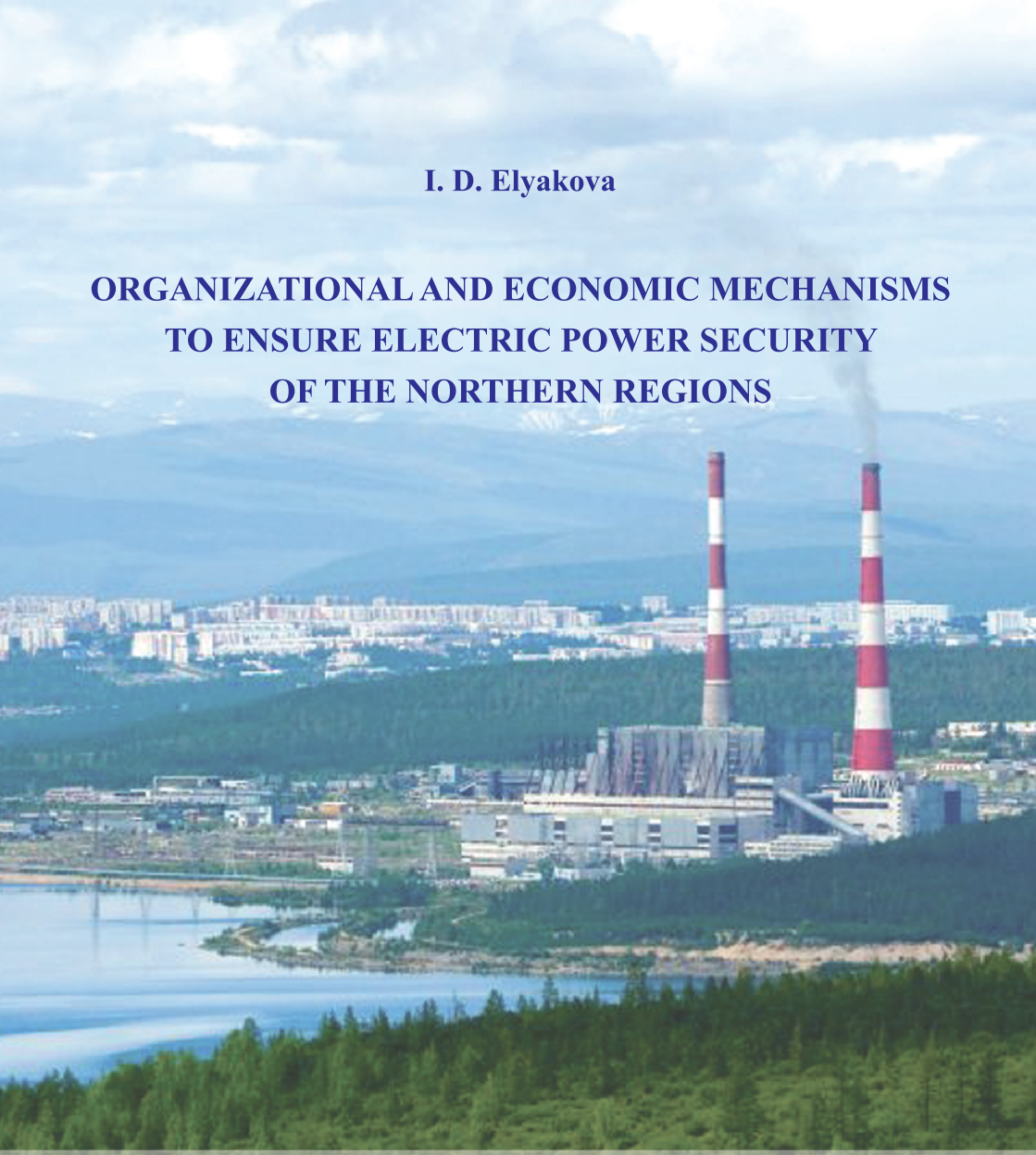
I. D. Elyakova

ORGANIZATIONAL AND ECONOMIC MECHANISMS TO ENSURE ELECTRIC POWER SECURITY OF THE NORTHERN REGIONS



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
M.K. AMMOSOV NORTH-EASTERN FEDERAL UNIVERSITY

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ORGANIZATIONAL AND ECONOMIC MECHANISMS TO ENSURE ELECTRIC POWER SECURITY OF THE NORTHERN REGIONS

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The monograph explores the theoretical and methodological foundations of the regional electric power security system; proposes the interpretation of the electric power security. It also sets forth the major issues and trends in the development of the regional power sector. Considerable attention is paid to the role of electric power in improving the energy security of the Republic of Sakha (Yakutia) and economically sustainable development of the region, including fuel - energy system. The study proposes a classification of threats to ensure electric power security of the Republic's energy districts and a system of electric power indicators of the region. Furthermore, it develops and formulates the conceptual foundations of organizational and economic mechanisms to ensure electric power security of the Republic of Sakha (Yakutia). The book contains an assessment of the economic potential of the Republic of Sakha (Yakutia), reviews the prospects for growth in the consumption of electric energy in the long term, taking into account the development of the economy of the northern region.

The monograph is intended for scientists and specialists of the economy of the northern regions, for graduate and undergraduate students of higher educational institutions of power industry, as well as for a wide range of readers.

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CONTENTS

INTRODUCTION

The reliable operation of the energy sector is a prerequisite for the normal life of society, an important driver of economic growth and is one of the elements of national security. Today, more than ever, all the regions are concerned not only with how to provide their territories with energy sources, but also how to do it at the least cost and with the greatest impact, therefore, with the most efficient production and use of electric power.

Energy security is a rather complex, multifaceted concept. However, until recently, studies conducted in the field have been limited solely to the technical aspects of the problem, which, in general, fit into the theory of reliability of energy systems. Only in the transition period, due to the worsening crisis in the economy, there emerged a need for a broader, integrated approach to energy security, taking into account the influence of the energy factor on the economic security of the country and its regions.

The main factors negatively affecting the state of the power industry of the Republic of Sakha (Yakutia) are as follows: high depreciation of fixed assets and losses in electric networks, lack of intra-regional electric connections between the three power districts of the republic, high cost of diesel fuel for power plants and primary energy resources, shortage of investment resources and inefficiency of their use, low innovation potential of energy companies, existence of cross-subsidization of energy consumers, and lack of incentives to provide energy efficiency and reduce energy intensity of the economy.

The relevance of the study of the theoretical and methodological foundations of the electrical energy security of the northern region and the insufficient knowledge of electrical energy security make it necessary to search for organizational and economic mechanisms for ensuring electrical energy security and justify their formation at the regional level with the consideration of specific aspects of areas of the North. In order to achieve sustained economic growth of the northern territories it is necessary to develop effective organizational and economic mechanisms to ensure electrical energy security of the region.

The problems of energy security have been studied by numerous research institutes of the country, independent scholars and experts. Currently, these issues in the academic institutions of the energy complex of Russia are being dealt with by

groups of scientific research institutions, such as: the Energy Research Institute of Russian Academy of Sciences (Moscow), led by academician A.A. Makarov; the L.A. Melentyev Institute of Energy Systems of the SB RAS (SEI SB RAS) (Irkutsk), led by Associate Member of the RAS N.I. Voropay; the Institute of Socio-Economic and Energy Problems in North Komi Scientific Center of the Ural Branch of the Russian Academy of Sciences (Syktyvkar), led by Doctor of Engineeering Yu.Ya. Chukreyev; the Institute of Energy Strategy (Moscow), led by Doctor of Physical and Mathematical Sciences Professor V.V. Bushuyev; the Institute of Economics and Industrial Engineering SB RAS (Novosibirsk), led by Academician V.V. Kuleshov; the Academician V. P. Larionov Institute of Physical and Technical Problems of the North (Yakutsk), led by Corresponding Member of RAS M.P. Lebedev.

Significant contribution to the development of the theory and practice of energy security has been made by S.V. Biryukov, L.L. Bogatyrev, L.Yu. Bogachkova, V.V. Bushuyev, N.I. Voropay, V.A. Volkonsky, L.D. Gitelman, V.P. Goryunov, P.V. Goryunov, V.I. Denisov, A.M. Karyakin, S.M. Klimenko, E.M. Kosmatov, V.V. Kudryavyi, A.I. Kuzovkin, A.A. Kuklin, V.V. Kuleshov, V.P. Kutovoy, A.A. Makarov, A.M. Mastepanov, L.B. Melamed, L.A. Melentyev, V.V. Morozov, A.L. Myzin, A.S. Nekrasov, V.R. Okorokov, R.V. Okorokov, N.A. Petrov, V.A. Rylsky, V.I. Ryasin, V.A. Savelyev, V.V. Sayenko, B.G. Saneyev, V.K. Sengachev, S.M. Senderov, G.B. Slavin, A.P. Troitsky, Ya.M. Urinson, M.B. Cheltsov, Yu.K. Shafrannik, Ye.V. Yarkin and many others.

Considerable contribution to the development of the theoretical and methodological aspects of the regional economics have been made by the works of the following scientists: A.A. Adamesku, M.K. Badman, N.V. Beketov, Kh.N. Gizatullin, A.G. Granberg, Ye.G. Yegorov, E.I. Yefremov, V.D. Kalashnikov, S.N. Leonov, N.V. Lomakina, P.A. Minakir, N.N. Nekrasov, A.S. Novoselov, N.V. Okhlopkova, N.A. Petrov, A.A. Popov, N.M. Ratner, A.A. Rumyantsev, A.I. Tatarkin, D.V. Shopenko. From the standpoint of the theory of large power systems generally recognized are scientific views of the formation of the national fuel and energy complex of scholars such as L.S. Belyaev, N.I. Voropay, Yu.D. Kononov, A.A. Makarov, L.A. Melentyev, A.S. Nekrasova, Yu.N. Rudenko, B.G. Saneyev.

Despite the enormous importance of electrical energy security for the regions and the large number of scientific and practical studies on the problems of energy security, some problems are not well understood and many institutional and economic challenges remain unsolved. For example, there is no analysis of threats to electrical

energy security of a region in the North of Russia; no electrical energy security indicators have been identified for different regions of the country, approaches to its assessment, etc. Problems of electrical energy security in the regions make it necessary to select possible ways and effective tools for its implementation.

The great economic importance of solving the problems of electrical energy security of the northern region, the need to find mechanisms to ensure electrical energy security at the regional level, taking into account the specifics of the North determined the relevance and the choice of the research issue.

The aim of the study is to provide a theoretical and methodological substantiation and conceptualization of organizational and economic mechanisms to ensure the electric energy security of the regions of the North.

The object of research in this paper is the electrical energy complex, the set of interrelated companies providing generation, transmission and distribution of energy, and the electricity supply system of the Republic of Sakha (Yakutia). The subject of the study is the organizational and economic processes of formation of electrical energy security in the northern region.

The monograph explores the theoretical and methodological foundations of the regional electric energy security system; it proposes the interpretation of the electrical energy security of the region, establishes the role of electric power industry in ensuring the reliable operation of the economy and the livelihood of the population. It also sets forth the major issues and trends in the development of the regional power sector. Considerable attention is paid to the role of electric power industry in improving the energy security of the Republic of Sakha (Yakutia) and economically sustainable development of the region, including the fuel-energy system.

The paper reflects the following aspects:

- it describes the theoretical aspects of energy and electrical energy security of the regions; clarifies the concept of “energy security”, formulates the concept of the definition of “electrical energy security of the region”, defines the role and characteristics of the electric power industry of the Republic of Sakha (Yakutia), identifies problems of the regional power sector, which are the main factors threatening the electrical energy security of the northern region, for the whole republic and for each power district;

- sets forth methodological approaches of formation of the electrical energy security in the North, the concept of a priority system to ensure the electrical energy security of the Republic of Sakha (Yakutia) as a factor of reliable functioning of the

economy and the livelihood of the population of the northern region, defines and classifies threats to the electrical energy security of the Republic of Sakha (Yakutia) and its power districts, develops, on the basis of classification of threats, groups and composition of electrical energy security indicators of the republic, formulates the basic monitoring facilities and indicative analysis, proposes management practices that can increase and ensure the electric energy security of the republic and of its energy regions;

- develops and formulates the conceptual framework of organizational and economic mechanisms to ensure electrical energy security of the Republic of Sakha (Yakutia); proposes improvement of the mechanisms; defines the conditions for these mechanisms and the factors influencing them; proposes the conceptual scheme for the implementation of the program complex of long-term development and modernization of electric power industry of the Republic of Sakha (Yakutia); substantiates the creation of an investment fund for the modernization and development of the region's electrical power sector, whose funds can be used for deficit-free electric power development of the North; proposes organizational and economic mechanisms of electrical energy security of power districts of the Republic of Sakha (Yakutia) to prevent and resolve security threats common to all energy regions and specific for each power district in providing electricity energy security of the power districts of the republic; identifies the key perspectives for the development and use of renewable energy sources as a mechanism to ensure electrical energy security in the northern territories of Russia;

- establishes a framework for regulating electricity tariffs as an economic mechanism to ensure electrical energy security of the Republic of Sakha (Yakutia), including the methods of pricing in the regional electricity market; proposes means for improving the tariff policy of the region and the method of state regulation of tariffs; estimates the effect of tariff policy in the power industry of the republic on electric power security in the region; develops a method of regulation of tariffs for electric energy and presents in the form of a logical and structure diagram; estimates the impact of various scenarios of tariff changes on the economy and social sphere of the northern region, taking into account different scenarios for development of the power sector;

- considers prospects for the development of electric power industry as a basis for improving the electrical energy security of the Republic of Sakha (Yakutia): assesses the economic potential of the Republic of Sakha (Yakutia); analyses prospects for a

growth in consumption of electric energy in the long term, taking into account the development of the economy of the region and adjacent territories; defines and substantiates effective principles of regional investment policy in the electric power industry of the Republic of Sakha (Yakutia); gives an estimation of the social and economic impact of organizational and economic mechanisms to ensure the electrical energy security of the republic.

The author expresses her sincere gratitude to Doctor of Economics, Professor of Academy of Natural Sciences and Academician of the Academy of Sciences of Sakha (Yakutia) N.V. Okhlopkova, Doctors of Economics, Professors L.A. Golovanova, V.I. Denisov, V.R. Darbasov, E.I. Yefremov, N.V. Lomakina, N.N. Tikhonov, E.V. Yarkin, Deputy of the State Duma of the Russian Federation K.K. Ilkovsky for their valuable advice and great support in my becoming a scholarly economist – a Doctor of Economics – and in preparation for the publication of this monograph.

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CHAPTER 1. PROBLEMS AND THEORETICAL ASPECTS OF ELECTRIC ENERGY SECURITY IN THE REGION

1.1. The essence of energy security and its importance in the region

In modern conditions the main challenge facing the state is to ensure the national security (NS) of the country. In international practice national security means (in various wordings) the state of protection against internal and external threats to the well-being of the population, rights and freedoms of citizens, economic prosperity, sovereignty and integrity of the state, social and political stability of society, and to the national interests. The official definition of the general concept of "security" is given in the RF Law "On Security", adopted in 1992: "Security is the state of protection of important interests of the individual, society and the state from internal and external threats. The vital interests are a set of requirements satisfaction of which reliably ensures the existence and the possibility of progressive development of the individual, society and the state. Security threats are a set of conditions and factors that endanger the vital interests of the individual, society and the state [5]." Essentially, this definition can also be applied to the concept of "national security."

The mentioned Law implies the need to balance the vital interests of the individual, society and the state, and their mutual responsibility for ensuring security.

National security involves different types of security, including energy security (EnS) of the country, since the energy industry and energy security are closely related, as will be shown below, with many components of national security. Based on the above provisions, with certain reservations, we can group all kinds of security into three important areas:

- security of the individual, including health security;
- security of society and the state;
- economic security, including resource security [20].

The first area includes energy-related environmental, industrial security, as well as personal, property, health and epidemiological, etc. The second area includes energy-related social, internal and foreign policy, information, personnel, and defense (military), demographic security, security of the state border, culture security, etc. Among the components of economic security, apart from energy security, we are

mostly interested in general economic, financial, foreign economic, technological, natural disaster, raw materials, water management, labor resource, as well as food security.

Let us consider the energy aspects of national security, by which we shall mean a system of interconnection of the energy industry and national security. In this system, each relationship characterizes the influence (impact) of the energy industry on the level of one type of security (one component of NS) or the reverse effect of the state of any kind of security on the energy industry. Schematically, these connections are shown in Fig. 1.1.1.

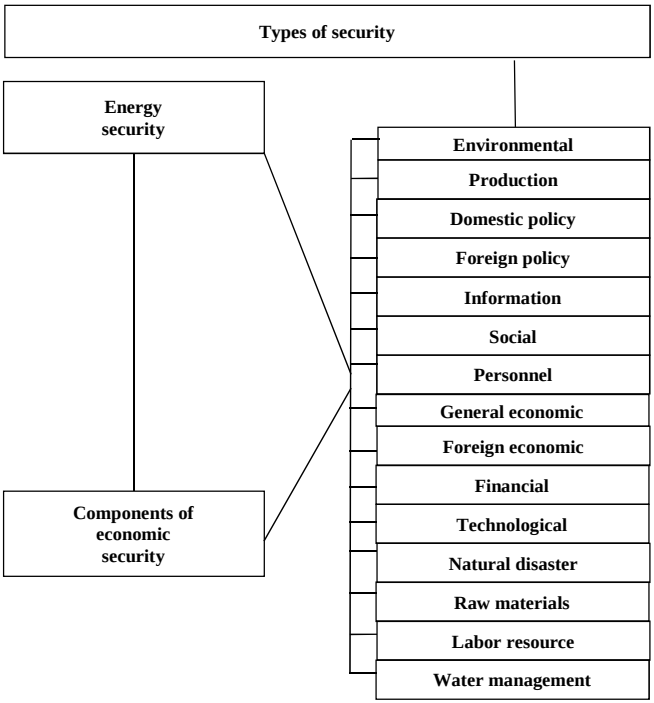


Fig. 1.1.1. The relationship of the energy industry and types of security (the structure of the energy aspects)

Energy security on the mega-level (global level) is a condition of protection of our planet from global threats of exhaustion and lack of fuel and energy resources. Around the world, the explored reserves of fuel resources are diminishing due to their high consumption. Thus, the consumption of oil and oil products per capita in the OECD countries over the past 12 years has increased by 10.4% - from 1742.5 kg to 1923.8 kg. Energy consumption as a whole has grown even faster: over 12 years from 4.1 tons (in oil equivalent) - up to 4.6 [75].

At the macro level (the level of the state) energy security involves ensuring sustainable operation of the fuel and energy sector and the supply of the national economy with its products, the achievement of stable exports, but not at the expense of the needs of one's own economy in the fuel and energy resources.

One third of world reserves of natural gas, 1/10 oil, 1/5 coal and 14% of uranium are concentrated on the territory of Russia [73]. With the country's population of less than 2.5% of the world's population, its geological reserves of energy resources are estimated to be about 30% of the total world reserves. It is plain to see the key role of the energy industry in the economy of any country.

In Russia, which possesses a huge potential of energy and fuel resources and an enormous industrial, scientific and technical potential of the energy sector, it is difficult to overestimate the value of the fuel and energy complex (FEC) in the national economy and its impact on the livelihood and well-being of the population. The exceptional importance of the energy sector in the economy and social sphere of the country, gives every reason to place the issue of energy security at the level of the priority tasks of the Russian state. For any country that depends on the energy factor, energy security is also an indispensable condition for the economic and national security of the state. Consequently, in the system of national and economic security of the Russian Federation, energy security must be understood as one of the most important components of the state policy.

Energy security in the Russian Federation, in essence, is aimed at creating conditions for the reliable operation of all fields of the fuel and energy complex, secure and quality power supply of the consumers with the best possible implementation of the energy saving potential, but is mainly determined by the negative processes of economic, technical, technological, and social nature in the fuel and energy complex of the country [34].

For energy-exporting countries, including Russia, energy security, as a rule, involves ensuring the sustainable operation of the fuel and energy complex and the

supply of the national economy with its products, the achievement of stable exports (but not at the expense of the needs of one's own economy in energy resources), as well as the creation of conditions for successful competition of the country's own energy companies on foreign markets.

The most important component of energy security for countries with a small amount of domestic fuel and energy resources (FER) is reliability, security of external energy supplies. The most important component of energy security for countries with a moderate supply of their own resources is energy independence – the ability to manage, in case of the loss or reduction of external supplies, with its own resources.

The problems of energy security at the meso-level (regional level) and micro-level (the level of utilities), in our view, particularly in terms of economic development perspective of the regions will become more and more urgent, as we should acknowledge the fact of uneven geographical distribution of fuel and energy resources in combination with social and economic, geographical, natural and climatic characteristics of the regions as well as the specifics of the operation of territorial entities and energy enterprises. Today, more than ever, all the regions are concerned not only with how to provide their territories with energy sources, but also how to do it at the least cost and with the greatest impact, therefore, with the most efficient production and use of electric power.

In the northern regions there are objective problems with timely and full provision of the economy and the population with energy resources, which certainly have a negative impact on the process of supplying energy resources to different areas of the country. In most cases, these processes are associated with high costs for northern delivery, complexity and difficulty of delivering energy to consumers, difficult navigation conditions, inefficient deployment of energy resources, remoteness of consumers from the energy sources, etc. These problems of energy security are of paramount importance and relevance for the economy and population of the whole northern region and the country as a whole, so in the North the provision of energy security is the main task of the state at all levels of government.

Thus, we can reasonably argue that it is the regional level where the main problems of energy security of the country emerge, and different scenarios of their solutions should be proposed and implemented by the regions themselves. However, it is impossible to solve all the problems, which often have an objective character, without government intervention. Therefore, it is necessary to adopt and implement

comprehensive programs for the modernization and development of the energy industry of the Russian Federation and its regions, in particular. These programs, in our opinion, should have the status of public document as a guarantor of the energy security of the country and its regions, in particular.

Before considering the concept of “energy security”, it should be pointed out that the “energy industry” (energy economy) refers, on the one hand, to the “complex set of processes of transformation and transmission of energy from the sources of natural energy resources to the receivers of energy inclusive”, i.e. processes of extraction/production, processing, conversion, transportation, distribution and consumption of energy (fuel and energy resources). On the other hand, the energy industry is a “complex of interconnected systems consisting of a set of facilities and installations for receiving, processing, conversion, transportation, storage and use of energy resources and energy products of all kinds in the economy [20]. ”

The key role of energy industry in the provision of operation and development of the productive forces of the country, as well as the life of the population has led to the introduction of the concept of “energy security.” Energy security is a rather complex, multifaceted concept. However, until recently, studies conducted in the field have been limited solely to the technical aspects of the problem, which, in general, fit into the theory of reliability of energy systems. Only in the transition period, due to the worsening crisis in the economy, there emerged a need for a broader, integrated approach to energy security, taking into account the influence of the energy factor on the economic security of the country and its regions. This was due to the significant infrastructural role of the fuel and energy complex in the economy, predetermined by the particular importance of uninterrupted satisfaction of the demand for energy resources - fuel, electricity and heat, without which it is unthinkable in the climatic conditions of Russia to provide the livelihood of the population and the normal functioning of the economic complex, as well as by the contribution of the fuel and energy complex in the formation of the gross domestic product (GDP) and the gross regional product (GRP).

In contemporary literature there is no single interpretation of the term “energy security”, but at the same time, it is possible to single out several major and most well-known approaches to this definition of the concept, which do not contradict, but rather complement each other.

In the most well-known interpretation set out by scientists of the L.A. Melentyev Institute of Energy Systems (ISEM) of SB RAS, energy security is defined as “a state

of protection of vital interests of the individual, society and the state from the threat of shortages in ensuring their needs by economically affordable fuel and energy resources of acceptable quality, as well as from the threat to the supply of fuel and electricity to the consumers [20]."

On the basis of the official interpretation formulated in the "Energy Strategy of Russia for the period until 2030", approved by the Federal Government on November 13, 2009 No. 1715-r, the country's energy security is defined as "the state of security of the country, its citizens, society, state and economy from threats to reliable fuel and energy supply. These threats are determined by external (geopolitical, macroeconomic, market) factors, as well as by the condition and operation of the energy sector of the country." This state of protection corresponds under normal conditions to the satisfaction of the needs of fuel and energy resources in full, the required quality at economical prices, and in emergency situations – to the guaranteed provision of the minimum necessary requirements.

In our opinion, this approach does not reflect the ability of consumers to effectively use the energy resources received, but it reflects the essence and objectives of energy security more fully.

The World Energy Council (WEC) offers the following interpretation of this concept: "Energy security is a belief that energy will be available in the quantity and quality that is required in the present economic conditions." Such a definition is based primarily on the fact that energy security is one of the most important components of the national security of any country, irrespective of each state's inventory of energy resources, available domestically and imported from outside, including those strategically important for these countries.

Another important factor is the price of energy products for their customers, respectively, in our opinion, it is necessary to supplement the definition with this refinement: "at economically acceptable prices and with energy resources of required quality."

In this context, it is noteworthy to mention the interpretation of this definition in the concept of energy security of the Tomsk region: "Energy security is the state of protection of citizens, society and the state from threats, caused by external and internal factors, of shortages in ensuring their reasonable energy needs by economically available resources of acceptable quality under normal conditions and under extraordinary circumstances [139]."

This definition, in our opinion, focuses only on the reliability of power supply, i.e. on the technical side of power supply.

Let us compare the formulations of the definition of “energy security” given by the following scientists and experts:

- Ye.Ya. Sokolov, Doctor of Engineering, Professor, understands the concept of energy security as “ensuring the sustainable operation of the fuel and energy complex and the supply of the national economy with its products, the achievement of stable exports (but not at the expense of the needs of one’s own economy in energy resources), as well as the creation of conditions for successful competition of the country’s own energy companies on foreign markets [154].” This definition contains a mention of competition of energy supplies (economic component), but further it focuses only on the technical component of security of supply of fuel and energy resources.

- V.A. Savelyev, Doctor of Engineering, Professor, offers the following definition: “Energy security is the state of protection of important “energy interests” of the individual, society and the region from internal and external threats. These interests amount to the uninterrupted supply of consumers with affordable fuel and economic resources of acceptable quality [147].”

The last definition, in our opinion, more profoundly reveals the essence of the concept by the requirement of uninterrupted energy supply and protection of consumers against internal and external threats, but at the same time, the emphasis in the definition is put on the technical side, i.e. on the uninterrupted supply of energy and fuel resources.

The main thing, in our opinion, is that all the definitions of the concept of “energy security” describe it at the macro-level, which leads us to an idea of having to specify and complement it at the meso-level as well.

Thus, V.I. Ryasin, Doctor of Economics, Professor, believes that “the energy security of the region should be understood as the characteristics of the fuel and energy complex of the region, which determines the ability of the complex on the basis of the effective use of internal and external resources to provide, in the context of the economic development of the region, the reliable energy supply of economic entities and the population.”

P.N. Maltseva, Candidate of Economics, Associate Professor, offers the following interpretation: “Energy security of the region is the state of protection against internal and external threats, corresponding to the full satisfaction of the

needs of the individual, business, society and the economy of the region in the fuel and energy resources in normal conditions and guaranteed satisfaction in a state of emergency."

In our opinion, for the regional energy sector it is necessary to strengthen this definition with economic components of energy security and address energy security with capabilities of the regional economy.

In our view, the regions of the North are better described by the definition of the concept proposed by Doctor of Economics V.I. Ryasin, according to which in order to manage energy security in the region, first of all, it is necessary to determine the condition of the fuel and energy complex of the region and the ability to attract resources, as well as to conduct analysis of possible consequences of threats and develop measures for their prevention and elimination.

According to the "Energy Strategy of Russia for the period until 2030", "ensuring energy security is determined by the resource adequacy, economic accessibility, environmental and technological affordability. Resource adequacy defines the physical capabilities of the sufficient energy supply of the national economy and population, economic accessibility is the profitability of such supply at the appropriate prices, environmental and technological affordability are the possibility of extraction, production and consumption of energy resources available at each stage of technology and environmental constraints that determine the security of operation of energy facilities."

From the standpoint of the dynamic development of the economy and social sphere of the Russian Federation territories, the implementation of scientific and technical progress in the vital processes of industries and livelihoods of the population that depend on advanced development of each territory especially in the field of electric power, brings about a need to clarify the definition of "energy security of the region", as well as, in our opinion, a need for scientific definitions of "electrical energy security of the region" and "a threat to electrical energy security of the region." The latter is particularly relevant for the northern regions, because that is where the most pressing tasks exist to provide the vast region with electricity and heat in the extreme climatic conditions.

So particular importance should be given to the careful elaboration of issues of regional energy security, both on theoretical and practical levels.

1.2. The role of electric power industry in the regional economy of the North

The electric power industry plays a critical, constantly growing role in ensuring reliable operation of the Russian economy, strengthening its position in the international arena and in addressing social issues. The reliable operation of the energy sector, without which it is impossible to solve any of the problems facing society in its efforts to raise the country's economy to a new level, is one of the key elements of the national security in general.

In ensuring the long-term potential, the dynamic growth of the Russian economy and its sustainable development a specific role is played by the power industry. It is one of the budget-making branches of the fuel and energy complex and life-support system of the whole national economy. The reliable and stable operation of the power industry creates an industrial base for the rise of industrial production and ensures the success of social and economic innovation-oriented reforms in the country.

The role of the electric power industry in the economy of Russia is connected with the solution of major economic problems. Firstly, living conditions of people are dependent on the uninterrupted supply of electricity. Failures in the power supply, as has been shown by the events of recent years, have serious economic, social, and political consequences. Secondly, the electric power industry is an essential productive resource used by almost any technological process. The role of the power industry as a driving force of scientific and technical progress is very important. The level of power availability largely determines the technological level of production.

The main product of the industry, electrical power, plays a very special role in the life of modern society, being not only the most versatile commodity, after money, but also an irreplaceable resource in most manufacturing processes, in the livelihood of households and the social sphere.

The electric power industry is a subsystem of the economy as a whole, actively interacting with it. On the one hand, the power companies provide demand for production resources, and thus actively influence the structure of production, the level of output and employment in other industries. On the other hand, the development of these enterprises are affected by domestic and external demand, depending on the levels and structure of production, the technology used, foreign markets, policy of the government. Thus, the processes of restructuring and development of the electric power industry, including the regional level, are essential to the modern economy of the country and its regions.

The electric power industry, as one of the basic branches of the economy, amounted to 10.8% of the total industrial production in February 2009 compared to February 2009 - 10.8%. These data are presented in Table 1.2.1 and in Fig. 1.2.1.

Table 1.2.1

The structure of the Russian industrial production and its changes in the years 1990-2009, in%

Branches of industry	Structure (In December 2000 prices), %				Change		
	January 1990	August 1998	December 2007	February 2009	January 1990 - August 1998	August 1998 - December 2007	December 2007 - February 2009
1	2	3	4	5	6	7	8
Industry, including by branches:	100.0	100.0	100.0	100.0	0.0	0.0	0.0
Electric power industry	7.0	13.0	8.8	10.8	6.0	-4.2	2.0
Fuel industry, including:	15.6	22.9	18.4	23.4	7.3	-4.5	5.1
Oil production	11.5	16.1	13.5	17.7	4.6	-2.6	4.1
Oil refining	2.0	2.8	2.0	2.6	0.8	-0.8	0.6
Gas production	1.0	2.4	1.6	1.9	1.4	-0.8	0.3
Coal industry	1.1	1.5	1.2	1.3	0.4	-0.3	0.1
Iron and steel industry	6.2	7.1	7.3	6.3	0.9	0.2	-1.1
Non-ferrous metals industry	4.7	8.2	7.2	8.0	3.5	-1.0	0.8
Chemicals and petrochemicals	5.2	5.3	6.4	5.8	0.0	1.1	-0.6
Mechanical engineering	29.5	16.8	26.0	14.6	-12.7	9.2	-11.4
Forest, woodworking and pulp-and-paper industries	5.8	4.0	4.1	4.1	-1.8	0.1	0.0
Building materials	4.2	2.5	3.1	2.6	-1.6	0.5	-0.5
Food industry	12.3	13.0	14.0	17.8	0.7	1.0	3.8
Light industry	4.9	1.1	1.1	1.1	-3.8	0.0	0.0
Other	4.7	6.2	3.7	5.5	1.5	-2.5	1.8
Industry, including by branches:	100.0	100.0	100.0	100.0	0.0	0.0	0.0
Raw materials industries	51.5	68.1	59.7	70.4	16.6	-8.4	10.7
Processing industries	48.5	31.9	40.3	29.6	-16.6	8.4	-10.7

Source: The Institute of Economic Analysis Fund

By February 2009, the share of the electrical power industry was 10.8% of the total industrial production.

The Russian Federation Law "On Electric Power Industry" the last industry is defined as a sector of the economy of the Russian Federation, which includes a set of economic relations arising in the process of production, transmission, dispatching management, marketing and consumption of electric power and heat, and as a basis for the functioning of the economy and livelihoods.

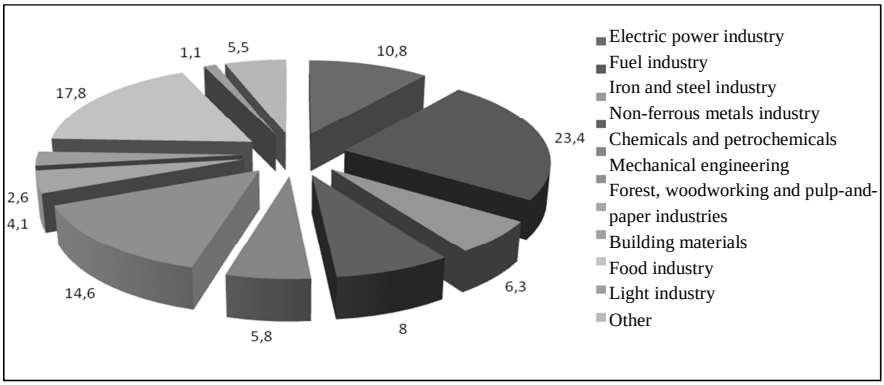


Fig. 1.2.1. The structure of industrial production in Russia In February 2009, in %

The actual role of the electric power sector in ensuring economic security of the country cannot be assessed unambiguously. On the one hand, it obviously has a huge social and economic burden on the industry. The electric power industry is the only sector of the economy, without whose products and services the population and all the sectors of the economy cannot currently exist. We also should not underestimate the contribution of the power industry in the overall economic situation, through a centralized fiscal redistribution of incomes. On the other hand, a destructive effect on the course of economic development is determined by periodic attempts to implement in practice inadequate pricing policy by an increase in domestic prices to the level of world market prices. We should not forget that the energy sector can also create constraints to economic growth. Such constrains include: resource constraints; structural constraints; environmental constraints.

Also, the power industry has a decisive influence on inflation, which is the most important indicator of economic security. Since the late 1990s, one of the key factors that the actual rate of inflation exceeded the planned parameters, was the dynamics of

tariffs for products of natural monopolies, whose prices during that period continually rose faster than those of the industry as a whole (the impulse of growth in prices and tariffs in the power sector is “transferred” to the consumer market, mainly due to increased cost of housing and utilities services). The impact on the living standards of the population is also obvious. Higher tariffs for electricity and heat, outstripping inflation, have the most negative impact on the poorest segments of the population. For 30% of the population (43.6 million people) the share of the cost of utilities is one and a half to two times higher than on average in Russia. As a result of rising energy costs, its share in the structure of consumption of the poorest groups of the population increases, which negatively affects their quality of life. This occurs due to the increase in electricity tariffs for the population (the electricity supply directly to the public up is to 8-9% of electricity consumption), as it occurs in connection with the increase in prices for housing and other services and utilities, which account for about 14-17% of electric power consumption. As a result of rising prices for housing and utilities services the incomes of the poorest 10% fell by 4.6% in 2006 and 5.2% in 2007, and almost half of this reduction in income is due to the increase in electricity tariffs.

Social policy in the electric power industry should be aimed at ensuring a reliable unlimited supply of electric power to the population of the country at affordable prices. The pricing policy of the state in the field of electric power should achieve an acceptable compromise for the population between the level of energy prices and the necessary investment needs required to ensure the reproduction of the fixed assets of the electric power industry.

Social policy in the energy sector should also include the implementation of a package of measures to address the social problems in the electric power industry itself (working conditions, work methods, training and retraining, northern specificity, etc.).

Recently, there has been an improvement of the situation in the power sector - increase in the electricity production, the level of cash collections from customers, strengthening payment discipline. The growth in electricity tariffs for industrial consumers roughly corresponds to the dynamics of the producer price index of industrial products.

However, the fundamental problems of the electric power industry, already noted back in the 1980s and developed during the post-Soviet period, are still very far from being radically and definitively solved.

First of all, we should note that in the Russian economy, as in most modern countries, there is a close relationship between the dynamics of electric energy consumption and the rate of growth of gross domestic product (Fig. 1.2.2.), but, on reaching sufficiently high rates of economic growth, the production and consumption of electric power may increase significantly slower than GDP.

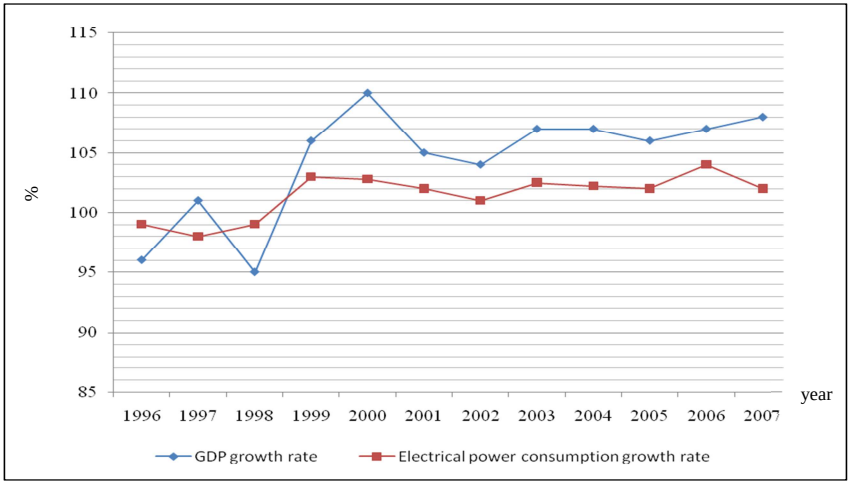


Fig. 1.2.2. The dynamics of the growth rate of electricity consumption and GDP

The opposite is also true: during an economic downturn power consumption is reduced more slowly than GDP.

This regularity in the past decade most clearly manifested in absolute terms, the decline in production in the electric power industry was noticeably smaller than in the economy at large. However, the electrical capacity of GDP has increased almost 1.4 times higher and currently is 3-4 times higher than the level of the industrialized countries. In other words, the initially low energy efficiency in the Russian economy in recent years has declined even further.

The industry of the Republic of Sakha (Yakutia), one of the largest regions of the Far Eastern Federal District (FEFD), has considerable potential: it accounts for 47% of proven coal reserves, 35% of oil and gas in Eastern Siberia and the Far East, 22% water resources, 16% of Russian timber stocks. Currently Yakutia provides 100% extraction of antimony in the country, 98% diamonds, 40% tin, 15% gold and 24% diamonds output [156].

The regional electric power complex is the most important resource and infrastructure subsystem of the regional economy. The reliable and efficient operation of the electric power industry is the basis for the progressive development of the regional economy and an essential factor in ensuring the quality of life of its population.

The power industry as one of the basic branches of economy of the republic, as well as a subsystem of the regional economy, plays an important role in achieving economic self-reliance, maintenance of industrial activity in the economy, solving the problems of regional self-financing and economic development of the northern region.

The power generation capacity of Yakutia was mainly created in the period from 1970 to 1985, when the development of the electric power industry went ahead of the other industries. Currently, the power grid of Yakutia is an important part of the electric power industry of the Far East of Russia. About 40% of the territory (1222 km^2) of the Republic of Sakha (Yakutia), inhabited by approximately 85% of the population, or in 18 out of 35 administrative territorial units (uluses), is covered by the centralized electric power supply.

The peculiarity of the electric power industry in the republic is that, using to 65% of its natural gas, 17% of fuel oil and 43% of thermal coal, it is an integrating part of the economic activity of the fuel and energy complex (FEC) of the republic as a whole. Therefore, any factors that affect the operation and development of the electric power industry, also affect the closely related fuel and energy complex in the economy of the republic.

The basis of the regional power sector and system-making energy company in the Republic of Sakha (Yakutia) is the Open Joint-Stock Company “Yakutskenergo”.The share of the company in the production of electricity in 2010 was more than 90% (Table 1.2.2.). In 2007 Neryungrinskaya SDPP became part of the OJSC “DEK” and the proportion of “Yakutskenergo” decreased to 52% by 2010. The share of the Neryungrinskaya power plant in the electricity production in 2010 was 32.3%, the proportion of independent power supply sources (OJSC “Sakhaenergo” and depart-mental power plants) in 2000 - 2010 was about 9%.

Table 1.2.2

Power balance of the Republic of Sakha (Yakutia), kWh/year

Balance item	Year										
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production of electricity, in total	7645.0	8091.3	8096.4	8096.1	8302.1	7724.5	7654.6	7334.8	7709.9	7047.7	7344.9
Including:											
- "Yakutskenergo"	7059.7	7453.0	7504.2	7487.5	7690.4	6944.9	6825.5	4302.8	4106	3768.9	3812.3
- Neryungrinskaya SDPP (a subsidiary of DEK)								2271.9	2542.4	2161.2	2373.1
- "VGES – 3" (Vilyuisk Hydroelectric Power Plant)					1.0	141.2	224.5	222.4	426.8	537.7	501.2
- "Sakhaenergo"	284.4	281.8	276.1	279.6	398.0	388.4	388.9	347.8	321	311.1	296.8
- Departmental power plants	300.9	356.5	316.1	329.0	212.6	250.0	215.8	190.0	313.7	268.8	361.5
Electricity received, in total	168.9	162.0	161.9	165.5	178.2	174.4	172.7	143.9	148.9	150.9	148.7
Including:											
- Magadan Region	148.9	142.0	138.0	145.6	157.5	157.5	154.8	127.3	131.5	135.7	134.5
- Chukotka Autonomous Area	20.0	20.0	23.9	19.9	20.7	16.9	17.9	16.6	17.4	15.2	14.2
Output for FOREM (Federal All-Russia Wholesale Market of Electrical Energy and Power)	996.6	1440.6	1541.1	1511.1	1544.3	1173.4	882.1	785.8	1017.1	784.3	896.3
Consumption, total	6817.3	6812.7	6717.2	6750.5	6936.0	6725.5	6945.2	6692.9	6841.7	6414.3	6959.3
Including:											
- auxiliary plant use	418.8	436.6	418.5	429.0	427.6	416.5	431.8	409.9	376.2	352.8	362.0
- losses in electric networks	840.2	945.8	866.5	837.9	919.3	945.8	970.6	882.5	898.3	959.1	964.6
- effective consumption	5558.3	5430.3	5432.2	5483.6	5589.1	5363.2	5542.8	5400.5	5567.2	5102.4	5632.7

Source: Statistical reporting forms "Electricity balance," 6-TP

The electric power industry of the republic at the present stage is represented by power plants with a total installed capacity of 2,460 MW, including power stations of the OJSC SC “Yakutskenergo” - 1,219 MW (49.6%), the subsidiary OJSC “DEK” - 618 MW (25.1%), by power plants of the OJSC “Sakhaenergo” - 216 MW (8.8%), the hydroelectric power plant Svetlinskaya of the OJSC “VGES-3”- 270 MW (11.0%). The share of hydropower accounts for 38.6% of the total capacity of power plants, the share of power plants fueled by natural gas - 16.4%, coal power plants - 25.2% and diesel fueled power plants - 19.8%. The total length of transmission lines is more than 22,000 km.

The basis of the electric power industry of the Republic of Sakha (Yakutia) are the generating capacities of the Vilyuisk Hydroplant-1, 2 - 680 MW, the Svetlinskaya Hydroplant - 270 MW, the Mirny gas turbine power plant - 72 MW, the Yakutsk state district power plant - 320 MW, the Yakutsk thermal power station - 12 MW, the Neryungi state district power plant - 570 MW, the Chulman combined heat and power plant - 48 MW, diesel power plants of the OAO “Sakhaenergo” - 216 MW, enterprises of electrical networks - 135 MW and other power stations - 137 megawatts and distribution networks of the OAO AK “Yakutskenergo”. The total length of transmission lines is 22,509 km.

The installed thermal power of the sources of the OJSC SC AK “Yakutskenergo” is 2,343 Gcal, the total length of heating systems of the company is 902.09 km.

The four large power plants – the Vilyui and the Svetlinskaya HPPs, the Yakutsk and Neryungri SDPPs – account for 84.1% of electricity generation in the republic.

The four isolated power districts (Central, West, North and South) formed on the basis of these four large energy capacities have a service area 3.2 million sq. km, the installed capacity 1,880.8 MW and 0,006 km of electric networks per 1 sq. km.

In addition to the three local power districts (CPD, WPD, SYPD) with centralized power supply, isolated consumers of the Northern power district are serviced by more than 250 small diesel power plants with a total capacity of 525 MW. The individual electric power of a diesel power plant is from 90 to 800 kW and more, the average power of diesel generators is 30, 60, 300 kW and greater. The average cost of electricity in the Northern power district ranges from 2 to 16.7 rubles per kWh.

Thus, the basis of the regional electricity sector of the Republic of Sakha (Yakutia) are the power generation and distribution networks of the OJSC SC “Yakutskenergo”, whose share in the total electricity production in the republic in 2010 was 52%.

The effective energy consumption in the Republic of Sakha (Yakutia) in 2000 - 2010 stabilized at 5.4-5.6 billion kWh/year (Table 1.2.3.).

In recent years, the power consumption in all sectors, except for services, has decreased. This dynamics is explained not only by the structural changes in the economy, but also by a change in methods of accounting, as well as the introduction of energy efficiency measures.

Table 1.2.3

Effective energy consumption of the Republic of Sakha (Yakutia), million kWh/year

Indicator	Year										
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Effective consumption, total	5558.3	5430.3	5432.2	5483.6	5589.1	5363.2	5542.8	5400.5	5567.2	5102.4	5632.7
Including:											
- Industry	2966.3	3017.3	3128.2	3121.6	3199.1	2592.2	2812.8	2767.9	3190.7	3522.2	3703.3
- Transport and communications	167.0	153.0	163.0	149.0	144.0	143.0	140.0	133.0	131.8	168.3	209.8
- Construction	160.0	182.0	178.0	159.0	153.0	272.0	156.0	155.0	153.2	115.2	77.1
- Agriculture	301.0	290.0	273.0	295.0	347.0	326.0	347.0	170.0	191.6	187.3	188.6
- Services	797.0	853.0	810.0	896.0	882.0	1184.0	1246.0	1435.0	1184.8	706.8	683.4
- Population	1167.0	935.0	880.0	863.0	864.0	846.0	841.0	739.6	715.1	755.4	770.5

Source: Statistical reporting forms “Electricity balance,” 6-TP

The uneven dynamics of effective power consumption in the industry is due to the high share of electricity used for the power and heat supply of the SC “ALROSA” (Open Joint-Stock Company) facilities in Western Yakutia. In the near future all the heat load in the settlement of Aikhal will be transferred to gas heat sources, resulting in a further reduction of power consumption in the industry of the energy district.

The climatic features of the power system operation:

- Winters are long and cold with little snow, and summers are short, in most of the territory dry, hot;
- Temperatures fluctuate from – 65°C in winter and up to + 40°C in summer, that is, the amplitude of the fluctuations in temperature is about 100°C;
- The average annual temperature at which the grid operates is 10.3°C;
- The prevalence of winds of north-westerly direction;
- Permafrost in most parts of the republic.

The main differences between the operation of the electric power industry of the Sakha Republic (Yakutia) and the power systems of other regions of Russia, and especially, the northern territories of the Far East are as follows:

- Low-temperature operating conditions of the power system;
- The isolation of Yakutia's power grid from the Unified National (All-Russia) Electric Grid (UNEG), the presence of network constraints, decentralized electricity supply consumer sector;
- A vast area of service, a large number of installed energy sources and coverage of more than 70% of the republic's territory by diesel power plants;
- The annual northern delivery of expensive diesel fuel through a complex transportation network;
- The monopolistic nature of the regional electricity market;
- The excess of supply over consumer demand for electricity in the three power districts, except for the central power district where there is a great shortage of electricity capacity;
- High cost of production of electrical energy, which leads to the loss of existing and potential consumers in the republic;
- High degree of wear of fixed assets and the related urgent need for modernization of generating capacities;
- And the network system;
- The existence of cross-subsidies among energy consumers across the power districts of the republic.

The data from the above table 1.2.2. on the dynamics of production of electricity in the Republic of Sakha (Yakutia) (2000-2010) reflect the future growth of production in accordance with the plans of large-scale development of mineral resources for the next decade.

The high energy intensity of mining (diamond, coal, oil and gas) industry and the intensification of hydrocarbon fuel production from the prospective deposits, as well as of the diamond fields with difficult-to-recover reserves determine the greatest growth in electricity consumption in the republic in the medium term. Due to the rapid economic development of Eastern Siberia and the Far East in the long term after 2010 the republic is expected to have the highest growth of electricity consumption - by 4.5 times the current rate. Ensuring the growing demand for electricity and increasing fuel and energy efficiency is the most important strategic goal of the republic's development.

So electric power as one of the basic branches of the economy of the republic plays an important role in achieving economic self-reliance, maintenance of industrial activity and economic development of the northern region. Stability and sustainability of the regional economy involves proper functioning and development of the regional power complex of the northern region. In this regard, the economic security of the region is inextricably linked to its electrical energy security.

1.3. Electric power security of the region as an economic category

The investigation of the nature and content of the category “energy security” has shown that in the conditions of the northern regions it is especially urgent to introduce the concept of “electrical energy security of the region”. In many ways, it is determined by the climatic conditions of the northern areas in which the supply of the economy and the population with fuel and electricity is a vital factor in their existence. Therefore, in the conditions of the North the provision of electrical energy security is the main task of the state at all levels of government. According to the “Energy Strategy of the Republic of Sakha (Yakutia) for the period until 2030”, the main priority of the state’s energy policy in the North of Russia is providing consumers of the region with electric power security.

The end consumers of the regional electric power sector are the natural and legal persons who pay for the energy products - electricity and thermal energy, the price of which includes such a component as a guarantee of sustainable, reliable and sufficient energy consumption - the cost of the electrical power security of the consumer. Based on the above, the electric power industry plays a crucial role in the framework of the energy and economic security of the region.

For the purpose of the study of the state of the electrical energy security of the region it is necessary to clarify and define the concept of energy security and energy security threats.

The key role of the energy industry in the provision of operation and development of the productive forces of the country, as well as the life of the population has led to the introduction of the concept of “energy security”, defined as: “Energy security is the state of security of the country and its citizens, society and the state, protecting their economies from threats to the reliable fuel and energy supply [20].”

This state of protection corresponds under normal conditions to the satisfaction of the needs of fuel and energy resources in full, the required quality at economical prices, and during emergency situations – to the guaranteed provision of the minimum necessary requirements. This opinion, as was noted earlier (p. 24), is shared by a team of scientists of the L. A. Melentyev Institute of Energy of SEI SB RAS.

On the basis of this and the fact that energy security has other components – electrical, heat, and fuel security of the region, the above definition of the term "energy security" (pp. 24-27) can also be viewed from the standpoint of these components.

For the regions of the North a key role in ensuring sustainable operation and development of the regional economy and the livelihoods of people is played by the electric power complex that provides the local market with a specific product - heat and electricity. The state of the thermal and power supply system has a significant influence on the formation of energy and economic threats and the electric power, and socio-economic security of the region, especially those in the northern territory.

The analysis of the scientific literature has revealed that researchers examining energy security issues, do not pay due attention to the electric power security issues. It should be stated that there is no definition of the category "electrical energy security of the region."

In our opinion, the above definitions mainly take account of consumer protection against threats of shortage of fuel and energy resources of acceptable quality. But at the same time, this definition does not reflect any means of prevention and minimization of all kinds of threats (including threats of shortage of fuel and energy resources, provided at an affordable price and quality required), the status and the ability of the fuel and energy complex to provide a reliable power supply.

Therefore, the proposed definition does not describe the complexity of solving urgent and strategic goals of energy security. Based on this conclusion, let us define the concept of "electrical energy security" as applied to the region.

In our opinion, the term ***"electric energy security of the region"*** *should be understood as the condition and capacity of the electric power industry through the effective use of internal and external energy sources, taking into account the socio-economic development of the region, to provide the reliable electric power supply to consumers at reasonable prices and of required quality.*

Thus, the study of problems, condition and characteristics of the regional electric power complex, its ability to provide consumers with electricity necessitates the identification of existing and strategic threats, indicators of the electrical energy security, the assessment of negative effects of the electrical energy security threats to the economy and social sphere of the region. To accomplish these tasks, it is important to establish a terminological certainty, clarifying the definition of "threat to the energy security of the region.".

There are different definitions of the concept "threat to energy security." Thus, we can mention the definition given by N.I. Voropay, S.M. Klimenko, S.M. Senderov and M.B. Cheltsov: "threat to energy security" means the totality of conditions and factors that create in the consumer systems of fuel and energy supply extreme situations that are dangerous for the normal functioning of these systems and affecting the vital interests of the individual, society and the state [42].

This definition essentially repeats the one given in the RF Law "On Security" (in the first part of Article 1 and Article 2) threat is defined as a set of conditions and factors that endanger the vital interests of the individual, society and the state.

One of the main reasons why we have to address the problem of determining threats to regional electric power security is the fact that in recent years there has been a trend for growth in the number of accidents due to the high level of depreciation of fixed assets, leading to a halt and stoppage of power supply to consumers of the northern region; lack of intra-regional transmission lines between three power districts of the republic, which is a threat of freezing facilities of life support and livelihoods; acute shortage of investment resources and under-funding of investment in the development and modernization of the electric power industry exacerbate the condition of the electric energy security of the area. One of the major constraints of economic development in the central district of the republic is a shortage of installed capacities of electric power.

This circumstance undoubtedly makes it urgent to solve the problem of electrical energy security of the region, identify and prevent possible threats to the stable operation of the electrical power industry, so in this regard it is necessary to introduce the concept of "threat to the electrical energy security of the region."

In our opinion, ***the threat to the electrical energy security of the region*** *should be understood as a set of conditions and factors leading to the cessation of electricity supply in the region and the emergence of critical and emergency situations that cause damage to the population and the economy of the local territory.*

Ensuring electrical energy security involves the identification and systematization of events that are either directly or indirectly may pose a threat to the electric power industry and the process of power supply to the national economy and is accompanied by the emergence of critical and emergency situations both in the electric power industry, and with consumers of its products.

Impacts on the process of reliable electricity consumption supply have a different nature or cause: under-delivery of fuel for power plants, lack of material resources, limited production capacities of the systems as a result of internal social and economic reasons, the failure of equipment due to improper actions of personnel, industrial accidents, natural disasters.

On this basis, in order to ensure the electric energy security it is necessary to analyze the possible causes of manifestation of certain impacts or major threats, the result of the implementation of which is the impact on the electric power systems.

The results of the study of various theoretical foundations of energy security, including electrical energy security, devoted to the electric energy security of the regions, especially in the North, helps us to identify the problems of ensuring that security and to determine the most important threats to the electric energy and economic security of the region, as well as to group these threats by certain characteristics.

1.4. Problems of electric energy security of northern region

Major problems facing our Republic, like any other Energy-isolated North region, are dictated not only by harsh climate conditions and extremely low density of population, but also by aggregate factors, which negatively influence on economical, financial, and technical circumstances of electric energy industry.

Problems of electric energy security and supply of local economy and population occur primarily in those regions, where they are technologically isolated (or have poor connection) exist from United national electrical network, such as Northern territories of the Far East including the Republic of Sakha (Yakutia).

Social and economical features of Yakutia are following: vast geographical distance with difficult accessibility; long distances among settlements; poor communication networks and systems; seasonal fuel and material-equipment transportation scheme complexity; low density of population. Extreme climate and

environmental conditions of Yakutia and High North aggravate security issues in large measure, thus exacerbate the security of main part of power consumers of the Russian Federation.

Obviously zone-based electric energy complex is the connecting network and basic development economy branch of the Republic of Sakha (Yakutia); it provides the development of the whole fuel and energy complex in the northern territories and establishes comfortable inhabitancy to population of high north region, whereas energy procurement remains as special critical question.

Electricity supply system of the Republic of Sakha (Yakutia), as it mentioned above, is objectively divided into four independent energy supply regions, which are not interconnected among each other and with the united national electrical grid (UNEG): Western, Central, South-Yakutian and Northern energy regions.

Four energy regions in the Republic is occasioned by specific features of energy provision in Yakutia such as provision by technologically energy consumers isolated from each other as well as with independent supply source.

Consequently, electrical energy complex of the Republic of Sakha (Yakutia) from the very beginning of construction of technologically isolated from each other electricity producing plants is objectively divided into four Power Districts:

- Western Electricity District (WED) - connects Aykhal-Udachny, Mirny, Lensky industrial hub and group of Vilusk agricultural regions. The main sources of energy are Vilusky Hydro Power Station (HPS)-1 and HPS-2, “Yakutskenergo Corp.”, Vilusky HPS-3, ALROSA Corp. Mirny TPP (GRES - Peat-fired thermal power station) and Lensky Diesel power station (DPS) are used as an alternate source of electricity in the structure of Western Electricity grid.

- Central Electricity District (CED) - connects central industrial hub and groups of central regions including regions of the Republic on the other side of the river Lena. The main sources of energy are Yakutsk TPP (GRES) and Yakutsk TPS (Thermal power station).

- South-Yakutia Energy District - connects South-Yakutia industrial hub. The main sources of power are Neryungri GRES and Chulman TPS.

- Northern Energy District - connects plants which provide function of the autonomous Diesel power stations in the northern region of the Republic.

From the beginning of 90s of the 20th century high deterioration rate of main energy funds is explained by serious underfunding of Power System sector. Lack of private capital of “Yakutskenergo Corp.” got worst by low paying capacity among

consumers. So, in 1998 cash payments constituted only 14% from all served energy. Others are – barter trade, set-offs and enormous liabilities to Power System plants.

General decline of economy badly affected on machines capacity condition of "Yakutskenergo Corp." Absence of vital parts for maintaining production facilities working, without mentioning their upgrade and replacement, brought to equipment deterioration and function disability. Long exploitation of production facilities for 35-40 years needs enormous material expenses for technical retooling and modernization. In spite of highlighted circumstances, the Republic's investment budget material expenses for "Yakutskenergo Corp." are not pledged. Starting from 2002 there is vital shortage in funding of Federal Targeted Investment Programs for Power System plants from federal budget. Because of limitedness of market, outbound investment receipt is hardly probable too. There are only not for-profit, but socially oriented investment projects here. Therefore, one of the main sources of income for appropriate functioning Electric Power System, which means security of the Republican Power engineering, electricity and heat tariffs still remain. Nowadays Energy Company tariffs consist of just 8.4% of capital contribution, and from them the main part of capital contribution – 7.8% - goes for amortization and only 0.6% happens to be profit. Existing severe tariffs restrictions definitely make investment-driven development unachievable.

Subsequently, this analysis of nowadays Power System of Yakutia detected a wide range of weaknesses and problems illuminating critical situation in the field and treats for the Republican Power System security.

Meanwhile many problems keep going in Energy system which can be a limiting factor of stable economy development in the Republic of Sakha (Yakutia) and important problems solution for Power engineering security:

- Lack of inner regional electric power transmission lines among three technologically isolated areas of the Republic. Cessation of economic sector and population of Northern region can take place, which would result in significant losses in all spheres of life support facilities can happen. It can happen if the accidents at the energy plants occur, consequently, in the restriction or termination of power supply of local territory, with absence of reserve energy supply and inner-regional energy network among three technologically isolated energy regions.

- High level of deterioration on electricity generating equipment, electricity lines, electrical substation. The technical condition of fixed capital assets is characterized by a high percentage of deterioration: it is more than 55 average %, including

deterioration of electricity lines - 75%, heat networks - 51.2%, power and other equipment - 60.5%; substations - 81.4%, machinery and equipment - 61.9%. Therefore, the most of fixed capital assets has a low technology level; the further exploitation involves a high cost of resources and the accident risks;

- High losses in the electricity lines due to high deterioration and low pass-through function of lines losses is 17% average among OJSC “Yakutskenergo”. In Western Electricity District on ETL “VES” due to low pass-through function of lines losses reach 32 %, that is why more costly sources of energy work on diesel fuel work, leading to unnecessary increase in the cost of electricity production costs. At present, such state of electrical networks requires immediate reconstruction and construction of new power lines;

- Lack of full funding for the repair of power plants, leading to high rate deterioration of equipment determines the probability of recurrence of mass accidents in cascade development, increasing the threat to livelihoods in the northern cities and villages;

- Financial level of Power System companies provide solution only for the current problems of production activity and without investment it doesn’t allow us to solve the problems of long-term production;

- Acute shortage of investment resources and underfunding of capital investment for the construction of energy-efficient units of the Power System industry leads to the problems of incomplete construction, as well as suppressing development of Power System and economy of the region, exacerbating the threat of Northern Territories Power engineering security;

- Delivery problems of diesel fuel for the Northern power stations in isolated communities have a complex transport infrastructure. Thus, the weight of the fuel component in the cost of electric power in North Energy District of the republic reaches up to 65-70% due to the high cost of imported diesel fuel. It should be noted that for the power district 94% of “Yakutskenergo” total diesel consumption and 76% of the consumption of electric power is accounted for the budget sphere of housing and communal services;

- High specific fuel consumption and the cost of electricity production, irrational modes of operation of the equipment reduce economic performance and efficiency;

- Energy consumption is sharply reduced by diamond mining and energy coal enterprises in the western and southern parts of the Yakutia;

- Growing shortage of production and margin power (energy) in the central energy region of the republic today is one of the main suppressing factors for the development of the economy;

- Geographical dispersion of decentralized consumers and low power loads cause a number of problems associated with the reliability of electricity supply to consumers;

- Major organizational problem of managing the Power System industry of the republic is the lack of an effective control mechanism to Energy company OJSC "Yakutskenergo" due to the loss of management from the central government sector of the state power (on 01.01.2011, the state-owned of the Republic of Sakha (Yakutia) shares are 1.31%);

- In the republic there is medium single tariff for electric energy, where high expense of economically justified diesel power tariff is distributed among the other groups of consumers, which determines the need for cross-subsidization among consumers of power regions of the country. In 2010, subsidies for diesel Energy of the Republic of Sakha (Yakutia) reached 3.5 billion and main price charge falls to the industrial customers.

Existing problems in Power System engineering of the Republic of Sakha (Yakutia) are main factors, leading to the security of the Power System engineering of the northern region and having common characteristics to all energy regions and the specific problems for each power districts listed below in Table 1.4.1.

Consequently, nowadays identified specific problems of electric power of the Republic of Sakha (Yakutia) in energy districts are not consistent with the objective of further development of the economy of the territory and ensure the safety of its electricity system. To solve the running problems for ensuring electricity security of the Republic of Sakha (Yakutia), apart from identifying the determining role of power and importance in the national economy, determining of the socio-economic nature of the Electric power system security of the northern region, the existing problems of development of electric power industry of the republic and security arrangements of its electricity security there is need to develop aspects of the formation and organizational and economic mechanisms to ensure electricity security of the regions of the North and the determination of the prospects of the industry as a basis for improving the electricity security of the region of the North.

Table 1.4.1

Common and specific problems of energy districs' Power System security in Republic of Sakha (Yakutia)

#		Central Electricity District (CED)	Western Electricity District (WED)	South-Yakutia Energy District (SYED)	North Energy District (NED)
1	2	3	4	5	6
1	Common problems of energy districts	Technical: 1) High degree of deterioration; 2) Untimely solutions of modernization and renovation; 3) Lack of energy-saving technologies.	Technical: 1) High degree of deterioration; 2) Untimely solutions of modernization and renovation; 3) Accidents in power facilities; 4) Lack of energy-saving technologies.	Technical: 1) High degree of deterioration; 2) Untimely solutions of modernization and renovation; 3) Accidents in power facilities; 4) Lack of energy-saving technologies.	Technical: 1) High degree of deterioration; 2) Untimely solutions of modernization and renovation; 3) Lack of energy-saving technologies.
		Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) The existence of cross-subsidies between business and residential customers; 3) Lack of investment fund and under-funding of projects and the emergence of the investment needs for the development of the electricity sector; 4) Short financing of Power System development investment programs from federal special-purpose program, investment programs financed from the State Budget of Yakutia and energy companies own resources. 5) Formation of the cost of fuel and repair of power system objects are low from the planned regulatory costs;	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) The existence of cross-subsidies between business and residential customers; 3) Lack of investment fund and under-funding of projects and the emergence of the investment needs for the development of the electricity sector; 4) Short financing of Power System development investment programs from federal special-purpose program, investment programs financed from the State Budget of Yakutia and energy companies own resources. 5) Formation of the cost of fuel and repair of power system objects are low from the planned regulatory costs;	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) The existence of cross-subsidies between business and residential customers; 3) Lack of investment fund and under-funding of projects and the emergence of the investment needs for the development of the electricity sector; 4) Short financing of Power System development investment programs from federal special-purpose program, investment programs financed from the State Budget of Yakutia and energy companies own resources. 5) Formation of the cost of fuel and repair of power system objects are low from the planned regulatory costs;	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) The existence of cross-subsidies between business and residential customers; 3) Lack of investment fund and under-funding of projects and the emergence of the investment needs for the development of the electricity sector; 4) Short financing of Power System development investment programs from federal special-purpose program, investment programs financed from the State Budget of Yakutia and energy companies own resources. 5) Formation of the cost of fuel and repair of power system objects are low from the planned regulatory costs;

Continuation of table 1.4.1

1	2	3	4	5	6
		6) In calculating tariffs for next regulated period there is no accounting of the savings saved through the implementation of energy efficiency actions and savings due to the shortfall of income, therefore, not created expenses during the reporting period. 2. The increase in accounts of loans receivable and bills payable, loss of companies leads to an unstable financial and economic condition.	6) In calculating tariffs for next regulated period there is no accounting of the savings saved through the implementation of energy efficiency actions and savings due to the shortfall of income, therefore, not created expenses during the reporting period. 2. The increase in accounts of loans receivable and bills payable, loss of companies leads to an unstable financial and economic condition.	6) In calculating tariffs for next regulated period there is no accounting of the savings saved through the implementation of energy efficiency actions and savings due to the shortfall of income, therefore, not created expenses during the reporting period. 2. The increase in accounts of loans receivable and bills payable, loss of companies leads to an unstable financial and economic condition.	6) In calculating tariffs for next regulated period there is no accounting of the savings saved through the implementation of energy efficiency actions and savings due to the shortfall of income, therefore, not created expenses during the reporting period. 2. The increase in accounts of loans receivable and bills payable, loss of companies leads to an unstable financial and economic condition.
	Specific problems of energy districts	Technical: 1) The growing shortage of energy and power because of the high demand of electricity; 2) The lack of intra-regional transmission lines between the three technologically isolated energy areas; 3) Natural gas delivery dates violation; 4) Accidents on the main pipeline Kyzyl-Syr – Mastakh – Berge - Yakutsk.	Technical: 1) The lack of intra-regional transmission lines between the three technologically isolated energy areas ; 2) High losses in transmission lines due to their low throughput; 3) Failures on the pipeline, which became consequence of the termination of gas boilers-stations supply in Ayhal and Udachny; 4) Shortages in delivery of diesel fuel for the production of electric energy from reserved sources of energy (DES) in Vilyuiskiy region (Suntarsky, Nyurbinsk, Verkhnevilyuisk); 5) Natural gas and diesel fuel price increase. 6) water limitation on KVGES and VGES-3 (hydro power stations) during lack of water and shortages in Chernyshevsky water storage research; 7) Low transfer capacity of 220 kV ransmission line from Mirny to Nyurba.	Technical: 1) The lack of intra-regional electric lines between technologically isolated three energy areas; 2) Violation of the date of delivery of coal;	Technical: 1) The problems of diesel fuel delivery to the northern isolated power plants and settlements because of the harsh transport infrastructure; 2) High specific fuel consumption; 3) Non-rational equipment's modes of operation; 4) The lack of intra-regional electric lines between technologically isolated three energy areas; 5) The geographical dispersion of consumers and their decentralized small power loads; 6) The accelerated deterioration of diesel generators and power grids; 7) Failure to supply electric energy from Bilibino nuclear power plant for Cherskii village, Magadans ZES for Ust-Nera.

Continuation of table 1.4.1

	2	3	4	5	6
		Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) Outgoing price increase for natural gas in comparison with deficiency of electric energy tariffs and, consequently, loss of enterprises, leading to an unstable financial and economic condition.	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) Outgoing price increase for diesel fuel and natural gas in comparison with deficiency of electric energy tariffs and, consequently, loss of enterprises, leading to an unstable financial and economic condition.	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) Outgoing price increase for coal because of absence of governmental regulator for OJSC “Yakutugol”, which is the monopolist of coal supply for Neryungri GRES.	Economical: 1. Shortcomings in the methods of state regulation of electricity tariffs in the Yakutia: 1) The existence of cross-subsidies between the electrical and thermal energy; 2) Outgoing price increase for diesel fuel in comparison with deficiency of electric energy tariffs and, consequently, loss of enterprises, leading to an unstable financial and economic condition; 3) A high proportion of the fuel component of the cost of electricity, the high cost of electricity, leading to rise of tariffs on electric energy produced by the Diesel Power Stations.

CONCLUSIONS ON CHAPTER 1

1. Theoretical aspects of energy and electricity security of the regions have been revealed.

2. Regional electric power system is the most important resource and infrastructure subsystem of the regional economy. Electric Power industry as one of the basic branches of economy of the country, as well as being a subsystem of the regional economy, plays an important role to achieve economic independence, maintaining production activities in the economy, solving the problems of regional self-financing and economic development of the northern region. Reliable and efficient operation of power is the basis for the progressive development of the regional economy and essential factor in ensuring the quality of life of its population.

3. The role of electricity in economy of the northern regions is linked with solving of the major economic problems of the Republic of Sakha (Yakutia). Firstly, uninterrupted supply of electricity is dependent on living conditions of people in the north region. Secondly, electricity is an essential inputs used by almost any process. Thirdly, within current market conditions the development of regional economy encourages faster development of Electric Power engineering.

4. Investigation of the essence and content of the category “Electric power security” is specifically significant for the northern regions as the most pressing tasks are to ensure the wider region with electricity and warmth in extreme climatic conditions. Correspondingly, particular importance is in the careful design of the regions electric safety issues both at theoretical and practical level.

5. While positioning dynamic development of the economy and social sphere in regions of the Russian Federation by implementation of scientific and technical progress in the vital processes of each territory industries and livelihoods that depend on advanced development especially electricity, there is a need to clarify the definitions of “Power system security” and “energy security of the region” and also, as we believe, there is a need for scientific definitions implementation for “electricity security of the region” and “the threat of electricity security of the region.”

In our opinion, under the threat of electricity security of the region it should be understood a set of conditions and factors, which lead to the cessation of electricity supply in the region and formation critical and emergency situations that harm the economy and the population of the area, and can also be a cause of their destabilization.

6. Power supply of the Republic of Sakha (Yakutia) is objectively divided into four independent energy power region (Western, Central, South and Northern Yakutia) due to a particular feature of the regional power sector as the exercise of power supply energy sources technologically isolated from each other.

7. Determined the problems of the regional power sector are the main factors leading to the threats of the electricity security of the northern region in the whole country and for each energy area.

8. Solution of the accumulated problems of ensuring electricity security of the Republic of Sakha (Yakutia) is required to develop the methodological approaches and the formation of organizational and economic mechanisms to ensure electric power system security of the Northern regions, as well as the determination of the prospects of the industry as a basis for ensuring Power engineering security.

★ ★ ★

CHAPTER 2. METHODOLOGICAL APPROACHES OF ELECTRIC SYSTEM SECURITY IN THE REGIONS OF THE NORTH

2.1. Conceptual approaches forming electricity security in the region

To solve the problem of providing electricity security of the Republic of Sakha (Yakutia), it is necessary to develop an integrated concept for electric power security including both strategic and operational objectives of the country. Nowadays, there are several specific projects aimed to solve researched problem. Thus, strategy questions for energy security are considered in the concept of energy security of the Tomsk region, the strategy of development of the city of Novosibirsk, in a number of scientific researches and designs of institutes and companies from other regions of Russia.

To determine the conceptual basis of priority electricity security ensuring of the Republic of Sakha (Yakutia) and its energy regions as a factor of reliable functioning of the economy and livelihoods of the region as a whole one should consider the current power supply network of the Republic, as well as the changing trend in the production and consumption of electricity in the region.

As it was mentioned above, generating capacity and distribution networks of OJSC “Yakutskenergo” are the basis of electric power industries in the Republic of Sakha (Yakutia). Power supply of most consumers are isolated from each other by large and small energy sources, for example Yakutskaya TPP, cascade of hydropower stations in Vilyuysk region, Neryungrinskaya TPP and more than 600 diesel power plants in the Arctic Circle of the country (see Figure 2.1.1). In general, production and consumption of electrical energy can be divided into four distinct energy zones (Power Districts), which are not integrated to centralized electric line of the Russian territory.

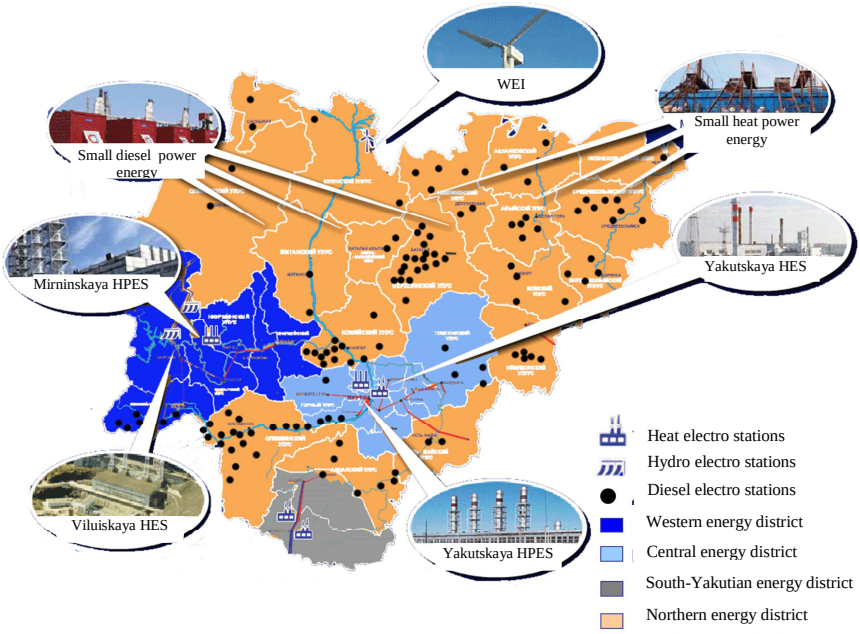


Figure 2.1.1. Electric Energy supply in Republic of Sakha (Yakutia)

In our opinion one should again emphasize objectively prevailing zoning of electric power in the republic, which is determined by specific features of electricity in Yakutia, where electricity supply of local consumers is performed by technologically isolated from each other energy sources, as well as by autonomous power plants.

In recent years according to above mentioned thesis about power consumption evaluation in the country, the decline in all sectors of the economy of the northern region, except for the service sector, is registered. This dynamics is explained not only by structural changes in the economy, but also by a change in accounting methods, as well as the implementation of measures for energy efficiency.

Researches in causes of crisis situations in the power of the republic have shown that the main causes of threats to security of electricity are following:

- The physical and moral depreciation of fixed assets and an urgent need to replace them;

- A huge deficit of investments for modernization, renovation and the construction of new energy facilities;

- An increase in prices for primary energy sources (diesel fuel, natural gas and coal), correspondingly growth of tariffs for electricity and thermal energy;

- Growing shortage of production, reserve capacity and energy in the central area of energy; sharp decline in energy consumption in the Western and Southern energy districts by diamond and coal mining enterprises;

- The current system of cross-subsidization of consumers;

- Non-payments crisis.

These threats cause lowering of Power system engineering security confirm the poor safety of the republican electricity system, which, in its turn must be understood as a warning for possible local and global crises, accidents, failure to supply fuel to the settlements, and so on, and consequently, possible negative consequences, expressed by stop activity in economy sectors and the public, and therefore, in significant damage to the economy of the Republic of Sakha (Yakutia).

Feature of Electric supply system in republic is an integration element of economic activities of the fuel and energy complex as whole with using up to 65% of natural gas, 17% diesel fuel and 43% power-generating coal. Consequently, any factors influencing to functioning and developing of electricity system are also closely related with fuel industry sector and economy of the republic.

In this situation the objective question arises: who is responsible for power system security in the republic? The responsibility for power system in the country attached to Unified Energy System of the Russian Federation, the responsibility for the regions lies on corporate institutions of Electric energy supply involving government and regional state authorities (share fraction of the Republic of Sakha (Yakutia) consists – 1,34%).

As a result of the reform out in the electric energy supply of the country carried in the federal level vertically, the Unified Energy System of the Russian Federation integrated holding company does not currently exists, at the regional level instead of common corporate institutions in the market of electric energy (power) horizontally enlarged generating companies have appeared, which guarantee supplies of provisions (energy supply companies), territorial grid organizations, entities of the supervisory control, etc. This vertical separation of companies provides the development of competition in production, that is the generation of electricity with the formation of corporate institutions in competitive environment for attracting investment; liberalization of tariffs in the wholesale and retail markets of the energy (in the wholesale market price zone); state ownership in infrastructure projects and

state-regulated access to networks; electric energy sales by trading on competitive tenders and through direct contracts in the wholesale market; the obligations of the regulated guaranteeing suppliers (energy supply companies) for the servicing liability of every consumers' applicants.

Ensuring the implementation of solutions of own local problems, a separate power energy company can't solve the problem without government assistance even if it wishes. Obviously, in this case the republican body of state power takes responsibility. It is government of the Republic of Sakha (Yakutia) which is responsible for the stable functioning of its economy, which cannot be achieved without the already developed advanced energy industry. Hence, there is need to create appropriate public authority of the Republic of Sakha (Yakutia) in the represented the Ministry of Fuel and Energy resources of Republic of Sakha (Yakutia), which must accomplish the following tasks:

- Analysis of the electric power industry in the region, taking into account its technical and economic aspects;

- Coordination of the various electric energy supply companies and the needs of the economy of the northern region with taking into account its development;

- The anticipatory control actions adaptation on the parameters of the electric power security taking into account the effects of external and internal environment.

Terms of electric power industry of Yakutia and processes of its reform without taking into account regional peculiarities can cause threats to its security and reliability of electric power supply to consumers of the northern territories. This is unacceptable because of the threat especially on destabilization of social life and significant economic losses in the region.

Based on the above, we believe that use the task of ensuring electricity security of the region based on reliability and efficiency improvement of the power system should be the priority of the state energy policy in the harsh environment of the northern territories.

An approach for the prevention and elimination of threats to energy security in the region proposed by E.A. Malyshev PhD of economical sciences and chairman of the Permsky oblast Committee on Energy can be adopted on the basis of electric energy system security formation in fuel and energy complex. It consists of six successive stages [96]:

Stage 1 - the analysis of the peculiarities and problems of consumers' power supply;

Stage 2 - identification of threats and their consequences, the development of indicators for each of the threats and management techniques that can enhance the security of electric power in the region;

Stage 3 - development of the territorial program to ensure the reliability and development of the energy power system;

Stage 4 - evaluation of order priority in funding among power generating facilities;

Stage 5 - identifying mechanisms and sources of modernization programs funding of electric power equipment;

Stage 6 - the conclusion of the agreement on joint financing of programs for the prevention and removal of threats to security of electricity in the region.

Table 2.1.1 reflects proposed Concept of prioritized electric power security of the Republic of Sakha (Yakutia), which can be represented as a conceptual framework in the application number 4.

The first stage – rating of the safety of the electric energy security in general, including its security in energy districts, in the areas where you should first assess the characteristics and problems of consumers' power supply and then identify a list of possible threats to the electric power and related indicators of safety.

The second stage is the development of scenarios to ensure power system security of the republic.

The third stage is the choice of prioritized ways for development of the power system in the republic.

The fourth stage is the implementation of the scenario to ensure electric power security of the Republic.

Table 2.1.1

Concept of prioritized maintenance of electric energy security in the Republic of Sakha (Yakutia)

№	Stages	Main directions
1	2	3
1.	Rating of the safety of the electric energy security of the republic as a whole, including energy areas of the northern region (normal, crisis, pre-crisis).	Rating of peculiarities and problems of power supply. Identifying of the main types of threats to the security of each power district of the republic.
		Development of indicators of the electricity security of each energy districts of the republic.
		Monitoring indicators of electricity power system security of each energy districts of the republic.
		Determination of the value and the level of safety for each energy districts of the republic.

Continuation of table 2.1.1

2.	Development of scenarios to ensure power system security of energy districts of the republic.	The development of actions to reduce the impact and neutralizing significant threats to the electric power system for each energy districts of the republic.
		Prediction of electric power system development in republic for period 2020-2030 taking into account the socio-economic development of the Republic and its Municipalities of the Republic of Sakha (Yakutia).
3.	Choice of prioritized ways for development of the power system in the republic including energy districts.	Scenarios for power system development of the republic, including energy districts.
		Cross-regional, intra-regional and intra-districts electricity transmission lines.
		Techno-economic requirements evaluation in investment, financial, material and human resources needs (business case for investment projects).
		Mutual interests agreement of energy companies with the Government of the Republic of Sakha (Yakutia), including the administration of the municipalities.
4.	Implementation of the scenario to ensure electric power security of the Republic and its energy districts.	Evaluation of order in funding among power generating facilities.
		Definition of organizational-economic mechanisms and sources of funding for the modernization and development of power system.
		Power system security monitoring. Investment projects realization.

Thus, Concept of prioritized electric power security of the Republic of Sakha (Yakutia) (Yakutia) is represented as a factor of reliable functioning of the economy and the livelihood of the population of the northern region.

2.2. Monitoring and indicative analysis of the electric power security of the region

Monitoring and an indicative analysis of the electric power security should be the most important component in power system security management of regions and basis of information support of these activities. There is a necessity for establishment of special monitoring system of power system security. This system must have rigid principles in an adequate level for being calibrated in variety and complexity of the causes and factors that form the condition of the electric power security.

These principles of monitoring and indicative analysis of the electric power security of the region must include [20]:

1. Power system safety management tasks are subordinated to common problem of electric energy security management.

2. Power system safety monitoring in the region and industry-specific reflection of the problems in energy industry and their interaction with related industries of the fuel and energy sector in the local economy.

3. Safety monitoring hierarchy structure, its management compliance to territorial and industry levels of FEC region.

4. The continuity of processes and phenomena identification, which determine the threats of electric power system and economic security.

5. Predictions in accounting processes of regional electric power system development, which reflects the properties of high time delay in industry development.

6. Maintenance of complexity of the actions for threats neutralizing to the security of electric energy coupled with the effects in power system.

7. Maintenance of methodological approach unity principle in indicative analysis electric energy security of the region.

8. The principle of priority of regulatory, organizational and economic methods and mechanisms in management and security of electric power of the region.

According to the enlightened principles, monitoring management for electricity security in northern territories should be implemented in unified governmental territorial and industrial monitoring systems of the economic security of the region.

Aims of monitoring and indicative analysis are following:

- identification of compositions, features, appearances of existing and predicted threats to security of electricity system;
- estimation of the current and expected level of electricity system security of the region;
- verification and choice of actions and management practices for threats preventions in the region power system.

Monitoring and indicative analysis of the electric power security of the region consists of 3 components:

1. Continuous (systematic) surveillance and tracking of processes and states from the standpoint for identifying threats to the power system security in two areas:

a) Energy supply area is an electric energy system, power system, sets of interrelated companies providing generation, transmission and distribution of electric energy;

b) Energy consumption area - sectors of the economy and the population.

The proposed monitoring is carried out on the basis of current observations (factual evidences) for already implemented or imminent threats to electric system security, as well as on the basis of prediction for the economy and the power system to determine the expected threats.

2. Rating or estimation (based on the results of the first component) of power system threats indicators of the region as a system of indicators characterizing of the level, composition and degree of appearance of electricity security threats.

3. Comparison of indicators values with the system of its critical values (threshold, risky, maximum allowable) and also resulting from comparison conclusions and recommendations.

In the process of analysis of the electric power security it is important to identify those groups of properties, phenomena and processes that collectively reflect the sensibility of the environment (economic, social, natural systems) to the electric power security threats, and therefore, must act as objects indicative analysis.

It is rational to distinguish three types of such objects as the objects of monitoring the electricity security of the region:

1. The degree of economy and social services satisfaction from electricity usage.

2. Stability of electric power development.

3. The degree of negative impact of electric energy engineering on the environment.

Due to criteria of energy safety management the formation of indicators is reasonable to perform by monitoring objects types of energy power in the region. In this regard, we distinguish the following groups of indicators:

- electric energy provision of to the region;
- power and capacity balance;
- provision by fuel;
- basic production facilities;
- economics and finance.

In the diagnosis of the republican territories on the electricity security it is appropriate to highlight three main principles of rating: normal, pre-crisis and recessionary.

Classification of normal concerns conditions in which all or substantially all remain acceptable indicative values preserve acceptable values, which correspond with normative or desired threshold indicator value or slightly deviates from the latter.

Pre-crisis state is a condition in which there is a clear risk of failures or malfunctions can occur close to the threshold limit values indicators in the power system of the region.

Recessionary state is characterized by serious failures in power system beyond accepted threshold limit values and threatens the safe operation and sustainable development of the region's electric energy. The seriousness of the recessionary state is in the need to apply emergency measures to reconstruction an acceptable recovery state. The state of recession is accompanied by great economic losses and often need external assistance for the rapid and effective response to electric energy security threats. Phase of the crisis is characterized by a significant deterioration in the overall security of the electricity situation in the region.

Realization of energy system security indicative analysis in contemporary stage should be subordinated to the overall goal of monitoring – the formation of a state control market system and regulation in the electricity industry.

A key point in the monitoring system is occupying to ensure energy system security, its diagnosis consisting from recognition and classification of the economy and power states (in terms of quantified degree of recession), but also consisting from identifying, analyze, and following localization of the reasons that may cause destabilization, the instability of the separate spheres of life in the region. The monitoring system requires strict accounting of the structural role of the electric energy industry in the regional economy, as well as in specific features of the functioning and development of electric energy power in the Far North territories.

Development of the system limit threshold indicators of power system security of the region is important component for monitoring electric power and activity to ensure power system security of the region. Preliminary condition of this task is development of a technique indicative analysis of a particular region and the formation of an expert group of scientists and specialists electric power sphere.

To determine the norm threshold of indicators one might select such ways as:

- analytical-optimizing methods (on the basis of economical values or rational principles);

- probative methods (on the basis of past soviet experience and analysis of factual power security level data).

The meaning of methodology is to determine the norm threshold indicators of electric energy security of the region where in the first approach it is revealed correlation reduced to the identification of the ratio of tangible harm to consumers, which is expressed in a low level of electricity security of the region to the costs of reducing this damage.

To estimate the thresholds indicators of electric energy security an expert method may be used. Based on expert analysis by an objective distinction threats are determined and their respective thresholds of performance indicators are established.

The threshold values of the power system security indicators of the regions differ depending on the specific areas. Part of the threshold values indicators have values common to the entire territory of the country, some significantly differ, in this regard there is a need to develop indicators of the electricity safety characteristic of each particular region.

For basic principles of monitoring indicative analysis of energy security of the region include the following:

1. Critical (normative) values of the indicators should take into account the possibility to finance activities for providing power system security of the region and the needs of the region to achieve and maintain an acceptable level of safety of its electric power engineering.

2. Monitoring indicative analysis of electric energy security of the region should be realized on the basis of the synthesis of unified single scientific framework and indicators system, on one hand, and specific techniques of indicative analysis for each region, on the other hand.

3. In developing methodology for monitoring the security of the electric system indicative analysis and determining the structure of the indicators maximum availability of the information data of state and departmental statistics should be provided, as well predictions from authoritative of power and economy development.

4. Monitoring of electric power security should be performed by energy enterprises under the organizational and methodological guidance and supervision of the public authorities. The latter, as we see, should directly realize an indicative analysis, develop and adjust critical (normative) values of indicators in the necessity attract scientific and design organizations. In the system of labeled national authorities in regional level of the Republic of Sakha (Yakutia), the main place should belong to the Ministry of Fuel and Energy industry. The determining role should be given to the State Committee of price policy - Regional Energy Commission of the Republic of

Sakha (Yakutia) (REC). As it can be clearly seen, governmental management of power system security monitoring in Republic of Sakha (Yakutia) should be carried out by the government of the republic represented by above-mentioned ministries and state committees.

5. The results of region monitoring can be used at different hierarchical levels of management development and operation of electric power areas: the highest level - the republican administration (the head of the Government President of the Republic of Sakha (Yakutia)), the average level - the Ministry of Fuel and Energy industry and the State Committee of price policy – the Regional Energy Commission of the Republic of Sakha (Yakutia) (State Committee of price policy - REC and the municipal administrations of the republic, design and research organization), the lowest level - electric energy production companies.

2.3. The definition and classification of electrical power safety threats of the Republic of Sakha (Yakutia) and its power districts

One of the most important problems of regional electrical power security in the Republic of Sakha (Yakutia) and its power districts is that in recent years the tendency to growth of emergency cases for the following reasons is traced: high wear level of fixed assets (generating capacities and power lines), bringing to a stoppage and, in some cases, to the power supply cessation of consumers in the northern region; lack of intraregional power lines among three technologically isolated power areas of the republic (CPD, WPD, SYPD) and lack of power reserves in the central power region; threats of electrical power safety can be called the difficulties arising with diesel fuel delivery for consumers in the northern power districts of the republic (NPD), including high and unregulated by the state fuel prices; acute shortage of investment resources and insufficient funding of capital investments in modernization and development of electrical power branch. Also the following issues have impact on process of reliable and high-quality power supply of consumption: low technical equipment and low efficiency of power objects, short delivery of primary energy carriers for power plants, shortage of material resources, breakdown of equipment as a result of the personnel wrong actions, production accidents and natural disasters.

Electrical power safety assurance assumes identification and systematization of the events which approach directly or indirectly can pose threat for power industry, for power supply process of a national economy and the population of the Republic of Sakha (Yakutia) and its power districts, in particular. The process of power supply is accompanied by threat of critical and emergency situations occurrence of both at producers, and at consumers of the electric power in each power area. For electrical power safety assurance of the Republic of Sakha (Yakutia) the analysis of possible reasons of emergence and manifestation of any influences is necessary, i.e. the main threats in every separate power district and in the republic, as a whole.

On the basis of the threats classification of electrical power safety offered by us is the approach used at a grouping of threats to the country safety which has the following signs: sphere of human activity (political, economic, social, legal, military, ecological, demographic, genetic, scientific and technical, technological, ideological, psychological, intellectual, information and raw); threat source (internal, external); relation to human activity (objective and subjective); probability of realization (the real - can be carried out at any moment; the potential - in case of formation of certain conditions); consequences (general, local) [20]. The critical and emergency situations which took place in the past and arising in power industry of the northern region now, accounting their features, allow classifying threats of electrical power safety of the region by the reasons of their emergence in the sphere of human activity.

As a result of theoretical bases research of energy security and various aspects of electrical power safety the most important groups of threats of electrical power safety of the Republic of Sakha (Yakutia) and its power districts were specified: technical threats; threats in the sphere of economy and finance; political threats; threats in the legal sphere; threats in the management sphere; natural threats; the threats caused by a human factor; raw threats.

Technical threats

To the technical threats we can refer a low technological level and quality of electric equipment, uncompensated aging and elimination of funds; high degree of wear, inexpediency of repair morally and technically outdated OPF, deficiency of the electric power generation capacities, poor quality of the electric power. Rate of the equipment aging of power supply system advances its modernization possibilities. Thus, equipment aging can already limit development of region's economy in the next years. It is necessary to notice that there are two main ways to decrease deficiency of generating capacities: first, construction of generating capacities, secondly, development of electric networks.

So, a consequence of untimely repair of the obsolete equipment of diesel power plant in 1993 in the Deputatsky village (Northern power district of the republic) there was an accident as a result of which all objects of the settlement activity were frozen, the significant damage to economy and the republic population was done.

Threat of accidents on such power objects, as hydroelectric power stations, in Western power district of republic is accompanied by the increased risk of negative influence on the diamond-mining and oil and gas industry, and also on the social sphere of this territory. The global industrial techno genic catastrophe on Sayano-Shushenskaya hydroelectric power station in 2009, caused by fatigue failure of the equipment can be a sad example. Consequences of that accident were reflected in an ecological situation of the water area adjacent to hydroelectric power station, on social and economic spheres of the region.

To the technical threats of the northern region (the Republic of Sakha (Yakutia), in particular) except the above-mentioned it is necessary to refer the lack of electric networks among power areas and lack of a large reserve source of the electric power at accidents.

Threats in the sphere of economy and finance

It is possible to allocate some reasons of a critical situation emergence with electrical power safety in this sphere. Among them there are non-payments, unreasonable tariffs, the high prices of primary energy carriers (fuel for power plants), growth of cross subsidizing of consumers of the electric power, decrease in volumes of consumption by the industrial enterprises, absence of incentives on economy of cost of electricity generation, acute shortage of investment resources.

First of all, it should be noted the problems connected with dynamics of the prices as the prices define many reasons of threats.

It is possible to allocate major factors which have impact on dynamics of tariffs for the electric power:

1. Increase of the internal prices of primary energy carriers - natural gas, coal and diesel fuel (in northern regions where diesel power plants are in use). Quantitative estimates of this indicator differ, but in any case it is estimated by the dozens percent. “Power strategy of Russia for the period till 2020”, developed by the Government of the Russian Federation assumes that only for 2010-2012 gas price for industrial consumers will grow approximately by 40% [8]. According to this document, for ensuring necessary growth of investments into gas branch by 2012 internal gas prices have to grow not less than twice.

The rise in prices for diesel fuel directly depends on the world prices on oil of the Brent brand which now makes 125 - 130 dollars for barrel, its growth is expected in further.

2. Acute shortage of investment resources. Today wear of active part of funds in power industry makes 60-65%. In 5-7 years in the absence of large-scale private capital investments this indicator will exceed 70%. The probability of emergence of generating capacities deficiency and need in investments attraction for its prevention are seen as the most important arguments of ensuring electrical power safety of regions. Along with growth of electricity consumption, need of capital investments into electrical power objects is obvious. For ensuring payback of such investments the price level existing today on the electric power is obviously insufficient and it has to be cardinally increased.

3. Decrease in volumes of consumption by the industrial enterprises. As a result of non-alignment of the large oil and gas companies - consumers of electric energy to JSC Yakutskenergo networks recently there is a decrease in electricity consumption. It is favorable to companies-consumers to build own sources of electricity generation, at the existing price level on the electric power of JSC Yakutskenergo their own investment projects on building of new electro generating objects become profitable. For example, projects on construction (to 200 megawatt) and, it is necessary to notice, not so cheap (by the volume of investment per rated capacity) combined-cycle electric generating plant (CHP) become attractive to the oil companies in many respects because they have access to use of associated gas, an oil production by-product. By the way, because of backwardness of a gas transmission network in the majority of its production places alternative possibilities of associated gas application are extremely limited, thereafter, often it is simply burned. Prime cost of the electric power made on such CHP, has rather high constant (depreciation of fixed assets, compensation, repair and service), but thus very low variable making (fuel). Therefore, use of such electric power is economically attractive alternative to its acquisition at the power industry enterprises. It is necessary to make a reservation that acquisition of own source of electric energy at the expense of construction of new generating capacities is not always economically justified.

5. Decrease in the financial streams aimed at the development of the electrical power enterprises. In the conditions of increase in volumes of electricity consumption this factor will inevitably lead to critical situations in power supply: probability of obtaining low volumes of the profit received by the companies; limited opportunities for attraction of external financing; inappropriate use of profit, and at last, to the growth of cross subsidizing for industrial consumers and population.

Political threats

For regional electrical power security the greatest problems can cause the following political threats:

1. Irrational actions of social movements against construction of new power generation facilities.

2. Speeches of these movements of the representatives in protection of ecology are capable to lead to blocking of decision-making and implementation of the reasonable highly effective projects aimed at the development of power industry.

Threats in the legal sphere

At implementation of competitive model of branch development the main functions of regulators one usually refers:

- licensing;
- price control;
- competition support (implementation of antimonopoly regulation);
- control over activity of natural monopolies, ensuring non-discriminatory access to their infrastructure and services;
- assistance to development of the electric power market , the general control over its functioning.

All specified functions demand a regulation on the state and regional level.

Threats in the management sphere

We allocated a number of the problems connected with ensuring reliable power supply:

1. Inopportuneness of the decision of such significant problems for ensuring electrical power safety, as repair, modernization of power objects and financing of investment projects, and also the insufficient funding of the specified actions put in tariffs.

2. Inefficient use of resources - fuel, material and financial. Unsatisfactory use of energy saving technologies, power squandering.

3. Violation of delivery time of fuel. Impossibility of production warehousing of power industry as indisputable argument for terms observance of uninterrupted fuel supply for power plants of the northern region.

4. Inefficiency of carrying out energy saving policy and weakness of mechanisms of its realization.

5. Low level of automation of decision-making processes on management of power generation facilities.

6. Weakness of state mechanism of regulation and control over economic activity of the companies.

7. Responsibility dispersion. At emergence of problems with electrical power safety responsibility, a priori, has to be assigned to the regional authorities. Without denying responsibility of the regional authorities for electrical power safety, we consider that it (responsibility) has to be assigned, first of all, to power engineering specialists.

8. The regional power companies and subjects administrations providing an obstacle to give to the industrial enterprises the right of the admission to the wholesale market.

9. Control over quality of services.

10. Stimulation of investments, developments of capacities.

Natural threats

Natural threats include two main subgroups:

- natural disasters (floods, the ice phenomena, fires) which can lead to destruction or considerable damage of electrical power objects;

- aggressive manifestations of natural processes (severe winters, long low-water content of a river drain), bringing to the general or local intensity in balances of energy resources and to interruptions in fuel - and power supply.

As experiment of other regions shows it is impossible to underestimate possibility of manifestation of spontaneous processes even in conditionally stable regions on climatic indicators.

Already in the first half of 2011 in the territory of Russia there were 6610 centers of natural fires on the area of 142 510 hectares that exceeded an indicator for the same period of 2010 by 1,2 times.

Average annual damage from floods in Russia - 3,25 billion dollars, they threaten about 70% of territories and to 40 large cities.

As a result of unknown in size of ice jams on the Lena River in 2001 there was a flood which consequences couldn’t be eliminated with forces of the Republic of Sakha (Yakutia). Total damage from natural disasters made about 6 billion rubles.

Predicted warming of climate and inevitable growth of further development of river valleys, undoubtedly, will lead to increase in repeatability and aggressive force of floods.

The threats connected with a human factor

Now the problem of formation of safety culture in power industry as a whole is actively solved, however into the forefront it is worth putting the importance of a human factor in ensuring safe operation of technical devices.

The assessment of reliability of systems of ensuring electrical power safety without reliability of work of the person can't give a true picture. Errors of the personnel at an operational phase can be divided into the following groups:

- mistakes of the operator in management of installation;
- mistakes when carrying out maintenance, checks or repair;
- mistakes by drawing up regulations and operational instructions or insufficient control over their observance;

It is possible to distinguish from the main reasons of mistakes as follows:

- unsatisfactory preparation or low qualification of the personnel;
- unsatisfactory working conditions;
- unsatisfactory equipment by the necessary instruments;
- indiscipline and low organization.

It is natural that on different sites of activity of the person there is different responsibility and various probability of emergence of mistakes.

Also it should be noted the reasons of threats emergence of the electrical power safety, connected with a human factor and characteristic for power industry transition to the market:

- reduction of the funds allocated for preparation of the personnel.
- absence of the qualified experts in management of power consumption modes.

It is obvious that the specified reasons are temporary ones, however it is necessary to pay attention to them, as the inadequate relation to this threat can lead to global disasters.

Raw threats

It is well-known that the power industry directly depends on providing with necessary fuel for electricity generation for power plants. This problem is actual one for regions where the power industry is focused on concrete types of fuel. In this regard, it would be desirable to note the main reasons for threats of electrical power safety in the northern region:

- high probability of short delivery of diesel fuel because of the high prices and difficulties of northern delivery;
- exhaustibility of stocks of coal and natural gas, growth of their prices.

Obviously it is represented that in the regions focused on concrete types of fuel, actions on elimination of such reasons in case of an unsatisfactory situation with fuel have to be developed. On the other hand, within certain regions it is possible to use alternative types of fuel.

Offered classification of threats is differed by its complex and fuller reflection of conditions and, therefore, features of functioning of power industry in the conditions of the North. Criteria of allocation of the main groups of threats are nature of processes and the phenomena (manifestations) generating threats to electrical power safety of the northern region, and also possible negative consequences on economy and the social sphere of the Republic of Sakha (Yakutia). For northern territories technical threats and threats in the sphere of economy and finance are especially significant.

The classification of main types of threats of electrical power safety offered in table 2.3.1 and their consequences for the Republic of Sakha (Yakutia) is made on the basis of the revealed threats as a whole on the republic and presented in the generalized type of the most significant threats of electrical power safety.

Table 2.3.1

Classification of main types of threats of electrical power safety and their consequence for the Republic of Sakha (Yakutia)

The factors defining types of threats	Consequences for the Republic of Sakha (Yakutia)
1. Technical threats	
1.1 Lack of intra-regional power lines between three technologically isolated power areas of the republic and lack of reserve capacities.	Growth of quantity, volumes and consequences of accidents, technological violations and repair expenses.
1.2 High degree of wear of the fixed business assets, on the average it makes more than 50,5%.	Decrease in electricity generation.
1.3 High losses in networks in view of high wear and low capacity of power lines (on the average - 17%).	Material damage to economy and to the population.
1.4 Stop of power plants because of accidents and technological violations.	Growth of number of cascade (chain) accidents in electric networks, especially on wooden support.
1.5 High specific fuel consumption and cost of electricity generation, irrational modes of operation.	Termination of power supply and/or rolling blackouts of consumers from power supply.
1.6 Deficiency of rated capacities of generation in Central energy district in the presence in the	Threat of freezing of power generation facilities, economy and settlements of the republic northern power district.

Continuation of table 2.3.1

republic of the hydropower and fuel resources 1.7 lack of power lines between three technologically isolated power areas. 1.8 Deterioration of a condition of regional economy and life support of the population of the Northern region and, as a result, losses in all spheres of life support. Lack of large reserve sources of the electric power at accidents in Central and Western power districts. 1.9 Accidents of electric equipment of DES and power lines in the local territory of northern areas of the republic. 1.10 Territorial dispersion of the decentralized consumers in the republic. 1.11 Sharp decrease in volumes of consumption of energy in Western and Southern Yakutsk power areas the diamond-mining and coal enterprises. 1.12 Refusal of potential industrial consumers of the centralized sources of the electric power and construction of own autonomous sources. 1.13 Problems of northern delivery of diesel fuel for power plants. 1.14 Inefficient use of energy resources.	Growth of emissions of production waste and, as a result, environmental pollution.
2. Threats in the sphere of economy and finance	
2.1 Lack of own financial means on the solution of perspective tasks. 2.2 Insufficient funding of funds for repair of power objects. 2.3 Acute shortage of investment resources, insufficient funding of capital investments in modernization and development, building of power effective objects of branch and on energy saving. 2.4 High prime cost of the electric power developed by diesel power plants in Northern power district of the republic. 2.5 The high prices of primary energy carriers (fuel for power plants). 2.6 Refusal of the potential industrial enterprises of the region of electricity consumption in in view of high tariffs.	The accelerated wear, aging of the equipment and/or its conclusion from work. Growth of accident rate of the equipment, volumes of emergency and recovery and repair work. Decrease in reliability of power supply of consumers and/or restriction of holiday of the electric power. Lag of input of new capacities, advancing of increase in demand of electricity consumption over its production, decrease in reserves of energy (power). Inefficient electricity generation. Growth of tariffs for the electric power for consumers. Financial instability of the enterprise, decrease in its solvency;

Continuation of table 2.3.1

2.7 Growth of non-payments and debts for the delivered electric power. 2.8 Existence of cross subsidizing of consumers of the electric power.	Short-reception of tax and other payments by budgets of different levels. Nedoosvoyeniye of investment means, untimely input of power objects. Overexpenditure of financial means of the enterprises of power industry and consumers of electric resources.
3. Political threats	
3.1 Actions of social movements against the construction of new power facilities. Presentations of these movements in defense of the environment can lead to blockage of decision-making and informed high-impact projects aimed at the development of electric power industry.	Blocking the decision-making and the inability of sound investment projects for the development of electric power industry. Freezing investment and electricity shortages.
4. Threats in the legal field	
4.1 Low levels of legal support regulation of the electricity security of the region.	The physical and moral deterioration of equipment, disabling it. The backlog of new capacities, advancing the growth of demand in electricity consumption over its production, decrease in reserves. Growth of emergency equipment, the volume of emergency repair and maintenance work. The rising cost of electricity and tariffs, inefficient use of energy resources.
5. Threats in the management field	
5.1 Untimely solutions vital tasks (maintenance, modernization and construction of energy efficient buildings, etc.). 5.2 Mismanagement of fuel, material and financial resources. 5.3 Inefficiency of energy-saving policies and the weakness of the mechanisms for its implementation. 5.4 The inefficiency of the economic and energy policies, inadequate legislation. 5.5 Inefficiency of energy conservation policy. 5.6 Low level of automation of management decision-making power facilities. 5.7 The weakness of the state mechanism of regulation and control over the economic activities of companies. 5.8 Dispersal of responsibility. If you have any problems with the electricity security	Inefficient use of energy-saving technologies. The reduction and / or discontinuation of power supply to consumers.

Continuation of table 2.3.1

responsibility, a priori, should rest with the regional authorities. Without denying the responsibility of the regional authorities for electric power security, we believe that it (responsibility) should be attributed, primarily, to the engineers. 5.9 Obstruction of regional energy companies and administrations of the territories to provide industrial companies the right of access to the wholesale market. 5.10 Control over the quality of services. 5.11 Promotion of investment, the development of capacities.	
6. Natural threats	
6.1. Natural disasters - floods, fires, etc. 6.2. The threat of water shortage for Vilyuiskaya and Svetlinskaya hydroelectric power plants.	Failure of electric power facilities. Growth of emergency equipment. The reduction and / or discontinuation of power supply of the republic.
7. Threats connected with the human factor	
7.1. Human error during the operation phase. 7.2. Low qualification of personnel, poor organization of work and poor working conditions.	Failure of electric power facilities, disable and / or limiting the supply of electricity to consumers. Growth of emergency equipment.
8. Raw threats	
8.1. Breach of security of fuel supply. 8.2. Exhaustion (exhaustible) of natural resources.	The increasing threat electricity security of the republic. The reduction and / or discontinuation of power supply to consumers.

The above classification of security threats to the electric power of the Sakha Republic (Yakutia), including its power districts, in our opinion, indicates that the problem of electricity security is a particularly important and relevant to the population and the economy of the Republic of Sakha (Yakutia), as well as other areas of northern Russia.

Warning of the threats identified in each power district and the country as a whole, will help to prevent negative trends violation of reliable power supply, the destabilization of the region's economy and the deterioration of living standards.

Proposed in Table 2.3.2 Classification of the main types of security threats to the electric power and its implications for energy regions of the Republic of Sakha (Yakutia) is made on the basis of the threats identified in each power district and presented in summary form the most significant security threats to the electricity power regions of the republic.

Table 2.3.2

Classification of the main types of security threats on the electricity power districts of the Republic of Sakha (Yakutia)

№ s/p	Central Power District (CPD)		Western Power District (WPD)		South Yakutia Power District (SYPD)		Northern Power District (NPD)	
	Types of threats	**Possible consequences**	**Types of threats**	**Possible consequences**	**Types of threats**	**Possible consequences**	**Types of threats**	**Possible consequences**
1. Common threats	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA, 4) Lack of energy-saving technologies.	The occurrence of accidents and emergencies in the power district, the restriction and /or termination of power supply.	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA, 4) Lack of energy-saving technologies.	The occurrence of accidents and emergencies in the power district, the restriction and / or termination of power supply.	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA 4) Lack of energy-saving technologies.	The occurrence of accidents and emergencies in the power district, the restriction and / or termination of power supply.	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA 4) Lack of energy-saving technologies.	The occurrence of accidents and emergencies in the power district, the restriction and / or termination of power supply.
	Economic: 1. Shortcomings of the methods of state regulation of electricity tariffs in the RS (I): 1). The existence of cross-subsidies (PS) between the electric and thermal energy;	Growth of rates, -lower welfare; - increasing number of insolvent consumers; - restriction and / or termination of electricity supply to consumers of energy district;	**Economic:** 1. Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): 1). The existence of cross-subsidies (PS) between the electric and thermal energy;	- Growth of rates, lower welfare;- increasing number of insolvent consumers; - restriction and / or termination of electricity supply to consumers of energy district;	**Economic:** 1. Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): 1). The existence of cross-subsidies (PS) between the electric and thermal energy;	-Growth of rates, lower welfare;- increasing number of insolvent consumers; - restriction and / or termination of electricity supply to consumers of energy district;	**Economic:** 1. Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): 1). The existence of cross-subsidies (PS) between the electric and thermal energy; 2). The existence of cross-subsidies (PS) between business and residential customers;	- Growth of rates, lower welfare;- increasing number of insolvent consumers; - restriction and / or termination of electricity supply to consumers of energy district;

Continuation of table 2.3.2

	2). The existence of cross-subsidies (PS) between business and residential customers; 3). Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; 4) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (Y) and its own resources of energy companies; 5). Formation of the cost of fuel and repair of power objects below the	- precarious financial condition of the power industry of power district; - producer losses of e /energy; - reduction in tax revenues to the local budget.	2). The existence of cross-subsidies (PS) between business and residential customers; 3). Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; 4) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (I) and its own resources of energy companies; 5). Formation of the cost of fuel and repair of power objects below the planned regulatory costs;	-precarious financial condition of the power industry of power district; - producer losses of e /energy; - reduction in tax revenues to the local budget.	2). The existence of cross-subsidies (PS) between business and residential customers; 3). Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; 4) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (I) and its own resources of energy companies; 5). Formation of the cost of fuel and repair of power objects below the	-precarious financial condition of the power industry of power district; - producer losses of e /energy; - reduction in tax revenues to the local budget.	3). Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; 4) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (I) and its own resources of energy companies; 5). Formation of the cost of fuel and repair of power objects below the planned regulatory costs; 6). In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of	-precarious financial condition of the power industry of power district; - producer losses of e /energy; - reduction in tax revenues to the local budget.

Continuation of table 2.3.2

	planned regulatory costs; 6). In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period.		6). In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period.		planned regulatory costs; 6). In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period.		income, therefore, is not of the expenses during the reporting period. 2. The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition.	
	2. The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition. 3. The lack of investment: 1). Low share of investment in modernization and development of power objects;		2. The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition. 3. The lack of investment: 1). Low share of investment in modernization and development of power objects;		2. The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition. 3. The lack of investment: 1). Low share of investment in modernization and development of power objects;		3. The lack of investment: 1). Low share of investment in modernization and development of power objects; 2). Low amounts of financing of investment programs of development of power industry of power district; 3). The emergence of investment needs, the shortage of investment funds and under-funding of investment projects.	

Continuation of table 2.3.2

	2). Low amounts of financing of investment programs of development of power industry of power district; 3). The emergence of investment needs, the shortage of investment funds and under-funding of investment projects.		2). Low amounts of financing of investment programs of development of power industry of power district; 3). The emergence of investment needs, the shortage of investment funds and under-funding of investment projects.		2). Low amounts of financing of investment programs of development of power industry of power district; 3). The emergence of investment needs, the shortage of investment funds and under-funding of investment projects.			
2. Specific threats ОЭлБ	**Technical:** 1) Growing shortage of energy and power because of a great demand of the electric power; 2) The lack of intra-regional transmission lines between the three technologically isolated areas of energy; 3) Violation of the date of delivery of natural gas; 4) Accidents on the main gas pipeline	- deficiency of energy and capacities on the Yakut state district power station as the main limiting factor of development of economy and the social sphere; - the occurrence of accidents and emergencies in the power district; - restriction and / or termination of power supply.	**Technical:** 1) Lack of intra-regional power lines between three technologically isolated power areas; 2High losses in transmission lines due to low bandwidth; 3) accidents on the gas pipeline and, as a result, the termination of supply by natural gas boilers in villages Aykhal and Udachny;	- accidents on the high voltage line, including high accident rate of electric networks on wooden poles because of their wear (high voltage line break); - restriction of power supply of consumers at high losses of the electric power in power supply networks;	**Technical:** 1) Lack of intra-regional power lines between three technologically isolated power areas; 2) Violation of delivery time of coal.	- inability to transfer excess energy and capacity in the CED and EDAs; - high cost of production of electric / power due to free prices for steam coal for power stations energy district.	**Technical:** 1) High wear of OPF; 2) High wear of a power line and high level of losses of the electric power in distributive networks of a low voltage (up to 25 %); 3) Morally and physically obsolete diesel power generators; 4) Non-rational modes of operation of the equipment DES; 5) Underutilization of electrical equipment; 6) Seasonal character of fuel delivery, short terms of the navigation, difficult transport scheme with transfers from one type of transport on another;	- restriction of power supply of consumers at high losses of the electric power in power supply networks; - threat to freeze settlements and villages, the losses of producers and consumers of electric power.

Continuation of table 2.3.2

	Kyzyl-Syr-Mastakh-Berge-Yakutsk.		4) short deliveries of diesel fuel for energy production from reserve sources (DES) in Vilyuysky region (Suntarsky, Nyurbinsky, Verkhnevilyuysky); 5) higher prices for natural gas and diesel fuel; 6) Water restriction on KVGES and VGES-3 provided water shortage and the lack of an adequate supply of water to the Chernyshevskoe reservoir; 7) low capacity of the high voltage line 220 kV Mirnyi-Nyurba.	- poor quality of the electric power in Vilyuysky region; - occurrence of accidents and emergencies in the power district; - restriction and / or termination of power supply.			7) Non-optimal structure of fuel balance bringing to considerable costs of diesel fuel – 59%; 8) Problems of northern diesel fuel delivery for power plants remote settlements because of difficult transport infrastructure; 9) High specific fuel consumption; 10) Lack of intra-regional power lines between three technologically isolated power areas; 11) Territorial dispersion of the decentralized consumers and their small power loadings; 12) The accelerated wear and aging of diesel generators and power supply networks; 13) Short energy deliveries to the Bilibino nuclear power plant - for the Chersky village, the Magadan ZES - for the Ust-Nera village.	

Continuation of table 2.3.2

	Economic: 1. Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y):	- deterioration in the financial sectors of the economy; - growth of energy tariffs and as a result, search by consumers and construction of autonomous power sources;	**Economic:** 1. Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y):	- growth of energy tariffs - reduction of productive e / energy and, as a consequence, search by consumers and construction of autonomous power sources;	**Economic:** 1. Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y):	- deterioration in the financial sectors of the economy; - growth of energy tariffs and as a result, search by consumers and construction of autonomous power sources;	**Economic:** 1. High prime cost of the electric power bringing to notable financial losses; 2. Impossibility of technical modernizations at the expense of own local power industry sources;	- unstable financial condition of the power industry enterprises in power district; - restriction of electricity supply to consumers.
	1). The existence of cross-subsidies (PS) between power districts; 2). Advancing increase in natural gas prices compared with the rates for electric / power due to failure rate and, as a result, loss of enterprises, leading to an unstable financial and economic condition; 3). Groundlessness of tariffs on e / energy because of the existence of the SS between the CED and power districts of the republic.	- restriction of electricity supply to consumers.	1). The existence of cross-subsidies (PS) between power districts; 2). Advancing increase in natural gas prices compared with the rates for electric / power due to failure rate and, as a result, loss of enterprises, leading to an unstable financial and economic condition; 3). Groundlessness of tariffs on e / energy because of the existence of the SS between the CED and power districts of the republic.	- restriction of electricity supply to consumers.	1). The existence of cross-subsidies (PS) between power districts; 2). Increase in coal prices due to the lack of government regulation of JSC HK Yakutugol, which is the monopolist of the steam coal supply of Neryungrinsky state district power station. 3). Groundlessness of tariffs on e / energy because of the existence of the SS between the CED and power districts of the republic.	- restriction of electricity supply to consumers.	3. Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y): -The existence of cross-subsidies (PS) between power districts; 4. Growth of tariffs for diesel fuel and advancing rise in prices for diesel fuel in comparison with tariffs on energy because of insufficiency of a tariff and, as a result, the losses of the enterprises bringing to an unstable financial and economic condition;	

Continuation of table 2.3.2

							5. A high proportion of the fuel component cost of electricity, the high cost of electricity, leading to high tariffs on e / energy produced by the DPP; 6. The annual amount of credit resources (more than 2 billion rubles.) involved for delivery of diesel fuel threatens the financial stability of the company.	

In the given classification of the main types of security threats to the electric power, the possible implications for the whole of the Republic of Sakha (Yakutia), and for its energy areas in particular have been defined.

Thus, we identified and grouped the main types of security threats to the electric power characteristic of the electric power industry of the northern region, as a whole, and for its energy areas, in particular. The classification of the main types of security threats to the electric power of the Sakha Republic (Yakutia) and its power regions, taking into account features of the operation of the electricity industry in the North and the definition of their manifestation of differences in each power district with the release, in particular: technical threats, threats in the field of economics and finance, political threats, threats of legal developments; threats in the field of management; natural hazards, threats caused by human factors, raw threats.

2.4. Indicators of ensuring electrical power safety of the Republic of Sakha (Yakutia)

As it was noted in the previous chapter one of the most important problems of regional electrical power security in the Republic of Sakha (Yakutia) and in its energy regions, in particular, is that in recent years the tendency of emergencies growth has been traced for the following reasons: high level of wear of fixed assets (generating capacities and power lines), bringing to a stop and, in some cases, to the termination of power supply of consumers of the northern region; lack of intra regional power lines among three technologically isolated power areas of the republic (CER, WER, SYER) and lack of a reserve of capacities in the Central power district; as example of threats of electrical power safety it is possible to call the difficulties arising with delivery of diesel fuel for consumers of Northern energy region of the republic, including high fuel prices not regulated by the state; acute shortage of investment resources and insufficient funding of capital investments in modernization and development of electrical power branch. The following has also its impact on process of reliable and high-quality power supply of consumption: low technical equipment and low efficiency of power objects, short delivery of primary energy carriers for power plants, shortage of material resources, and equipment failure as a result of the wrong actions of the personnel, production accidents and natural disasters.

Feature of electrical power safety of regions is possibility of its measurement. Basis for an assessment of threats and damages from their influence - both accepted, and unacceptable - indicators of electrical power safety of regions which were developed on the basis of some indicators characterizing energy security of Russia, presented in “Russian security” [20], and indicators of energy security of territorial subjects of the Russian Federation in the territory of the Far East, presented in the monograph of group of scientists of Institute of systems of power of L.A. Melentyev of the Siberian Branch of the Russian Academy of Science “The eastern vector of Russia’s energy strategy: the modern state of view to the future [44]. ”

At the heart of the above-offered indicative analysis (page 63-64) the following principles lie [20]:

1. Subordination of problems of management of electrical power safety to a common problem of management of energy security.

2. Tracking of level of electrical power safety in the region and reflection of branch character of problems of power industry and their interactions with allied industries of energy industry of the region and economy.

3. Hierarchy of structure of monitoring of electrical power safety, its compli-ance to territorial and branch levels of energy industry management of the region.

4. Continuity of identification of processes and the phenomena defining threats to electrical power and economic safety.

5. The forecast of the accounting of developments of power industry of the region, reflecting properties of a high lag effect of development of branch.

6. Observance of the principle of complexity of actions on neutralization of threats of electrical power safety in power systems taking into account the interfaced effects.

7. Observance of the principle of unity of methodical approach of the indicative analysis of electrical power safety of the region.

8. Principle of priority of standard and legal, organizational and economic methods and mechanisms of management and providing with electrical power safety of the region.

In our opinion, the following principle of priority of economic safety and ensuring social stability is necessary still in society, as main goal of any state and concrete territory.

Criteria of allocation of the main groups of threats are factors defining types of threats both characteristic general and specific threats of electrical power safety of the Republic and its energy regions.

On the basis of the above principles of the indicative analysis and revealed threats of electrical power safety we can allocate the following groups of indicators:

- security of the region with the electric power;
- balance of the electric power and power;
- security with fuel;
- fixed business assets;
- economy and finance.

Due to the new economic operating conditions of the republican power company reflecting existing problems in power industry and threats to electrical power safety of the republic and its energy regions such indicators, as “excess level of losses in power lines,” “a lack of own current assets on development are in addition developed and offered and power industry modernization,” “sufficiency and validity of tariffs for electric energy.”

As the “excess level of losses in power lines indicator” in power industry system isn’t considered. In the Republic of Sakha (Yakutia) losses in power lines in Vilyuysky electric lines of JSC Yakutskenergo make more than 40%. Thus, nearly a half of the made electric power because of the low capacity of existing po-wer lines of VL-110 kV doesn’t reach consumers of Vilyuysky region of the republic.

We think that if we do not consider the supposed indicator, so we won’t be able fully evaluate a level and peculiarities of energy power security in the Western energy region of our republic. Such moments are in other energy regions of the republic, that is why the evaluation of indicator “norm-above level of losses in lines of electro transmission” to secure energy safety of the northern region is better to enter the group of indicators “The main productive funds.”

All indicators ES and tariffs rates for energy and social security of the population depend on levels of proposed indicators “lack of own funds to develop and modernize energy power” and “economic proved tariffs on energy.”

The structure of the main indicators of electrical power safety of the Republic of Sakha (Yakutia) is revealed taking into account classification of threats also presented in the generalized scheme in fig. 2.4.1. In our opinion, first of all these indicators prove level of electrical power safety of the region.

1. Security with the electric power	- a share of own development; - index of change of a share of electricity consumption in the region in relation to consumption in the Far East federal district the Russian Federation; - index of change of shower electricity consumption in the region; - index of change of a share of electricity consumption on unit of made production (service).
2. Balance of the electric power and power	- share of the electric power made in the territory of the Republic; - covering coefficient (the relation of total located electrogenerating power to an annual maximum); - share of power of consumers of the electric power with not redundant power supply; - share of power of consumers of the electric power in zones of the decentralized power supply.
3. Security with fuel	- security with primary energy resources of power plants (coal, gas and diesel fuel); - share of dominating fuel in electricity generation; - average specific consumption of conditional fuel on electricity generation.
4. The fixed business assets	- degree of wear of the electrical power equipment; - excess level of losses in power lines; - share of capital investments in power industry on the relation to the cost of the fixed business assets
5. Economy and finance	- a financial condition of the electrical power enterprise; - lack of own current assets on development and power industry modernization; - sufficiency and validity of tariffs for electric energy; - share of excess of accounts payable over the debit in the annual volume of shipped production; - share total (debit and creditor) mutual debt of the enterprises of power industry in the annual volume of shipped production.

Fig. 2.4.1. Structure of the generalized indicators characterizing electrical power safety of the Republic of Sakha (Yakutia) and its energy regions

System of the indicators which have received quantitative expression, and its comparison with threshold values or with the accepted standard indicators allow to signal beforehand about imminent danger and to undertake measures for its prevention.

The main methods of control over electrical power safety of the Republic of Sakha (Yakutia), as a whole, as one of the most important organizational and economic mechanisms of ensuring electrical power safety of the region taking into account specifics are allocated and features of functioning of power industry of the North (tab. 2.4.1).

Table 2.4.1

Main methods of control over electrical power safety of the Republic of Sakha (Yakutia)

Indicators	Methods of management
Security of the region with the electric power: - share of own development; - index of change of a share of electricity consumption in the region on the relation to consumption in the Far East federal district; - average specific consumption of conditional fuel on electricity generation; - share of dominating fuel in electricity generation; - index of change of shower electricity consumption in the region; - index of change of a share of electricity consumption on unit of made production (service); - compliance of quality of the released electric power to specifications. **Balance of the electric power and power:** - share of the electric power made in the region territory; - covering coefficient (the relation of total located electro generating power to an annual maximum); - share of power of consumers of the electric power with not redundant power supply; - share of power of consumers of the electric power in zones of the decentralized power supply. **Security with region fuel:** - security with primary energy resources of power plants (coal, gas and diesel fuel); - share of dominating fuel in electricity generation **Fixed business assets:** - degree of wear of the electrical power equipment;	- financing of state programs of development of power industry; - allocation of the target credits to the electrical power enterprises of the region for production development and modernizations of power objects, and also on introduction of energy saving technologies; on fuel acquisition, power equipment modernization for the purpose of transition to local (cheap) types of fuel; - creation of Fund of own current assets for northern delivery of fuel for power plants; - formation of investment fund of power industry of the region; - inclusion of an investment extra charge in tariffs on the electric power; - granting to the electrical power enterprises of tax privileges; - insurance of investment risks; - attraction of financial means of consumers of the electric power and administrative resource; - application of local (cheap) fuel; - financing of scientific research in sphere of energy saving technologies; - use of renewable sources of energy power; - financing of scientific research in energy saving technologies for industrial enterprises; - strengthening of antimonopoly law; - raising of image or energy power enterprises through cooperation with Media.

Continuation of table 2.4.1

- excess level of losses in power lines; - share of capital investments in power industry in relation to the cost of the fixed business assets. **Economy and finance:** - financial condition of the electrical power enterprise; - lack of the own funds to develop a branch; **- economically proved tariffs on energy power;** - share or enlarging of credit debt over debit in annual amount of supplied production; - share of summed (debit and credit) mutual debt of energy enterprises in annual amount of supplied production.	

On the basis of the made analysis of the revealed threats of electrical power safety of each power area, in particular, and as a whole on the republic:

- the main groups of indicators of electrical power safety of the Republic of Sakha (Yakutia) used and for its every energy region have been developed;

- the main groups of indicators of electrical power safety of the Republic of Sakha (Yakutia), as a whole, and in every energy region, in particular are offered; such indicators of electrical power safety as “excess level of losses in power lines,” “a lack of own current assets are in addition developed on development and power industry modernization,” “sufficiency and validity of tariffs for electric energy;”

- the interrelation of the offered indicators with the threats of electrical power safety considering specifics is defined and features of functioning of power industry of every energy region in the conditions of the North: security with the electric power; characteristic of electrical power resources; security with fuel; fixed business assets; economy and finance;

- for each group of threats of electrical power safety of the republic the methods of management considering specifics of possible manifestation of threats, capable to increase electrical power safety of energy regions and consequently, the Republic of Sakha (Yakutia) are offered.

Offered classification of threats differs also the complex and private, and, therefore, fuller reflection of conditions and features of functioning of power industry of the republic and its energy regions in the conditions of the North.

CONCLUSIONS ON CHAPTER 2

1. The main priority of the state power policy of the Republic of Sakha (Yakutia) is ensuring electrical power safety of consumers of the region that means, first of all, increase of reliability and efficiency of a power supply system. The conceptual scheme of priority ensuring electrical power safety of the Republic of Sakha (Yakutia) as factor of reliable functioning of economy and life support of the population of the northern region as a whole has been stated.

2. The most important component of management of activity on ensuring electrical power safety of regions and a basis of information support of this activity there have to be a monitoring and the indicative analysis of electrical power safety. Creation of special system of monitoring of electrical power safety in the northern region is necessary.

3. Purposes, objects and basic principles of monitoring and indicative analysis of electrical power safety of the region have been defined. It is expedient to carry out formation of indicators on types of objects of monitoring of power industry of the region proceeding from conditions of management of electrical power safety.

4. As a result of research of theoretical aspects of the power and electrical power safety of regions main types of threats of electrical power safety, characteristic for power industry of the northern region, as a whole and for its power areas, in particular are revealed, systematized and grouped. Classification of main types of threats of electrical power safety of the Republic of Sakha (Yakutia) and its energy regions with determination of differences of their manifestation in everyone concrete energy region, with allocation is carried out, in particular: technical threats; threats in the sphere of economy and finance; political threats; threats in the legal sphere; threats in the management sphere; natural threats; the threats caused by a human factor; raw threats.

Classification of main types of threats of electrical power safety and their possible consequences for the Republic of Sakha (Yakutia) and its energy regions has been defined.

5. Offered classification of threats differs also by complex, private, and, therefore, fuller reflection of conditions and features of functioning of power industry of the republic and its energy regions in the conditions of the North.

6. On the basis of the made analysis of the revealed threats of electrical power safety of each power area, in particular, and as a whole on the republic the main groups of indicators of electrical power safety of the Republic of Sakha (Yakutia) we could offer such indicators of electrical power safety as “excess level of losses in power lines,” “a lack of own current assets on development are in addition developed and power industry modernization,” “sufficiency and validity of tariffs for electric energy.”

7. The prevention of the revealed threats in every energy region and the republic, as a whole, will help to avoid negative tendencies of violation of reliable power supply of consumers, destabilization of economy of the region and deterioration of welfare of the population.

★ ★ ★

CHAPTER 3. FORMATION OF ORGANIZATION AND ECONOMIC MECHANISMS OF SECURITY ELECTRIC POWER OF THE REPUBLIC OF SAKHA (YAKUTIA)

3.1. Conceptual approaches of improvements of organizational and economic mechanisms to ensure electricity security of Sakha Republic (Yakutia)

Based on the analysis of the characteristics and the specific conditions of operation of the electricity of the North, exploring issues to ensure electricity security of the Republic of Sakha (Yakutia), it is necessary to develop conceptual approaches to improve organizational and economic mechanisms to ensure electricity security of the Northern region.

Organizational and economic mechanism of power in the region is a mechanism that covers the organizational and economic processes which can help us effectively influence the production of electricity, the labor collective, and includes such components as:

- Organizational arrangements, including a system of reliable and stability of the region's electricity sector, including system planning power generation, electricity supply, technology management, the system of information and control, the system of contracts and realization of electricity and heat, as well as a security system in power facilities;

- The economic mechanism consisting of effective methods and leverage on the economic activity of enterprises of electric power through long-term economic standards, the prices and tariffs, through taxes and loans, through allowances and incentives, and through other tools of effective management of business entities themselves.

Consequently, the institutional and economic mechanisms of electricity security in the region represent the relationship of elements in the impact of the economic processes taking place in the regional energy complexes and aimed at the efficient use of material and human resources to ensure the safety of the electric power in the region.

Our analysis shows that the development of organizational and economic mechanisms for regional electricity security is almost impossible without the development of scientific methods and finds real organizational and economic mechanisms of concentration of public authorities and businesses in order to ensure a reliable power development in the region.

Elements of the organizational-economic mechanism for electricity security of the region include the impact of an object, the subjects and the subjects of intervention instruments on the subject.

An object is the impact of the regional electric power complex, located in a particular territory, functioning in accordance with the legal framework of the state and the territory.

Subjects is the aggregate of interconnected companies providing generation, transmission and distribution of energy and electricity supply system, the state authorities of the Russian Federation, bodies of state power of subjects of government and municipal authorities, as well as consumers of electricity.

The impact of the tools is a set of methods to influence economic processes targeted to the rational and efficient use and saving of energy resources areas to improve and ensure electric energetic security of the region.

Thus, the process of formation and implementation of organizational and economic mechanisms must consist of the following basic steps:

1) Defining the principles of electricity security of the country as a key priority of the state energy policy in the North.

2) Formation of the purposes of organizational and economic mechanisms to ensure electricity security of the northern region, taking into account the current and strategic threats to its security of electrical power.

3) Definition of the tasks of organizational and economic mechanisms to ensure electricity security of the northern region.

4) Development of schemes and options of modernization and development of electric power of the area to ensure the safety of its electric power.

5) Development of methods to ensure the practical realization of organizational and economic mechanisms to ensure electricity security of the country.

6) Assessing social and economic impact of organizational and economic mechanisms of electricity security of the region.

The basic principles of organizational and economic mechanisms for improving and ensuring the security of the electricity of the northern region, in our opinion, should be the following:

- The principle of *the focus* – the definition of the objectives and a list of targets and deadlines for implementation;

- The principle of *the priority* of the related measures and events to ensure the security of electricity;

- The principle of *the complexness* – the sum of all influencing factors to ensure the security of electricity;

- The principle of *various approaches* to the formation of the energy policy of modernization and development of the region's electricity sector in order to increase its electricity safety;

- The principle of *the effectiveness* of energy policy in the region and the challenges of reaching the electric power safety;

- The principle of *the social and economic impact* in the framework of realization of the organizational and economic mechanisms;

- The principle of *minimizing risks*, including the risks of technological, industrial, political, economic, financial and social factors;

- The principle of *abiding current legislation*;

- The principle of *the best interests* of all parties to ensure electricity security in the region.

The purpose of the organizational and economic mechanisms for ensuring security of electric power of the Republic is the organization of an effective impact on the organizational and economic processes taking place in the electricity industry and to improve the efficiency of the sector , the management of and energy savings, cost optimization for the production of electricity, reducing the cost of consumers and the public budget to pay for energy by making better use of it, and also to achieve energy-efficient economy in the region and ensuring the safety of its electricity.

The main tasks of ensuring electric power security of the Republic of Sakha (Yakutia) are presented in Table . 3.1.1.

Table 3.1.1.

The goals of the electric energetic security of the Republic of Sakha (Yakutia)

	Types of tasks	Ways of solving
1	Organizational and economic	Development of a conceptual scheme of priority to ensure electricity security of Yakutia, and each of its power regions in particular. Development of a conceptual scheme of the Complex modernization programs and long-term development of the power of Yakutia. Development of mechanisms with effective management techniques for electricity security of energy regions of Yakutia and the method of state regulation of prices for electricity.

Continuation of table 3.1.1.

2	Regulatory and legal	Providing the legal framework of processes aimed at improving the provision of electric power and its security in the Republic.
3	Technical	Technical and engineering support activities aimed at improving and ensuring electricity security of the Republic.
4	Financial	Financial support of organizational and economic mechanisms of modernization, development of electric power and electric power security in the region.

When developing scenarios, upgrade options and power development of the northern region, aimed at providing its electric security should be considered the most rational approaches used in selecting as the criteria for effectiveness of alternatives. The criteria for effectiveness of the alternatives may be different, but when solving the economic problems of the most reasonable criteria, in our opinion is the criterion of the maximum effect of the given constraints, and the criterion of a minimum of costs on terms of achievement of the desired effect.

The practical implementation of organizational and economic mechanisms is executed using a combination of methods, that is, system of rules and procedures used to achieve these goals. For effective implementation of mechanisms to ensure electricity security in the northern region to the complex application of technological, scientific, technical, legal, social, psychological, organizational and economic mechanisms and methods.

In order to create the organizational and economic mechanisms for the implementation of the Complex program of modernization and development of the power of the republic, first of all you need the consistency of economic interests of the electricity market, since the execution of tasks to ensure electricity security of the country and improvement the reliability and efficiency of the power system in the Republic of Sakha (Yakutia) is only possible with the joint and therefore concerted action of all relevant federal authorities and administrative areas, power supply companies and large consumers of electricity.

For the effective operation and development of electrical power, and providing electricity security of the Republic of Sakha (Yakutia) a number of organizational activities are necessary, the main ones are:

1. Creation of a single regulatory authority for controlling the activities of the fuel and energy complex of Yakutia, including electricity, oil, gas and coal industries

– the Ministry of Fuel and Energy of the Republic of Sakha (Yakutia), which is primarily will be responsible for ensuring the energy security of the region in the extreme conditions of the North.

2. With the functional units the ministry must be provided by the Department to ensure the safety of the electric power, as well as the Department of energy saving and state energy supervision, owning an appropriate set of functions arising from the laws of the investment policy of the fuel supply, of the electrical and heat supply, of electric energy security.

3. The establishment of the investment and energy efficiency as part of the State Committee on pricing - REC of Yakutia in order to carry out the functions of control over the investment fund the modernization and development of the electricity industry.

The executive government of the Republic of Sakha (Yakutia) consists of 16 ministries and 6 state committees (as on the 1st of January, 2012):

1. The Ministry of Federal Relations and External Relations of Sakha (Yakutia).
2. Ministry of Housing and Public Utilities and Energy, Republic of Sakha (Yakutia).
3. Ministry of Health of Republic of Sakha (Yakutia).
4. Ministry of State Property and Land Relations of Yakutia.
5. The Ministry of Culture and Spiritual Development of Yakutia.
6. The Ministry of Higher Education, Training and Placement of Personnel of Yakutia.
7. Ministry of Education of Republic of Sakha (Yakutia).
8. The Ministry of Nature Protection of Sakha (Yakutia).
9. The Ministry of Business and Tourism Development Sakha (Yakutia).
10. The Ministry of Youth Affairs and Sports of Republic of Sakha (Yakutia).
11. The Ministry of Agriculture and Food Policy of Yakutia.
12. Ministry of Architecture and of the complex Construction of Yakutia.
13. The Ministry of Transport and Roads of Sakha (Yakutia).
14. The Ministry of Labor and Social Development of Sakha (Yakutia).
15. The Ministry of Finance of Republic of Sakha (Yakutia).
16. The Ministry of Economy and Industrial Policy of Yakutia.
17. The State Committee on Geology and Mineral Resources of Yakutia.
18. The State Committee for pricing - Regional Energy Commission of Yakutia.
19. The State Committee for placement of state orders of Yakutia.

20. The State Committee for Communications and Informational Technology of Yakutia.

21. The State Committee on Science and Innovation Policy of Sakha (Yakutia).

22. The State Committee on the Life Safety of the population of Sakha (Yakutia).

Also the executive bodies of the Republic of Sakha (Yakutia) include:

1. Department of hunting of Yakutia.
2. Department of Water Affairs of Republic of Sakha (Yakutia).
3. Department of the peoples of Republic of Sakha (Yakutia).
4. Department for Press and Broadcasting of Republic of Sakha (Yakutia).
5. Department of Forestry Relations of Republic of Sakha (Yakutia).
6. Veterinary Department of Republic of Sakha (Yakutia).
7. Department of Employment of Republic of Sakha (Yakutia).
8. Department on archives of Republic of Sakha (Yakutia).
9. Controlling Office of the President of Republic of Sakha (Yakutia).
10. Office of Vital Records of the Government of Republic of Sakha (Yakutia).
11. Office of the State Construction Supervision of Sakha (Yakutia).
12. Central office for organizational support of magistrates in the Republic of Sakha (Yakutia).

Supervisors and two inspectorates are also included in the executive bodies of the Republic of Sakha (Yakutia).

1. Main State Inspectorate for Supervision of the technical state of self-propelled vehicles and other equipment (Glavgostech - surveillance).
2. State Housing Inspectorate.

The Republic of Sakha (Yakutia) has all kinds of energy resources (oil, gas, coal, hydro sources) with significant potential reserves, which are one of the main basic sectors of the economy.

However, in 2010 the Government of the Republic of Sakha (Yakutia) recently has eliminated the Ministry of Industry of Republic of Sakha (Yakutia), transferring the management and control of the fossil fuel industry to the level of the Department of Economic Development and the Ministry of Industrial Policy of Sakha (Yakutia) . Since April 2002, after the reorganization of the Ministry of Fuel and Energy Industry of Yakutia, the functions of government and control of the electric power complex rests with the Ministry of Housing and Energy of Yakutia. Consequently, a regional fuel and energy complex is split into two ministries and actually reduced its importance to the level of these ministries departments. Considering the main

objectives of the State's energy policy on the priority of Energy Development and the Energy Strategy of the Russian Federation and Republic of Sakha (Yakutia), also considering regulatory legislation in the energy sector on the priority of their development and to ensure energy security of the regions it was necessary to create the Ministry of Fuel and Energy of the Republic of Sakha (Yakutia) including the two departments to ensure electricity security of the region of the North. And as a part of the State Committee on pricing - REC of Yakutia Investment Management and energy efficiency in order to carry out the functions of control over the investment fund for development of electric power .

In 2013, one of the proposed organizational and economic mechanisms was realised - in the structure of the Government of the Republic of Sakha (Yakutia) was established the Ministry of Industry of the Republic of Sakha (Yakutia).

The most important tool for the implementation of state energy policy, including ensuring electricity security is improvement of strategies and programs for development of the power of the republic associated with different strategies and programs at the federal level. Among such programs should note the Energy Strategy of the Republic of Sakha (Yakutia) for the period until 2030, energy topics of general economic (social and economic) policy documents of the Republican or the Far East levels, including The strategy of development of the power of the Far East until 2020 and for prospective until 2025, a national program of energy saving, industry republican program for innovative development (and possibly reform) electricity, heat, coal, oil and gas industry, renewable energy.

Along with these programs an important role may be played by some territorial and municipal programs (such as Yakutsk, Yuzhno-Yakutsk, Central, Western, and Northern power districts, etc.) and corporate programs (for example, "ALROSA" OJSC, "Yakutskenergo" OJSC, HK-Yakutugol OJSC, etc.).

The development, implementation and monitoring of these programs should involve government agencies and businesses, as well as specialized research institutes, design, geological, consulting and other organizations.

The monitoring system should provide control of the progress of the current "Energy Strategy of the Republic of Sakha (Yakutia) in the period up to 2030" and proposed "Conception of electricity security of the Republic of Sakha (Yakutia)". In identifying significant deviations from the fundamental parameters of the above documents should be taken timely steps to remedy the situation, or carried out timely adjustment of the "Energy Strategy."

The results of the analysis of the current state of the functioning of the existing problems and the power of the republic, considering its further investment development that requires a large amount of investment and financial resources, as well as the threats and crises of electricity security of the northern region, led to the need to improve and develop the organizational and economic mechanisms to ensure electricity security of the Republic of Sakha (Yakutia) and its power districts.

3.2. The improvement and development of organizational and economic mechanisms to ensure electricity security of the Republic of Sakha (Yakutia)

With the help of our proposed organizational and economic mechanisms and methods to ensure security of electricity cost-effective financial security Complex modernization programs and long-term development of the power of the Republic of Sakha (Yakutia) are possible, including major investment projects of regional energy Yakutia, which will facilitate the integration of the Unified national electric power system of Russia. In other words, based on the proposed organizational and economic mechanisms the economic efficiency of the electricity sector of the Republic of Sakha (Yakutia) should be provided.

Our proposed organizational and economic mechanisms to ensure electricity security of the northern region and institutional relationships are based on the following conceptual approaches:

- Coordination of the economic interests of the economic entity, consumers, investors, the public and the authorities of the region, based on the rule of “the two keys”: the part of the Government of the Republic of Sakha (Yakutia) and of OJSC “Yakutskenergo,” creation of an investment fund for modernization and development of the power of the Republic of Sakha (Yakutia);

- Creation of the Ministry of Fuel and Energy of the Republic of Sakha (Yakutia) (with the Department to ensure the safety of the electricity and the Department of Energy Conservation and the State Energy Supervision) within the structure of the Government of Yakutia, and of the Department for Investment Management and energy conservation in the State Committee on Pricing – REC of Yakutia to control investment fund of modernization and development of the power of the Republic of Sakha (Yakutia);

- Specific objects of modernization and development of the electricity the northern territory aimed at improvement of the efficiency and reliability of the

existing system of power supply are defined in a number of concept and program documents on modernization and long-term development of the electric power of the Republic.

The documents on modernization and development of the power of the Republic of Sakha (Yakutia) providing its electric safety are demonstrated in Table. 3.2.1.

Table 3.2.1

Complex modernization programs and long-term development of the power of the Sakha Republic (Yakutia)

	Program title
1	The concept of socio-economic development until 2020 project.
2	The Energy Strategy of Russia for the period up to 2020 (approved by the Decree of the Government of the Russian Federation № 1234-r dated 28.08.03 was).
3	The Energy Strategy of Russia for the period up to 2030 Project.
4	The federal target program "Economic and social development of the Far East and Transbaikalia until 2013."
5	Strategy for Socio-Economic Development of the Far East, the Republic of Buryatia, Trans-Baikal Territory and the Irkutsk region for the period up to 2025.
6	The Energy Strategy of the Republic of Sakha (Yakutia) in the period up to 2030 (approved by the Government of Sakha (Yakutia) № 441 from 29.10.09)
7	The scheme of integrated development of the productive forces, transport and Energy of the Republic of Sakha (Yakutia) to 2020 (adopted by the Government of the Russian Federation on February 8, 2007).
8	Investment project "Integrated Development of South Yakutia." The project is coordinated RAO "Gazprom", RAO UES of Russia, RAO Russian Railways, etc.
9	Program development of the power of the Sakha Republic (Yakutia) in 2010-2014 (approved by the Government of the Sakha Republic (Yakutia) № 600 from 29.12.10).
10	Investment projects of OJSC “Yakutskenergo" for 2008-2012.
11	The optimization program of local power of the Sakha Republic (Yakutia) to 2015 (approved by the Government of the Sakha Republic (Yakutia) № 346 from 29.07.10
12	Republican program "Energy in the Republic of Sakha (Yakutia) in 2010-2015" (approved on July 29, 2010 by the Government of the Republic, № 340).

Conceptual diagram of the implementation of the modernization programs of the Complex and long-term development of the power of the Republic of Sakha (Yakutia) has the following organizational and economic mechanisms of its implementation (see Figure 3.2.1).

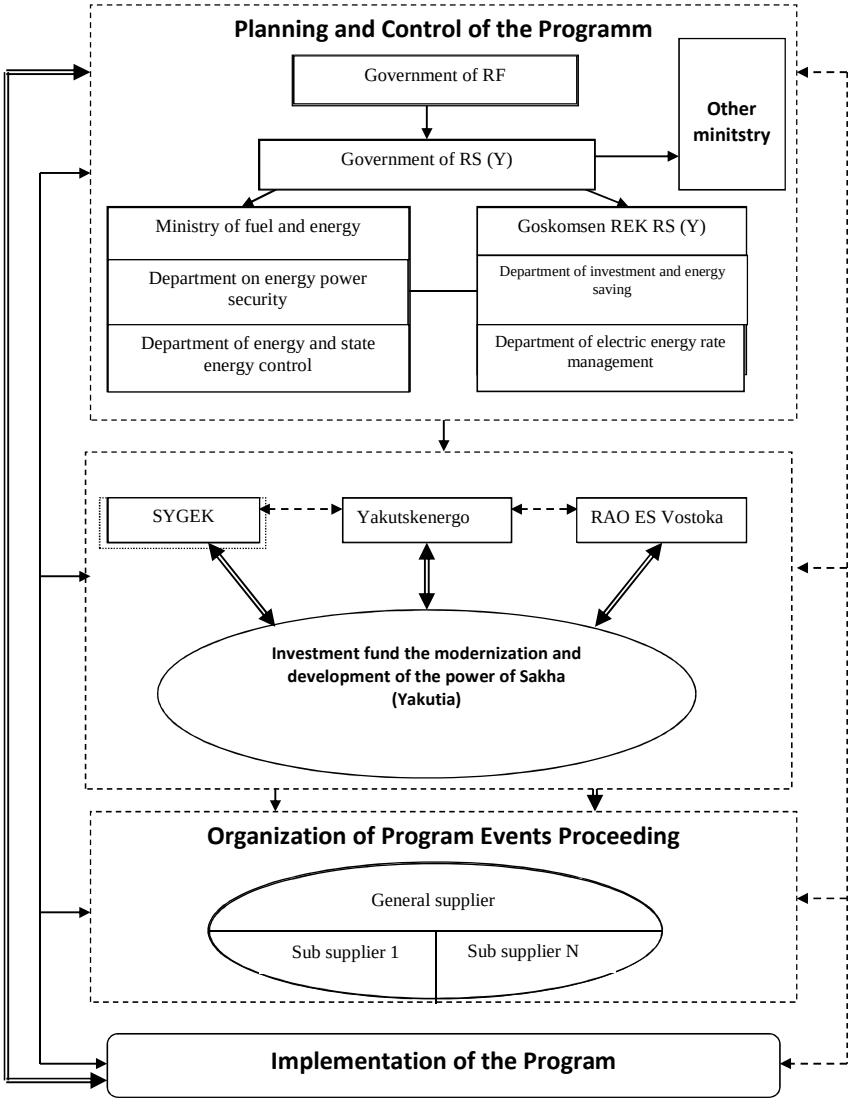


Figure. 3.2.1. Conceptual framework for the implementation of Complex program of modernization and development of the power of the republic

Within the energy company OJSC “Yakutskenergo” creation of an investment fund for modernization and development of the power of the Republic of Sakha (Yakutia) should be created. One of the sources for this fund may become the centralized in it means of the investment allowances in electricity tariffs, by keeping the mechanism of cross-subsidization of electricity consumers and the mechanism of subsidizing energy consumers of the northern district. Thus, the volume of cross-subsidizing consumers annually is 3.5 billion rubles in 2010 prices, which may be one of the main sources of investment fund for modernization and development of the power of the Republic of Sakha (Yakutia), which will be sent to the non-deficit in the development of power and primarily on ensuring regional electricity safety and economic security of the area.

Planning and control over the activities of an investment fund for modernization and development of the power of the Republic of Sakha (Yakutia) should be provided partly by the Government of the Russian Federation - Ministry of Energy of the Russian Federation, and partly by the Government of the Republic of Sakha (Yakutia) by two ministries - the Ministry of Fuel and Energy of the Republic of Sakha (Yakutia) and the State Committee on pricing - REC of Yakutia.

The organization and financing of the power development program in the region should be performed by OJSC “Yakutskenergo”, OJSC “RAO UES of the East” and the newly created electricity companies, for example, the Yuzhno-Yakutsk HES, etc.

The organization and implementation of development programs in the region is provided by general contractor of program for power in the region.

Implementation of programs of modernization and development of the electricity in the country and in its areas of energy, according to our proposed conceptual framework of the modernization programs of the Complex and long-term development of the power of the Republic of Sakha (Yakutia), is based on the institutional relationship of joint investment.

The principal developer of the complex modernization programs and construction of electric power equipment supply companies, in our opinion, should include: a vertically integrated energy company OJSC "Yakutskenergo" and departmental energy supply companies, the Government of the Russian Federation, the Government of the Republic of Sakha (Yakutia), as well as the administrative authorities of neighboring territories of Eastern Siberia and the Far East, the large industrial energy users, commercial banks and portfolio investors.

Proposed above conceptual approaches and conceptual scheme of the Complex modernization programs and long-term development of the power of the Republic of Sakha (Yakutia) can attract large investment funds on a long term basis for the modernization of the system of regional energy systems and organization to ensure the implementation of programs in a timely manner. It is necessary to respect the interests of vertically integrated federal level energy companies OJSC “RAO Energy System of East” and OJSC “RAO Energy System of Siberia,” and regional level OJSC “Yakutskenergo,” and priorities of economic development of the Republic of Sakha (Yakutia).

The implementation of complex programs, funding for the modernization and the development of the power of the Republic of Sakha (Yakutia), involving government, corporate and private investments intends target (which is in power engineering) use of funds.

The sources of funding for the modernization and development of the power of the Republic of Sakha (Yakutia) are now:

1. Own funds of power companies - depreciation, net income, investment allowance, the dividends on shareholdings, etc.

2. Borrowings - bank loans and credit and financial institutions, foreign investors, leasing, sale of shares etc.

3. Budgetary funds - state investments in targeted investment programs from the state budget of the Russian Federation and the regional and municipal budgets.

Acting power scheme of funding programs on modernization and development of the power of the Republic of Sakha (Yakutia) is shown in Fig. 3.2.2.

The potential sources of financing of the investment fund the modernization and development of the power of the Republic of Sakha (Yakutia) can also be:

1. Means of maternal energy companies - investments of OJSC “RAO UES of the East”;

2. Budget funds:

- Subventions for the compensation for the difference in electricity tariffs for decentralized group of regions of the budget. The volume of cross-subsidies between consumers power district in the amount of 3.5 billion rubles (at 2010 prices) in the form of investment allowances in tariffs for electricity;

- Investment deposit (tax benefits);

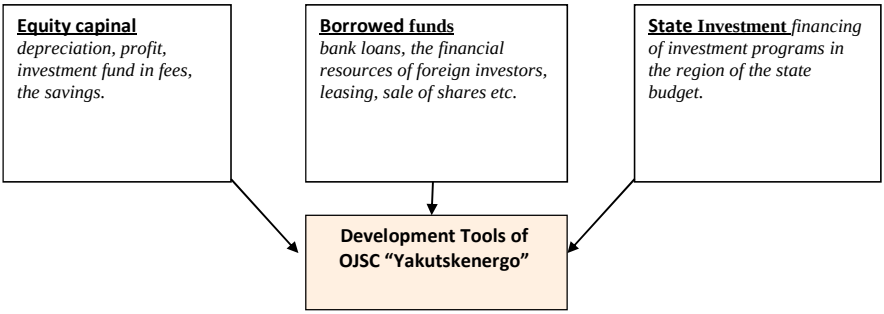
- Proceeds from the sale of property and shares of enterprises, state-owned and joint ownership of the federal, regional and municipal authorities;

- Dividends on shareholdings energy enterprises in joint ownership;

- Financial support for investment projects - through interest rate subsidies on loans to energy companies.

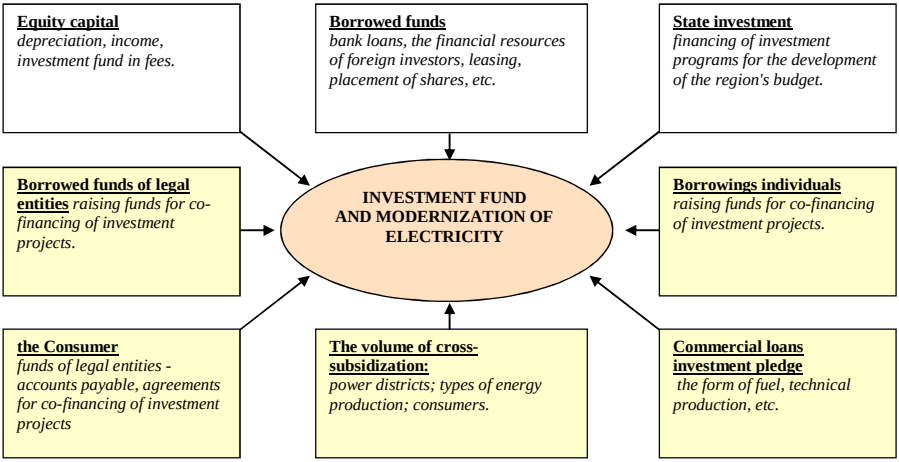
3. Borrowings:

- Involvement of legal and natural persons for co-financing of investment projects;
- Trade credit - delivery of fuel, technical production, etc.;
- Payable to the federal and regional budgets and legal persons, decorated for a specific time period.



Scheme 3.2.2. The current scheme of financing long-term development programs and modernizing the power of the Republic of Sakha (Yakutia)

The proposed scheme funding Complex modernization programs and long-term development of the power of the Republic of Sakha (Yakutia), in our opinion, is more effective (Figure 3.2.3)



Scheme 3.2.3. The proposed concept of funding Complex modernization programs and long-term development of the power of the Republic of Sakha (Yakutia)

Consequently, funding for the modernization and development of the power of the Republic of Sakha (Yakutia) is carried out at the expense of their own (profit, depreciation, investment allowance in rates) and borrowed funds (investments, loans, shares, etc.) of OJSC "Yakutskenergo," as well as investment funds and large consumers of energy system, and government and corporate investment.

Investment fund for modernization and development of electric power in the region should be focused on ensuring electricity security of the northern region in the following areas:

- The financing of priority investment projects of modernization of electric power for the development of economic and social development of the region;
- Co-financing of investment projects included in the federal and regional target program of electric power of Yakutia;
- Co-financing of investment projects, in case if OJSC "Yakutskenergo" deficits own investment resources generated from internal funds (depreciation, income and investment allowance) and foreign investment;
- Insurance against risks of private investment, including retail funds borrowed for investment projects for the development of electric power industry and to ensure electricity security of economic and social development of the country.

Thus, taking into account the development of the economy and the specifics of the regional power sector there are conceptual approaches to improve organizational and economic mechanisms to ensure electricity security of Sakha (Yakutia) proposed, the basic principles of organizational and economic mechanisms to ensure electricity security of the Republic of Sakha (Yakutia) are defined, the allocated area of responsibility of regional authorities for ensuring the safety of the electric power in the region is determined, the conceptual scheme of the Complex program of long-term development and modernization of the power of the Republic of Sakha (Yakutia) is proposed.

3.3. Organizational and economical mechanisms of electric energy security of Republic Sakha (Yakutia)

Offered organizational and economical mechanisms of electric energy security supply for several energy sector that prevent and eliminate threats for energy sectors of the Republic of Sakha (Yakutia) are presented in tables 3.3.1.-3.3.4.

Table 3.3.1.

Organizational and economical mechanisms of ensuring electric power security in Central power district of the Republic of Sakha (Yakutia)

Central energy sector (CES)			
№	Threats		Electric energy safety mechanisms
1	Common power supply threats	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA, 4) Lack of energy-saving technologies.	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 3) Federal financing of electric energy in-vestment projects in the Republic of Sakha (Yakutia); 4) Financing of research in energy-saving technology sphere; 5) Investment insurance. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities.
		Economic: 1) Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): a) The existence of cross-subsidies (PS) between the electric and thermal energy b) The existence of cross-subsidies (PS) between business and residential customers;	**Organizational:** Adoption of new tariff politics in RS (Y). **Economical:** Realization of electric energy cross-subsidy abolition program
		c) Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; d) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (Y)	**Organizational:** 1) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 2) Federal financing of electric energy in-vestment projects in the Republic of Sakha (Yakutia); 3) Financing of research in energy-saving technology sphere; 4) Investment insurance. **Economical:** Investment incentives adding to electric

Continuation of table 3.3.1.

		and its own resources of energy companies;	energy rates for expanded reproduction of facilities.
		e) Formation of the cost of fuel and repair of power objects below the planned regulatory costs;	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Development and authorization of fuel rates on electric power production by Ministry of Energy of the Russian Federation; 3) Development and authorization of repair standards on electric power production by Ministry of Energy of the Russian Federation. **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of standard repair costs.
		f) In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period.	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia). **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic ofSakha (Yakutia) with consideration of economy received from energy-saving technology introduction.
		2) The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition.	**Organizational:** 1) conclusion of treaties with consumers and contractors that includes fines for defaulters; 2)timely payment for electric energy; 3) timely payment for fuel, material, con-tracts payment. **Economical:** Forming of net working capital fund to cover gap in balance of payment because of seasonal energy resource supply for consumers.

Continuation of table 3.3.1.

2	**Specific threats for electric energy security**	**Technical:** 1) Growing shortage of energy and power because of a great demand of the electric power; 2) The lack of intra-regional transmission lines between the three technologically isolated areas of energy; 3) Violation of the date of delivery of natural gas; 4) Accidents on the gas-main pipeline 'Kysyl-Syr-Mastakh-Berge-Yakutsk'.	**Organizational:** 1) conclusion of long-termed treaties on natural gas supply with fair economically sound price, regulated by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service of the Russian Federation, Federal Anti-Monopoly Service of the Russian Federation; 2) Interregional power lines construction from Neryungry SES through Nyzhny Kuranah, Tommot to Maya; 3) Construction of second State electric station in Yakutsk; 4) Finishing of third line of gas-main pipe-line 'Kysyl-Syr-Mastakh-Berge-Yakutsk'construction. **Economical:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha of (Yakutia); 2) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 3) Investment incentives adding to electric energy rates for expanded reproduction of facilities; 4) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 5) Contemporaneous management of natural gas price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.
		Economic: 1) Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y): 2) The existence of cross-subsidies (PS) between power districts;	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. **Economical:** 1) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development aiming for integration of technologically isolated Central, Western and South Yakutian energy sectors in the Republic of Sakha (Yakutia).

Continuation of table 3.3.1.

		3) Advancing increase in natural gas prices compared with the rates for electric / power due to failure rate and, as a result, loss of enterprises, leading to an unstable financial and economic condition	**Organizational:** conclusion of long-termed treaties on natural gas supply with fair economically sound price, regulated by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service of the Russian Federation, Federal Anti-Monopoly Service of the Russian Federation; **Economical:** Contemporaneous management of natural gas price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.

Table 3.3.2.

Organizational and economical mechanisms of ensuring electric power security in Western power district of the Republic of Sakha (Yakutia)

Western energy sector (WES)			
№	**Types of threats (common and specific for energy sector)**		**Mechanisms**
1	**Common types of threats**	**Technical:** 1) high depreciation of production facilities; 2) high losses in power lines; 3)ill-timed modernization and renovation of production facilities; 4) absence of energy-saving technology.	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. 3) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 4) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 5) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 6) Financing of research in energy-saving technology sphere; 7) Investment insurance. 8) Forming of insurance fund for accident elimination 9) Reserve power supply for 1 class consumers. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities.

Continuation of table 3.3.2.

		Economical: 1) Current method of state electric energy rate management in the Republic of Sakha (Yakutia) has essential faults: a) cross-subsidization of electric energy by heat energy; b) cross-subsidization of business consumers by consuming public.	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia) **Economical:** Realization of electric energy cross-subsidy abolition program
		c) Investment deficit and underfunding of investment projects with risen demand on investments for the purpose of electric energy complex development; d) Small amount budget and private financing of electric-power industry investment program	**Organizational:** 1) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 2) Federal financing of electric energy in-vestment projects in the Republic of Sakha (Yakutia); 3) Financing of research in energy-saving technology sphere; 4) Investment insurance. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities..
		e) Tariff costs on fuel and repair are lower than their planned normative level.	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in Republic of Sakha (Yakutia); 2) Development and authorization of fuel rates on electric power production by Ministry of Energy of the Russian Federation; 3) Development and authorization of repair standards on electric power production by Ministry of Energy of the Russian Federation. Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of Republic of Sakha (Yakutia) with consideration of standard repair costs.

Continuation of table 3.3.2.

		f) When making rate for next adjustment period companies have no information of spared funds due to energy-saving measures and of uncollected revenue, though undelivered expenditures in reporting period. 2) Increasing of accounts receivable and payable, losses causing financial strain..	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of economy received from energy-saving technology introduction. **Organizational:** 1) conclusion of treaties with consumers and contractors that includes fines for defaulters; 2) timely payment for electric energy; 3) timely payment for fuel, material, contracts payment. **Economical:** Forming of net working capital fund to cover gap in balance of payment because of seasonal energy resource supply for consumers.
2	**Specific threats**	**Technical:** 1) The lack of interregional power lines between three isolated energy sectors; 2) high losses in power lines because of low capacity; 3) Accidents on gas pipeline and as consequence, natural gas supply interruption of heating plants in Aikhal and Udachny; 4) incomplete diesel fuel delivery for electric energy production with reserve power supply (diesel electric station) in Viluy region (Suntarsky, Nyurbinsky, Verhnevilyusky regions); 5)increasing natural gas and diesel fuel prices; 6) water limit on Vilyu cascade of hydroelectric plants and Vilyu hydroelectric plant-3 provided by low water-level and lack of required water reserves in	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. 3) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 4) Financing of research in energy-saving technology sphere; 5) Investment insurance. 6) conclusion of long-termed treaties on natural gas supply with fair economically sound price, regulated by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service of the Russian Federation, Federal Anti-Monopoly Service of the Russian Federation; 7) interregional 220 kV power line construction from Tchernyschevsky through Mirny-Lensk-Peleduy-Vitim to Krasnoyarsk

Continuation of table 3.3.2.

		Tchernyschevsky reservoir 7) low capacity of 220 kV Mirny-Nyurba power line.	aimed for integration of technologically isolated Central and Western energy sectors; 8) interregional 220 kV power lines construction from Mirny through Suntar to Nyurba; from Viluy hydroelectric plant through Aikhal to Udachny; from Mirny through Suntar to Olekminsk; 9) conservation of electric energy boilers in Aikhal and Udachny for reserve heating energy supply; 10) Forming of Insurance net working capital fund for fuel delivery in northern regions, including these costs in rates. **Economical:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 3) Investment incentives adding to electric energy rates for expanded reproduction of facilities; 4) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 5) Contemporaneous management of natural gas price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers
		Economical: 1) Current method of state electric energy rate management in the Republic of Sakha (Yakutia) has essential faults: a) cross-subsidization of electric energy rates between energy sectors.	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. **Economical:** 1) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia);. 2) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia) aiming for integration of technologically isolated Central, Western and South Yakutian energy sectors in the Republic of Sakha (Yakutia).

Continuation of table 3.3.2.

		b) Leading natural gas price growth in comparison with electric energy rates because of rate insufficiency, and as a consequence, losses causing financial strain.	**Organizational:** conclusion of long-termed treaties on natural gas supply with fair economically sound price, regulated by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service of the Russian Federation, Federal Anti-Monopoly Service of the Russian Federation; **Economical:** Contemporaneous management of natural gas price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.

Table 3.3.3.

Organizational and economical mechanisms of ensuring electric power security in Southern Yakutian power district of the Republic of Sakha (Yakutia)

Southern Yakutian energy sector (SYES)			
№	**Types of threats (common and specific for energy sectors)**		**Mechanisms**
1	**Common threats**	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA 4) Lack of energy-saving technologies.	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 3) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 4) Financing of research in energy-saving technology sphere; 5) Investment insurance. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities
		Economical: 1) Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): 1). The existence of cross-subsidies (PS) between the electric and thermal energy; 2) The existence of cross-subsidies (PS) between business and residential customers;	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia) **Economical:** Realization of electric energy cross-subsidy abolition program

Continuation of table 3.3.3.

		3) Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; 4) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (Y) and its own resources of energy companies;	**Organizational:** 1) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 2) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 3) Financing of research in energy-saving technology sphere; 4) Investment insurance. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities.
		5) Formation of the cost of fuel and repair of power objects below the planned regulatory costs;	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Development and authorization of fuel rates on electric power production by Ministry of Energy of the Russian Federation; 3) Development and authorization of repair standards on electric power production by Ministry of Energy of the Russian Federation. **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of standard repair costs.
		6) In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period..	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia). **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of economy received from energy-saving technology introduction.

Continuation of table 3.3.3.

		7) The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition.	**Organizational:** 1) conclusion of treaties with consumers and contractors that includes fines for defaulters; 2) timely payment for electric energy; 3) timely payment for fuel, material, contracts payment. **Economical:** Forming of net working capital fund to cover gap in balance of payment because of seasonal energy resource supply for consumers.
2	**Specific threats**	**Technical:** 1) Lack of intra-regional power lines between three technologically isolated power areas; 2) Violation of delivery time of coal**.**	**Organizational:** 1) conclusion of long-termed treaties on coal supply with fair economically sound price; 2) Interregional power lines construction from Neryungry SES through Nyzhny Kuranah, Tommot to Maya; **Economical:** 1)) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 3) Investment incentives adding to electric energy rates for expanded reproduction of facilities; 4) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 5) Contemporaneous management of coal price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.
		Economic: 1) Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y): a)The existence of cross-subsidies (PS) between power districts.	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. **Economical:** 1) Application of offered state electric energy rate management method in the

Continuation of table 3.3.3.

			Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development aiming for integration of technologically isolated energy sectors of the Republic of Sakha (Yakutia) (CES, WES,SYES);
		b) Increase in coal prices due to the lack of government regulation of JSC HK Yakutugol, which is the monopolist of the steam coal supply of Neryungrinsky state district power station	**Organizational:** 1) conclusion of long-termed treaties on coal supply with fair economically sound price; **Economical:** 1) Contemporaneous management of coal price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.

Table 3.3.4.

Organizational and economical mechanisms of ensuring electric power security in Northern power district of the Republic of Sakha (Yakutia)

Northern energy sector (NES)			
№	**Types of threats (common and specific for energy sector)**		**Mechanisms**
1	**Common types of threats**	**Technical:** 1) High degree of wear of BPA 2) The high level of losses in transmission lines 3) Untimely solutions modernization and renovation of BPA 4) Lack of energy-saving technologies	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 3) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 4) Financing of research in energy-saving technology sphere; 5) Investment insurance. 6) Micro electric station construction, modernization of existing diesel fuel electric stations; 7) optimization of power supply due to renewable energy application: construction of micro hydroelectric station, wind-driven power plants, floating atomic power station **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities.

Continuation of table 3.3.4.

		Economical: 1) Shortcomings of the methods of state regulation of electricity tariffs in the RS (Y): a). The existence of cross-subsidies (PS) between the electric and thermal energy; b) The existence of cross-subsidies (PS) between business and residential customers.	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) separate calculation of electric energy production costs and heating energy production costs for setting of economically based rates **Economical:** Realization of electric energy cross-subsidy abolition program
		c) Deficiency of investment means and insufficient funding of investment projects and emergence of requirements in investments for development of an electrical power complex; d) Low volumes of financing of investment programs for the development of electric power district federal program, investment programs financed from the State Budget of RS (I) and its own resources of energy companies.	**Organizational:** 1) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 2) Federal financing of electric energy in-vestment projects in the Republic of Sakha (Yakutia); 3) Financing of research in energy-saving technology sphere; 4) Investment insurance. **Economical:** Investment incentives adding to electric energy rates for expanded reproduction of facilities.
		e). Formation of the cost of fuel and repair of power objects below the planned regulatory costs; .	**Organizational:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Development and authorization of fuel rates on electric power production by Ministry of Energy of the Russian Federation; 3) Development and authorization of repair standards on electric power production by Ministry of Energy of the Russian Federation. **Economical:** Economically sound tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of standard repair costs.

Continuation of table 3.3.4.

		f). In calculating tariffs for the regulated period following the lack of consideration of the savings now through the introduction of energy efficiency measures and savings due to the shortfall of income, therefore, is not of the expenses during the reporting period.	**Organizational:** Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia). **Economical:** Economically proved tariff forming by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia) with consideration of economy received from energy-saving technology introduction.
		g) . The increase in accounts receivable and accounts payable, loss of enterprises, leading to an unstable financial and economic condition.	**Organizational:** 1) conclusion of treaties with consumers and contractors that includes fines for defaulters; 2)timely payment for electric energy; 3) timely payment for fuel, material, contracts payment. **Economical:** Forming of net working capital fund to cover gap in balance of payment because of seasonal energy resource supply for consumers.
2	**Specific treats**	1) High wear of FA; 2) High wear of a power line and high level of losses of the electric power in distributive networks of a low voltage (up to 25 %); 3) Morally and physically obsolete diesel power generators; 4) Non-rational modes of operation of the equipment DES; 5) Underutilization of electrical equipment; 6) Seasonal character of fuel delivery, short terms of the navigation, difficult transport scheme with transfers from one type of transport on another;	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. 3) Accomplishment of local energy optimization program of the Republic of Sakha (Yakutia) in 2012-2017; 4) Federal financing of electric energy investment projects in the Republic of Sakha (Yakutia); 5) Financing of research in energy-saving technology sphere; 6) Investment insurance.

Continuation of table 3.3.4.

		7) Non-optimal structure of fuel balance bringing to considerable costs of diesel fuel – 59%; 8) Problems of northern diesel fuel delivery for power plants remote settlements because of difficult transport infrastructure; 9) High specific fuel consumption; 10) Lack of intra-regional power lines between three technologically isolated power areas; 11) Territorial dispersion of the decentralized consumers and their small power loadings; 12) The accelerated wear and aging of diesel generators and power supply networks; 13) Short energy deliveries to the Bilibino nuclear power plant - for the Chersky village, the Magadan ZES - for the Ust-Nera village.	7) conclusion of long-termed treaties on diesel fuel supply with fair economically sound price, regulated by The State Committee on pricing - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service of the Russian Federation, Federal Anti-Monopoly Service of the Russian Federation; 8) Forming of Insurance net working capital fund for fuel delivery in northern regions, including these costs in rates. **Economical:** 1) Adoption of new tariff policy in electric-power industry in the Republic of Sakha (Yakutia); 2) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 3) Investment incentives adding to electric energy rates for expanded reproduction of facilities; 4) Forming of investment fund for electric-power industry development in the Republic of Sakha (Yakutia); 5) Contemporaneous management of natural gas price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers
		Economic: 1) High prime cost of the electric power bringing to notable financial losses; 2) Impossibility of technical modernizations at the expense of own local power industry sources;	**Organizational:** 1) Adoption of foreground electric energy safety ensuring concept in the Republic of Sakha (Yakutia); 2) Adoption of conceptual plan of electric energy industry long-termed development program accomplishment. 3) Forming of fund for fuel delivery to northern region. **Economical:** 1) Application of offered state electric energy rate management method in the Republic of Sakha (Yakutia); 2) Forming of investment fund for electric-power industry development aiming for integration of technologically isolated energy sectors of the Republic of Sakha (Yakutia) (CES, WES,SYES).

Continuation of table 3.3.4.

		3) Shortcomings of an operating method of state regulation of tariffs for the electric power in RS(Y): -The existence of cross-subsidies (PS) between power districts; 4) Growth of tariffs for diesel fuel and advancing rise in prices for diesel fuel in comparison with tariffs on energy because of insufficiency of a tariff and, as a result, the losses of the enterprises bringing to an unstable financial and economic condition;	**Organizational:** 1) conclusion of long-termed treaties on diesel fuel supply with fair economically sound price; 2) Forming of fund for fuel delivery to northern region. **Economical:** 1) Contemporaneous management of diesel fuel price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers
		5) A high proportion of the fuel component cost of electricity, the high cost of electricity, leading to high tariffs on e / energy produced by the DPP; 6) The annual amount of credit resources (more than 2 billion rubles.) involved for delivery of diesel fuel threatens the financial stability of the company.	**Organizational:** Accomplishment of local energy optimization program of the Republic of Sakha (Yakutia) in 2012-2017. **Economical:** Contemporaneous management of diesel fuel price and electric energy rates with consideration of marginal growth index on electric energy price for region consumers.

Accordingly offered organizational and economical system of energy security mechanisms of the Republic of Sakha (Yakutia) that prevent and eliminate common power supply threats for all different energy sectors and specified threats for separate energy sector, is the most effective for the North region.

3.4. The use of renewable energy sources, increasing the electric power security of the North

The availability of energy is one of the necessary conditions for the existence of human civilization. The basis of today's energy industry are the fuel energy reserves of hydrocarbons (coal, oil and gas), which account for about 90% of energy received. There are four areas of energy industry: traditional energy industry on fossil fuel (coal, gas, oil and oil products); hydropower; nuclear power, renewable energy sources (RES).

The renewable energy sources, as is known, include solar radiation, power of wind, rivers, streams, tides and waves, biomass, geothermal energy dissipated heat power of air and water. The economic potential of renewable energy sources in the world is estimated at about 20 billion tons of conditional fuel (c.f.) per year, in other words, more than 2 times the annual production of all types of fossil fuels. However, in practice, the renewable (alternative) energy sources account for only about 1% of global electricity generation.

The motivation of using renewable energy sources is the exhaustibility of major non-renewable energy resources, in which connection, a priori, it can be argued that there is a need for greater use of non-traditional renewable energy sources. According to the most optimistic forecasts, coal will last for 1,500 years, oil for 250 years, gas for up to 120 years, while pessimistic forecasts determine the following periods: oil resources will be depleted in 40 years, gas in 80 years, uranium in 80 - 100 years , coal could last for another 400 years [184].

No less significant incentive for renewable sources is an environmental problem of pollution caused by the traditional electric power industry on fossil fuels. Thus, according to the UNESCO, Russia annually discharges into the atmosphere 6,000,000 tons of ash, 8,000,000 tons of carbon dioxide, 3,000, 000 tons of nitrogen oxides, sulfur and other harmful substances [184]. Obviously, getting into the soil, they are absorbed by plants and through food have a detrimental effect on human health. Environmental problems in the Far East region, and, for that matter, in the Northern power district of the Republic of Sakha (Yakutia), are associated with the use of coal and liquid fuels (diesel and fuel oil) as the main type of fuel. This fact aggravates the problem of the ecologization of the northern power industry, which is to become more efficient under the extreme conditions of the North. In our view, it should be based on a combination of renewable energy sources (hydropower, geothermal CHP; wind power plants, thermal power plants running on local natural gas, etc.) and small nuclear energy sources; in particular, floating nuclear power plants (FNPP).

The undeniable environmental benefit of renewable energy sources is not only their environmental friendliness, but also their low operating cost. “Clean” energy seems to us even more acceptable in comparison with the energy derived from fossil fuels, if by introducing a corresponding tax on non-renewable energy resources in the price of fossil fuels we include the price of damage to the environment and human health during its production and use.

Prospects for the use of renewable sources of energy are associated with future fuel shortage in the traditional energy sector. The sharp rise in oil prices in late 2007 - early 2008 forced the countries consuming hydrocarbon resources to take the need to transfer their energy systems to renewable energy alternatives more seriously [186].

The main motive of using renewable energy sources in Russia is, of course, the exhaustion of fossil fuel reserves. Thus, according to official forecasts, easily extracted gas in Russia will last for 80 years, and oil - for 20 years. If the rate of $1 worth electricity for $1 of GDP in the developed world is 0,46 kW/h, in the US 0.52, then in Russia this rate is 4.7 kW/h [86]. Consequently, the unit cost of electricity in Russia is ten times higher than those in the world, and given the high transportation and process losses it amounts nearly to 15 times. The share of electricity in the cost structure of gross domestic product in Russia is up to 50%, while in the developed countries it is just 5%.

An equally important incentive for the use of renewable resources, we believe, is the electric energy security of the country and of its northern regions in particular. The inaccessibility of many areas of the country (especially its northern territories) is one of the main problems for centralized power supply. Accordingly, the need to increase the use of renewable energy sources is due to the fact that the area of decentralized energy supply covers more than 70% of the territory of the Russian Federation, which is populated by about 10 million people, including rural areas of the North - 2.5 million people, the number of temporary residents is 0.4 million people, and those leading a nomadic and semi-nomadic way of life – 0.05 million people) [28]. That is why for many northern regions renewable sources of energy may be the only source of energy, and hence the existence.

Small-scale and renewable energy industry for many countries at the present time is already an important component of the energy supply. It plays an important role in energy supply in Denmark, Iceland, New Zealand, Canada, Germany, Norway, Spain and other countries. The European Commission estimates that by 2020 the EU countries will create 2.8 million jobs in the renewable energy industry. The renewable energy industry will create 1.1% of GDP [185]. According to the magazine “Energy abroad”, in May 2009 13% of U.S. electricity was produced from renewable energy sources, 9.4% of electricity was generated from hydropower; about 1.8% was derived from wind energy, 1.3 % from biomass, 0.4% from geothermal sources and 0.3% from solar energy. In Australia in 2009, 8% of its electricity was generated from renewable sources.

Currently, according to the International Energy Agency, the production of electricity from renewable energy sources (renewable energy) is estimated at more than 200 billion kWh, representing about 5% of total production, in 2020 it will be 13%, by 2060 - 33% [168]. Moreover, much of the energy demand will be met by solar cells, wind turbines, small hydro plants and biomass from crop residues and waste of wood processing industry. As for geothermal energy, wave and tidal power, in some parts of the world these energy sources can also be significant. According to the evaluation of the U.S. Environmental Protection Agency in 20 years renewable energy will be able to meet one third of the world's energy needs as against 1/17 today. In another 20 years it will satisfy 2/3 power requirements [86].

In Russia, the cost-effective renewable energy potential is higher than 270 million tons of coal equivalent per year, or 25% of the annual domestic energy consumption. Moreover, significant renewable resources are available in most regions of the country, including those considered problematic from the standpoint of energy (Table 3.4.1).

Table 3.4.1

Russia's renewable energy resources

Type of resource	Resource, million tce		
	Gross	Technical	Economic
Small-scale hydropower	360	125	65 - 70
Geothermal energy	$18 \cdot 10^{17}$	$2 \cdot 10^{7}$	115 -150
Biomass energy	10^{4}	50 - 70	35 - 50
Wind energy	$26 \cdot 10^{3}$	$2 \cdot 10^{3}$	12 - 15
Solar energy	$23 \cdot 10^{5}$	$2{,}3 \cdot 10^{3}$	13 - 15
Low-grade heat	525	105	30 – 35
Total	$183 \cdot 10^{6}$	$25 \cdot 10^{6}$	270 - 335

Source: "Energy Abroad", Moscow: NTF "Energopress", 2008

It is known that fuel delivery to the northern regions is associated with difficult access and high delivery costs of fuel, therefore it is extremely inefficient to use. Need in the importation of a large part of the fuel in some regions of the Russian Federation has been eliminated due to the extensive use of their non-traditional power plants (Table 3.4.2).

Unfortunately, in Russia virtually no attention has been paid to the development of the electric power industry and, especially, renewable energy. Mainly initiative projects have been implemented. In particular, according to the program of energy saving developed by the SB RAS for 2005, of the 42 projects funded 13 are directly devoted to alternative power generation, including heat pumps, biomass processing, deep processing of coal, gasification, solar energy, etc.

Table 3.4.2

Fuel economy through the construction of non-traditional power plants

Power plants, power grids	Costs, $ million // Fuel Economy, tons of coal equivalent		
	1998 – 2000	2001 – 2005	2006 – 2010
Mutnovskaya Geothermal Plant, OAO Kamchatskenergo	0//0	160//500	0//800
Verkhnemutnovskaya Geothermal Plant, OAO Kamchatskenergo	25//56	0//60	0//120
Pauzhetskaya Geothermal Plant (re-construction), OAO Kamchatskenergo	10//90	0//200	0//200
Okeanskaya Geothermal Plant, OAO Sakhalinenergo	0//0	25//40	30//300
Kalmytskaya Wind Power Plant, OAO Kalmenergo	6// 10	10//20	10//I10
Zapolyarnaya Wind Power Plant, OAO Komienergo	3//5	2//10	0//10
Zapadno-Primorskaya Wind Power Plant, OAO Yantarenergo	0//0	5//5	10//75
Dagestanskaya Wind Power Plant OAO Dagenergo	0//0	2//5	4//30
Magadanskaya Wind Power Plant, OAO Magadanenergo	0//0	20//30	30// 150
Leningradskaya Wind Power Plant, OAO Lenenergo	0//0	5//10	10//75
Morskaya Wind Power Plant, OAO Karelenergo	0//0	10//20	30// 150
Kislovodskaya Solar Power Plant, OAO Stavropolenergo	0//0	ПЗ*	2//6
Small-scale hydroelectric power plants, first-stage	10//10	30//100	60//500
Total	57//171	270//1003	186//2526

* Project building

At present, Russia has a number of experimental and pilot plants using renewable energy sources, about 300 small-scale hydropower stations, dozens of small wind and solar installations. At present, power generating installations of renewable energy are being operated and built by regional power companies Kamchatskenergo, Stav-

ropolenergo, Komienergo, Dagenergo, Kalmenergo, Kabbalkenergo, Kubanenergo, Kolenergo, Yantarenergo. Non-traditional power plants have been designed in OAO "Magadanenergo," "Dalenergo," "Lenenergo," "Carelenergo," "Sakhalinenergo [187]." Our country uses now only 1500000 of conditional tons from alternative renewable energy sources, whose total contribution to the country's energy does not exceed 0.1%. [100]

But today, it is necessary to develop electric power based on renewable energy sources more actively than ever before. We consider it necessary to mention the following arguments for the efficiency of power plants based on renewable energy sources: the ability to solve problems of providing electricity to remote and inaccessible areas with less effort and resources; the need to reduce the amount of expensive construction of transmission lines; the optimization of equipment utilization schedules on other plants; the need to reduce emissions from the electricity sector.

Perspective directions of innovative development of the power of the northern territories, in our view, should include the following:

1. The use of small, low-power mobile nuclear plants in the Far North.

2. The use of geothermal resources. Artesian basins of thermal waters have been discovered in the Sayan-Baikal mountain system in Buryatia (about 400 thermal springs), Yakutia, in the north of Western Siberia, Chukotka (13 high-thermal sources with a total flow rate of 166 l/s) [168].

3. The use of solar energy. In Canada, Sweden, Norway, Finland and Alaska in addition to small-scale hydropower plants, solar power plants are becoming more widely used. Solar cells are imbedded into the roof tiles, ceramic tiles and window glass, which makes it possible to produce electricity in separate buildings.

4. The use of wind energy. Modern technologies have greatly improved the efficiency of windmills (wind turbines). Wind power installations, as well as solar power plants, are especially effective in small communities of the North for autonomous energy users, located remotely from centralized energy systems.

7. The use of biological resources. Being an additional energy source, firewood and wastes of primary wood processing are used by small thermal power stations of the North.

The electric power industry of the Republic of Sakha (Yakutia), as was already mentioned, have a particularly acute problem of fuel supply and electricity to customers of numerous small settlements located remotely from centralized sources of electricity. The low concentration of customer load in the northern regions of the

country, a complex transport scheme of delivery of fuel, price increases for fuel itself (coal, fuel oil, gas condensate, firewood) and transportation, environmental pollution dictate the need for new kinds of energy supply of the northern territories. Consequently, the provision of clean electricity, gas and water to the population of the northern regions is a problem having a great national economic significance.

The most promising areas in the use of renewable energy sources in the Republic of Sakha (Yakutia) are the introduction of wind power plants (WPP), small-scale hydroelectric power plants (from 100 to 30,000 kW) and the use of low-power nuclear power stations is (LPNPP), the most promising being the use of small hydropower plants in the North.

The construction of wind power plants with an environmentally friendly technology makes it possible to use wind energy whose potential is great and inexhaustible in the Arctic region, as well as along the river valleys of the republic. The cost of 1 kW/h of electricity produced from a wind farm is 250 kW, 4 times cheaper than the cost of electricity produced by diesel power, respectively, annual savings of diesel fuel will make 958 thousand rubles.

Currently, in the territory of the Republic there are 14 communities (for wind loads) for the construction of wind farms with total capacity of 9250 kW, the operation of which will save up to 6,800 tons of diesel fuel per year.

We should not forget that modern hydropower, which is one of the most economical and environmentally friendly power generation types, allows you to save the natural landscape, not only during the operational phase, but also during the construction process, as the construction of small hydropower facilities is less costly and quickly pays off. Small-scale hydro power plants do not have a negative impact on the quality of water; fully preserve its original natural properties. They practically do not depend on weather conditions and are able to provide a stable supply of low-cost electricity to consumers. Small hydro power plant units are designed for operation in a wide range of pressures and flows with high power characteristics.

For the power supply of small settlements, of greatest interest to date is the use of water power of the small rivers of Yakutia, the technical hydro potential of which amounts to 30 million kW with an average annual energy of about 250 billion kW/h, and the technical potential of their resources are estimated at 10 million kW and 8 billion kW/h of energy. [28] Preliminary calculations show that small-scale hydro plants shorten the delivery of liquid fuel in the amount of 150 thousand tons of coal equivalent [28]. The process of small river hydropower exploitation was started with the

construction of a cascade on the river Vilyuy, which became the basis of the energy base of the largest diamond mining companies in Russia. However, it should be noted: our analysis of 2005 data shows that it is much more difficult to use the energy of small rivers in the North than in areas with a temperate climate. The main disadvantage of small hydro power plants is a short period of their functioning due to the very uneven distribution of river runoff and its long absence in the winter. Despite this fact, the creation of small hydro power plants has several advantages compared to the large-scale stations: the short term of construction of the plant (no more than 1-2 years); full automation of the electricity production; minor flooding of land and a negligible impact on the environment, as well as the possibility of complex use of reservoirs (water supply, recreation, etc.).

On the territory of the Republic of Sakha (Yakutia) there are 280 small settlements, supplied with power from isolated power sources, and only a small part of consumers has the ability to build small hydropower plants due to physical and geographical conditions of the area. Based on the analysis of energy use by the existing mini-hydro plants based for certain localities, we currently explored the feasibility of their construction in the Republic of Sakha (Yakutia). The power of the majority of the plants provides coverage for winter peak loads of respective localities. Due to the fact that all the above rivers of Yakutia in winter are covered with ice for about 7 months during which there is no flow, the most viable option seems to us the construction of seasonally adjusted hydropower plants.

From the standpoint of large-scale electricity exports of greatest interest may be the Uchurskaya hydropower cascades, whose energy output is 17.2 billion kWh. However, depending on the importing country and other preferred points of electricity generation, investment opportunities, transport schemes, the strategy of development of water resources may be different.

Power distribution of the YUYAGEK facilities can be considered in two different or complementary directions:

- From the area of the Uchurskaya power plant to the east, with branching routes to Japan (via Sakhalin) and China (via Komsomolsk);

- From the area of the Uchurskaya power plant to the west, then to the south along the railroad Skovorodino-Yakutsk to China.

Commercially available hydro potential of the republic is estimated at 257 billion kWh and Yakutia’s own needs for electricity in the foreseeable future, it seems, do not exceed 10-15% of this potential.

The accelerated use of renewable energy sources on the basis of renewable energy sources can solve the problem of electricity security of local consumers with environmentally friendly electricity, the problem of ecologization, the problem of the northern delivery of expensive liquid fuels as well as reduce the rate of loss of power transmission lines and reduce the cost of electricity.

Due to the introduction of alternative renewable energy sources in the structure of electricity production, the share of decentralized power supply will be reduced from 5% to 3% by 2017. The most promising areas in the use of renewable energy sources in the Republic of Sakha (Yakutia) are the introduction of wind power plants (WPP), small-scale hydroelectric power plants (from 100 to 30,000 kW) and the use of low-power nuclear power stations is (LPNPP).

Thus, the development of renewable energy sources is one of the mechanisms to ensure electricity security in the northern territories of Russia.

CONCLUSIONS ON CHAPTER 3

1. The organizational and economic mechanisms for electricity security in the region represent a relationship of elements in the system of impacts of the economic processes taking place in the territorial energy complex and aimed at the efficient use of material and human resources to ensure the security of the electric power in the region.

2. The determining role of the state in providing electricity security in the North is required and must be significantly improved through the development of the regulatory framework, the formation of organizational and economic mechanisms, through effective financial and credit policies, pricing, tax and insurance policies, through direct administrative impacts on the adoption and implementation of the Complex of programs of modernization and development of the electricity industry of the areas.

3. The proposed organizational and economic mechanisms to ensure electricity security of the northern region and institutional relationships are based on the following conceptual approaches:

- coordination of the economic interests of the economic entity, consumers, investors, the population and the authorities of the region, based on the rule of “two keys”: on the part of the Government of the Republic of Sakha (Yakutia) and OAO AK “Yakutskenergo,” the creation of an investment fund for modernization and development of the power industry of the Republic of Sakha (Yakutia) ;

- creation within the Government of Sakha (Yakutia) - the Ministry of Fuel and Energy of Republic of Sakha (Yakutia) (the Department to ensure the security of electricity) and the Administration for Management of Investment and Energy Efficiency under the State Committee on Pricing - REK RS (Y) with the aim to carry out the functions of control over the activities of the Investment Fund for power development.

4. The proposed organizational and economic mechanisms of electricity security of power districts of the Republic of Sakha (Yakutia) for prevention and elimination of threats common to all energy regions and specific to each power district to ensure electricity security of power regions of the republic, in our opinion are the most effective mechanisms to ensure electricity security in the whole region of the North, such as the Republic of Sakha (Yakutia).

5. The accelerated use of renewable energy sources on the basis of renewable energy sources can solve the problem of electricity security of local consumers with environmentally friendly electricity, the problem of ecologization, the problem of the northern delivery of expensive liquid fuels as well as reduce the rate of loss of power transmission lines and reduce the cost of electricity.

6. The most promising areas in the use of renewable energy sources in the Republic of Sakha (Yakutia) are the introduction of wind power plants (WPP), small-scale hydroelectric power plants (from 100 to 30,000 kW) and the use of low-power nuclear power stations is (LPNPP). Due to the introduction of alternative renewable energy sources in the structure of electricity production, the share of decentralized power supply will be reduced from 5% to 3% by 2017.

★ ★ ★

CHAPTER 4. REGULATION OF TARIFFS FOR ELECTRICITY AS ECONOMIC MECHANISM TO ENSURE ELECTRICITY SECURITY OF THE REPUBLIC OF SAKHA (YAKUTIA)

4.1. The principles of pricing at the regional electricity market

The methodological aspect of pricing in the developed countries is the developing by public authorities of general principles, methods, and standards of pricing. Along with the direct establishment and control of prices, the public authorities control the validity of calculation of tariffs and their application.

The need for the involvement of public authorities in the process of pricing emerges when suppliers and consumers of goods (services) cannot reach a compromise on the issues of prices and volume of production that is when it is not possible to balance their interests. The extent of the state's influence is determined by the depth of the contradictions between the producers and consumers of goods (services). The deeper the contradictions, the stronger must be the influence of the state. It should be borne in mind that the involvement of a third party (the state) in the resolution of the contradictions between the market participants, in essence, means the transfer by these market participants of part of their powers to the public authority.

In such a situation, the state authorities can act not only in the interests of producers and consumers of regulated products (services), but also in the national interests or the interests of any social or economic groups. Government regulation, making it possible to resolve the conflict of interests of producers and consumers of goods (services), in turn, considerably weakens the competitive mechanisms to improve the efficiency of production and consumption of goods (services). The best way to achieve economic efficiency, no doubt, is the organization of competition.

However, there are some sectors of the economy in which the state control is more economically justified because of the technological features of the activity and the extent of the market. Thus, in the field of transport (rail, airport services and transport terminals), the fuel and energy complex and telecommunications the organization of competition is much more time-consuming and costly than the state control over the level of prices for the services provided. The sphere of activity in which such control (regulation) is preferred, called natural monopolies.

In accordance with the Law "On natural monopolies," service providers for the transmission of electric and thermal energy are considered natural monopolies. Regional energy and electrification companies are simultaneously engaged in generation, transmission and distribution of heat and electricity.

The degree of government influence on the pricing depends on many factors of economic, historical, social, political nature. In very general terms, there are three levels of government influence on the pricing of any commodities (services), which characterize the degree of state regulation:

- Soft control method - the use of tax incentives for specific nomenclature of the goods (services) (e.g., pharmaceutical products, baby products, handicrafts, etc.);

- Moderate control method - direct targeted subsidies to the manufacturers of certain goods (services) allocated from the budgets of all levels. In this case, the regulators can put conditions on the volume of production and the level of prices on subsidized goods (services) (production of agricultural products, coal mining, etc.);

- Hard control method - direct state regulation of prices and tariffs on the products (services), carried out by determining the rates of prices and tariffs, the establishment of limits on the amount (or the marginal profitability) as well as by forming methods of direct calculation of prices and tariffs.

The specificity of power in the Republic of Sakha (Yakutia) is that the direct competition in the industry has long been and remains economically inefficient and virtually impossible because of the isolation of the republic from the Unified Energy System of Russia (at least in the field of generation). In our view, we should pay attention to the fact that all the industrialized countries continue to preserve state regulation of tariffs for electric energy, along with the application of market-based pricing.

All this calls for close monitoring of government regulation on the principles and methods of pricing in the electricity industry. On the other hand, the regulatory authorities must ensure an open, transparent and objective process of tariff setting, enabling the possibility of further effective work not only for consumers, but also for the monopolistic company itself. At the same time, the geographic, climatic, and the abovementioned organizational features of Russian power industry do not make it possible to directly benefit from the experience of foreign countries in the matter of regulation of tariffs for the services of electricity supply companies.

Under the conditions of public ownership and centralized economic management, the mechanism of state regulation of prices and tariffs based on price lists, in general, provided balanced economic proportions and allowed the owner (the state) to exer-

cise its basic economic interests. At the same time, this regulation was of an extremely costly nature, did not create internal incentives to improve the efficiency of the production and consumption of electricity and heat.

It should be noted that the tariffs for electric and thermal energy in almost all countries, in one way or another, are regulated by the state.

The main elements of the state regulatory system in the industrialized world can be boiled down to three components:

* legal and regulatory framework;
* organizational support;
* methodological support.

The basis of the regulatory framework for regulation of tariffs for electric and thermal energy in countries such as the USA, France, Spain and others is a set of laws that determine the overall order of regulation, review procedure, administration and application of tariffs [86].

Organizational support for the state regulation of tariffs for electric and thermal energy is typically administered by special bodies of state administration, having the appropriate authority to review, approve and introduce tariffs into effect. In the industrialized countries, the regulatory authorities are independent in decision-making and responsibility for decision-making under the law.

In spite of all the variety of specific regulation mechanisms, the basic principles of state regulation of tariffs applied in the world are as follows:

- establishing the level of tariffs that balance the interests of energy producers (suppliers) and consumers;
- obligation to supply energy to all consumers at rates established by law;
- economic justification of costs and benefits for calculation and approval of tariffs;
- openness, accessibility for consumers and the population of materials of the regulatory authorities for review and approval of tariffs for electric and thermal energy;
- realization of the rights of shareholders and other owners of power supply companies to obtain a reasonable level of profit (income) on invested capital;
- ensuring the necessary level of security of energy supply;
- minimizing the environmental burden from the activities of energy companies;
- focus on carrying out energy-saving policies to consumers of electric and thermal energy.

In the Russian Federation, the state regulation of tariffs for electricity and heat was provided by the Federal Law "On state regulation of tariffs for electric and thermal energy in the Russian Federation," according to which the following basic principles should be observed:

- the provision of the balance of the economic interests of suppliers and consumers of electricity and heat based on the availability of these types of energy and with a view to ensuring an economically reasonable return on the capital invested in the production and transmission of electricity and heat and the work on operational management in the electric power industry;
- the determination of the economic feasibility of the planned (settlement) costs and benefits for calculation and approval of tariffs;
- openness and accessibility for consumers, including the population, information on the review and approval of tariffs in accordance with the disclosure standards established by the Government of the Russian Federation and provides for mandatory publication of information disclosed in the official media, which, in accordance with the federal laws and the laws of the subjects of the Russian Federation publish the official materials of public authorities;
- ensuring the economic feasibility of commercial organizations' cost of production, transmission and distribution of electric and thermal energy;
- the provision of commercial organizations in the field of power generation, transmission and distribution of electric and thermal energy with funds for the development of production, science and technology and social development, including the funds allocated for energy efficiency and providing energy, engineering and environmental security (including nuclear and radiation security) of the Russian Federation, carried out by borrowing, private investment, funds of commercial organizations (mutual funds, insurance funds, funds for research and development activities), and other funds;
- the creation of conditions to attract domestic and foreign investment;
- the determination of the amount of funds allocated for labor compensation, in accordance with the industry tariff agreements;
- the selection of suppliers of energy equipment and contractors for energy and power grid construction on a competitive basis;
- reporting of the results of power supply companies' activities for the period of the previously approved tariffs;

- accounting of compliance with legislation on energy saving and increasing energy efficiency, including requirements for the development and implementation of programs in the field of energy conservation and increasing energy efficiency, requirements for accounting and control over the use of energy resources, reduction of the loss of energy resources [17].

The state regulation of prices (tariffs) in the field of heat and electricity supply can be based on long-term regulation parameters corresponding to a period of at least five years.

The establishment of regulated prices (tariffs) in the power sector by the regulatory authorities in accordance with the purposes and principles of the state regulation provided for by the Federal Law “On electric power industry” [2]:

- regulation of prices (tariffs) is based on the principle of obligatory separate accounting by organizations conducting regulated activities;
- when setting regulated tariffs (prices), including long-term ones, as well as during their adjustment, the regulatory authorities take measures to exclude the economically unreasonable expense (income) of the organizations;
- the regulatory bodies establish the level of reliability and quality of provided goods (services) in accordance with the guidelines on the calculation of the level of reliability and quality of provided goods (services) as issued by the Ministry of Energy of the Russian Federation in coordination with the Federal Tariff Service;
- the regulatory authorities on the basis of pre-agreed measures to reduce the expenses of the organizations performing the regulatory activity are required to maintain a consistent level of expenditure for the period to compensate for the costs of these activities, including interest on loans, attracted for their implementation;
- if the organization conducts other than regulated activities, the costs of their implementation and income (loss) from these activities are not included in the calculation of regulated prices (tariffs), except as provided by the rules of the wholesale and retail markets;
- if the organization’s activities are regulated by authorities of more than one subject of the Russian Federation, the governing bodies must agree on the measures installed for the necessary gross proceeds so that the total amount of the required gross revenues should allow to compensate economically reasonable costs and ensure an economically reasonable return on invested capital of the organization for all the regulated activities;

- the regulation of prices (tariffs) can set: the prices (tariffs) for electric energy (power); limiting (minimum and (or) maximum) levels of prices (tariffs); price premiums (rate surcharges). The regulated prices (tariffs) can be established both in numerical terms, and in the form of formulas or procedures for determining such prices.

During the regulation of prices (tariffs) such methods are used as the method of economically justified costs (costs), the indexation method, the method of return on invested capital, as well as other methods based on the long-term management options.

The choice of method of regulation in each organization performing the regulatory activity is made by the regulator.

When using the method of economically justified costs (costs), the regulated prices (tariffs) are calculated on the basis of the size of the necessary gross proceeds of the organization performing the regulatory activity from the sale of each product (services) and the estimated volume of production corresponding to the type of product (services) for the current regulatory period.

The basis for calculating the tariff is defined differently depending on the use of a particular method.

In order to implement the regulated activity using the method of economically justified costs a tariff is calculated on the basis of necessary gross revenues (hereinafter - NGR). The principles of pricing, reflected in the Resolution of the Government of the Russian Federation of 26.02.2004 [6], define the NGR as an economically viable amount of funding necessary for the organization to carry out the regulated activity during the billing period of regulation, and contain a number of rules governing the types of expenses included in it. According to paragraph 16 of the Principles of pricing, using this method, tariffs are calculated based on the size of the NGR and the estimated volume of production of the relevant product (services) for the current regulatory period. The estimated annual production volume is determined on the basis of the consolidated pro forma balance sheet of production and supply of electric energy (power) within the Unified Energy System (UES) in the subjects of the Russian Federation. The balance is formed by the RF FTS with quarterly and monthly breakdown on the basis of the principle of minimizing the total cost of electric energy (power) supplied to consumers, with the participation of the regulatory bodies of the subjects of the Russian Federation, the organization that provides services for the operation and development of the UES of Russia, the trading system administrator and system operator of the wholesale electricity market.

The determination of expenses included in the NGR, and the assessment of their economic feasibility is made in accordance with the legislation of the Russian Federation and normative legal acts regulating relations in the field of accounting (paragraph 17 of the Principles of pricing). The costs included in the NGR are planned and divided into expenses deducing tax on profits, and expenses from the profits after tax. The new Principles of pricing determine in more detail the structure and content of the expenses included in the necessary gross revenues.

The first group of expenses is listed in item 19 of the Principles of pricing:

1) Fuel costs, which are included in the NGR, based on the standards of specific fuel consumption, approved by the RF Ministry of Energy in consultation with the RF FTS, fuel prices, fuel consumption calculated volumes based on the structure of its use, established over the past three years, the standards of stockpiling of fuel calculated in accordance with the procedure approved by the Ministry of Energy in consultation with the RF FTS;

2) The cost of purchased electric and thermal energy, and payment for services rendered by organizations performing the regulatory activity - based on the tariffs approved by the authorized body of the regulation;

3) The cost of raw materials - based on expenditure norms, respectively, which are approved by the Ministry of Energy and Ministry of Atomic Energy of the Russian Federation;

4) The cost of repair of fixed assets, based on the standards of expenses (subject to indexation) for the repair of fixed assets, respectively, approved by the Ministry of Energy and Ministry of Atomic Energy of the Russian Federation in coordination with the Federal Tariff Service of the Russian Federation; the price of repair work, program of repairs to ensure a reliable and safe operation of production and technical facilities and accident prevention (Section 26, Principles of pricing);

5) The cost of labor and social contributions - based on the size of payroll determined by the regulatory body. The payroll is determined in accordance with the industry tariff agreements concluded by the organization, and the actual amount of the wage bill in the last accounting regulation period, taking into account the forecast of consumer price index (paragraph 27 of the Principles of pricing);

6) The cost of depreciation of fixed assets and intangible assets - based on the amount of depreciation of fixed assets as defined in accordance with the regulations governing the relations in the field of accounting;

7) Non-operating expenses, including the cost of doubtful debts. Within the provisions for doubtful debts receivables may be taken into account that arose in the implementation of the regulated activity. The payment of doubtful debts to be paid off by the provision included in the tariff in the previous regulatory period, is recognized as income and excluded from the necessary gross revenues in the next regulatory period, taking into account the tax on profits. The non-operating expenses also include the costs for the conservation of the basic production assets used in regulated activities;

8) Other expenses. The list of expenditures of this group is not exhaustive. The Principles of pricing also include other expenses. Within them, the expenses for works and production services performed under contracts with organizations to carry out routine maintenance, expenses for works and services outside work performed under contracts with organizations including the costs of communications services, private security, public services, legal, information, audit and advisory services, etc., allocations to reserves, intended to ensure the security of nuclear power plants at all stages of their life cycle and development, fee for maximum permissible emissions (discharges) of pollutants into the environment, rent of property and other costs associated with the production and/or sale of products.

The second group of costs is determined in section 20 of the Principles of pricing their list is also not exhaustive. These include:

1) Capital expenditures (investments) on the expanded reproduction of basic production assets (BPA). The cost of investment in the accounting regulation period is determined on the basis of investment programs (projects) of organizations performing the regulatory activity agreed with the regulator. Investment programs (projects) should contain a list of objects, the volume of investments, the timing of their development, the sources of funding for capital investments, as well as calculation of the payback period of the latter. Funds for the financing of capital investments allocated for the development of production are determined by the amount of depreciation and long-term debt, as well as the conditions for their return. The regulatory authorities are obliged to take into account the costs associated with the return and maintenance of long-term debt allocated to the financing of capital investments from the date of receipt of funds for the implementation of the project, as well as incorporate those costs in the calculation of rates for subsequent accounting periods of regulation throughout the agreed term of the project payback;

2) The payment of dividends and other income from the profit after tax. The estimated value of dividends will be determined based on the sum of dividends (distributable income) stated by the organization performing the regulatory activity to the current regulatory period, the amounts of actually paid dividends for the past three years, and the amount of the remaining after-tax income and fees received in the last reporting period;

3) Contributions to the authorized (share) capital of organizations. These costs are included in the NGR only in cases prescribed by the legislation of the Russian Federation;

4) Other commercially reasonable costs attributable to the profit after tax, including the costs of organizations to provide benefits to employees, guarantees and compensation in accordance with the sector tariff agreements.

The inclusion of other costs in the NGR is restricted by the fact that these costs and the opportunity to take them into account shall be determined by the RF FEC.

In addition to these costs in accordance with paragraph 21 of the Principles of pricing the NGR include the amount of income tax, as well as payments to the federal budget for the use of property in federal ownership. When calculating the amount of income tax, capital asset depreciation amount is determined in accordance with the Tax Code of the Russian Federation (not the accounting legislation).

Since the NGR is a planned rather than actual value, most of the expenditures shall be subject to rationing by the authorized regulatory bodies. At the same time, when establishing a tariff, some standard to be applied in the calculation, may be missing. In that case, paragraph 31 of the Principles of pricing provides that in the absence of standards for certain items of expenditure expert estimates may be used in the calculation based on reported data provided by the organization performing the regulatory activity. In addition, the Principles of pricing establish specific rules on the use of prices for costs accounted for in the tariff. According to paragraph 36 in the determination of costs the following items are used:

- State-regulated tariffs (prices);

- Prices set on the basis of contracts concluded as a result of competition, bidding, auctions and other purchasing procedures to ensure the appropriate and efficient expenditure of funds;

- Officially published forward market prices and tariffs imposed on accounting regulation period, including exchange-traded futures prices for fuel and raw materials.

In the absence of such data forecasting index of price changes across industries shall apply.

When using *the method of economically reasonable return on invested capital*, the base for the calculation of the tariff is the investment capital of the organization engaged in regulated activity, calculated in accordance with the Principles of pricing.

The economically justified level of return on invested capital is determined by the regulator on the basis of the forecast of inflation rate adopted in the formation of the federal budget for the next financial year, taking into account the cost of long-term debt capital formed at the current financial market in the accounting period.

The Principles of Pricing (paragraph 35) set restrictive criteria for determining the rate of return on invested capital - it must not exceed the current refinancing rate of the Central Bank of the Russian Federation, but it cannot be lower than the minimum rate of return of federal loan bonds as of 1 July of the last accounting year.

The evaluation of the invested capital is based on the balance sheet as of the last reporting date. This takes into account the decisions of the regulation bodies of the organization, leading to a change in the share and additional capital attributable to the regulated activities in the current regulatory period. The value of the invested capital is defined as the sum of the shares of the registered and additional capital attributable to this type of regulatory activity and long-term liabilities (long-term debt reasonably attributable to this type of regulated activity) of the organization engaged in the regulated activities.

This method of setting tariffs may apply to the following activities: the production of electricity, heat production, the transfer of power and heat, operational control in the electric power industry.

The indexing method is applied in the case provided for in paragraph 37 of the Principles of pricing, if the inflation rate (consumer price index), defined in the forecast of socio-economic development of the Russian Federation does not exceed 12 percent per year in the accounting regulation period. In this case, the regulatory authorities may apply the method of indexation (including a term exceeding one year) based on the projected inflation rate (consumer price index). Subject to indexation are both maximum and specific previously approved tariffs.

At the same time, the application of the indexation method takes into account not only the inflation indices, but also cost reduction programs of the organizations performing the regulatory activity, consistent with the regulatory authorities, changes in the composition and amount of financing of the program of investment in the power

industry; deviations of actual power generation in hydro power plants from the forecast, deviations in actual prices of fuel from the forecast, deviations of actual consumer price index from the forecast index accepted when setting tariffs, changes in regulations, including tax laws that affect the amounts of expenses of organizations carrying out regulated activities.

The way the mentioned variables will be taken into account in the indexation of tariffs will be determined by the RF FTS in its guidelines. Since the use of this method does not require the establishment of a tariff, it can be assumed that the regulator on the basis of the analysis of these indicators will establish certain factors, with the help of which the tariff will be indexed.

4.2. Improvement of State regulation of electricity rates

The positive sides of the existing system of State regulation and formation of tariffs for electricity and heat are following:

- the effective functioning of the two-levelled system of State regulation in the field of power and heat supply systems (FTS of Russia and REC), aimed at protecting the interests of consumers while preserving the “natural monopoly” energy supplying organizations in such non-price zone temporarily isolated regions from the national network of Russia as the Republic of Sakha (Yakutia), the Magadanskaya oblast, Kamchatka Krai, Chukotka Autonomous Okrug, and the introduction of a market-based pricing in the generation of energy and the development of competition in the market of manufacture of electrical and thermal energy in the price area of the power supply the rest of the country;
- use of the economically justified costs on regulated activities and the introduction of a regulatory approach to the analysis and calculation of the main components of cost of energy supplying organizations. This approach is effective in low level or no competition in the field of power and heat supply systems in northern regions of the country;
- providing conditions for self-financing and, to a lesser extent, ongoing development organizations. However, it should be mentioned that formally ensure self-financing of electric power industry of the Republic of Sakha (Yakutia) does not give due effect due to a severe shortage of funds for fuel delivery and investment funds for development, modernization and ensure electricity security in the northern territories.

The main disadvantages of current methods of State regulation of tariffs for electrical energy in the Republic of Sakha (Yakutia), in our view, are following:

1. The existence of cross-subsidization of electricity consumers in the four energy regions of the Republic (Central power region, Western power region, Southern Yakutia power region and Northern power region).

Tariff policy of the Government of the Republic of Sakha (Yakutia) for heat and electricity generated by JSC SC Yakutskenergo bases on the average electricity rates across the company differentiated by certain categories of consumers on the basis of their ability to pay, social security and the degree of significance of the sectors and individual enterprises in the economy of the Republic.

And as a result, during 1992-2010 energy pricing established cross-subsidization in three ways:

a) subsidies among consumers of electricity and heat by low tariffs for heat by raising electricity rates;

b) subsidizing consumers in areas with high-cost production of electricity (Northern power region) at the expense of consumers with low-cost production of electricity (Western power region);

c) in certain categories of consumer subsidies of electrical and heat energy through the establishment of preferential tariffs for them due to the high tariffs for industrial consumers.

For certain types of consumers such pricing principles are unfair in economic and social terms. In accordance with the principles of pricing in the Russian Federation for products, prices which are subject to State regulation should be set at the price of their actual production costs.

Save of electric energy consumer subsidies led to a slippage in the economy, resulting in a failure to comply with the basic principles of pricing in the electricity industry and the formation of unrealistic spending budgets and, consequently, leads to reduction of financial assistance from the Federal Fund of financial support of the Russian Federation. In general, there is the distortion of inter-budgetary relations at all levels, as well as the distribution of tax revenues. At the level of the Republic one can observe a shortage of the necessary amount of financial assistance from the federal budget due to the distorted shape of the budget, taking into account the average tariffs for energy, resulting in lower tax revenues to cover the real costs. At the level of municipalities in local self-government there is the distorted formation of

own material costs on heating and electricity, fuel that leads to uneconomical and inefficient use of energy resources, especially where expensive diesel fuel is used.

Thus, the tariff policy in electric power industry of the Republic of Sakha (Yakutia) weakens the power security of the northern region.

2. The problem is not limited to the disparities in the levels of tariffs for different groups of consumers of electricity. A similar situation exists in the framework of the industrial group of consumers.

Comparison of tariffs for electrical energy between the public and the industry in the Far Eastern region and the developed countries of the world in 2010 is shown in Figure 4.2.1.

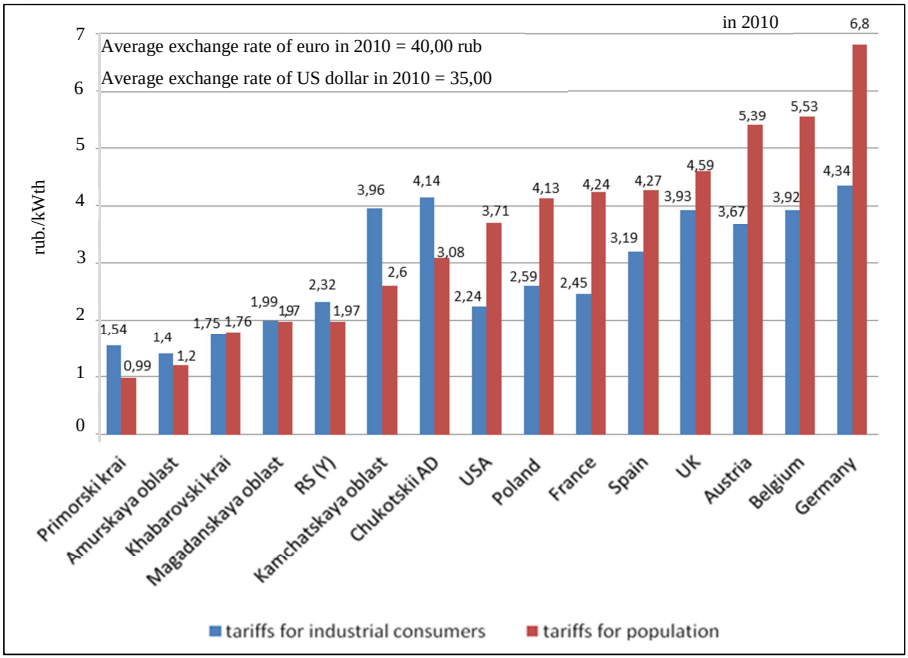


Figure. 4.2.1. the comparative characteristic of cross-subsidization of electricity tariffs between the population and the industry

As you can see in Figure 4.2.1, the tariffs for electric energy for the population of the far eastern region and everywhere in the developed world rates for them are much higher than for industrial consumers, this is due, above all, with the technology of generation, transmission and distribution for different categories of consumers.

Rates for different categories of industrial customers (appendix1) is calculated without taking into account the key factors differentiating performance uneven load schedules of individual categories of consumers, consumers attach to mains (voltage levels, remoteness from supply sources); it does not take into account the fact that the allocation of fixed costs and profits of energy supplying organizations among major subsystems-production, transport and distribution of electricity and then justified inclusion of data of costs and profit rates by categories of consumers (in accordance with the actual load of the engine in the power supply of each customer category).

3. By the Resolution from August 17, 2004 No. 378 a the Government of the Republic of Sakha (Yakutia) approved programme for the phased elimination of cross-subsidies among consumer categories in the tariffs for electric energy produced by JSC SC Yakutskenergo. The main objective of the program was the preparation of the consumer and provider to the market conditions of the energy industry and the requirements in the legislation establishing the tariffs for all categories of consumers at economic levels. Term of realization of the program was provided for 2006-2013, the deadline for the Elimination of cross-subsidization of budget users, in accordance with the programme ends in 2011, the population - 2013. However, in view of the possible budget and real incomes, the program was not fully implemented. Therefore, currently the decline slightly and cross-subsidization has remained almost at the same level as at the start of the implementation of the programme.

Thus, it can be concluded that the program is not running at the moment. It should be noted that the requirements of the law have intensified in parts of cross-subsidies among customer categories. By present, the Government of the Russian Federation has developed a draft Ordinance on the introduction of the social norms for the population. It will reduce rate of social norms for the population, according to it within social norm the tariff for population will be discountable, higher social standards - at a commercially reasonable rate for 2010 is 5.25 rubles per 1 kWh.

4. In recent years, due to high electricity rates for industrial consumers and persons assimilated to them a negative factor for the electricity company of JSC SC Yakutskenergo is pointed out: non-industrial consumers refuse from services AK Yakutskenergo in favor of own production or services of the wholesale market.

5. Today new contracts with potential large industrial consumers are not signed because of high tariffs. A situation in which the use of such new industrial consumers as Gazprom on supply of Chayandinskoe deposits, becomes problematic, almost impossible one. An example is the problem of reducing the projected growth of

approximately 5 years ago electricity production JSC SC Yakutskenergo – due to the implementation of the power supply tender for Talakan pumping station “objects” of joint-stock company Transneft Talakanskaya gas turbine power plant OJSC Surgutneftegaz instead of a stock company Yakutskenergo. It should be understood that it is impossible to overstate the anticipation of increased electrical energy because growth prospects of the energy company as it is to increase electricity production, which contributes to lower tariffs for electricity and thus attract new consumers in power districts of the Republic.

6. In the current methodology problems of costs and profit allocation of the companies between the electric and thermal energy are not developed. Acting technique virtually eliminates the possibility of using a flexible marketing policy in the sphere of sales of electricity and heat by energy supply companies (taking into account the specifics of the particular region and competitive regional electricity consumer markets and heat).

7. One of the essential, in our view, shortcomings of existing methods of tariffs - the minimum required balance profit-saving organizations is calculated without the use of a standard approach and is formed and approved in State Committee on pricing - REC of the Republic of Sakha (Yakutia) in absolute amount in millions of rubles.

In foreign practice, for example, when defining the necessary profit of joint stock electricity companies regulators use “reasonable rates of return on capital” (based on the weighted average cost of capital in the credit and stock markets to levels of interest on bonds and long-term loans, dividend rates on share aggregated groups of industrial enterprises). However, taking into account the actual conditions of regional economy, implementation of the normative method for calculating profits of regulated utility companies must be carried out gradually, with some caution. This is due, firstly, to the lack of development credit and stock market in the Russian Federation and the Republic of Sakha (which have not yet become a key and stable mechanism, regulating the processes of flow of capital into the Russian economy) and, secondly, the existence of serious problems in the evaluation of the real value of basic production assets of the utility companies.

8. The current system of regulation of electricity rates on the basis of the definition of “reasonable costs” creates an incentive to inflate costs. One can observe inefficient and technologically outdated energy facilities with high unit costs of fuel and electricity transmission losses in electric networks, reduced productivity while

increasing strength, there is no effective and efficient mechanism to encourage savings in material costs.

9. The definition of the necessary costs of generation, transmission and distribution of energy is impeded by the fact that not enough skilled legal frameworks apply outdated regulations determine production costs in the production of electric and thermal power, including no departmental standards for determining losses in electric networks, taking into account the length of the power lines, proximity to energy sources, as well as technical and technological state of electrical networks

10. One of the reasons for the shortcomings of the State regulation of tariffs for heat and electricity in the Republic of Sakha (Yakutia) was in 1995-97 the establishment of preferential tariffs for certain groups of users (for example, ALROSA and JSC Aldanzoloto) with no reimbursement of income drop-down of the power company, leading to its loss, the shortfall for the normal operation of power equipment and conducting routine repairs, not mentioning the allocation of resources to investments for the reconstruction of existing funds as well as for the construction of new high-performance energy.

11. The calculations for a number of energy systems show that the energy supplying organizations shortfalls in revenue are not included in the fees for electricity due to high fuel prices, and benefits for a number of consumer groups are so large that they cannot be compensated. Therefore, it is necessary to embed in the minds and practices of local and federal authorities the following principle: if decisions are made on a preferential tariff for a particular group of consumers, at the same time the question about budget grants must be decided. This principle should be legislated by means of amendments to the Russian Federation law “On electric power industry” of 26.03.2003 N 35-FZ.

The main directions on improving State regulation of tariffs for electrical energy in the Republic of Sakha (Yakutia), in our view, are the following:

1. Development and application of a new tariff policy in electric power industry of the Republic, which takes into account the creation of the investment fund at the expense of investment allowances in electricity tariffs in three electric power regions (Central power region, Western power region, Southern Yakutia power region) for the purpose of strategic development and modernization of the electric power industry, as well as the use of the mechanism of subsidizing consumers of the local diesel electric power industry of the Northern power region.

2. The preservation mechanism of cross-subsidies or grants from the budget of the Republic of Northern power region, due to the isolation of the power region, as well as the technological specifics of diesel power plants, evenly spaced and fully autonomous in the sparsely populated and undeveloped economies.

3. Pursuant of the paragraph 5 of the Protocol of the meeting with Prime Minister Vladimir Putin in the city of Mirny on August 21, 2009 № VP-P9-34pr, agreed by the Government of the Republic of Sakha (Yakutia) with interested federal bodies of executive power. On the basis of the above mentioned document subsidies from the federal budget for the reimbursement of expenses for production of electric power from diesel power plants should be provided. Allocation of these funds is lowering the production costs of electricity; it is a prerequisite for the implementation of program activities to optimize local energy of the Republic of Sakha (Yakutia) up to 2015.

4. In order to achieve the greatest effect from the alleged subsidies for the normal operation of diesel power plants of the Republic of Sakha (Yakutia), by the invitation of the Government of the Republic of Sakha (Yakutia) funds must be granted from the federal budget to financial assistance in the form of grants in two ways:

- for tariff reduction for electric power supply from diesel power plants;
- the financing of the program of optimization of the local energy of the Republic of Sakha (Yakutia).

List of objects in the program of optimization of the local energy of the Republic of Sakha (Yakutia) is formed in accordance with its mission in three ways:

Track 1 - “reduction of decentralized electricity supply”- includes a summation of the PTL to settlements with autonomous sources of electricity with the installation of a modern power transformer stations. According to this, in 11 districts of the Republic there will be transmission lines of different class with a voltage from 0.4 to 35 kV with a total length of more than 550 km with 33 transformer substations, which will bring constant use in reserve 15 of DES and reduce diesel consumption in the production of electricity at 4.86 tons. (In 2009, the cost of fuel for electricity production by these stations is at about 140 million rubles).

Track 2 - “the construction of the Thermal power plant of low power and heating stations, working on local coals, the reconstruction of the existing DES” includes the following:

• construction of 8 thermal power stations, 4 thermal power plants operating on local coals instead of DES, which work on expensive imported diesel and do not meet modern requirements for energy efficiency;

• reconstruction of the existing 6 diesel stations with installation of modern equipment with 4 degrees of automation to replace obsolete equipment of diesel stations;

• reconstruction of distributive electric networks in regional capitals and cities with relatively high-voltage power transmission lines, where the construction of technologically and economically impractical.

For the 2010-2015 4 HPP of lower power and 8 heating stations will start working, 6 diesel stations in 11 districts of the Republic will be reconstructed [16]. The construction of the power plants will be considerably improved the quality of life of the population, which is expressed in the year-round hot water, centralized cold water supply and discharge. Total power input power and thermal plants will be 89 MW electrical and 115.2 Gcal/h thermal power. 11 DES with a total installed capacity of 60.5 Mw are to be decommissioned.

New low-power and thermal power stations will consume approximately 176 thousand tons of coal of Dzhebariki-Hajinskoe, Kangalasskoe and Zyrianskoe coal deposits. The annual savings in expenditure on the acquisition and delivery of fuel to electricity and heat supply as a result of the construction of small capacity low-power thermal power plants and the rehabilitation of existing DES will be 1.4 billion rubles.

It should be noted that in order to ensure that the growing demand for coal should be envisaged to introduce measures to increase coal production, therefore, correction of the program for the development of coal industry of the Republic of Sakha (Yakutia) could be possible.

Track 3 – “energy efficiency programmes” includes:

• construction of highly effective DES in areas where the directions 1 and 2 cannot be implemented;

• minimization of electrical energy losses with the reconstruction of distributive electric networks and use of the SIP;

• introduction of new economical DES with an installed capacity of consumer loads;

• construction of gas diesel stations in the gasification of localities of the Republic of Sakha (Yakutia);

• introduce measures to reduce energy consumption through installing of reduced output receivers and approval of higher rates in the area of decentralized electricity supply to encourage energy savings;

• use of renewable energy sources with the construction of small hydropower, solar and wind power plants [16].

5. Lower electricity rates for consumers in the Central, Western and South energy regions of the Republic may have a positive impact on the financial position of enterprises of the Republic. It is particularly important to reduce the tariff for the leading companies of the Republic - ALROSA (JSC) and Yakutugol, whose financial situation has been deteriorated due to market conditions.

6. Taking into account the requirements of the legislation in force, in the next 2 years, particularly the elimination of cross-subsidies in budget organizations, and the need to raise tariffs on electric energy for the budgetary organizations and population are required.

7. In our view, as a key way to improve regional electricity security it is necessary to develop method of regulating tariffs on electric energy, namely a differentiated cost of electricity of energy regions i.e. differential energy costs on regions taking into account economically justified costs for its production and with average tariffs, as well as the existence of cross-subsidization of electricity consumers and electricity subsidies mechanism for Northern energy district.

8. The application of a new method of State regulation of tariffs for electrical energy, i.e. “moderate tariff State regulation” method in electric power industry of the Republic to provide direct targeted subsidy to producers of electricity and subsidies to energy consumers of the Northern District from budgets of all levels; the inclusion of investment additions into 3 energy regions (Central power region, Western power region, Southern Yakutia power region).

9. Thus, while maintaining the mechanism of cross-subsidies and subsidies for electricity consumers of the energy region of the budget, it is possible to make investment allowances in fees for creating the investment fund development and modernization of the electricity grid to improve electric power security of the Republic of Sakha (Yakutia) and the energy of the area, in particular: Central power region, Western power region, Southern Yakutia power region and Northern power region.

4.3. Development of a method of regulating tariffs for electrical energy in the Sakha (Yakutia)

Tariff policy in electric power industry of the Republic of Sakha (Yakutia) on electric and thermal energy generated by JSC Yakutskenergo SC and other power producers, through the mechanism of cross-subsidization of consumers is based on the average energy tariffs for Energy Company.

These tariffs are differentiated on separate categories of consumers on the basis of their solvency, social security and degree of the importance of branches and the separate enterprises in republic economy. Similar approach breaks one of the basic principles of the federal law on state regulation of tariffs for electric and thermal energy which consists in establishment of tariffs for energy, proceeding from validity of expenses for their production. The consumer of the electric power has to pay its real cost.

Researches showed that existing technological features of functioning of power industry caused formation of the mechanism of cross subsidizing of consumers in realized system of regulation of tariffs for energy of JSC Yakutskenergo which is expressed in the following forms:

- between power areas - Western and Southern Yakutian energy regions with the cheap cost of energy are subsidized by Central and Northern energy regions, having the high cost of electricity generation;
- between types of production (electric and thermal energy) - due to electric energy more expensive thermal energy is subsidized;
- between consumers - industrial consumers and equated to them ones have to subsidize budgetary organizations, the housing and communal services enterprise and the population.

The existing mechanism provides a covering of losses on production of electric and thermal energy in areas with the highest expenses at the expense of establishment of single average tariffs for consumers. So, in the Northern energy region of RS (Y) the specific expenses on diesel fuel in cost of electricity generation exceeds 70% because of a systematic and unregulated rise in prices for delivered fuel. At the same time 94% from the general consumption of diesel fuel goes to this energy region as a whole on JSC Yakutskenergo and 76% of consumption of volumes of the electric power the budgetary sphere and housing and communal services.

In view of the high cost of fuel and low volumes of consumption cost of electricity generation by diesel power plants, production costs become overestimated in comparison with other power sources. At the expense of preservation of system of cross subsidizing amount of money on these purposes makes more than 3, 5 billion rubles. As a result, because of the special social importance of the northern energy region the high cost of the electric power developed by diesel power plants, is subsidized at the expense of other consumers of the republic.

Now the differentiated tariffs on the thermal energy made in JSC Yakutskenergo are estimated on conditionally allocated four energy regions. At the same time tariffs on heat power are subsidized at the expense of tariffs for the electric power. As the population won't be able to pay an overall cost of housing-and-municipal services for a long time and promote their absolute payback, the cost of services of housing and communal services in the republic is above, than in the neighboring regions for 45-70%. In this regard preservation of the mechanism of the second form of cross subsidizing in region power industry is necessary.

As a result of preservation of the third form of cross subsidizing - between industrial consumers and the population, the budgetary and agricultural consumers - there was a price distortion in favor of one consumer at the expense of the second ones. On the other hand, several years ago the similar pricing policy in power industry had positive sides against high inflation in the country and general decline in production.

However at the same time we have to note that preservation of the mechanism of cross subsidizing of consumers of the electric power led to a distortion in economy, non-performance of the basic principles of pricing in power industry, formation of economically unreasonable and unreal expenses of the budget that conducts to reduction of the financial help from Federal fund of financial support of subjects of the Russian Federation. As a whole, the inter-budgetary relations at all levels of the budget are distorted, and also the mechanism of distribution of the tax income suffers. At the level of the republic it means a short-reception of necessary volumes of the financial help from the federal budget as expenses of budgets are formed taking into account average tariffs for the electric power. At the level of municipalities it means the distorted formation of own material inputs on warm the electric power and fuel that attracts an uneconomical and inefficient expenditure of energy resources, especially where there is a need of delivery of expensive diesel fuel.

The fulfilled analysis on production expenses of energy power of Yakutskenergo allows us to conclude that state tariff regulating is done at the average energy tariffs on a whole energy company and does not reflect real expensese on energetic expenses of the Republic. The pricing system operating in an energy branch and establishments of the tariffs, based on annual correction of tariffs on an inflation index, can't provide effective realization of reforming and regulation of an electrical power complex in the republic.

Analysis of products cost of JSC Yakutskenergo during 2008-2010 (thousand rubles) is provided in tab. 4.3.1.

Table 4.3.1

Analysis of market cost of Yakutskenergo for 2008-2010. (thousand rubl.)

№	Item	2008	2009	2010	2010/2009 в %
1.	Raw materials, basic materials	90263	80110	90895	113,5
2.	Auxiliary materials	132034	167562	209299	124,9
3.	Construction services by production character	1119356	1177015	1481929	125,9
4.	Fuel for technological purposes	1477495	1840112	2059551	111,9
5.	Energy for technological network costs	4692992	5757051	5622687	97,6
6.	Labor fees	1681969	1776055	1776055	100
7.	Social contributions	353437	382035	369217	112,8
8.	Depreciation of fixed assets	963420	1417222	1598100	122,2
9.	Other costs	588244	530884	648041	122,0
10.	Total expenditure	11099210	13128046	13855774	105,5
11.	Costs of revenue	592363	972153	1546834	159,1
12.	Financial result from other results	-17620	60501	745364	1221,3
13.	Taxes	368457	341673	459869	134,2
14.	Use of profit	241526	569979	341600	59,8
15.	Necessary commodity products, electric and thermal energy	11691573	14100199	15402607	109,2
	including commodity products for electrical energy	10290377	12431356	13576129	109,2
16	The amount of electricity (productive supply of consumers), in million kW/hour.	4593	4462	4298	96,3
17	The actual average tariff for electric energy	**2,240**	**2,786**	**3,159**	**113,4**

Source: financial statements of Yakutskenergo for 2008-2010.

According to the Table 4.3.2. the calculation of marketable production required for establishing average tariffs of JSC Yakutskenergo SC in 2010 it can be concluded that commercially reasonable rates in the four energy districts differ from the approved average tariffs for the power company.

Dynamics of generated electricity tariffs cost does not correspond to the real economic costs of their production; therefore, economically unjustified electricity tariffs on JSC Yakutskenergo SC in energy regions of the Republic are put.

Table 4.3.2

Calculation of marketable production required to establish average tariffs of JSC Yakutskenergo in 2010

	Unit	CPR	SYPR	WPR	NPR	JSC Ya-kutsken-ergo SC
Power energy						
Useful ouput	Million kWh.	1156,6	1060,8	1843,9	236,9	4298,2
Economically sound tariff	rub/kWh	3,88	2.2	1,41	17,56	3,159
Approved average rate	rub/kWh	2,93	3,18	3,20	2,62	3,159
Necessary revenue	Million rubles	4488,4	2329,5	2599,2	4158,9	13575,9
Actual revenue	Million rubles	3392,3	3371,4	5901,1	620,9	13285,6
Transfer of energy	Million rubles.			501,1		

This fact shows that the State regulation of tariffs, an electricity supply company and the regulator does not determine the economically justified costs energy companies on energy regions of the Republic, and agree only on acceptable rates for consumers in the region and required loss-free commodity earnings for the company as a whole. Changes in the system of State regulation of tariffs must set in motion a mechanism for stimulating influence on the economic activities of vertically integrated energy companies, with the aim of substantially increasing the production efficiency by reducing losses in the power system and electricity companies, as well as through the mechanism of attraction of investments for its development.

The ineffectiveness of the existing methods of regulating tariffs for electrical energy is reducing investment in the industry and, as a result, frequent emergency situations at stations and electrical networks, extra losses, high levels of fuel consumption per unit of energy, substantial wear on the networks and generating capacity. As a result, not enough power is consumer safety, as reflected in the lack of funds to ensure the reliability and efficiency of energy systems. It should be added that the existing tariff regulation does not encourage new innovative development priorities of the regional energy sector and the economy of the region.

All these circumstances dictate the need for a substantial revision of the method of regulation of tariffs for electrical energy in the Republic of Sakha (Yakutia), as well as the need to establish a new tariff policy in the northern region.

The basic principles of the new tariff policy in electric power industry of the Republic of Sakha (Yakutia), in our view, should be:

- preservation of State regulation of tariffs for electrical energy in technologically and geographically isolated power system, which is the power system, where there is no or limited competition in the market for the sale and consumption of electricity;

- ensuring of the reliability and safety of the operation of the electric power industry of the northern region, on the basis of reasonable tariffs for electrical energy to consumers with the condition of application of the proposed method of regulating tariffs, taking into account the mechanisms of government subsidies from the budgets of the consumers of the Northern power region;

- in the territories temporarily isolated from the unified energy system of Russia, i.e. in the northern regions of Russia, we propose to introduce the principle of subsidized tariffs for electricity produced by diesel power plants;

- balancing of economic interests of suppliers and consumers of electrical energy;

- to protect consumers from unjustified increase in prices (tariffs) for electric energy (power);

- the establishment of final electricity rates for consumers, based on the assessment of economic feasibility and efficiency of tariffs for industrial and consumer demand assessment of housing and communal services, agricultural and budgetary users, as well as the population.

- the inclusion of the investment allowance rates to create an investment fund of the modernization and development of the power industry in the power regions of the Republic of Sakha (Yakutia) for the proper functioning and development of the electric power system of the North;

- encouraging both producers and consumers of electrical energy to the development and application of innovative energy-saving technologies;

- ensuring access to information for electric power consumers on the functioning of the wholesale and retail markets, as well as on the activities of the subjects of the electric power industry;

- ensuring electricity and environmental safety;

- energy efficiency and economic efficiency of energy production and use.

Based on the recommended principles of tariff policy in the Republic the methodology of regulation of tariffs for electrical energy was created as follows: 1) identifying cost-effective production cost of electricity in each of the four power regions of the Republic of Sakha (Yakutia); 2) taking the average tariff for electricity in three energy power regions: Central, Western and Southern Yakutia, which is formed by the investment allowance received through cross-subsidization of electricity tariff in the power regions; 3) establishing of the average tariff in Northern power region, characterized by the high cost of electricity production, subsidizing the tariff from the regional budget (p. 183-184). Testing of the method allowed us to estimate the amount of funds for cross-subsidization of the tariff on electricity among energy regions: Central, Western and Southern Yakutia is 3.5 billion rubles. (p. 183-184), average tariff in Northern energy region with subsidies from the regional budget must be set as 3.09 rub/kWh. (p. 183-184).

Final tariffs for consumers should be based on an assessment of the economic feasibility and efficiency of tariffs for industrial and consumer demand assessment of housing and communal services, agricultural and budgetary users, as well as the population.

Determination of tariffs for electricity production in the Republic of Sakha (Yakutia) includes 2 phases:

The first stage is the determination of tariffs for electricity production in the Republic of Sakha (Yakutia), i.e. on the basis of the application of the proposed method of regulating tariffs for electrical energy regulatory organizations – The State Committee on pricing policy – REC of the Republic of Sakha (Yakutia) and the Federal service for tariffs-tariff validity analysis must be performed on the electrical energy in the Republic of power regions and the power company, as well as compare them with actual costs, including identification of excess costs expenditures, identification of cost savings through undeveloped planned costs and the introduction of energy-efficient technologies (EET).

At this stage it is anticipated the cost of producing electricity in the energy areas economically reasonable costs of electricity production, including an investment allowance on the Western power region in the amount of cross-subsidization of consumers of Northern power region.

Because of the special social significance of the State support to the population and local producers in the Arctic, where we can observe high real cost of producing electricity from diesel power stations, it is proposed to maintain the mechanism for receiving subsidies from the budgets to cover the difference in tariffs on electric energy.

The first phase is completed by the establishment of average tariffs for electrical energy in the Republic as a whole, including all four power regions.

In the first stage it is formed by the average tariff on electricity production by the following formula:

$T_{av} = (Pr_{cpr}+Pr_{sypr}+Pr_{wpr}+Pr_{ner})/V$

where:

$Pr_{cpr} = [(C_{cpr} + Pf_{cpr})/(L_{cpr} + CS_{sypr})]/V_{cpr}$;

$Pr_{sypr} = [(C_{sypr} + Pf_{sypr}) – D_{cpr}]/V_{sypr}$;

$Pr_{wpr} = [(C_{wpr} + Pf_{wpr}) + IA_{wpr}]/Vwpr$;

$Pr_{npr} = [(C_{npr} + Pf_{npr}) + (L_{npr}-(G_{npr} + Sub_{npr})]/V_{npr}$,

including $IA_{npr} = CS_{npr} = G_{npr}$

cpr – Central power region;

sypr – Southern Yakutia power region;

wpr – Western power region

npr – Northern power region

Pr – price;

C – costs;

Pf – profits;

L – losses;

V – volume of electricity production;

CS – cross-subsidies;

IA – Investment allowance.

G – grants;

Sub – subvention.

Thus, the formula for the calculation of the average tariff is equal to:

$T_{av} = [(C_{cpr} + Pf_{cpr})/(L_{cpr} + CS_{sypr})]/V_{cpr} + [(C_{sypr} + Pf_{sypr}) – D_{cpr}]/V_{sypr} + [(C_{wpr} + Pf_{wpr}) + IA_{wpr}]/Vwpr + [(C_{npr} + Pf_{npr}) + (L_{npr}-(G_{npr} + Sub_{npr})]/V_{npr}$

In the second stage the tariffs for electrical energy to consumers are determined, based on the assessment of economic feasibility and efficiency of tariffs for industrial and consumer demand assessment of housing and communal services, agricultural and budgetary users, as well as the population. For electricity customers in Northern power region of the Republic, where there are diesel power stations suitable tariffs for electrical energy must be installed.

The essence of the proposed method of regulating tariffs for electric energy in the electric power industry of the Republic of Sakha (Yakutia) and in each of its power regions, in particular, is represented as a logical-block diagram (Figire 4.3.1).

As a result of the proposed method of tariff regulation the annual volumes of cross-subsidies would amount more than 3.5 billion rubles a year disregarding inflation and will be centralized in the investment fund of industry modernization and

development of the Sakha (Yakutia), where the funds are intended to become one of the main sources of formation of the Investment Fund (table 4.3.3). This method of regulation of tariffs for electrical energy is recommended to introduce as an effective financial mechanism for the timely implementation of Complex programs of modernization and long-term development of the power industry of the Republic of Sakha (Yakutia).

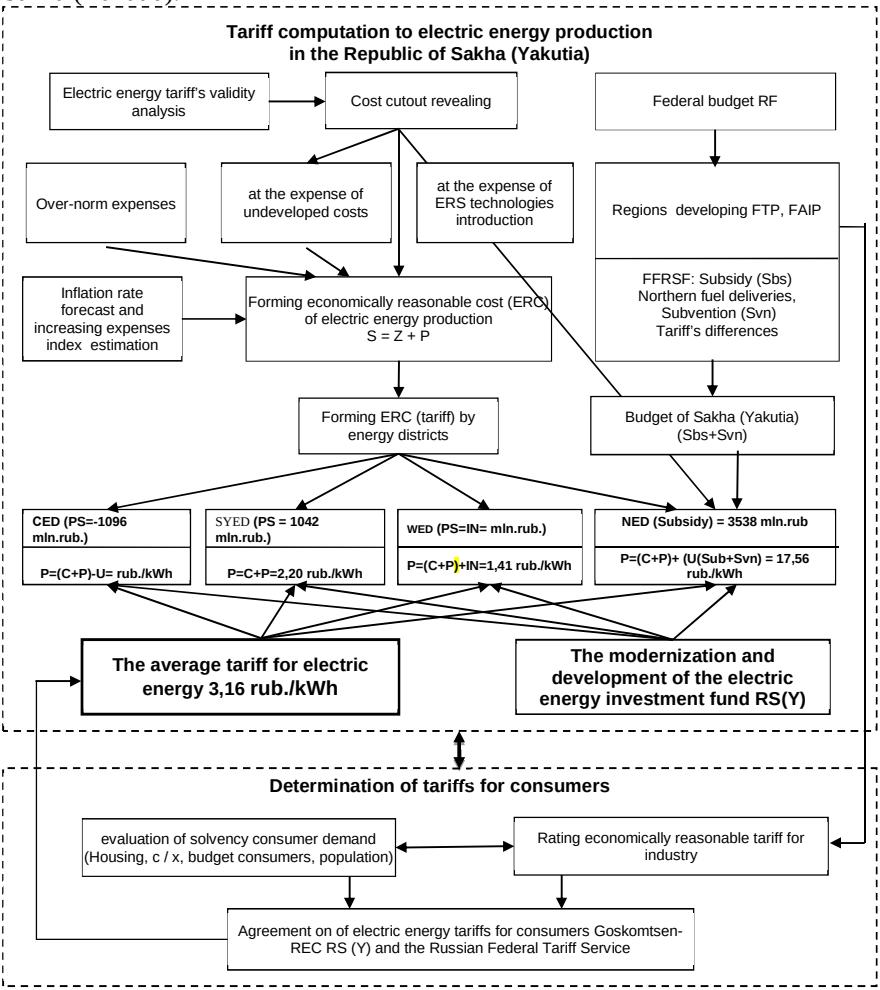


Figure. 4.3.1. Logical frame of the proposed method of regulation of tariffs for electric energy in the Republic of Sakha (Yakutia), and in each of its power district, in particular

Table 4.3.3

Volumes of cross-subsidy among energy districts of Yakutskenergo LtD *in 2010*

	Unit of measurement	CED	SYED	WED	NED	Yakutskenergo LtD
Electric energy (power)						
Productive supply	Mln kWh	1156,6	1060,8	1843,9	236,9	4298,2
Economic value-added tariff	rub/ kWh	3,88	2.2	1,41	17,56	3,159
Approved normal tariff	rub/ kWh	2,93	3,18	3,20	2,62	**3,091**
Required gross proceeds	Mln rub.	4488,4	2329,5	2599,2	4158,9	13575,9
Actual proceeds	Mln rub.	3392,3	3371,4	5901,1	620,9	13285,6
Energy transfer	Mln rub.			501,1		
Cross-subsidy	Mln rub.	-1096,1	1041,9	3803,0	**-3538,0**	210,8
Heat energy (power)						
Productive supply	ths. Gcal	1942,7		14,9		1957,6
Economic value-added tariff	rub/ Gcal	927,9		1602,6		933,0
Approved normal tariff	rub/ Gcal	819,6		1547,8		825,4
Required gross proceeds	Mln rub.	1802,6		23,9		1826,5
Actual proceeds	Mln rub.	1592,2		23,5		1615,7
Energy transfer	Mln rub.	-210,3		-0,4		-210,8
Cross-subsidy	Mln rub.	-1306,5	1041,9	3802,6	**-3538,0**	0

Economic efficiency of offered method on tariffs regulation for electric energy consists in the following:

1. in an increase of reliability of electric utilities due to their modernization and, as a result, providing electric energy power security of the Northern region;

2. in supplies reduction of Northern delivery of expensive fuel for diesel engine power plants;

3. in economic expediency of cost reduction in local electro energy industry and preventing threats for Northern region consumers from interruption of power supplies.

4.4. Role of influence of electric energy tariffs on economy and social standard of living in the Republic of Sakha (Yakutia)

The economic and social situation in the Republic depends to a large extent on a level and a balance of energy costs, since the North is characterized by the high consumption of energy and fuel. Recently a need was recognized for analysis of influence of tariffs level to electric power and its impact on changes in financial and economic performance of companies and sectors of National Economy, income and expenditure of budgets, and also on a social standard of living.

In 1997 for the first time research work "Evaluation and analysis of electric energy tariffs changes on economy and social standard of living of the Republic population" was done by the Institute of Physics and Technological problems of the North YNS SO RAN together with the Institute of power systems named after L.A. Melentyev SO RAN, the State committee on statistics of the Republic of Sakha (Yakutia) and the State committee on coordination and disciplining of the prices and "Yakutskenergo" LtD. Mentioned research included: development of methods and models for potential impact analysis to the economy and social services of the Republic from electric- and heat-energy tariffs changes; source data capture (by production cost structure and financial condition of main businesses and branches, population social standard of living and their expenses structure etc.); implementation of experimental computations and analysis of results. The author of this dissertation research was one of the contractors of the mentioned above scientific work.

Based on previous scientific and practical experience of work in the North-Eastern Federal university named after M.K. Ammosov, the Khabarovsk institute of economic study DVO RAN, the Ministry of Fuel Industry and Energy and the State committee on pricing policy – Regional energetic commission in the Republic of Sakha (Yakutia), also on the basis of methodological approaches of given research work, author of this dissertation work carried out new analysis of influence of electric energy tariff changes in term of several electro energetic development scenario.

For evaluation of tariff changes influence a methodological approach was offered to evaluate potential impact from rate regulation, shown in Figure 4.4.1.

As seen in Figure 4.4.1., process of effect of electric energy price changes on economy of the Republic of Sakha (Yakutia) and population social standard of living can be shown as an aggregation: object – influence – analysis – regulation (feedback). To evaluate the influence of electric energy price changes, model of direct influence on regulation objects will be regarded. Activity analysis (electric energy tariffs changes) was realized using electronic sheets system "Excel".

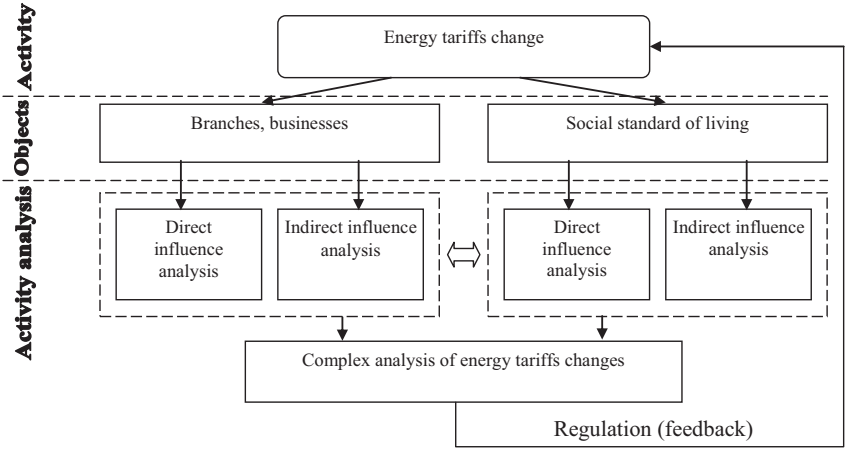


Figure 4.4.1. Scheme of methodological approach to tariffs changes analysis.

More generally production cost changes under power supply price rise (fall) influence can be expressed by:

$$Ри = РэДэ + РтДт + РмДм + РзДз + РпДп \quad (1)$$

Where, *Ри – Index of changes of production costs (i.e. sum of costs after price changes regarding to their pre-level).*

Рэ, Рт, Рм, Рз, Рп – Indexes of changes accordingly of consumed energy, fuel, materials, salaries and other expenses.

Дэ, Дт, Дм, Дз, Дп – Share in structure of costs accordingly of consumed energy, fuel, materials, salaries and other expenses.

If the tariffs are changed so the changes of production costs of enterprises-consumers of electro energy which is defined not only by increase of costs but possible changes in profit either:

$$Рц = Ри + ИИП * ПР \quad (2)$$

where *Рц* – index of cost production changes

ИИП – index with changes of profit

ПР – share of profit in cost before increase

The main indexes in model of direct influence are indexes of changes of costs and prices for products, which are expressed in percentage and show changes of corresponding values (costs, prices) if tariffs are changed. While calculating the direct influence of changes only energetic compound is considered (РэДэ).

Direct influence of increase or fall of tariffs is better to consider in short term period of costs changes. Short term period differs from long term one by constant of production capacity that gives us the right in the research to apply as the norm the definition "under other similar conditions." From macroeconomic point of view it is estimated the evaluation of indexes of direct costs dealing directly with production costs of enterprises. Changes of payments into the budget (tax on profit) will be macroeconomic effect in this situation.

According to mentioned above research work model of evaluation of energy tariffs changes influence on enterprises condition and branches of industry is represented in the form of scheme of analogue mathematical model of direct influence of energy, where under "model" we understand table and formula interpretation of calculation process.

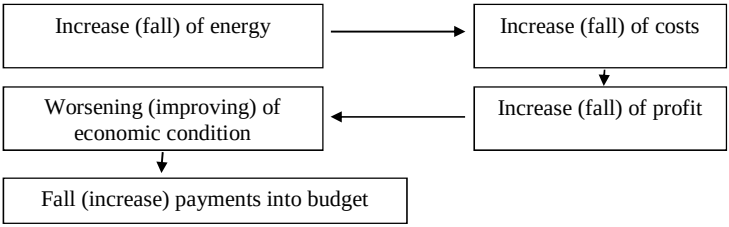


Figure 4.4.2. Scheme of analogue and mathematical model of direct influence

Necessary explanations and their interpretations in the form of tables in which correlation between mentioned indexes were put are as follows:

ИТЭ – changes of energy tariffs in %***;***

ИТТ **–** changes of heat energy in %;

$ТП_i$ – goods production;

$СС_i$ – cost;

$ПР_i$ – profit;

$ЭН_i$ – energy;

$ЭЭ_i$ – electro energy;

$ТЭ_i$ – heat energy;

$ПБ_i$ – payments into budget;

$БП_i$ – balance profit;

$ННП_i$ – tax for profit;

If *i=1, so parameters are considered before tariffs changes, if i=2, so parameters are considered after tariffs changes.*

Δ - energy changes, which can be positive and negative depending on increase or fall of tariff;

$ПБ_i$ – payment into budget before and after increase of prices;

s – rate of tax on profit at an enterprise.

Basic ratio:

$$ПР=ТП-СС;$$
$$ЭН=ЭЭ+ТЭ.$$

Table and formula interpretation (Calculated tables) of model of direct influence are presented in Tables 4.4.1 - 4.4.4.

Table 4.4.1

Changes of financial condition of enterprises regarding direct influence of tariffs

Enterprises	Energy $ЭН_2$	Changes Δ	Cost $СС_2$	Profit with constant price $ПР_2$	Tax on profit with constant price $ННП_2$	Volume of sales with constant profit $ТП_2$
Yakutskenergo	$ЭЭ_1$*(1+ИТЭ/100) +$ТЭ_1$*(1+ИТТ/100)	$ЭН_2$-$ЭН_1$	$СС_1$-Δ	$ТП_2$ –$СС_2$	If $ПР_2$>0, $ПР_2$*0,35; 0	$ЭЭ_{и-ас.1}$*(1+$ИТ_{нас.}$/100) + $ЭЭ_{пром.1}$*(1+$ИТЭ_{пром.}$/100) +$ТЭ_1$*(1+ИТТ/100)
ALROSA Vodokanal Utilities of RS (Y)	$ЭЭ_1$*(1+ИТЭ/100) +$ТЭ_1$*(1+ИТТ/100)	$ЭН_2$-$ЭН_1$	$СС_1$-Δ	$ПР_1$-Δ, if $ПР_1$- Δ > 0; 0, if $ПР_1$≤0	$ННП_1$-Δs	$ТП_1$+ Δ
Total						

Data of Tables 4.4.1 и 4.4.2 show the changes of financial condition of enterprises in different scenario of energy tariffs changes i.e. one can see not only increase of energy tariffs but fall either.

Table 4.4.2

Coordinative changes of financial condition of enterprises regarding direct influence of energy tariffs changes, in %

Enterprise	Expenses of production		Cost of production with constant profit		Share of profit in cost production with constant price		Coordinative changes of profit with constant price %(q)	Costs with constant profit %	Cost with constant price %
	%(Ри)	Mln rub	%(Рц)	Mln rub	bas.,%	new%			
Yakutskenergo	$(CC_2/CC_1)*100$	$CC_1*Р_и / 100$	$(Р_ц$(Mln rub) $/ТП_1)*100$	$ТП_2-Р_и+CC_1$	$ПР_{C1}$	$ПР_2/ТП_2*100$	$((ПР_2-ПР_1)/(ПР_1)*100$	$(ПР_2/Р_и$(Mln rub))*100	$(ПР_2/Р_и$(Mln rub))*100
ALROSA	$(CC_2/CC_1)*100$	$CC_1*Р_и / 100$	$(Р_ц$(Mln rub) $/ТП_1)*100$	$Р_и+ПР_1$	$ПР_{C1}$	$ПР_2/ТП_2*100$	$((ТП_1-Р_и-ПР_1)/(ПР_1)*100$	$(ПР_2/Р_и$(Mln rub))*100	$((ТП_1-Р_и)/Р_и))*100$
Vodokanal	CC_2/CC_1*100	$CC_1*Р_и / 100$	$(Р_ц$(Mln rub) $/ТП_1)*100$	$Р_и+ПР_1$	$ПР_{C1}$	$ПР_2/ТП_2*100$	$((ТП_1-Р_и-ПР_1)/(ПР_1))100$	$(ПР_2/Р_и$(Mln rub))*100	$(ТП_1-Р_и)/Р_и))*100$
Utilities of RS (Y)	$(CC_2/CC_1*100$	$CC_1*Р_и / 100$	$(Р_ц$(mln rubl) $/ТП_1)*100$	$Р_и+ПР_1$	$ПР_{C1}$	$ПР_2/ТП_2*100$	$((ТП_1-Р_и-ПР_1)/(ПР_1))100$	$(ПР_2/Р_и$(Mln rub))*100	$((ТП_1-Р_и)/Р_и))*100$

In table 4.4.3 changes of payments into budget are calculated as follows:

$$(ПБ_2)=ПБ_1-(ННП_1 - ННП_2).$$

In calculation methodology it is supposed that production prices of the enterprises are not changed and electric energy consuming stays the same.

Table 4.4.3

Possible change of tax revenue from corporates in the budget of the Republic with the electric energy tariffs changes.

Corporate	Change in payments to the budget at the tariff's change	Change in profit tax payment at the tariffs change
…	$((ПБ1-ПБ_2)/ПБ_1)* 100$	$((ННП_1 – ННП_2) / ННП_1)*100$, if $ННП_1 > 0$

Table 4.4.4 shows the relative changes in the cost and profit in a percentage.

Table 4.4.4

Possible change in the cost and profit in corporates with the electric energy tariffs changes, in %

Corporate	Change in the cost with tariff changes, in %	Profit change with tariff's change, in %
…	$((CC_2-CC_1)/CC_1)*100$	$((P_2-P_1)/P_1)*100$

Table 4.4.5

Relative change of the financial condition of the enterprises
(taking account changes of tariffs, prices for products and salary), in %

Enterprises	Costs of production		Production cost at invariable profit		Profit share in costs of products at constant price		Relative change of profit at constant price, % (q)	Profitability at invariable profit, %	Profitability at constant price, %
	%(Рц)	Mln rub	%(Рц)	Mln rub	basic %	new%			
Yakutskenergo LtD (Open Joint-Stock Company)	$СС_2/СС_1+Т_{и1}*0,5*Р_{газ.и}+Т_{и1}*0,5*_{Руг.и}+РУ_{и1}*0,5*Р_{маш.и}+ЗП_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$ТП_2-Р_и+СС_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ПР_2-ПР_1)$ /$\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$ПР_2/Р_и$(mln rub.)*100
Yakutgazprom LtD	$СС_2/СС_1+РУ_{и1}*0,5*Р_{маш.и}+3П_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$
Yakutugol' LtD	$СС_2/СС_1+М_{и1}*0,03*Р_{лес.и}+М_{и1}*0,01*Р_{псм.и}+РУ_{и1}*0,5*Р_{маш.и}+ЗП_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$
ALROSA LtD (open joint-stock company)	$СС_2/СС_1+РУ_{и1}*0,5*Р_{маш.и}+3П_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$
ГУП housing and communal services of the Republic of Sakha (Yakutia)	$СС_2/СС_1+РУ_{и1}*0,5*Р_{маш.и}+3П_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$
LtD Yakutsement	$СС_2/СС_1+РУ_{и1}*0,5*Р_{маш.и}+3П_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$
Vodokanal LtD	$СС_2/СС_1+РУ_{и1}*0,5*Р_{маш.и}+3П_{и1}*I_{сж}$	$СС_1*Р_и$	$Р_ц$(mln rub.) /$ТП_1$	$Р_и+ПР_1$	$ПР_{С1}$	$ПР_2/ТП_2$	$(ТП_1-Р_и-ПР_1)/\|ПР_1\|$	$ПР_2/Р_и$(mln rub.)*100	$(ТП_1-Р_и)/Р_и$

In the previous model we received direct influence of change of tariffs on the financial condition of the enterprises (tab. 4.4.5). Now we will make actually model of complex influence on the production sphere which will in a complex describe influence on the industry as a whole (from here the model name is originated). For this purpose it is necessary to calculate three values on formulas:

$$C_n = \Sigma Pu_i * C_i;$$

$$P = \Sigma ИИП_i * ПР_i;$$

$$B = \Sigma ПБ_2,$$

where Pu_i is an index of growth of production costs in separate branch;

C_i is a share of expenses of separate i-branch in expenses of the whole industry, therefore $\Sigma C_i = 1$;

$ИИП_i$ - an index of change of profit

Then the indicator of C_n will show us the general index of growth of expenses in the Republic industry as a whole.

The second indicator P indicates the general change of profit in the industries. In power industry the ИИП index is higher than zero, however all other indexes will be negative in case of increase of tariffs as the profit will decrease. Thus, the indicator P will show us how the profit in all industry will decrease in case of increase in tariffs. In case of fall of tariffs the situation will be the reverse.

This indicator is convenient to compare with $\boldsymbol{P_1 = \Sigma П P_i}$ - profit in all industry before changes of tariffs.

The third important indicator characterizes total amount of payments in the budget after changes of tariffs which also should be compared with payments before change of tariffs of $\boldsymbol{B_1 = \Sigma\ ПБ_1}$.

Using this model, it is possible to estimate influence of tariffs changes on economy of the republic at the level of all industry of the Republic of Sakha (Yakutia) due to tab. 4.4.6 and 4.4.7.

Table 4.4.6

Data on payments of the enterprises in the budget of the Republic of Sakha (Yakutia), in thousand rubles, 2010

Main industrial consumers of the electric power	Profit, thousand rubles	Profit tax, thousand rubles	Profit taxes in the republican budget	Profit taxes in the federal budget
Yakutskenergo LtD (Open Joint-Stock Company)	1561294	312259	281033	31226

Continuation of table 4.4.6

SUE Housing and communal services of the Republic of Sakha (Yakutia)	73735	14747	13272	1475
Yakutugol' LtD	23121503	4624301	4161871	462430
ALROSA LtD (Open Joint-Stock Company)	49725000	9945000	8950500	994500
Aldanzoloto LtD ГРК	1488000	297600	267840	29760
Vodokanal LtD	40386	8077	7269	808
Yakutsement LtD	199000	39800	35820	3980
Total	74720918	15241784	13717605	1524179

Table 4.4.7

Data on expenses for production and production realization at the enterprises of the Republic of Sakha (Yakutia), in thousand rubles, 2010.

Main industrial consumers of the electric power	Production volume, one thousand rub	Prime cost, thousand rubles	during expense for the electric power				Profit	Profit tax	Costs %
			Quantity, one thousand kWh	Tariff, rub / kWh	Expenses on consumption electric power, thousand rubles.	Weight, %			
Yakutskenergo LtD (Open joint-stock company)	16608765	15047471	281237	2,128	598472	3,9	1 561 294	312259	10,4
SUE Housing and communal services of the Republic of Sakha (Yakutia)	8464698	8390963	166118	3,228	536351	6,3	73735	14747	0,9
XK Yakutugol' Ltd	33337503	10216000	363693	3,435	1249285	1,2	23121503	4624301	226,3
ALROSA LtD (Open Joint-Stock Company)	113394000	63669000	1461813	3,473	5076877	8	49725000	9945000	78,1
LTD Aldanzoloto	4394000	2906000	142001	3,435	487773	1,7	1488000	297600	51,2
Vodokanal LtD	1030905	990519	30887	3,63	112118	11	40386	8077	4,1
Yakutsement LtD	1216000	1017000	39936	3,63	144968	14,2	199000	39800	19,6

As a result of modernization of power generation facilities and implementation of large investment projects for the analysis of influence of tariffs change for business economics and on the budget of the Republic of Sakha (Yakutia), it is necessary to make imitating calculations for options of change of tariffs for electric energy: at the first stage - increase of tariffs for 10% and 20%, at the subsequent stages - decrease in tariffs for 10%.

Influence of various scenarios of tariffs change on economy and the budget of the Republic of Sakha (Yakutia) is shown in tables. 4.4.8 and 4.4.10., including influence of various scenarios of tariffs change on business economics is shown on enclosure 2.

Table 4.4.8

Influence of various scenarios of tariffs change on electric energy on economy and budget of the Republic of Sakha (Yakutia)

Industrial consumers	Consumption volume, in one thousand kWh.	Tariff, in rub / kWh.	Costs of the electric power, thousand rubles.	Expenses at a tariff for the electric power for 10%	Changes	Expenses at a tariff for the electric power for 20%	Changes	Expenses at a tariff for the decrease electric power for 10%	Changes
Total	2628620	3,492	9179427,0	10097369	917942	11015312	1835885	8261484	-917943
including industrial enterprises									
ALROSA LtD (Open Joint-Stock Company)	1461813	3,473	5076877	5584564	507687	6092252	1015375	4569189	-507688
Vodokanal LtD	30887	3,63	112118	123 332	11 214	134 544	22 426	100 908	-11 210
SYE Housing and communal services of the Republic of Sakha (Yakutia)	39936	3,63	144968	600816	64464	655435	119083	491576	-44776

Table 4.4.9

Influence of various scenarios of tariffs change on electric energy on budget expenses

Consumers	Consumption volume, in one thousand kWh.	Tariff, in rub / kWh.	Costs of the electric power, thousand rubles.	Expenses at a tariff for the electric power for 10%	Changes	Expenses at a tariff for the electric power for 20%	Changes	Expenses at a tariff for the electric power decrease for 10%	Changes
Budget, total	291185	3,087	898962,4	988858,2	89895,8	1078755	179792,5	809066,2	-89896,2
including									
federal	72950	3,087	225215,7	247737,3	22521,57	270258,8	45043,14	202694,1	-22521,6
republican	73238	3,087	226102,9	248713,2	22610,29	271323,5	45220,58	203492,6	-22610,3
local	144998	3,087	447643,8	492408,2	44764,38	537172,6	89528,76	402879,4	-44764,4

Table 4.4.10

Influence of various scenarios of change of tariffs on electric energy on the budget income

The budget (income of scientific and production association), during	Consumption volume, in one thousand kWh	Tariff, in rub / kWh.	scientific and production association, action	scientific and production association at increase in a tariff at 20%	Change (+ economy, - an overexpenditure)	scientific and production association at increase in a tariff at 20%	Change (+ economy, - an overexpenditure)	at decrease in a tariff for 10%	Change (+ economy, - an overexpenditure)
ALROSA LtD	1461813	3,473	9945000	9843463	-101537	9741925	-203075	10046538	101538
Vodokanal LtD	30887	3,63	1 486	-757	-2243	-2 999	-4485	3 728	2242
SUE Housing and communal services of the Republic of Sakha (Yakutia)	39936	3,63	14747	1854	-12893	-9069	-23817	23702	8955
Total	1532636	10,733	9961233	9844560	-114430	9729857	-231377	10073968	112735

At change of tariffs for the electric power official materials of branches of the state statistics and the budgetary inspection of consumer expenses of the population and its structure formed a basis for creation of a model of an assessment of influence on a population standard of living. Change of tariffs for electric energy can influence a population standard of living in two directions:

1) the component of expenses on energy is being changed directly - direct influence changes.

2) other components (expenses on a food, nonfoods, services, transport) can be changed because of increase or fall of an electrical power component of prime cost producers and the organizations which are engaged in delivery of consumer goods, so it can change the prices of the production and services - indirect influence.

Within this dissertation work calculations of tariffs change direct influence of electric energy on a standard of living of the population of the republic was done.

As a result of modernization of power generation facilities and implementation of large investment projects for the analysis of influence of change of tariffs for a standard of living of the population of the Republic of Sakha (Yakutia), it is necessary to make imitating calculations for options of tariffs change on electric energy: at the first stage - increase of tariffs for 10% and 20%, at the subsequent stages - decrease in tariffs for 10%.

Influence of various scenarios of change of tariffs on a standard of living of the population of the Republic of Sakha (Yakutia) is shown in tab. 4.4.11-4.4.13

Table 4.4.11

Influence of various scenarios of tariffs change on electric energy on a population living standard of the Republic of Sakha (Yakutia)

Consumers of the electric power	**Scenarios of change of tariffs**								
	Useful issue electric power, kWh.	**Tariff for the electric power, kWh,**	**The commodity production, in rub.**	**Increase of a tariff for 10%**		**Increase of a tariff for 20%**		**Decrease in a tariff for 10%**	
Population	908198	1,934	1756633	1932296	175663	2107959	351326	1580969	-175663

Table 4.4.12

Expenses on payment of housing utilities within consumer expenses for 2010

	cost, in rub.	specific weight in expenses on payment of housing utilities, %	specific weight in a total amount of consumer expenses, %
Consumer expenses per capita	20699,0	-	100
Expenses on payment of housing utilities - total	4066,9	100	19,3

Continuation of table 4.4.12

including on payment:			
- heating	1574,08	38,7	7,5
- electric power	346,0	8,5	1,7
- gas	112,72	2,8	0,5
- water, sewerage	1015,0	25,0	4,8
- other housing services	1019,1	25,1	4,9

Table 4.4.13

Influence of various scenarios of tariffs change on electric energy on a population living standard of the Republic of Sakha (Yakutia)

	Cost, in rub.	specific weight %	Cost at a tariff for the electric power 10% higher	variation	Tariff for the electric power 10% higher	variation	Tariff for the electric power lowered for 10%	variation
Average per capita income of the population	23029,3	100	23029,3	100	23029,3	100	23029,3	100
Consumer expenses per capita	20966,0	91,0	21000,0	91,1	21069,0	91,4	20931,0	90,8
Expenses on payment of housing utilities - total	4066,9	17,6	4101,5	17,8	4136,2	17,9	4031,6	17,5
including on payment:								
- heating	1574,08	6,8	1574,08	6,84	1574,08	6,84	1574,08	6,84
- electric power	346,0	1,5	380,0	1,65	415,2	1,80	311,4	1,35
- gas	112,72	0,5	112,72	0,49	112,72	0,49	112,72	0,49
- water, sewerage	1015,0	4,4	1015,0	4,41	1015,0	4,41	1015,0	4,41
- other housing services	1019,1	4,4	1019,1	4,43	1019,1	4,43	1019,1	4,43

According to the federal law electric power tariffs are established by executive authorities of territorial subjects of the Russian Federation, but changes in recent years have been made to the federal law on which limit tariffs are approved by the Federal Tariff Service. In connection with federal authorities carried-out reforms carrying out policy of elimination of cross subsidizing of the population by industrial consumers is actively required. For realization of the recommended policy in the Republic of Sakha (Yakutia) in 2004 it was accepted long-term (till 2013) stage-by-stage program of elimination of cross subsidizing in tariffs for electric energy. And at comparable levels tariffs for the population in 2013 have to grow to 2,5 - 3 times.

Differently, regardless of a rate of inflation in relation to the average growth of tariffs for the electric power, the tariff for population will raise to 15%. This circumstance, a priori, is painfully perceived by any segments of the population, but, it is necessary to notice, on the average - the share of expenses of the population on the electric power is insignificant, it makes 1,7%.

Due to the adoption of the law of the Russian Federation “About power industry of the Russian Federation” and taking into account power industry, reforming questions of the state regulation of tariffs for the electric power can be significantly changed, up to establishment of competitive tariffs. But in technologically isolated regions, including our republic we consider that preservation of the state regulation of tariffs is necessary in republic power industry.

To assess possible economic and social consequences for the republic on condition of the complete elimination of cross subsidizing of tariffs for electric energy Northern power area of the republic we will consider influence of change of electric energy tariffs on a population standard of living of this power area which is presented in tab. 4.4.14 .

Increase of electric energy tariff by 8,6 times (from 1,97 rubles to 17 rubles for 1 kWh) assumes essential increase of a share of expenses on electric energy (to 24,76%) and decrease in a population standard of living.

Table 4.4.14

The analysis of influence of changes of tariffs for a standard of living of the population of the Northern power area in 2010

	Tariff for the electric power, rub/kWh	**Standard of consumption, kW/month.**	**Expenses on payment of the electric power, rub/month.**	**Living wage on working ability of the person, rub/month.**	**Share of expenses on the electric power in a living wage, in %**
2010	1,97	150	295,5	10300	2,87
At subsidizing elimination	17	150	2550	10300	24,76

Calculations show that an electrical power component in the average per capita income of the population of the Northern power area at elimination of cross subsidizing of consumers of the electric power increases more than by eight times. Proceeding from it, for social protection of the population Northern power area, in our opinion, consumers of diesel power plants won’t be able to pay in due time the

consumed electric power that will inevitably bring needed allocation of the budgetary grants not only to increase of threats in the financial sphere of the Northern power area, but also to threat of providing of its electrical power safety.

Thus, tariffs for electric energy are an effective remedy of positive change of an economic situation in the Republic of Sakha (Yakutia) and providing northern territories with economic and energy security.

Calculations show that an electrical power component in the average per capita income of the population of the Northern power area at elimination of cross subsidizing of consumers of the electric power increases more, than by eight times. Proceeding from it, for social protection of the population of the Northern energy region, in our opinion, consumers of diesel power plants won't be able to pay in due time the consumed electric power that will inevitably bring need allocation of the budgetary grants otherwise it will not only increase of threats in the financial sphere the Northern energy region, but also threat of providing of its electrical power safety.

Thus, tariffs for electric energy are an effective remedy of positive change of an economic situation in the Republic of Sakha (Yakutia) and that is also important, are an effective remedy of providing northern territories economic and energy security.

CONCLUSIONS ON CHAPTER 4

1. The methodological aspect of pricing in the developed countries consists in development by government bodies of the general principles, methods and pricing standards. Along with direct establishment and price control government bodies exercise control over validity of calculation of tariffs and their application. In the Russian Federation state regulation of tariffs for the electric and thermal energy is provided by the legislation of the Russian Federation

2. At price control (tariffs) such methods, as a method of economically reasonable expenses (expenses), an indexation method, a method of profitability of the invested capital, and also other methods based on long-term parameters of regulation are applied. The choice of a method of regulation in each organization which is carrying out adjustable activity is made by regulator.

3. Existing technological features of functioning of power industry caused formation of the mechanism of cross subsidizing of consumers taking into account which the tariff policy of the Government of the Republic of Sakha (Yakutia) in

power industry is under construction on establishment of average tariffs for energy on the company in realized system of regulation of tariffs for energy of JSC Yakutskenergo, as a whole, the consumers differentiated on separate categories, proceeding from their solvency, social security and degree of the importance of branches and the separate enterprises in republic economy.

4. The operating technique of formation of tariffs for the electric power actually excludes possibility of use by power supplying companies of flexible marketing policy in the sphere of sale electro and - heat power (taking into account specifics of the concrete region and opportunities of strengthening of the competition in the regional consumer markets electro - and heat power.

5. Decrease in level of investments testifies to an inefficiency of existing methods of regulation of tariffs for electric energy in branches and, as a result, increase of emergencies at stations and in electric networks, excess losses, high rates of fuel consumption on an energy unit, considerable wear of networks and generating capacities. As a result, electrical power safety of consumers that is expressed is insufficiently ensured in shortage of financial means on ensuring reliability and efficiency of a power supply system. Existing tariff regulation doesn't stimulate innovative priorities of development of a regional power complex and region economy.

6. Keeping the mechanism of cross subsidizing and dating of consumers of the electric power of the Northern power area of the republic from the budget, formation of an investment extra charge in tariffs for creation of investment fund of development and power industry modernization in a power supply system for the purpose of increase of electrical power safety of the Republic of Sakha (Yakutia) and everyone is possible its power area, in particular: CER, WER, SYER and NER.

7. On the basis of the recommended principles of tariff policy in the republic the method of regulation of tariffs for electric energy as effective organizational and economic mechanism of ensuring electrical power safety of the Republic of Sakha (Yakutia) is offered.

8. The recommended principles of tariff policy and the method of regulation of tariffs offered by the author on electric energy are an effective remedy of ensuring electrical power safety of northern territories and positive change of an economic situation in the Republic of Sakha (Yakutia) on achievement by economic safety of the region as ultimate goal of the state power policy of the Republic of Sakha (Yakutia).

CHAPTER 5. OUTLOOK OF POWER INDUSTRY AS BASES OF INCREASE OF ELECTRICAL POWER SAFETY OF THE REPUBLIC OF SAKHA (YAKUTIA)

5.1. Assessment of economic potential of the Republic of Sakha (Yakutia)

The Republic of Sakha (Yakutia) takes leading positions on many indicators among regions of the Far East and Eastern Siberia. From the point of view of development of natural and resource potential, creation of necessary infrastructure, both the region as a whole and the Republic of Sakha (Yakutia) are very perspective. In recent years lag of the East of the country and especially its northern territories from other Russian regions on rates of economic growth, a standard of living of the population, the budgetary security and a number of other indicators became very clear. Today simply not only economic growth of eastern and northern regions which will allow not to lag behind at the best other Russian territories, and but also break in attraction of investments for achievement of high growth rates of economy is necessary.

The main competitive advantage of eastern and northern territories is their natural and resource potential. Exactly the development of natural resources attracts potential investors, and natural resources can become pledge of dynamic development of economy of such northeast regions as our republic. At the same time, in the macroregion (regions of the Far East and the Eastern Siberia) the investment projects connected with processing of raw materials are declared and studied. Therefore implementation of the large investment projects based on use of rich resources potential of eastern and northern regions of the country is the most obvious element of development of the specified regions. Regions of the East of Russia have the considerable volume of the confirmed stocks of the hydro carbonic raw materials opened in the 1970-80th years and concentrated in a number of large-scale oil and gas deposits which part is unique on oil and gas stocks. Total initial recoverable resources of oil in the territory of Eastern Siberia and the Far East Russia make about 17,5 billion tons, initial recoverable resources of natural gas is more than 45 trillion CBM. The confirmed stocks of oil in the Far East region make 1,9 billion tons, natural gas - 4,3 trillion CBM [44].

In regions of the East and the North-East of Russia large coalfields, iron ores, ores of non-ferrous metals (gold, silver, tin, lead, zinc, titan, uranium, germany, niobium, etc.) and apatites are also located.

An important role in development of the East of Russia is played by infrastructure projects - oil pipeline construction “Eastern Siberia-Pacific Ocean,” construction of the main gas pipelines, construction of the railroad of Berkakit-Tommot-Yakutsk with its further extension to Magadan and continuation of construction of the transcontinental highway to Alaska.

The East of Russia is rich with the water resources which development (construction of Turukhansky hydroelectric power station, South Yakutia Hydropower Complex, etc.) together with development of network infrastructure will allow to provide with the electric power growing needs of the macroregion for electric energy, and also to provide export of electric energy to the Pacific Rim countries. The planned volume of export only in the Chinese direction is planned of 60-72 billion kWh by 2020 and requires about 12 GW of rated capacity.

For exploitation of natural resources of the East of Russia, development of processing and infrastructure branches, realization more than 100 investment projects according to which the volume of investment can make more than 150 billion dollars [11] is planned in the macroregion. Data on the largest investment projects of the East of Russia (except for the Republic of Sakha (Yakutia)) is provided in enc. 5. The rating of regions of the East of Russia on natural resource potential and data on distribution of the largest investment projects in the territory of the East of the country is given in tab. 5.1.1.

Table 5.1.1.

Rating of regions of the East of Russia on natural resource potential and distribution of the largest investment projects on the territory

Region	Place among regions in Russia by natural resources potential	Number of investment projects	Volume of investments, $ bln.
The Republic of Sakha (Yakutia)	1	12	22,4-24,8
Krasnoyarsk Territory	3	16	47,2-48,4
Irkutsk Region	7	8	2,8-3,8
Khabarovsk Territory	10	12	5,4
Chita Region	11	7	3,7

Continuation of table 5.1.1.

Amur Region	12	6	3,2
The Chukotka Autonomous District	14	0	-
The Republic Buryatia	15	3	1,6-2,0
Primorskiy Territory	17	8	3,9-4,6
Magadan Region	20	3	2,3
Jewish Autonomous District	38	1	1,0
Sakhalin Region	39	5	52,0-67,0
Kamchatka Region	42	1	14,3

Source: www.economy.gov.ru - an official site of the Ministry economic development of the Russian Federation.

The average rating of natural and resource capacity of regions of the East of the country is much higher than the average Russian indicator, according to the specified rating, the Republic of Sakha (Yakutia) takes the 1st place among 13 regions of the Far East federal district with the necessary volume of investment of 22,4-24,8 billion dollars, or 672-744 billion rubles.

Within eight last years in the Republic of Sakha (Yakutia) positive rates of economic growth have been noted: the gross regional product, industrial output, agriculture grows. On the general level of economic development the Republic of Sakha (Yakutia) corresponds to 16 subjects of the Russian Federation with high level of development, in which more than a half from goods and services are made in the Russian Federation. Specific weight of the republic in production of gross domestic product of the country makes 1,3 percent. The average volume of a gross regional product per capita is about 166 percent from the average level across Russia (the 4th place in the Russian Federation). The Republic of Sakha (Yakutia) steadily takes leading positions in the Far East in all directions of development of economy and the social sphere: the first places on the volume of industrial production, agriculture production, input of houses, a turn of public catering; the second position - on export of goods and services and a third one - on investments into fixed capital.

As it was mentioned above, the Republic of Sakha (Yakutia) wins first place among regions of Russia on natural resource potential. In the territory of the republic more than 1500 fields of natural resources and over 5 thousand of manifestations of different types of mineral raw materials now have been revealed. Cost only the confirmed stocks is estimated at 1,3 trillion dollars, expected potential makes 5,4 trillion dollars [14]. But it should be noted that only the most insignificant part of

these resources as acceleration of process of involvement of natural resources in economic circulation in big degree is restrained by the territorial isolation and lack of stable relations with the neighboring regions.

The largest fields and sources of natural resources of the region are:

• hydroenergy resources on the rivers of the basin of Lena (Uchur, Timpton, Olyokma). For the purpose of development of an export potential of power industry construction of South Yakutia Hydropower Complex of 8 000 MWt (YuYaGEK) - the hydroelectric power station cascade on the rivers Uchur, Timpton and Olyokma is necessary. YuYaGEK creation with development more than 25 billion kWh of the electric power a year (for data: on the annual electric power production makes about 38-40 billion kWh in DVFO) considerably will expand export possibilities of the Republic of Sakha (Yakutia), one of problems of Power strategy of Russia and Power strategy of the Republic of Sakha (Yakutia) for the period till 2030 thereby to be solved is a replacement of export of energy carriers with export of electric energy.

• high-quality southern Yakut coals, including a perspective Elginsky field with balance stocks in 2,1 billion tons, including 1 billion tons on the category C1 and with possible production to 30 million tons of high-quality being coked and steam coals a year [15]. The Elginsky coal-field is located in the Southeast of Yakutia in 450 km to the east of by Neryungri and in 320 km to the north of BAM. In adjacent territories there are small gold-fields and Severostanova's knots of the ore province, and also Sutamsky iron ore area; fields and manifestations of molybdenum, niobium and tantalum, corundum and other valuable mineral manifestations have been revealed. Coal stocks on the Northwest site make 2 172,6 million tons.

Prospects of growth of the consumer market of the Pacific Rim are development of world economy; economic growth in connection with increase in a consumer demand; the long-term prospect of growth of electricity consumption in Asia makes 5,9% a year till 2020.

According to expected data, coal export in 2010 made 17,6 million tons, thus about 57% fell on Japan (10,0 million tons), 11% (2,0 million tons) is for Korea and India, also export to Hong Kong, Taiwan and other countries of ATP [15].

• oil and gas fields in the Central and the Western Yakutia from which: Chayandinsky (by very reserved estimates production of natural gas here can be brought to 20 billion cubic m/year), Talakansky (production projections: in 2015 - 10 million tons, in 2020 - 12 million tons), Srednebotuobinsky (has to provide oil production volume to 3 million tons per year) are distinguished [15]. In the territory

of Yakutia 29 fields of hydrocarbonic raw materials are opened. Chayandinsky NGKM belongs to unique fields, it contains more than a half of all explored reserves of the republic.

Expected taken stocks of oil in the territory of Yakutia make 2,4 billion tons of oil and 0,6 billion tons of condensate. Explored reserves of oil make 295,7 million tons. Expected and taken resources of natural gas in the territory of the Republic of Yakutia are estimated at 9,4 trillion CBM. Now explored reserves of the industrial categories C1+C2 make 2,3 billion CBM of gas. The oil and gas complex of the Republic of Sakha (Yakutia) is at a stage of radical reorganization. Current situation with unconditional dependence of the Republic of Sakha (Yakutia) on delivery of oil products because of its limits leads to considerable budgetary expenses. At the same time the republics reconnoitered in the territory allow providing stocks of hydrocarbons not only needs of the republic for oil, gas and products of their processing, but also are sufficient for their delivery to other regions of Russia and to export.

The forecast of internal need of east regions of the country in natural gas is based on estimates of the solvent demand arising in connection with opportunities of reorientation of fuel balance of regions from coal and fuel oil on gas. By available estimates the need of Eastern Siberia and the Far East for natural gas by 2020 will make about 39 bcm. Demand for gas in the countries of Pacific Rim has a steady tendency to growth. The need for import of natural gas for the countries being the most probable buyers for the Republic of Sakha, by available estimates will make: in China - by 2010 - 15 bcm, by 2020 - 60 bcm; in the Republic of Korea - by 2010 - 6 bcm, by 2020 - 15 bcm; in Japan by 2020 - 10 bcm [15].

• the forest raw resources estimated at 9 billion cubic meters, or 11% from the all-Russian forest raw resources. The settlement cutting area making 35 million cubic meters, is used now as much as possible for 3-4%;

• unique mineral raw materials, first of all:

- diamonds (more than 90% of diamonds of the country is extracted here; at their cost the Republic of Sakha (Yakutia) takes the second place in the world);

- gold (production makes 25% from the all-Russian gold mining). Now development of Kuranakhsky, Nezhdaninsky, Nizhneyakokitsky, Kyuchussky fields that will allow extracting in addition more than 30 t of gold a year is planned;

- other unique minerals and metals. The Tomtorsky field of niobium, Elkonsky group of complex fields with a high potential of uranium raw materials, a zinc-lead Sardana field have special prospects.

It is possible to distinguish construction of the main oil pipeline “Eastern Siberia-Pacific Ocean,” construction of the railroad of Berkakit-Tommot-Yakutsk, and also creation of electronetwork infrastructure from the largest infrastructure projects for ensuring delivery of power of YuYaGEK, increase of reliability of power supply and accession of new consumers. Here completion of construction of the railroad of Berkakit-Tommot-Yakutsk enters as well the site completion Kerdem-Nizhny Bestyakh, construction of the combined car - and the railway bridge through the Lena River. The railway line of Berkakit-Tommot-Yakutsk passes in the meridional direction on the territory of the Republic of Sakha (Yakutia) and on a big extent lies along Amuro-Yakutskaya Highway (AYaM) that considerably facilitated construction conditions. The route of a railway line passes through large settlements (the item of Chulman, Aldan. Томмот) in close proximity to coal-fields (Denisovsky, Chulmakan), high-quality iron ores (Taiga), the only thing in the Far East of the largest field of phosphatic fertilizers (Seligdar) and through the Aldan gold-field.

Implementation of projects on production of hydrocarbonic raw materials on the basis of any one of deposits of Eastern Siberia is economically unprofitable owing to remoteness of the region from the main sales markets and backwardness of infrastructure. Therefore the coordinated mode of development of the corresponding fields with the purpose to provide optimum loading of uniform pipeline system is necessary. Implementation of the projects connected with development of fields, and also infrastructure projects will provide the essential growth of a gross regional product of the Republic of Sakha (Yakutia) and will allow diversifying structure of economy of the republic. Planned dynamics of change of structure of GRP of the Republic of Sakha (Yakutia) is given in tab. 32 and in fig. 5.1.1.

Table 5.1.2

Forecast of production of a gross regional product

Scenario	Year						
	2008	2010	2015	2020	2025	2030	Growth for period, %
1	2	3	4	5	6	7	8
GRP, billion rubles. (in prices of 2008)							
Inertioal	264	300	348	393	441	485	185
Energy-raw	264	301	370	506	571	639	240
Innovationally-strategical	264	306	450	669	813	1035	392
1	2	3	4	5	6	7	8
Average annual rate, %							
Inertial	105	106,6	103,1	102,5	102,3	102,0	103
Energy-raw	105	106,8	104,2	106,5	102,5	102,3	104
Innovationally-strategical	105	107,7	108,0	108,3	105,0	105,0	106,5

Sources: Forms statistical reporting of the Republic of Sakha (Yakutia); Project of the Concept of long-term social and economic development of the Russian Federation, Moscow: Minekonomrazvitiya, 2008

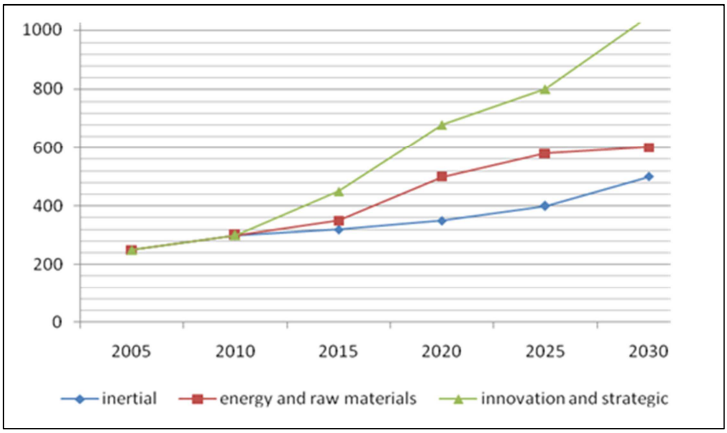


Figure 5.1.1. Dynamics of change of structure of GRP of the Republic of Sakha (Yakutia)

Data on the largest investment projects of the East of Russia (except for the Republic of Sakha (Yakutia), proceeding from Power strategy of the Republic of Sakha (Yakutia) for the period till 2030, are provided in the appendix 3, and on the Republic of Sakha (Yakutia) are given below.

Development of the Talakansky oil-gas condensate field

According to JSC Surgutneftegaz plans on development of Talakansky NGKM, oil production by 2015 will make about 10 million tons per year, by 2020 - about 12 million tons.

Development of the Chayandinsky oil-gas condensate deposit

The purpose of the project is development of stocks of oil and gas of the Chayandinsky field, gas transportation to the route of the main gas export pipeline, supply of gas to a foreign market. Total cost of the project - 4060 million dollars.

Development of iron ore fields of South Yakutia

Creation of a metallurgical complex on the basis of explored reserves of the iron ores, coking coals, stocks of auxiliary raw materials (gumboils, limestones) in the Far East region (in the territory of South Yakutia) is possible in the presence of the operating railroad. Delivery of production of a complex is planned for the markets of consumers of Far East of Russia and Asian Pacific Region countries. The total cost of the project - 456,2 million dollars.

Development of the Kuranakhsky gold deposit

It was planned to invest 150-200 million dollars on modernization and expansion of capacities of Kuranakhsky ore mining and processing enterprise within the 2006-2010th years. According to plans, in 2015 production will reach 12-15 tons of gold per year. Implementation of the project will allow creating from 3000 to 3500 new workplaces, tax payments (without calculations for the VAT) will make 160-200 million dollars.

Development of the Nezhdaninsky gold deposit

In the 2006-10th years it was planned to invest 200-400 million dollars in its development. The project included three stages: 2006-2008 - carrying out of prospecting works, 2006-2007 - creation of trial installation on the basis of existing gold recovery plant, 2009-2010 - creation of capacities. In 2015 production on a field has to make 12-15 tons of gold. Thanks to development of a field from 1000 to 3000 new workplaces will be created; tax payments (without calculations for the VAT) will make 150-200 million dollars.

Gold mining on the Nizhneyakokitsky ore field as a result of gold mining development on the Nizhneyakokitsky ore field is planned to bring gold mining to 3 tons per year. Gold mining will make 1355 kg annually. Total cost of the project - 63,8 million dollars.

Development of a zinc-lead Sardana field

Development of a complex zinc-lead field with a germaniye, creation of new branch of a color mountain promyshlenknost of the Republic of Sakha (Yakutia) is planned. The particular interest has the industrial contents of germanium by which quantity the field belongs to the category of large-scale deposits. The markets of consumers are Russia and Asian Pacific Region countries. The total cost of the project - 1300 million dollars (preliminary estimate.

Development of the Elginsky coal-field

Creation of the industrial complex including coal mine, concentrating factory and all necessary infrastructure is planned. Providing Russia with coal of the Far East and implementation of export deliveries of production to Asian Pacific Region countries. The annual volume of production of ordinary coal in 30 million tons per year, from which it is supposed to receive 23,2 million tons of commodity coal production, is planned, including: 9,33 million tons of steam coals and 7,55 million tons of a concentrate coking coal, and also 4,37 million tons of middlings. Total cost of the project - 3850 million dollars.

Oil pipeline construction “Eastern Siberia-Pacific Ocean”

As a source of raw materials of the project of East oil pipeline deliveries of 24 million tons of oil from Western Siberia and 56 million tons from fields of Eastern Siberia and Yakutia are assumed. Oil pipeline construction “Eastern Siberia-Pacific Ocean” will be carried out by the Transneft company in two stages:

- within the first stage along the route BAM and the Trans-Siberian Railway the site “Taishet (Irkutsk region) - Skovorodino (Amur region)” the 30 million tons oil in a year and 2370 km long (including on the territory of the Republic of Sakha (Yakutia) - 1370 km) is constructed. The project also provides creation the sea oil terminal in Primorsky Krai for oil shipment for export. It is supposed that after oil pipeline input in operation the West Siberian oil has to be pumped over to Skovorodino where the oil platform will be constructed, and to be unloaded in tanks and further to be transported by railway transport of Primorsky Krai (to 20 million tons per year) and to China (about 10 million tons per year). In addition, “Transneft” and “The Chinese national oil and gas corporation” signed the agreement on development of the feasibility report of the construction project of the 30 million tons per year Skovorodino - China oil pipeline branch (the Russian site - about 70 km).

- realization of the second stage of the project providing increase in power of the oil pipeline on 50 million tons per year, is coordinated on terms to oil production development in Eastern Siberia and Yakutia. Further site construction “Skovorodino - Primorsky Krai (the sea terminal)” 50 million tons and 1885 km long, increase in capacity of a site “Taishet-Skovorodino” to 80 million tons and expansion of the sea terminal is supposed.

The total volume of investments of “Transneft” in the main petro transport infrastructure (oil pipelines, bulk terminals) is determined in 11,9 billion dollars, including at the first stage - 6,65 billion dollars, at the second stage - 4,85 billion dollars, the oil pipeline branch to China - 0,4 billion dollars (the Russian site).

Completion of construction of the railroad Berkakit-Tommot-Yakutsk

The purpose of the project is railroad construction Berkakit-Tommot-Yakutsk (Nizhny Bestyakh) of 804,6км and input in continuous operation for passenger and cargo traffic for ensuring year-round functioning of transport system of the republic, regardless of an environment, depreciation of delivery of freights. The main consumers are the Government of the Republic of Sakha (Yakutia) (ensuring delivery of freights to the republic, including winter delivery), municipalities (providing with fuel and products), the extracting and processing enterprises, commercial structures, the population of the republic (passenger traffic). Total cost of the project is 986,7 million dollars.

Thus, the total cost of construction of planned investment projects in the Republic of Sakha (Yakutia) makes more than 16736 million dollars.

In medium-term and long-term prospect in the Republic of Sakha (Yakutia) the essential growth of consumption of electric energy and power is expected. The reason of growth is the vigorous investment activity of the state and private companies directed on exploitation of natural resources and creation of necessary production, transport and power infrastructure.

The full list of the large investment projects planned to realization in the Republic of Sakha (Yakutia) with the indication of planned volumes of consumption of electric energy, allows to develop the long-term forecast of production of electric energy and the power, aimed at development of available capacities of a power supply system and ensuring electrical power safety of the republic.

5.2. Prospects of growth of consumption of electric energy in the region

The main priority of the state power policy of the Republic of Sakha (Yakutia) is provision of consumers of the region with electrical power safety that means, first of all, increase of reliability and efficiency of a power supply system. The lack of investments in power industry in aggregate with the outlined growth of power consumption and in connection with economy revival seriously aggravated problems of electrical power safety and power supply of economy of the northern region.

47,3% of reconnoitered in the Far East federal district of coal fall to the share of the Republic of Sakha (Yakutia) , 34,6% of the stocks of natural gas reconnoitered on industrial categories and 21,9% of taken stocks of oil of Eastern Siberia and the Far East (without the Sakhalin shelf), and also 50,4% of hydroenergy resources of the large and average rivers of the Far East federal district [14].

Prospects of development of power industry of the Republic of Sakha (Yakutia), first of all, are connected with formation of the integrated power system of Eastern Siberia and the Far East through load centers of the centralized power supply of the Republic of Sakha (Yakutia); with large-scale development of resources of South Yakutia; with accumulation of generating capacities at the expense of reconstruction and modernization of operating thermal power plants; with carrying out active energy saving policy for the purpose of increase of efficiency of use of fuel and energy; with

stabilization and coal mining development; with development of an oil and gas complex for ensuring internal needs of the Far East in gas fuel and oil raw materials, and also with the gas export organization to Asian Pacific Region countries. The main expected outputs and electro energy consumption according to the inertial and innovative scenario are presented in table 5.2.1.

Table 5.2.1.

The production and electricity consumption forecast in the Republic of Sakha (Yakutia)

Electro energy (mln kWt h)	2000	2005	2010		2015		2020	
Scenario			1	2	1	2	1	2
Production	7 645	7 333	9 433	11 689	11 065	19 648	12 983	41 818
Including hydropower plants	2 971	2 851	3 088	3 366	3 526	4 000	4 175	9 000
Acceptance	169	101	180	190	170	160	150	100
Delivery	997	1 273	1 500	2 100	2 000	5 900	3 800	19 700
Consumption	6 817	6161	8 113	9 779	9 235	13 908	9 333	22 218

1 - inertial scenario of development of power industry of RS (Ya);

2 - innovative scenario of development of power industry of RS (Ya).

Source: The scheme of complex development of productive forces, transport and power of the Republic of Sakha (Yakutia) till 2020

Both forecasts are caused by a dominating role of potential of energy resources of Yakutia in fuel and energy complex development in the east of Russia:

1. Scenario of inertial development: input of capacities of Vilyuysky GES-3 (Svetlinsky hydroelectric power station), construction of the high voltage line of 220 kV Mirnuy-Nyurba comes to the end. Electro heating in settlements of Nyurbinsky and Suntarsky uluses takes root. Construction of combined heat and power plant of low power in the item is planned. Deputy and Zyryanka and around the item of Dzhebariki-Haya on coal of the field of the same name; start in operation of trial wind power installation (WPI) in a complex with DES. Dominating source of power supply for consumers of Northern energy district, still, the diesel power plant will remain. The 4th unit of Neryungrinsky state district power station for participation in export of the electric power is entered into China.

2. Scenario of innovative development: expansion of power of Neryungrinsky state district power station (without being limited to the 4th unit) with input of LEP-500 of kV “Neryungrinsky state district power station Tynda” for export of the electric power to China is carried out. Construction and input of hydroelectric power stations in South Yakutia is carried out. Combined heat and power plants of low power are entered into the item Chersky, by Dzhebariki-Haya and into the village Zyryank or in Srednekolymsk. WPI capacity in the village Tiksi and other settlements of the Arctic zone extends.

One of perspective and really possible directions of development of electric capacities, in our opinion, is construction of the modern cascade of hydroelectric power stations in the territory of the republic and in next Krasnoyarsk and Irkutsk krays, and also in the Magadan region. Expediency of construction of the cascade of hydroelectric power stations close with large consumers of the electric power is confirmed by need of the complex and integrated development East Siberia and Far East.

In this regard, realization of innovative option of development provides implementation of the large hydropower project. The hydroelectric power station cascade on the Rivers Uchur and Timpton will allow creating the largest on power return in the Far East a hydropower complex. South Yakutia Hydropower Complex creation with development about 23,5 billion kW of hours of the electric power a year considerably will expand export possibilities of the Republic of Sakha (Yakutia). The cost of the project of four stations is estimated over 8 billion US dollars (226,8 billion rubles) [14] . Creation of the integrated power system of Yakutia with an exit to a power supply system of the Far East will give the chance of realization of a powerful hydro energy potential of the Republic of Sakha (Yakutia) in the markets of the Far East and Pacific Rim countries. Rapid growth of the industry in Southern Yakutia and Western energy regions, connected with the large-scale growth of the coal industry, with production of non-ferrous metals, with the oil-extracting and gas industry, hydropower, with creation and operation of production and social infrastructure, will promote the dynamic growth of electricity consumption which according to the innovative scenario by 2020 will increase by 3,3 times in comparison with 2000, according to the inertial scenario by 1,3 times (fig. 5.2.1.).

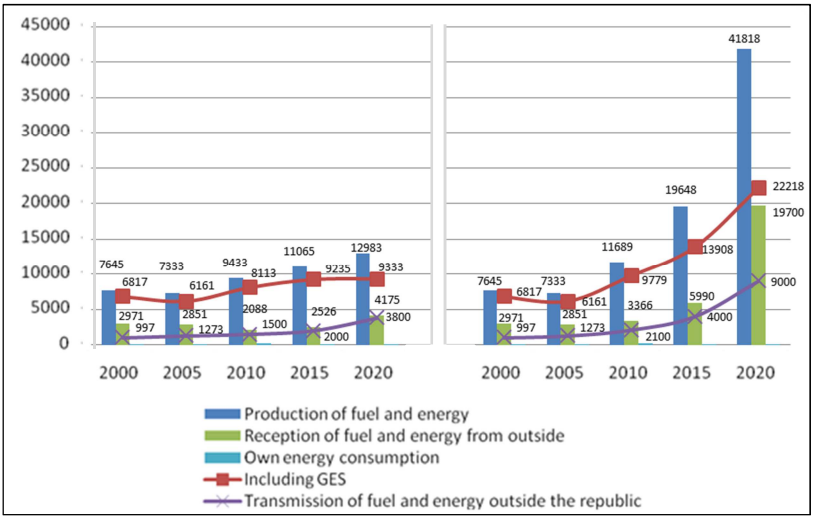


Figure 5.2.1. Dynamics of balance of the electric power of the Republic of Sakha (Yakutia) in 2000-2020.

Realization of actions for construction of hydroelectric power stations in the south of Yakutia will increase electric power development on hydroelectric power stations in relation to 2005 more than by 15 times due to the innovative scenario, and in 1,7, due to the inertial scenario. Within the realization “Schemes of complex development of productive forces, transport and power of the Republic of Sakha (Yakutia) till 2020” the construction and input of hydroelectric power stations in South Yakutia is carried out. Combined heat and power plants of low power are entered into the villages Chersky, Dzhebariki-Haya and in the settlements of Zyryank or in Srednekolymsk, extends VEU capacity in the settlement of Tiksi and other settlements of the Arctic zone.

In the inertial scenario development of power industry is directed on satisfaction, generally to internal requirement. Innovative one provides an entry of power industry of the Republic of Sakha (Yakutia) into the market of energy of the Far East and the organization of large-scale export of the electric power to such countries of PR, as China, North and South Korea and Japan. For the solution of objectives during the period till 2020 in the Republic of Sakha (Yakutia) it is necessary to realize a number of power projects: construction of VL-220 kV “Neryungrinsky state district power station - Nizhny Kuranakh - Tommot - Maya”, project cost - 12,84 billion rubles in

established prices; construction of VL-220 kV “Nyurba - Verkhnevilyuysk - Vilyuysk – Yakutsk,” project cost - more than 6 billion rubles; within development of small power - construction in remote areas of the republic of 7 Diesel PS and 2 mini-combined heat and power plants, 2 mini-hydroelectric power stations and 2 WPS, and also reconstruction of operating networks.

The general cost of modernization and building of new objects of a big and small-scale power generation during the predicted period till 2020 can make by moderate option about 595 billion rubles and by strategic option of 626,2 billion rubles [14].

Development of local power industry northern energy region of the republics is presented in accepted by the Government of RS (Ya) “The program of optimization of local power of the Republic of Sakha (Yakutia) for the period till 2017.” It is developed according to the purposes of a state policy in the power industry, defined in the Concept of long-term social and economic development of the Russian Federation till 2020, Power strategy of Russia till 2030, Power strategy of the Republic of Sakha (Yakutia) for the period till 2030. The program is also coordinated with the directions of development of regions of the Far East federal district, set by Strategy of social and economic development of regions of the Far East, the Republic of Buryatia, Zabaykalsky Krai and the Irkutsk region for the period till 2025, Prospect of development of the local power based on the Act of the Russian Federation “About energy saving and increase of power efficiency,” and defined by the Scheme of complex development of productive forces, energy drinks and transport of the Republic of Sakha (Yakutia) till 2020.

Need of development of the Program of local power industry for the Republic of Sakha (Yakutia) arose because of actual problems in the local isolated power industry Northern energy region, and also its social importance for the republic as a whole.

As it was noted in other sections of this dissertation research, development of the Program is caused also by other problem factors:

- in areas of the decentralized power supply the structure of fuel balance is characterized by a high share of use of diesel fuel (98%) that is at the bottom of the high cost of the developed electric power (in 2011 - 21,5 rub/kW of h), surpassing average Russian level by 10 times (on separate diesel stations prime cost reaches 90 rub/kW of h);

- delivery of fuel and material resources is characterized by the difficult transport scheme with use of several means of transport and a navigation short time, demands

one time accumulation of considerable means and leads to "freezing" of current assets for a period of up to one and a half years owing to creation of deponatsionny stocks of diesel fuel;

- the size of the credit resources attracted annually for delivery of diesel fuel coincides with level of the greatest possible debt position providing financial stability of the enterprises of power industry;

- high level of losses of the electric power in distributive networks (16%), exceeding average Russian (10%) that at high prime cost of the electric power leads to notable financial losses;

- impossibility of technical modernization at the expense of own sources formed by local power: at necessary annual investments into 3,0-3,5 billion rubles depreciation and profit in the sum reach only 202,9 million rubles.

Considering scale of a problem of optimization of local power, its influence on development not only the Republics of Sakha (Yakutia), but also regions of the Far East, need of the solution of problems of optimization and development of local power was put at federal level and got approval of Russian Prime Minister V.V. Putin.

Main objectives of the “Optimization of Local Power of RS” Program (POLE) are minimization of negative impact on environment, reduction of emissions of polluting substances in environment, decrease in expenses of local power on far supply diesel fuel, a cogeneration of electric and thermal energy at the expense of construction of combined heat and power plant of low power, decrease in technological and cost level of losses in networks.

For achievement of the specified purposes it is necessary to solve the following problems:

- introduction of energy saving actions, partial transition of local power to nonconventional renewable energy sources, including at the expense of construction of mini-and micro hydroelectric power station, objects of wind power generation and solar generation;

- high voltage line construction to diesel power plants for the purpose of reduction of a zone of the decentralized power supply - replacement of local diesel generation centralized gas and hydro generation, optimization of quantity of DES;

- construction of thermal stations and combined heat and power plant of low power with energy generation on coal;

- optimization of production of thermal energy in the locations of combined heat and power plant of low power at the expense of replacement of existing heat sources.

Thus, development and optimization of local power industry consists, first of all, in ensuring its electrical power safety, with the help:

- introductions of such innovative technologies, as construction of nonconventional sources of generation, reconstruction, modernization of DPS, allowing to reduce the volume of emissions of polluting substances in environment;

- commissioning of power lines;

- commissioning of thermal stations and the combined heat and power plants of the low power reducing consumption of diesel fuel in power industry of the Republic of Sakha (Yakutia).

The structure of the fuel balances, available potential of use of VIE (renewables) and specifics of existing system of moving testify that the program realized in the territory of the Republic of Sakha (Yakutia) has to play the leading role in optimization of local power. Now power supply of consumers is high spending because of the high cost of imported diesel fuel, and geographical coincidence of system of moving and potential of VIE allow to reach a considerable positive effect of implementation of priority investment projects within POLE. Wind energy, as it was spoken in chapter 3.4. of this dissertation research, is the main direction of development of renewable power in Yakutia.

Economic potential of wind energy of Yakutia at the height of 50 m, according to directories, makes 27,9 billion kW of h/year. On distribution of annual daily average receipts of solar energy the territory of the Republic of Sakha (Yakutia) is comparable to the territory of Krasnodar Krai of the Russian Federation with a capacity of solar radiation of 4-5 kW of h/sq.m a day.

Use of potential of VIE within POLE will allow to reduce volumes of emissions of polluting substances in environment at the expense of reduction of operating time of diesel power plants or their full closing of 173,8 tons.

Development of renewable power in the Republic of Sakha (Yakutia) construction of solar power stations on the basis of direct transformation of solar radiation to the electric power by means of photo cells is not less attractive to us. The power supply system from solar energy can be used both as autonomous power supply, and as a generating source in the general network.

For rather short term it is necessary to introduce energy saving actions, to carry out partial transition of local power on nonconventional, renewable energy sources,

including at the expense of construction of mini-and micro hydroelectric power station, solar and wind generation; also it is necessary to construct power lines, to make large-scale input of four combined heat and power plants of low power and seven thermal power plants working at local fuel (coal), to make equipment modernization at diesel stations. Thus construction of mini-combined heat and power plant won't lead to increase in volumes of emissions of polluting substances since in settlements after input of station closing of existing boiler rooms is supposed.

For maintenance of high rates of economic growth of the region the banking system providing long-term and effective crediting of large investment projects is necessary.

On the solution of the collected problems on systematization and planning taking into account social and economic development of regions of the republic, on attraction and effective use of investments development of the effective principles of regional investment policy in power industry of the Republic of Sakha (Yakutia) and implementation of priority investment projects of power industry of the northern region, according to the Complex of programs of modernization and long-term development of power industry is necessary for RS(Y) directed, first of all, on ensuring electrical power safety of the republic.

5.3. Improvement of the basic principles of investment policy of the Republic of Sakha (Yakutia) in power industry

The essence of investment policy consists in ensuring reproduction of the fixed business assets, their expansion and modernization.

Character of investment policy is determined by extent of the state intervention in economic processes, extent of coordination of this policy on other state institutes which are tax, financial and credit, license and price policy, policy of the income and employment, attraction of foreign investments, a legal framework and the general administrative way.

In the countries of the developed market type at the general increase of level of profit taxes of the companies, as a rule, in a phase of an economic crisis methods of the accelerated depreciation are encouraged and privileges on the investment credits are entered.

On the form of government it is possible to allocate the following types of investment policy: liberal and centralized. Mainly economic methods of state regulation by the investment processes, the developed vertical system of investors (the state - financial institutions - businessmen - small investors), and also various sources of investments (private, state, attracted, etc.), the developed financial infrastructure are inherent in liberal type of investment policy. The role of the state consists in establishment of “rules of the game” in relationship “the investor - the state” that allows economic system to self-regulate and develop rather freely. This type of investment policy is resisted by the centralized investment policy which main line is use of mainly rigid administrative methods of management. Sources of investments in this case are formed by means of accumulation of resources by various state structures, long-term forecasting is centrally carried out, and the general legal framework rigidly regulates development of investment process. Participation of stock market in investment process is purely nominal.

In power industry of the northern region the following features are inherent in investment process. Decentralization of investment process. It is possible to allocate two directions of this process: the federal center - the region; the regional government - a regional electrical power complex. In the first case there is a transfer of operating functions in favor of regional power structures at simultaneous reduction of federal sources of investments. In the second case the economic policy of the Republic of Sakha (Yakutia) leads to gradual reduction of volumes of the state investments, increase in number of the privatized enterprises and loss of part of own supervising and operating functions in an electrical power complex. The share of direct state investments in gross capital investments is insignificant.

Therefore, modern investment process in power industry of the Republic of Sakha (Yakutia) is characterized by reduction of a share of the state investments at preservation of the state control over the overwhelming volume of capital investments.

In recent years the Republic of Sakha (Yakutia) has approved a number of long-term documents of development of power industry reflected the above-stated section 3.2. Complex of programs of development and modernization of power industry of the Republic of Sakha (Yakutia), including Scheme of complex development of productive forces, energy drinks and transport of the Republic of Sakha (Yakutia) till 2020, Power strategy of the Republic of Sakha (Yakutia) for the period till 2030. These documents are a component of the Concept of long-term social and economic

development of the Russian Federation till 2020, Power strategy of Russia till 2030 and Strategy of social and economic development of the Far East, the Republic of Buryatia, Zabaykalsky Krai and the Irkutsk region for the period till 2025. They define unity of strategic objectives and problems of economy of the region of the North. Successful implementation of investment projects on development of power industry of the Republic will promote complex development of economy and territories adjoining to it.

Prospects of development of power industry of the Republic of Sakha (Yakutia), first of all, are connected with implementation of large-scale projects, such, as "Schemes of placement of productive forces, transport and power of the Republic of Sakha (Yakutia) till 2020" and "Complex development of South Yakutia." One of the main directions of these projects is construction of the cascade of hydroelectric power station on the rivers of South Yakutia, allowing to increase electrical power safety of the northern territory and to provide growing power consumption of capacities of the republic and the neighboring regions to it. Expediency of construction of the cascade of hydroelectric power stations close with large consumers of the electric power is proved by need of the complex and integrated development of Eastern Siberia and the Far East Russia.

Strategy of development of the Power pool system of Eastern Siberia and the Far East, including such northern territories as the Republic of Sakha, the Magadan region, Kamchatka territory and Chukotka Autonomous Area is presented in fig. 5.3.1.

Definition of the purposes, quantitative reference points and, the main thing, mechanisms of realization of investment policy demands development of complex long-term strategy of power interaction of regions of Eastern Siberia and the Far East; stage-by-stage development of joint fuel and energy balances; development of the general scheme of electric networks with export electricity transmissions through knots of the centralized power supply of the Republic of Sakha (Yakutia).

Scheme of perspective development of Unified Energy System of Eastern Siberia and Far East. Realization of strategy will allow:

- Collect isolated energy regions in unified energy system of the republic (southern, central and western) to increase energy safety – proof and efficiency of energy supply;
- create the northern branch of the Unified national energy net in the North-East of Russia unify Yakutia with Irkutsk, Magadan and Amur regions.

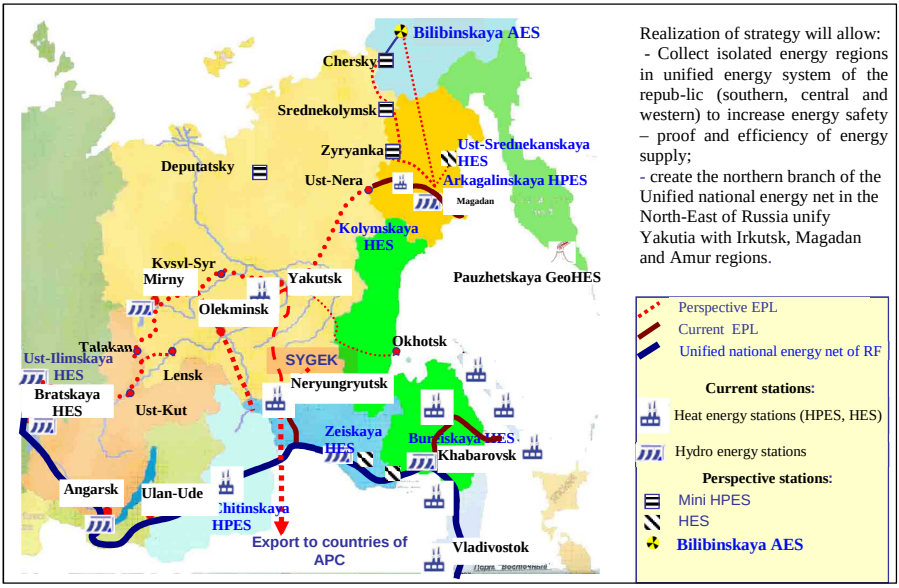


Fig. 5.3.1. Scheme of perspective development of Unified Energy System of Eastern Siberia and Far East

On the solution of objectives during the period till 2020 in the Republic of Sakha (Yakutia) it is necessary to realize a number of large power projects. The general costs of modernization and building of new objects of a big and small-scale power generation, according to the Complex of programs of modernization and development of power industry of the Republic of Sakha (Yakutia) during the expected period till 2020, can make about 485 billion rubles [14]. For maintenance of such high rates of economic growth of the region the banking system for long-term and effective crediting of large investment projects is necessary.

The analysis of investment processes carried out above in power industry of the North showed existence of the problems connected with investment of large power generation facilities and caused in large volumes of single investments in the long-term period. Realization of the Complex of programs of development and modernization of power industry of the Republic of Sakha (Yakutia) is connected with many risks internal and external.

We refer to internal risks the following:

- rates of social and economic development of the republic and the neighboring territories defining internal need for production and possibility of deliveries of the electric power to consumers;

- investment risks which influence construction of power generation facilities of the region.

The environment of the markets belongs to external risks in the Pacific Rim countries, as China and Japan influencing potential opportunities of export of the electric power from the Republic of Sakha (Yakutia).

For the solution of the collected problems of reliable functioning and development of power industry of the republic, problems on attraction and effective use of investments, including on decrease in risks of realization of the Complex of programs of development and modernization of power industry of the Republic of Sakha (Yakutia) development of the principles of regional effective investment policy in power industry of the Republic of Sakha (Yakutia) directed, including on ensuring electrical power safety of the republic is necessary.

The solution of strategic tasks on perspective development of power industry of RS(Y) will depend in many respects on pursued investment policy in the region at local and federal levels. It is the important instrument of development of investment activity in the republic and implementation of planned projects.

Formation of investment policy in power industry of the Republic of Sakha (Yakutia) is influenced by such major factors as:

- investment - attractive;
- production;
- technological;
- economic;
- resource (security with financial resources, fuel, PTN etc.);
- regulatory;
- institutional;
- rating and image, etc.

Therefore, these factors considered at definition of a priority of investment projects in power industry of the republic in case of threats to electrical power safety are distributed on importance degree.

Except the designated and offered organizational and economic mechanisms of ensuring electrical power safety of the Republic of Sakha (Yakutia) and its energy regions, acceptance of Regional power policy RS (Y) including effective investment

policy in the region which is urged to provide observance of priority of investments of investments into the most actual and especially important power generation facilities is necessary for ensuring electrical power safety of the republic.

Thus, the administration of the republic has to define priorities and the basic principles of investment policy of the region, create system of the economic measures stimulating movement of investments in the necessary direction - for example, providing guarantee certificates for the purpose of decrease in strategic risks of investors.

The effective investment policy of the Republic of Sakha (Yakutia) in power industry is based on such principles as:

- "the principle of state regulation of investment processes for the purpose of input or output of certain capacities;"
- "principle of complexity;"
- "principle of balance;"
- "principle of social partnership;"
- "the principle of transparency of investment climate and capital investments in certain enterprises, branches and fields of activity" which, in our opinion, demand basic addition. Thus, demands specification: "through credit and tax privileges, for example, by means of the investment credit;"
- "the principle of economic efficiency" should be read as "the principle of power and economic efficiency."

The element of scientific novelty of this research is justification of the principles offered by us:

- "the principle of allocation of the priority directions ensuring electrical power safety of the northern region." The regional investment policy has to provide observance of priority of investments into the power generation facilities most actual for the region, especially important for ensuring electrical power safety of the region.
- "principle of a program of formation of investment projects of development of power industry and achievement of an ultimate goal." In this direction both at the level of the republic and at the level of all regions, there is an essential reserve in management of electrical power safety of own territories at the expense of development of investment projects with application of program and target methods focused on social and economic effects.

Proceeding from need to develop rational structure of governing bodies of investment process in region power industry in new conditions (first of all, executive

authorities at federal and regional levels), we offer the organizationally economic mechanism of ensuring electrical power safety of the republic which consists, first, in the organization of planning and control by the Complex of programs of modernization and development of power industry of RS (Y), secondly, in the organization of their financing and, thirdly, in the organization of performance of actions of these programs, that is in coordination of investment programs, including an order and construction conditions, financing of power generation facilities, commissioning, etc.

Continuous monitoring of implementation of investment programs of development of power industry of the republic, irrespective of types of property of power generation facilities, with definition of "bottlenecks" and acceptance of correcting actions is also necessary. Besides, executive bodies of the power of the Republic of Sakha (Yakutia) and adjacent regions within ensuring electrical power safety have to not only carry out monitoring and the indicative analysis of ensuring electrical power safety, but also carry out monitoring of development of power industry in the regions, conditions of its mutual development, efficiency of the organization of the markets.

For effective realization of organizational and economic mechanisms of realization of this Complex of programs of modernization and development of power industry of the republic and the principles of investment policy of the Republic of Sakha in power industry, first of all, coherence of economic interests of subjects of the market of the electric power as performance of tasks of ensuring electrical power safety of the republic and to increase of reliability and efficiency of a power supply system in RS (Y) and in the Far East is possible only at joint and consequently, coordinated actions of all interested regions, federal authorities and administrations of the territories, the power supplying organizations and large consumers of the electric power is necessary.

For definition of the purposes, quantitative reference points and, the main thing, mechanisms of realization of regional investment policy of the Republic of Sakha (Yakutia) are necessary: development of complex long-term strategy of power interaction of regions of the Far East and Eastern Siberia; stage-by-stage development of joint fuel and energy balances; development of the general scheme of electric networks with export electricity transmissions through knots of the centralized power supply of the Republic of Sakha (Yakutia).

Social and economic development of the Republic of Sakha (Yakutia) will depend more and more on extent of its participation in formation of the interregional energy markets. Its electrical power safety and efficiency of economy will depend entirely on carrying out rational power policy in Siberia, in the Far East and in Russia as a whole. Certainly, the role of fuel and energy resources of Yakutia in power cooperation of Russia and North East Asia in the XXI century will constantly amplify.

Improvement of the principles of investment policy of the Republic of Sakha (Yakutia) consists in definition and addition with the effective principles of regional investment policy in power industry. Element of scientific novelty of this research is the following addition of formulations of the existing principles: “the principle of transparency of investment climate and capital investments in certain enterprises, branches and fields of activity through credit and tax privileges, for example, by means of the investment credit;” “principle of power and economic efficiency.” The principles are formulated and proved: “the principle of allocation of the priority directions ensuring electrical power safety of the northern region” and “the principle of a programming of formation of investment projects of development of power industry and achievement of an ultimate goal.”

5.4. Assessment of social and economic effect of organizational and economic mechanisms of electrical power safety ensuring of the Republic of Sakha (Yakutia)

The social and economic effect from realization of organizational and economic mechanisms of increase and ensuring electrical power safety in the region is important to achieve the purpose and the correct solution of objectives, on the basis of these estimates all complex of actions of the program of development of power industry and ensuring electrical power safety of the Republic of Sakha (Yakutia) is approved.

Assessment of indicators of social and economic effect of organizational and economic mechanisms of electrical power safety ensuring of the Republic of Sakha (Yakutia) is economically expedient to carry out on power areas of the Republic, because the existing and alleged threats of ensuring electrical power safety of energy regions of the Republic of Sakha (Yakutia) have the general and specific (distinctive) signs peculiar to energy regions of the republic.

Indicators of social and economic effect of organizational and economic mechanisms of ensuring electrical power safety of every energy region of the Republic of Sakha (Yakutia) are given in tab. 5.4.1. - 5.4.4 .

Table 5.4.1.

Social and economic effect of organizational and economic mechanisms of ensuring electric power safety in Central power district of the Republic of Sakha (Yakutia)

Central Power District (CPD)				
№	**Threat types (common and specific to CPD)**		**Mechanisms (common and specific to CPD)**	**Effect**
1	2	3	4	5
1	**Common threats**	**Technological:** 1) High wear-out rate of BPA 2) High level of transmission line losses 3) Delayed modernization and upgrade of BPA 4) Lack of energy-saving technologies	**Organizational:** 1) New tariff policy of electrical energy industry of the Republic of Sakha (Yakutia) 2) Formation of renewal and development fund of electrical energy industry of the Republic 3) Financing of investment projects from FTP and FTIP 4) Financial assistance in energy saving technologies research 5) Investment risks insurance **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by modernization and upgrade of BPA and reducing technological and cost line losses **Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district
		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) of electric power and heat energy	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Elimination of cross-subsidization in electricity tariffs	**Technological:** Application of separate accounting of electric and heat energy production cost in order to set economically justified tariffs

Continuation of table 5.4.1

		2) Cross-subsidization (CS) of industrial consumers and the public		**Economic:** 1) Reduction of electricity tariffs for all consumers of the district, reduction of electricity costs 2) Reduction of electricity tariffs for industrial consumers to competitive level 3) Expansion of electric power market due to new large consumers **Social:** Raise of social welfare and reduction of public sector expense
		3) Lack of investment money and underfunding of investment projects, increasing demands for investments for power complex development 4) Low amount of financing investment programs of power sector development from FTP, investment programs funded by government budget of the Republic and at the expense of power companies	**Organizational:** 1) Formation of renewal and development fund of electrical energy industry of the Republic 2) Financing of electric power investment projects from FTP and FTIP 3) Investment risks insurance 4) Financial assistance in energy saving technologies research **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines in order to consolidate technologically isolated power districts. **Economic:** Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation **Social:** Ensuring electric power safety in economy of the district and population
		5) Formation of fuel costs and repairing power facilities for less standard costs	**Organizational:** 1) The adoption of a new power tariff policy in the Republic	**Technological:** Timely recovery (renovation) of fixed production assets

Continuation of table 5.4.1

			2) Development and adoption of new standards of specific fuel consumption for electric power production by the Ministry of Energy of the Russian Federation 3) Development and adoption of repair standards for electric power production by the Ministry of Energy of the Russian Federation **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including standard costs of power facilities repair	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		6) In calculation of tariffs for the following period there is a lack of accounting the savings from implementation of energy-efficiency measures and the savings from shortfalls of income, which accordingly means that there was no expenses during reported period	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including the savings from implementation of energy-efficiency measures	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		2. Increase of accounts payable and receivable, losses of enterprises that cause fragile financial and economic condition	**Organizational:** 1) Acceptance and execution of contracts with consumers and suppliers including punitive sanctions and measures for non-	**Economic:** Stable financial and economic performance of power industry and economy of the region

Continuation of table 5.4.1

			payment. 2) Timely payments for electricity 3) Timely payments for fuel, industrial goods and services to other organizations **Economic:** Formation of working capital fund in tariffs for cash deficiency on electricity consumers payments due to seasonality of energy supply	**Social:** Providing reliable power supply and social services to power district
2	**Specific threats**	**Technological:** 1) Growing shortage of energy and power due to high demand for energy 2) Lack of intraregional power transmission lines between three technologically isolated districts 3) Delay in delivery of natural gas 4) Incidents on the main gas line Kysyl-Syr – Mastakh – Bergeh – Yakutsk	**Organizational:** 1) Long-term contracts of natural gas delivery for acceptable and economical price, which is the subject to public regulation of State Price Policy Committee - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation 2) Construction of intraregional transmission lines Neryungri regional power station – Nizhniy Kuranakh – Tommot – Maya 3) Construction of the Yakutsk regional power station-2 4) Completion of construction of the third gas line Kysyl-Syr – Mastakh – Bergeh – Yakutsk **Economic:** 1) The adoption of a new power tariff policy in the	**Technological:** 1) Ensuring electric power safety in isolated power districts by modernization and upgrade of BPA 2) Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines Neryungri regional power station – Nizhniy Kuranakh – Tommot – Maya 3) Meeting consumers' demand for electric power due to the Construction of the Yakutsk regional power station-2 4) Good delivery of natural gas to meet demands of the economy and people of the power district **Economic:** 1) Reduction of electricity tariffs for consumers

Continuation of table 5.4.1

			Republic 2) Application of the suggested public regulation of electricity tariffs in the Republic 3) Extra charge to electricity tariffs in order to expand production of BPA 7) Formation of renewal and development fund of electrical energy industry of the Republic 4) Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	2) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 3) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district
		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) between power districts	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power modernization and long-term development program **Economic:** 1) Application of the suggested public regulation of electricity tariffs in the Republic 2) Formation of the investment fund for electric power modernization and development in order to unify technologically isolated power districts of the Republic – CPD, WPD, SYPD	**Technological:** Ensuring electric power safety in isolated power district **Economic:** 1) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 2) Reduction of tariffs with account of extra charges to electricity tariffs by means of opening a new energy and power market and cooperation with the United national power system of Russia **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.1

		3) Faster growth of natural gas prices in comparison with electricity tariffs because of insufficient tariffs and, as a consequence, losses of enterprises that cause fragile financial and economic condition	**Organizational:** Long-term contracts of natural gas delivery for acceptable and economical price, which is the subject to public regulation of State Price Policy Committee - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation **Economic:** Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	**Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Stabilization of financial and economic state of power enterprises, providing reliable power supply for population and social sphere of the power district

Table 5.4.2.

Social and economic effect of organizational and economic mechanisms of ensuring electric power safety in Western power district of the Republic of Sakha (Yakutia)

Western power district				
№	**Threat types (common and specific to WPD)**		**Mechanisms (common and specific to WPD)**	**Effect**
1	2	3	4	5
1	**Common threats**	**Technological:** 1) High wear-out rate of BPA 2) High level of transmission line losses 3) Delayed modernization and upgrade of BPA 4) Lack of energy-saving technologies	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power modernization and long-term development program	**Technological:** Ensuring electric power safety in isolated power districts by modernization and upgrade of BPA **Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development

Continuation of table 5.4.2

			3) The adoption of a new power tariff policy in the Republic 4) Formation of renewal and development fund of electrical energy industry of the Republic 5) Financing of electric power investment projects from FTP and FTIP 6) Financial assistance in energy saving technologies research 7) Investment risks insurance 8) Establishment of insurance fund for damage control and recovery **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Social:** Providing reliable power supply and social services to power district
		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) of electric power and heat energy 2) Cross-subsidization (CS) of industrial consumers and the public	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Execution of a program on elimination of cross-subsidization in electricity tariffs	**Technological:** Application of separate accounting of electric and heat energy production cost in order to set economically justified tariffs **Economic:** 1) Reduction of electricity tariffs for all consumers of the district, reduction of electricity costs 2) Reduction of electricity tariffs for industrial consumers **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.2

		3) Lack of investment money and underfunding of investment projects, increasing demands for investments for power complex development 4) Low amount of financing investment programs of power sector development from FTP, investment programs funded by government budget of the Republic and at the expense of power companies	**Organizational:** 1) Formation of renewal and development fund of electrical energy industry of the Republic 2) Financing of electric power investment projects from FTP and FTIP 3) Financial assistance in energy saving technologies research 4) Investment risks insurance **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines in order to consolidate technologically isolated power districts. **Economic:** Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation **Social:** Ensuring electric power safety in economy of the district and population
		5) Formation of fuel costs and repairing power facilities for less standard costs	**Organizational:** 1) The adoption of a new power tariff policy in the Republic 2) Development and adoption of new standards of specific fuel consumption for electric power production by the Ministry of Energy of the Russian Federation 3) Development and adoption of repair standards for electric power production by the Ministry of Energy of the Russian Federation **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of	**Technological:** Timely recovery (renovation) of fixed production assets **Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.2

			the Republic of Sakha (Yakutia), including standard costs of power facilities repair	
		6) In calculation of tariffs for the following period there is a lack of accounting the savings from implementation of energy-efficiency measures and the savings from shortfalls of income, which accordingly means that there was no expenses during reported period	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including the savings from implementation of energy-efficiency measures	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		2. Increase of accounts payable and receivable, losses of enterprises that cause fragile financial and economic condition	**Organizational:** 1) Acceptance and execution of contracts with consumers and suppliers including punitive sanctions and measures for non-payment. 2) Timely payments for electricity 3) Timely payments for fuel, industrial goods and services to other organizations **Economic:** Formation of working capital fund in tariffs for cash deficiency on electricity consumers payments due to seasonality of energy supply	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
2	**Specific threats**	**Technological:** 1) Lack of intraregional power transmission lines between three	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in	**Technological:** 1) Ensuring electric power safety in isolated power district due to con-

Continuation of table 5.4.2

		technologically isolated districts 2) High level of power transmission lines losses because of the low capacity 3) Gas pipeline incidents which cause interruption in natural gas supply of boiler stations of Aikhal and Udachniy 4) Short delivery of diesel fuel for power production from back-up power source (diesel power stations) in Vilyuiskiy group (Suntarskiy, Nyurbinskiy, Verkhnevilyiiskiy) 5) Rise in natural gas and diesel fuel prices 6) Limited water supply in cascade of Vilyuiskiy hydro-electric power stations and Vilyuiskiy hydro-electric station-3 under conditions of lack of water and stockout in Chernyshevsky reservoir 7) Low capacity of transmission lines – 220 kW in Mirnyi	the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power modernization and long-term development program 3) Financing of electric power investment projects from FTP and FTIP 4) Financial assistance in energy saving technologies research 5) Investment risks insurance 6) Long-term contracts of natural gas delivery for acceptable and economical price, which is the subject to public regulation of State Price Policy Committee - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation 7) Construction of intraregional 220 kW transmission lines Chernyshevsk – Mirnyi – Lensk – Peledui – Vitim – Krasnoyarsk in order to consolidate two technologically isolated power districts of the Republic – WPD and CPD 8) Construction of intraregional 220 kW transmission lines Mirnyi – Suntar – Nyurba; Vilyuiskiy hydro-electric power station – Aikhal – Udachniy; Mirniy –	struction of intraregional 220 kW transmission lines Mirnyi – Suntar – Nyurba; Vilyuiskiy hydro-electric power station – Aikhal – Udachniy; Mirniy – Suntar – Olekminsk 2) Meeting consumers' demand for electric power due to the Construction of 220 kW transmission line Mirnyi – Suntar – Nyurba 3) Good delivery of diesel fuel to Vilyuiskiy regions and natural gas to Mirninskiy region to meet demands of the economy and people of the power district **Economic:** 1) Reduction of electricity tariffs for consumers 2) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 3) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.2

			Suntar – Olekminsk 9) Preservation of electric boiler houses in Aikhal and Udachnyi as emergency heat power resources 10) Establishment of insurance fund of working capital for fuel supplies from the north, including funding from tariffs **Economic:** 1) The adoption of a new power tariff policy in the Republic 2) Application of the suggested public regulation of electricity tariffs in the Republic 3) Extra charge to electricity tariffs in order to expand production of BPA 4) Formation of renewal and development fund of electrical energy industry of the Republic 5) Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	
		Economic: 2. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) between power districts	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power	**Technological:** Ensuring electric power safety in isolated power district **Economic:** 1) Formation of additional funds in total amount of 3.5 billion ru-

Continuation of table 5.4.2

			modernization and long-term development program **Economic:** 1) Application of the suggested public regulation of electricity tariffs in the Republic 2) Formation of the investment fund for electric power modernization and development in order to unify technologically isolated power districts of the Republic – CPD, WPD, SYPD	bles by means of application the method of electricity tariffs regulation 2) Reduction of tariffs with account of extra charges to electricity tariffs by means of opening a new energy and power market and cooperation with the United national power system of Russia **Social:** Providing reliable power supply and social services to power district
		2) Faster growth of natural gas prices in comparison with electricity tariffs because of insufficient tariffs and, as a consequence, losses of enterprises that cause fragile financial and economic condition	**Organizational:** Long-term contracts of natural gas delivery for acceptable and economical price, which is the subject to public regulation of State Price Policy Committee - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation **Economic:** Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	**Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Stabilization of financial and economic state of power enterprises, providing reliable power supply for population and social sphere of the power district

Table 5.4.3.

Social and economic effect of organizational and economic mechanisms of ensuring electric power safety in South Yakutian power district of the Republic of Sakha (Yakutia)

South Yakutian power district				
№	**Threat types (common and specific to SYPD)**		**Mechanisms (common and specific to SYPD)**	**Effect**
1	2	3	4	5
1	**Common threats**	**Technological:** 1) High wear-out rate of BPA 2) High level of transmission line losses 3) Delayed modernization and upgrade of BPA 4) Lack of energy-saving technologies	**Organizational:** 1) The adoption of a new power tariff policy in the Republic 2) Formation of renewal and development fund of electrical energy industry of the Republic 3) Financing of electric power investment projects from FTP and FTIP 4) Financial assistance in energy saving technologies research 5) Investment risks insurance **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by modernization and upgrade of BPA **Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district
		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) of electric power and heat energy 2) Cross-subsidization (CS) of industrial consumers and the public	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Execution of a program on elimination of cross-subsidization in electricity tariffs	**Technological:** Application of separate accounting of electric and heat energy production cost in order to set economically justified tariffs **Economic:** 1) Reduction of electricity tariffs for all consumers of the district, reduction of electricity costs

Continuation of table 5.4.3

				2) Reduction of electricity tariffs for industrial consumers **Social:** Providing reliable power supply and social services to power district
		3) Lack of investment money and underfunding of investment projects, increasing demands for investments for power complex development 4) Low amount of financing investment programs of power sector development from FTP, investment programs funded by government budget of the Republic and at the expense of power companies	**Organizational:** 1) Formation of renewal and development fund of electrical energy industry of the Republic 2) Financing of electric power investment projects from FTP and FTIP 3) Financial assistance in energy saving technologies research 4) Investment risks insurance **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines in order to consolidate technologically isolated power districts. **Economic:** Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation **Social:** Ensuring electric power safety in economy of the district and population
		5) Formation of fuel costs and repairing power facilities for less standard costs	**Organizational:** 1) The adoption of a new power tariff policy in the Republic 2) Development and adoption of new standards of specific fuel consumption for electric power production by the Ministry of Energy of the Russian Federation 3) Development and adoption of repair standards for electric power production by the Ministry of Energy of	**Technological:** Timely recovery (renovation) of fixed production assets **Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.3

			the Russian Federation **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including standard costs of power facilities repair	
		6) In calculation of tariffs for the following period there is a lack of accounting the savings from implementation of energy-efficiency measures and the savings from shortfalls of income, which accordingly means that there was no expenses during reported period	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including the savings from implementation of energy-efficiency measures	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		2. Increase of accounts payable and receivable, losses of enterprises that cause fragile financial and economic condition	**Organizational:** 1) Acceptance and execution of contracts with consumers and suppliers including punitive sanctions and measures for non-payment. 2) Timely payments for electricity 3) Timely payments for fuel, industrial goods and services to other organizations **Economic:** Formation of working capital fund in tariffs for cash deficiency on electricity consumers payments due to seasonality of energy supply	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.3

2	**Specific threats**	**Technological:** 1) Lack of intraregional power transmission lines between three technologically isolated districts 2) Delays in coal delivery	**Organizational:** 1) Long-term contracts of coal delivery for acceptable and economical price 2) Construction of intraregional transmission lines Neryungrinsky regional power station – Nizhniy Kuranakh – Tommot – Maya **Economic:** 1) The adoption of a new power tariff policy in the Republic 2) Application of the suggested public regulation of electricity tariffs in the Republic 3) Extra charge to electricity tariffs in order to expand production of BPA 4) Formation of renewal and development fund of electrical energy industry of the Republic 5) Simultaneous regulation of coal prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	**Technological:** 1) Ensuring electric power safety in isolated power districts by modernization and upgrade of BPA 2) Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines Neryungri regional power station – Nizhniy Kuranakh – Tommot – Maya 3) Meeting consumers' demand for electric power due to the Construction of the Yakutsk regional power station-2 4) Good delivery of coal to meet demands of the economy and people of the power district **Economic:** 1) Reduction of electricity tariffs for consumers 2) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 4) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.3

		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) between power districts	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power modernization and long-term development program **Economic:** 1) Application of the suggested public regulation of electricity tariffs in the Republic 2) Formation of the investment fund for electric power modernization and development in order to unify technologically isolated power districts of the Republic – CPD, WPD, SYPD	**Technological:** Ensuring electric power safety in isolated power district **Economic:** 1) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 2) Reduction of tariffs with account of extra charges to electricity tariffs by means of opening a new energy and power market and cooperation with the United national power system of Russia **Social:** Providing reliable power supply and social services to power district
		2)Coal prices growth caused by lack of government regulation of Yakutugol JSC, which is the only supplier of power-station coal to Neryungrinskiy regional power station	**Organizational:** Long-term contracts of natural gas delivery for acceptable and economical price, which is the subject to public regulation of State Price Policy Committee - Regional Energy Commission of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation **Economic:** Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	**Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Stabilization of financial and economic state of power enterprises, providing reliable power supply for population and social sphere of the power district

Table 5.4.4.

Social and economic effect of organizational and economic mechanisms of ensuring electric power safety in Northern power district of the Republic of Sakha (Yakutia)

Northern power district				
№	**Threat types (common and specific to NPD)**		**Mechanisms (common and specific to NPD)**	**Effect**
1	2	3	4	5
1	**Common threats**	**Technological:** 1) High wear-out rate of BPA 2) High level of transmission line losses 3) Delayed modernization and upgrade of BPA 4) Lack of energy-saving technologies	**Organizational:** 1) The adoption of a new power tariff policy in the Republic 2) Formation of renewal and development fund of electrical energy industry of the Republic 3) Financing of electric power investment projects from FTP and FTIP 4) Financial assistance in energy saving technologies research 5) Investment risks insurance 6) Construction of Co-generation plant, modernization of existing diesel power stations 7) Power sources optimization by means of renewable power sources: construction of small hydro-electric power station, use of wind-driven power plants (WDPP), as well as construction of floating nuclear power plants (FNPP) **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** 1) Ensuring electric power safety in isolated power districts through implementation of local power industry optimization program 2) Improving electric power safety in isolated power districts by means of renewable power sources 3) Partial or complete rejection of diesel fuel delivery from the north 4) Good delivery of diesel fuel to meet demands of the economy and people of the power district **Economic:** 1) Reduction of electricity tariffs for consumers 2) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district

Continuation of table 5.4.4

		Economic: 1. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) of electric power and heat energy 2) Cross-subsidization (CS) of industrial consumers and the public	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Execution of a program on elimination of cross-subsidization in electricity tariffs	**Technological:** Ensuring electric power safety in isolated power district **Economic:** 1) Reduction of electricity tariffs for all consumers of the district, reduction of electricity costs 2) Reduction of electricity tariffs for industrial consumers **Social:** Providing reliable power supply and social services to power district
		3) Lack of investment money and underfunding of investment projects, increasing demands for investments for power complex development 4) Low amount of financing investment programs of power sector development from FTP, investment programs funded by government budget of the Republic and at the expense of power companies	**Organizational:** 1) Formation of renewal and development fund of electrical energy industry of the Republic 2) Financing of electric power investment projects from FTP and FTIP 3) Financial assistance in energy saving technologies research 4) Investment risks insurance **Economic:** Extra charge to electricity tariffs in order to expand production of BPA	**Technological:** Ensuring electric power safety in isolated power districts by construction of intraregional power transmission lines in order to consolidate technologically isolated power districts. **Economic:** Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation **Social:** Ensuring electric power safety in economy of the district and population
		5) Formation of fuel costs and repairing power facilities for less standard costs	**Organizational:** 1) The adoption of a new power tariff policy in the Republic	**Technological:** Timely recovery (renovation) of fixed production assets

Continuation of table 5.4.4

			2) Development and adoption of new standards of specific fuel consumption for electric power production by the Ministry of Energy of the Russian Federation 3) Development and adoption of repair standards for electric power production by the Ministry of Energy of the Russian Federation **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including standard costs of power facilities repair	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		6) In calculation of tariffs for the following period there is a lack of accounting the savings from implementation of energy-efficiency measures and the savings from shortfalls of income, which accordingly means that there was no expenses during reported period	**Organizational:** The adoption of a new power tariff policy in the Republic **Economic:** Formation of economically justified tariffs by Regional Energy Commission, State Price Policy Committee of the Republic of Sakha (Yakutia), including the savings from implementation of energy-efficiency measures	**Economic:** Stable financial and economic performance of power industry and economy of the region **Social:** Providing reliable power supply and social services to power district
		3. Increase of accounts payable and receivable, losses of enterprises that cause fragile financial and economic condition	**Organizational:** 1) Acceptance and execution of contracts with consumers and suppliers including punitive sanctions and measures for non-payment.	**Economic:** Stable financial and economic performance of power industry and economy of the region

Continuation of table 5.4.4

			2) Timely payments for electricity 3) Timely payments for fuel, industrial goods and services to other organizations **Economic:** Formation of working capital fund in tariffs for cash deficiency on electricity consumers payments due to seasonality of energy supply	**Social:** Providing reliable power supply and social services to power district
2	**Specific threats**	**Technological:** 1) Heavy wear of BPA 2) Heavy wear of transmission lines and high level of power losses in distributing low-voltage network (up to 25%) 3) Obsolete and worn-out diesel-generators in power stations 4) Inefficient operating modes of diesel power stations facilities 5) Underutilization of electric equipment 6) Seasonal fuel supplies, short navigation terms, complex transport system with transshipment from one transport to another 7) Non-optimal fuel balance which causes considerable costs of diesel – 59% 8) Problems with fuel supplies from the north	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) 2) The adoption of conceptual framework of implementation of electric power modernization and long-term development program 3) Implementation of local power system optimization program for 2012-2017 years 4) Financing of electric power investment projects from FTP and FTIP 5)Financial assistance in energy saving technologies research 6) Investment risks insurance 7) Long-term contracts of diesel fuel delivery for acceptable and economical price, which is the subject to public regulation of State	**Technological:** 1) Ensuring electric power safety in isolated power district due to implementation of local power system optimization program 2) Improving electric power safety in isolated power districts by means of renewable power sources 3) Partial or complete rejection of diesel fuel delivery from the north 4) Good delivery of diesel fuel to meet demands of the economy and people of the power district **Economic:** 1) Reduction of electricity tariffs for consumers 2) Formation of additional funds in total amount of 3.5 billion rubles by means of applica-

Continuation of table 5.4.4

		for power stations of hard-to-reach places because of the complex transportation infrastructure 9) High specific fuel consumption 10) Lack of intrare-gional transmission lines between three techno-logically isolated power districts 11) Geographically dis-tributed decentralized consumers and small power loads 12) Short life of diesel generators and transmis-sion lines 13) Power shortfalls in Bilibinskiy atomic pow-er station – for Cherskiy, Magadanskiy foreign power station – for Ust-Nera.	Price Policy Committee - Regional Energy Commis-sion of the Republic of Sakha (Yakutia), Federal Tariff Service and FAS of the Russian Federation 8) Establishment of insur-ance fund of working capital for fuel supplies from the north, including funding from tariffs **Economic:** 1) The adoption of a new power tariff policy in the Republic 2)Application of the suggested public regulation of electricity tariffs in the Republic 3) Extra charge to electrici-ty tariffs in order to expand production of BPA 4) Formation of renewal and development fund of electrical energy industry of the Republic 5) Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	tion the method of elec-tricity tariffs regulation 3) Improvement of regional economic per-formance and develop-ment 4) Reduction of north delivery of 3283 tons due to the imple-mentation of local power system optimization pro-gram, which economic efficiency accounts to 111 million rubles annu-ally **Social:** Providing reliable power supply and social services to power district
		Economic: 1. High prime cost of electric power that caus-es financial losses 2. Impossibility of tech-nology modernization at their own sources of lo-cal electric power indus-try	**Organizational:** 1) The adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Ya-kutia) 2) The adoption of concep-tual framework of imple-mentation of electric power	**Technological:** Ensuring electric power safety in isolated power district **Economic:** 1) Reduction of budget expenses on fuel delivery from the north Reduction of north deliv-

Continuation of table 5.4.4

		3. Deficiency in government regulation of electricity tariffs in the Republic: 1) Cross-subsidization (CS) between power districts	modernization and long-term development program 3) Establishment of fund for fuel delivery from the north **Economic:** 1) Application of the suggested public regulation of electricity tariffs in the Republic 2) Formation of the investment fund for electric power modernization and development in order to unify technologically isolated power districts of the Republic – CPD, WPD, SYPD	ery of 3283 tons due to the implementation of local power system optimization program, which economic efficiency accounts to 111 million rubles annually 2) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 3) Reduction of tariffs with account of extra charges to electricity tariffs by means of opening a new energy and power market and cooperation with the United national power system of Russia 4) Reduction of electricity tariffs for consumers 5) Formation of additional funds in total amount of 3.5 billion rubles by means of application the method of electricity tariffs regulation 6) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district
		4. Diesel fuel tariff growth and faster growth of diesel fuel prices in comparison	**Organizational:** 1) Long-term contracts of diesel fuel delivery for acceptable and economical price	**Economic:** 1) Reduction of electricity tariffs for consumers

Continuation of table 5.4.4

		with electric power tariffs because of insufficient tariffs and, as a consequence, losses of enterprises that cause fragile financial and economic condition	2) Establishment of fund for fuel delivery from the north **Economic:** Simultaneous regulation of natural gas prices and electric power tariffs with account of ultimate index of electricity tariffs growth for the consumers of the region	2) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district
		5. High prime cost of fuel in electric power industry, high prime cost of electric power production, which causes high tariffs for electric power, generated by diesel power stations 6. Annual credit resources (more than 2 billion rubles) used for diesel fuel delivery puts at threat financial liability of the company	**Organizational:** Implementation of local power system optimization program for 2012-2017 years **Economic:** Simultaneous regulation of diesel fuel prices and electric power tariffs	**Economic:** 1) Reduction of electricity tariffs for consumers 2) Reduction of diesel fuel delivery costs and reduction of credit resources, used for diesel fuel delivery, as a consequence 3) Improvement of regional economic performance and development **Social:** Providing reliable power supply and social services to power district

Thus, organizational and economic mechanisms of ensuring electric power safety in the Republic of Sakha (Yakutia) include:

– Development of a long-term comprehensive program of social and economic development of the region, considering inter-sectoral balance of development and performance of each sector and infrastructure, aimed at raising of living standards;

– Development of a long-term regional program of electric power strategic development, aimed at electric power safety in the region;

– Development and adoption of the concept of priority ensuring of electric power safety in the Republic of Sakha (Yakutia) and concept of reliable supplies of fuel and power resources (internal and external) – the basis of life support and life activity of people in the North;

– Efficient state policy of sector regulation considering details of investment climate in the region.

As of economic effect of the suggested method of electric power tariffs regulation in the Republic of Sakha (Yakutia), it consists in the following:

– First, improvement of electric power facilities reliability as a result of their modernization due to extra charges to electricity tariffs in the suggested fund of electric power industry modernization and development in total amount of 3.5 billion rubles and ensuring electric power safety in the northern region;

– Second, reduction of expensive diesel fuel delivery of 3283 tons from the north due to the implementation of local power system optimization program for 2012-2017 years, which economic efficiency amounts to 111 million rubles annually;

– Third, economic viability of cost reduction in electric power industry and prevention of interruptions of power supplies for the consumers in the northern region;

– In whole, ensuring electric power safety in the Republic of Sakha (Yakutia).

The social effect of the suggested method of electric power tariffs regulation in the Republic of Sakha (Yakutia) consists in providing reliable power supply and social services to power districts.

CONCLUSIONS ON CHAPTER 5

1. The level of average rating of natural-resource potential of the Eastern regions of the country is considerably higher than the average figure according to the rankings, the Republic of Sakha (Yakutia) is on the 1st place among the 13 regions of the Far-Eastern Federal District. Economic assessment of the investment potential of the Republic of Sakha (Yakutia) is $22,4-24,8 billion, or 672-744 billion rubles.

2. In the medium and long term perspective in the Republic of Sakha (Yakutia) is expected significant increase in the consumption of electricity and power. The reason of growth is an active investment activity of state and private companies directed at the development of natural resources and the creation of necessary production, transport and energy infrastructure.

3. The development of the power Republic of Sakha (Yakutia) is primarily connected with the formation of the unified energy system in Eastern Siberia and the Far East through the centralized power generation center of the Republic of Sakha (Yakutia).

4. The rapid growth of the republican Economy, especially industry in South Yakutia and Western power region: a large-scale growth of the coal industry, production of non-ferrous metals, oil and gas industry, hydropower, construction and operation of industrial and social infrastructure demanding huge costs of electricity will contribute the dynamic growth of electricity consumption, which according to the innovation scenario will increase in 3.3 times by 2020 in comparison with 2000, by inertia scenario – in 1.3 times.

5. In order to create the organizational economic conditions and mechanisms of implementation of the modernization programs of the Complex and the development of the Power of the Republic first of all it is necessary to reconcile economic interests of the electricity market, since the execution of tasks to ensure electricity security of the country and improve the reliability and efficiency of the power system in the Republic of Sakha (Yakutia) and the Far East is only possible with the joint and therefore concerted actions of all regions, bodies of the Federal Government and Administration of the territory, power supply companies and large consumers of electricity.

6. To the regard of the Republic of Sakha (Yakutia) as a subject of the Federation, the main effective principles of regional investment policy in the power sector to ensure electric power safety in the Northern regions have been developed and amended. The elements of scientific novelty of this study are the following supplement formulations of existing principles: “the principle of transparency in the investment climate in certain enterprises, industries and activities through credit and tax incentives e.g. through investment loan,” “the principle of energy and economic efficiency.” It had been stated and justified such principles as: “the principle of setting priorities for providing electric power safety of the northern region” and “the principles of program formation of investment projects and the development of electric power to achieve the ultimate goal.”

7. The assessing of the social and the economic impact of the implementation of the organizational and economic mechanisms to ensure the security of the electricity in the Republic of Sakha (Yakutia) is important to achieve the goals and objectives. On the basis of these estimates the full range of power activities’ development of the program of the Republic of Sakha (Yakutia) and its electricity security is approved.

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CONCLUSION

Thus, as a result of the scientific research the main conclusions and suggestions were conducted as follows:

1. The theoretical aspects and methodological approaches of energy and electricity security of the regions, research on improving the organizational and economic mechanisms of the electricity security of the regions were studied including improving methods of pricing and state regulation of tariffs and pricing regions in power. As a result the insufficient development of the theoretical aspects and methodological approaches of the electricity security of the regions were found and it was necessary to conceptualize the organizational-economic mechanisms and develop scientific methods to ensure electricity security of the northern region.

2. The value, the key feature of the energy power industry of the Republic of Sakha (Yakutia) in the economy and the social sphere to ensure reliable power supply at present and in the future was estimated.

3. There were identified some factors adversely affecting the electric power industry and threats for ensure electricity security of the northern region and its energy regions: the high depreciation of fixed assets and losses in electric networks, non-repairable power facilities, power shortage in the Central Power, shortages and difficulties in northern supply of fuel, the constant increase in fuel costs for diesel power, natural gas and steam coal, an acute shortage of investment resources and the inefficiency of use, low innovation potential of energy companies, the lack of the incentives for energy conservation and reduce the energy intensity of the economy.

4. The theoretical-methodological study and conceptualization of organizational and economic mechanisms to ensure the safety of electric power of the North was proposed. The study of the nature and content of the category “Electric Power Security” found its relevance in the North. It is determined by the harsh climatic conditions, when the supply of fuel and electricity of the economy and the population is a vital factor in their existence. The definition of “electricity security of the region” and a “threat to electricity security of the region” were proposed by the author. The kinds of threats that are typical for the energy power of the northern region, including the power districts of the republic were determinced. The classification of the main types of security threats to the electric power of the Republic of Sakha (Yakutia) with the definition of community and the specific threats and their possible consequences in each power district was done.

5. The basic indicators of the electricity security of the Republic of Sakha (Yakutia) used for each its energy district; proposed management techniques that can increase the safety of electric power of the Republic of Sakha (Yakutia) were developed.

6. The organizational and economic mechanisms to ensure electricity security of the Northern Region taking into account the specifics of the regional economy, the characteristics of the operation and management of enterprises electricity of the Northern Territory to prevent and resolve common of all energy regions and specific for each individual power district security threats to provide electricity power regions of the Republic were developed. On our opinion they are the most effective mechanisms to ensure electricity security in the whole region of the North, as the Republic of Sakha (Yakutia).

7. We propose a method of regulating the electricity tariff on the basis of the recommended principles of tariff policy in the power of the Republic of Sakha (Yakutia), as an effective means of ensuring regional security of electricity in the Republic of Sakha (Yakutia). We estimate the effect of tariff changes on scenarios for electricity market of the Northern Region, taking into account the long-term economic development of the region.

8. With regard to the North Region we identified the main principles of the effective regional investment policy in the energy power of the Republic of Sakha (Yakutia) and supplemented with two reasonable effective principles of investment policy.

9. The author represented some conceptual and methodological approaches to ensure electricity security of the Northern Region and the organizational-economic mechanisms to ensure electricity security of the Republic of Sakha (Yakutia) and its power regions, including developed concept of priority to ensure electricity security of the Republic Sakha (Yakutia). The conceptual scheme of the Complex modernization programs and the development of the power of the Northern Territory and the concept of sources of funding for these programs, as well as the proposed new tariff policy principles and effective regional investment policy and the method of rate regulation in the power of the Republic and its power districts are universal and can be used in regional consumer markets of electricity, and can also serve as a basis for the development of the Concept electric security both in the Republic, and similar technologically isolated from the Unified Energy System of Russia National Energy Systems, for example, in the Magadan and Sakhalin, Kamchatka Region and the Chukotka Autonomous District.

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Appendix 1

The dynamics of electricity tariffs "Yakutskenergo" 1990-2010 years. (denominated ruble)

Name of consumers	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Industrial consumers 700kV.A and above																						
tariff	rub / kWh	0,000062	0,0001004	0,00427	0,082	0,186	0,324	0,438	0,500	0,50	0,58	0,82	0,97	1,25	1,48	1,717	1,875	2,034	2,319	2,644	3,141	3,492
index growth by 1990	in times		1,6	69	1323	3000	5226	7065	8065	8065	9355	13226	15645	20161	23871	27694	30242	32806	37403	42645	50661	56323
index growth over previous year	in times		1,62	42,53	19,20	2,27	1,74	1,35	1,14	1,00	1,16	1,41	1,18	1,29	1,18	1,16	1,09	1,08	1,14	1,14	1,19	1,11
Industrial consumers till 750 kV.A.																						
tariff	rub / kWh	0,0001	0,000162	0,006885	0,082	0,186	0,324	0,438	0,500	0,50	0,58	0,82	0,97	1,25	1,48	1,717	1,875	2,034	2,319	2,644	3,141	3,492
index growth by 1990	in times		1,6	69	820	1860	3240	4380	5000	5000	5800	8200	9700	12500	14800	17170	18750	20340	23190	26440	31410	34920
index growth to the previous year	in times		1,62	42,50	11,91	2,27	1,74	1,35	1,14	1,00	1,16	1,41	1,18	1,29	1,18	1,16	1,09	1,08	1,14	1,14	1,19	1,11
Agriculture																						
tariff	rub / kWh	0,00001	0,00001	0,0004	0,012	0,054	0,115	0,165	0,250	0,25	0,38	0,60	0,68	0,87	1,02	1,253	1,875	2,034	2,319	2,644	3,141	3,492
index growth by 1990	in times		1,0	40	1200	5400	11500	16500	25000	25000	38000	60000	68000	87000	102000	125300	187500	203400	231900	264400	314100	349200
index growth to the previous year	in times		1,00	40,00	30,00	4,50	2,13	1,43	1,52	1,00	1,52	1,58	1,13	1,28	1,17	1,23	1,50	1,08	1,14	1,14	1,19	1,11
Budget organization																						
tariff	rub / kWh	0,0001	0,0001	0,00425	0,082	0,140	0,245	0,343	0,400	0,40	0,40	0,60	0,68	0,87	1,08	1,183	1,280	1,600	1,819	2,128	2,650	3,087
index growth by 1990	in times		1	43	820	1 400	2 450	3 430	4 000	4 000	4 000	6 000	6 800	8 700	10 800	11 830	12 800	16 000	18 190	21 280	26 500	30 870
index growth to the previous year	in times		1,00	42,50	19,29	1,71	1,75	1,40	1,17	1,00	1,00	1,50	1,13	1,28	1,24	1,10	1,08	1,25	1,14	1,17	1,25	1,16
Urban population in homes with gas stoves																						
tariff	rub / kWh	0,00004	0,00004	0,0006	0,012	0,108	0,162	0,200	0,300	0,30	0,46	0,60	0,68	0,80	0,96	1,12	1,40	1,73	1,97	2,30	2,88	3,17
index growth by 1990	in times		1	15	300	2 700	4 050	5 000	7 500	7 500	11 500	15 000	17 000	20 000	24 000	28 000	35 000	43 250	49 250	57 500	72 000	79 250
index growth to the previous year	in times		1,00	15,00	20,00	9,00	1,50	1,23	1,50	1,00	1,53	1,30	1,13	1,18	1,20	1,17	1,25	1,24	1,14	1,17	1,25	1,10
In homes with electric stoves																						
tariff	rub / kWh	0,00002	0,00002	0,0004	0,006	0,095	0,143	0,175	0,260	0,26	0,32	0,42	0,48	0,56	0,68	0,79	0,99	1,23	1,40	1,64	2,05	2,22
index growth by 1990	in times		1,0	20,0	300,0	4750,0	7150,0	8750,0	13000,0	13000,0	16000,0	21000,0	24000,0	28000,0	34000,0	39500,0	49500,0	61500,0	70000,0	82000,0	102500,0	111000
index growth to the previous year	in times		1,00	20,00	15,00	15,83	1,51	1,22	1,49	1,00	1,23	1,31	1,14	1,17	1,21	1,16	1,25	1,24	1,14	1,17	1,25	1,08
Rural population																						
tariff	rub / kWh	0,00001	0,00001	0,00040	0,002	0,030	0,045	0,100	0,150	0,15	0,23	0,30	0,34	0,40	0,50	0,58	0,73	0,95	1,14	1,36	1,71	1,97
index growth by 1990	in times		1	40	200	3 000	4 500	10 000	15 000	15 000	23 000	30 000	34 000	40 000	50 000	58 000	73 000	95 000	114 000	136 000	171 000	197 000
index growth to the previous year	in times		1,00	40,00	5,00	15,00	1,50	2,22	1,50	1,00	1,53	1,30	1,13	1,18	1,25	1,16	1,26	1,30	1,20	1,19	1,26	1,15

Appendix 2

The calculation of electricity prices on the financial and economic indicators of "ALROSA"

Index	electricity tariff			electricity tariff			difference			electicity tariff			difference			elecricity tariff			difference		
	tariff 3,473 rub. per kWh			tariff 3,473 per kwh. increased 10%= 3,8203 rub.			(+) - increased.(-) - redused			tariff 3,473 per kwh. increased 20%= 4,1676 rub.			(+) - increased.(-) - redused			tariff 3,473 per kwh. increased 10%= 3,1257 руб.			(+) - increased.(-) - redused		
	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.
Total salable produce	**113394000**			**113394000**						**113394000**						**113394000**					
Including cost	**63669000**			**64176687**			**507687**			**64684375**			**1015375**			**63161312**			**-507688**		
Among them:																					
The payroll fund	19387		1512/ 1008	19387		1512/ 1008	0			19387		1512/ 1008	0			19387		1512/ 1008	0		
Cost of the delivery and storage of raw materials	2683			2683			0			2683			0			2683			0		
Linehaul transport, Delivery of fuel	1837			1837			0			1837			0			1837			0		
Depreciation	8793			8793			0			8793			0			8793			0		
Repair fund																					
Material	5860			5860			0			5860			0			5860			0		
Electricity	**5076877**			**5584564**			**507687**			**6092252**			**1015375**			**4569189**			**-507688**		
Total cost	63669000			64176687			507687			64684375			1015375			63161312			-507688		
Including profit	**49725000**			**49217313**			**-507687**			**48709625**			**-1015375**			**50232688**			**507688**		
Profit tax expense	**9945000**	**994500**	**8950500**	**9843463**	**984346**	**8859116**	**-101537**	**- 10154**	**-91384**	**9741925**	**974193**	**8767732**	**-203075**	**-20307**	**-182768**	**10046538**	**1004654**	**9041884**	**101538**	**10154**	**91384**

Appendix 3

The calculation of electricity prices on the financial and economic indicators of public corporation “Vodokanal”

Index	electricity tariff			electricity tariff			difference			electicity tariff			difference			elecricity tariff			difference		
	tariff 3,63 rub. per kWh			tariff 3,63 per kwh. increased 10%= 3,993 rub.			(+) - increased.(-) - redused			tariff 3,63 per kwh. increased 20%= 4,356 rub.			(+) - increased.(-) - redused			tariff 3,63 per kwh. increased 10%= 3,267 руб.			(+) - increased.(-) - redused		
	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .
Total salable produce	**511 944**			**511 944**						**511 944**						**511 944**					
Including cost	**504 514**			**515 728**			**11 214**			**526 940**			**22 426**			**493 304**			**-11 210**		
Among them:																					
Raw material	4 144			4 144			0			4 144			0			4 144			0		
The payroll fund	47 662		3718/ 2478	47 662		3718/ 2478	0			47 662		3718/ 2478	0			47 662		3718/ 2478	0		
Linehaul transport, Delivery of fuel	93			93			0			93			0			93			0		
Cost of PB	16 348	16 348		16 348	16 348		0			16 348	16 348		0			16 348	16 348		0		
Depreciation	22 713			22 713			0			22 713			0			22 713			0		
Repair fund	14 805			14 805			0			14 805			0			14 805			0		
Material	7 614			7 614			0			7 614			0			7 614			0		
Electricity	**112 118**			**123 332**			**11 214**			**134 544**			**22 426**			**100 908**			**-11 210**		
Total direct costs	438 785			438 785			0			438 785			0			438 785			0		
Craft costs	53 819			53 819			0			53 819			0			53 819			0		
General business expenses	11 911			11 911			0			11 911			0			11 911			0		
Including profit	**7 430**			**-3 784**			**-11 214**			**-14 996**			**-22 426**			**18 640**			**11 210**		
Profit tax expense	**1 486**	**149**	**1337**	**-757**	**-76**	**-681**	**-2243**	**-225**	**2018**	**-2 999**	**-300**	**-2699**	**-4485**	**-449**	**-4036**	**3 728**	**373**	**3355**	**2242**	**224**	**2018**

Appendix 4

The calculation of electricity prices on the financial and economic indicators of Municipal Unitary Enterprise "Housing and Communal Services RS (Y)"

Index	electricity tariff			electricity tariff			difference			electicity tariff			difference			electricity tariff			difference		
	tariff 3,288 rub. per kWh			tariff 3,288 per kwh. increased 10%= 3,6168 rub.			(+) - increased.(-) - redused			tariff 3,288 per kwh. increased 20%= 3,9456 rub.			(+) - increased.(-) - redused			tariff 3,288 per kwh. increased 10%= 2,9592 руб.			(+) - increased.(-) - redused		
	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub.	incl. reg. budg./ local, thous. rub.	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .	sum, thous. rub.	incl. Fed. budg, thous. rub .	incl. reg. budg./ local, thous. rub .
Total salable produce	**8464698**			**8464698**						**8464698**						**8464698**					
Including cost	**8390963**			**8455427**			**64464**			**8510046**			**119083**			**8346187**			**-44776**		
Among them:																					
Raw material	6182173			6182173			0			6182173			0			6182173			0		
The payroll fund	1557790		121507/81005	1557790		121507/81005	0			1557790		121507/81005	0			1557790		121507/81005	0		
Cost of the delivery and storage of rew materials	1969679			1969679			0			1969679			0			1969679			0		
Linehaul transport, Delivery of fuel	1174883			1174883			0			1174883			0			1174883			0		
Cost of PB	409639	409639		409639	409639		0			409639	409639		0			409639	409639		0		
Depreciation	403920			403920			0			403920			0			403920			0		
Repair fund	230133			230133			0			230133			0			230133			0		
Material	71490			71490			0			71490			0			71490			0		
Electricity	**536352**			**600816**			**64464**			**655435**			**119083**			**491576**			**-44776**		
The costs of training and development of production	167348			167348			0			167348			0			167348			0		
Other expenses for maintenance and operation	150934			150934			0			150934			0			150934			0		
Total direct costs	7582310			7582310			0			7582310			0			7582310			0		
Craft costs	193801			193801			0			193801			0			193801			0		
General business expenses	613587			613587			0			613587			0			613587			0		
Including profit	**73735**			**9271**			**-64464**			**-45348**			**-119083**			**118511**			**44776**		
Profit tax expense	**14747**	**1475**	**13272**	**1854**	**185**	**1669**	**-12893**	**-1290**	**-11603**	**-9069**	**-907**	**-8163**	**-23817**	**-2382**	**-21435**	**23702**	**2370**	**21332**	**8955**	**895**	**8060**

Appendix 5

Data on the largest investment projects of the East of Russia (except the Republic of Sakha (Yakutia)

The name of the project	Name of products and annual production capacity	Term **of realization**	The annual consumption of electric energy in the framework of the project, mln kWh.	Maximum power consumption, MW
Amur Region				
The development of iron ore deposits Garinsky and construction of mining and processing plant	Ore production - 10.5 million tons, iron ore concentrate - 4.5 million tons, iron ore pellets - 3.2 million tons	2010	1 140	228
Complex processing of mineral raw materials to produce aluminum , silicon, and their compounds.	Aluminum, 300 thousand tons , silicon	2010	4 800	960
Building on the base of iron ore Garinsky steel plant	steel , 2.5 million tons	2015	5 000	1 000
The completion of the railway line “Ulak-Elga”to the Elga coal deposit	Transportation of coal and 20 million tons	2010	320	64
Construction of the refinery in Skovorodino	processing 10 million tons of oil	2015	700	140
Development of Kuranakh deposit of titanium- magnetite ore in Tyndinsky region (Big Seyim)	Ore production - 2.5 million tons, ilmenite concentrate - 240 thousand tons, Titanium Concentrate - 660 thousand tons, titanium dioxide - 70-80 thousand tonnes	2010	369	74
Integrated development of Sergeevsky lignite deposit	Coal mining - 1300 thousand tons, fuel oil - 50 thousand tons, natural gasoline - 10 thousand tons, 60 million cubic meters of gas and 365 thousand tons of coal briquettes	2015	112	22
The Jewish Autonomous Region				
Development of Kimkansky and Suntarsky iron ore deposits (Obluchensky region)	Ore production - 16.5 million tons , iron ore concentrate - 5.6 million tons	2010	2 393	479
Primorsky Krai				
Building-integrated refinery and petrochemical complex	Processing 15 million tons of oil	2010	708	142
Construction of Suhodol in the Bay Coal Terminal	Capacity 8-10 million tons of coal	2010	148	30
Pulp and Paper Manufacturing Ussuri	Production of 400 thousand tons of pulp	2020	747	149
Construction and operation of the industrial port of Vladivostok	The planned turnover – 5 million tons	2020	93	19

Sakhalin Region				
Transport and energy transition Continent - Sakhalin - Hokkaido (Japan)		2020	527	105
Poronajsky Pulp Production	Production of 250 thousand tons of pulp	2020	467	93
Building the world's largest plant for the production of liquefied natural gas	liquefaction of 9.6 million tons of gas	2010	3 638	728
Gas pipeline Sakhalin - Komsomolsk-on -Amur - Khabarovsk.	Design capacity - 4.5 billion cubic meters of gas per year	2010.	89	18
Construction of the railway line Elyinsk - Uglegorsk	142,6 km	2010	143	29
Deposits of “Sakhalin 1-9”.	Production of 45 million tons of oil	2010	6 314	1 263
Khabarovsk Krai				
Creating a pulp mill in Amursk	Manufacturing 700 thousand tons of bleached sulphate pulp	2015	1 303	261
Construction of the plant in the Khabarovsk region for the production of primary aluminum	Production of 350 thousand tons of aluminum	2010	5 250	500
Construction at the Port of Busan plant for the production of primary aluminum	Production of 600 thousand tons of aluminum	2015	9 000	500
Creation of production of chemi-thermomechanical pulp and newsprint pos.Hor on the basis of “Khor biomechanical Plant”	Production of 300 thousand tons of chemi-thermo mechanical pulp	2020	558	112
Development of Maymakansky titanium apatite deposit. Ayano-Maisky region district	Mining 16 million tons of ore and 700 thousand tones of limonite concentrate, 1210 thousand tones of phosphate rock	2020	1 734	347
Krasnoyarsk Territory				
Construction of pipelines connecting Yurubcheno Tokhomskoye - zone oil and gas (YTZ) with the Trans-Siberian trunk oil pipeline million tons	Transported 40 million tons of oil	2010	1 268	254
Vankor oil field (including licensed areas around) , the construction of the pipeline Vankor - Purpe (550 km) with a capacity of 18 million tons of oil per year	Production and transport 15-18 million tons of oil	2010	2 000	400
Oil and gas deposits Of Evenkii Yurubcheno - Tokhomskoye, Kuyumbinskoe, Nizhneangarsk group Sobinsko - Teterinskaya group).	Production of 26-27 million tons of oil, 30-35 billion cubic meters of gas	2015	3 015	603
Irkutsk Region				
Verkhnechonskoye oil and gas field , Katanga Mining District	14-17 million tons of oil	2012.	800	115
Pulp and Paper Mill , Ust -Kut	Manufacturing 830 thousand tons of pulp , 280 thousand tons of paper and paperboard	2015	1 658	332
Aluminum smelter in Taishet in the Irkutsk region	Production of 600 thousand tons of aluminum	2009	9 700	1 120
Kovykta gas field	Extraction of 30-35 billion cubic meters of gas	2010-2020	850	150

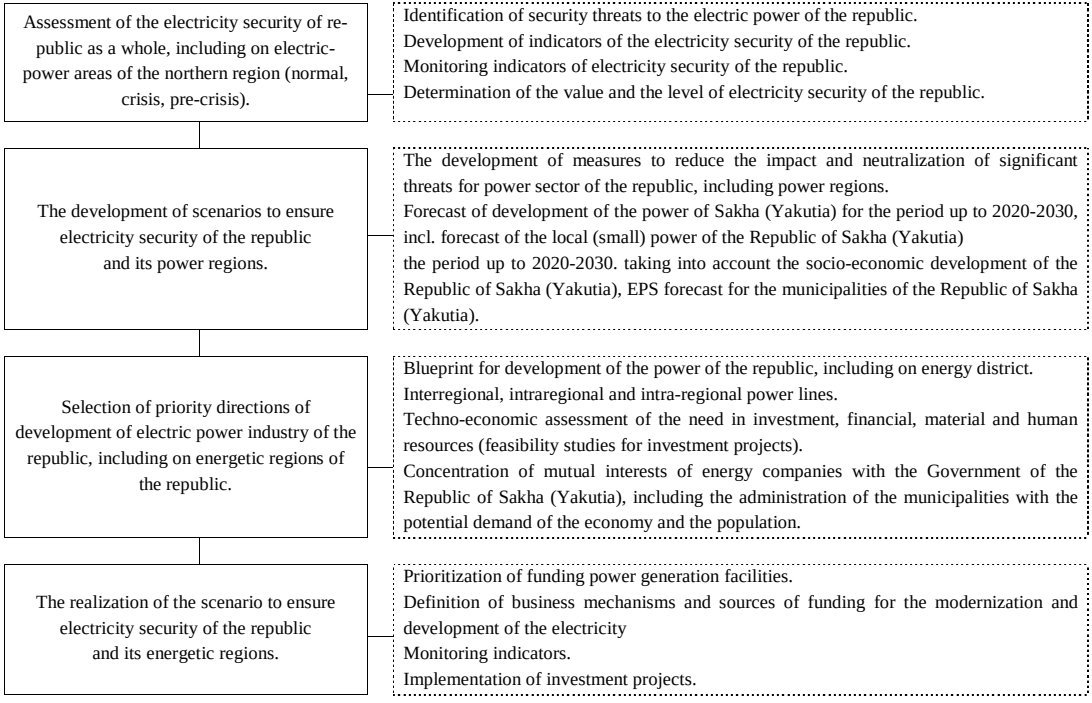
Sukhoi Log gold deposit. Bodaybinskiy District Mining	Production of 12-15 million tons of ore, 30-33 tons of gold	2015	600	125
Development of coal deposits in East Siberia Zheronsky	Production 3.5 million tons of coal	2015	113	23
Development of coal deposits in East Siberia Karantsaysky	Production of 4 million tons of thermal coal , 50 km of the railway	2015	130	26
Development of coal deposits in East Siberia, cut Ascension	Ascension production of 4 million tons of thermal coal , 25 km of the railway	2015	130	26
Kovykta gas processing complex		2015	1 500	250
Sayan Gas Processing Complex, Sajansk	Processing 30 billion cubic meters of gas	2015	300	40
Siberian Steel Mill		2010	400	125
Ferroalloy plant in Angarsk and Bratsk		2010	500	75
Usolye - Sibirsky Silicone		2012	1 000	180
Consumers with a load of 5-20 MW			800	150
Chita region				
Udokan copper. Kalar district	Mining 15 million tons of ore, production of 180 thousand tons of copper per year	2020	2 436	487
Mastering Lugokanskaya , Kultuminskaya Bystrinsky mining deposits	Production of 5,1 million tons of ore, production of 33.3 thousand tons of copper , 2.7 tons of gold , 47.2 tons of silver	2020	553	111
Construction Amazarskogo pulp mill	Production of 400 thousand tons of unbleached pulp	2009	747	149
Apsat coking coal production	Production of 2.4 million tons of coal, 1.7 million tons of coke concentrate, 600 thousand tones of middling	2020	82	16
Mastering Katuginskogo deposits of tantalum-niobium ore.	Production of 3 million tons of ore per year, producing 244 tons of tantalum fluorotantalate potassium, 4.9 thousand tons of technical niobium pentoxide, 61.5 thousand tons of zircon concentrate, 7.3 thousand tons tons the amount of oxides of rare earths , 135 tons of uranium in the uranium concentrate, 7.5 thousand tons tons of cryolite	2015	325	65
Chiney deposit of titanium -magnetite ores. Building a career, mining and processing plant. Chita region, Kalar district Mining	11, 1 million tons of ore production. 3.2 million tons of iron ore and 600 thousand tons of titanium concentrate , 23.7 thousand tons of copper, 400 kg of gold , 6.5 tons of silver, 770 kg of platinum , 1 tonne of palladium	2010	1 203	241
Mining for Eastern and Siberian parts of the EEC			18 333	3 550

Mainline rail East and Siberia				
Transcontinental Highway (TCM) Alaska - Siberia with a tunnel through the Bering Strait in the direction of Transsib-Berkakit - Yakutsk -Magadan - Whalen , Alaska.		2020	7 500	1 500
The main oil pipelines of the East and Siberia				
Project export pipeline system Eastern Siberia - Pacific Ocean (ESPO Taishet -Nakhodka with a branch to China).	First of all - 30 million tons, 2640 km, the second stage - 50 million tons, 4658 km	2010	2 536	423
East Siberia - Pacific Ocean - Pipeline - branch - branch	Pipeline to China with capacity of 30 million tons	2008	951	159
Pipeline “Talakan - Ust –Kut”	Transport 26 million tons of oil, 500 km	2010	824	165
Natural gas pipelines and East Siberia				
Gas export pipeline - Eastern Route	Transportation 30-40 billion cubic meters of gas per year	2015	557	111
Total consumption of electric energy and capacity in investment projects			**106 364**	**18 230**

Source: Government of the Republic Sakha (Yakutia) on September 6, 2006 number 411 (as amended on 19.04.2010) “On the scheme of integrated development of the productive forces, Transport and Energy of the Republic Sakha (Yakutia) to 2020”

Appendix 6

The conceptual scheme of the priority supply of the electricity security of the Republic of Sakha (Yakutia) and its energetic regions



Elyakova Izabella Damdinovna

ORGANIZATIONAL AND ECONOMIC MECHANISMS
TO ENSURE ELECTRIC POWER SECURITY
OF THE NORTHERN REGIONS

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The monograph explores the theoretical and methodological foundations of the regional electric power security system; proposes the interpretation of the electric power security. It also sets forth the major issues and trends in the development of the regional power sector. Considerable attention is paid to the role of electric power in improving the energy security of the Republic of Sakha (Yakutia) and economically sustainable development of the region, including fuel - energy system. The study proposes a classification of threats to ensure electric power security of the Republic's energy districts and a system of electric power indicators of the region. Furthermore, it develops and formulates the conceptual foundations of organizational and economic mechanisms to ensure electric power security of the Republic of Sakha (Yakutia). The book contains an assessment of the economic potential of the Republic of Sakha (Yakutia), reviews the prospects for growth in the consumption of electric energy in the long term, taking into account the development of the economy of the northern region.

The monograph is intended for scientists and specialists of the economy of the northern regions, for graduate and undergraduate students of higher educational institutions of power industry, as well as for a wide range of readers.