the 20 kV switching station (purchase of the plot for the expansion of substation) - prepare and complete replacement of protective and control equipment.	The facility was designed in the spatial and urban plans with what is required expansion of the existing plots. The spatial planning documentation doesn't exist.	Preliminary solution, location conditions, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/20 kV Novi Sad 5	Adaptation of 110 kV to connect to the transmission system.	The spatial planning documentation is prepared.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/35/20 kV Subotica 1	Reconstruction of the 110 kV switching station, reconstruction of the 20 kV switching station and replacement of complete protective and control equipment.	Complete investment and technological documentations are prepared and the contract with the contractor and suppliers of equipment was signed. Decision on approval of works is provided.	Project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 100/35 kV Kikinda 1	The formation of 20 kV supply point in the existing TS 110/35 kV Kikinda 1: upgrading of the 110 kV switching station, reconstruction of the 35 kV switching station, installation of the 110/20 kV transformer, the construction of the 20 kV switching station and replacement of the complete protective and control equipment.	The spatial planning and technical documentations are being prepared.	Spatial planning documentation, conceptual solution, location conditions, feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.
TS 110/10 kV FOB	Complete reconstruction of the substation 110/10 kV FOB is planned. Due to the load forecast and predicted the construction of 110/10 kV Beograd 41 - Blok 32 is not necessary to increase the installed capacity of the transformer, but remains the same installed power of 2x31.5 MVA.	Investment and technical documentations are not available. Preparation of documentation will start in 2017.	No availability based on of investment and technical documentation.
TS 110/35/10 kV Beograd 1	The reconstruction of the 110 kV switching station was planned. The reconstruction and increase in feeder cell number in the 35 kV switching station was planned.	Investment and technical documentations are not available. Preparation of documentation will start in 2017.	No availability based on of investment and technical documentation.
TS 110/35 kV Beograd 6	Replacement of the old 110 kV facility with the new facility in SF6 technology is predicted, as well as complete replacement of the 35 kV switching station with new SF6 facility with a double busbar systems, replacement of relay protection equipment with a new microprocessor-based equipment, introduction of remote control, replacement of complete auxiliary consumption and reconstruction of installations.	Feasibility study, preliminary project, the specification of equipment and works and tender documents are prepared.	Project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Beograd 2	Increasing of installed capacity by replacing two power transformers of 2x31.5 MVA with power transformers of 63 MVA is provided. The installation of 110 kV facility will be reconstructed in its entirety as a facility in the open space (retain the existing number of bays with somewhat different order, and two system busbars, leaving space for a spare 110 kV bay). Replacement of the 35 kV facility in the building is foreseen, in the place of the existing facility, with new facility with two busbar systems with constructing four feeder cells.	So far the following documents are collected: preliminary feasibility study, conceptual solution, feasibility study, preliminary project, resolution of property relations are in progress, the specification of equipment and works and tender documents are established.	Project for building permit, building permit, project for construction, usage permit.
TS 110/35 kV Beograd 9	Replacement of two old transformers with new transformers of the same power and the installation of a new power transformer of 63 MVA is planned. Reconstruction of the 110 kV switching station is planned in two phases. In the first phase a transformer will be in operation through his 110 kV transformer bay and the rest of the 110 kV switching station will be dismantled and carried out the necessary construction and electrical works on the installation of new equipment. It is necessary to ensure the reconnection of 110 kV lines, outside the facility of substation Beograd 9. In the second phase of the reconstruction the second 110/35 kV transformer will be in operation via the reconstructed part of the 110 kV switching station.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Beograd 7	Instead of the existing two power transformers of 2x63 MVA it will be installed four transformers of 2x63 MVA +2x31.5 MVA. Reconstruction of the 110 kV switching station is planned in two phases. In the first phase a transformer will be in operation through his 110 kV transformer bay and the rest of the 110 kV switching station will be dismantled and carried out the necessary construction and electrical works on the installation of new equipment. In the second phase of the reconstruction the second 110/35 kV transformer will be in operation via the reconstructed part of the 110 kV switching station. it is necessary to build an additional facility for the connection of the transformer T3 and T4 (2x31.5 MVA).	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Beograd 10	Complete replacement of equipment in 110 kV facility is planned. Complete replacement of 35 kV facility is predicted. It retains the two existing power transformers of 2x31.5 MVA. Complete reconstruction of own consumption, grounding, lighting and lightning protection installation is provided. Reconstruction of the 110 kV switching station will be implemented in two phases. In the first phase a transformer will be in operation through its 110 kV transformer bay and the rest of the 110 kV switching station will be dismantled and carried out the necessary construction and electrical works on the installation of new equipment. In the second phase of the reconstruction the second 110/35 kV transformer will be in operation via the reconstructed part of the 110 kV switching station.	Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.	Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.

Indicator of this project is the percentage of implementation of activities shown by years in the following table

Table 24: The dynamics of the implementation of activities in the period of implementation of Program

Project: Reconstruction of TS 110/X kV at the end of their life cycle	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs	EPS, DSO	19 TS	18 TS	16 TS	13 TS	11 TS	8 TS	8 TS
The preparation of spatial planning documents		4 TS	3 TS	3 TS	2 TS	1 TS		
The preparation of technical documentation		9 TS	8 TS	6 TS	5 TS	5 TS	3 TS	3 TS
Permissions		5 TS	5 TS	5 TS	3 TS	3 TS	2 TS	3 TS
Realization of works		9 TS	9 TS	8 TS	6 TS	3 TS	5 TS	5 TS
Starting operation			5 TS	5 TS	5 TS	5 TS	3 TS	3 TS

P.8. The project of construction of new TS 110/X kV in order to increase security of supply and increase the efficiency of electricity distribution

In the past twenty five years the construction of new TS 110/X kV was not in accordance with needs, caused due to changes in spatial distribution and structure consumption as well as the increase in consumption that occurred in the meantime. New 110/X kV substations take on the role in uneconomical loaded medium-voltage network and solve the problem of unsafe power supply from existing TS 110/X kV and TS 35/X kV, high losses and poor voltage in the medium voltage grid. The construction process of new TS 110/X kV substations have been intensified in the last 5- 10 years, and will continue over the next ten years due to the large number of buildings whose construction is required. The project for construction of new TS 110/X kV contains the following set of subprojects for construction of new substations:

1. TS 110/X kV Beograd 23 - Autokomanda (2x40 MVA, € 9 million - RSD 1112 million);
2. TS 110/35 kV Beograd 42 - Grocka (1x31.5 MVA, € 3.5 million - RSD 432.3 million);
3. TS 110/35 kV Beograd 44 - Surčin (2x31.5 MVA, € 5.65 million - RSD 697.3 million);
4. TS 110/10 kV Beograd 43 (2x20 MVA, € 4 million - RSD 494 million);
5. TS 110/35/10 kV Sokobanja (1x31.5 MVA, € 1.97 million - RSD 243.3 million);
6. TS 110/10 kV Niš 6 (2x31.5 MVA, € 5.02 million - RSD 620 million);
7. TS 110/X kV Bela Palanka (2x20 MVA, € 2.5 million - RSD 308.8 million);
8. TS 110/X kV Boljevac (1x31.5 MVA, € 2.6 million - RSD 321 million);
9. TS 110/10 kV Leskovac 5 (2x31.5 MVA, € 4 million - RSD 494 million);
10. TS 110/X kV Stara planina (2x31.5 MVA, € 3.25 million - RSD 401 million);
11. TS 110/20 kV Srbobran 2 (1x31.5 MVA, € 1.9 million - RSD 234.7 million);
12. TS 110/20 kV Krnješevci (1x31.5 MVA, € 2.2 million - RSD 271.7 million);
13. TS 110/20 kV Perlez (1x20 MVA, € 1.94 million - RSD 240 million);
14. TS 110/X kV Plandište (1x31.5 MVA, € 3.5 million - RSD 432.3 million);
15. TS 110/20 kV Beočin (1x31.5 MVA, € 3 million - RSD 370.5 million);
16. TS 110/X kV Novi Sad 8 (1x31.5 MVA, € 3.5 million - RSD 432.3 million);
17. TS 110/X kV Kraljevo 6 (2x31.5 MVA, € 1.74 million - RSD 214.9 million);
18. TS 110/X kV Užice 2 (2x31.5 MVA, € 2.84 million - RSD 350.7 million);
19. TS 110/X kV Kopaonik (2x31.5 MVA, € 8.68 million - RSD 1071.6 million);
20. TS 110/X kV Ub 2 (2x31.5 MVA, € 2.5 million - RSD 308.8 million);
21. TS 110/20 kV Tutin (2x20 MVA, € 2.5 million - RSD 308.8 million);
22. TS 110/35 kV Priboj (2x31.5 MVA, € 2.5 million - RSD 308.8 million);
23. S TS 110/20 kV Aranđelovac 2 (2x31.5 MVA, € 2.5 million - RSD 308.8 million);
24. TS 110/20 kV Koceljeva (1x31.5 MVA, € 1.0 million - RSD 123.5 million);
25. TS 110/20 kV Svilajnac (2x20 MVA, € 2.5 million - RSD 308.8 million);
26. TS 110/35 kV Gornji Milanovac 2 (2x31.5 MVA, € 2.5 million - RSD 308.8 million);
27. TS 110/20 kV Novi Pazar 3 (2x31.5 MVA, € 3 million - RSD 370.5 million);
28. TS 110/35 kV Despotovac (2x20 MVA, € 2.5 million - RSD 308.8 million);
29. TS 110/X kV Loznica 2 (2x31.5 MVA, € 2.5 million - RSD 308.8 million);
30. TS 110/35/10 kV Ušće (2x31.5 MVA, € 2.52 million - RSD 311.2 million);
31. TS 110/35/20 kV Kragujevac 21 - Nova Zastava (2x63 MVA, € 3.904 million - RSD 468 million);
32. TS 110/X kV Smederevo 5 (2x31.5 MVA, € 3 million - RSD 494 million);

33. TS 110/10 kV Kragujevac 22 - Centar (2x31.5 MVA, € 5 million - RSD 617.5 million);

34. TS 110/35 kV Požarevac 2 (2x31.5 MVA, € 4 million - RSD 494 million);

35. TS 110/X kV Smederevska Palanka 2 (1x31.5 MVA, € 1.9 million - RSD 234.7 million);

During implementation of Program it is planned to finish the construction of 32 TS 110/X kV and should be prepared urban planning and technical documentation and provided permission for three TS 110/X kV (Boljevac, Leskovac 5 and Stara Planina).

From the aspect of energy efficiency estimated effect of the project is to reduce the losses of 49.464 GWh per year, which accounts for about 0.048% of final energy consumption (energy and non-energy use) in 2015. The estimate is formed based on the available studies of long-term development of the networks, the previous feasibility study and models available distribution systems.

Table 25: Basic characteristics and effects of the project

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation based on the available documentation
New 35 TS 110/X kV with total installed capacity in the planning period of 1,789 MVA	€ 115.1 million (RSD 13,929.2 million) (own resources of EPS)	Improving voltage in the medium voltage grid, reducing losses, increasing the level of security, optimal development of medium voltage networks.	Annual loss reduction: 49.464 GWh (1.16% of the present value of losses in the distribution system); Reduction in the annual cost of losses: € 2.465 million; Reducing emissions CO_2 ≈ 39,507 t per year (evaluation); Increasing security of supply for the total energy supplied: 3,072 GWh; Number of customers for which security of supply is ensured: ≈430,000;

Table 26: Missing planning and technical documentation

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/X kV Beograd 23 (Autokomanda) - 2x40 MVA	The contract involves the first phase of the procurement of equipment and works. Tender for the second phase is in progress. Construction work at the location has started.	The project of constructed facility and usage permit.
TS 110/35 kV Beograd 42 (Grocka) - 1x31.5 MVA	The preparation of the feasibility study and preliminary project is in progress.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35 kV Beograd 44 (Surčin) - 2x31.5 MVA	The preparation of spatial planning documents is in progress.	Detailed regulation plan, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/10 kV Beograd 43 (Železnik) - 2x20 MVA	Preliminary solution (preliminary design) is completed.	Locational conditions, feasibility studies, preliminary design, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35/10 kV Sokobanja - 1x31.5 MVA	The construction of the facility is in progress.	Use permit.
TS 110/10 kV Niš 6 - 2x31.5 MVA	The project is currently in the process of obtaining building permits.	Building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Bela Palanka - 2x20 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Boljevac - 2x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit
TS 110/10 kV Leskovac 5 - 2x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Stara planina - 2x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/20 kV Srbobran 2 - 1x31.5 MVA	The preliminary design and location conditions are prepared.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/20 kV Krnješevci - 1x31.5 MVA	Preliminary works on the construction of the building are in progress.	Project for construction, the project of constructed facility, usage permit.
TS 110/20 kV Perlez - 1x20 MVA	Conceptual design is completed and location conditions are provided. It is not clear status of preliminary project, feasibility studies and studies of environmental impact assessment.	Project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Plandište - 1x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/20 kV Beočin - 2x31.5 MVA	No investment activities	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Novi Sad 8 - 1x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Kraljevo 6 - 2x31.5 MVA	The construction of the facility is in progress.	The project of constructed facility and usage permit.
TS 110/X kV Užice 2 - 2x31.5 MVA	The feasibility study and preliminary project are in progress.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Kopaonik - 2x31.5 MVA	The construction of the facility is in progress.	The project of constructed facility and usage permit.

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/X kV Ub 2 - 2x31.5 MVA	Preparation of preliminary project is in progress.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/20 kV Tutin - 2x20 MVA	The feasibility study and preliminary project are in progress.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35/10 kV Priboj - 2x31.5 MVA	Conceptual design and feasibility studies have been completed, resolving property relations is in progress.	Project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35/20 kV Aranđelovac 2 - 2x31.5 MVA	Conceptual design and feasibility studies have been completed and property relations are resolved	Project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Koceljeva - 1x31.5 MVA	No investment activities. TS is already built as110/20 kV. It is necessary to equip the 110 kV transmission bay and 110 kV transformer bay and to install 110/20 kV transformer.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/20 kV Svilajnac - 2x20 MVA	Location is determined.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Gornji Milanovac 2 - 2x31.5 MVA	Location is determined.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/20 kV Novi Pazar 3 - 2x31.5 MVA	Location is determined.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35 kV Despotovac - 2x20 MVA	Location is determined.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Loznica 2 - 2x31.5 MVA	The feasibility study and preliminary project are in progress.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35/10 kV Ušće	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/35/20 kV Kragujevac 21 (Nova Zastava)- 2x63 MVA	Previous feasibility study and general project have been completed	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Smederevo 5 - 1x31.5 MVA	The feasibility study has been completed. Preliminary design is in progress	Conceptual design, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Kragujevac 22 (Centar) - 2x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.

Subproject	Status of project preparation	Missing planning and technical documentation
TS 110/35 kV Požarevac 2 - 2x31.5 MVA	The feasibility study and preliminary project are in progress.	The feasibility study, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.
TS 110/X kV Smederevska Palanka 2 - 1x31.5 MVA	No investment activities.	Spatial planning documentation, preliminary design, location conditions, feasibility studies, preliminary project, project for building permit, building permit, tender documentation for the building, project for construction, project of the constructed facility, usage permit.

Indicator of this project is the percentage of implementation of activities shown by years in the following table.

Table 27: The dynamics of the implementation of activities in the period of implementation of Program

Project: Construction of new TS 110/X kV	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs	EPS, DSO	24 TS	22 TS	24 TS	21 TS	21 TS	10 TS	8 TS
The preparation of spatial planning documents		2 TS	13 TS	13 TS	7 TS	5 TS	3 TS	3 TS
The preparation of technical documentation		15 TS	14 TS	7 TS	5 TS	3 TS	3 TS	
Permissions		4 TS	2 TS	3 TS	11 TS	2 TS	5 TS	4 TS
Realization of works		8 TS	6 TS	6 TS	14 TS	13 TS	7 TS	5 TS
Starting operation			5 TS	3 TS	3 TS	3 TS	11 TS	2 TS

3.1.3. Sub-sector of Environmental Protection in the Sector of Electrical Energy

Withdrawal of eight thermal units from operation, mentioned in Chapter 3.1.2.1, is the consequence of, in addition to their age (what applies to units A1 and A2 at TPP Kolubara A that will be in operation only till the end of 2017), the need to satisfy the requirements of the Regulation on limit values for emissions of air pollutants from combustion plant ("Official Gazette of the Republic of Serbia", no. 6/16), respectively the application of the mechanism of the limited operation of a plant (20,000 operating hours in the period 2018-2023). In order to improve environmental protection, in the sector for the production of electrical energy from fossil fuels it is planned that the emissions of sulphur dioxide, nitrogen oxides and particulate matter are reduced to the prescribed emission limits defined by the Regulation ("Official Gazette of the Republic of Serbia", no. 6/16). The reduction of emissions to the prescribed limit values is a part of the National Plan for the reduction of emissions whose adoption is a consequence of the Decision of the Ministerial Council EZ D/2013/05/MC-EnC on the rules of implementation of the Large Combustion Plants Directive (2001/80/EC) and the Decision of the Ministerial Council EZ D/ 013/06/MC-EnC on the implementation of part of the Directive on industrial emissions (2010/75/EU). Provisions of the Directive 2001/80/EC apply to plants whose installed thermal power is greater than or equal to 50 MWt. The implementation of the National Plan for the reduction of emissions is foreseen in the period 1 January 2018 - 31 December 2027.

The implementation of the project for the construction of the flue gas desulphurization (FGD) plant on units A3-A6 at TENT A and the preparation activities for the construction of the FGD plant on units B1 and B2 at TENT B are in progress. Plants for the reduction of emissions will, due to their own consumption, cause the reduction of available power at the connection point to the transmission system. The consumption of plant for the reduction of emissions is at most 2% of the available power, so the expected reduction is between 4 MW per unit at TPP Kostolac B (units B1 and B2) and 10 MW per unit at TENT A and TENT B (units A3-A6 and B1-B2). Although these plants have an impact to the reduction of the energy available for the delivery to the transmission system, the impact is not of crucial importance to the balance of electricity as in the case of capital repairs in the period of implementation of the Program

In addition to compliance with the regulative regarding the emission of harmful substances in the air, in accordance with the Regulation ("Official Gazette of the Republic of Serbia", no. 6/16), extended operation of the reconstructed thermo units for the next 100,000 hours is conditioned by respecting the regulatory requirements relating to the protection of the quality of water and land, as well as handling all types of waste. In this regard, it is necessary that the works on the extension of the lifetime of thermal units include, at least, the following activities:

- the construction of the plant for treatment of waste water in accordance with the Regulation on the limit values of emissions into water,
- the construction of new objects for waste disposal in accordance with the Regulation on waste disposal at landfills and
- the development of procedures for waste management.

The listed activities relating to the improvement of environmental protection are covered by the projects that are part of the Single project pipeline in the field of energy. These projects are grouped within the Program and included into the unique project of environment protection.

P.9. The project of environmental protection in the sector of the electricity production from EPS's power plants

The project of environmental protection in the sector of electrical energy includes thirteen sub-projects intended for reducing emissions of toxic gases SO_2 and NO_x and their reduction in permissible limits and solving the problem of ash handling, waste storage and treatment of waste water at locations of certain generation facilities owned by EPS. Besides the fact that it provides a transition to sustainable energy, the project contributes to ensuring the security of electrical energy

supply (as it allows the retention of existing facilities in operation) and the development of energy market (as it allows the placement of energy from EPS's power plants in the regional market, wherein the necessary conditions in terms of environmental protection are provided).

1) SO_2 and NO_x emission reduction at Thermal Power Plant Nikola Tesla A, unit A1 - the project value is 36 million € - the term of project realization has not yet been clearly defined;
2) SO_2 and NO_x emission reduction at Thermal Power Plant Nikola Tesla A, unit A2 - the project value is 36 million € - the term of project realization has not yet been clearly defined;
3) SO_2 emission reduction at Thermal Power Plant Kostolac A, unit A2 - the project value is 49 million € - the project will be realized in the period 2022-2023;
4) NO_x emission reduction at Thermal Power Plant Kostolac A, unit A2 - the project value is 10 million € - the project will be realized in 2022;
5) NO_x emission reduction at Thermal Power Plant Nikola Tesla A, unit A6 - the project value is 12.2 million € - the project will be realized in the period 2020-2021;
6) NO_x emission reduction at Thermal Power Plant Nikola Tesla B, unit B1 - the project value is 12.3 million € - the project will be realized in the period 2019-2020;
7) NO_x emission reduction at Thermal Power Plant Nikola Tesla B, unit B2 - the project value is 12.2 million € - the project will be realized in the period 2018-2019;
8) NO_x emission reduction at Thermal Power Plant Kostolac B, unit B2 - the project value is 12.2 million € - the project will be realized in the period 2018-2019;
9) SO_2 and NO_x emission reduction at Thermal Power Plant Kostolac A, unit A1 - the project value is 27 million € - the term of project realization has not yet been clearly defined;
10) SO_2 emission reduction at Thermal Power Plant Nikola Tesla B, units B1 and B2 (desulphurization) - the project value is 190 million € - the project will be realized in the period 2021-2022;
11) New ash handling system at Thermal Power Plant Nikola Tesla A - the project value is 65.8 million € - the project will be realized in the period 2020-2021;
12) Adaptation of landfill in accordance with the EU Directive for landfill (Thermal Power Plant Nikola Tesla A, Thermal Power Plant Nikola Tesla B, Thermal Power Plant Kolubara A, Thermal Power Plant Morava) - the project value is 55 million € - the term of project realization has not yet been clearly defined;
13) Construction of Waste Water Treatment Plant at: Thermal Power Plant Kostolac A, Hydro Power Plant Đerdap (eight locations) and Drinsko-Limske Hydro Power Plants (eight locations) - the project value is 18 million € - the term of project realization has not yet been clearly defined.

The estimated values of certain projects are different from the values listed in Table 129 of the Program (page 215) in which the values from the Single project pipeline in the field of energy are specified. The difference is due to the updated information formed based on the available documentation and/or selection of different technologies. The corrections will be applied during the next update of the Single project pipeline in the field of energy. Total estimated value of the project is 535.7 million €.

The indicators of realization of these projects are percentages of realization of the term plan agreed with the contractor on quarterly basis, in the years when projects are planned for implementation. Considering that the usual duration of such projects is one year, it means that indicator "Project was completed" is relevant in terms of monitoring their realization within the Program.

In the construction and reconstruction of lines and substations, which are the subject of projects in the field of transmission and distribution of electricity, and in the course of their exploitation, the impacts on environment are present and those impacts will be addressed for each project individually by appropriate study of environmental impact assessment. For a selected set of projects within the Program, on the basis of available information, basic information about

environmental impact (CO_2 emissions, emissions of harmful substances into the air, increased non-ionizing radiation, the quantity of waste water, waste, chemicals, soil pollution and accidents that are source of environmental pollution, with the necessary measures for environment protection) will be addressed in the Report on strategic assessment of environmental impact of the Program for the period 2017-2023.

The estimated aggregate contribution of the analysed projects in the field of electrical energy in terms of reducing annual emissions of greenhouse gases, with the exception of the construction of wind farms that are discussed in the chapter relating to the field of renewable energy, is 3.033 Gg CO_2eq, which represents about 37% of the intended nationally determined contributions for 2030.

Also, by achieving the goals foreseen in the National Action Plan for Renewable Energy Sources of the Republic of Serbia in the sector of electricity generation, a reduction in sulfur dioxide emissions is achieved.

Environmental aspects affected by the construction and reconstruction of power lines are:

- air pollution,
- increased noise and vibrations,
- potential water pollution,
- potential soil pollution and occupation of cultivated land,
- negative impact on biodiversity,
- potential increased non-ionizing radiation in the vicinity of the power line,
- negative impact on the landscape.

Environmental aspects affected by the construction and reconstruction of transformer substations are:

- air pollution,
- increased noise and vibrations,
- potential water pollution,
- potential soil pollution,
- negative impact on biodiversity,
- potential increased non-ionizing radiation inside and in the vicinity of the transformer substation,
- negative impact on the landscape.

3.2. Sector of Thermal Energy

Within the district heating system in Serbia, operates 59 energy entities with the total available capacity of the heat source of about 6900 MW (2880 MW belongs to PUC Beogradske elektrane), more than 2100 km of distribution network and 23500 thermal-transmitting substations. The average age of the boiler units, distribution networks and thermal-transmitting substation is 21-24 years.

Strategic objectives in the field of thermal energy are defined by the Strategy of Energy:

- providing thermal energy for a secure supply of consumer goods and industry in strict conformity with the norms of environmental protection;
- increasing the energy efficiency in the production, distribution and supply of heat energy;
- increase the share of renewable energy sources (RES) and diversification of energy sources in use;
- sustainable business of energy entities engaged in the production, distribution and supply of thermal energy

Note: In the following part of the text, for energy operators involved in the production, distribution and supply of heat energy will be used the term heating plant.

Strategic courses of action are:

- continuous modernization of existing district heating systems;
- development and implementation of a tariff system for production, distribution and supply of heat energy;
- institutional system linking
- expansion of existing district heating systems;
- promotion of energy sources application and its efficient use through:
    - Reduction of share of liquid fuels and coal
    - Significant use of biomass (possibly co-combustion in existing heating plants, coal-fired)
    - Introduction of combined production of electricity and heat
    - Increase the number of connections for use of sanitary hot water;
    - Raising the capacity of local governments concerning market regulation (billing based on the consumed quantity of thermal energy).

3.2.1. Overview of Measures in the Sector of Thermal Energy

Measures in the area of thermal energy are directed towards meeting strategic goals and include:

3.2.1.1 Improving the Regulatory Framework in the Field of Thermal Energy

Energy industry entities participating in the work of this system is regulated by: Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014), Law on Efficient Use of Energy ("Official Gazette of the Republic of Serbia", no. 25/2013), Law on Utility Services ("Official Gazette of the Republic of Serbia", no. 88/2011 and 104/2016), Law on Public Enterprises ("Official Gazette of the Republic of Serbia", no. 15/2016), Law on Companies ("Official Gazette of the Republic of Serbia", no. 36/2011, 99/2011, 83/2014 - sec. law and 5/2015), Law on Public-Private Partnership and Concessions ("Official Gazette of the Republic of Serbia", no. 88/2011, 15/2016 and 104/2016), The Law on Local Government ("Official Gazette of the Republic of Serbia", no. 129/2007 and 83/2014 - sec. law), The law on public procurement ("Official Gazette of the Republic of Serbia", no. 124/2012, 14/2015 and 68/2015 Law on Housing and Building Maintenance ("Official Gazette of the Republic of Serbia", no. 44/95, 46/98, 1/2001 - decision by USRS, 101/2005 - sec. law, 27/2011 - decision by US and 88/2011) and by associated secondary legislation to these laws.

A local government unit shall issue a license for carrying out energy activities: generation, distribution and supply of heat energy. At the same time, unit also keep the register of issued licenses and archive of producers of heat energy with output power of 0.1 to 1 MW. By Regulations that unit independently adopts, the conditions of delivery and supply of thermal energy for customers in unit area are determined. rights and obligations of manufacturers, distributors and suppliers and final customers of thermal energy are also defined. Unit shall issue regulations which govern the cost distribution from a common measuring station in the heat-delivery station, and the conditions and manner of maintains part of the system from the end of the distribution system to the final customer, including its heating equipment. Units of local government unit defines the rights and obligations of final customers of heat energy, especially in the case of termination of the contract and the conditions for submitting and resolving final customer's demands for suspension of supplies of thermal energy. The unit gives consent to heat energy prices and prescribe other conditions for the provision of reliable and secure heat energy supply of customers, in accordance with the Energy Law. The energy entity that performs the energy activity of heat energy supply determine the price of final customers supply, and the methodology for determining the price is determined by an act of the Government.

In accordance with The Efficient use of energy law and the law establishing the integrated prevention and control of environmental pollution, new and revitalized facilities for the production of thermal energy, and systems for heat energy distribution must meet minimum requirements in terms of energy efficiency (minimum efficiency of production plant and the minimum level of the distribution system).The minimum energy efficiency requirements that must be met by new revitalized plant and systems are prescribed by Government, on the Minister proposal. With the request for issuing energy permission for construction of new or reconstruction of existing facilities for the production of thermal energy, the applicant is required to submit a study on energy efficiency of the plant. Study shall contain technical and economical analysis of the increase in the total efficiency of the energy, which would be exerted by using the combined generation of heat and electrical energy. Beside an application for a building permission for the construction of new or reconstruction of old systems or parts of systems for heat energy distribution, the investor is required to, as part of technical documentation, include a study on energy efficiency. This study is proving fulfilment of the prescribed minimum energy efficiency system requirements. The following documents are in the process of preparing:

- Regulation on minimum energy efficiency requirements that must be met by the plant for the production of electrical energy, as well as plants for combined production of electrical and thermal energy, systems for the transmission and distribution of electric energy, plants for thermal energy production and systems for thermal energy distribution;
- Regulation on the content of the study on the energy efficiency of the electricity production plants, plants for combined production of electrical and heat energy, systems for transmission and distribution of electrical energy, plants for the production and distribution of thermal energy.

The Efficient Use of Energy Law regulates that local governments units have an obligation to include, as one of the elements for calculating the price of heating services in tariff system for district heating services, amount of measured, and actually handed overheat energy. In determining the tariff price of certain elements in the tariff system for distribution of thermal energy value of losses cannot be used if they are greater than the value of maximum losses that are determined by act of the Government under Article 45 Paragraph 2 of the Efficient Use of Energy Law.

The Efficient Use of Energy Law requires that all owners of boiler capacity greater than 20 kW are required to ensure the implementation of the combustion process control in order to determine the degree of boilers utility, as well as to take measures in order to achieve prescribed amount for state values of combustion.

Law on Efficient Use of Energy established who are the subjects of energy management systems, but also defines the conditions (limit values for primary energy consumption) that companies must

meet in order to become obligatory entity of energy management. The Law prescribes the obligations of energy management system obligatory entity: the implementation of planned energy saving goals on an annual basis, the appointment of the required number of energy managers, adoption of programs and energy efficiency plan, submitted annual reports on the achievement of the goals contained in plan and program of energy efficiency to the complement ministry, ensure the implementation of energy overviews at least once in five years, and other activities and measures that are in accordance with the provisions of Law.

Energy Law defines the notion of a privileged heat producer. These are producers who use renewable energy sources and meet the requirements in terms of energy efficiency. The stimulating resources are assigned by local governments. Local government units should keep the register of privileged heat producers and are obligated to inform the Ministry in charge of mining and energy of the data contained in this register at least once a year.

Inspection over the implementation of the provisions of the Energy Law in the field of thermal energy, as one of the duties in framework of his activities, performs energy inspector. On that way Ministry in charge of mining and energy is indirectly involved in the supervision and monitoring of all activities in the area of thermal energy.

1. Activity - the establishment of local energy group and engagement of energy inspectors in the Ministry in charge of mining and energy pursuant to the Energy Law, whose activity will cover the area of thermal energy.
2. Activity - harmonization of legal acts brought by local governments with the provisions of the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) and the Efficient Use of Energy Law ("Official Gazette" no. 25/2013), which treat the area of thermal energy. Checking of the compliance of legal acts adopted by local governments periodically every 2 to 3 years, except in the case of a change of legislation. Supervision of 2nd activity is supposed to be realized by implementing LEP base of Ministry in charge of mining and energy that is filled with the necessary documentation, which is updated within the prescribed period by local governments. Energy Inspectors in the Ministry in charge of Energy and Mining supervise and control over the data in the database. Ministry in charge of mining and energy, and local governments are in constant communication via the LEP base. LEP database should serve to create a register of local boilers used for space heating, which are not part of the thermal plant.
3. Activity - according to the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) and the Law on Efficient Use of Energy ("Official Gazette" no. 25/2013) the transition to the payment of thermal energy by consumption (this activity not may be linked to a single moment, but it is a process). All participants in the sector of thermal energy must be involved in this process. Local governments need to be more involved in the implementation of these activities, and final customers of thermal energy must be educated and informed on the implementation of 3rd Activity. On the one hand, it is expected that, longest three years after the introduction, payment by consumption cause a drop in revenues of enterprises engaged in the production, distribution and supply of thermal energy. However, on the other hand, charges by consumption carries a benefit of operating costs reduction for heating plants, as effect of reduction of energy expenses. One of the most important points in the realization of 3rd Activity is related to the establishment of an economic price for a unit of supplied thermal energy to final customers. Only in this case, transfer from payment in general sense to the payment by consumption of thermal energy will not represent critical point that could potentially threaten the plant operation. The indicator for monitoring of the implementation of 3rd Activity - monitoring the transition to the calculation and payment according to consumption of thermal energy (% of incensement of heat customers who have switched to a payment based on the actual consumption of thermal energy).
4. Activity - Harmonization of Program for heat plant development with the Program of local government development .Local government units must comply their programs and

development plans with the provisions of the Efficient Use of Energy Law ("Official Gazette" no. 25/2013) according to which the distributor of heat energy is obligated to determine the manner and pace of construction of new and reconstruction of existing distribution system and other distribution capacities for a period of five years, by its Development plan. The distributor is obliged to submit the annual report to the local government unit. The most important role in process of infrastructure development plans harmonization have local governments.

Activities referred to improving the regulatory framework in the field of thermal energy are summarized in Table 28

Table 28: Activities to improve the regulatory framework in the field of thermal energy

Activity	Deadline making	Indicator	Responsible institutions
Improving human resource capacities of ministry responsible for energy affairs by filling jobs in the Group for local energy and engagement of energy inspectors	IV quarter of year 2017	Established group and placed inspectors in the field of local energy	The ministry responsible for energy affairs
Alignment of legal acts which have brought local governments and aligning them with the provisions of the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014), which is treated in the field of thermal energy.	II quarter of year 2018	Completed and updated LEP base (inspectors in the field of local energy check regulations compliance)	Local governments, the ministry responsible for energy affairs
Payment based on consumption of thermal energy	2017-2020.	Established billing system according to consumption of thermal energy for all customers in district heating system (DHS)	Local governments, energy entities engaged in the production, distribution and supply of thermal energy, the ministry responsible for energy affairs

Activity	Deadline making	Indicator	Responsible institutions
Harmonization Program of heating plant development with programs of local governments and framework of energy management	II quarter of year 2018	Adopted act of the local government on the compliance program for the development of infrastructure (heating distribution networks and distribution network for natural gas)	Local governments and energy undertakings engaged in the production, distribution and supply of thermal energy
Adoption of Act and Regulation which are in conjunction with Article 45 and 46 of the Law on the efficient use of energy[*1]	III quarter of year 2017	Adopted Act and Regulation	Ministry responsible for energy affairs
Adoption of the Regulation pursuant to Article 51 of the Law on the efficient use of energy[*2]	IV quarter of year 2017	Adopted Act - Regulation	Ministry responsible for energy affairs

Notes:

[*1] Within the document Methodology for determining the price of end customer thermal energy supply defines minimum efficiency of existing production facilities, depending on the type of fuel, as well as minimum efficiency of existing distribution network depending on its capacity.

[*2] The minister responsible for energy affairs shall prescribe conditions under which equipment of heating installations with measuring devices would be technically unfeasible or not economically feasible in relation to the estimated long-term energy-saving.

3.2.1.2 Technical Measures for Providing Heat Energy for Safe Supply of Consumers, Improving Energy Efficiency in Production, Distribution and Supply of Thermal Energy, Increasing the Share of Renewable Energy Sources in Heat

1. Activity - potential realization of the project "Building heating pipelines Beograd - Obrenovac (using heat from TENT A - 600 MWt at the expense of reducing available capacity for electricity generation from 150 MWe) - to increase security of supply of consumers, reduce pollutant emission from power plants, increasing the use of energy from cogeneration system, lower cost of heating, increased possibility of small local boiler houses closure. Indicators for monitoring the implementation of activities are reduced consumption of imported energy source (natural gas) in the heating plants and the amount of heat delivered from the heating plant in TENT A3-A6. For potential further implementation of project it is essential that all participants in the project make necessary business decisions.
2. Activity - Implementation of projects related to the improvement of heat source of heating plant - construction of new heat sources, extinguishing dilapidated and uninhabitable boilers, fuel conversion by natural gas where it is technically feasible, transition to renewable energy resources, installation of external flue economizer tract because of usage of flue gas waste heat, system improving for automatic control of thermal sources, CHP plant. Indicators for monitoring the implementation of the activities - the percentage improvement of system efficiency by improving efficiency of heat source, increasing percentage share of renewable

energy sources as the main fuel, percentage increase in the share of cogeneration plants in district heating systems.

3. Activity - Implementation of projects related to the improvement of district heating distribution system - rehabilitation of district heating networks, replacing dilapidated hot water pipeline shares, further development of the network in order to connect new end customers of heat energy. Indicator - reduction of distribution network losses; improvement reliability of consumer's supply with thermal energy by monitoring the number of complaints during the heating season.

Activity - Implementation of projects relating to the promotion of heat-transmitting substations - modernization of measuring and control equipment in the heat-transmitting station, remote system monitoring and management of consumption, remote reading consumed thermal energy, installation of new compact substations. Indicators for monitoring the implementation of 4. Activity - Increasing operation reliability, improving energy efficiency, fulfilment of necessary conditions for introduction of a charge by the consumed thermal energy.

3.2.2. Measurable Goals and Indicators

Measurable goal	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Increase of share of CHP in the production of thermal energy (%)[*1]	4.16	4.16	4.33	4.50	4.66	4.83	5
Reduction of losses in the distribution network (%)	18	17	16	15	14	13	12
Increase of heat consumption expressed over the heated surface (10^6 m^2)[*2]	43.21	43.77	44.33	44.90	45.48	46.07	46.66
Development of distribution network (km)[*3]	3,860	3,898.6	3,937.6	3,977	4,036.6	4,097.2	4,158.6

Notes:

The share of renewable energy in the sector of thermal energy is monitored within reporting on the implementation of the National Action Plan for the use of renewable energy in accordance with Article 66 of the Energy Law.

[*1] Installed capacity of the heat sources in district heating systems in Serbia is 6,900 MWt of which 4.16% of the heat is produced in CHP plants, which in relation to the installed capacity of thermal sources equals 287.31 MWt. According to the existing plans and programs for the development of heating plants in Serbia in the period from 2017 to 2023 the potential for building new CHP plants is 43.3 MWt. In this sense, the projected increase in share of CHP plants in the installed heat sources within the district heating system is given in the table of measurable goals and indicators.

PUC Beogradske elektrane included in its development plan the project Belgrade Supply of Thermal Energy from the Combined Production of Electricity and Heat in the Existing TPP Nikola Tesla A, Obrenovac using lignite. Under this project it is planned to build a heating plant with capacity of 600 MWt. Implementation of this major project would increase the share of CHP plants in the production of thermal energy by 8.7% compared to the installed capacity of thermal sources of the district heating system, which means that if the project of construction of heating pipeline id implemented in the period 2017 -2023 the share of CHP plants in the

production of thermal energy will be 13.5% compared to the current installed capacity of thermal sources in the district heating system.

*2 Increase of heat consumption is taken into account through the enlargement of heating surfaces connected to the district heating system. On the basis of certain strategic documents of PUC Beogradske elektrane primarily relying on the development strategy of city of Belgrade in 2016- 2021 (the largest consumption is on the territory of city Belgrade - 52%) and the development of PUC Beogradske elektrane, the growth in consumption in the area of capital of 1.289% is anticipated. In this sense, this projection for the increase of heat consumption is seen off, expressed through the heating surface.

*3 Taking into account the development plans of the largest production systems (primarily refers to PUC Beogradske elektrane which with its installed capacity of thermal sources covers 42% of the total installed capacity of all boilers), distribution and supply, i.e. the possibility of real expansion of the network, predicted is the network expand of 1% per year until 2020, and from 2020 onwards growth rate of 1.5% of the network is projected. As the entry data, the overall length of network for the heat distribution (two-pipe system - a push and return) is taken.

3.2.3. The List of Projects in the Sector of Thermal Energy

In the sector of thermal energy during the implementation of the Program the implementation of the following projects from the sector of thermal energy will get started:

P.10. Supply of thermal energy for city of Belgrade from the TPP "Nikola Tesla A", via heat pipeline with capacity of 600 MW of heat energy;

P.11. Construction of new thermal sources, shutting down boilers which are in poor condition, fuel conversion, the transition to the use of renewable energy, installation of external economizer on the flue tract because of usage of waste heat of the flue gas, improving the system for automatic control of thermal sources, CHP plants;

P.12. Rehabilitation of district heating network, replacing worn-out parts of distribution of hot water pipelines, further development of the network in order to connect the new end customers of heat energy;

P.13. Rehabilitation of the district heating system in Serbia - Phase V;

P.14. Promoting the use of renewable energy sources - biomass market development in Serbia (BMZ-ID 201197888).

Table 29: Basic characteristics and effects of the projects

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Supply of thermal energy for city of Belgrade from the TPP "Nikola Tesla A", via heat pipeline with capacity of 600 MW of heat energy	**165,000,000.00 €** The financing model will be determined later	The projected capacity of 600 MWt heating pipes provides heat for more than 50% of the consumption of thermal power plants Novi Beograd. A complementary project is to connect the large and efficient heating plants (Novi Beograd, Dunav, Konjarnik ...) into a single system for supplying consumers as well as installation of the system storage of thermal energy. DHS Belgrade will be potentially supplied with 600 MWt from units A3 to A6 in TENT-A, which will influence on the decrease of available power to TENT A of about 150 MWe. The project provides: - increase the share of production / use of heat from CHP plants (this project contributes to the 8.7% increase of the share of CHP plants that produce thermal energy compared to the current installed capacity of thermal sources in DHS); - reducing the consumption of imported energy and import dependence (in the primary energy saving is equivalent to 164,940,000 m^3/year); - reducing emissions and improving environmental protection (reduction of CO_2 emissions by 327,876 t/yr.; - reducing the use of fossil fuels in PCU BE; - increased operational safety of power system because of reliable DHS; - lower heating prices for final customers and the ability to connect new final users on DHS; - the stability of prices of heating in the long term; - rapid return on invested assets; - the possibility of local boiler shutdown - the biggest polluters;	Savings in primary energy of 600 MWt: - expressed in the natural gas: 164 940 000 m^3/year, - expressed in fuel oil 143 167 920 kg/year. Reduction of CO_2 emissions: - to 327 876 t/year, if the savings are expressed in natural gas, - 458 851 t/year, if the savings are expressed in fuel oil.

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Construction of new thermal sources, shutting down boilers which are in poor condition, fuel conversion, the transition to the use of renewable energy, installation of external economizer on the flue tract because of usage of waste heat of the flue gas, improving the system for automatic control of thermal sources, CHP plants. Projects include 28 plants.	**121,012,572.00 €** Source of funding: - one's own funds of PUC, - grants to the Ministry in charge of energy through the Budget Fund for EE, - donations - Credit lines - Programs KfW, GIZ, IPA projects	The project includes: - replacement of worn boiler units which have used fossil fuels and switching to the biomass, or natural gas; - installation of new boiler units that using biomass as primary fuel; - construction of CHP plants that using biomass as primary fuel; - implementation of technologies for the use of geothermal energy - use of flue gas "waste heat" by installation of economizer on the flue tract The project provides: - increase the share of heat production from renewable energy sources, i.e. reducing the use of fossil fuels; - reducing the consumption of imported energy and import dependence (saving primary energy that is equivalent to> 8,000.00 toe); - reducing emissions and improving environmental protection (reduction of CO2 emissions by> 25,000 t/yr.; - increased reliability of the system by new of production facilities; - increase the quality of delivered heat energy; - the ability to connect new final users on DHS; - the possibility of local boiler shutdown - the biggest polluters;	Annual reduction of energy consumption:> 8,000.00 toe (1.32% in the total primary energy consumed annually for the production of thermal energy in DHS); Money saving:> 3,300,000.00 euros Reducing CO_2 emissions: >25,000 tCO_2 Number of customers (existing and new) that will refer to the effects of projects:>105,000 It is necessary to develop detailed feasibility studies for a detailed quantification of the effects of energy savings and emissions reduction effects of harmful components into the atmosphere.

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Rehabilitation of district heating network, replacing worn-out parts of distribution of hot water pipelines, further development of the network in order to connect the new end customers of heat energy. Projects include 16 plants.	**50,000,000.00 €** Source of funding: - one's own funds of PUC, - grants to the Ministry in charge of energy through the Budget Fund for EE, - donations - Credit lines - Programs KfW, GIZ, IPA projects	The project includes:: - replacement of dilapidationed sections of the distribution network - expansion of the distribution network for connecting new final customers on DHS. The project provides: - replacement of old technology with the new - pre-insulated hot water pipes; - reducing the losses - the heat isolation and due to leakage; - reducing the number of failures in the distribution network and reducing the need for urgent interventions, additional crews and contractors to repair faults and incidents on hot water pipes; - increase the quality of delivered heat energy to final customers; - reduction in the need for system supplementation with chemically prepared water thereby additionally reduces the costs; - small number of interruption of delivery / supply of heating energy; reduced the number of complaints and appeals and the number of allowances to the interruption of heat supply;	Annual reduction of energy consumption:> 6,000.00 toe (1% in the total primary energy consumed annually for the production of thermal energy in DHS) Money saving:> 3,700,000.00 euros Number of customers (existing and new) that will refer to the effects of projects:> 477,000 It is necessary to develop detailed feasibility studies for a detailed quantification of the effects of energy savings and emissions reduction effects of harmful components into the atmosphere.

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Modernization of measuring and control equipment in the heat-transmitting station, remote system monitoring and management of consumption, installation of new compact substations. Projects include 12 plants.	**14,096,800.00 €** Source of funding: - one's own funds of PUC, - grants to the Ministry in charge of energy through the Budget Fund for EE, - donations - Credit lines - Programs KfW, GIZ, IPA projects	The project includes: - installation of new compact substations; - installation of calorimeters in house substations; - automation and the implementation of a system for district monitoring and optimization of the work of thermal-delivery substations. The project provides: - higher delivery quality of thermal energy to final customers; - creation of conditions for payment based heat energy consumption; - a detailed insight into the billing of thermal energy; - optimization of the system.	Annual reduction of energy consumption:> 940.00 toe (≈0.2% in the total primary energy consumed annually for the production of thermal energy in DHS) Money saving:>390,000.00 euros Number of customers (existing and new) that will refer to the effects of projects:> 225,000 It is necessary to develop detailed feasibility studies for a detailed quantification of the effects of energy savings and emissions reduction effects of harmful components into the atmosphere.
Rehabilitation of the district heating system in Serbia - Phase V	**30,000,000.00 € from credit** **2,000,000.00 € donation**	Up to 10 Plants in Serbia. Within the framework of Project implementation of the following technical measures are realized: - reconstruction of existing and construction of new generation capacity including the construction of a combined heat and power (CHP); - replacement of old parts and / or expansion of the distribution network; - reconstruction of existing or installation of new substations; - reconstruction of existing and installation of modern SCADA system	Realization of the program will enable: - higher delivery quality of thermal energy to final customers; - a detailed insight into the billing of thermal energy; - improving the efficiency of production capacity; - connection of new customers to DHS.

Technical characteristics	The value of the project and source of funds	Description of the effects of implementation	Valorised average annual effects of the implementation on the basis of available documentation
Promoting the use of renewable energy sources: biomass market development in Serbia (BMZ-ID 201197888)	Provided funds in the amount of € 100,000,000 (with a donation of € 7,000,000 provided by the German and Swiss governments); The project will be implemented in several phases. Start of the project is 2017. First phase: 20,000,000 € Second phase: 80,000,000 €	The program will be implemented in several phases, the first phase will be implemented in the period 2017-2021.The main investments are related to the installation of biomass boilers, heat pumps, hot water network reconstruction, construction of warehouses for the procurement of biomass and other equipment necessary for the supply of biomass, monitoring and control systems in boilers, construction works.	Realization of the program will enable: - Improving environmental protection by reducing emissions of CO_2 and SO_2 by 70% - increasing efficiency (reducing heat loss by 25%), - improving the sustainability and availability of supply (through greater use of renewable energy sources, reducing the number of interruptions and improving public services of heat energy supply) - positive impact on the local environment and stimulating the local economy.

Table 30: Planning and technical documentation lacking

Project	Status of project preparation	Planning and technical documentation lacking
Supply of thermal energy for city of Belgrade from the TPP "Nikola Tesla A", via heat pipeline with capacity of 600 MW of heat energy.	Proposal for a Feasibility study and preliminary design was completed in 2016 and is waiting for the approval of Detailed regulation plan in the first quarter of 2017, how it could be delivered to the Review Commission, Ministry of Construction for giving their opinions about the project. Feasibility study and preliminary design of Belgrade thermal energy supply from combined production of electricity and heat in existing TPP Nikola Tesla A in Obrenovac using lignite from Kolubara (Innovation Centre of Faculty of Mechanical Engineering, University of Belgrade), proposal was made in July 2016, following the adoption of a planning document, it will be submitted to the Review Commission. Detailed regulation plan (DRP) for Belgrade thermal energy supply from TPP NT A through heating pipes - power line TPP NT A-HP Novi Beograd ,,proposal was made and implementation of the procedure of adoption before the Commission for plans of city Belgrade, and then City Hall is in progress. After adoption of the DRP and positive opinion of the Audit Commission will be approached to preparation of project documentation for obtaining location requirements, building permit and registration papers (performance of works). For potential further implementation of project it is essential that all participants in the project make necessary business decisions. It is necessary to EPS prepare documentation for optimization of thermal energy providing from the site TPP NT A and undertake activities on the reconstruction of A4-A6 units of TPP NT A.	Only a preliminary design was done. After obtaining positive opinion of the review committee of Republic competent ministry in the field of construction, preparation of the remaining technical documentation will be performed - for obtaining a building permit and for performance of works.

Project	Status of project preparation	Planning and technical documentation lacking
Construction of new thermal sources, shutting down boilers which are in poor condition, fuel conversion, the transition to the use of renewable energy, installation of external economizer on the flue tract because of usage of waste heat of the flue gas, improving the system for automatic control of thermal sources, CHP plants Projects include 28 heating plants in 28 cities and municipalities in Serbia.	A larger number of projects are still in the development phase, and feasibility studies were carried out. Only a small number of projects has prepared project and technical documentation in the form that it is possible to apply for a building permit.	Spatial planning study, technical study for obtaining building permits and study of environmental impact.
Rehabilitation of district heating network, replacing worn-out parts of distribution of hot water pipelines, further development of the network in order to connect the new end customers of heat energy. Projects include 16 heating plants.	Projects for revitalization of distribution system are carried out according to plan, on an annual basis, and, in accordance with this planning and technical documentation is provided.	Spatial planning study, technical study for obtaining building permits and study of environmental impact.

Project	Status of project preparation	Planning and technical documentation lacking
Modernization of measuring and control equipment in the heat-transmitting station, remote system monitoring and management of consumption, installation of new compact substations. Projects include 12 heating plants.	A larger number of projects are still in the development phase, and feasibility studies were carried out. Only a small number of projects has prepared project and technical documentation in the form that it is possible to apply for a building permit.	Spatial planning study, technical study for obtaining building permits and study of environmental impact.
Rehabilitation of the district heating system in Serbia - Phase V	The project is in its initial stage and it is expected to nominate up to 10 heating plants in Serbia for participation in the program.	Spatial planning study, technical study for obtaining building permits and study of environmental impact.
Promoting the use of renewable energy sources: biomass market development in Serbia (BMZ-ID 201197888)	The project is in its initial stage.	Spatial planning study, technical study for obtaining building permits and study of environmental impact.

Table 31: Dynamics of activities in period of Program implementation

Project: Supply of thermal energy for city of Belgrade from the TPP "Nikola Tesla A", via heat pipeline with capacity of 600 MW of heat energy	Responsible institution	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs	Responsible institutions PUC BE, EPS	x						
Preparation of spatial planning documentation		x						
Preparation of technical documentation		x	x					
Permissions			x					
Realization of construction			x	x	x			
Entry into service					x			
Project: Construction of new thermal sources, shutting down boilers which are in poor condition, fuel conversion, the transition to the use of renewable energy, installation of external economizer on the flue tract because of usage of waste heat of the flue gas, improving the system for automatic control of thermal sources, CHP plants. Projects include 28 heating plants in 28 cities and municipalities in Serbia.	Responsible institution Individual plants in which the project is implemented	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs		x	x					
Preparation of spatial planning documentation		x	x	x				
Preparation of technical documentation		x	x	x				
Permissions		x	x	x	x			
Realization of construction		x	x	x	x	x	x	x
Entry into service		x	x	x	x	x	x	x

Project: Rehabilitation of district heating network, replacing worn-out parts of distribution of hot water pipelines, further development of the network in order to connect the new end customers of heat energy. Projects include 16 heating plants	Responsible institution Individual plants in which the project is implemented	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs		x	x					
Preparation of spatial planning documentation		x	x	x				
Preparation of technical documentation		x	x	x				
Permissions		x	x	x	x			
Realization of construction		x	x	x	x	x	x	x
Entry into service		x	x	x	x	x	x	x
Project: Modernization of measuring and control equipment in the heat-transmitting station, remote system monitoring and management of consumption, installation of new compact substations. Projects include 12 heating plant	Responsible institution Individual plants in which the project is implemented	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs		x						
Preparation of spatial planning documentation		x						
Preparation of technical documentation		x						
Permissions		x	x					
Realization of construction		x	x	x				
Entry into service		x	x	x				

Rehabilitation of the district heating system in Serbia - Phase V - Project includes 16 heating plant	Responsible institution Individual plants in which the project is implemented	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs		x						
Preparation of spatial planning documentation		x						
Preparation of technical documentation		x						
Permissions		x	x					
Realization of construction								
Entry into service				x	x	x	x	x

All projects presented in Table 29 are based on the improvement of energy efficiency, which is quantified by the amount of energy savings. All heating plants are liable to system for energy management (SEM), which was established in the Law on the efficient use of energy. In this context, every taxpayer of SEM is obliged to annually achieve energy efficiency improvements of at least 1% in savings, or over a period of 5 years, at least 5% savings. Energy management system will have an impact on the improvement of energy efficiency as one of the most important measures. In the context of the possible effects of the implementation of SEM, the expected effects (savings) in the sector of thermal energy are at least 1% of annual consumption of primary energy (Note: The level of efficiency of energy entities engaged in the production, distribution and supply of thermal energy is not equal. In this regard, the feasibility objective should be taken into account - savings of 1% of primary energy annually. In this context, the efficiency level should be monitored through the indicator - specific energy consumption). Considering all heating plants, savings of 1% of primary energy equals 6000 toe.

3.2.4. Subsector of Environmental Protection in the Sector of Thermal Energy

Current legislation whose provisions regulate the operation of the district heating system in the protection and preservation of the environment are:

- Law on Environmental Protection ("Official Gazette of the Republic of Serbia", no. 135/2004, 36/2009, 36/2009, sec. law, 72/2009, sec. law, 43/2011, the decision of the Constitutional Court and 14/2016),
- Law on Soil Protection ("Official Gazette of the Republic of Serbia", no. 112/2015),
- Water Law ("Official Gazette of the Republic of Serbia", no. 30/2010 and no. 93/2012),
- Law on the Protection of Environmental Noise ("Official Gazette of the Republic of Serbia", no. 112/2015),
- Law on Protection against Non-ionizing Radiation ("Official Gazette of the Republic of Serbia", no. 36/2009),
- Law on Waste Management ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010 and 14/2016),
- Law on Air Protection ("Official Gazette of the Republic of Serbia", no. 36/2009 and 10/2013),
- and 88/2010),
- Law on Environmental Impact Assessment ("Official Gazette of the Republic of Serbia", no. 135/2004 and 36/2009),
- Law on Integrated Prevention and Control of Environmental Pollution and The Law on Amendments to the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the Republic of Serbia", no. 135/2004 and 25/2015),
- Law on Chemicals ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010, 92/2011, 93/2012 and 25/2015),
- Law on Nature Protection ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010, 91/2010 - correction and 14/2016).

In addition, the legal basis includes accompanying regulations and rules and accepted international treaties and agreements. Of special significance for air emissions limits are:

- Regulation on limit values of air emissions from combustion plants ("Official Gazette of the Republic of Serbia", no. 6/16) and
- Regulation of the measurements of air pollutant emissions from stationary sources of pollution ("Official Gazette of the Republic of Serbia", no. 05/2016).

The Law on Integrated Prevention and Control of Environmental Pollution and the Law on Amendments to the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the Republic of Serbia", no. 135/2004 and 25/2015) prescribe the conditions

and procedures for issuing integrated permits for installations and activities that may have adverse effects on human health, the environment and property, and regulate the types of activities and facilities, supervision and other issues of importance for the prevention and control of environmental pollution.

The integrated pollution prevention and control refers to the new, as well as existing facilities with a high pollution potential, in accordance with the definitions from Regulation on types of activities and facilities for which integrated permit is issued ("Official Gazette of the Republic of Serbia", no. 84/2005). A preliminary list of facilities that are required to obtain an integrated permit includes existing facilities covered by the aforementioned Regulation ("Official Gazette of the Republic of Serbia", no. 84/2005) and this list is regularly updated by a working group within the Ministry in charge of environmental protection. According to this list, 20 heating plants (documentations Novi Beograd, HP Zemun, HP Dunav, HP Voždovac, HP Konjarnik, HP Mirijevo, HP Cerak, HP Banovo Brdo, HP Miljakovac, HP Medaković, HP Subotica, "Energetika" doo. Kragujevac, PUC "Toplana" Bor, PUC "Gradska toplana" Kruševac, PUC "Energetika", PU "Gradska toplana" Niš - heating plant Krivi Vir, PU "Gradska toplana" Niš - heating plant Jug, PUC "Novosadska toplana" - HP Zapad, PUC "Novosadska toplana" - HP Jug, PUC "Novosadska toplana" - HP Sever) are required to obtain an integrated permit. Local governments are responsible for issuing integrated permits for pollution prevention.

Operation of all heating plants in district heating systems falls under the provisions of the Regulation on limit values of air pollutant emissions from combustion plants ("Official Gazette of the Republic of Serbia", no. 6/2016), according to criteria regarding the size of combustion plants. According to this criteria the values for air pollutant emissions are defined. In accordance with the article 4 of the Regulation ("Official Gazette of the Republic of Serbia", no. 6/2016) large combustion facilities are those, whose thermal capacity is equal to 50 MWt or more, regardless of the type of fuel used (solid, liquid or gas).

Heating plants contain 40 combustion plants with heat power exceeding 50 MWt (total heat power> 3200 MWt), which have an obligation to harmonize emissions pollutant emissions in accordance with the defined values of emissions from Annex 1 ("Official Gazette of the Republic of Serbia" no. 6/2016).

Medium combustion plants are those which produce heat from solid fuel and whose installed heating power is equal to or greater than 1 MWt and less than 50 MWt, those which produce heat for households from liquid fuel and whose installed heating power is equal to or greater than 5 MWt and less than 50 MWt, and those which produce heat for households from gaseous fuel and whose installed heating power is equal to or greater than 10 MWt and less than 50 MWt

There are 145 registered medium combustion plants taking place in heating plants (total heat power > 1900 MWt), which have an obligation to harmonize air pollutant emissions in accordance with the defined values of emissions from Annex 2 of the Regulation ("Official Gazette of the Republic of Serbia", no. 6/2016).

Since in the field of thermal energy natural gas is dominant in the structure of energy consumption, in this sector incentives should be given to the use of natural gas and renewable energy resources, which significantly influence the reduction of greenhouse gas emissions into the atmosphere.

The estimated aggregate contribution of the analysed projects in the sector of thermal energy in terms of reducing annual emissions of greenhouse gases is 0.328 Gg CO_2eq, excluding construction of or transition to biomass boilers which are discussed in the section relating to the sector of renewable energy, which represents about 4% of intended nationally determined contribution for 2030.

3.3. Sector of Renewable Energy Sources

Strategic goals of the Republic of Serbia in the area of renewable energy sources are defined by the Energy Strategy. Parameters for monitoring the realization of each goal are defined.
Increase of energy production from renewable energy sources is important for the reduction of import dependency, improving energy security and environmental protection.
Share of renewable energy sources in gross final consumption of energy (27%) as well as the share of energy from renewable sources in transport (10%) until 2020 is planned target in the Action Plan for RES. Table of measurable goals is created in accordance with that.

Table 32: Indicators related to renewable energy sources

Measurable goals	2020.
Participation of renewable energy sources in gross final consumption of the Republic of Serbia (%)	27
Participation of renewable energy sources in gross final consumption in the transport sector of the Republic of Serbia (%)	10
Total projected net reduction of the greenhouse gas emission by using renewable energy sources (t CO_2eq)	19,333,265
Projected net reduction of the greenhouse gas emission by using renewable energy sources in transport sector (t CO_2eq)	726,684

The methodology for calculation of the share of renewable energy sources is defined in accordance with Directive 2009/28/E3, which was transposed into Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014). Projected net reduction of the greenhouse gas emission by using renewable energy sources is calculated using the methodology described in Notes the Table 33 below.
Meeting the goals in the sector of renewable energy sources, among other things, is caused by the needs to reduce the greenhouse gas emission. The objectives related to increasing the share of renewable energy sources and reducing the greenhouse gas emission are directly related and for the period of implementation of Program are shown in Table 33.
Total emissions of greenhouse gases during the year 1990 (without sinks), was 83,519.50 Gg CO2eq, and intended nationally determined contributions to reduction is 9.8% of that value, amounting to 8,184.911 Gg CO2eq [36]. Through projected net reduction of the greenhouse gas emission by using renewable energy sources (19,333.265 Gg CO2eq compared to the initial 14,833.472 Gg CO2eq during the year 2009, calculated using the methodology described in Notes the Table 33 below) should be achieve a further reduction in greenhouse gas emission for 4,499.793 Gg CO2eq by the year 2020. It makes about 55% of the intended nationally determined contributions for the year 2030. Further implementation of projects in the sector of renewable energy sources in a period 2021-2030 will additionally increase the contribution of renewable energy sources in reducing the greenhouse gas emission.
Finally, share of renewable energy sources in gross final consumption and designed reduce emissions of greenhouse gases will be possible to evaluate after the adoption of new action plans in this sector.

Table 33: Overview of goals energy production from renewable sources by sectors and goals of reducing emissions of greenhouse gases as a result of the production of energy from renewable sources, by years of implementation of Program

	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Expected gross final energy consumption from RES in heating and cooling sectors (ktoe)	1,127	1,143	1,152	1,167	1,175	1,181	1,188
Expected gross final energy consumption from RES in production of electricity sector (ktoe)	1,031	1,059	1,108	1,151	1,171	1,190	1,210
Expected gross final energy consumption from RES in transport sector (ktoe)	117	159	203	246	250	256	262
Total expected gross final energy consumption from RES (ktoe)	2,275	2,361	2,463	2,564	2,596	2,627	2,660
Projected net reduction of the greenhouse gas emission by using renewable energy sources in heating and cooling sectors (t CO_2eq)	3,761,712	3,815,117	3,845,157	3,895,224	3,921,927	3,941,954	3,965,318
Projected net reduction of the greenhouse gas emission by using electricity from renewable energy sources (t CO_2eq)	13,177,592	13,535,471	14,161,758	14,711,357	14,966,984	15,209,830	15,465,458
Projected net reduction of the greenhouse gas emission by using renewable energy sources in transport sector (t CO_2eq)	345,618	469,686	599,662	726,684	738,500	756,224	773,948
Total projected net reduction of the greenhouse gas emission by using renewable energy sources (t CO_2eq)	17,284,922	17,820,274	18,606,577	19,333,265	19,627,411	19,908,008	20,204,724

Note: Goals for 2021, 2022 and 2023 will be revised in accordance with future National Action Plan for RES, that will be adopted by the year 2020. Projected reduction of the greenhouse gas emission by using renewable energy sources is calculated using the following emission factors that are multiplied by the produced energy: for heating plants 0.287 tCO_2/MWh of the produced heat (emission factor from the Energy Strategy), for electricity 1.099 tCO_2/MWh (combined emission factor for electricity production in power system of Serbia: 1.099 tCO_2/MWh (national emission factors for 2017.)) and for fuel 2,954 tCO_2/toe (emission factor from the Energy Strategy).

3.3.1. Specifics of the Field of RES

While creating measures and activities to achieve the objectives in the area of renewable energy sources defined by the Energy Strategy, Program proceeds from the specifics of the area of renewable energy sources, assumed international obligations of the Republic of Serbia and the situation in this area. The specifics in this field are the result of the use of renewable energy sources in three different sectors: **Sector of Electrical Energy**, **Sector of Thermal Energy and Transport Sector**.

In the Sector of Electrical Energy, in accordance with the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) and the concept of liberalization of the electricity market, electricity generation since 2011 is performed according to market principles, which can be considered as the most important specificity in the Sector of electrical energy. It follows that the production of electricity is equally enable to enterprises founded by the Republic of Serbia, AP Vojvodina, units of local self-government and private investors, respectively those participants are equal in electricity market.

In the Sector of Thermal Energy, practice suggests that the proposed goals are not realized as planned, which is necessary to analyse the causes and define appropriate measures and activities that would contribute to greater use of renewable energy in this sector.

In the Transport Sector, the production of biofuels is the energy activity that is performed in accordance with market principles. Policy in this area should be directed to the creation of the basis for the establishment of transparent and non-discriminatory regulatory-financial measures to stimulate investors to invest in the production of biofuels and to place the biofuel on the market. The engagement domestic resources in the production of biofuels, taking into account the competition rules and equal treatment of domestic and foreign entities in the market, should be the basis for the adoption of legal framework in this area. Additional complexity in the transport sector is imposed by requirements of biofuel sustainability from the point of environmental protection and agriculture, and when determining the rate in this sector it is necessary to include the Ministry in charge for agriculture and environmental protection. In addition to biofuels, stimulating the use of electric vehicles can contribute significantly to achievement of sectorial goal of 10%, and it is necessary to consider that possibility.

Other specifics: The importance and benefits of using renewable energy sources are not sufficiently known to the public, which is why one of the goals defined by the Energy Strategy is informing and educating the public about the importance of using renewable energy. Obligation of strengthening public awareness about renewable energy sources is regulated by the Energy Law, and derives from EU legislation. To increase awareness of the importance of renewable energy sources it is necessary to involve the media, educational and scientific institutions and civil society organizations.

Additionally, an important aspect in the area of renewable energy sources are administrative procedures for plant construction. Considering that these procedures are a relatively complex, and that the rules of which depend on the process and pace of issuing licenses and permits, mainly under the authority of Ministry of construction and the Ministry of public administration, measures to rationalize administrative procedures must be considered in cooperation with the two ministries. Proceeding from the above, it can be concluded that the creation of measures to achieve the goals of the Energy Strategy in the area of renewable energy sources, required the cross-sectorial approach in order to be effective.

Particularly, when developing regulatory-financial measures, it should consider the possibility of establishing a unique financial fund for the whole area of the renewable energy source in order to, in addition to the institutional stability of the financing of projects in the area of renewable energy, enable comprehensive planning funding, easier monitoring of financial flows and better harmonization of schemes of incentives for greater use of renewable energy sources that are established in different sectors (agriculture, environment, forestry, etc.).

3.3.2. Overview of Activities and Measures in the Field of Renewable Energy Sources

Measures and activities are defined in the Program in order to achieve intended goals in the field of renewable energy sources.

Activities and measures in the field of renewable energy sources can be classified into two main groups:

1) harmonizing regulations of Republic of Serbia with undertaken international obligations in the field of renewable energy sources, which are not covered by the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014);
2) analysis of the effects of the existing regulations, particularly regulations governing the stimulation of production electric power from renewable energy sources, and on the basis of the results of a comprehensive technical-economical analysis the potential changes of the existing regulations.

Overview of the measures and activities is presented in the following tables.

Table 34: Overview of measures in the field of renewable energy sources

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
1.	Consideration of possibility for establishing a support scheme for producers of electricity using RES based on market principles	1. Gradually directing the production of electricity from renewable energy sources to market principles 2. Economic and sustainable growth in electricity production from renewable energy sources	Government of Republic of Serbia, Ministry in charge of mining and energy	Selected optimal model which can be used as a basis for a possible change of regulations, based on the analysis within the activities 1. shown in Table 35	2020.	Sector of electrical energy
2.	Consideration of possibilities for establishing a special model of incentives for the participation of citizens in the production of electricity from renewable energy sources	1. Increasing the participation of citizens, associations, energy cooperatives and local communities in the production of electricity from RES 2. Balanced geographic distribution of electricity production 3. The distribution of economic benefits from the use of renewable energy sources directly to citizens and local communities	Government of Republic of Serbia, Ministry in charge of mining and energy	Drafted study with a proposal of optimal solution, which can be used as a basis for a possible change of regulations, based on the analysis within the activities 5. shown in Table 35	2020.	Sector of electrical energy

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
3.	Replacement of fossil fuels by renewable energy sources in the district heating plants	1. Increasing the share of renewable energy sources in district heating plants 2. Reduction of district heating plants dependence on imported energy 3. Increasing security of energy supply	Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection, Public Investment Management Office, Local authorities, District heating plants	Increased share of RES in gross final consumption of heat energy in accordance with the indicative path within the NREAP	2023.	Sector of Thermal Energy
4.	Consideration of tax and financial incentives for citizens to use energy efficient boilers/furnaces/ biomass cookers	1. Increasing the share of renewable energy sources in the consumption of thermal energy 2. Directing the consumption of biomass in a sustainable way 3. Increasing security of energy supply, security of citizens and reducing dependence on energy imports	Government of Republic of Serbia, Ministry in charge of finance, Ministry in charge of mining and energy, financial organizations	The completed analysis which defines models of incentives the citizens to use energy-efficient appliances of the biomass and the effects of their application that could be basis of potential changes in regulations	2020.	Sector of Thermal Energy
5.	Consideration of the tax and financial incentives to use geothermal energy	1. Increasing the share of renewable energy sources in the consumption of thermal energy	Government of Republic of Serbia, Ministry in charge of finance, Ministry in charge of mining and energy	The completed analysis which defines models of incentives to use geothermal energy and the effects of their application that could be basis of potential changes in regulations	2020.	Sector of Thermal Energy

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
6.	Consideration of the tax and financial incentives to use of energy plantations	1. Increase technically usable potential of biomass in energy purposes	Government of Republic of Serbia, Ministry in charge of Finance, Ministry in charge of agriculture and environmental protection, Ministry in charge of mining and energy	Drafted study with a proposal of optimal solution of tree species, planting mode, species and types of land suitable for the cultivation of energy plantations, which can serve as a basis for a possible changes of regulations for tax and financial incentives for the use of energy plantations	2021.	Energy sector
7.	Establishment of national scheme verification of the fulfilment of sustainability biofuels	1. Production of biofuels in a sustainable way 2. Reducing dependence of domestic producers from foreign verifiers of fulfilment of the sustainable production of biofuels	Government of Republic of Serbia, Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection	Established a nationwide scheme of verification fulfilment of the sustainability biofuels	2019.	Transport sector

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
8.	Consideration of the tax and financial incentives for biofuels and for their placing on the market	1. Increased use of renewable energy sources in transport 2. Engagement of local resources 3. Rural development	Government of Republic of Serbia, Ministry in charge of Finance, Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection	Drafted study with a proposal of optimal solutions, which can serve as a basis for draft of regulations	2018.	Transport sector
9.	Development of the Strategy for the collection and use of urban waste to produce heat and electricity	1. Solving the problem of waste 2. Increasing the share of renewable energy sources in district heating plants 3. Reduction of import dependence the district heating plants 4. Increase the security of energy supply and security	Ministry in charge of agriculture and environmental protection, Ministry in charge of mining and energy, Local authorities	Drafted strategy for the collection and use of urban waste to produce heat and electricity	2018.	Sector of environmental protection, Sector of electrical energy, Sector of Thermal Energy
10.	Considering possibilities of introduction of incentives for the use of electric vehicles	1. Reducing the use of fossil energy sources in transport	Government of Republic of Serbia, Ministry in charge of mining and energy, Ministry in charge of transport, Ministry in charge of finance	Drafted study with a proposal of optimal solutions, which can serve as a basis for draft of regulations	2019.	Transport sector

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
11.	Creating the conditions for education and information of citizens and youth people about the importance and benefits of using renewable energy sources	1. Raising awareness of the importance of renewable energy sources to create conditions for the improvement of the status of environmental protection and rational use of natural resources	Government of Republic of Serbia, Ministry in charge of mining and energy, Ministry in charge of education, science and technological development	Adopt programs of education and information, including the promotion of renewable energy sources	2019.	Sector of electrical energy, education sector, media sector
12.	Consideration of the possibility of introducing of incentives for innovation and promotional projects in the production and use of renewable energy sources	1. Encouraging local resources in science and innovativeness on the development and introduction of new technologies in the field of renewable energy sources 2. Increasing energy efficiency and economic profitability of renewable energy sources	Ministry in charge of mining and energy, Ministry in charge of education, science and technological development	Drafted study with a proposal of optimal solutions, which can serve as a basis for draft of regulations	2019.	Sector of electrical energy

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
13.	The inclusion of the procedure for issuing energy permits for objects of power up to 10 MW and obtaining the status a temporary privileged producer and producers of renewable energy sources in the electronic services of the portal E-government	1. Simplification of the administrative procedures and elimination of administrative barriers	Ministry in charge of mining and energy, Ministry in charge of public administration and units of local self-government, Chamber of Commerce and Industry of Serbia	The electronic services on the portal E-government	2019.	Sector of electrical energy

No	Content of measure	Goal of measure	Implementers of measures	Indicator of achievement measures	Deadline of realization	Field of measure application
14.	Promotion of electricity produced from renewable energy sources in the public sector	1. Increase of production from renewable energy sources 2. Strengthening the awareness about the importance of renewable energy sources for the rational use of natural resources and improvement of environmental protection	Government of Republic of Serbia, Ministry in charge of agriculture and environmental protection, Ministry in charge of mining and energy, Republic Directorate for Property of the Republic of Serbia, Local authorities	Increased share of renewable energy sources in the public sector	2023.	Sector of electrical energy, sector of environmental protection

Table 35: Plan of activities for realization of measures in the area of renewable energy sources

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
1.	Analysis of possible incentive models for a producer of electrical energy from RES based on market principles (auctions, tenders, feed-in premiums and green certificates) and the analysis of the domestic electricity market and stock market so that the producers from RES would become market participants with an assessment of optimal economic incentive model for domestic conditions	Ministry in charge of mining and energy, AERS, SEEPEX	Conducted analysis of possible incentive models	2018.	Measure no. 1. Measure no. 2.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
2.	Analysis of the impact of the operation of wind power plants on transmission system of the Republic of Serbia in all aspects of electricity quality and engagement of other power plants in the system	Transmission system operator	Conducted analysis of the impact of the operation of wind power plants on transmission system	2019.	Measure no. 1.
3.	Analysis of the impact of distributed electricity generation on the parameters of electricity quality (voltage, higher harmonics, flickers and continuity of supply) and losses in distribution system	Distribution system operator	Conducted analysis of the impact of distributed generation on distribution system	2019.	Measure no. 1. Measure no. 2.
4.	Analysis of hydro potential of the Republic of Serbia for hydro power plants with a capacity of up to 10 MW	Ministry in charge of mining and energy	Established inventory of SHPP	2019.	Measure no. 1.
5.	Analysis of incentive models for citizens and small projects in the area of RES (feed-in tariffs, energy cooperatives, net metering, green certificates, etc.) based on the international practice with the assessment of optimal economic incentive model for domestic conditions	Ministry in charge of mining and energy	Conducted analysis of possible incentive models	2018.	Measure no. 2.
6.	The establishment of a work group with the task to collect and analyse information on the possibilities and ways of creating a single financial fund for the whole area of RES	Ministry in charge of mining and energy	Established work group	2018.	Measure no. 2.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
7.	Establishment of a mechanism for regular statistical monitoring and improvement of data quality in the field of RES	Ministry in charge of mining and energy, Statistical Office of the Republic of Serbia	Fully established regular and quality statistical reporting in the field of RES	2020.	Measure no. 3. Measure no. 4.
8.	Establishment of a work group with the task to collect information on the costs and feasibility of replacing fossil fuels with RES, develop a common plan for transition to biomass heating plants, provide support to heating plants in finding the ways of funding, monitoring the implementation of projects, etc.	Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection, Body responsible for the management of public investments, Local governments	Established work group	2018.	Measure no. 3.
9.	Establishment of a work group with the task to investigate the possibility, validity and limitations of tax incentives or other financial models for citizens so that they would use energy efficient boilers/furnaces/stoves on biomass and to develop a proposal of concrete measures	Ministry in charge of mining and energy, Ministry in charge of finance, Ministry in charge of agriculture and environmental protection	Established work group	2018.	Measure no. 4.
10.	Establishment of a work group with the task to investigate the possibility, validity and limitations of tax incentives or other financial models for use of geothermal energy	Ministry in charge of mining and energy, Ministry in charge of finance	Established work group	2018.	Measure no. 5.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
11.	Establishment of an electronic portal for the trading of biomass within the project "Reducing barriers to greater use of biomass"	Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection, Chamber of commerce and industry of Serbia	Established electronic portal for the trading of biomass e	2018.	Measure no. 3. Measure no. 4. Measure no. 6.
12.	Identification of land suitable for energy crops	Ministry in charge of agriculture and environmental protection, Ministry in charge of mining and energy, Republic geodetic authority	Identified and mapped land suitable for energy crops	2020.	Measure no. 6. Measure no. 7. Measure no. 8.
13.	Establishment of a work group with the task to examine the opportunities and validity of introduction of incentive models for energy crops and to develop a proposal of incentive model	Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection	Established work group	2018.	Measure no. 6. Measure no. 7. Measure no. 8.
14.	The realization of the Project of developing a nationwide scheme of verification fulfilment of the sustainability biofuels from IPA 2014	Ministry in charge of mining and energy	Established a nationwide scheme of verification fulfilment of the sustainability biofuels	2020.	Measure no. 7.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
15.	Establishment of a work group with the task to investigate the possibilities and limitations of tax or other financial incentives for encouraging biofuel production from domestic resources and to develop a proposal of specific incentive model	Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection, Ministry in charge of finance	Established work group	2018.	Measure no. 8.
16.	Data preparation for development of the Strategy for the collection and use of urban waste for producing heat and electricity	Ministry in charge of agriculture and environmental protection, Ministry in charge of mining and energy, Local governments	Percentage of realization of dynamic project plan within which the Strategy for the collection and use of urban waste to produce heat and electricity was developed	2018.	Measure no. 9.
17.	Establishment of a work group with the task to examine the possibilities, validity and limitations of incentives for the use of electric vehicles and to develop a proposal of the specific incentive model	Ministry in charge of mining and energy, Ministry in charge of traffic, Ministry in charge of finance	Established work group	2018.	Measure no. 10.
18.	Preparation of a study with the proposal of an optimal solution for fitting the consumption of electric vehicles into the daily electricity production diagrams with an analysis of the effects of integration of electrical transport into a national energy system that can serve as a basis for introducing incentives and making regulations	Distribution system operator, EPS	Prepared study with the proposal of an optimal solution for fitting the consumption of electric vehicles into the daily electricity production diagrams	2019.	Measure no. 10.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
19.	Establishment of a work group with the task to consider the possibility and the arrangements for the introduction of RES in the school curriculum, media promotions of the importance of RES and scientific discoveries in the area of RES	Ministry in charge of mining and energy, Ministry in charge of education, science and technological development, Ministry in charge of culture and information	Established work group	2018.	Measure no. 11.
20.	Preparation of national internet platform about RES in Serbia with an application for mobile phones	Chamber of commerce and industry in Serbia, Ministry in charge of mining and energy	Established national internet platform about RES (Green portal)	2018.	Measure no. 11.
21.	Preparation of Guide for citizens about the importance of RES and possibilities of their investments in RES	Ministry in charge of mining and energy	Prepared Guides for citizens	2019.	Measure no. 11.
22.	Establishment of a work group with the task to investigate the possibilities and limitations for financing innovations and promotional projects in the area of RES and to develop a proposal of the specific model of financial support for innovation and promotional projects	Ministry in charge of mining and energy, Ministry in charge of education, science and technological development	Established work group	2018.	Measure no. 12.

No	Activity	Responsible Entity	Indicator of activity realization	Deadline of realization	Measure referred to activity
23.	Establishment of a work group with the task to identify problems relating to the implementation of administrative procedures in the area of RES and consider the possibility of using electronic services of the E-administration portal	Ministry in charge of mining and energy, Ministry in charge of construction, transport and infrastructure, Ministry in charge of public administration and local government	Established work group	2018.	Measure no. 13.
24.	Data preparation for implementation of NREAP based on the proposals and the analysis results obtained from activities no. 1. - 20.	Government of the Republic of Serbia, Ministry in charge of mining and energy	Adopted NREAP	2020.	Measures no. 1.-14.
25.	Development of draft regulation that changes the existing regulations in the area of RES	Government of the Republic of Serbia, Ministry in charge of mining and energy and other ministries depending on the jurisdiction	Amended regulations in the area of RES based on the results of comprehensive analyses	Continuous in line with other activities	Measures no. 1.-14.

3.3.3. The List of Projects in the Area of Renewable Energy Sources

The area of RES is characteristic due to the very diverse list of entities that implement individual projects in this area, and thanks to which the national goals are realized.

Since private investors are usually the ones who implement individual projects, complete information about individual projects (source of funds, status of project preparation, lacking of planning and technical documentation) cannot be provided, as in the case of other sectors. For this reason, only the largest projects are listed here. The majority of projects listed in this chapter are also listed in the chapters relating to the sector of electrical energy and the sector of the thermal energy, according to the nature of each project and contribution of each project to targets in the mentioned sectors.

P.15. Project for the construction of new wind power plants at the territory of the Republic of Serbia awarded with the temporary status of privileged producers with power up to 500 MW

The project includes construction of the following production facilities in the period 2017-2023:

1) Wind Farm Alibunar, by the end of February 2018, installed capacity of 42 MW, estimated annual production of 100.8 GWh;
2) Wind Farm Malibunar, by the end of April 2018, installed capacity of 8 MW, estimated annual production of 19.2 GWh;
3) Wind Farm Plandište 1, by the end of November 2018, installed capacity of 102 MW, estimated annual production of 244.8 GWh;
4) Wind Farm Kovačica, by the end of November 2018, installed capacity of 104.5 MW, estimated annual production of 250.8 GWh;
5) Wind Farm Čibuk, by the end of November 2018, installed capacity of 158.46 MW, estimated annual production of 380.3 GWh;
6) Wind Farm Košava, by the end of April 2019, installed capacity of 68 MW, estimated annual production of 163.2 GWh;
7) Wind Farm Kostolac, by the end of 2020, installed capacity of 66 MW, estimated annual production of 145 GWh (this project is included in the Single project pipeline in the field of energy, together with the solar power plant Petka in Kostolac, installed capacity of 9.9 MW, estimated annual production of 13 GWh. The Single project pipeline in the field of energy is a list for whose formation the Office for European Integration of the Republic of Serbia was in charge and which is formed according to the rules approved by the Government and it is available at internet address: http://www.mre.gov.rs/doc/medjunarodna-saradnja/Revidirana %20Jedinstvena %20lista %20prioritetnih %20infrastrukturnih %20projekata %20u %20oblasti %20energetike_srb.pdf);

Total value of investments in construction of new wind power plants is estimated to about 706 million €, and total annual production from listed power plants is estimated to about 1,303 GWh. The production from these plants should provide significant 1.2% GFC of the Republic of Serbia.

P.16. The project of transition to boilers on biomass

In order to realize the targets relating to biomass heating, in the preparation there are several projects of introduction of biomass or use of geothermal energy as a fuel in heating plants, with the expected total capacity of about 105 MW and annual production of 21,000 toe. Mentioned targets will be realized through the activities within the project "Promotion of use of renewable energy sources - development of biomass market", as well as through individual commercial projects. Thus, the project belongs to the group of projects for which the funds were allocated within several rounds of bilateral negotiations between the Government of Germany and the

Republic of Serbia. Information about specific projects is specified in more detail in chapter 3.2 which is related to the field of thermal energy.

Total investments in the realization of projects are 100 million € (20 million € in the first phase, and 80 million € in the second phase), and the implementation of the projects is planned for the period 2017-2021. Total estimated production of thermal energy from biomass is about 244 GWh (21 thousand toe), which provides 0.2% gross final energy consumption of the Republic of Serbia.

P.17. EPS's projects that are implemented based on the signed memorandums and agreements

During the implementation of the Program, the project of the reconstruction of EPS's small hydro power plants connected to the distribution network with a restoration of production at the designed level will be continued (HPP: Radaljska Banja, Vrelo, Turica, Pod Gradom, Moravica, Seljašnica, Kratovska Reka, Raška, Jelašnica, Vučje, Sićevo, Sveta Petka, Temac, Sokolovica and Gamzigrad), and the activities on the construction of two small hydro power plants at water management facilities (SHPP Rovni and SHPP Ćelije), which are funded from EBRD loan, will be continued, based on the Law on the Ratification of the Guarantee Agreement (EPS Project for Small Hydropower Plants) between the Republic of Serbia and the European Bank for Reconstruction and Development ("Official Gazette of the Republic of Serbia" - International Agreements, no. 1/12).

Based on the concluded memorandums and agreements, the feasibility of the continuation of the implementation of the following initiated projects will be analysed in the next period:

1. ten cascade hydro power plants on the Ibar River (locations: Bojanići, Gokčanica, Ušće, Glavica, Cerje, Gradina, Bela Glava, Dobre Strane, Maglič and Lakat), with total capacity of 120 MW, annual production of 451 GWh and total investment value of about 350 million €, based on the Law on Ratification of the Agreement between the Government of the Republic of Serbia and the Republic of Italy on cooperation in the field of energy ("Official Gazette of the Republic of Serbia"- International Agreements, no. 7/12);
2. hydro power plant on the Velika Morava River (locations: Ljubičevo, Trnovče, Svilajnac, Mijatovac and Varvarin), with total capacity of 150 MW, annual production of 650 GWh and total investment value of about 350 million €, based on the Agreement on cooperation signed between PE "Elektroprivreda Srbije", Belgrade and RWE AG, Opernplatz 1, Essen, Germany from 14.7.2010., and the Memorandum of Understanding on a strategic partnership between PE "Elektroprivreda Srbije", Belgrade and RWE AG, Opernplatz 1, Essen, Germany, represented by RWE Innogy GmbH, Gildehofstrasse 1, Essen, Germany RWE Innogy Serbia doo, Belgrade, Francuska 27, RWE Technology GmbH, Huyssenallee 12-14, Essen, Germany, approved by the conclusion of the Government 05 no. 018-5850/2012-1 of 8.9. 2012.

The above mentioned projects will be implemented in accordance with the above mentioned acts while the same are valid, i.e. until the repeal, cancellation or termination of the same.

3.3.3.1 Other Projects in the Sector of RES

Apart from the mentioned projects for construction of wind and solar power plants in Kostolac, several other projects relating to renewable energy resources are included in the Single project pipeline in the field of energy:

1) The utilization of geothermal energy in Bogatić - project value is 2.7 million € - the term of project realization has not yet been clearly defined;
2) Plant for combined heat and power plant that use communal waste as fuel in Šabac - project value is 30 million € - the term of project realization has not yet been clearly defined;
3) Promotion of renewable energy resources - developing the biomass market in Serbia, Component I - project value is 20 million € - the term of project realization has not yet been clearly defined;

4) Biomass fired boiler house 2x1.25 MW construction in the settlement Tivol in Ruma - project value is 1.6 million € - the term of project realization has not yet been clearly defined;
5) Biomass combined heat and power plant in Šabac - project value is 17 million € - the term of project realization has not yet been clearly defined;
6) New biomass fired combined heat and power boiler house 4.0 MW construction in Pećinci - project value is 9 million € - the term of project realization has not yet been clearly defined;
7) Enhancing of energy efficiency and usage of renewable energy sources in primary schools and public buildings in the City of Kraljevo area - project value is 1 million € - the term of project realization has not yet been clearly defined

In addition to the listed renewable energy projects, the Ministry in charge of mining and energy, in cooperation with the Standing Conference of Towns and Municipalities, arranged a part of the information database - SLAP database (www.slap.skgo.org), which has been in use since 2009, and into which the proposals of projects relating to increasing energy efficiency and use of RES in buildings that are under the jurisdiction of local governments can be introduced. This database encourages the management structure, as well as all employees in the public sector to propose projects relating to their facilities, and which could contribute to the increased use of RES.

Proposed projects under the SLAP database provide the Ministry an insight into the extent and nature of possible investments in the future. Also, the collected information will enable the proposing of projects for further development and implementation to potential donors and financiers.

The implementation of these projects is in different stages, and reporting by aggregate effects of these projects (since these are mostly smaller investments, for example, the introduction of biomass as a fuel in hospitals or schools, that are spatially distributed by local governments) will be a part of the report on the implementation of National Renewable Energy Action Plan (hereinafter referred to as: NREAP).

3.4. Sector of Oil

Achieving the strategic objectives in the area of oil sector is realized by implementation of measures and projects, which are defined in the way to provide accomplishment of one or several envisaged goals by the Energy Development Strategy of Serbia to 2025 with projections to 2030. These complex measures involve regulatory, organizational, technical, technological and other activities, as well as capital investment projects. The adopted strategic objectives for oil sector are:

- Providing the security of supply of the domestic market in petroleum products which quality corresponds to the highest EU standards;
- Reducing the import dependence;
- Providing new routes for crude oil supply.

The degree of certain strategic objectives′ implementation will be monitored by indicators presented in Table 36.

3.4.1. Measures for Oil Sector

Measures defined for oil sector that are primarily directed towards to provision of the strategic objectives′ implementation are:

1. **The harmonization of national legislative framework with the EU Acquis and the EC regulation.** A set of activities that follows this measure are referring to the adoption of new or adjustment of existing laws and regulations to the EU directives and recommendations, as well as to the decisions and recommendations of the Energy Community (Table 37) [43].
2. **Measures in oil subsector - exploration and production:**
    - Increase of resource base and production
    - Realization of planned oil production (Table 39) by increase of oil reservoir recovery and using the measures for lowering the production decline
    - Exploitation of unconventional oil resources - oil shale

A set of activities that follows these measures is presented in Table 38.

Table 36: Indicators for monitoring the effects of measure and project implementation in oil sector

Strategic goal	Indicator	Description	The method of calculating	Value in 2016	Target / calculated value in 2023
Provision of secure supply of domestic market with petroleum products of the quality that meets the highest EU standards	Reserves-to-production ratio[1]	Indicates the availability of produced reserves at certain values of annual oil production; it is expressed in years.	R/P =produced reserves (mill. t)/ annual oil production (mil.t/year)	14.30	16.47
	Advance in crude oil refining[2]	Indicates the increase of crude oil refining depth; it is expressed in percentages.	Depth of refining (%) = Depth of refining (t) / Total input* (t) Depth of refining (t) = total input*(t)-losses (t) - own consumption (t) - residual fuel oil (t) * Total input includes: crude oil, the external semi-products that are going to refining (without natural gas) and hydrogen (obtained from a refined natural gas at a refinery)	84.89%	92% in 2020
		Indicates the increase of "white derivative" production; it is expressed in percentages.	White derivatives (%) = White derivatives * (t) / Total input (t) * White derivatives include: LPG, propylene, gasoline, (aviation gasoline, jet fuel, all gas oils, primary gasoline, aromatics (benzene, toluene)	74.10%	85.8% in 2020
	Days of establishing the mandatory stocks of crude oil and petroleum products (related	Indicates the dynamics of establishing the mandatory stocks of crude oil and petroleum products; it is expressed in days.	Days of establishing the mandatory stocks of crude oil and petroleum products = Stored reserves (t)/Needed reserves (t)/61)	13	61

Strategic goal	Indicator	Description	The method of calculating	Value in 2016	Target / calculated value in 2023
	to establishing minimum stocks equivalent to at least 61 days of consumption)				
Reduction of import dependency	Reserves-to-production ratio[1]	Indicates the availability of produced reserves at certain values of annual oil production; it is expressed in years.	R/P = produced reserves (mill. t)/ annual oil production (mil.t/year)	14.30	16.47

1) Energy indicator of sustainable development-economic dimension, source: Energy Indicators for Sustainable Development: Guidelines and Methodologies, International Atomic Energy Agency, United Nations Department of Economic and Social Affairs, International Energy Agency, Eurostat and European Environment Agency, 2005 , http://www.unosd.org/content/documents/1237Pub1222_web %20EISD.pdf; Data source: Petroleum industry of Serbia (NIS)

Note: The value of reserves in this indicator is variable parameter due to many factors such as discovery of new reservoirs, application of new technologies, as well as changes in economic conditions.

2) Energy indicator of sustainable development-economic dimension, source: NIS

3) Energy indicator of sustainable development-economic dimension, defined in accordance with the Energy Indicators for Sustainable Development: Guidelines and Methodologies, International Atomic Energy Agency, United Nations Department of Economic and Social Affairs, International Energy Agency, Eurostat and European Environment Agency, 2005 , http://www.unosd.org/content/documents/1237Pub1222_web %20EISD.pdf; Data Source: Public Enterprise Transnafta, Directorate for Commodity Reserves and Ministry of Mining and Energy.

Table 37: Activities for harmonization of national legislative framework with the EU Acquis and EC regulations

Activity	EU/EC regulation for alignment	Deadline	Responsible institutions
Adoption of Action Plan to align with Acquis on minimum stocks of crude oil and/or petroleum products	Directive 119/2009/EC	at the drafting stage	Ministry of Mining and Energy (Department of oil and gas and Department of geology and mining), Directorate of energy reserves as an entity of the Ministry of Energy and Mining
Adoption of Rulebook on deadlines, content and manner of submitting data on purchase and sale of oil, oil derivatives, biofuels and compressed natural gas, and data on the prices of petroleum products and biofuels with and without excise taxes and taxes	Council Decision 99/280/ EC and Council Regulation 2964/95	Quarter 2 - 2017	
Adoption of Regulation on a program of measures to put the mandatory stocks of oil and oil derivatives at the market when security of energy supply is threatened - Crisis Plan	Directive 119/2009/EC	Quarter 2 - 2017	
Transposition of Directive 94/22/EC in accordance with second revised National Program for the Adoption of the Acquis (NPAA), adopted in November 2016	Directive 94/22/EC	Quarter 4 - 2018	Ministry of Mining and Energy (Department of oil and gas and Department of geology and mining)
Adoption of Rulebook on business reporting for companies involved in petroleum exploration and production	Directive 2013/30/EU, articles 20-22.	Quarter 4 - 2018	Ministry of Mining and Energy (Department of oil and gas and Department of geology and mining)
Analysis of the Law on Mining and Geological Research as a basis for transposing the Directive 94/22/ EC in accordance with the second revised National Program for the Adoption of the Acquis (NPAA), adopted in November 2016	Directive 94/22/EC	2017-2018 period	Ministry of mining and energy (Department of geology and mining)

Activity	EU/EC regulation for alignment	Deadline	Responsible institutions
Adoption of secondary legislation of the Law on Mining and Geological Research for regulating issues related to the disposal and management of mining waste and the conditions, criteria and procedures for issuing permits for waste management	Directive 2006/21/EC	at the drafting stage	Ministry of Mining and Energy
Establishing or strengthening the institutional and administrative capacities for regulation implementation and for implementing the public tender for issuing and use of an authorization for prospection and production of hydrocarbons	-	2019-2021 period	Ministry of Mining and Energy (Department of geology and mining)
Establishing or strengthening the institutional structure and administrative capacities in order to monitor fulfilment of the obligations for submission the circumstances of each major accident in which are involved companies registered in its territory for petroleum exploration and/or exploitation, and on their own or through subsidiaries are performing offshore petroleum exploration or exploitation activities outside the EU territory	-	2019-2021 period	Ministry of mining and energy (Department of geology and mining)
Realization of the planned dynamics of gradually increasing the quantity of mandatory stocks of crude oil and/or petroleum products	Directive 119/2009/EC on maintaining the minimum stocks of crude oil and/or petroleum products (of 90 days of average net daily import or 61 days of average daily inland consumption, whichever of the two quantities is greater)	2021-12/31/2022	Directorate of energy reserves as an entity of the Ministry of Energy and Mining

Activity	EU/EC regulation for alignment	Deadline	Responsible institutions
Including in electronic services the procedure for issuing energy permits for construction of facilities for petroleum products production, oil and petroleum product pipeline, storage facilities for oil, derivatives, biofuels, compressed natural gas and liquefied natural gas of more than 10 m^3 in volume	-	In 2018	Ministry of Mining and Energy, Ministry of Public Administration and Local Self-Government, Chamber of Commerce and Industry of Serbia

Table 38: Activities in oil subsector - exploration and production

Measure	Activity	Deadline	Responsible entity/institution
Increase of resource base and production	The continuation of geological exploration for oil in south-eastern part of the Pannonian basin in Serbia	2017-2020/2021 period	Petroleum industry of Serbia (NIS)
	The requests for continuation of geological exploration for oil in south-eastern part of the Pannonian basin in Serbia	2020/2021-2023 period	
	Projects of geological exploration works in Bosnia and Herzegovina and at the licensed blocks in Hungary and Romania	2017-2023 period	
	Completion of "Study of the regional geological model and estimate of future prospects on oil and gas in Pannonian Basin"	Until 2018	
	Investments in concessionary rights abroad	2017-2023 period	
Realization of planned oil production by increase of oil reservoir recovery and by using the measures for lowering the production decline	Investments in geological-technical measures	2017-2023 period	NIS
	Drilling of development wells	2017-2023 period	
	Application of enhanced oil recovery methods (CO_2 injection)	2017-2023 period	
	Application of oil production stimulation methods	2017-2023 period	
Exploitation of unconventional oil resources - oil shale	Reorganization of Public enterprise for underground coal mining - Resavica - "Aleksinac mine"	-	Ministry of economy and Ministry of Mining and Energy

Crude oil production plan for 2017-2023 period is given in Table 39 [44]. It involves planned production at the currently active exploitation fields: Jermenovci, Lokve, Janosik, Velika Greda south, Elemir, Zrenjanin, Zrenjanin north, Itebej, Boka, Rusanda, Mihajlovo, Srpska Crnja, Vojvoda Stepa, Turija North, Čoka, Kikinda Varoš, Kikinda Varoš south, Kikinda Varoš north, Majdan, Mokrin, Cantavir, Kelebija, Palić, Velebit, Sirakovo, Bradarac-Maljurevac and Kasidol, as well as the planned production from discovered oil fields: Kikinda west, Iđoš, Rusanda northeast, Kikinda east, Vrbica, Podlokanj, Crna bara south, Kurjače and Obilićevo.

Table 39: Oil production plan for 2017-2023 period

Planned oil production* (t)						
2017.	2018.	2019.	2020.	2021.	2022.	2023.
858,051	762,028	669,482	627,030	589,455	565,329	533,700

*Note: The planned crude oil production from exploitation fields is defined on the basis of active approvals, and planned production from discovered fields is based at the current assumptions on the expected crude oil price in the future period.

In the territory of the Republic of Serbia, NIS company is carrying out oil geological exploration in seven approved exploration areas: in the one approved exploration area south of Sava and Danube river by 12/31/2019 and in six approved exploration areas in Vojvodina by 12/32/2020. According to provisions of the Law on Mining and Geological Research (OGRS, no. 101/15) NIS will apply for continuation of the oil geological exploration for a period of 5 years (exploratory periods 3 + 2 years).

Future projects of geological exploration will determine geological, geophysical, geochemical, laboratory and other necessary methods to be applied at prospect locations for discovering the oil reservoirs.

Project development plans, implementation of geological exploration works and other obligations imposed by law is given in Table 40 [44].

Table 40: Projects of oil geological explorations

No	Title	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	Geological exploration projects at the exploratory area of northern Banat									
	Project development			X	X			X		
	Obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	Annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X
2	Geological exploration projects at the exploratory area of middle Banat									
	Project development			X	X			X		
	obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X

No	Title	2017	2018	2019	2020	2021	2022	2023	2024	2025
3	Geological exploration projects at the exploratory area of southern Banat									
	Project development			X	X			X		
	obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X
4	Geological exploration projects at the exploratory area of northern Bačka									
	Project development			X	X			X		
	obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X
5	Geological exploration projects at the exploratory area of southern Bačka									
	Project development			X	X			X		
	obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X
6	Geological exploration projects at the exploratory area of Srem									
	Project development			X	X			X		
	obtaining the approval for project continuation				X			X		
	Project implementation	X	X	X	X	X	X	X	X	X
	annual/final reports on projects	X	X	X	X/X	X	X	X/X	X	X/X
7	Geological exploration projects at the exploratory area south of Sava and Danube rivers									
	Project development		X	X		X	X			
	obtaining the approval for project continuation			X			X			
	Project implementation	X	X	X	X	X	X	X	X	
	annual/final reports on projects	X	X	X/X	X	X	X/X	X	X/X	

By 2020, at the approved exploration areas for carrying out the oil geological exploration will be implemented planned 3D seismic surveys, followed by seismic and geological interpretation for the purpose of allocation of sites for exploration drilling.

The planned number of exploratory wells that will be drilled in the territory of Serbia for 2017-2023 period is given in Table 41 [44]. Number of wells is given on the basis of the current

geological exploration projects for the period from 2017 to 2020. The drilling plan for 2021-2023 period is given according to the results achieved so far, and it will be defined by new projects.

Table 41: Number of planned exploratory wells*

Year	2017	2018	2019	2020	2021	2022	2023
Number of wells	7	8	7	8	10	11	14

*Note: Number of planned exploratory wells is based on the current assumptions of the expected crude oil price in the future period.

NIS′ projects of geological exploration works in Bosnia and Herzegovina and at the licensed blocks in Hungary and Romania refers to:

- The results of hydrocarbon exploration in the territory of the Serbian Republic in Bosnia and Herzegovina that are carried out by "Jadran-Naftagas" (daughter company of NIS and Neftegazinkor) will define the dynamics of future exploration and production in this region.

- In Romania, NIS has started geological exploration activities at the six licensed blocks.

- In Hungary, NIS has started in cooperation with the Austrian RAG company geological exploration activities at two licensed blocks.

The completion of "Study of the regional geological model and estimate of future prospects on oil and gas in Pannonian Basin" with aim of analysis and interpretation of geological data collected at territory of Serbia, Hungary, Romania and Bosnia and Herzegovina for geological modelling of the Pannonian Basin and selecting the most prospected sites for future oil geological exploration, is planned for the end of 2017.

Plan of drilling wells at active exploitation fields for 2017-2023 period is given in Table 42 [44].

The values of reserves-to-production ratio (R/P) for 2017-2023 period are presented in Table 43 [44].

Table 42: Planned drilling projects in active exploitation fields for 2017-2023 period

Year	2017	2018	2019	2020	2021	2022	2023
Number of wells	30	20	20	20	20	20	20

Table 43: Reserves-to-production ratio values

Year	2017	2018	2019	2020	2021	2022	2023
R/P (years)	14.99	15.75	16.79	16.86	16.87	16.55	16.47

3. Measures in oil subsector - refining

- Continuing the modernization of the oil refinery in Pančevo

A set of activities that follows this measure is presented in Table 44.

4. Measures in oil subsector - transportation

- Construction of the First facility of petroleum product pipeline system
- The development of international cooperation for connecting the oil pipeline systems, as well as product pipeline systems

A set of activities that follows these measures is presented in Table 45.

5. Measures in oil subsector - sales

- Provision of mandatory stocks of crude oil and petroleum products according to Directive 119/2009/EC.

A set of activities that follows this measure is presented in Table 46

6. Measures for improving the energy efficiency

In table 47 are given measures and activities of NIS′ Energy efficiency action plan for 2017 [44]. NIS company′s Energy efficiency action plan is done on an annual basis.

Since 2008, oil refinery in Pančevo has been included in a program of comparative analysis of refinery key performance indicators according to "Solomon" methodology, where the value of energy intensity index ("EII") is monitored. The estimated EII value after implementation of "Deep refining" project is presented in the review of mentioned project [44].

7. Environmental protection measures

The environmental protection measures and activities for harmonization of NIS′ operations with legislation of the Republic of Serbia and the EU legislation by 2025 are presented in Table 48 [44]. The projects and activities for environmental protection in Transnafta Public Enterprise for 2016-2023 period are given in table 49 [45].

The emission of harmful substances into the air, the amount of waste water, waste, chemicals, soil pollution and accidents, that are a source of environmental pollution, with measures taken for environmental protection that are presented by NIS on an annual basis, will be shown in the Report on Program′s Strategic Environmental Assessment for 2017-2023 period.

Table 44: Activities in oil subsector - refining

Measure	Activity	Deadline	Responsible entity
The continuation of oil refinery modernization in Pančevo	The second phase of modernization of the refinery in Pančevo for improving production and increasing the energy efficiency of refining and processing plants	2017-2019 period	NIS

Table 45: Activities in oil subsector - transportation

Measure	Activity	Deadline	Responsible entity
Construction of the First facility of petroleum product pipeline system	Construction of Pančevo- Smederevo section	End of 2020	Public enterprise Transnafta
	Construction of Pančevo- Novi Sad section	End of 2022	Public enterprise Transnafta
The development of international cooperation for connecting the oil pipeline systems, as well as product pipeline systems	Agreements with interested parties in the region and wider	End of 2022	Ministry of Mining and Energy and Public enterprise Transnafta

Table 46: Activities in oil subsector - sales

Measure	Activity	Deadline	Responsible entity
The establishment of mandatory stocks of crude oil and/or petroleum products	Supply of crude oil and petroleum products	End of 2022	Ministry of Mining and Energy
	Changing the legal regulations	In 2017	Ministry of Mining and Energy and Ministry of Finance
	Provision of new storage capacities	End of 2022	Ministry of Mining and Energy, Republic Directorate for Commodity Reserves and PE Transnafta (storages under public ownership)

Table 47: NIS ′ Energy Efficiency Action Plan for 2017

Name of NIS′ Block	Activity	Type of energy	Energy savings	Unit	Cost savings [000 RSD]
Exploration and production	Reactive power compensation	Electrical energy	-	-	2,908
	Balancing, repair, replacement of pumping units, working in lower tariff	Electrical energy	2,771	000 kWh	23,397
	Reducing the energy consumption and costs for heating tanks and installation of energy-efficient equipment, the transition from diesel generators to TS	Electrical energy	8,462	000 kWh	74,706
	Modernization of lighting	Electrical energy	117	000 kWh	869
Refining	Reducing electricity consumption by installing the heat exchangers, by changing dimensions of the steam lines and by other operational activities	Electrical energy	13,100	000 kWh	88,065
	Investment measures for energy efficiency increasing	thermal energy	77,428	Gcal	325,707
	Organizational and technical	thermal energy	19,961	Gcal	92,457
	Investment measures for energy efficiency increasing	Fuels	25,447	toe	622,752
	Organizational and technical	Fuels	3,400	toe	80,192
Energy	Installation of more energy-efficient equipment	electrical energy	940	000 kWh	5,800

Name of NIS′ Block	Activity	Type of energy	Energy savings	Unit	Cost savings [000 RSD]
	Automation and modernization of plant	electrical energy	2,427	000 kWh	17,212
	Reconstruction of a plant′s segment	thermal energy	87	Gcal	803
	Automation and modernization of plant	Fuels	668	toe	20,215
Sales	Purchase of new vehicles	Fuels	62	toe	8,818
Business centres	Modernization of air conditioning	electrical energy	300	000 kWh	2,400
	Modernization of air conditioning	thermal energy	1,500	Gcal	10,800
Plant for production of "Jazak" drinking water	Modernization of lighting	electrical energy	15	000 kWh	81

Table 48: The environmental protection activities for harmonization of NIS′ operations with legislation of the Republic of Serbia and the EU by 2025

Name of NIS′ block	Activity	Investments (Million USD)	Deadline	Responsible entity
Refining Block				
1	Reclamation and separation of oiled and atmospheric sewage system in Pančevo oil refinery	0,05	2017-2025	NIS
2	Project for washing the ejector′s gas at S-2200 (reducing SO_x emission)	1,06	2017-2025	NIS

Name of NIS′ block	Activity	Investments (Million USD)	Deadline	Responsible entity
3	Installation of separator at SLOP line	1,06	2017-2025	NIS
4	Reconstruction of dispatcher′ objects in Pančevo oil refinery	0,02	2017-2025	NIS
5	CEMS at S-5000	0,17	2017-2025	NIS
6	Reconstruction of system for gas detection and fire protection in furnaces	0,44	2017-2025	NIS
7	Reconstruction of FB-0805 tank	0,41	2017-2025	NIS
8	Reconstruction of FB-1109 tank	0,20	2017-2025	NIS
9	Amine gas treating with DA-2107 II at the atmospheric distillation plant according to IED directive 2010/75 / EU	2,10	2017-2025	NIS
10	Installing the "Low NOx" burners for reducing emissions at processing furnace	2,78	2017-2025	NIS
11	Redirесting of off-gas from S-5000 to the gas flare	0,10	2017-2025	NIS
12	Construction of a closed sampling system in production	0,22	2017-2025	NIS
13	Reconstruction and modernization of the Pančevo refinery port at Danube river	0,03	2017-2025	NIS
14	Modernization of installations for bitumen loading / unloading at filling stations/ railway filling stations, incineration of waste gases from the tank and installation of radar mixers and temperature probes at tanks	0,87	2017-2025	NIS
15	Adaptation of natural gas heating system at the S-9900, S-9950 and natural gas flow regulation at the S-9900	0,01	2017-2025	NIS
16	Construction of new platforms and rehabilitation of existing platforms in Pančevo and Novi Sad refineries for increasing employees′ safety	0,38	2017-2025	NIS

Name of NIS′ block	Activity	Investments (Million USD)	Deadline	Responsible entity
17	Arranging a location for contractors according to the plan for 2016	0,01	2017-2025	NIS
18	Flue gas exhale for furnace BA-0252	1,00	2017-2025	NIS
19	Reconstruction of the VME system	0,50	2017-2025	NIS
20	EC filter istallation at the smoke channel of the FCC plant	4,00	2017-2025	NIS
21	Reconstruction for harmonization according to rquirements of "VOC" Directive 1994/63/ EC and 2009/126 /EC	0,68	2017-2025	NIS
	Energy Block			
22	Geothermal energy projects	0,21	2017-2025	NIS
23	The thermal power plant-heating plant project in Pančevo - part of NIS	70,6	2017-2025	NIS
24	The construction of cogeneration plants	15,61	2017-2025	NIS
25	Projects of compressed natural gas (CNG)	2,27	2017-2025	NIS
26	Projects of heating system reconstruction in the Novi Sad Refinery	0,67	2017-2025	NIS
27	Adaptation of condensate recovery system	0,24	2017-2025	NIS
	Exploration and Production Block			
28	Environmental protection projects	10,27	2017-2025	NIS
	Sales block			
29	Investment in technical and technological measures that have to be taken in the part of the system for handling and storing gasoline in accordance with the requirements of VOC Directive 1994/63 / EC and 2009/126 / EC	6,02	2017-2025	NIS

Name of NIS′ block	Activity	Investments (Million USD)	Deadline	Responsible entity
30	Installation of separators, piezometers and flow meters for oiled wastewater with accompanying project documentation at SSG and storages	0,92	2017-2025	NIS
31	Remediation of water intake by filter installation, reconstruction of sewer and facilities for waste water treatment in the N ovi Sad Refinery	0,40	2017-2025	NIS
32	Reconstruction and upgrading of "SND NS" sewage system	0,28	2017-2025	NIS
Oilfield Services Block				
33	Procurement and installation of wastewater measuring devices	0,12	2017-2025	NIS
34	Construction of sewage system - NAFTAGAS Oilfield Services Block, Sangaj	0,10	2017-2025	NIS
35	Construction and equipping of storages for disposal of hazardous and non-hazardous waste (equipment for manipulation and measurement of waste, absorbents, bundwalls)	0,15	2017-2025	NIS
36	Construction of 3 new tanks for mud waste disposal	2,98	2017-2025	NIS

Table 49: Projects and activities for environmental protection in PE Transnafta for 2016-2023 period

No.	Project/Activity	Description	Investments (million RSD)	Deadline	Responsible entity
1	Report on security and accident protection plan - Crude oil terminal	Identification of hazards and review of the possible accident situation development, the analysis of consequences and prevention measures	5	2016-2023 period	PE Transnafta
2	Report on security and accident protection plan - oil product storages in Refinery	Identification of hazards and review of the possible accident situation development, the analysis of consequences and prevention measures	5	2016-2023 period	PE Transnafta
3	Environmental impact assessment with accident protection plan for "Ledinci" fuel storage	- Environmental protection measures - Description of possible significant effects of fuel storage on the environment	1	2016-2023 period	PE Transnafta
4	Environmental impact assessment with accident protection plan for "Knić", "Umac baza" and "Jeminska Stena" storages	- Environmental protection measures - Description of possible significant effects storage of fuel on the environment	3	2016-2023 period	PE Transnafta

No.	Project/Activity	Description	Investments (million RSD)	Deadline	Responsible entity
5	Environmental monitoring at the PE Transnafta facilities	- Air monitoring/ air immissions and emissions - total hydrocarbons BTX, NO_2 and CO) - Surface water monitoring for the presence of hydrocarbons of petroleum origin - Groundwater monitoring for the presence of hydrocarbons of petroleum origin - Monitoring of the water at the exit of oily water separator - hydrocarbons C10-C40 - Soil quality - Level of noise and vibration - The groundwater level	5	2016-2023 period	PE Transnafta
6	Remedial measures in the event of contamination/ accident	- The state of the environment at the site after contamination - Exploring operations - The amount and concentration of hazardous substances at the site and environmental impact - The project′s solution for remediation - Control measures	21	2016-2023 period	PE Transnafta
7	Pollution preventive measures at the PE Transnafta facilities	- Engagement of authorized company for pollution prevention-constructing the protective dams on watercourses - Provision of adsorbents and protective equipment - Provision of polyethylene film for the safe disposal of contaminated waste - Selective separation of waste and safe storage	12	2016-2023 period	PE Transnafta

No.	Project/Activity	Description	Investments (million RSD)	Deadline	Responsible entity
8	Measures and activities for pollution prevention caused by an accident - Terminal and pipeline system	- Construction of the collecting manholes - Extraction of oil from soil and water using the vacuum pump - Remediation of contaminated soil and water - Terrain reclamation - Construction of piezometers	40	2016-2023 period	PE Transnafta
9	Measures and activities for pollution prevention caused by an accident -petroleum product pipeline	- Construction of the collecting manholes - Pumping the derivative from soil and water by vacuum pumps - Remediation of contaminated soil and water and permanent waste disposal - Terrain reclamation - Construction of piezometers	-	2016-2023 period	PE Transnafta
10	Measures and activities for pollution prevention caused by an accident - "Ledinci" storage	- Setting up absorbent booms and collection of spilled fuel from the water and concrete surfaces - The use of means for decommissioning and dismantling of hydrocarbon from the water surfaces - Collection of spilled fuel from the tank, catchment tanks and manholes - Cleaning the separators - Remediation of contaminated soil and permanent disposal of hazardous waste - Terrain reclamation - Construction of piezometers for groundwater monitoring	15	2016-2023 period	PE Transnafta

No.	Project/Activity	Description	Investments (million RSD)	Deadline	Responsible entity
11	Measures and activities for pollution prevention caused by an accident - Knić", "Umac baza" and "Jeminska Stena" storages	- Setting up absorbent booms and collection of spilled fuel from the water and concrete surfaces - The use of means for decommissioning and dismantling of hydrocarbon from the water surfaces - Collection of spilled fuel from the tank, catchment tanks and manholes - Cleaning the separators - Remediation of contaminated soil and permanent disposal of hazardous waste - Terrain reclamation - Construction of piezometers for groundwater monitoring	-	2016-2023. period	PE Transnafta
12	Disposal of hazardous and non-hazardous waste at the PE Transnafta facilities	- Examination of waste and determining the waste index number - Procurement of containers and barrels for selective separation and collection of waste - Adaptation of the temporary storages for waste collection at Transnafta′s locations - Waste labelling and waste list managing - Disposal of hazardous and non-hazardous waste - Developing and updating the waste management plans	15	2016-2023 period	PE Transnafta

No.	Project/Activity	Description	Investments (million RSD)	Deadline	Responsible entity
13	Waste water collection and treatment, regularity control of facilities for collection, drainage and waste water treatment	- Collection of waste water - Monitoring the water tightness	10	2016-2023. period	PE Transnafta

3.4.2. The Projects in Oil Sector

3.4.2.1 Projects in Oil Refining Subsector

P.18. Strategic project "Deep refining" [44]

Table 50: Basic characteristics of the project

Technical characteristics and project description	The effects of realization based on available documentation	The value of the project and funding source
Implementation of delayed coking technology as a second phase of oil refinery modernization in Pančevo	This project will enable an increase in the depth of refining (at 92%) and increased production of white derivatives (to 85.8%), with improvement of refining process efficiency, increasing the plant′s availability and maximizing the level of energy costs′ optimization. Due realization of the project and other measures that are planned to be implemented in Oil Refinery Pančevo, energy intensity index ("EII", defined on the basis of the "Solomon" methodology) will be almost equal to the refineries in world that use EII as a reference index. According to macroeconomic indicators used for the project calculation, the expected average increase in profit before interest, income taxes, depreciation and amortization (i.e. EBITDA) for the period after the beginning of the project is $87 million per year.	$330 million without VAT (NIS′ own funds)

Table 51: State of the project

Project	Project preparation status	Lacking planning and technical documentation
Deep refining	Feasibility study of the project is done during 2013 and 2014. Three technological solutions were considered in the study with aim of increasing the depth of refining, and delayed coking technology (DCU) has proven to be an optimal solution. In 2015, the contract between CB&I company and NIS for development of base and extended base project "Deep refining" (BDP/FEED) has been signed. During 2015, CB&I has developed a conceptual study of the project and submitted a base project (BDP). In 2016, CB&I has completed the activities on the development of the expanded base project for the construction of main and auxiliary facilities. A tender procedure has been conducted and CB&I has been selected for the implementation of EPCM project′s phase. The project has two "work packages": WP1 - construction of DCU and ancillary facilities, WP2 - modernization and reconstruction of existing facilities due to changes in the refinery′s operating mode.	Obtaining the missing licenses

Table 52: Dynamics for realization of activities in the period of Program′s implementation

Project "Deep refining"	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Construction of DCU and ancillary facilities	NIS	x						
Modernization and reconstruction of existing facilities due to changes in the refinery′s operating mode			x	x				
Testing of new refining possibilities				x				

3.4.2.2 The Projects in the Oil Subsector-Transportation

P.19. Project "Construction of the First facility of petroleum product pipeline system"

The objective of Petroleum product pipeline system construction in Serbia is provision of an economical, efficient and environmentally friendly mode of transportation of petroleum products that are produced in the oil refinery Pančevo. It represents a project of national and strategic importance since it significantly contributes to supply security [45].

From an economic point of view, transport of petroleum product by pipeline is the most efficient way in terms of the amount of operational expenses, minimum losses during transport and it is considered as a „just-in-time" type of transportation regarding accuracy and reliability of transportation dynamics.

From the socioeconomic point of view, petroleum product transportation by pipelines can contribute to the reduction of traffic congestion, and to reduction of external costs which are compensated from the budget (numerous traffic accidents, environmental pollution, abrasion and damage of roads). Indirect social benefit, by using this type of oil product transportation in comparison to other ones, is lower energy consumption

From an environmental and safety point of view, the petroleum product pipeline system is the safest type of product transportation with the least adverse impact on the environment (the lowest emissions of carbon dioxide, nitrogen oxides, and volatile organic compounds, without noise) and at least accidents resulting in death or serious injury.

The other advantages of petroleum product pipeline system are: great transportation capacity, shorter route since the pipes can be laid in the water also, it occupies small area and very important issue is the possibility of cross-border regional connectivity that is supported by The Energy Community Treaty of Southeast Europe.

Table 53: Basic characteristics of the project "Construction of the First facility of petroleum product pipeline system"

Technical characteristics	Description	The effects of implementation on the basis of available documentation	The value of the project and funding source
The length of First facility of petroleum product pipeline is: 26.9 km +90.3km = 117.2 km. It has three terminals (shipping terminal in Pančevo, receiving terminals in Smederevo and Novi Sad)	Construction of the First Facility of the Products Pipeline System is envisaged in three phases: construction of the products pipeline connecting oil refinery in Pančevo with the existing storage tanks in Smederevo and Novi Sad; construction of new storage tanks in Pančevo and Smederevo and providing conditions for further transport. It goes from terminal in Pančevo in two directions: to the south (Smederevo) and to the north (Novi Sad). The southern direction starts with Pančevo-Smederevo section, i.e. from shipping terminal within the oil refinery in Pančevo, along the Pančevo-Kovin road to the receiving terminal in Smederevo, which is located next to the existing NIS′ storage. The northern direction starts by Pančevo-Novi Sad product pipeline route that is in a zone of existing pipeline route (former Yugoslav′s oil pipeline) and it connects to the receiving terminal, at the location near the oil refinery in Novi Sad.	Increasing the oil derivative supply security. More cost-effective mode of transportation at a price lower than the current 4.7 EUR/t for marine transport and up to 9 EUR/t for road transport. The energy consumption per ton of transported petroleum products will be significantly reduced and thereby increasing efficiency by about 60%. Preservation of transport infrastructure at the previous routes of supply. Environmental pollution reduction and consequently decreasing the impact on the population's health and reducing the health care costs.	30 million euros according to the preliminary project design, but it should be much lower with application of more rational technological solutions; PE Transnafta.

Table 54: Status of project

Project	Status of project preparation	Lacking planning and technical documentation
First facility of petroleum product pipeline system construction	Complete planning documentation is done; The Feasibility Study with the Basic Design and the Environmental Impact Assessment Study for Construction of the First Facility of the Products Pipeline System (Pančevo-Smederevo and Pančevo-Novi Sad sections) are completed.	The implementation project and Project for construction permit for Pančevo-Smederevo section The implementation project and Project for construction permit for Pančevo-Novi Sad section Tender documentation for construction.

Table 55: Dynamics for realization of activities in the period of Program′s implementation

Project: "First facility of petroleum product pipeline system construction"	Responsible entity	2017	2018	2019	2020	2021	2022	2023
The implementation project and Project for construction permit for Pančevo-Smederevo section	PE Transnafta	x						
Resolving property and legal affairs for Pančevo-Smederevo section	PE Transnafta	x						
Preparation of tender documentation	PE Transnafta		x					
Construction	PE Transnafta			x	x			
The implementation project and Project for construction permit for Pančevo-Novi Sad section	PE Transnafta	x						
Resolving property and legal affairs for Pančevo-Smederevo section	PE Transnafta		x					
Preparation of tender documentation	PE Transnafta				x			
Construction	PE Transnafta					x	x	

3.4.2.3 Projects in Oil Subsector - Sales

P.20. Project "Establishing the mandatory stocks of crude oil and/or petroleum products"

In the Republic of Serbia, establishment of crude oil and/or petroleum product mandatory stocks (MS) is planned for 201 -12/31/2022 period, starting from stocks in 2015 that were corresponded to 9.5 days of 61 days of average daily inland consumption. [46], [47] MS will be determined for each year in the mentioned period, based on data from the previous year in an amount of 90 days of average net daily import or 61 days of average daily inland consumption, whichever of the two quantities is greater. Also, the structure of mandatory reserves will be determined for each year, where it involves petroleum products whose common share expressed in units of oil equivalent is equal to at least 75% of the total domestic consumption in previous year.

Directorate of energy reserves has formed MS in 2015 equals to 9.5 days of 61 days of average daily inland consumption and has continued to manage project for establishing the mandatory stocks of crude oil and/or petroleum products in 2016 [48].

Directorate of energy reserves is obliged to pay the excise tax on petroleum product purchase. It is necessary by amending the Law on excise taxes to provide purchase of petroleum products without excises that will directly contribute to more efficient MS forming concerning the fact of limited budget for this purpose.

In order to form MS, PE Transnafta has started revitalization of certain number of petroleum product storages that belong to the Army of Republic of Serbia. Besides that, it has started to build at the terminal in Novi Sad two crude oil storage tanks with capacity of 20,000 m^3. This construction is planned to be completed in the second half of 2017 [49]. According to that, it is necessary to change the defined MS structure since the oil stocks would be increased from 20,000 tons to about 51,000 tons, and petroleum product stocks would be reduced.

Also, Republican Directorate for Commodity Reserves (RDCR) plans to increase storage capacities by the construction of new storage tanks [50].

Data on the available storage capacities under the public ownership and ownership of public enterprise (RDCR and PE Transnafta) and dynamics of their increase in order to form MS are presented in table 56. In tab. 57 is given the dynamics of project for establishing the mandatory stocks of crude oil and/or petroleum products.

Based on the analysis, it was found that lack of storage volume for forming the MS is about 155,000 tons amounting to 20.4 days of average daily consumption. The problem of insufficient storage capacity can be solved by using the existing available storage capacities in the Republic of Serbia (that are not used currently), by the construction of new storage capacities under public ownership, by the construction of new storage capacities through public-private partnership and contractual rights for purchasing the certain quantities of petroleum products.

For establishment of mandatory stocks, that includes the provision of new storage capacities, purchase of petroleum products, storage costs and other necessary expenses (insurance, quality control, etc.), it is necessary to provide about 650 million Euros.

Table 56: Available storage capacities under public ownership and public enterprise ownership

Year	2016	2017	2018	2019	2020	2021	2022	2023
PE Transnafta, tons	45,600	92,400	103,200	114,600	121,656	121,656	121,656	121,656
RDCR, tons	115,739	115,739	115,739	154,939	170,939	186,939	186,939	186,939
Total capacity, tons	161,339	208,139	218,939	269,539	292,595	308,595	308,595	308,595
MS, days	21.2	27.4	28.8	35.5	38.5	40.6	40.6	40.6
The planned dynamics for MS establishing, days	17	23	31	39	47	54	61	61

Table 57: Dynamics for realization of activities in the period of Program′s implementation

Project: "Establishing the mandatory stocks"	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Supply of oil and petroleum products	Ministry of Mining and Energy	x	x	x	x	x	x	
Amending the Law on Excise Taxes	Ministry of Finance	x						
Redefining the existing structure of MS	Ministry of Mining and Energy	x	x					
Provision of new storage capacities	Ministry of Mining and Energy, Republic Directorate for Commodity Reserves (RDCR) and PE Transnafta (storages under public ownership)	x	x	x	x	x	x	

3.4.2.4 The Possibility of Exploiting and Refining the Oil Shale

The estimated reserves of oil shale in the Republic of Serbia are about 4.8 billion tons. The reserves of oil shale are found in the following basins: Aleksinac, Vranje, Senonian Tectonic Trench, Valjevo-Mionica, Western Morava, Kruševac, Babušnica, Kosanica, Niš and Levač. In the Aleksinac basin, a higher degree of exploration of oil shale has been achieved in comparison to the other basins, and the potential reserves of oil shale in Aleksinac reservoir are estimated at around two billion tons.

In 2012, the study on estimate of productive oil shale reserves for Public enterprise for underground coal mining Resavica - "Aleksinac mine" has been done. It is determined that reserves of Dubrava field are 352,759,195 tons where the oil yield ranges from 9.9% to 12.5%. PE Resavica - "Aleksinac mine" has an exploitation permit No. 04-783/ 2.

There are more interested parties in the oil shale exploitation. The cost- effective exploitation of oil shale from Aleksinac basin is directly related to the crude oil price. According to the analysis, the beginning, as well as an implementing the exploitation, is conditioned by the price of crude oil on the world market from 70 to 80 $/barrel. Oil shale can be effectively used for the production of synthetic oil (by extraction), that can be used as a fuel or upgraded by refining to petroleum products, while the residual part of extracted oil shale could be used for electricity production.

From the standpoint of environmental impact, the project is acceptable since there is no need for disposal of extracted oil shale. It will be used for electricity and heat production. The oil shale ash, that is by-product from oil shale combustion, could be used as a raw material in the construction industry. By using the modern technologies, gas emissions would be reduced, while all waste water would be subjected to treatment in the treating facility.

The exploitation and refining of oil shale has multiple positive effects such as:

- valorisation of unused mineral resources;
- an increase in domestic oil production;
- production of electricity and heat;
- the progress of undeveloped region in Serbia;
- new jobs and
- direct impact on GDP growth.

Regarding the current state of the PE Resavica - "Aleksinac mines" it is necessary to take appropriate measures and actions in terms of company′s financial consolidations. This can be achieved through the reorganization of the company that would provide an opportunity for finding a strategic partner or for privatization. Due this present situation, dynamics for implementation of activities in the period of Program′s implementation cannot be defined.

3.5. Sector of Natural Gas

Achieving the strategic objectives in the natural gas sector should be obtained by implementation of measures and realization of projects, which have been selected and defined based on an impact that they have on one or more strategic goals. Complex measures include regulatory, organizational, technical and other activities. Their joint realization, with engineering demanding and investment intensive project activities, should synergistically contribute to achievement of the objectives of the Strategy. The adopted strategic objectives in the natural gas sector are:

- Ensuring security of supply of the national natural gas market,
- Establishing national and regional natural gas market,
- Diversification of sources and routes of natural gas supply.

The level of realization of strategic objectives will be monitored by indicators presented in Table 58.

3.5.1. Measures for the Natural Gas Sector

Measures in the field of natural gas that are primarily directed toward accomplishing the strategic objectives. Measures include, as follows:

1. **Harmonization of legislation with obligations arisen from a membership in the Energy Community**; A set of activities related to this measure includes adoption of plans and instructions related to ensuring secure supply of natural gas, conditions for access to the networks for the transmission of natural gas, as well as adoption of a new legal framework related to exploration and exploitation of hydrocarbons, and rules on reporting, for companies that perform research and exploitation of oil and natural gas. Also, for ensuring the certification process of the transmission system, it is necessary to adopt changes on the Law on Ministries, the Law on Government, the Law on Public Utilities and the Law on Commercial Companies.
2. **Improvement of regulatory and technical conditions for the operation of gas infrastructure**; The key activities within this measure are adoption of rules for the operation of transmission system, revision and improvement of the methodology for determining the price for accessing to natural gas distribution system, equipping of transmission pipeline system with measurement and data acquisition systems necessary for the operation and development of the natural gas market, as well as taking over measuring devices and metering and regulating stations in facilities of existing consumers or producers by the distribution systems operators.
3. **Planning of gas infrastructure development**; This measure refers to adoption of ten-year development plans, for transmission and storage capacities, as well as five-year plans for distribution systems development, and research and preparation of documentation for the future development of gas infrastructure.
4. **Reorganization of the natural gas distribution sector**; This measure includes a range of activities aimed at development of the national natural gas market. This should be achieved by regulatory and other incentives for enlargement of the existing distribution companies or their integration with communal utilities, aimed to accomplish their financial sustainability.
5. **Realization of planned natural gas production in the Republic of Serbia**; This measure includes a set of technical-technological and organizational activities aimed at achieving optimal natural gas production, which significantly contributes to the security of the supply of the domestic market. The plan for the production of gas dissolved in petroleum and free gas for the period up to 2023 is given in.

A particular set of measures is related to the improvement of energy efficiency of production, transmission and distribution of natural gas. These measures have a positive effect on the functioning of the entire natural gas sector, and include:

- Improving efficiency of oil and natural gas production,

- Maintenance and rehabilitation of the transmission system,
- Maintenance and rehabilitation of the distribution system.

The listed measures, along with related activities, envisaged deadlines for adoption, institutions responsible for implementation and indicators for monitoring are presented in Table 60-Table 63.

Table 58: Indicators for monitoring the effects of the implementation of measures and the realization of projects in the natural gas sector

Strategic goal	Indicator	Description	Method for calculating
Ensuring a secure supply of the national natural gas market	(N-1) index of the system availability [52]	The indicator determines daily operational flexibility of the gas system, and the system's ability to respond to consumers` demands in extreme conditions.	N-1 = (technical capacity of entering points + maximal technical production capability + maximal storage technical deliverability + maximal technical LNG facility capacity- technical capacity of the single largest gas infrastructure)/ Maximal daily gas demand with a statistical probability of occurrence once in 20 years x 100%
Establishment of national and regional natural gas market	Level of market openness [40]	The indicator shows the level of liberalization of the natural gas market, and refers to the amount of natural gas which is sold on open gas market.	Ratio of amounts of natural gas sold on an open market, and the overall consumption of natural gas x 100%
Diversification of sources and routes for natural gas supply	Import Route Diversification (IRD) [53]	The index determines import diversification of supply routes, and depends on available capacities of interconnections.	Sum of squares of percentage shares of interconnections and percentage shares of delivery from LNG terminals in overall supply. Lower value of the index means greater diversification of supply routes.

Table 59: Plan of natural gas production in the period 2017-2023 (in thousands of m^3)

Planned natural gas production						
2017	2018	2019	2020	2021	2022	2023
516,632	469,781	429,924	397,369	364,912	343,522	322,353

Table 60: Measures for ensuring a secure supply of the national natural gas market

Strategic goal:	**Ensuring a secure supply of the national natural gas market**			
Measure	**Activity**	**Deadline for adoption of the regulation**	**Responsible entity**	**Indicator of the activity**
Harmonization of legislation with obligations arisen from a membership in the Energy Community	Adoption of the Preventive action plan for safeguarding the security of natural gas supply	III quarter 2017.	Ministry in charge of mining and energy (Sector for oil and gas)	Adopted plan harmonized with Regulation 994/2010
	Adoption of the Crisis plan for safeguarding the security of natural gas supply	III quarter 2017.	Ministry in charge of mining and energy (Sector for oil and gas)	Adopted plan harmonized with Regulation 994/2010
	Transposition of the Directive 94/22/EU in accordance with the revised Second National Program for the Adoption of the EU Acquis (NPAA), adopted in November 2016	IV quarter 2018.	Ministry in charge of mining and energy (Sector for oil and gas, Sector for mining and geology)	Transposed the Directive 94/22/EC in accordance with the revised Second National Program for the Adoption of the EU Acquis
	Adoption of the Regulation on reporting for companies that conduct research and exploitation of oil and gas	IV quarter 2018.	Ministry in charge of Mining and Energy (Sector for oil and gas, Sector for mining and geology)	Adopted regulation harmonized with the Directive 2013/30/EU - articles 20-22.

Strategic goal:	**Ensuring a secure supply of the national natural gas market**			
Measure	**Activity**	**Deadline for adoption of the regulation**	**Responsible entity**	**Indicator of the activity**
Planning the development of gas infrastructure	Adoption of a ten-year plan for the development of the transmission system (to be adopted every year)	2017-2023.	Transmission system operators - TSO (Transportgas Srbija d.o.o and „Yugorosgaz-Transport" d.o.o.), AERS	Obtained the approval from AERS
	Adoption of a ten-year plan for the development of natural gas storage (to be adopted every year)	2017-2023.	Storage operator	Document delivered to AERS
	Adoption of plans for development of distribution systems (to be made every year for a period of five years)	2017-2023.	Distribution system operators (DSO)	Publicly available document
Improvement of regulatory and technical conditions for the operation of gas infrastructure	Adoption of Natural gas transmission system code	II quarter 2017.	TSO - Transportgas Srbija, AERS	Obtained the approval from AERS
	Inclusion of the procedure for issuing energy permits for the construction of facilities for natural gas transmission, facilities for natural gas distribution, storage facilities for natural gas and direct gas pipelines in electronic services E-portals	2018.	Ministry in charge of mining and energy, Ministry in charge of public administration and units of local self-government, Serbian Chamber of Commerce	Introduced new electronic service on E-portal

Table 61: Measures for establishing national and regional natural gas market

Strategic goal:	**Establishing national and regional natural gas market**			
Measure	**Activity**	**Deadline for adoption of the regulation**	**Responsible entity**	**Indicator of the activity**
Harmonization of legislation with obligations arisen from a membership in the Energy Community	Adoption of the Decree on conditions of natural gas delivery and supply	IV quarter 2017	Ministry in charge of mining and energy (Sector for oil and gas)	Adopted Decree harmonized with the Directive 2009/73/EU, the Decree 715/2009 and the Decree 994/2010
Providing a legal framework for carrying out the certification process of the transmission system	Amendment of the Law on Ministries, the Law on Government, the Law on Public Enterprises and the Law on Commercial Companies	2018.	Government of the Republic of Serbia, National Assembly of the Republic of Serbia, Ministry in charge of mining and energy	Conducted certification procedures and obtained certification of the operator of the transmission system from AERS
Improvement of regulatory and technical conditions for the operation of gas infrastructure	Revision and improvement of Natural gas transmission and distribution connection charging methodology	2020.	AERS	Adopted innovative methodology that promotes economy of scale and encourage efficiency in operation of distribution companies
	Gas transmission system equipping with metering and data collection devices (measuring equipment, measuring and operational platform, SCADA) necessary for the functioning and development of the gas market	2020.	TSO - Transportgas Srbija	Share of exits from transmission system equipped with metering and data collection devices (current state: 34% in the system TSO - Transportgas Serbia and 100% in the system of TSO - Yugorosgaz-Transport)

Strategic goal:	**Establishing national and regional natural gas market**			
Measure	**Activity**	**Deadline for adoption of the regulation**	**Responsible entity**	**Indicator of the activity**
	Adoption of plans for takeover metering devices and metering and regulating stations, in the facilities of existing customers or producers	Until 2020	DSOs	Adopted plans for takeover, by the founders of the distribution companies
Reorganization of the natural gas distribution sector	Analysis of business performance and recommendation of measures for the consolidation of distribution sector and reorganization of distribution companies with negative financial balances	2018-2021.	Ministry in charge of mining and energy, units of local self-government	Adopted reorganization plans by the founders of distribution companies

Table 62: Measures for diversification of sources and routes for natural gas supply

Strategic goal:	**Diversification of sources and routes for natural gas supply**			
Measure	**Activity**	**Deadline for adoption of the regulation**	**Responsible entity**	**Indicator of the activity**
Planning the gas infrastructure development	Feasibility studies for construction of main gas pipelines to the borders with Romania, Croatia, Montenegro, Macedonia and Bosnia and Herzegovina	2020-2023	TSO (PE Srbijagas) Ministry in charge of mining and energy	Feasibility studies completed
	Feasibility studies for construction of compressor stations	2020-2023	TSO (PE Srbijagas) Ministry in charge of mining and energy	Feasibility studies completed
	Geological Research and Feasibility Study for the underground gas storage Itebej	2018-2021	TSO (PE Srbijagas) Ministry in charge of mining and energy	Feasibility study completed
	Geological Research and Feasibility Study for the underground gas storage Tilva	2020-2023	TSO (PE Srbijagas) Ministry in charge of mining and energy	Feasibility study completed

Table 63: Measures aimed at improving energy efficiency of production, transmission and distribution of natural gas, environmental protection and at reducing the impact on climate change

Measure	Activity	Deadline for adoption of the regulation	Responsible entity	Indicator for energy efficiency monitoring	Indicator for environment and climate change monitoring
Improvement of oil and natural gas production processes	Introduction of more efficient technologies and optimization of oil and natural gas production processes	2017-2023	NIS	Specific consumption of natural gas for oil and natural gas production: In 2015: 66.67 m^3/toe (Statistical Office of the Republic of Serbia, Total energy balance in 2015)	Specific amount of natural gas flared in oil and natural gas production processes [m^3/toe]
Maintenance and rehabilitation of the transmission system including revitalization of compression station	Diagnostics of the existing transmission infrastructure, replacement of critical sections and preventive maintenance of equipment and installations	2017-2023.	Transmission system operators	Losses in transmission (as a percentage of total transmitted gas): In 2015: 0.32% (AERS, Report for 2015.) Preferred value in 2023: 0.3%	Emitted amount of natural gas in transmission network: In 2015: 8 million m^3 (AERS, Report for 2015.)
Maintenance and rehabilitation of the distribution systems	Diagnostics of the existing distribution infrastructure, replacement of critical sections and preventive maintenance of equipment and installations	2017-2023.	Distribution systems operators	Losses in distribution (as a percentage of total distributed gas): In 2015: 0.57% in total, in some distribution system significantly higher (AERS, Report for 2015.) Preferred value in 2023: < 0.5% in total, < 2% for the each distribution system	Emitted amount of natural gas in distribution networks: 2015: 8 million m^3 (AERS, Report for 2015.)

3.5.2. Projects in the Natural Gas Sector

P.21. Gas interconnection project Serbia - Bulgaria, the main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria)

The interconnection project Serbia - Bulgaria is listed at the Single list of infrastructure projects in energy, the Priority list of energy projects (PECI list), the List of projects of common interest (P list) and at the List of projects for gas connection of Middle Eastern and South Eastern Europe (CESEC list).

Table 64:Main characteristics of the project

Technical characteristics	Description	The effects of realization based on available documentation	The value of the project and funding source
Main single gas pipeline; length 109 km, diameter DN 700, technical capacity 1.8 billion m^3/year, maximum operating pressure 55 bar	Main pipeline MG-10 Niš - Dimitrovgrad is an infrastructural basis for the establishment of gas interconnection with Bulgaria. Primary technical elements are: pipeline, facilities and associated infrastructure. An integral part of the pipeline are: - 2 overtaking stations - in a location near the state border and within the existing pipeline junction point "Niš 2". - 6 block stations - 2 pipeline inspection gauge within overtaking stations - 4 main metering and regulating stations (MMRS) as follows: MMRS "Niš 2" with a capacity of 30,000 m³/h, MMRS "Bela Palanka 2" capacity of 3,000 m³/h, MMRS "Pirot" capacity of 35,000 m³/h, MMRS "Dimitrovgrad" capacity of 7,000 m³/h - Devices for cathodic protection of the pipeline - Devices and equipment for the remote control and monitoring of facilities	Securing a new supply route. Increase of available natural gas quantity from import for 38% (from 12.96 million m^3/day to 17.89 million m^3/day). Compared to the maximum daily imported quantity of natural gas, in the period 2011-2015 for the consumers in Serbia (11.2 million m^3/day), the interconnection provides 44% of import needs.	85.5 million € Pre-accession EU funds, credit and the Budget of the Republic of Serbia

Table 65: Impact of the project on the achievement of strategic goals

Strategic goal	Description	The value of the indicator after realization of the project	Change compared to 2015
Ensuring a secure supply of the national natural gas market	Significantly improves; Additional entrance to natural gas network increases the security of supply, reliability of the system and creates a possibility for importing natural gas from other sources.	(N-1) = 64.3%	+86%
Establishment of national and regional natural gas market	Improves; Provides a possibility for reducing transit costs and development of distribution network in eastern and southern Serbia. It is prerequisite for the establishment of regional natural gas market. Potentially increases number of market participants.	-	-
Diversification of sources and routes for natural gas supply	Significantly improves; Introduces a new route of supply. Provides a new route for supply from Russia or from other supply sources (Azerbaijan, LNG from terminals in Greece etc.).	IRD = 6007	-39.9%

Table 66: State of the project

Project	Project preparation status	Lacking planning and technical documentation
Main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria)	Spatial plan for special purpose area with elements of detailed regulation was completed.	Conceptual design, Location conditions, Feasibility study, Preliminary design, Study on environmental impact assessment, Project for building permit, Building permit, Project for construction, Project of the constructed facility (as-built design) in accordance with the requirements of the Law on Planning and Construction, Energy permits in accordance with Energy Law, the tender documents for construction.

Table 67: Dynamics for realization of activities in the period of Program implementation

Project: Main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria)	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Exploration works	PE Srbijagas	x						
Conceptual design and location permit	PE Srbijagas	x						
Study on impact assessment on environment and society	PE Srbijagas	x						
Resolving property issues	Ministry in charge of mining and energy, PE Srbijagas	x						
Preliminary design and feasibility study	PE Srbijagas	x						
Energy permit	Ministry in charge of mining and energy,	x						
Project for building permit and building permit	PE Srbijagas		x					
Preparation of tender documents	Ministry of Finance - Sector for contracting and financing programs from EU funds (CFCU), PE Srbijagas		x	x				
Project for construction	PE Srbijagas			x	x			
Construction	-				x	x		

P.22. Gas interconnection project Serbia - Croatia, main gas pipeline MG 08 Gospođinci (Futog) - Sotin (Croatian border)

The interconnection project Serbia - Croatia is listed at the Single list of infrastructure projects in energy, the Priority list of energy projects (PECI list), the list of projects of common interest (P list) and at the List of projects for gas connection of Middle Eastern and South Eastern Europe (CESEC list).

Table 68: Main characteristics of the project

Technical characteristics	Description	The effects of realization based on available documentation	The value of the project and funding source
Main single pipe gas pipeline; length 95 km, diameter DN 600, capacity 1.5 billion m^3/year, nominal pressure 75 bar	Main pipeline MG 08 Gospođinci (Futog) - Sotin is an infrastructural basis for the establishment of gas interconnection with Croatia. Primary technical elements are: pipeline, facilities and associated infrastructure. An integral part of the pipeline are: - Overtaking station and pipeline inspection gauge at the location near the state border, - Block stations, - Devices for catholic protection of the pipeline, - Devices and equipment for the remote control and monitoring of facilities.	Securing a new supply route. Increase of available natural gas quantity from import for 31% (from 12.96 million m^3/day to 17.06 million m^3/day). Compared to the maximum daily imported quantity of natural gas, in the period 2011-2015 for the consumers in Serbia (11.2 million m^3/day), the interconnection provides 37% of import needs	85.5 million € (Data source: PE Srbijagas) Pre-accession EU funds, the Budget of the Republic of Serbia and other sources of funding

Note: During elaboration of the interconnection project Serbia - Croatia, in cooperation with the Croatian side, the beginning of the network is adopted to be in Gospođinci. This caused increase of the pipeline length that caused the difference in the value of the project presented above, and the value presented in the Single list of infrastructure projects in the energy sector (Table 129 on page 215).

Table 69: Impact of the project on the achievement of strategic goals

Strategic goal	Description	The value of the indicator after realization of the project	Change compared to 2015
Ensuring a secure supply of the national natural gas market	Significantly improves; Additional entrance to natural gas network increases the security of supply, reliability of the system and creates a possibility for importing natural gas from other sources.	(N-1) = 58.9%	+70.9%
Establishment of national and regional natural gas market	Improves; Provides a possibility for reducing transit costs. It is prerequisite for the establishment of regional natural gas market. Potentially increases number of market participants.	-	-
Diversification of sources and routes for natural gas supply	Improves; Provides a possibility for alternative supply of Algerian gas from Italy, via Croatia, or from a future LNG terminal in Croatia (anticipated capacity of 5-6 m^3 billion/year).	IRD = 6,348	-36.5%

Table 70: State of the project

Project	Project preparation status	Lacking planning and technical documentation
MG 08 Gospođinci (Futog) - Sotin (Croatian border)	The route at the level of the general design	Spatial plan for the special purpose area, Conceptual design, Location conditions, Feasibility study, Preliminary design, Study on environmental impact assessment, Project for building permit, Building permit, Project for construction, Project of the Constructed Facility (As-built Design) in accordance with the requirements of the Law on Planning and Construction, Energy permits in accordance with Energy Law, the tender documents for construction.

Table 71: Dynamics for realization of activities in the period of Program implementation

Project: MG 08 Gospođinci (Futog) - Sotin (Croatian border)	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Preparation of planning documents	PE Srbijagas						x	
Exploration works							x	
Conceptual design and location permit								x
Study on impact assessment on environment and society								x
Resolving property issues						x	x	x
Preliminary design and feasibility study								x
Energy permit								x
Project for building permit and building permit								x
Preparation of tender documents								x
Main project								
Construction	-							

P.23. Gas interconnection project Serbia - Romania, pipeline Mokrin - Arad (border with Romania)

The project of gas interconnection Serbia - Romania is on the Single list of infrastructure projects in the energy sector.

Table 72: Main characteristics of the project

Technical characteristics	Description	The effects of realization based on available documentation	The value of the project and funding source
Main single gas pipeline; length 6 km, diameter DN 600, technical capacity 1.6 billion m^3/year, maximum operating pressure 50 bar	Main gas pipeline Mokrin -Arad is an infrastructural basis for the establishment of gas interconnection with Romania. Primary technical elements are: pipeline, facilities and associated infrastructure. An integral part of the pipeline are: - Overtaking station and 2 pipeline inspection gauges - Block stations - Devices for cathodic protection of the pipeline - Devices and equipment for the remote control and monitoring of facilities	Securing a new supply route. Increase of available natural gas quantity from import for 34% (from 12.96 million m^3/day to 17.34 million m^3/day). Compared to the maximum daily imported quantity of natural gas, in the period 2011-2015 for the consumers in Serbia (11.2 million m^3/day), the interconnection provides 39% of import needs.	Estimated value of the project 85 million € (Data source: Market report: Serbia natural gas sector: prospects, market structure and strategy, 22 August 2016, EY) Part in Serbia 6 million € (Data source: PE Srbijagas) EU pre-accession funds, the Budget of the Republic of Serbia and other sources of funding

Note: In the conceptual development (consideration) of the project interconnection Serbia - Romania, in cooperation with the Romanian side, a metering station is envisaged on the territory of the Republic of Serbia, what caused the difference of the value given above and the value given in the Single list of infrastructure projects in the energy sector (Table 129 on page 215).

Table 73: Impact of the project on the achievement of strategic goals

Strategic goal	Description	The value of the indicator after realization of the project	Change compared to 2015
Ensuring a secure supply of the national natural gas market	Significantly improves; Additional entrance to natural gas network increases the security of supply, reliability of the system and creates a possibility for importing natural gas from other sources. Significant disburdening of the basic main pipeline Horgoš - Batajnica.	(N-1) = 60.6%	+76%
Establishment of national and regional natural gas market	Improves; Provides a possibility for reducing transit costs. It is prerequisite for the establishment of regional natural gas market. Potentially increases number of market participants. Provides a possibility for the inclusion of existing and future gas storages in the regional natural gas market.	-	-
Diversification of sources and routes for natural gas supply	Improves; Particularly in the case of realization of transcontinental project for natural gas supply over Romania.	IRD = 6,224	-37.7%

Table 74: State of the project

Project	Project preparation status	Lacking planning and technical documentation
Gas interconnection project Serbia - Romania, pipeline Mokrin - Arad (border with Romania)	The route at the level of the general design	Spatial plan for the special purpose area, Conceptual design, Location conditions, Feasibility study, Preliminary design, Study on environmental impact assessment, Project for building permit, Building permit, Project for construction, Project of the Constructed Facility (As-built Design) in accordance with the requirements of the Law on Planning and Construction, Energy permits in accordance with Energy Law, the tender documents for construction

Table 75: Dynamics for realization of activities in the period of Program implementation

Project: Gas interconnection Serbia - Romania	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Preparation of planning documents	PE Srbijagas						x	
Exploration works								x
Conceptual design and location permit								x
Study on impact assessment on environment and society								x
Resolving property issues								x
Preliminary design and feasibility study								x
Energy permit								
Project for building permit and building permit								
Preparation of tender documents								
Main project								
Construction	-							

P.24. Project for increasing the capacity of Underground storage Banatski Dvor

Table 76: Main characteristics of the project

Technical characteristics	Description	The effects of realization based on available documentation	The value of the project and funding source
Increasing the technical capacity of the storage to 800-1,000 million m^3, with withdrawal capacity up to 10 million m^3/day	Upgrade of the underground gas storage in Banatski Dvor from current capacity of 450 million m^3, to capacity of 800 to 1 billion m^3 with maximum technical capacity of production of 9.96 million m^3/day (415,000 m^3/h) and maximum technical capacity of injection of 5.52 million m^3/day (230,000 m^3/h).	Doubling of natural gas amount available from underground storage (from 5 million m^3/day to 10 million m^3/day). Compared to the maximum daily imported quantity of natural gas, in the period 2011-2015 for the consumers in Serbia (11.2 million m^3/day), the additional capacity provides 44.6% of needs.	65 million € Project finance (Data source: PE Srbijagas)

Table 77: Impact of the project on the achievement of strategic goals

Strategic goal	Description	The value of the indicator after realization of the project	Change compared to 2015
Ensuring a secure supply of the national natural gas market	Significantly improves; Available amounts of natural gas in occurrence of maximum daily consumption are significantly increased by project realization.	(N-1) = 66.6%	+93.3%
Establishment of national and regional natural gas market	Improves; Additional storage capacities, with envisaged interconnections, provides a possibility for use in the regional gas market.	-	-
Diversification of sources and routes for natural gas supply	Without impact	-	-

Table 78: State of the project

Project	Project preparation status	Lacking planning and technical documentation
Increasing the capacity of underground storage Banatski Dvor	At the level of the general design	Spatial plan for the special purpose area, preliminary project, location conditions, feasibility study, preliminary design, study on environmental impact assessment, project for building permit, building permit, project for construction, Project of the Constructed Facility (As-built Design) in accordance with the requirements of the Law on planning and construction, energy permits in accordance with Energy law, the tender documents for construction.

Table 79: Dynamics for realization of activities in the period of Program implementation

Project: Increasing the capacity of underground storage Banatski Dvor	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Exploration works	Storage operator (Natural Gas Underground Storage "Banatski Dvor" doo Novi Sad)				x			
Conceptual design and location permit						x	x	
Study on impact assessment on environment and society						x	x	
Resolving property issues						x	x	
Preliminary design and feasibility study							x	
Energy permit							x	
Project for building permit and building permit							x	
Preparation of tender documents							x	
Main project							x	x
Construction	-						x	x

P.25. Construction of main, delivery and distribution pipelines

Table 80: Main characteristics of projects (Data sources: documentation of PE Srbijagas and Yugorosgaz a.d., Market report: Serbia natural gas sector: prospects, market structure and strategy, 22 August 2016, EY)

Technical characteristics		Description	The effects of realization based on available documentation	The value of the project and funding source
Construction of transmission network (in 2015: the length of transmission network - 2,423 km, the number of main metering and regulating stations on transmission system exit - 269)	Main pipeline RG 11-02	Main single line pipeline RG 11-02 Leskovac - Vladičin Han - Vranje; length 70.7 km, diameter 323.9 mm, maximal operation pressure 50 bar, 6 block stations, 3 main metering and regulating stations (MMRS "Vlasotince" 5,000 m³/h, MMRS "Vladičin Han/Surdulica" 5,000 m³/h, MMRS "Vranje" 10,000 m³/h)	Extension of the national transmission network to south part of Serbia, in municipalities Vlasotince, Vladičin Han, Surdulica and the city of Vranje, provision of opportunities for further development of gas system toward Bujanovac and Preševo, as well as for interconnection with natural gas network of the Republic of Macedonia	15.6 million US$ is the value of complete RG 11-02 pipeline project. Until 2023, planned investments are 7.8 million US$ (projects, resolving of property relations and purchase of equipment and pipes, construction of pipeline from pipeline junction point (PJC) Niš to PJC Vladičin Han) Own resources of Yugorosgaz a.d.
	Main pipeline MG 01/II Itebej - Beograd Jug	Main single line pipeline; app. length 130 km and diameter 610 mm	Increasing dependability of national transmission network operation; Unload of Kikinda - Pančevo pipeline; Creation of opportunities for better functioning of national natural gas market	65.1 million € Own resources of PE Srbijagas, Budget of the Republic of Serbia
	Main pipeline Batajnica - Velika Plana - Niš	Main pipeline; length 116+161 km and diameter DN 700	Increasing dependability of national transmission network operation; Connection of pipeline Niš - Dimitrovgrad to Batajnica; Creation of opportunities for better functioning of national natural gas market	91.7 + 115.7 million € Own resources of PE Srbijagas, Budget of the Republic of Serbia
	Delivery pipeline RG 09-04/2 Aleksandrovac - Tutin	Delivery pipeline; operation pressure -up to 50 bar, length app. 121 km and diameter 323.9 mm	Development of transmission network of the Republic of Serbia and construction of distribution networks at municipalities along pipeline route (Brus- Kopaonik, Raška, Novi Pazar, Tutin).	53 million € Own resources of PE Srbijagas, Budget of the Republic of Serbia
	Delivery pipeline Mokrin - UGS Banatski Dvor	Delivery pipeline; operation pressure -up to 50 bar, length 50 km and diameter DN 600	Connection of UGS Banatski Dvor to pipeline from Romania; Creation of opportunities for better functioning of national natural gas market	30 million € Own resources of PE Srbijagas, Budget of the Republic of Serbia
Construction of distribution networks (in 2015: length of distribution network - 16,532 km, number of active connections/delivery points - 262,506)		Maximum operating pressures in distribution networks are 16 bar and 4 bar; Pipelines are constructed of steel and PE pipes with different diameters	Reduction of electricity consumption in households; substitution of using liquid fuels (heavy fuel oil, fuel oil) in district heating systems and industry; Increasing of efficiency of primary energy use by implementation of more efficiency technologies (CHP, condensing boilers etc.).	245 million € Own resources of DSOs, Budget of the Republic of Serbia

Table 81: Impact of the project on the achievement of strategic goals

Strategic goal	Description
Ensuring a secure supply of the national natural gas market	Improves; Construction of pipeline Itebej-Belgrade South increases security of supply of the area of Belgrade and Central Serbia.
Establishment of national and regional natural gas market	Significantly improves; Infrastructure preconditions (transmission system) are created for natural gas consumption in South, South-western and Central Serbia. Construction of new and extension of existing distribution networks enable increasing of natural gas consumption and development of natural gas market.
Diversification of sources and routes for natural gas supply	Without impact

Table 82: State of the project

Project	Project preparation status	Lacking planning and technical documentation
Construction of main, delivery and distribution pipelines	Depending on the project: Conceptual design, location conditions, feasibility study, preliminary design, study on environmental impact assessment, project for building permit, building permit, project for construction, Project of the Constructed Facility (As-built Design) in accordance with the requirements of the Law on planning and construction, energy permits in accordance with Energy law, the tender documents for construction.	Depending on the project: Conceptual design, location conditions, feasibility study, preliminary design, study on environmental impact assessment, project for building permit, building permit, project for construction, Project of the Constructed Facility (As-built Design) in accordance with the requirements of the Law on planning and construction, energy permits in accordance with Energy law, the tender documents for construction.

Table 83: Dynamics for realization of activities in the period of Program implementation

Project: Construction of main, delivery and distribution pipelines	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Conceptual design and location permit	PE Srbijagas, Yugorosgaz a.d., DSOs	x	x	x	x	x	x	x
Study on impact assessment on environment and society		x	x	x	x			
Resolving property issues		x	x	x	x	x	x	x
Preliminary design and feasibility study		x	x	x	x			
Energy permit		x	x	x	x			
Project for building permit and building permit		x	x	x	x	x	x	x
Preparation of tender documents		x	x	x	x	x	x	x
Main project		x	x	x	x	x	x	x
Construction	-	x	x	x	x	x	x	x

3.5.3. Sub-sector of Environmental Protection in the Sector of Natural Gas

Natural gas is an energy source with significant environmental advantages over other fossil fuels. The emission of nitrogen oxides from combustion of natural gas is much lower compared to coal, liquid fuels and biomass, and there is virtually no emissions of particles and oxides of sulfur. The carbon dioxide emission coefficient for natural gas is significantly lower than all other fossil fuels.

Direct environmental protection measures in the natural gas sector relate to the reduction of the amount of natural gas burnt on the torch during the production of oil and natural gas, and which it emits during transport and distribution. These measures, the activities that accompany them, the deadlines for execution, the responsible entities, as well as the indicators for their monitoring are listed in Table 84.

Table 84: Measures to improve environmental protection and reduce the impact on climate change in the production, transport and distribution of natural gas

Measure	Activity	Deadline for execution	Responsible institutions	Indicator for monitoring environmental impacts and climate change
Improving the process of oil and natural gas production	Introducing more efficient technologies and optimizing the production of oil and natural gas	2017-2023	NIS	The specific amount of natural gas burnt on torches in the production of oil and natural gas [m^3/ten]
Maintenance and rehabilitation of the transport system, including revitalization of the compressor station	Diagnostics of the existing transport infrastructure, replacement of critical parts and investment maintenance of equipment and installations	2017-2023	TSO	Emitted quantity of natural gas: 2015: 8 million m^3 (AERS, Report for 2015)
Maintenance and rehabilitation of the distribution system	Diagnostics of the existing distribution infrastructure, replacement of critical parts and investment maintenance of equipment and installations	2017-2023	DSO	Emitted quantity of natural gas: 2015: 8 million m^3 (AERS, Report for 2015)

3.6. Sector of Coal

Energy strategy in coal sector defines following strategic targets:

- Safe and reliable supply of coal firing power plants and
- Securing of sufficient amounts of coal for final consumption and generation of heat energy.

Table 85: Electricity generation balance in coal firing power plants and coal for production, according to referent scenario and scenario with applied energy efficiency measures

No.	Position	Year			
		2015	2020	2025	2030
(1)	(2)	(3)	(4)	(5)	(6)
1.	Referent scenario				
1.1.	Electricity generation in thermal power plants (in GWh)	26,679	23,865	25,563	27,284
1.2.	Coal for electricity generation (in1000 t)	38,772	34,203	34,946	37,711
2.	Scenario with applied energy efficiency measures				
2.1.	Electricity generation in thermal power plants (in GWh)	26,621	24,283	25,481	27,284
2.2.	Coal for electricity generation (in 1000 t)	38,772	34,203	34,946	37,706

This chapter provides detailed description of parameters for monitoring completion of individual targets.

Indicator no. 1

Target: Securing of sufficient amounts of coal for final consumption and generation of heat energy

Indicator: Ratio between domestic coal production and coal required for final consumption and transformation in heating plants; Indicator shows that there is capability to meet requirements for coal in these areas of domestic production. This indicator is not including the fact that there is domestic production of high quality coal in small amounts (anthracite, hard coal, etc.). It is calculated as a ratio of energy value of produced coal and sum of final energy and energy required for transformation in heating and combined plants.

Year 2015

Domestic coal production:

PEU mines	595,284 t,	17,000 kJ/kg
Underwater mine	225,000 t,	9,000 kJ/kg
EPS		(7,500 kJ/kg)
drying	548,752 t	
industry	231,921 t	
heating plants	211,197 t	
Final consumption:	27,984 TJ	
Heating plants:	2,732 TJ	
Combined plants (excluding blast furnace gas):	2,845 TJ	
Consumption:	33,561 TJ	

Value of indicator: **0.58 (58%)**

Target value of indicator in: 0.75.

Indicator no. 2

Target: Safe and reliable supply of coal firing power plants

Indicator: Ratio of effective and theoretical production rate of EBS (Excavator-Belt conveyor-Stacker) system. This indicator shows utilization of installed production rate of equipment. Second indicator is ratio between achieved operational time of EBS system and theoretical time. This indicator shows time utilization of equipment. Indicators are given separately for coal and overburden.

Table 86: Values of indicators for coal and overburden in 2015

Basin	Open pit mine	Time utilization	Production rate utilization
Kolubara	Field B/C	0.24	0.24
	Field D	0.45	0.32
	Veliki Crljeni	0.46	0.36
	Tamnava West Field	0.22	0.38
	Total	**0.31**	**0.34**
Kostolac	Drmno	0.31	0.31
	Total	**0.31**	**0.31**
EPS	**Total**	**0.31**	**0.33**

Table 87: Values of indicators for overburden in 2015

Basin	Open pit mine	Time utilization	Production rate utilization
Kolubara	Field B/C	0.43	0.28
	Field D	0.34	0.36
	Veliki Crljeni	0.62	0.37
	Tamnava West Field	0.37	0.43
	Total	**0.38**	**0.36**
Kostolac	Drmno	0.44	0.49
	Total	**0.44**	**0.49**
EPS	**Total**	**0.40**	**0.40**

Target value of indicator in 2023: To achieve planed production it is necessary to increase value of production rate utilization indicator to 0.5, thus creating conditions for more efficient time utilization and rationalization of work-force (precondition to halt operation of the systems during weekends).

Indicator no. 3

Target: Achievement of production rate utilization on coal and overburden, for the purpose of safe supply of fuel to power plants.

Indicator: Ratio of achieved and planned production of overburden and coal at open pit mines; This indicator shows the level of achieving required production rate of coal and overburden, for the purpose of safe supply of thermal power plants.

Table 88: Achieved indicators on coal production in 2015

Basin	Open pit	Coal production plan, t	Achieved coal production, t	Indicator
Kolubara	Field B/C	3,300,000	1,296,938	0.39
	Field D	11,382,000	12,298,460	1.08
	Veliki Crljeni	3,500,000	3,673,013	1.04
	Tamnava West Field	10,100,000	11,419,040	1.13
	Total	**28,282,000**	**28,687,451**	1.01
Kostolac	Drmno	8,499,000	8,341,640	0.98
	Total	**8,499,000**	**8,341,640**	0.98
EPS	**Total**	**36,781,000**	**37,029,091**	1.00

Table 89: Achieved indicators on overburden production in 2015

Basin	Open pit	Overburden production plan, m^3	Achieved overburden production, m^3	Indicator
Kolubara	Field B/C	10,000,000	7,713,293	0.77
	Field D	21,000,000	16,461,944	0.78
	Veliki Crljeni	1,550,000	1,643,653	1.06
	Tamnava West Field	23,000,000	21,479,029	0.93
	Total	**55,550,000**	**47,297,919**	0.85
Kostolac	Drmno	42,000,000	36,897,434	0.87
	Total	**42,000,000**	**36,897,434**	0.87
EPS	**Total**	**97,550,000**	**84,195,353**	0.86

Indicators are showing drawbacks in excavation of overburden by 15%, which can cause inability to produce required amount of coal in long term. Amount of overburden must be corresponding to the strip ratio. Ratio of produced overburden of 84,195,353 m^3 and coal of 37,029,091 t (2.27), is not suitable to current strip ratio.

Target value of indicator in 2023: Overburden indictor should be 1.0, with plan suitable to coal production and strip ratio for the current year.

Indicator no. 4

Target: Optimization and concentration of underground coal production

Indicator: Ratio of spent and planned investments shows level of completion of planned projects. Optimization and concentration of underground coal production also shows potential threats due to lower production caused by lack of investment.

Year 2015

Planned investment: 998,213,000 РСД

Spent investment: 324,063,770 РСД

Value of indicator: **0.32 (32%)**

Target value of indicator in 2023: 0.90

Indicator no. 5

Target: More intensive exploration of coal deposits across the whole area of Republic of Serbia

Indicator: Ratio of completed and planned explorations is showing degree of completion of planned project "More intensive exploration of coal deposits across the whole area of Republic of Serbia" and suggests to potential threats due to lack of quality data caused by reduced level of investments.

Example for JPPEU, same methodology is applied for the other subjects (EPS):

Year 2016

Planned explorations:	5,190.0 m
Completed explorations:	650.8 m
Value of indicator:	**0.12 (12%)**

Target value of indicator in2023: 0.90

Indicator no. 6

Target: More intensive exploration of coal deposits across the whole area of Republic of Serbia

Indicator: Ratio of reserves category A+B and total reserves ($A+B+C_1$). Indicator shows level of deposit exploration, regarding reliable and quality estimation of coal reserves.

Kolubara basin:

Reserves of A category:	64,882,090 t
Reserves of B category:	1,127,278,570 t
Reserves of C_1 category:	913,064,140 t
Indicator:	**Reserves $(A+B)/(A+B+C_1) = 0.566$**

Open pit mine Drmno:

Reserves of A category:	0 t
Reserves of B category:	238,675,082 t
Reserves of C_1 category:	159,310,462 t
Indicator:	**Reserves $(A+B)/(A+B+C_1) = 0.599$**

Public Company for Underground Coal Mining (JPPEU):

Reserves of A category:	3,888,810 t
Reserves of B category:	436,106,730 t
Reserves of C_1 category:	595,356,870 t
Indicator:	**Reserves $(A+B)/(A+B+C_1) = 0.739$**

Target value of indicator in2023: 0.60

Indicator no. 7

Target: Introduction of Coal quality management system

Indicator: Number of train shipments with coal of insufficient quality - delivered with lower calorific value (below 6,500 kJ/kg), with higher calorific value (over 7,500 kJ/kg) and total number of train shipments.

Example for PK Tamnava West Field

Year 2015

Number of train shipments:	9,891
Number of shipments with insufficient quality:	
- shipments with quality lower than 6,500 kJ/kg	1,106
- shipments with quality higher than 7,500 kJ/kg	2,606
Value of indicator:	**0.375**

Indicator shows large number of train shipments with insufficient coal quality, mainly with quality higher than required.

Target value of indicator in2023: 0.20

3.6.1. List of Measures in Coal Sector

Strategic actions as given in Strategy are:

- More intensive exploration of coal deposits across the whole area of Republic of Serbia
- Opening of replacement capacities for existing open pit mines which will stop the production and opening of open pit mines as suppliers for new thermal power plants.
- Optimization and concentration of underground coal production.
- Introduction of coal quality management system.

Beside these strategic actions, which define projects to be executed, following table provides activities for harmonization of national legal framework with legislation of EU and Energy Community in coal sector.

Table 90: Activities for harmonization of national legal framework with legislation of EU and Energy Community in coal sector

Item	EU regulation to be harmonized with	Deadline	Responsible institutions
- Establishment of rules for State subsidy to coal industry, for purpose to contribute to restructuring of coal industry. Rules will take into account social and regional aspects of restructuring and requirements of maintaining it, such as precaution measures, minimal amount of domestic coal production, as a guarantee to access the reserves. - Establishment of meanings and limitation of opportunities for State aid to coal industry, as well as goals to access coal reserves, reduction of aid and targets for reducing exceptional expenses. - Definition of situations, limitations and conditions for aid to be considered as acceptable, regarding functioning of unified market. - Defines the scale of the aid and conditions for public access and transparency which must be met by companies - aid receivers, as well as procedures for assigning and control of the aid, including the role of European Commission in these processes. - Introduction of good management components into utilization of natural resources of coal. - Reporting to the Commission, which further on reports to the European Parliament. Activities are important regarding aspects for improving competitiveness of unified market and the environment, as well as efficiency of resource production.	2010/787/EU: Council Decision of 10 December 2010 on State aid to facilitate the closure of uncompetitive coal mines	Second revision of National program for acceptance of EU Acquis for period 2016-2018, accepted by the RoS Govt. on 17th November 2016, with conclusion 05 no. 337-10957/2016-2, which accepts Second revised National program for acceptance of EU Acquis (NPAA) in Chapter 3.8.2 State aid and planned measures for this period. Regarding harmonization of legislation in area of State aid, ministry authorized for finance set December 2017 as provisional deadline for harmonization of this decision with Act on rules for assigning State aid.	Ministry authorized for finance

3.6.2. List of Projects in the Coal Sector

P.26. More intensive exploration of coal deposits across the whole area of Republic of Serbia

Kolubara basin

Single area of eastern part of Kolubara coal basin

Reference for coal exploration is [54]. Since coal production at open cast mines Field D and Field C will be finished in 2020 and 2025 respectively, smaller scale multipurpose explorations are planned, including geological exploration at mine Field C related to recovery of internal waste dump. Due to insufficient exploration level, and in accordance to mine planning of open cast mine Field E, this project includes geological exploration to be completed within 4 years, starting on 2016. List of planned works and dynamics, by open cast mines, are given in following tables.

Table 91: Dynamics of geological exploration on mine Field C, related to recovery of internal waste dump

No.	Item	Dynamics
1	Field works	2016
2	Laboratory works	2016

Table 92: Dynamics of geological exploration on mine Field C

No.	Item	Dynamics
1	Exploration drilling	2016
2	Geological works	2017
3	Hydrogeological works	2017
4	Laboratory works	2017

Table 93: Dynamics of geological exploration on mine Field D

No.	Item	Dynamics
1	Exploration drilling	2016
2	Geological works	2017
3	Laboratory works	2017

Table 94: Dynamics of geological exploration on mine Field E

No.	Item	Dynamics
1	Multipurpose exploration works - Exploration drilling, 31,000 m - Other works	2016, 2017 and 2018
2	Exploration works	2016, 2017 and 2018
3	Geotechnical exploration works	2016, 2017 and 2018
4	Hydrogeological exploration works	2016, 2017 and 2018

Small scale multipurpose geological explorations are planned at the mine Field E, until the end of the production, at level of 200,000 to 250,000 € per annum, which can be used for elaboration of five year reports.

Field G

Due to high level of coal reserves of A and B category in Field G of 100%, this mine is well explored. Opposing to coal, exploration of clearly existing non-ferrous concomitant mineral resources within the deposit are completely neglected. Plan is to perform geological explorations until 2018 to 2022, at latest. Dynamics of geological explorations in period 2018-2022 are given in Table 95.

Table 95: Dynamics of geological exploration at mine Field G, in period 2018-2022

Works	2018	2019	2020	2021	2022
Multipurpose exploration works	x	x	x	x	x
Geological exploration works	x	x	x	x	x
Geotechnical works	x	x	x	x	x
Hydrogeological works	x				x

There will be no detailed geological exploration at mine Field G until the end of coal production.

Tamnava West Field

Geological explorations are planned in such manner to be performed in front of the mining operations, at least for the period to secure all the parameters required for in-time and reliable geological interpretation of the deposit and unhindered planning and overburden and coal excavation. These are given in Table 96.

Table 96: Dynamics of geological exploration at deposit Tamnava West Field

Works	2018	2019	2020
Multipurpose exploration works	x	x	x
Geological exploration works	x	x	x
Geotechnical works	x	x	x
Hydrogeological works	x	x	x

Investment of 300,000 € are completed during 2015 as part of previous plan, aside of afore mentioned geological explorations for period 2018-2020. Until the end of production, small scale explorations are planned in periods 2022-2026 and 2029-2033, at level of 400,000 €, i.e. 80,000 € per annum in planned period of 5 years, which can be used for elaboration of five years reports.

Table 97: Planned investments for geological explorations of Tamnava deposit

Works	Amount (€)
Multipurpose exploration works	573,653
Geological exploration works	323,518
Geotechnical works	55,856
Hydrogeological works	43,227
Total	**996,255**

Dynamics and cumulative investments in planned detailed geological explorations by years are given in Table 98.

Table 98: Investment dynamics into geological explorations

Works	2018	2019	2020	Total (€)
Multipurpose exploration works	194,913	190,827	187,914	573,653
Geological exploration works	107,278	101,205	115,035	323,518
Geotechnical works	25,480	14,629	15,747	55,856
Hydrogeological works	15,289	18,308	9,630	43,227
Total	**342,959**	**324,969**	**328,327**	**996,255**

Field Radljevo

Due to insufficient exploration level and in accordance to opening dynamics of Radljevo open pit mine, project is planning geological exploration which should be completed within 4 years, starting on 2016. Dynamics of geological explorations in period 2016-2019 are given in Table 99.

Table 99: Dynamics of geological exploration at Radljevo deposit

Works	2016	2017	2018	2019
Multipurpose exploration works	x	x	x	x
Geological exploration works	x	x	x	x
Geophysical exploration works	x	x	x	x
Geotechnical works	x	x	x	x
Hydrogeological works	x	x	x	x

Geological explorations until the end of production at Radljevo open pit mine are planned in such manner to be performed in front of the mining operations, at least for the period to secure all the parameters required for in-time and reliable geological interpretation of the deposit and unhindered planning and overburden and coal excavation. Therefore, it is necessary to complete the geological exploration on period 2023-2028, similar in size and scope to those planned for period 2016-2019. Dynamics of geological explorations in period 2023-2028 are given in Table 100.

Table 100: Dynamics of geological exploration at Radljevo mine in period 2023-2027

Works	2023	2024	2025	2026	2027
Multipurpose exploration works	x	x	x	x	x
Geological exploration works	x	x	x	x	x
Geophysical exploration works	x	x	x	x	x
Geotechnical works	x	x	x	x	x
Hydrogeological works	x	x	x	x	x

Small scale explorations are planned until the end of coal production, in periods 2030-2034, 2037-2041 and 2043-2047. Planned investments in these explorations are 500,000 €, i.e. 100,000 € per annum in planning period of 5 years which can be used for elaboration of 5 years reports. Presented dynamics of geological explorations, for each operational deposit in planned period until 2025 i.e. 2050, are planned in such manner to be performed in front of the mining operations, at least for the period to secure all the parameters required for in-time and reliable geological interpretation of the deposit and unhindered planning and overburden and coal excavation.

Table 101: List of geological works and exploration costs (€) at Radljevo deposit by types in period 2016-2019

Works	2016	2017	2018	2019	Total (€)
Multipurpose exploration works	509,659	540,459	723,854	265,311	2,039,283
Geological exploration works	900,379	696,886	933,064	261,711	2,792,040
Geophysical exploration works	172,703	229,450	167,792	268,339	838,284
Geotechnical works	182,361	154,817	129,583	84,706	551,467
Hydrogeological works	204,859	402,937	116,824	242,896	967,516
Total	**1,969,961**	**2,024,548**	**2,071,118**	**1,122,963**	**7,188,589**

Table 102: Investment (€) in geological exploration in eastern part of Kolubara basin

No.	Item	Total investment in period2015-2049	Investment in period2015-2020	Investment in period2021-2049
1	**Geological exploration**			
1.1	Exploration related to recovery of internal waste dump of Field C	80,000	80,000	0
1.2	Geological exploration at Field C	440,000	440,000	0
1.3	Geological exploration at Field D	480,000	480,000	0
1.4	Geological exploration at Field E	7,530,000	5,280,000	2,250,000
1.4.1	Multipurpose exploration works	4,280,000	2,030,000	2,250,000
1.4.2	Exploration works	1,450,000	1,450,000	0
1.4.3	Geotechnical works	450,000	450,000	0
1.4.4	Hydrogeological works	1,350,000	1,350,000	0
2	Designing	2,500,000	1,500,000	1,000,000
	Total	**11,030,000**	**7,780,000**	**3,250,000**

Coal reserves

Kolubara coal basin

Overall minable reserves in Kolubara basin, at the end of 2015, are 2,105,224,800 t of coal, while total non-balanced reserves are 2,645,574,081 t of coal. Reserves in mining fields in Kolubara coal basin are given in Table 103.

Table 103: Overview of coal reserves in Kolubara coal basin

Deposit	Category	Balanced reserves (t)	Non-balanced reserves (t)	Geological reserves (t)
Field C old Fields B and C	A	7,355,290	3,260,760	10,616,040
	B	33,704,980	3,959,420	37,664,400
	A+B	**41,060,260**	**7,220,180**	**48,280,440**
Field D	A	34,276,560	43,875,950	78,152,510
	B	-	24,053,510	24,053,551
	A+B	**34,276,560**	**67,929,460**	**102,206,020**
Field E	B	146,207,300	27,620,050	173,827,350
	C_1	150,720,140	104,349,620	255,069,760
	B+C_1	**296,927,440**	**131,969,670**	**428,897,110**
Field F	B	464,559,700	-	464,559,700
	C_1	181,600,500	-	181,600,500
	B+C_1	**646,160,200**	**-**	**646,160,200**
Field G	A	21,873,290	25,728,230	47,601,520
	B	14,393,170	40,105,680	54,498,850
	A+B	**36,266,460**	**65,833,910**	**102,100,370**
Field Veliki Crljeni	A	1,376,950	15,460,220	16,837,170
	C_1	-	49,973,480	49,973,480
	A+C_1	**1,376,950**	**65,433,700**	**66,810,650**
Tamnava - West Field	A	-	26,147,790	26,147,790
	Б	56,283,760	11,121,600	67,405,360
	C_1	245,021,530	44,675,650	289,697,180
	A+Б+C_1	**301,305,29**	**81,945,040**	**383,250,330**
Field Radljevo	B	223,472,020	30,557,550	254,029,570
	Ц$_1$	169,743,800	47,179,910	216,923,710
	Б+C_1	**393,215,820**	**77,737,460**	**470,953,280**
	C_2	potential, estimated		191,363,430
Field Šopić - Lazarevac	B	109,712,900	-	109,712,900
	C_1	-	19,331,500	19,331,500
	Б+C_1	**109,712,900**	**19,331,500**	**129,044,400**
	C_2	potential, estimated		127,172,300
Field Zvizdar	B	78,944,740	-	78,944,740
	C_1	165,978,170	22,948,320	188,926,500
	Б+C_1	**244,922,910**	**22,948,320**	**267,871,240**
TOTAL RB KOLUBARA	A	64,882,090	114,472,950	179,355,030
	B	1,127,278,570	137,417,810	1,264,696,421
	C_1	913,064,140	288,458,480	1,201,522,630
	A+B+C_1	**2,105,224,800**	**540,349,240**	**2,645,574,081**
	C_2	**potential, estimated**		**318,535,730**

Kostolac coal basin

Overall minable reserves in Kostolac coal basin, at active mine Drmno, are 300 million tonnes of coal, while some 400 million tonnes of coal are balanced in western part of the basin.

Effectiveness of coal exploration at Drmno is best represented by the amount of reserves of B and C_1 categories of $643x10^6$ t (with balanced reserves of $398x10^6$ t and non-balanced of $245x10^6$ t), including potential reserves of C_2 category, estimated at $164x10^6$ t. Reserves of category B are around 55% of total explored reserves, while remaining 45% are of C_1 category. Balanced reserves are 61% of overall explored reserves, while non-balanced are remaining 39%. B category reserves

of $190x10^6$ t are 65% out of total minable reserves of $293x10^6$ t, while C_1 category reserves of $103x10^6$ t are 35%.

Effectiveness of coal exploration at western part of Kostolac basin is best represented by the amount of reserves of B and C_1 categories of $603x10^6$ t (with balanced reserves of $408x10^6$ t and non-balanced of $195x10^6$ t), including potential reserves of C_2 category, estimated at $36x10^6$ t. Reserves of category B are around 25% of total explored reserves, while 39% are of C_1 category. Balanced reserves are 63% of overall explored reserves, while non-balanced are remaining 37%. Conceptual contours of open pit mine total minable reserves of coal are $355x10^6$ t.

Total geological reserves of Kostolac basin are 1,643,802,637 t, where balanced $B+C_1$ category of reserves are 881,702,050 t, non-balanced $B+C_1$ category of reserves are 522,298,897 t and potential reserves of C_2 category are 239,801, 690 t of coal.

Active open pit mines

Balanced reserves of B+C1 category in Drmno deposit, according to Book of coal reserves in Drmno deposit (2013) on 31st March 2013, are 397,985,545 t and 245,271,819 t of non-balanced reserves of same category.

Designed open pit mines

Geological reserves of coal in Klenovik deposit, according to Book of coal reserves (2010) on 31st December 2010, are 8,595,000 t of B category and all of those are non-balanced. Balanced reserves of B+C1 category in Ćirikovac deposit, according to Book of coal reserves (2010) on 30th June 2010, are 75,505,300 t. According to the same reference there are 74,012,568 t of non-balanced reserves of $B+C_1$ category and estimated, potential reserves of C_2 category of 162,414,100 t of coal.

Potential open pit mines

According to the Book of reserves (2014) (not verified), balanced reserves of $B+C_1$ category in western part of Kostolac basin are 408,211,206 t, with 194,419,510 t of non-balanced reserves of same category, as well as 35,886,110 t of potential C_2 reserves. All of these reserves are within conceptual contours of designed open pit mines, while 208,671,468 t are outside of these contours. Afore mentioned reserves are balanced are balanced in Book of resources and reserves of coal, while the coal in third coal seam was not included. However, it should be mentioned that reserves in third coal seam are estimated in this reference at level of 1,024,000,000 t.

Overview of geological and minable coal reserves according to existing documentation

Overview of geological and minable coal reserves according to existing documentation for active, designed and potential open pit mines is given in Table 104.

As already mentioned, Kostolac basin has one active open pit mine in Drmno, designed mines are Klenovik and Ćirikovac, while potential open pit mines are Dubravica and Jagodica in western part of Kostolac basin.

Analysis of balanced reserves in Books of reserves for all four deposits in Kostolac basin, shows that balanced reserves are part of geological reserves of category B and C_1 which are fulfilling limiting criteria for mining (minimal thickness, minimal quality, etc.), without any objects on top of them with large value and whose extraction is economically viable, while non-balanced reserves are those whose extraction is not viable in relation to justifying afore mentioned limiting mining conditions.

Potential reserves are those reserves which are not explored at sufficient level, and as such are categorized in C_2 and D_1 categories. Minable reserves are balanced reserves, reduced by minable losses.

Table 104: Overview of coal reserves in Kostolac coal basin

Deposit	Category	Balanced reserves (t)	Non-balanced reserves (t)	Geological reserves (t)
Drmno	A			
	B	238,675,082	112,382,957	351,058,039
	C_1	159,310,462	132,888,861	292,199,323
	A +B+C_1	397,985,544	245,271,818	643,257,364
	C_2			
	Total	**643,257,364**		
		Minable reserves: 292,938,852		
Klenovnik	A			
	B		8,595,000	
	C_1			
	A +B+C_1			
	C_2			
	Total	**8,595,000**		
		Minable reserves: 0		
Ćirikovac	A			
	B	54,403,038	63,233,168	121,636,207
	C_1	19,102,261	8,779,400	27,881,661
	A +B+C_1	75,505,299	74,012,568	149,517,868
	C_2			162,414,100
	Total	**461,449,836**		
		Minable reserves: 0		
Western Kostolac	A			
	B	161,576,217	13,742,976	175,319,193
	C_1	246,634,989	180,506,190	427,141,179
	A +B+C_1	408,211,206	194,249,166	602,460,372
	C_2			208,671,468
	Total	**811,131,840**		
		Minable reserves: 408,211,206		
TOTAL KOSTOLAC	A	454,654,337	197,954,101	648,013,439
	B	425,047,712	322,174,451	747,222,073
	C_1	879,702,049	520,128,552	1,395,235,604
	A +B+C_1			371,085,568
	C_2	454,654,337	197,954,101	648,013,439
	Total	**1,766,321,172**		
		Minable reserves: 701,150,058		

Having in mind that Books on reserves are including analyses of balancing reserves mainly on conceptual solutions of open pit mining, reserves in Klenovnik and Ćirikovac deposit must be considered with some scepticism, by taking into account that limiting conditions of mining are changing both in space and in time. However, it should be mentioned that coal reserves in Klenovnik deposit are non-balanced and that this mine is permanently closed, and that reserves in Ćirikovac deposit are balanced, non-balanced and potential and that this mine is only temporarily closed.

Anyhow, it should be noted that Kostolac basin is a single coal deposit, which is artificially divided into existing fields. Regarding this aspect and for the purpose of better coal recovery, basin also can be considered as eastern, central and western part. At the moment, mining operations are taking place in the eastern part of the basin at open pit mine Drmno. Inactive mines Klenovnik and Ćirikovac are located in the central part of the basin, while activities in the western part of the

deposit were limited only to geological explorations. According to the Books of reserves, central part of Kostolac basin has 75 million tonnes of balanced reserves (Ćirikovac deposit), over 82 million tonnes of coal in non-balanced reserves (Klenovnik and Ćirikovac deposits), and over 160 million tonnes of potential reserves in Ćirikovac deposit. Therefore, it is necessary to perform detailed analysis, with suitable study, all potential solutions for valorisation both balanced and non-balanced and potential reserves of coal in this part of the basin, including connecting central and western part of the basin, for the purpose of exploitation and optimal recovery of reserves.

Planned explorations at Drmno deposit should be completed within five years cycles, meaning that field and laboratory works should be done in four years period while the fifth year includes development and approval of Book of reserves.

List of geological works and costs for exploration, by types, in single time cycle is given in Table 105.

Table 105: Overview of exploration cost in single time cycle

Works	Amount (€)
Multipurpose exploration works	1,500,000
Geological exploration works	1,000,000
Geotechnical exploration works	200,000
Hydrogeological exploration works	1,300,000
Total	**4,000,000**

Planned scope of geological explorations until the end of coal production at Drmno deposit will be completed in 8 five-year cycles with overall costs of 32,000,000 €. Cost of one five year cycle is 4,000,000 €, i.e. 800,000 € per annum. Exploration works are performed according to dynamics of coal mining, regarding recategorization of balanced reserves into higher rank of category.

Public Company for Underground Coal Mining (JPPEU)

Coal reserves of mines in JPPEU, on 31st December 2015, are approximately 600,000,000 t of coal, where most of these are brown coal-lignite and lignite types.

Table 106: Review of coal reserves in mines of JPPEU

Type	Balanced reserves (t)	Non-balanced reserves (t)	Total (t)
Hard coal	5,766,350	1,704,290	7,470,640
Brown coal	79,761,340	21,366,760	101,128,100
Brown-lignite coal	330,864,180	12,673,460	343,507,640
Lignite	178,995,000	3,184,000	182,179,000
Total	595,356,870	38,928,510	634,285,380

Kovin coal basin

Kovin basin (protected and not-protected parts) has verified reserves at level of 271 million tonnes of coal (5 million in not-protected part and 266 million in protected part).

Total geological reserves for Kovin coal deposit in protected part, fields A and B (Book of coal reserves in Kovin deposits, fields A and B, 2015) are 308,894,622 t, comprised of 167,206,129 t of B category and 141,688,493 t of C1 category. Balanced reserves included B and C1 category of reserves above level of 0 m. Non-balanced reserves below this level are 42,786,864 t of coal. Total verified balanced reserves for protected part in fields A and B are 266,107,758 t of B+C_1 category,

where 165,575,751 t are B category and 100,532,007 t are C_1 category. Quality parameters of this coal reserves are: moisture 42.83%, ash 20.42%, S total 1.05%, S in ash 0.64%, S combustible 0.59%, coke 33.46%, C-fix 17.88%, volatiles 23.33%, combustible 39.63%, lower calorific value 8,914 kJ/kg, upper calorific value 10,120 kJ/kg. Mining losses are 15%, meaning that minable reserves in the deposit are 226,107,758 t of coal. Coal quality is around 9,000 kJ/kg.

Total reserves in non-protected part of field A are somewhat over 5,000,000 t of coal, with calorific value around 9,000 kJ/kg and S content of 0.48%. Aside of coal, reserves of graver are verified at amount of 5,200,000 m^3.

At the moment, Kovin project is a potential project, which depends on findings of feasibility study for mine and thermal power plant. Project includes construction of new lignite mine and thermal power plant with installed capacity of 700 MW, in the Kovin municipality. Lignite mine will utilize underwater coal mining technology, which is already present in existing mine with smaller production rate (Rudnik Kovin a.d.) and it will be located in protected part on left bank of River Danube, in Kovin municipality, south of Gaj settlement and west of Dubovac settlement.

This project includes:

- Development of coal mine in protected part of Kovin deposit (fields A and B) in Kovin, with planned production of 6 million tonnes per annum, for underwater mining of 266 million tonnes of balanced coal reserves. Planned investments into the mine are 260 million €.
- Construction of thermal power plant with provisional power of 700 MW, according to all EU standards applicable to large boilers. Planned investments into the power plant are 900 million €m while expected annual production rate is 490 GWh of electricity.
- Expected life of the mine and the power plant is over 35 years.

Required technical documentation for obtaining approvals for mining and energy license for thermal power plant is expected in recent future. This documentation is Feasibility study for development of mine and Feasibility study for construction of thermal power plant. Both documents will be developed in accordance to Serbian legislation. Upon completion of feasibility studies more detailed data will be available regarding this project, which at this moment are not defined. Expected parameters to be established by these feasibility studies are related to:

- number of units-blocks of the thermal power plant;
- actual location of the power plant;
- actual power of the power plant;
- equipment for excavation of overburden and waste;
- equipment for excavation of coal;
- price of coal;
- price of electricity;
- diversity and dynamics of selling the coal and electricity;
- actual budget and investments;
- investment return period;
- other issues important for preparation and realization of Kovin project.

As planned, coal exploitation should start on 2023. However, having in mind remaining period, already developed documentation, as well as existing experience with underwater mining, it is unlikely that coal mining and electricity generation will start on 2023.

Štavalj - Sjenica basin

Sjenica coal basin has minable reserves of 117 million tonnes of coal, with average calorific value of 15,000 kJ/kg and S content of 0.98%. Štavalj mine is located in western Serbia, near state border to Montenegro. Mining at this location started in 1965.

Prefeasibility study for construction of thermal power plant and mine at Štavalj (DMT GmbH - Montan Consulting Germany, Faculty of Mining and Geology, University of Belgrade Serbia, SES TLMAČE Slovakia) was developed in 2007. Study analysed construction of 320 MW power plant. Planned investment for power plant are 375 million €, with additional 20 million € for connection to the grid. Overall investment into the mine are estimated at level of 90 million €, while overall investment into the mine throughout its operational life of 40 years are 391 million € (31 m€ for infrastructure, 357 m€ for equipment and 10 m€ in construction).

Required production rate of mine is 2.3 million t of coal per annum (including 60,000 t for wholesale).

It is necessary to carry out activities for further analysis of the available parameters, given the potential construction of the mines and thermal power capacities.

P.27. Opening of replacement capacities for existing open cast mines which will stop production and opening of open cast mines dedicated to new thermal power plants

Opening of new mines, i.e. expansion of existing mines, as well as opening of replacement ones for existing open pit mines which will stop production, including mines dedicated to new thermal power plants are considered for Kostolac, Kolubara, Kovin and Sjenica coal basins.

Single considered project for **Kostolac coal basin** was increased production rate of Drmno open pit mine from 9 to 12 million tonnes of coal per annum, due to construction of new block TPP Kostolac B3, with 350 MW power.

Considered projects in **Kolubara coal basin** included increase production rate of Field C in relation to opening of Field E, opening of Field E as a replacement for Field C and Field D mines, opening of Field G as a replacement for open pit mine Veliki Crljeni, and opening of open pit mine Radljevo in relation to equalizing coal quality and in later stage as a replacement for Tamnava West field mine. In case of requirement for increase of production rate, Radljevo mine can increase its production rate for possible new power plant.

Considered project for **Kovin basin** was opening of new underwater mine for supplying the coal to new thermal power plant, with installed power of 700 MW.

Sjenica basin is included with project of new 320 MW power plant, which requires coal supply from the Štavalj underground mine, at level of 2.3 million t per annum.

Table 107: Main properties and outcomes of project "Completion of investment development and increased production rate of Drmno mine

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Infrastructure and traffic routes 9 mt	3,900,000 € (EPS resource)	Completion of investment development of Drmno mine for 9,000,000 tpa of coal, including production rate increase to 12,000,000 tpa of coal, enables safe supply of existing plants TPP Kostolac A and TPP Kostolac B with installed power of 1,007 MW, as well as supply of planned TPP Kostolac B3 (350 MW) with average coal quality of 9,800 kJ/kg. Total investments are around 350,000,000 €, while production rate of 12,000,000 tpa will be available since 2020.	Execution of project for production rate increase of Drmno mine enables continuity of electricity production, including supply of necessary amounts of coal for new block TPP Kostolac B3. Based on overall reserves of coal at Drmno mine overall electricity production of 200,000 GWh is feasible. Economic flow of the project provides Internal rate of return of: **IRR=10.42%** Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV**=107,017,210 € **NPV per t of coal**=0.39 €/t Acquisition of new ECS system with frequency regulation on drives (8 drive stations) and capability of velocity change in relation to production rate. Energy savings will be on level of 10% to 30%, i.e. savings of 540,000 kWh on annual level for system.
Revitalization of existing equipment at Drmno mine	13,500,000 € (EPS resource)		
Acquisition of new and completion of existing conveyors for rate of 9 million t	55,500,000 € (EPS resource)		
Acquisition of auxiliary mechanization	8,000,000 € (EPS resource)		
Coal quality management	5,000,000 € (EPS resource)		
Equipment for production rate increase to 12,000,000 tpa	120,000,000 € (SMEK credit and EPS resource)		
Technology change of ECS and ECC systems	59,000,000 € (EPS resource)		
Drainage-dewatering	80,000,000 € (EPS resource)		

Table 108: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Completion of investment development and production rate increase at Drmno mine	Finished feasibility study and Main mining project	Project of exploitation, Equipment assembly projects for 5 ECS systems

Table 109 Dynamics of activities within the referent period of Program

Project: Completion of investment development and production rate increase at Drmno mine	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Project documentation	EPS	x						
Preparation of technical documentation		x						
Approvals and acceptances by ministries and institutions		x	x					
Infrastructure and traffic routes 9 mt		x						
Revitalization of existing equipment at Drmno mine		x	x					
Acquisition of new and completion of existing conveyors		x	x	x				
Acquisition of auxiliary mechanization								
Coal quality management		x	x	x				
Power supply and communication								
Equipment for production rate increase to 12,000,000 tpa		x	x	x				
Technology change of ECS and ECC systems			x					
Drainage-dewatering		x	x	x	x	x	x	x
Excavation of overburden		x	x	x	x	x	x	x
Excavation of coal		x	x	x	x	x	x	x

Risks: Public procurements for work and services, completion of Chinese credit, stability of internal waste dump, acquisition of new equipment, realization of drainage system

Kolubara coal basin

Considered projects in **Kolubara coal basin** included increase production rate of Field C in relation to opening of Field E, opening of Field E as a replacement for Field C and Field D mines, opening of Field G as a replacement for open pit mine Veliki Crljeni, and opening of open pit mine Radljevo in relation to equalizing coal quality and in later stage as a replacement for Tamnava West field mine. In case of requirement for increase of production rate, Radljevo mine can increase its production rate for possible new power plant.

Field G

Open pit mine Field G is opened as a replacement for mine Veliki Crljeni. Designed production rate is 5,000,000 tpa of coal.

Following sub-projects must be completed in order to start the open pit mine Field G as a replacement for mine Veliki Crljeni:

- Relocation of River Kolubara in 2nd phase in total length of 2.6 km;
- Relocation of River Peštan in length of 1.8 km;
- Relocation of regional road M22 Belgrade-Gornji Milanovac (Ibarska magistrala) in length of 7.24 km;
- Relocation of 110 kV high voltage power line (2 pieces into one double line);
- Relocation of 35 kV high voltage power line (5 pieces);
- Relocation of settling ponds and facility for waste water treatment in Kolubara Prerada;
- Relocation of springs and water intakes;
- Acquisition of new equipment (self-propelled conveyor, 3 belt conveyors B=1,600 mm and 2 distribution stations);
- Revitalization and modernization of existing main equipment;
- Acquisition of new auxiliary mechanization.

Table 110: Main properties and outcomes of project "Opening of open pit mine Field G"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Relocation of River Kolubara in 2nd phase in total length of 2.6 km	10,460,000 € (EPS resource)	Open pit mine Field G is a replacement for Veliki Crljeni mine. Field G will secure sufficient coal for safe supply of TPP Nikola Tesla. Planned production rate is 5,000,000 tpa of coal with calorific value of 8,150 kJ/kg. Coal of this quality enables blending with lower quality coal from Tamnava West Field and Radljevo mines, thus making possible to utilize large amounts of coal with poorer quality making better recovery of deposit and increase its potential. Total investments are 60,605,585 €. Start of overburden production is in 2017, and start of coal production is in 2018.	Execution of opening of Field G mine enables continuity of electricity production. Based on overall reserves of coal at Field G mine overall electricity production of 30,000 GWh is feasible. Economic flow of the project provides Internal rate of return of: **IRR=14.86%** Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV**=21,634,494 € **NPV per t of coal**=0.60 €/t This open pit mine will use old equipment therefor no additional outcomes regarding energy efficiency will occur.
Relocation of River Peštan in length of 1.8 km	1,370,000 € (EPS resource)		
Relocation of regional road M22 in length of 7.24 km	5,850,000 € (EPS resource)		
Relocation of 110 kV power line and relocation of 35 kV power line (5 pieces)	2,000,000 € (EPS resource)		
Relocation of springs and water intakes	4,220,000 € (EPS resource)		
Relocation of settling ponds and facility for waste water treatment in Kolubara Prerada	5,000,000 € (EPS resource)		
Acquisition of new main and auxiliary equipment	29,500,000 € (EPS resource)		
Revitalization and modernization of existing main equipment	15,000,000 € (EPS resource and maintenance resource)		
Investment overburden	2,100,000 € (EPS resource)		

Table 111: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Opening of open pit mine Field G	Project documentation completely developed	Spatial plan is on approval.

Table 112: Dynamics of activities within the referent period of Program

Project: Opening of open pit mine Field G	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Project documentation	EPS	x						
Preparation of technical documentation		x						
Environmental and social impact assessment		x						
Approvals and acceptances by ministries and institutions		x						
Relocation of River Kolubara in 2nd phase in total length of 2.6 km		x						
Relocation of regional road M22 in length of 7.24 km		x	x	x				
Relocation of springs and water intakes			x	x				
Relocation of 110 kV power line and relocation of 35 kV power line		x	x					
Relocation of settling ponds and facility for waste water treatment		x						
Acquisition of new main and auxiliary equipment		x	x					
Revitalization and modernization of existing main equipment		x						
Excavation of overburden		x	x	x	x	x	x	x
Excavation of coal			x	x	x	x	x	x

Risks: Public procurements for work and services, relocation of infrastructure (rivers, roads, etc.)

Field C

Investments in open pit mine Field C are in function of achieving design production rate and opening of open pit mine Field E which is replacement for mine Field D. Designed production rate (according to new Additional project which is used for approval procedure) starts with 3,000,000 tpa in 2017, following with 4,000,000 tpa in successive years until 2030.

Following sub-projects must be completed in order to start the open pit mine Field E as a replacement for mine Field D:

- Acquisition of ECS system, with production rate of 6,600 m^3/h (bucket wheel excavator, belt conveyors B=2,000 mm with 4 drive stations and length of 5,000 m and stacker for capacity of 8,800 m^3/h);
- Recovery of internal waste dump and start of dumping in the area of former mines Field A and Glina.

Field E

Open pit mine Field E is a replacement for mine Field D. Designed production rate is 12,000,000 tpa of coal. Following sub-projects must be completed in order to start the open pit mine Field E as a replacement for mine Field D:

- Acquisition of ECS system, with production rate of 6,600 m^3/h (bucket wheel excavator, belt conveyors B=2,000 mm and stacker for capacity of 8,800 m^3/h);
- Acquisition of haulage equipment and equipment for selective excavation;
- Revitalization of existing equipment;
- Acquisition of auxiliary equipment;
- Construction of retention dams and regulation of River Peštan;
- Construction of infrastructure (assembly lot, workshops, etc.);
- Relocation of roads;
- Land acquisition.

Table 113: Main properties and outcomes of project "Opening of open pit mine Field E (completion of investment development of Field C)"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Relocation of infrastructure	41,230,000 € (EPS resource)	Open pit mine Field E, as replacement for mines Field D and Field C, will secure sufficient coal supply to TPP Nikola Tesla. Planned production rate increase on Field C to 6,000,000 tpa with mining at NW part of Field D at rate of 6,000,000 tpa to 11,000,000 tpa (until 2020) and mining of 1,300,000 tpa to 5,000,000 tpa from roof seam of Field E with equipment from mine Field D. Mining at Field E is planned for 2025. Total production rate is 12,000,000 tpa (5,000,000 tpa roof seam and 7,000,000 tpa main seam). Total investments are 235,200,000 €, with additional 510,214,000 € until the end of the life of the mine, i.e. total of 745,214,000 €. Planned production rate is 11,000,000 tpa.	Execution of opening of Field E mine enables continuity of electricity production. Based on overall reserves of coal at Field E mine overall electricity production of 190,000 GWh is feasible. Economic flow of the project provides Internal rate of return of: **IRR=11.42%** Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV**=170,495,911.15 € **NPV per t of coal**=0.41 €/t Acquisition of new ECS system with frequency regulation on drives (4 drive stations) and capability of velocity change in relation to production rate. Energy savings will be on level of 10% to 30%, i.e. savings of 300,000 kWh on annual level for system. Later on, two additional systems are acquired.
Relocation of settlements	9,340,000 € (EPS resource)		
Construction of infrastructure	7,200,000 € (EPS resource)		
Field C new equipment (ECS system)	79,000,000 € (EBRD bank)		
Equipment for Field D south wing (roof seam of Field E)	80,400,000 € (EPS resource)		
Field E (equipment until 2020)	3,500,000 € (EPS resource)		
Drainage-dewatering	15,000,000 € (EPS resource)		
Geological exploration	7,780,000 € (EPS resource)		
Acquisition of new auxiliary equipment	34,000,000 € (EPS resource)		

Table 114: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Opening of open pit mine Field E	Completed feasibility study and Main mining project	Renewal of Feasibility study, Main mining project for mine Field E, Environmental impact assessment.

Table 115: Dynamics of activities within the referent period of Program

Project: Opening of open pit mine Field E	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Project documentation	EPS	x	x					
Preparation of technical documentation		x	x					
Approvals and acceptances by ministries and institutions			x	x				
Relocation of infrastructure			x	x				
Relocation of settlements		x	x					
Construction of infrastructure			x	x	x	x	x	x
Field C new equipment (ECS system)			x	x	x			
Equipment for Field D south wing (roof seam of Field E)		x						
Field E (equipment until 2020)			x	x	x			
Drainage-dewatering			x	x	x			
Geological exploration		x	x	x	x	x	x	x
Excavation of overburden (including Field C)			x	x	x	x	x	x
Excavation of coal (including Field C)		x	x	x	x	x	x	x

Risks: Public procurements for work and services, recovery of mining benches and internal waste dump of Field C and Field D, relocation of infrastructure, financing

Field Radljevo

Open pit mine Radljevo is opened as additional capacity in western part of Kolubara basin, for purpose of equalizing coal quality. In western part of Kolubara basin coal series contains numerous dirt intrusions and coal is with highly variable quality. In order to equalize coal quality and utilize low quality reserves, coal from mine Radljevo will be blended with coal from mine Tamnava west field and mine Field G. In this case, production rate on Field G will be reduced and high quality reserves will preserved for homogenization. In case of construction of new power plant, production rate of Radljevo mine will be increased. Approval procedure is on-going at the moment for mining in this mine, which will be followed with acquisition of approvals for development of mines and execution of mining activities. Following sub-projects must be completed to open mine Radljevo:

- Land acquisition;
- Relocation of infrastructure;
- Acquisition of new and auxiliary equipment;
- Acquisition of ECS system, with production rate of 6600 m^3/h (bucket wheel excavator, belt conveyors B=2000 mm with 4 drive stations and length of 5000 m and stacker for capacity of 8800 m^3/h);
- Acquisition of used system with production rate of 4100 m3/h;
- Acquisition of 2 coal systems with production rate of 4100 m3/h;
- Acquisition of stacker for inter-burden;
- Acquisition of haulage equipment;
- Acquisition of drainage-dewatering equipment;
- Construction of infrastructure;
- Relocation of roads.

Table 116: Main properties and outcomes of project "Opening of open pit mine Radljevo"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Land acquisition and infrastructure	17,500,000 € (EPS resource)	Opening of Radljevo mine will compensate lack of production in western part of Kolubara basin with simultaneous reduction of production rate at Field G, thus preserving required coal quality for combustion in TPPs. Coal series in Radljevo mine has numerous dirt intrusions, thus reducing coal quality and making it more difficult for use in power plants. Blending of this coal with one from Field G will result in coal of sufficient quality and in same time enable recovery of reserves with poorer quality. In case of new power plants, production rate on Radljevo mine can be increased easily. Investments for production rate of 6,000,000 tpa of coal are 640,000,000 €. Start of production is planned for 2021. Total investments until 2023 are around 245,000,000 € and until the end of operational life are 640,000,000 €.	Execution of opening of Radljevo mine enables continuity of electricity production, and production rate can be easily increased in case of construction of new TPP. Economic flow of the project provides Internal rate of return of: **IRR=11.76%** Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV**=129,731,120 € **Avg. net profit** = 6.92 €/t **NPV per t of coal**=0.54 €/t Acquisition of new ECS system with frequency regulation on drives and capability of velocity change in relation to production rate. Energy savings will be on level of 10% to 30%, i.e. savings of 540,000 kWh on annual level for system.
Investment overburden	10,500,000 € (EPS resource)		
Main equipment	142,500,000 € (EPS resource)		
Auxiliary equipment	6,760,000 € (EPS resource)		
Power supply	4,590,000 € (EPS resource)		
Coal quality management system	5,500,000 € (EPS resource)		
Drainage-dewatering	10,190,000 € (EPS resource)		
Geological exploration	8,300,000 € (EPS resource)		

Table 117: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Opening of open pit mine Radljevo	Completed feasibility study and Main mining project	Approval procedure for Spatial plan Fire protection project

Table 118: Dynamics of activities within the referent period of Program

Project: Opening of open pit mine Radljevo	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Project documentation	EPS	x						
Approvals and acceptances by ministries and institutions		x	x					
Land acquisition and infrastructure		x	x	x	x	x	x	x
Investment overburden								
Acquisition of used excavator and stacker		x	x					
Main equipment			x	x	x	x	x	x
Auxiliary equipment			x		x	x	x	x
Power supply								
Coal quality management system			x	x			x	
Drainage-dewatering			x	x	x	x	x	
Geological exploration		x	x	x	x	x	x	x
Excavation of overburden			x	x	x	x	x	x
Excavation of coal						x	x	x

Risks: Public procurements for work and services, investments

Tamnava west field

To complete investment development of Tamnava west field it is necessary to acquire stacker and belt conveyor for inter-burden (with capacity of 12,000 m^3/h), bucket wheel excavator and self-propelled conveyor (capacity 4,500 m^3/h), as well as finalizing construction of crushing facility and development of second SUP line and introduction of coal quality management system. Also it is necessary to perform refurbishment and modernization of equipment damaged in flood, and to solve the issue of remaining mud in relation to waste dump stability.

Table 119: Main properties and outcomes of project "Finalizing investment development of Tamnava west field mine"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Construction of roads Paljuvi-Jabučje, Jabučje-Skobalj, Jabučje-Viš and hydro facilities	2,750,000 € (EPS resource)	Finalizing investment development of Tamnava west field mine is final stage of investment cycle in this mine, which started in 1986. Mine achieved designed production rate but investments are not completed. Beside this, catastrophic flood in 2014 made great damage to the mine. These investments are including missing equipment (mainly for inter-burden, coal transport, finalizing stock yard and introduction of coal quality management system), as well as refurbishment and modernization of flooded equipment and acquisition of new equipment. Finalizing investment cycle are creating conditions for supplying sufficient amount of coal to TPP Nikola Tesla. Planned production rate is 14,000,000 tpa until 2018, followed by 11,000,000 tpa of coal with quality of 7,000 kJ/kg. Total investment until 2025 is 250,000,000 €, and until the end of operational life 351, 389,540 €.	Execution of finalizing investment development of Tamnava west field mine project enables continuity of electricity production. Based on overall reserves of coal at Tamnava west field mine overall electricity production of 180,000 GWh is feasible. Economic flow of the project provides Internal rate of return of: **IRR=35.57%** Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV**=519,305,043.35 € **Avg. net profit** = 8.44 €/t **NPV per t of coal**=1.95 €/t Old and flooded equipment is completely modernized with new electric equipment. Energy savings 10% to 30%.
Land acquisition and relocation of Skobalj settlement	31,000,000 € (EPS resource)		
Construction of new stock yard and introduction of coal quality management system	54,400,000 € (KfW bank)		
Stacker for inter-burden (12,000 m^3/h)	18,700,000 € (KfW bank)		
New bucket wheel excavator (4500 m^3/h) and transfer belt conveyor	24,500,000 € (EPS resource)		
Refurbishment and modernization of equipment damaged in flood.	29,500,000 € (EPS resource, World Bank)		
Belt conveyors for inter-burden and coal	30,300,000 (EPS resource)		
Acquisition of auxiliary equipment	15,400,000 € (EPS resource)		
Drainage-dewatering	15,000,000 € (EPS resource)		

Table 120: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Finalizing investment development of Tamnava west field mine	Complete project documentation is finalized	Special purpose plan for land acquisition and relocation of Skobalj settlement

Table 121: Dynamics of activities within the referent period of Program

Project: Finalizing investment development of Tamnava west field mine	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Construction of roads Paljuvi-Jabučje, Jabučje-Skobalj, Jabučje-Viš and hydro facilities	EPS	x						
Land acquisition and relocation of Skobalj settlement		x	x					
Construction of new stock yard and introduction of coal quality management system		x	x					
Stacker for inter-burden (12,000 m^3/h)		x	x					
New bucket wheel excavator (4,500 m^3/h) and transfer belt conveyor			x	x	x			
Refurbishment and modernization of equipment damaged in flood.		x	x	x				
Belt conveyors for inter-burden and coal		x	x					
Acquisition of auxiliary equipment		x	x					
Excavation of overburden		x	x	x	x	x	x	x
Excavation of coal		x	x	x	x	x	x	x

Risks: Public procurements for work and services, Recovery of internal waste dump from consequences of 2014 flood

P.28. Optimization and concentration of underground coal production

JPPEU Resavica is a single company, with status of public company and 100% owned by Republic of Serbia. Main activity of the company is coal production. Mining takes place in 9 parts of the company and these are:

- Anthracite mine "Vrška Čuka", Avramica
- Ibarski hard coal mines, Baljevac
- Brown coal mine "Rembas", Resavica,
- Brown coal mine "Bogovina", Bogovina
- Brown coal mine "Soko", Soko Banja
- Brown coal mine "Jasenovac", Krepoljin
- Brown coal mine "Štavalj", Štavalj
- Lignite mine "Lubnica", Lubnica
- Aleksinac mine, contracting services in other mines.

Beside main activity of underground mining, company also operates one open pit mine Progorelica and one boron underground mine Pobrđski potok.

Overall production of all mines is around 550,000 tpa, while planned production for 2017 is 580,000 tpa.

- Anthracite mine "Vrška Čuka", Avramica, - 5,000 t
- Ibarski hard coal mines, Baljevac - 125,000 t
- Brown coal mine "Rembas", Resavica, - 175,000 t
- Brown coal mine "Bogovina", Bogovina - 15,000 t
- Brown coal mine "Soko", Soko Banja - 90,000 t
- Brown coal mine "Jasenovac", Krepoljin - 42,000 t
- Brown coal mine "Štavalj", Štavalj - 85,000 t
- Lignite mine "Lubnica", Lubnica - 45,000 t

Program for restructuring of Public Company for Underground Coal Mining is currently being developed. This Program will start as soon as it is approved by the Government of Republic of Serbia. Program will define which mines will be closed due to lack of coal reserves and poor economic performances which are showing no trend in improving income. Also, Program will define mines with resource potential, as well as capabilities to increase income with investments.

Plan is to increase production of coal to 600,000-700,000 tpa after optimization and concentration of coal production. Precondition is to finalize investment in Soko mine (investment in equipment and new technology), thus creating conditions for higher production rate in this mine.

Higher production rate in Štavalj mine is related to construction of new thermal power plant, due to lack of the coal market in this region of Serbia.

Even higher production rates are feasible, but only after opening underground mines in Ćirikovac and Poljana deposits.

There is a possibility of opening new coal deposits, with previously prepared investment documentation that will take into account all necessary parameters on the basis of which it can be concluded whether there is economic justification for opening them.

P.29. Introduction of coal quality management system

Serious problems are caused in thermal power plants because of large variations of delivered coal quality. Problems are mainly reflected through:

- Output power of power plants declines below nominal level due to poor quality of coal;
- Coal with low calorific value causes low efficiency of boilers and consumption of larger amounts of coal per produced MWh;
- Low calorific value of coal could cause problems with maintaining heat energy pressure and steam in boilers, resulting in consuming (expensive) oil fuel;
- Low calorific value of coal requires higher utilization of crushers to secure higher intake of coal into boiler, resulting in larger electricity consumption.

Beside advantages with easier combustion in power plants, coal homogenization enables mining of reserves with lower quality (which are blended on the open pit mine or stock yard with coal of better quality), thus resulting in higher recovery of the deposit. Also, coal homogenization has advantages related to environment protection (mainly by elimination of coal self-combustion at the stock yards).

Coal quality is the main cause for partial failures, which are resulting in lower productivity of power plants by 5%, meaning 180 MW lower power in production. Losses due to partial failures in power plants are 1200 GWh, all caused with insufficient coal quality. Introduction of homogenization (coal quality management) will eliminate around 30% of total losses (or reduction of 370 GWh) and save up to 9,000,000 € per year.

Coal quality management system will be introduced at three locations, therefore three sub-projects are defined:

1. Introduction of coal quality management system in western part of Kolubara basin (open pit mines Tamnava west field and Field G, later on Radljevo);
2. Introduction of coal quality management system in eastern part of Kolubara basin (first Fields C and D, and later on Field E);
3. Introduction of coal quality management system in Drmno mine - Kostolac.

These three sub-projects are on various level of development:

1. **Introduction of coal quality management system in western part of Kolubara basin**: complete investment documentation is finished, active public procurement procedure, selected contractor and currently at stage of base and detailed engineering. Complete finish of project is expected at the end of 2017. Value of investment is 54.4 million €, financed by KfW bank, bank donations and EPS resources.
2. **Introduction of coal quality management system in eastern part of Kolubara basin**: currently is in stage of development of technical and tendering documentation. Completion of documentation is expected during 2017. Expected schedule of the project depends on suggested solutions in documentation, but the project will be probably introduced in stages, with utilization of existing facilities in "Kolubara Prerada" until its closure, and later on with construction of new coal stock yard and crushing facility in the area of Vreoci village, which will be relocated. Planned amount is around 90,000,000 €, financed from EPS resources.
3. **Introduction of coal quality management system in Drmno mine - Kostolac**: Completed technical and tendering documentation, tendering procedure is expected during 2017. Expected finish is 2018. Planned amount is 5,225,230 €, financed from EPS resources.

Table 122: Main properties and outcomes of project "Introduction of coal quality management system"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Introduction of coal quality management system in western part of Kolubara basin	54,400,000 € KfW bank	Equalizing coal quality for optimal combustion in power plants. Utilizing low quality coal by blending with high quality coal, thus increasing recovery of the deposits. Higher efficiency of power plants. Reduced consumption of oil fuel in TPPs. Reduced pollution at stock yards caused by self-combustion of low quality coal.	Coal homogenization project at Tamnava mine secures increase energy efficiency in power generation at TPP Nikola Tesla, extends the operational life of available reserves in deposit and reduces total cost of electricity generation. Economic evaluation was done separately for Tamnava mine and TPP Nikola Tesla B. Achieved internal rate of return for mine is: **IRR = 8%** and for power plant is: **IRR = 238%**
Introduction of coal quality management system in Drmno mine - Kostolac	5,225,230 € EPS resource		Coal homogenization project at Drmno mine secures increase energy efficiency in power generation at TPP Kostolac, extends the operational life of available reserves in deposit and reduces total cost of electricity generation. Economic flow of the project provides Internal rate of return of: **IRR=57.3%** and it is very high for mining project, but it objectively depicts all the benefits of coal homogenization, which generates 410,000 t of coal for combustion in TPP n value sense. This means that period for investment return is 1.8 years, after starting coal homogenization. Economic flow of the project also provided calculation of net present value with discount rate of 8% at level of: **NPV=2,037.5 million RSD**
Introduction of coal quality management system in eastern part of Kolubara basin	90,000,000 € EPS resource		Project is in development stage. Research of BCG indicated that some 30% of total losses in TPP or 370 GWh can be eliminated by coal homogenization, which equals to 9.2 million € per year.

Table 123: Missing planning and technical documentation

Project	Status of project preparation	Missing planning and technical documentation
Introduction of coal quality management system	Introduction of coal quality management system in western part of Kolubara basin is in implementation stage. Finalizing engineering and activities on stock yard started. Completion of works - beginning of 2018. Introduction of coal quality management system in Drmno mine is in tendering preparation for selection of contractor. Introduction of coal quality management system in eastern part of Kolubara basin is in development stage.	Study "Introduction of coal quality management system in eastern part of Kolubara basin" is in development.

Table 124: Dynamics of activities within the referent period of Program

Project: Introduction of coal quality management system	Responsible entity	2017	2018	2019	2020	2021	2022	2023
Introduction of coal quality management system in western part of Kolubara basin project realization	EPS	x	x					
Introduction of coal quality management system in Drmno mine-project realization		x	x	x				
Tendering procedure		x						
Acquisition and assembly of equipment at Drmno mine			x	x				
System running-in			x	x				
Introduction of coal quality management system in eastern part of Kolubara basin-project realization		x	x	x	x			
Finalizing of Feasibility study		x						
Tendering procedure			x					
Acquisition and assembly of equipment at Drmno mine			x	x	x			
System running-in				x	x			

Risks: Public procurements for work and services, exploration works of poor quality

P.30. Introduction of new organization at EPS's open pit mines for purpose of work improvement and higher efficiency of EPS open pit mines

EPS, with assistance of Boston Consulting Group, defined set of required measures to improved efficiency and profitability of coal production, and at same time to maintain competitive price of electricity on world market and to reduce business costs. The purpose of these measures is to ensure safe supply of coal with sufficient quality to power plants. Main defined targets are:

- improvement of occupational safety;
- increasing utilization of mining machinery to level existing in central Europe;
- increasing automation level on production systems, for purpose of safer work and reduced number of workers;
- implementation of homogenization and coal quality management on all open pit mines;
- better planning and execution of land acquisition;
- more efficient utilization of available working hours (pauses, work on holidays and Sundays);
- improvement of maintenance system.

Priorities were defined, and expected profit in four year period is 235,000,000 €. This will create funding for new investments and opening of replacement mines.

Table 125: Main properties and outcomes of project "Improving efficiency of EPS's open pit mines"

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Improved efficiency of Prerada	-	Improving efficiency of drying process. Increase the price of heat energy and reducing subsidies to local community. Terminate internal railway..	Reduction of workers by 250; Reduced costs by 8,000,000 €; Increased income by 12,000,000 €
Increasing automation level in mines	one-time investment of ~10M€ and annual investments of 0.7 M€ per annum EPS resource	There are 96 drive stations in Kolubara, with over 1,000 workers. All manually controlled stations should be improved to remote controlled stations, except those planned for replacement in 2018 (Field E).	Reduction of workers by 560; Reduced costs by 5,000,000-6,000,000 €;
Increasing utilization of mining machinery	-	Replacement of old/outdated auxiliary mechanization, to increase availability. Improve land acquisition to ensure proper conditions for excavators. Construct roads to improve efficiency of auxiliary equipment and reduce travelling time through mines. Improve planning and maintenance execution.	Reduced costs by 15,000,000-25,000,000 €;
Improvement of capital maintenance through aggregate replacement of parts	15,000,000 € EPS resource	Reduce time for capital investment with higher aggregate replacement of parts. Invest into replacement of parts/components and their renewal and transport to location before failure of the system.	Reduced costs by 10,000,000-15,000,000 €;
System operation during break of the crew	-	System operation during pause. Pay the crews to work instead to have a break. Alternative is to use reserves to organize replacement crews to operate systems during the break of the original crew.	Reduced costs by 10,000,000-15,000,000 €;

Technical properties	Value of project and source of finance	Description of outcomes	Valorised averaged annual outcomes according to available documentation
Reducing the number of drivers	6,000,000 € EPS resource	Current road conditions are causing necessity to have assigned drivers to transport staff across the mines. Better roads on the mines will reduce requirements for drivers. Shift staff will drive the vehicles to their stations.	Reduction of workers by 200; Reduced costs by 2,000,000-3,000,000 €; Net savings 10,000,000 € in period of 6 years.
Reducing the cost of electricity through reactive power compensation	500,000 € EPS resource	Reducing costs of electricity through compensation of reactive energy. Solution is suggested in project "More rational utilization of energy through compensation of reactive energy in Kolubara", developed by Electro-technical Institute Nikola Tesla	Savings due to reduced extensive use of reactive energy by 230,000 € per annum (reduced consumption of reactive energy by 75,000,000 kvarh per annum); Savings due to reduced losses at level of 70,000 € per annum (reduced losses of active energy by 1,600,000 kWh per annum).
Reducing the cost of external services	-	Conduct detailed analysis of causes for higher costs and identify unnecessary increases in scope of given services. Secure competitive selection process for this type of services. Reduction of external services.	Reduced costs by 1,000,000-5,000,000 €;
Centralization and optimization of warehouse management	-	Implement centralized warehouse management in single unit/sector. Unify items catalogue. Supervise work orders and reserved materials/items. Consider to organize only one or two warehouses for accepting items.	Reduced costs by 1,000,000-5,000,000 €;

3.6.3. Sub-sector of Environmental Protection in Coal Sector

Main environmental protection aspects in coal sector (required environment impact assessments and prevention measures for not allowed environmental impact) in the area of coal mining, beside all the legislation listed in chapter 1, are additionally stipulated by Law on Mining and Geological Exploration (Official Gazette RoS, no. 101/2015). Projects listed in this chapter are mainly dedicated to reduced negative impact of coal exploitation on the environment.

One of the on-going projects is commissioning of new Excavator-Conveyor-Stacker (ECS) system in Kolubara basin, as a part of the project "Improve mining technology in MB Kolubara to increase thermo power plants efficiency and to reduce its environmental impact ", which is under credit of EBRD and KfW banks at level of 140 million €.

Purpose of this project is to secure reliable and continuous supply of coal, rational management of natural resources, including reduced pollution of ambient air, surrounding thermal power plants using coal from Kolubara basin. Project has technological importance, regarding environmental impact through harmful substances as well as social importance. Therefore, state-of-the-art environment protection measures are applied, in order to minimize impact of the equipment on the existing environmental condition. Special attention was given to spot and linear noise and dust emitters, for the purpose of elimination of their impact on the environment and neighbouring population.

Regarding noise protection, all requirements are met defined by standard "Acoustics - description of measuring and assessment of noise in the environment" - part 1 "Basic values and assessment procedures" standard SRPS ISO 1996-1 and part 2 "Establishment of noise levels in the environment" standard SRPS ISO 1996-2, which are identical to standards ISO 1996-1 and ISO 1996-2 2007 "Act on noise indicators, limiting values, methods for assessment of noise indicators, disturbances and harmful effects of noise in the environment" (Official Gazette RoS, no. 75/10) requirements of Action plan for environment protection (ESAP from Project on improving condition of environment in Kolubara basin) and Policy of environment protection and social policy of EBRD from 2008. Maximal level of noise after commissioning will concur to "Act on noise indicators, limiting values, methods for assessment of noise indicators, disturbances and harmful effect of noise in the environment".

For zone 4 "Business-residential areas, trading-residential areas and playgrounds", according to this Act, defined maximal level of noise during daytime is 60 dBA, and for night-time is 50 dBA. Most recent measures are applied for noise suppression, caused by surface mining technology, which are also used on open pit mines in Germany. Equipment used in the process has reduced noise level (rollers on belt conveyors with balance G 16, enclosure of belt conveyor drive stations, etc.).

Concerning protection from impact of suspended particles, all conditions are in accordance to limits, tolerance values and limit of tolerance as defined by "Decision of Government of Republic of Serbia on conditions for monitoring and requirements of air quality (Official Gazette RoS, no. 11/2010) and requirements of Action plan for environment protection (ESAP from Project on improving condition of environment in Kolubara basin) and Policy of environment protection and social policy of EBRD from 2008. This Directive if in complete compliance to norms provided in EU Directive 2008/50/EC (Directive 2008/50/EC on ambient air quality and cleaner air for Europe, Official Journal of the European Union L 152/31 11.6.2008). Air pollution is measured by monitoring and measuring concentration of suspended particles (PM10, PM2.5) in air, taking samples and their analysis. This area also included most recent methods for dust suppression (installed water sprinklers on all transfer points of material, starting at excavating point, over belt conveyors to the stacking). Dust suppression is also performed along the roads around this system.

Same approach will be used on new ECS system (VI ECS system) at open pit mine Drmno. Also, all new systems operating in EPS mines will utilize this system for environment protection.

Reclamation projects of degraded terrain was completed for all open pit mines of EPS, and these will be activated as soon as conditions on internal waste dumps allow (Remark: According to the Law on Mining and Geological Exploration, part of the Main mining project and Additional mining project are Technical projects on reclamation, which are executed once the conditions allows within the mine).

Monitoring of surface water quality released into recipients as a part of drainage, is taking place on all open pit mines. Also, control of ground water quality is organized through wells.

3.7. Sector of Energy Efficiency in Energy Consumption

Energy efficiency in area of final energy consumption and energy sources is regulated by two laws: Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014) and the Efficient Use of Energy Law ("Official Gazette" no. 25/2013) in Serbia. Through these two laws the requirements of Directive 2006/32/EC about energy efficiency of final consumption and energy services (ESD) have been transposed. In the meantime Directive ESD was replaces by a new-formed Directive 2012/27/EU about Energy Efficiency Directive (EED), whose obligatory implementation, for the signatories of the Contract of Energy community establishment, starts at the end of 2017, in accordance to the decision of the Ministerial Council (D/2015/08/MC -ENC) from October 2015. Decision defines out the terms and requirements for the performance of particular EED regulations which are different in regards to the members of the EU. Even though direct adjustment with new Directive has not been made yet, the aforementioned laws, primarily the Efficient Use of Energy Law ("Official Gazette" no. 25/2013), are largely compliant with its regulations.

In addition to these laws, the area of energy efficiency in the building sector is regulated by the Law on Planning and Construction ("Official Gazette of the Republic of Serbia", no. 72/2009, 81/2009 - corr., 64/2010 - decision, 24/2011, 121/2012, 42/2013 - decision, 50/2013 - decision, 98/2013 - decision, 132/2014 and 145/2014) and related Delegated legislation: Regulations on energy efficiency of building construction ("Official Gazette of the Republic of Serbia" No. . 61/2011) and the Regulations on the conditions, content and manner of issuing certificates of energy performance of buildings ("Official Gazette of the Republic of Serbia", no. 69/2012).

Action plan for energy efficiency is the document used to plan and implement energy efficiency improvements in accordance with Article 7 of the Efficient Use of Energy Law in Serbia. The 3rd action plan for energy efficiency for the period from 2016 to 2018 ("Official Gazette of the Republic of Serbia", no. 1/17) (3rd APEE) was adopted by the Government in late 2016. 3rd APEE was prepared in a format that is defined by Energy Community, in accordance with the requirements of Directive 2006/32/EC, but also included a number of elements concerning the future implementation of Directive 2012/27/EU. 3rd APEE comprises: (1) national savings goals for the period of 2016-2018.(2) Measures for the efficient use of energy, activities, responsible for activities, deadlines and evaluation of the expected results of each of the measures to achieve the set goals, (3) financial, legal and other instruments envisaged for implementation of the planned measures and activities, and (4) Ratings the degree of realization of the planned energy savings goal from the previous Action plan (for the period 2010-2015).

3.7.1. The Goals in the Area of Energy Efficiency and Indicators of Their Implementation

From the point of defining the goals it is important to have in mind the fact that the goals by 2018 are defined by the signatories of the Contract of Energy community establishment and in accordance with Directive 2006/32/EC, as final energy savings of 9% in the period from 2010 to 2018. By Directive 2012/27/EU, the European Union adopted the goal that energy consumption in the EU in 2020 must not exceed 1474 million toe of primary energy, i.e., 1078 million toe of final energy. For some State Members the individual goals are not defined in the Directive, but it is recommended that countries review their national goals in order to fit in a common goal. As part of the implementation of this Directive, by the signatories of the Contract of Energy community establishment, energy consumption that does not exceed 187 million toe of primary energy, i.e., 133 million toe of final energy is defined as the goal. Pursuant to this goal, the indicative target of the Republic of Serbia is that primary energy consumption does not exceed 17,981 million toe of primary energy and final energy consumption does not exceed 13,103 million toe of final energy for energy purposes in 2020. Defined values are greater than the projected ones according to the reference scenario, and in particular according to the scenario with the implementation of energy efficiency measures of the energy strategy. Also, data about the implementation of the energy balance in 2015, show that the realization of both, the consumption of primary energy (15,051 million toe), and the final energy consumption (8,776 million toe, which includes 617 thousand

toe for non-energy and 8,159 million toe for energy purposes) is significantly below the projected consumption according to both designed scenarios so Serbia will strive to maintain the trend of achieving savings of final energy consumption at the level of 1% compared to 2008. A significantly higher level of reserves exists in terms of final energy consumption than in terms of primary energy. Namely, there is space for average annual growth of 3.6% in primary energy consumption and, the average growth of 9.9% for total final energy consumption for energy purposes in the period up to 2020.

Projected reduce of greenhouse gases emissions caused by an increase in energy efficiency in the energy consumption has been calculated using the following emission factors that are multiplied by energy sources for final consumption: for heating plant - 0.287 tCO_2/MWh of the produced heat energy (emission factor with which it is calculated in the Energy Strategy), for the electrical energy - 1.099 tCO_2/MWh (combined emission factor for the production of electric energy in the electric power system of Serbia - national emission factors for 2017), 2,954 tCO_2/toe for oil derivate (an emission factor with which is calculated in the Energy Strategy),101 $kgCO_2$/TJ for coal and 56.1 $kgCO_2$/TJ for natural gas (Source for last two: IPCC Guidelines for National Greenhouse Gas Inventories - Stationary Combustion, their values are used in the Energy Strategy as well). Calculation of projected net reduction in emissions of greenhouse gases due to increased energy efficiency in energy consumption was made on the basis of differences in the consumption of two scenarios of the Energy Strategy: reference scenario and scenario with implementation of energy efficiency measures. Projected net reduction in emissions of greenhouse gases due to the implementation of energy efficiency measures amounts 6,669.548 Gg CO_2eq in 2030. It accounts for about 81% of the intended national specified contribution for 2030.

Since the fall of final energy consumption is greater than the fall in consumption of primary energy it is obvious that measures that have been implemented to improve energy efficiency at the level of final consumption produced significant results. On the other hand, measures in the sectors of transformation, transmission and distribution of energy were not identified in the previous action plans. Greater enforcement of energy efficiency measures in these sectors is expected as a result of the implementation of Delegated legislation of the efficient use of energy Law, primarily Rulebook and the Regulations that prescribe minimum energy efficiency requirements for new and reconstructed facilities for the generation, transmission and distribution of electricity and heat. Measures of energy efficiency in energy transformation, transmission and distribution are subject of chapters that analyse the specific areas within the Program. The measures and activities relating to final energy consumption are mainly discusses in this chapter.

According to Directive 2006/32/EC and by Decision 2009/05/MS-EnC Ministerial Council of the Energy Community of 18th December 2009, signatories of the Contract of Energy community establishment are committed to achieve savings goal of 9% of final energy consumption in the period of nine years starting in 2010. The reference year for the Republic of Serbia in respect of which the percentage of savings is accounted is 2008, because of the reason that at the time of the Decision implementation the most accurate available data on energy consumption are taken from the Energy Balance for the year of 2008. The planned target that was established for the first time in the framework of the First Action Plan for Energy Efficiency of the Republic of Serbia for the period from 2010 to 2012, was confirmed through the 3rd APEE as expected savings of 752.4 thousand toe by 2018. According to the analysis in the 3rd APEE, the savings of 308.3 thousand toe was achieved by 2014, and projected savings up to 2015 amounts 370 thousand toe. Value of savings are not projected for 2016 and 2017, but only the final saving for 2018. Having in mind that the energy management system is only just established and that its most significant effect can be expected in 2018, and that a similar conclusion can be applied to the implementation of efficient of tires in road vehicles and the marking and monitoring of fuel quality, the assumed savings per year in order to realize the set goal is formed within Program. The default implementation is formed based on the assumption that the savings on mentioned categories will occur only in 2018, and that the ratio between savings per year will be 0.8: 1: 1.2. Indicators of final energy

consumption saving goal achievement by years of realization of the 3rd APEE are shown in the following table.

Table 126: Indicators of realization of goal of final energy savings achievement per year, based on measures of energy efficiency improvement in the period 2016-2018.

Year	2016.	2017.	2018.
Final energy savings (thousands of toe)	448	545.5	752.4

During the creation of the 4th and 5th APEE analyse of the effects of the implementation of measures in order to achieve the goals defined in the 3rd APEE will be done. During the creation of 4th and 5th APEE the goals for the period 2019-2023. years will be also determined.

The implementation of two measurable goals in terms of energy efficiency, which realization is obligatory, was imposed to Serbia by Directive 2012/27/EU. Thus, under Article 5 EED requires from State Members annual renovation of the central government's buildings, which area is 3% of the total area of all buildings of the central government, with the aim of implementing measures in order to improve energy efficiency. The above decision of the Ministerial Council, for the countries that are signatories of the Contract of Energy community establishment, defines their obligation to improve energy efficiency in the 1% of the heated / cooled area of buildings which are owned and used by the central governments. In that way the building achieve the least energy properties defined by Article 4 of Directive 2010/31/EU. Signatories of the Contract of Energy community establishment have the obligation to establish and make publicly available an inventory of heated / cooled central government's buildings with a total area greater than 500 m^2 by the January 1st of 2017 and, starting from 2019, with an area of more than 250 m^2. After that they need to realize this goal according to the formed inventory. Realization of the goal should be started in 2018. It should be noted that the reconstruction of buildings of central government should be part of the wider renovation Strategy that is part of the measures that should be taken in order to meet the requirements of Article 4 of Directive 2012/27/EU. Serbia has begun with the activities on the preparation of this strategy by participation in the "TABULA" project which primary goal was the categorization of the building by the year of construction, construction style and energy demand for heating. The secondary goal was determination of energy efficiency measures in residential sector. Participation in the project is enabled the assessment and the categorization of the housing stock in Serbia. Renovation strategy should include all the buildings: residential, commercial and public. Implementation of the project as well as activities in order of establishment an inventory of the central government buildings was helped by GIZ.

Countries that are signatories of the Contract of Energy community establishment are obliged, by the transposition of Article 7 of Directive 2012/27/EU, to achieve cumulative savings during the period of 2017-2020 in the amount of 7% of the average final energy consumption for energy purposes (according to the definition of the Republic Institute for Statistics) in the period 2013-2015. The consumption of energy in transport can be exempt from this amount. Same obligatory schemes, related to distributors and retail companies that sell energy, are established in order to achieve this goal. By these schemes distributors or retail companies are becoming obligatory parties that ensure achievement of the mentioned savings in final energy consumption. The goal, elaborated in detail through the directive, is realized through the achievement of new savings each year, starting from January 1st in 2017. The savings amount to 0.7% of annual energy sales to final customers of all energy distributors or retail companies that sell energy to the extent that is an average of the last three year in the period prior to 1 January 2016. While doing so, the sale of energy in the transport sector, in terms of volume, may be partially or entirely dispensed from the calculation. The Directive gives the possibility to realize this savings by establishing an obligatory scheme for the energy efficiency, as defined in paragraph 1 of the article, or by applying the alternative measure, defined in paragraph 9, in accordance with paragraphs 10 and 11 of this article. While doing so, the amount of savings can be further reduced if savings has been already achieved by the other measures in the sector of transformation, distribution and transmission,

including efficient infrastructure of district heating and cooling, and if the measures that has already been implemented, starting from 2008, are taken into account. The largest reduction in the required savings in that case can be 25% of the calculated value. Paragraph 2 of Article 7 defines that the savings calculated with a reduction of 25% of the calculated value can be allocated per year. In that way Member State have obligation to achieve savings of 0.5% in 2017, an additional 0.5% in 2018, and then an additional 0.7% in 2019 and 0.7% in 2020. On the other hand, the cumulative value of energy that needs to be saved, if the reduction of 25% is calculated, is lower for 7.25% from the value which is calculated by using the savings per year defined by paragraph 2 of Article 7 of the Directive.

Given that, based on the energy balance for 2013 and 2014 and based on the previous data of the Republic Institute for Statistics for 2015, the final consumption of energy for energy purposes, with the exception of traffic, respectively were: 6,437.6 thousand toe, 5,758.8 and 6,123.3 thousand toe, the average value of consumption in relation to which the required savings has been accounted is 6,106.5 thousand toe. Indicators of possible realization of the implementation of Article 7 of Directive 2012/27/EU according to the schedule defined in paragraph 2 of Article 7 are given in the following table per year (second row). However, establishing a mandatory scheme for energy efficiency requires a series of coordinated preparatory activities that would be implemented in Serbia during 2017 and 2018. That is why it should be kept in mind that, if this is determinate to be the best or one of the options for implementing Article 7 of the Directive, implementation can start earliest in 2019. In this sense, the table shows the revised indicators of the implementation of the member 7. The Directive 2012/27/EC, assuming that implementation is realized only by applying obligatory scheme for the energy efficiency in the Republic of Serbia.

If it is assumed that investments in measures of energy efficiency incensement are proportion to annual savings achieved through the implementation of these measures, it is of great importance to start as soon as possible with the implementation of measures in order to achieve the goals defined in Article 7 of Directive 2012/27/EU. If the implementation of energy efficiency measures for achievement of savings, that are prescribed by Article 7 of Directive 2012/27/EU, could be implemented throughout the every year in the period 2017-2020. and in the manner suggested in paragraph 2 Article 7 of Directive, (second row in Table 127) it can be shown that the total investments would be approximately 36% less than the amount required for investment assuming that implementation is realized only by applying obligatory scheme for the energy efficiency started from 2019 (third row in the Table 127). These values clearly indicate the necessity of beginning with the implementation of other measures for improvement of energy efficiency in order to achieve the required cumulative savings defined in Article 7 as soon as possible (primarily by providing larger and more stable revenues for the work of the Budget Fund for energy efficiency).

Table 127: Indicators of two possible ways for realization of the implementation of Article 7 from Directive 2012/27/EU

Year	2017.	2018.	2019.	2020.	Cumulative
Projected annual savings in final energy consumption excluding transport if realization starts in 2017 (thousand toe)	30.5	61	103.7	146.4	341.9
Revised annual savings in final energy consumption excluding transport if realization starts in 2017 (thousand toe)			114	227.9	341.9

Note: Cumulative savings that Republic of Serbia needs to achieve, considering the possibility of reducing by 25%, if savings has been already achieved by the other measures in the sector of transformation, distribution and transmission, including efficient infrastructure of district heating

and cooling, and if the measures that has already been implemented starting from 2008 are taken into account, is lower than the value shown in the table and amounts 320.6 thousand toe.

One of the tools available to encourage the implementation of measures of improvement of energy efficiency is the Budget Fund for energy efficiency. As part of the Budget Fund, 160 million RSD is defined for the implementation of energy efficiency projects in local governments in 2016. These funds are small and insufficient for the implementation of all planned energy efficiency projects. For example, only for implementation of measures to improve the energy efficiency of buildings in the public and commercial sector (JK1 measure, planned for implementation in the 3rd APEE) the necessary funds are estimated at 58 million € per year. One of the possible mechanisms for increasing the means of the Fund is the introduction of fees for energy and energy sources. The means of approximately 9 million € annually could be provided, by introduction of feeds for energy and the energy sources (oil products and natural gas) in the amount of 0.015 price RSD/kWh at an early phase. This activity should be carried out as early as possible, preferably already in 2017, in order to realize savings prescribed by Article 7 of Directive 2012/27/EU with the lowest investment. Along with this means, Budget Fund collects funds from donations (organizations and funds) which are subsequently distributed to the users. Due to the limited means, the Budget Fund has, defining the funding for projects related to local governments only. The cycle of projects for local governments is time-consuming, since it presupposes the adoption of financing program for the year, issuing of public calls, selection of projects, implementation of public procurement procedures (in some cases, local governments had to make a change in budget and in procurement plan for the current year) and realization of the defined work. Consequently, it is necessary that Budget Fund has the resources to carry out a new public call for each year, as well as to finance the implementation of approved and contracted projects from the previous one. In addition to the incensement of the volume of projects financing in the public sector, increasing the Fund's resources is necessary and in order to enable implementation of projects of energy efficiency in other sectors of energy consumption. It is necessary to strengthen the capacity of the Ministry in charge of mining and energy to carry out activities of Budget Fund, considering that the Fund represents only a budget line, and that all works are performed by employees of the Ministry in charge of mining and energy.

Using the means from the Budget Fund is defined by the Rulebook of the conditions for distribution and use of the Budget Fund funds for improving the energy efficiency of the Republic of Serbia and the criteria for exemption from performing an energy overview ("Official Gazette" no. 15/16). This act defines who can be a user of the Budget Fund - legal and natural persons registered or with residence on the territory of the Republic of Serbia, with an emphasis on the users: (1) The local self-government units that are in the devastated areas in accordance with the regional development law, as well as other local self-government units, and (2) the household sector (individuals, buildings council). All procedures for the allocation of funds are accurately elaborated in the mentioned Rulebook, whereby it should be noted:

- a uniform use of Budget Fund funds is provided for the units of local self-government with the limit that only one project of a local self-government unit can be financed per year,
- defined criteria for project selection (maximization of relations between savings and investment, the share of own funds, payback period) are provided the maximum effects of the usage of resources,
- the measures of energy efficiency, which are the subject of financing, and in accordance with the measures of 3rd APEE are defined

It is necessary to provide significantly greater resources for operation of the Budget Fund in order to achieve realization of the goals in the area of energy efficiency by 2023. It is necessary to develop other mechanisms for financing the Budget Fund (the introduction of fees on energy and energy sources), which are possible in accordance with the its legal status in the period of 2917-2019. It is also necessary to analyse the possible improvement of its operation through potential

amending of its legal status and to establish a mechanism for the returning of the fund (revolving fund).

In accordance with the possibilities provided by the Law on Efficient Use of Energy ("Official Gazette of the Republic of Serbia", no. 25/2013), it is recommended that local self-government units establish budget funds at the local level to improve energy efficiency in a manner similar to the Budget Fund of the Republic of Serbia.

3.7.2. Overview of Measures and Activities for Their Implementation in the Area of Energy Efficiency

The list of measures in the area of energy efficiency was defined based on the 3rd APEE. In the measures of the Program, that will be implemented in the period 2018, the measures which are elements of this plan, but not yet implemented, have been added.

In addition to these measures, particular attention was paid to implementing measures required of Directive 2012/27/EU, which are not recognized as an element of the plan (e.g. The establishment of schemes of obligations in terms of energy efficiency) as well as activities on monitoring of the results of nearly applied measures implementation (such as the introduction of the energy management system). Periodical creation of new action plan for energy efficiency (4th - for the period from 2019 to 2021, and the 5th - for the period 2022-2024.) are considered as a special measures also. These action plans are documents that will include analysis of the effects of existing measures and list of new measures that should be implemented in the period of the Program realization.

The Efficient Use of Energy Law predicts the introduction of energy management at the local level, in the industrial sector and in the area of building, which is especially highlighted as a measure that should bring significant savings. The Law also prescribes the implementation of mandatory energy overview at system obliged entities within the prescribed period of time (one to five years for system obliged entities in the industrial sector, and once in ten years for the system obliged entities in the area of building construction). This system predicts a scheme to establish a system of training and licensing certified energy managers and energy advisors who will report to the competent Ministry through mandatory annual reports (energy managers) and implement mandatory energy overviews (energy advisers) The plan is to establish a system of energy managers in the first quarter of 2017, with the first reports of energy managers to the Ministry in charge of mining and energy sector expected in late March 2017. Energy management system is considered as the basic measure for improving energy efficiency in all sectors of energy consumption and therefore it is specified as a special measure in the review of measures even though it is the part of the measures that should be implemented in the 3rd APEE.

Overview of measures in the area of energy efficiency, which should be implemented during the implementation of Program, is given in the following table. Activities for the implementation of measures that are estimated from 3rd APEE are described in detail in the plan and therefore they are not re-homing in the Program (it is only pointed out that their description is given in the 3rd APEE.

Table 128: Overview of measures in the area of energy efficiency that will be implemented during the period of Program implementation

Name of measure	Description of the activities for the implementation of measures	Measures implementers	The targeted final consumption	Duration	Indicator of the implementation of measure
The measures predicted in the 3rd Action Plan for Energy Efficiency of the Republic of Serbia for the period 2016-2018.	Implementation of activities defined through the 3rd action plan for energy efficiency.	Ministry in charge of mining and energy, other entities predicted by individual measures within the 3rd APEE	All sectors	2017 -2018.	Saving of 752, .4 thousand toe by 2018.
The introduction and operation of energy management (SEM) in the public, commercial and industry sector	Identification of SEM obliged entities through the collection of reports on energy consumption in accordance with the Regulation on determining the limits of annual consumption of energy ("Official Gazette of the Republic of Serbia", no. 18/2016) Training and licensing of persons to perform the job of energy manager (EM) and energy advisor (EC) The appointment of energy managers by system obliged entities in accordance with the regulations that governing this area Finishing of the legal framework and its further improvement Preparation of programs and plans by SEM obliged entities Implementation energy efficiency improvement measures in order to achieve the goals of primary energy savings as defined by Regulation on establishing the limits of annual consumption of energy ("Official Gazette of the Republic of Serbia", no. 18/2016) Reporting to the Ministry through the established web application and database for monitoring Regular implementation of energy overview in the terms set by the law of the EKE. Implementation of projects that promote the implementation of SEM to the obliged entities and other institutions.	Ministry in charge of mining and energy, training organizations SEM obliged entities	Energy use in buildings, municipal services, large industrial systems and other final consumption	2017 - 2023. (and continues after the end of this period)	Saving of 49.9 thousand toe by 2018.

Name of measure	Description of the activities for the implementation of measures	Measures implementers	The targeted final consumption	Duration	Indicator of the implementation of measure
The transposition of Directive 2012/27/EU	Revision of the Efficient use of energy Law and other regulations of importance for the full transposition of the Directive	Ministry in charge of mining and energy and other institutions in charge of regulations that should be revised	All sectors of consumption	2017-2019.	Published amendments of the Efficient use of energy Law
Implementation of the requirements of Article 7 of Directive 2012/27/EU	Consideration and selection of the best modalities for the implementation of Article 7, with the support of EMRD REEP project Adoption of relevant regulation for the implementation of Article 7. Preparatory activities of obliged entities of implementation of Article 7. Implementation of the Article 7 according to the selected mode	Ministry in charge of mining and energy, public companies, suppliers, distributors	Households, public and commercial sector, street lighting and agriculture	2017 - 2020.	Saving of 320.6 thousand toe by 2020.
Implementation of the requirements of Article 4 of Directive 2012/27/EU	- Establishment of the list of central government buildings; - Identification of the minimum requirements that must be fulfilled by the central government building towards the requirements of Article 5 of Directive - Develop a plan for renovation of central government buildings in accordance with the requirements of Directive 2012/27/EU - Implementation of the plan formed for the renovation of central government buildings	Ministry in charge of mining and energy, Ministry in charge of Construction, Transport and Infrastructure	Public sector	2017 - 2023.	Adopted program of rehabilitation of central government buildings and reports on its implementation.

Name of measure	Description of the activities for the implementation of measures	Measures implementers	The targeted final consumption	Duration	Indicator of the implementation of measure
The completion of the legal framework for energy efficiency in buildings	Determining the cost-optimal levels of energy efficiency in buildings Inclusion of all forms of energy and thermo technical systems in building certification Develop a plan for meeting the requirements in terms of buildings with zero energy consumption Revise of the regulation on energy efficiency in buildings (the Regulations on energy efficiency of buildings construction - "Official Gazette of the Republic of Serbia", no. 61/2011 and the Regulations on the conditions, content and manner of issuing certificates of energy performance of buildings - "Official Gazette of the Republic of Serbia" No. . 69/2012), which was adopted on the basis of the Law of planning and construction ("Official Gazette of the Republic of Serbia", no. 72/2009, 81/2009 - corr., 64/2010 - decision, 24/2011, 121/2012, 42/2013 - decision, 50/2013 - decision, 98/2013 - decision, 132/2014 and 145/2014)	Ministry in charge of Construction, Transport and Infrastructure	The building sector	2017-2020	The revised regulation
Preparing the 4th Action Plan for Energy Efficiency of the Republic of Serbia for the period 2019-2021.	Preparation of the data and basses for 4th APEE; Analysis of the implemented measures and forming the goals of 4th APEE; - Creation of 4th APEE;	Ministry in charge of mining and energy	All sectors	2017-2018.	4th. APEE Adopted
Preparing the 5th Action Plan for Energy Efficiency of the Republic of Serbia for the period 2022-2024.	Preparation of the data and basses for 5th APEE; Analysis of the implemented measures and forming the goals of 5th APEE; - Creation of 5th APEE;	Ministry in charge of mining and energy	All sectors	2020-2021.	5th. APEE Adopted

Name of measure	Description of the activities for the implementation of measures	Measures implementers	The targeted final consumption	Duration	Indicator of the implementation of measure
Strengthening the technical and administrative capacity of the Ministry in charge of mining and energy in area of energy efficiency	- Reception of new staff; - Training for new staff;	Ministry in charge of mining and energy, Ministry in charge of finance	No impact	2017-2018.	new experts employed in the Department for Energy Efficiency
Establishment of sustainable ways of financing energy efficiency projects	- Consideration of options for improving the work of the Budget Fund for improving energy efficiency in existing legal requirements or with the change of secondary legislation; - Provision of higher revenues for the operation of the Budget Fund through donations, fees or other suitable mechanisms; - Financing of projects to improve energy efficiency by favourable loans from international financial institutions; - Selection of the optimal modalities of the operation of the Budget Fund that would give the best results, with a focus on the possibility that the funds invested in measures to improve energy efficiency back into the Budget Fund and the establishment of the necessary amendments to the proposal laws and regulations relevant to the work of the Fund;	Ministry in charge of mining and energy, Ministry in charge of finance, public companies for electricity distribution	Households, public and commercial sector	2017 - 2023.	Number of projects implemented from the funds of the Budget Fund

4. DETERMINATION OF PROJECT PRIORITIES

In order to collect information on strategic infrastructure projects in the energy sector and treatment of individual projects on a harmonized manner, as well as the optimal way of investors finding for individual projects, the Government of the Republic of Serbia has formed Single Project Pipeline in the Field of Energy. For the purpose of the project selection process, which significantly contribute to the achievement of the strategic objectives, the prioritization of these projects, as well as the assessment of the readiness (maturity) of the project realization, the Government of the Republic of Serbia has formed a specific Methodology for Selection and Prioritization of Infrastructure Projects [59] and the Guidelines for its implementation [60]. This methodology was applied for the assessment of projects that are subject of the Program and were not part of the Single list, for future inclusion on this list. Proposition of amendments to the Single list is displayed in the Table 129. The list does not include projects in the field of mining. During the year 2018, revision of the Single list will be conducted and new project ranking will be completed based on scoring.

Selection and analysis of projects that are subject of the Program was carried out on the basis of the strategic objectives defined in the Energy Strategy. During the process of priorities determination according to the Methodology [59] it is estimated that some strategic objectives were underestimated in the assessment system as defined in the Strategic Relevance Assessment Criteria in the Energy Sector [61]. In this sense the assessment system and parameters for assessment has been redefined, as well as the weighting factors of particular score in order to adequately comprehend the impact of projects to the realization of the goals defined by the Energy Strategy. The new scores are determined in the range 1-5, and the weighting factors are in the range 1-3. Overview of new scores by individual effects of projects, as well as the aggregated score is given in Table 130.

In Table 130 are particularly emphasized projects that are part of the Single Project Pipeline in the Field of Energy and projects of international importance lists: Energy Community Priority Infrastructure Projects list (PECI and PMI), European Commission Projects of Common Interest list (PCI), Western Balkans Investment Framework projects list (WBIF), Central and South Eastern Europe Gas Connectivity project list (CESEC), Western Balkans 6 initiative projects list (WB6) and group of projects that were allocated funds under several rounds of bilateral negotiations between the Government of the Federal Republic of Germany and the Government of the Republic of Serbia.

Table 131 presents projects rankings considered as part of the Program in accordance with the scores from the Table 130, where for each project is given the following set of information: responsible entity, a brief description of the project, a brief overview of the strategic priorities of the energy strategy to which the project contributes, preparedness of planning and technical documentation for implementation, information about provided funds to finance the project, a review of project realization main risks, project cost and implementation period during realization of the Program. Presented list can be subjected to change according to eventual change of the Program. There is a requirement of two-year reporting of the Program realization which can produce change of the Program in accordance with the Energy Law ("Official Gazette of the Republic of Serbia", no. 145/2014).

Table 129: Amended Single Project Pipeline in the field of energy which includes projects from Program (without projects in mining sector and in RES sector which are realized by private investors)

- Projects in the Program which are not part of the Single Project Pipeline in the Field of Energy

- Projects included in the Program and are already part of the Single Project Pipeline in the Field of Energy

- Projects for which funding is provided or the provision of financing is in progress, i.e., it is certain that funding will be provided

Project Rank	Project Name	Project Value	Period of Realization	Maximal Number of Points Based on Strategic Relevance	Group Based on Gap Assessment Report (i.e., assessments from the Program for projects in the Program)
1	Project "Improvement of metering infrastructure" - P.5	80 million €	2017-2022.	119	A, B
2	Project "Construction of the First facility of petroleum product pipeline system" - P.19	30 million €	2017-2022.	119	B
3	The project of construction a new thermo-block in TPP Kostolac B3 - P.1	715.6 million $	2017-2020.	110	A
4	Supply of thermal energy for city of Belgrade from the TPP Nikola Tesla A, via heat pipeline with capacity of 600 MW of heat energy - P.10	165 million €	2017-2023.	110	B

5	The project for construction of new substations 110/X kV in order to increase security of supply and increase the efficiency of electricity distribution - P.8	115.1 million €	2017-2023.	105	A, B, C, D (depending on relevant subproject of substation construction)
6	Construction of main, delivery and distribution pipelines - P.25	378 million €	2017-2023.	100	A, B, C, D (depending on relevant subproject of pipeline construction)
7	Promotion of renewable energies - developing the biomass market in Serbia, Component II (part of the project of transition to boilers on biomass - P.16)	80 million €	2017-2021.	95	A, B, C, D (depending on relevant subproject of transition of boiler to biomass)
8	Trans-Balkan corridor - phase 1 - new double 400 kV OHL Pančevo (Serbia) - Resita (Romania), new double 400 kV OHL Obrenovac (Serbia) - Bajina Bašta (Serbia) and regional 400 kV interconnection RS-BA-ME (The "Trans-Balkan corridor" project - phase 1 - P.2 - sections 1, 2 and 4)	126.6 million €	2017-2023.	90	2b
9	Storage capacity for mandatory stocks of crude oil and/or petroleum products (the project "Establishing the mandatory stocks of crude oil and/or petroleum products" - P.20)	12 million €	2017-2022.	90	1b
10	Thermal rehabilitation of public buildings - improving energy efficiency in the City of Belgrade	7.685 million €	not defined	90	2a

11	Trans-Balkan corridor - Internal line - New 400 kV OHL between TS Kragujevac (Serbia) - TS Kraljevo (Serbia) with the upgrade of TS Kraljevo (Serbia) to 400 kV voltage level (The "Trans-Balkan corridor" project - phase 1 - P.2 - section 3)	29.6 million €	2017-2023.	86	1b
12	Gas Interconnector Serbia Bulgaria - gas transmission pipeline on the Serbian territory (gas interconnection project Serbia - Bulgaria, the main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria) - P.21)	85.5 million €	2017-2019.	86	2b
13	Gas Interconnector Serbia Croatia - gas transmission pipeline on the Serbian territory (gas interconnection project Serbia - Croatia, main gas pipeline MG 08 Gospođinci (Futog) - Sotin (Croatian border) - P.22)	32 million €	2021-2023.	86	2b
14	Gas Interconnector Serbia Romania - gas transmission pipeline system between the Republic of Serbia and the Republic of Romania (Gas interconnection project Serbia - Romania, pipeline Mokrin - Arad (border with Romania) - P.23)	2.5 million €	2022-2023.	86	2b
15	Renewable energy project - Wind and Solar Park Kostolac (part of the project for the construction of new wind power plants at the territory of the Republic of Serbia awarded with the temporary status of privileged producers with power up to 500 MW - P.15)	105 million €	2017-2020.	86	2b
16	Implementation of energy efficiency measures in Belgrade (LEEN)	11 million €	not defined	86	2a
17	The project of utilization of geothermal energy-Bogatić	2.7 million €	not defined	86	2b
18	SO_2 and NOx emission reduction at the Nikola Tesla A1 TPP (part of the project of environmental protection in the sector of the electricity production from EPS's power plants- P.9)	36 million €	not defined	86	2a

19	SO_2 and NOx emission reduction at the Nikola Tesla A2 TPP (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	36 million €	not defined	86	2a
20	SO_2 emission reduction at the TPP Kostolac A, unit A2 (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	49* million €	2022-2023.	86	2a
21	NOx emission reduction at the TPP Kostolac A, unit A2 (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	15 million €	2022.	86	2a
22	NOx emission reduction at the Nikola Tesla A6 TPP (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	10 million €	2020-2021.	86	2a
23	NOx emission reduction at the Nikola Tesla B1 TPP (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	14.5 million €	2019-2020.	86	2a
24	NOx emission reduction at the Nikola Tesla B2 TPP (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	14.5 million €	2022-2023.	86	2a
25	NOx emission reduction at the TPP Kostolac B, unit B2 (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	17 million €	2018-2019.	86	2a
26	SO_2 and NOx emission reduction at the TPP Kostolac A, unit A1 (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	27 million €	not defined	86	2a

27	Construction of waste water treatment plant (WWTP) at: - TPP Kostolac A, - HPP Đerdap (8 locations) - HPP Drinsko-Limske (8 locations) (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	18 million €	not defined	86	2a
28	Thermal rehabilitation of public buildings - improving energy efficiency in the City of Kragujevac	4.89 million €	not defined	86	2a
29	CHP Energy Plant that use communal waste as fuel in Šabac	30 million €	not defined	86	2b
30	Strategic project "Deep refining" - P.18	330 million $	2017-2019.	86	B
31	SO_2 emission reduction at the Nikola Tesla B1 and B2 TPP - flue gas desulphurization - (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	146 million €	2021-2022.	81	2a
32	Underground Gas Storage Itebej	85 million €	not defined	81	2b
33	Trans-Balkan corridor Internal line - Single circuit 400 kV OHL TS Bajina Bašta - TS Kraljevo - phase II (The "Trans-Balkan corridor" project - phase 2 - P.2 - section 1)	36.7 million €	not defined	81	2b
34	Thermal rehabilitation of public buildings - improving energy efficiency in the City of Zrenjanin	7.2 million €	not defined	81	2a
35	Thermal rehabilitation of public buildings - improving energy efficiency in the City of Subotica	3.1 million €	not defined	81	2a
36	Gas Interconnector Serbia FYROM - Section on Serbian territory	8.5 million €	not defined	81	2a
37	Project for increasing the capacity of Underground storage Banatski Dvor - P.24	65 million €	2020-2023.	81	C

38	Gas Interconnector Serbia Montenegro - Section Niš (Doljevac) - Priština	50 million €	not defined	76	2b
39	Asbestos elimination and substitution from all energy and coal production and distribution facilities	5 million €	not defined	76	2a
40	Promotion of renewable energies - developing the biomass market in Serbia, Component I (part of the project of transition to boilers on biomass - P.16)	20 million €	2017-2021.	76	2a/2b
41	The project of reconstruction of 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level - P.3	28 million €	2017-2023.	76	A, B, C, (depending on relevant subproject of power line reconstruction)
42	Biomass fired boiler house 2x1.25MW construction in the settlement Tivol in Ruma	1.6 million €	not defined	76	2b
43	Thermal rehabilitation of public buildings efficiency in the City of Smederevo (115 buildings)	46 million €	not defined	76	2a
44	Construction of waste and hazardous waste storage facility with infrastructure for: - TPP Nikola Tesla A and B - TPP Kostolac A and B - TPP Kolubara A - TPP Morava - HPP Drinsko-Limske (8 locations) - HPP Đerdap (8 locations) (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	27 million €	not defined	76	2b

45	Construction of waste and hazardous waste storage facility with infrastructure for EPS distribution branches (20 locations)	50 million €	not defined	76	2b
46	Biomass CHP Energy Plant in Šabac	17 million €	not defined	76	2b
47	The project reinforcement of overhead and underground (cable) 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level - P.4	20.9 million €	2017-2021.	71	A, B, (depending on relevant subproject of power line reconstruction)
48	Project "Distribution network automation" - P.6	10.5 million €	2017-2023.	71	A, B (subproject depending on the automation that is being implemented)
49	New biomass fired CHP boiler house 4.0 MW construction in Pećinci	9 million €	not defined	71	2b
50	New ash handling system at TPP Nikola Tesla A (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	55 million €	2020-2021.	67	2a
51	Adaptation of the landfill according to EU Landfill Directive: - TPP Nikola Tesla A, - TPP Nikola Tesla B, - TPP Kolubara A, - TPP Morava (part of the project of environmental protection in the sector of the electricity production from EPS's power plants - P.9)	55 million €	not defined	67	2a
52	Enhancing of energy efficiency and usage of RES in primary schools and public buildings in the City of Kraljevo area	1 million €	not defined	67	2a

* Incorrectly stated value of the project "SO2 emission reduction at the TPP Kostolac A, unit A2" of 4 million € in the Single Project Pipeline in the Field of Energy. It is a material error that will be corrected in the updated Single Project Pipeline in the Field of Energy.

Remarks: Number of points for projects that are included in the Program is calculated by weighting the number of points calculated on the basis of the Strategic Relevance Assessment Criteria in the Energy Sector [61] with the same weight as for Single Project Pipeline in the Field of Energy.

Definition of groups based on the Gap Assessment Report:

Group 1 - prepared for tender process and implementation of investment:

Group 1a - projects with complete technical documentation, ready for preparation or implementation of the tender procedure;

Group 1b - projects with technical documentation in preparing process and after the technical documentation preparation ready for tender procedure.

Group 2 - prepared for preparation of technical documentation:

Group 2a - projects completed planning documentation and accompanying prerequisites for resolving property issues;

Group 2b - projects with gaps in spatial planning documents and unfulfilled preconditions for resolving of property issues.

Definition of project maturity for implementation in accordance with the assessment method is defined in the Questionnaire [62]. Scores are descriptive, uppercase letters A-D and their meaning is as follows:

A - prepared to call a tender procedure for construction works,

B - prepared for preparation of missing technical documentation,

C - minor shortcomings need to be addressed prior to the preparation of technical documentation,

D - significant shortcomings need to be addressed before preparation.

Projects that consist of several subprojects can contain different score values of the maturity of projects for implementation which relate to the different subprojects within the project.

Table 130: Prioritization of projects in accordance with recognized indicators of objectives achievement from the Energy Development Strategy of the Republic of Serbia

Rank	Order Number	Project Name	Number of Residents Representing Increased Security of Supply or Quality of Delivered Energy Products	Import Dependence Reduction and Creation of Conditions for Net Exports of Energy and Energy Products	Renewable Energy Sources	The Development of Energy Markets and Improvement of Competition	Projects of Regional and Broader Significance	Energy Efficiency	Environmental Protection	The Diversification of Routes and Sources of Supply	The Maturity of the Project for Implementation	The Fulfilment of International Obligations	Total
		Weighting Factor	3	3	3	1	1	2	3	2	3	1	
1	P.15	Project for the construction of new wind power plants at the territory of the Republic of Serbia awarded with the temporary status of privileged producers with power up to 500 MW	2	3	5	5	1	1	5	4	5	5	81
2	P.27	Opening of replacement capacities for existing open cast mines which will stop production and opening of open cast mines dedicated to new thermal power plants	5	5	1	1	1	4	1	2	5	1	66
3	P.29	Introduction of coal quality management system	3	3	1	1	1	4	4	2	5	3	65
4	P.18	Strategic project "Deep refining"	5	1	1	1	1	5	3	1	5	5	64
5	P.5	Project "Improvement of metering infrastructure"	5	1	1	5	1	5	1	1	5	3	60
6	P.2	The "Trans-Balkan corridor" project	3	1	1	5	5	5	1	4	4	1	59
7	P.21	Gas interconnection project Serbia - Bulgaria, the main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria)	2	1	1	5	3	2	2	5	4	3	55
8	P.10	Supply of thermal energy for city of Belgrade from the TPP Nikola Tesla A, via heat pipeline with capacity of 600 MW of heat energy	3	3	1	2	1	3	3	3	2	3	54
9	P.16	The project of transition to boilers on biomass (Germany - RS)	1	1	5	2	1	3	3	3	2	3	54
10	P.19	Project "Construction of the First facility of petroleum product pipeline system"	1	1	1	1	5	4	5	1	4	1	53

Rank	Order Number	Project Name	Number of Residents Representing Increased Security of Supply or Quality of Delivered Energy Products	Import Dependence Reduction and Creation of Conditions for Net Exports of Energy and Energy Products	Renewable Energy Sources	The Development of Energy Markets and Improvement of Competition	Projects of Regional and Broader Significance	Energy Efficiency	Environmental Protection	The Diversification of Routes and Sources of Supply	The Maturity of the Project for Implementation	The Fulfilment of International Obligations	Total
		Weighting Factor	3	3	3	1	1	2	3	2	3	1	
11	P.9	The project of environmental protection in the sector of the electricity production from EPS's power plants	1	3	1	3	1	1	5	1	3	4	51
12	P.30	Introduction of new organization at EPS's open pit mines for purpose of work improvement and higher efficiency of EPS's open pit mines	4	2	1	1	1	3	2	2	3	3	51
13	P.1	The project of construction a new thermo-block in TPP Kostolac B3	2	3	1	1	1	4	2	1	4	1	49
14	P.24	Project for increasing the capacity of Underground storage Banatski Dvor	4	1	1	2	3	2	2	2	3	1	47
15	P.26	More intensive exploration of coal deposits across the whole area of Republic of Serbia	3	2	1	1	1	1	2	2	4	1	45
16	P.7	The project of reconstruction of 110/X kV substations at the end of their life cycle in order to increase security of supply and increase the efficiency of electricity distribution at 110 kV voltage level	4	1	1	1	1	2	1	1	4	1	42
17	P.23	Gas interconnection project Serbia - Romania, pipeline Mokrin - Arad (border with Romania)	2	1	1	5	3	2	2	4	1	1	42
18	P.25	Construction of main, delivery and distribution pipelines	3	1	1	2	1	3	2	1	3	1	42
19	P.28	Optimization and concentration of underground coal production	1	1	1	1	1	2	3	1	4	3	41
20	P.20	Project "Establishing the mandatory stocks of crude oil and/or petroleum products"	5	1	1	3	1	1	1	1	1	5	40

Rank	Order Number	Project Name	Number of Residents Representing Increased Security of Supply or Quality of Delivered Energy Products	Import Dependence Reduction and Creation of Conditions for Net Exports of Energy and Energy Products	Renewable Energy Sources	The Development of Energy Markets and Improvement of Competition	Projects of Regional and Broader Significance	Energy Efficiency	Environmental Protection	The Diversification of Routes and Sources of Supply	The Maturity of the Project for Implementation	The Fulfilment of International Obligations	Total
		Weighting Factor	3	3	3	1	1	2	3	2	3	1	
21	P.22	Gas interconnection project Serbia - Croatia, main gas pipeline MG 08 Gospođinci (Futog) - Sotin (Croatian border)	2	1	1	5	3	2	2	3	1	1	40
22	P.8	The project for construction of new substations 110/X kV in order to increase security of supply and increase the efficiency of electricity distribution	2	1	1	1	1	3	1	1	3	1	35
23	P.3	The project of reconstruction of 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level	2	1	1	2	1	2	1	1	3	1	34
24	P.6	Project "Distribution network automation"	1	1	1	1	1	1	1	1	5	1	34
25	P.4	The project reinforcement of overhead and underground (cable) 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level	1	1	1	2	1	3	1	1	3	1	33

Remarks: Shaded fields represent projects for which funding is provided or the provision of financing is in progress, i.e., it is certain that funding will be provided.

Abbreviations: SPPFE - Single Project Pipeline in the Field of Energy

PECI - Projects of Energy Community Interest

PMI - Projects of Mutual Interest

PCI - European Commission Projects of Common Interest

WBIF - Western Balkans Investment Framework projects list

CESEC - Central and South Eastern Europe Gas Connectivity projects list

WB6 - Western Balkans 6 Initiative projects list

Germany - RS - group of projects that were allocated funds under several rounds of bilateral negotiations between the Government of the Federal Republic of Germany and the Government of the Republic of Serbia.

Table 131: Rank list of projects in accordance with recognized indicators of objectives achievement from the Energy Development Strategy of the Republic of Serbia, with explanations of individual contributions to strategic priorities and objectives and recognized advantages and disadvantages of projects

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
1	P.15	Project for the construction of new wind power plants at the territory of the Republic of Serbia awarded with the temporary status of privileged producers with power up to 500 MW	81	1. Responsible Entity: Private investors, EPS 2. Project Description: The project includes the construction of seven new wind farms of various forces that will provide a total annual production of 1,303 GWh, which makes that renewable sources provide a significant 1.2% of gross final energy consumption of the Republic of Serbia. The project implements more private investors and it is of strategic importance for the Republic of Serbia for achieving the objectives defined for the share of renewable energy in gross final energy consumption of the Republic of Serbia. 3. The Strategic Relevance: The project contributes to ensuring security of electrical energy supply, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: For most subprojects technical documentation is prepared, or in the final stages. Construction of the first wind farms is expected to begin during 2017. 5. Sources of Funding: Situation with the sources of financing of these facilities is not known.	706 million €	2017-2020.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
2	P.27	Opening of replacement capacities for existing open cast mines which will stop production and opening of open cast mines dedicated to new thermal power plants	69	1. Responsible Entity: EPS 2. Project Description: The project contributes to a safe and reliable supply of new and existing coal thermal electricity capacity. It consists of several subprojects whereby, in the period of implementation of the Program going to be realized an increase in capacity of opencast Drmno in Kostolac basins from existing 9 to 12 million tons of coal per year due to the construction of a new block of the Kostolac B3 350 MW power plant, while in Kolubara basin: increasing the capacity of the fields C in the function of opening of the E, opening of the field E as replacement capacity to open pit mine field C and the field D, opening of open pit mine field G as replacement capacity to open pit mine Veliki Crljeni, as well as opening of pit mine Radljevo in order to unify the quality of coal and at a later stage as replacement capacity to open pit mine Tamnava west field. 3. The Strategic Relevance: The project contributes to ensuring security of electricity supply, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: For some subprojects technical documentation has been prepared, while foe other subproject is in preparation. 5. Sources of Funding: Sources of financing were contracted for individual subprojects and for others are in the planning stage.	1,125 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
3	P.29	Introduction of coal quality management system	65	1. Responsible Entity: EPS 2. Project Description: The project contributes to increasing the productivity of plants by 5%, which means an increase in power production to 180 MW, reducing losses of 370 GWh, opportunities low quality coal exploitation and environmental protection (preventing self-combustion of coal disposed in landfills). Project consists of three subprojects that are in various stages of execution. During the implementation of a subproject, is carried out the preparation of documents for the realization of the next subprojects, with implementation of experiences, and thus facilitates the financing will. 3. The Strategic Relevance: The project contributes to ensuring security of electrical electricity, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: For two subprojects technical documentation is prepared, while for the third stage is in the preparation. 5. Sources of Funding: For two subprojects are provided sources of funding and not yet for the third subproject.	150 million €	2017-2020.
4	P.18	Strategic project "Deep refining"	64	1. Responsible Entity: NIS 2. Project Description: This project will enable an increase in the depth of processing (at 92%) and increased production of white products (to 85.8%), while improving and increasing the efficiency of the treatment process, increasing plant availability and maximize levels of optimization of energy costs in the Oil Refinery Pančevo. After the level of energy intensity it will be equated with the world's leading refineries. 3. The Strategic Relevance: The project contributes to ensuring security of supply of petroleum products, petroleum products market development and transition to sustainable energy. 4. Preparedness of Documentation: The project is in the final stage of preparation before implementation - necessary permits need to be provided. 5. Sources of Funding: Funding for the project was secured from own funds and NIS.	330 million $	2017-2019.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
5	P.5	Project "Improvement of metering infrastructure"	60	1. Responsible Entity: EPS 2. Project Description: The objective of the project is the replacement of worn-out measuring infrastructure and implementation of modern systems for remote reading and load management, and information systems that allow the use of the data collected. The project is being implemented in phases, through the replacement of electric meters and implementing the system in areas where it is carried out prior preparation and recording of the existing situation. 3. The Strategic Relevance: The project contributes to ensuring security of electricity and the development of the electricity market. 4. Preparedness of Documentation: The project is implemented in stages, wherein the documentation has been prepared for the rapid implementation of the first stage. Remaining technical documentation will be prepared during the implementation of the first stage, in order to incorporate experience gained in the first stage implementation. 5. Sources of Funding: Funding for the project was provided.	80 million €	2017-2022.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
6	P.2	The "Trans-Balkan corridor" project - phase 1	59	1. Responsible Entity: EMS 2. Project Description: Project, which consists of two phases in which is being implemented more subprojects of building new 400 kV power lines (in the 1st stage four sections is carried out) and connecting and switching substations, enables an increase in transmission capacity of the transmission network of Serbia, the replacement of worn-out 220 kV network, easier connection of production and storage capacities of electricity and better integration of the electricity market. 3. The Strategic Relevance: The project contributes to ensuring security of electrical electricity, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: Project is being implemented in phases, whereby certain sections are being built, some are pending the provision of the necessary permits, for some is on-going preparation of spatial planning and technical documentation, and for some this development has yet to begin, which makes it possible to facilitate the possibility of financing and implementation of the project itself. 5. Sources of Funding: Funding is provided for the first section, which is under construction (EMS own funds). For the second section, also provided additional funding through WBIF and credit. For others funding sources are not yet secured. It is also applied for investment grant WBIF and approval pending.	156.2 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
7	P.21	Gas interconnection project Serbia - Bulgaria, the main gas pipeline MG-10 Niš - Dimitrovgrad (border with Bulgaria)	55	1. Responsible Entity: PE Srbijagas 2. Project Description: Main gas pipeline MG-10 Niš - Dimitrovgrad represents the infrastructural basis for the establishment of a gas interconnection with Bulgaria. Primary technical elements of the gas pipeline are pipeline (a single pipe pipeline 109 km in length with a diameter of DN 700, technical capacity of 1.8 billion m^3/year and maximum working pressure of 55 bar), facilities and associated infrastructure. 3. The Strategic Relevance: Project contributes to the security of gas supply and gas market development. 4. Preparedness of Documentation: Planning and technical documentation for the implementation is not fully prepared. 5. Sources of Funding: Sources of funding are not provided, but the project is submitted for funding through the national IPA 2017 Improvement and approval of the Action document is in progress.	85.5 million €	2017-2020.
8	P.10	Supply of thermal energy for city of Belgrade from the TPP Nikola Tesla A, via heat pipeline with capacity of 600 MW of heat energy	54	1. Responsible Entity: PUC "Beogradske elektrane", EPS 2. Project Description: The projected capacity of 600 MWt heating pipeline provide heat for more than 50% of the consumption of heating plant Novi Beograd. A complementary project is to connect the large and more efficient heating plants (Novi Beograd, Dunav, Konjarnik ...) into a single system for supplying consumers as well as installation of the thermal energy storage system. District heating system Belgrade will be potentially supplied with 600 MWt from blocks A3 to A6 TENT-A, which will decrease available power of TENT A approximately 150 MWe. 3. The Strategic Relevance: The project contributes to ensuring security of supply of thermal energy, the development of the energy market and the transition to sustainable energy. 4. Preparedness of Documentation: Planning and technical documentation for the implementation is not fully prepared 5. Sources of Funding: Sources of funding are not provided.	165 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
9	P.16	The project of transition to boilers on biomass	54	1. Responsible Entity: PUC "Beogradske elektrane" 2. Project Description: Several projects prepare to introduce biomass or geothermal in use as fuel in heating plants, with expected total power of 105 MW and an annual output of 21,000 toe. These objectives will be implemented through the activities within the project "Promotion of renewable energies - developing the biomass market in Serbia", as well as through individual commercial projects. 3. The Strategic Relevance: The project contributes to ensuring security of supply of thermal energy, the development of the energy market and the transition to sustainable energy. 4. Preparedness of Documentation: Projects are in the initial stage from the aspect of the preparation of the spatial planning and technical documentation. 5. Sources of Funding: Sources of funding are partially secured for boilers involved in the project "Promotion of renewable energies - developing the biomass market in Serbia".	100 million €	2017-2021.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
10	P.19	Project "Construction of the First facility of petroleum product pipeline system"	53	1. Responsible Entity: PE Transnafta 2. Project Description: Construction of the First Facility of the Products Pipeline System is envisaged in three phases: construction of a product pipeline linking the oil refinery in Pančevo and existing storage tanks in Smederevo and Novi Sad, construction of new storage tanks in Pančevo and Smederevo and providing conditions for further transportation. The starting point is the terminal in Pančevo, from which branch off two directions: south - to Smederevo (26.9 km) and the north - to Novi Sad (90.3 km). Building a system of product pipeline through Serbia is to provide an economical, efficient and environmentally favourable manner of transport petroleum products produced by the oil refinery in Pančevo. 3. The Strategic Relevance: The project contributes to ensuring security of supply of petroleum products and the transition to a sustainable energy. 4. Preparedness of Documentation: Planning documentation is complete, and Feasibility Study with the Basic Design and Environmental Impact Assessment for the construction of the first facility of the products pipeline system (section Pančevo - Smederevo and Pančevo - Novi Sad) is carried out. 5. Sources of Funding: Funding for the project was secured from the Transnafta funds.	30 million €	2017-2022.
11	P.9	The project of environmental protection in the sector of the electricity production from EPS's power plants	51	1. Responsible Entity: EPS 2. Project Description: The project includes thirteen subprojects intended for reduction in emissions of harmful gases SO_2 and NOx, their reduction in permissible limits, resolving the problem of ash handling, waste storage and treatment of waste water in locations of particular generating capacity in EPS. 3. The Strategic Relevance: The project contributes to ensuring security of electrical electricity, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: For some sub-projects planning and technical documentation is prepared, while for some is in the preparation phase. 5. Sources of Funding: Funding for the project has not been provided.	484.5 million €	2018-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
12	P.30	Introduction of new organization at EPS's open pit mines for purpose of work improvement and higher efficiency of EPS's open pit mines	51	1. Responsible Entity: EPS 2. Project Description: EPS with the consulting firm Boston Consulting Group defined a set of necessary measures in order to coal production to be efficient and profitable, the price of energy produced competitive in the world market and to reduce operating costs all in order to secure supply of power plant coal of appropriate quality. There have been defined nine subprojects to be implemented within the project. 3. The Strategic Relevance: The project contributes to ensuring security of electrical electricity, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: This project is in its initial implementation stage. 5. Sources of Funding: Funds for financing will be provided from own resources of EPS.	33.6 million €	2017-2020.
13	P.1	The project of construction a new thermo-block in TPP Kostolac B3	49	1. Responsible Entity: EPS 2. Project Description: The project of building a new block in Kostolac B3 includes the construction of the third block of 350 MW in TPP Kostolac B, whose annual production will be 2,200 GWh and expansion of open pit mine Drmno, i.e. increase of coal production from 9 to 12 million tons per year. 3. The Strategic Relevance: The project contributes to ensuring security of electrical electricity, the development of the electricity market and the transition to sustainable energy. 4. Preparedness of Documentation: Preliminary design is completed and approved by the National Review Committee in 2014. Amendment of preliminary design is in progress, due to the changed conditions by the Chinese partner. The drafting and review of the Project for building permit is in progress. 5. Sources of Funding: For this project, the source of funding is provided: 85% of the loan of Chinese EXIM Bank, and 15% from EPS own funds.	715.6 million $	2017-2020.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
14	P.24	Project for increasing the capacity of Underground storage Banatski Dvor	47	1. Responsible Entity: Natural gas storage operator (Underground gas storage Banatski dvor Ltd. Novi Sad) 2. Project Description: Project includes the extension of underground storage of natural gas in Banatski Dvor from the current capacity of 450 million m^3 to the capacity of 800 million - 1 billion m^3 with a maximum technical production capacity of 9.96 million m^3/day (415,000 m^3/h) and the maximum technical and injection capacity of 5.52 million m^3/day (230,000 m^3/h). 3. The Strategic Relevance: Project contributes to ensuring the security of natural gas supply. 4. Preparedness of Documentation: Extending underground storage capacity is at the level of general design, which means that planning and technical documentation for implementation has yet to be formed. 5. Sources of Funding: Funding for the project has not been provided.	65 million €	2020-2023.
15	P.26	More intensive exploration of coal deposits across the whole area of Republic of Serbia	45	1. Responsible Entity: EPS 2. Project Description: The project includes exploration of coal deposits, which will in the future provide replacement capacity for exploitation. Intensification of exploration provides reliable information for further planning of coal mining and thermal power capacity planning. 3. The Strategic Relevance: The project contributes to ensuring security of energy supply. 4. Preparedness of Documentation: This project is at a mature stage of implementation, and it is only necessary to intensify further activities. The funds are planned to the existing documentation. 5. Sources of Funding: For the individual stages sources of funding are provided, and for the others are in the planning stage. The project is financed from own resources of EPS.	12.6 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
16	P.7	The project of reconstruction of 110/X kV substations at the end of their life cycle in order to increase security of supply and increase the efficiency of electricity distribution at 110 kV voltage level	42	1. Responsible Entity: EPS 2. Project Description: The project includes reconstruction of 34 substations 110/X kV, which are at the end of their life cycle, with the total installed capacity in the planning period 2,638 MVA. This involves the replacement of old equipment and adjustment capacity of substation to existing and prospective conditions in the distribution network. It is mainly about the objects that are older than 40 years, whose position in the network is significantly altered compared to the moment of their entry into operation. 3. The Strategic Relevance: The project contributes to ensuring security of energy supply. 4. Preparedness of Documentation: The project is implemented in stages, wherein the documentation has been prepared for the realization of the first phase. Remaining technical documentation will be prepared during the implementation of the first phase, in order to incorporated experience gained in the implementation. 5. Sources of Funding: For the first phase (five substations) sources of funding are provided - World Bank loan, while for the others have not been provided.	80.4 million €	2017-2023.
17	P.23	Gas interconnection project Serbia - Romania, pipeline Mokrin - Arad (border with Romania)	42	1. Responsible Entity: PE Srbijagas 2. Project Description: Main gas pipeline Mokrin - Arad represents the infrastructural basis for the establishment of a gas interconnection with Romania. The primary technical elements of the gas pipeline is pipeline (one-pipe pipeline 6 km in length with a diameter DN 600, technical capacity of 1.6 billion m^3/year and maximum operating pressure of 50 bar), the facilities that are an integral part of the pipeline and supporting infrastructure. 3. The Strategic Relevance: The project contributes to the security of gas supply and gas market development. 4. Preparedness of Documentation: Planning and technical documentation for the implementation is not fully prepared. 5. Sources of Funding: Funding for the project has not been provided.	6 million €	2022-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
18	P.25	Construction of main, delivery and distribution pipelines	42	1. Responsible Entity: PE Srbijagas, Yugorosgaz ad., Distribution system operators 2. Project Description: Within the framework of the project is planned to construct two main pipeline (Leskovac - Vladičin Han - Vranje, 70.7 km in length and Itebej - Beograd Jug 130 km in length), distribution pipeline (Aleksandrovac - Tutin 121 km in length) as well as distribution pipelines depending on the gas market development. 3. The Strategic Relevance: The project contributes to the security of gas supply and gas market development. 4. Preparedness of Documentation: Planning and technical documentation for the implementation is not fully prepared. 5. Sources of Funding: Funding for the project has not been provided.	378 million €	2017-2023.
19	P.28	Optimization and concentration of underground coal production	41	1. Responsible Entity: PE for Underground Coal Mining Resavica 2. Project Description: For a Public Enterprise for Underground Coal Mining Resavica reorganization program is currently drafting, whose implementation will start immediately after the harmonization and adoption by the Government of the Republic of Serbia. This program will define in more detail which mines is going to be close considering the reserves that are largely at the end of exploitation and because the economic indicators do not show the trend of revenue growth. Mines that have raw potential and the possibility that with the investment achieve the trend of revenue growth are going to be defined. 3. The Strategic Relevance: The project contributes to ensuring security of supply of coal and electricity and the transition to sustainable energy. 4. Preparedness of Documentation: This project is in the initial stage of the realization with well-defined periods of implementation of certain activities. 5. Sources of Funding: Funding for the project was provided in part by the Budget of the Republic of Serbia, partly from the company own funds and partly has not yet been provided.	not defined	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
20	P.20	Project "Establishing the mandatory stocks of crude oil and/or petroleum products"	40	1. Responsible Entity: Ministry in charge of mining and energy 2. Project Description: The project arose from the need to form mandatory reserves of oil and petroleum products in the period 2015 - 31.12.2022., starting from the reserves in a quantity for 9.5 days in the year of 2015 up to the quantity of average consumption in sixty-one day period or in quantity that is equal to the ninety days net import (depending on which of them is the greater). The structure of mandatory reserves will be determined for each year and will be represented by oil derivatives whose common representation, expressed in crude oil equivalent, is equal to at least 75% of the total domestic consumption from the previous year. The project encompasses revitalization of certain number of derivatives storages that belong to the Military of Serbia, as well as the construction of new storages by PE Transnafta and the Republic Directorate for Commodity Reserves. 3. The Strategic Relevance: The project contributes to ensuring security of supply of oil and petroleum products. 4. Preparedness of Documentation: This project is in the initial stage of the realization with well-defined periods of implementation of certain activities. 5. Sources of Funding: Funding for the project was provided in part by the Budget of the Republic of Serbia, partly from the PE Transnafta own funds and the Republic Directorate for Commodity Reserves and partly has not yet been provided	12 million €	2017-2022.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
21	P.22	Gas interconnection project Serbia - Croatia, main gas pipeline MG 08 Gospođinci (Futog) - Sotin (Croatian border)	40	1. Responsible Entity: PE Srbijagas 2. Project Description: Main gas pipeline MG-08 Gospođinci (Futog) - Sotin represents the infrastructural basis for the establishment of a gas interconnection with the Republic of Croatia. The primary technical elements of the gas pipeline is pipeline (95 km in length with a diameter of DN600, technical capacity of 1.5 billion m^3/year and maximum operating pressure of 75 bar), the facilities that are an integral part of the pipeline and the supporting infrastructure. 3. The Strategic Relevance: The project contributes to the security of gas supply and gas market development. 4. Preparedness of Documentation: Planning and technical documentation for the implementation is not fully prepared. 5. Sources of Funding: Funding for the project has not been provided.	32 mil. €	2021-2023.
22	P.8	The project for construction of new substations 110/X kV in order to increase security of supply and increase the efficiency of electricity distribution	35	1. Responsible Entity: EPS 2. Project Description: The project encompasses the construction of the 35 new substations 110/X kV, with total installed power of 1,789 MVA in the planning period. These substations take the function of previously uneconomically loaded medium voltage network, solve the problem of unsecure power supply from the existing substations 110/X kV and 35/X kV, problems of high losses and poor voltage conditions in the medium voltage network. Construction of a new substations 110/X kV has been intensified in the last 5-10 years. 3. The Strategic Relevance: The project contributes to ensuring security of electricity supply and the transition to sustainable energy. 4. Preparedness of Documentation: The project is implemented in stages, wherein the documentation has been prepared for the realization of the first stage. Remaining technical documentation will be prepared during the implementation of the first stage, in order to incorporate experience gained in the implementation. 5. Sources of Funding: Sources of funding are only partially provided from EPS own funds.	115.1 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
23	P.3	The project of reconstruction of 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level	34	1. Responsible Entity: EMS 2. Project Description: Over 2 000 km of overhead power lines in 110 kV transmission network was built more than 50 years ago. The project encompasses gradual reconstruction of power lines, starting from the lines which are in particularly bad condition and also have an important function in the network. It is anticipated annual reconstruction of 40 km of power lines. 3. The Strategic Relevance: The project contributes to ensuring security of electricity supply and the transition to sustainable energy. 4. Preparedness of Documentation: The project is being implemented in phases, with some sections in phase of reconstruction, some in process of provision of the necessary permits, some in process of preparation of spatial planning and technical documentation, and for some this development has yet to begin, which makes it possible to facilitate the possibility of financing and implementation of the project itself. Bearing in mind that this project is financed from EMS own funds, the project should not have problems with financing. 5. Sources of Funding: Sources of funding are provided from EMS own funds.	28 million €	2017-2023.
24	P.6	Project "Distribution network automation"	34	1. Responsible Entity: EPS 2. Project Description: The subject of the project is the automation of medium-voltage networks through the installation of equipment for remote monitoring and control of 1,050 points in the network and automation of 35/X kV substations through the installation of SCADA system. 3. The Strategic Relevance: The project contributes to ensuring security of energy supply. 4. Preparedness of Documentation: The project is implemented in stages, wherein the documentation has been prepared for the rapid implementation of first stages. Remaining technical documentation will be prepared during the implementation of the first phase, in order to incorporate gained experience. 5. Sources of Funding: Sources of funding are provided from EPS own funds.	10.5 million €	2017-2023.

Rank	Order Number	Project Name	Number of points	Basic Information Regarding Project	Project Value	Period of Realization
25	P.4	The project reinforcement of overhead and underground (cable) 110 kV power lines in order to increase security of supply and increase the efficiency of the transmission of electricity at 110 kV voltage level	33	1. Responsible Entity: EMS 2. Project Description: The project includes the implementation of six subprojects for construction of new transmission lines and cable lines of 110 kV which provides two-sided power supply of so far radially fed 110/X kV substations. At the same time it has been provided economical power transfer across some 110 kV lines. 3. The Strategic Relevance: The project contributes to ensuring security of electricity supply and the transition to sustainable energy. 4. Preparedness of Documentation: The project is being implemented in phases, with some sections in phase of reconstruction, some in process of provision of the necessary permits, some in process of preparation of spatial planning and technical documentation, and for some this development has yet to begin, which makes it possible to facilitate the possibility of financing and implementation of the project itself. Bearing in mind that this project is financed from EMS own funds, the project should not have problems with financing. 5. Sources of Funding: Sources of funding are provided from EMS own funds.	20.9 million €	2017-2021.

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