

PROPOSAL

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 Government 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 Government

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 Coal
- 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 Gigawatt-hours/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 consumers 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 CO₂ 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 bylaws 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	SEPEX	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:		2017.	2018.	2019.	2020.	2021.	2022.	2023.
The project of construction of new thermo-block in TPP Kostolac B3	Responsible entity							
	Organization and project management activities	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	<p>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.</p>	<p>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.</p>
Double 400 kV OHL TS Obrenovac - TS Bajina Bašta - 111 km	<p>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.</p>	<p>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.</p>

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:		2017.	2018.	2019.	2020.	2021.	2022.	2023.
The "Trans-Balkan corridor" project								
Organizational and project management activities	Responsible entity	1-4	2-4	2-4	3-5	3-5	3-5	3, 5
Preparation of spatial planning documentation	EMS	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 mm² to AlFe 3x240 mm², 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	x	x	x
Preparation of spatial planning documentation		40 km									
Preparation of technical documentation		40 km									
Study of the impact on the environment and society		40 km									
Permits		40 km									
Construction		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 mm², 3.98 km);
2. Single 110 kV OHL TS 110/20 kV Bela Crkva - TS 110/35 kV Veliko Gradište (AlFe 240 mm², 34.13 km);
3. Single 110 kV OHL TS 110/35 kV Ljubovija - TS Srebrenica (B&H - AlFe 240 mm², 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 mm², 29.56 km);
5. Single 110 kV OHL TS 110/35 kV Guča - TS 110/35 kV Ivanjica (AlFe 240 mm², 23 km);
6. Double 110 kV OHL TS 220/110 kV Kraljevo 3 - TS 110/35 kV Novi Pazar 1 (2xAlFe 240 mm², 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 ($\approx 0.002\%$ 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 ($\approx 0.0014\%$ 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 ($\approx 0.013\%$ 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, AI 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, AIFe 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), AIFe 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, AIFe 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, AIFe 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, 2xAIFe 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 Srebenica (B&H), AIFe 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:		2017.	2018.	2019.	2020.	2021.	2022.	2023.
Reinforcement of overhead and underground (cable) 110 kV lines	Responsible entity	1-6	1-6	2-6	4-6	5-6		
Organizational and project management activities	EMS	3						
Preparation of spatial planning documentation		1, 5-6	3					
Preparation of technical documentation		1, 2, 4	1-6	3, 5-6				
Permits			1-2	2-6	4-6	5-6		
Construction								

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
<p>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</p>	<p>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))</p>	<p>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.</p>	<p>6.4 million € (€ 4.8 million - reduction of costs of losses - ≈96 GWh per year, € 1.6 million - reduction of reading costs)</p>

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"		2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management activities	Responsible entity	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	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 Čičevac (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, Čičevac 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 consumers 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 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	<p>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;</p> <p>35 kV facility: dismantling of the foundations and switching station equipment and complete construction of the substation with the system of protection and management.</p>	<p>110 kV facility: building permit has been obtained, contractor is selected, works are in progress;</p> <p>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.</p>	<p>110 kV facility: usage permit;</p> <p>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.</p>
TS 110/20 kV Šabac 5	<p>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).</p>	<p>Complete project and building permits are prepared in 2011. The documents need to adapt to the new Law on Planning and Construction.</p>	<p>Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.</p>
TS 110/35/6.3 kV Šabac 1 (the future TS 110/35/20 kV)	<p>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).</p>	<p>Conceptual design and feasibility study have been adopted, tender procedure of equipment procurement has been completed.</p>	<p>The project for building permit, building permit, project for construction, usage permit.</p>

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
<p>TS 110/35 kV Bor 1</p>	<p>In the first stage of reconstruction is planned:</p> <ul style="list-style-type: none"> - 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. <p>In the second stage of reconstruction is planned:</p> <ul style="list-style-type: none"> - replacement of the second 31.5 MVA transformer with a power transformer of 63 MVA; - equipping four new 35 kV feeder cells. 	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>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.</p>
<p>TS 110/35 kV Vranje 1</p>	<p>Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.</p>	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>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.</p>
<p>TS 110/35 kV Kuršumljija</p>	<p>Complete replacement of equipment at the end of their life cycle in the high-voltage and medium-voltage side.</p>	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>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.</p>

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	<p>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.</p>	<p>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.</p>	<p>Project for building permit, building permit, project for construction, usage permit.</p>
TS 110/35 kV Beograd 9	<p>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.</p>	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.</p>

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
<p>TS 110/35 kV Beograd 7</p>	<p>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).</p>	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.</p>

Project	Description of reconstruction	Status of project preparation	Missing planning and technical documentation
<p>TS 110/35 kV Beograd 10</p>	<p>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.</p>	<p>Investment and technical documentations are not available. The project assignment was adopted at the Technical Council of EPS.</p>	<p>Feasibility study, preliminary project, the specification of equipment and works and tender documents, project for building permit, building permit, project for construction, usage permit.</p>

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	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 Arandjelovac 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 Strbobran 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 Krmješevci - 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 Arandelovac 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 Koceljjeva - 1x31.5 MVA	No investment activities. TS is already built as 110/20 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:	Responsible entity	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Construction of new TS 110/X kV	EPS, DSO	24 TS	22 TS	24 TS	21 TS	21 TS	10 TS	8 TS
Organizational and project management jobs		2 TS	13 TS	13 TS	7 TS	5 TS	3 TS	3 TS
The preparation of spatial planning documents		15 TS	14 TS	7 TS	5 TS	3 TS	3 TS	
The preparation of technical documentation		4 TS	2 TS	3 TS	11 TS	2 TS	5 TS	4 TS
Permissions		8 TS	6 TS	6 TS	14 TS	13 TS	7 TS	5 TS
Realization of works			5 TS	3 TS	3 TS	3 TS	11 TS	2 TS
Starting operation								

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 SO₂ 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) SO₂ 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) SO₂ 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) SO₂ 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) SO₂ 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) SO₂ 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 213) 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 (CO₂ 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 CO₂eq, 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 is 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
<p>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>	<p>165,000,000.00 € The financing model will be determined later</p>	<p>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.</p> <p>The project provides:</p> <ul style="list-style-type: none"> - 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 m³/year); - reducing emissions and improving environmental protection (reduction of CO₂ 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; 	<p>Savings in primary energy of 600 MWt:</p> <ul style="list-style-type: none"> - expressed in the natural gas: 164 940 000 m³/year, - expressed in fuel oil 143 167 920 kg/year. <p>Reduction of CO₂ emissions:</p> <ul style="list-style-type: none"> - 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
<p>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.</p>	<p>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</p>	<p>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;</p>	<p>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 CO₂ emissions: > 25,000 tCO₂ 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.</p>

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
<p>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.</p>	<p>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</p>	<p>The project includes:: - replacement of dilapidated 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;</p>	<p>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.</p>

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
<p>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.</p>	<p>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</p>	<p>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.</p>	<p>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.</p>
<p>Rehabilitation of the district heating system in Serbia - Phase V</p>	<p>30,000,000.00 € from credit 2,000,000.00 € donation</p>	<p>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</p>	<p>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.</p>

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
<p>Promoting the use of renewable energy sources: biomass market development in Serbia (BMZ-ID 201197888)</p>	<p>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 €</p>	<p>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.</p>	<p>Realization of the program will enable:</p> <ul style="list-style-type: none"> - Improving environmental protection by reducing emissions of CO₂ and SO₂ 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
<p>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>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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).</p> <p>For potential further implementation of project it is essential that all participants in the project make necessary business decisions.</p> <p>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.</p>	<p>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.</p>

Project	Status of project preparation	Planning and technical documentation lacking
<p>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> <p>Projects include 28 heating plants in 28 cities and municipalities in Serbia.</p>	<p>A larger number of projects are still in the development phase, and feasibility studies were carried out.</p> <p>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.</p>	<p>Spatial planning study, technical study for obtaining building permits and study of environmental impact.</p>
<p>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> <p>Projects include 16 heating plants.</p>	<p>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.</p>	<p>Spatial planning study, technical study for obtaining building permits and study of environmental impact.</p>

Project	Status of project preparation	Planning and technical documentation lacking
<p>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.</p>	<p>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.</p>	<p>Spatial planning study, technical study for obtaining building permits and study of environmental impact.</p>
<p>Rehabilitation of the district heating system in Serbia - Phase V</p>	<p>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.</p>	<p>Spatial planning study, technical study for obtaining building permits and study of environmental impact.</p>
<p>Promoting the use of renewable energy sources: biomass market development in Serbia (BMZ-ID 201197888)</p>	<p>The project is in its initial stage.</p>	<p>Spatial planning study, technical study for obtaining building permits and study of environmental impact.</p>

Table 31: Dynamics of activities in period of Program implementation

	Responsible institution	2017.	2018.	2019.	2020.	2021.	2022.	2023.
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		x						
Organizational and project management jobs								
Preparation of spatial planning documentation		x						
Preparation of technical documentation		x						
Permissions	Responsible institutions PUC BE, EPS		x					
Realization of construction			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.		2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs	Responsible institution Individual plants in which the project is implemented	x	x					
Preparation of spatial planning documentation		x	x					
Preparation of technical documentation		x	x					
Permissions		x	x		x			
Realization of construction		x	x		x			
Entry into service		x	x		x			

<p>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.</p> <p>Projects include 16 heating plants</p> <p>Organizational and project management jobs</p> <p>Preparation of spatial planning documentation</p> <p>Preparation of technical documentation</p> <p>Permissions</p> <p>Realization of construction</p> <p>Entry into service</p>	<p>Responsible institution</p> <p>Individual plants in which the project is implemented</p>	2017.	2018.	2019.	2020.	2021.	2022.	2023.	
		x	x						
		x	x	x					
		x	x	x					
		x	x	x	x				
		x	x	x	x	x			
		x	x	x	x	x	x		
		x	x	x	x	x	x	x	x
<p>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</p> <p>Organizational and project management jobs</p> <p>Preparation of spatial planning documentation</p> <p>Preparation of technical documentation</p> <p>Permissions</p> <p>Realization of construction</p> <p>Entry into service</p>	<p>Responsible institution</p> <p>Individual plants in which the project is implemented</p>	2017.	2018.	2019.	2020.	2021.	2022.	2023.	
		x							
		x							
		x							
		x	x						
		x	x	x					
		x	x	x					
		x	x	x					

Rehabilitation of the district heating system in Serbia - Phase V - Project includes 16 heating plant		2017.	2018.	2019.	2020.	2021.	2022.	2023.
Organizational and project management jobs	Responsible institution Individual plants in which the project is implemented	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 CO₂eq, 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 ₂ eq)	19,333,265
Projected net reduction of the greenhouse gas emission by using renewable energy sources in transport sector (t CO ₂ eq)	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 ₂ eq)	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 ₂ eq)	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 ₂ eq)	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 ₂ eq)	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 tCO₂/MWh of the produced heat (emission factor from the Energy Strategy), for electricity 1.099 tCO₂/MWh (combined emission factor for electricity production in power system of Serbia: 1.099 tCO₂/MWh (national emission factors for 2017.)) and for fuel 2,954 tCO₂/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.	<p>Consideration of possibility for establishing a support scheme for producers of electricity using RES based on market principles</p>	<ol style="list-style-type: none"> 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 	<p>Government of Republic of Serbia, Ministry in charge of mining and energy</p>	<p>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</p>	<p>2020.</p>	<p>Sector of electrical energy</p>
2.	<p>Consideration of possibilities for establishing a special model of incentives for the participation of citizens in the production of electricity from renewable energy sources</p>	<ol style="list-style-type: none"> 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 	<p>Government of Republic of Serbia, Ministry in charge of mining and energy</p>	<p>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</p>	<p>2020.</p>	<p>Sector of electrical energy</p>

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	<ol style="list-style-type: none"> 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 	<p>Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection, Public Investment Management Office, Local authorities, District heating plants</p>	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	<ol style="list-style-type: none"> 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 	<p>Government of Republic of Serbia, Ministry in charge of finance, Ministry in charge of mining and energy, financial organizations</p>	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	<ol style="list-style-type: none"> 1. Increasing the share of renewable energy sources in the consumption of thermal energy 	<p>Government of Republic of Serbia, Ministry in charge of finance, Ministry in charge of mining and energy</p>	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.	<p>Consideration of the tax and financial incentives to use of energy plantations</p>	<p>1. Increase technically usable potential of biomass in energy purposes</p>	<p>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</p>	<p>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</p>	2021.	Energy sector
7.	<p>Establishment of national scheme verification of the fulfilment of sustainability biofuels</p>	<p>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</p>	<p>Government of Republic of Serbia, Ministry in charge of mining and energy, Ministry in charge of agriculture and environmental protection</p>	<p>Established a nationwide scheme of verification fulfilment of the sustainability biofuels</p>	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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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.	<p>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</p>	<p>1. Simplification of the administrative procedures and elimination of administrative barriers</p>	<p>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</p>	<p>The electronic services on the portal E-government</p>	<p>2019.</p>	<p>Sector of electrical energy</p>

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	<ol style="list-style-type: none"> Increase of production from renewable energy sources 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	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 Čelije), 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, Huysenallee 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.