On approval of the Concept for the development of the electric power industry of the Republic of Kazakhstan for 2023 – 2029

Decree of the Government of the Republic of Kazakhstan dated March 28, 2023 No. 263.

The Government of the Republic of Kazakhstan DECIDES:

1. Approve the attached Concept for the development of the electric power industry of the Republic of Kazakhstan for 2023 – 2029 (hereinafter referred to as the Concept).

2. Central, local executive bodies, government bodies directly subordinate and accountable to the President of the Republic of Kazakhstan (as agreed), and other organizations (as agreed) responsible for the implementation
Concepts:

1) take the necessary measures to implement the Concept;

2) provide information on the progress of implementation of the Concept in the manner and within the time limits established by Decree of the Government of the Republic of Kazakhstan dated November 29, 2017 No. 790 “On approval of the State Planning System in the Republic of Kazakhstan.”

3. Entrust control over the implementation of this resolution to Ministry of Energy of the Republic of Kazakhstan.

4. This resolution comes into force from the date of its signing.

A. Smailov

Prime Minister of the Republic of Kazakhstan

Approved
Government resolution
Republic of Kazakhstan
dated March 28, 2023 No. 263

CONCEPT
DEVELOPMENT OF THE ELECTRIC POWER INDUSTRY OF THE REPUBLIC OF KAZAKHSTAN FOR 2023 – 2029

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Concept for the development of the electric power industry of the Republic of Kazakhstan for 2023 – 2029 years

Section 1. Passport

Name: Concept for the development of the electric power industry of the Republic Kazakhstan for 2023 – 2029.

Basis for development: order of the President of the Republic of Kazakhstan No. ÿÿ-ÿ-17709.1 dated January 26, 2022.

State body developer: Ministry of Energy of the Republic Kazakhstan.

State bodies responsible for implementation: Ministry of Energy of the Republic of Kazakhstan, Agency for the Protection and Development of Competition of the Republic of Kazakhstan, Ministry of National Economy of the Republic of Kazakhstan, Ministry of Ecology and Natural Resources of the Republic of Kazakhstan, Ministry of Finance of the Republic of Kazakhstan, Ministry of Justice of the Republic of Kazakhstan.

Implementation period: 2023 – 2029.

Section 2. Analysis of the current situation

2.1 Assessing the current state of the industry

The electric power industry of the Republic of Kazakhstan is the most important industry, which is the basis for the life support of the country, the functioning and development of the economy, ensuring national security. The reliability of energy supply to consumers depends on the effectiveness of the regulatory environment,

state of the electric power industry, including the technical condition of power equipment, level of investment and quality of management.

Over the past twenty years, a number of institutional, market and regulatory reforms have been carried out in the electric power industry, which have produced both positive effects and negative consequences.

From 2009 to 2015, within the framework of the Tariff in Exchange for Investment program with the introduction of the regulatory instrument of marginal tariffs for electric energy, a medium-term power reserve was created through repair campaigns, reconstruction, restoration and construction of 3 GW of capacity totaling just over 1 trillion tenge .

However, the completion of the program with a tariff freeze, and as a consequence, chronic underfunding and a low level of investment attractiveness to date, have led to a sharp aging of funds and a low rate of modernization of energy equipment.

On January 1, 2019, along with the electric energy market, the electric power market began to function, aimed at ensuring the attraction of the required amount of investment in the generation sector for the construction of new power plants and maintaining existing capacities. The capacity market is aimed at recoupment of investment costs of energy producing organizations (
hereinafter referred to as EPO). The volume of attracted investments in the generation sector within the electric capacity market over the four years of operation amounted to only about 300 billion tenge.

As part of the project "Modernization of the National Electric Grid", high-voltage equipment was modernized at 43 substations in stage I and at 55 substations in stage II, a supervisory control and management system SCADA/EMS (Supervisory Control and Data Acquisition/Energy Management Systems) was installed, and an automated system was introduced commercial metering of electricity (hereinafter referred to as ASKUE), which increased the reliability of the national electric grid (hereinafter referred to as NES).

Implementation of the projects "Construction of the second line of 500 kV transit North-South of Kazakhstan" (1097 km), "Construction of a 500 kV line of North-South transit through the East" (1700 km) made it possible to increase the transmission capacity between the Northern and Southern zones to 2100 MW, which increased the reliability of power supply to the southern regions, which are energy-scarce.

The programs “Development of Heat and Electric Power Industry” and “Lending to regional budgets, budgets of cities of republican significance, the capital for the reconstruction and construction of heat supply systems” from 2020 to 2022 implemented 53 projects

in the amount of 96.2 billion tenge, which are aimed at the reconstruction, modernization and construction of heat supply systems, substations and power lines with voltages above 35 kV.

Since 2009, the legislation of the Republic of Kazakhstan has enshrined a system of state support for the development of renewable energy sources (hereinafter referred to as RES). The adoption at the state level of a decision to improve the investment climate in the renewable energy sector, taking into account world practices, became the foundation for the development of this energy sector in our country.

The basis of the electric power industry in Kazakhstan is coal-fired power, while coal deposits are mainly concentrated in Northern and Central Kazakhstan, and the main sources of electrical energy are also located here. In addition, for the sake of energy security, coal plants will maintain their presence in the generation sector in the medium term.

2.2 Production and consumption of electrical energy

As of January 1, 2023, the production of electrical energy is carried out by 204 electric power stations (74 traditional, 130 renewable energy). The total installed capacity of power plants in Kazakhstan amounted to 24523.7 MW, available capacity
– 19024.3 MW.

At the same time, the total installed capacity of renewable energy sources is 2388 MW, including wind power plants - 957 MW, solar power plants - 1149 MW, hydroelectric power station (hereinafter - HPP) - 280 MW, biogas power plants - 2 MW.

In 2022, electricity production in Kazakhstan amounted to 112865.9 million kWh (in 2020 - 108085.8 million kWh, in 2021 - 114447.9 million kWh), with coal being the main fuel (share of coal stations - 66.7% , gas – 21.5%,
HPP – 7.3%, RES – 4.5%).

Electricity consumption amounted to 112,944.6 million kWh (in 2020 - 107,344.8 million kWh, in 2021 - 113,890.3 million kWh), of which 78.7 million kWh was covered by importing electrical energy from neighboring countries.

In 2022, there was a historical maximum of consumption for all years and amounted to 16459 MW with a generation of 15203 MW, as a result of which 1256 MW was imported from the Russian Federation, which marks a sharp jump compared to previous years (in 2018 - 268 MW, in 2019 - 301 MW, in 2020 – 300 MW, in 2021 – 388 MW)
(diagram 1).

Diagram 1 – Peak load and generation for 2018-2022

The reasons for the shortage of electrical energy and power are the high accident rate, technical limitations of generating equipment and a limited number of maneuverable generating units to compensate for imbalances in

energy system (due to the historical structure of generating capacities)

At the end of 2022, 55.5% of the generating equipment of thermal power plants (hereinafter referred to as TPP) is more than 30 years old (Diagram 2).

Diagram 2 – Age of generating equipment of thermal power plants

2.3 Electrical energy transmission

Electric networks of the Republic of Kazakhstan are a set of substations, switchgears and power lines connecting them with a voltage of 0.4-1150 kV, intended for transformation, transmission and (or) distribution of electrical energy.

The role of the system-forming network in the Unified Electric Power System of the Republic of Kazakhstan (hereinafter referred to as the UES of the Republic of Kazakhstan) is performed by the NES, which includes interregional and (or) interstate power transmission lines with a voltage of 220 kV and higher. As of January 1, 2023, 83 substations with a voltage of 500 are operating -220 kV, the total length of power lines is 26970.8 km.

The management of the NPS is carried out by the joint-stock company "Kazakhstan Company for management of electric networks" (hereinafter - KEGOC JSC), combining the functions of an energy transmission organization and a system operator. At the same time, as part of the development of market relations, the activities of the system operator KEGOC JSC require increased transparency, eliminating the risks of creating discriminatory conditions in the market and avoiding conflicts of interest with market participants.

At the same time, the loss of electrical energy during transportation in 2022 is 5%, while the standard technical losses in the national electrical grid are about 6-7%.

Electricity transmission at the regional level (within the country) is carried out by 19 regional electric grid companies (hereinafter referred to as REC) and 126 small energy transmission companies, which operate electric networks with a voltage of 0.4-220 kV.

The average level of wear and tear on electrical networks in Kazakhstan is 66%. The highest level of wear and tear is in the Kostanay region - 85.3%, the lowest - 29.5% in the city of Astana.

The average level of REC losses is about 14% and ranges from 6% to 18% due to differences in topology, voltage classes, length of electrical networks and the number of substations. In turn, significant losses in distribution networks are associated with the operation of most power lines for more than 40 years and a significant length.

The electrical networks of western Kazakhstan remain isolated from the UES of the Republic of Kazakhstan and the backbone network of the Western zone is fully loaded, and therefore there is insufficient capacity of transit flows.

In addition, the presence of a large number of private small players at the regional level has a significant impact on the growth of the final price for consumers.

2.4 Electrical energy supply

Electric energy is supplied by energy supply organizations (hereinafter referred to as ESO), which buy electrical energy on the wholesale market and sell it on the retail market. At the beginning of 2023, more than 500 companies have a license to carry out activities for the purchase of electrical energy for energy supply purposes. At the same time, about 140 organizations actually operate, including 35 ESOs that are subject to state regulation.

ESO electricity tariffs are formed based on the selling prices of energy-producing organizations, the cost of the service to ensure the readiness of electrical power to bear the load, tariffs for the transmission of electrical energy and the supply markup of the energy supplying organization itself.

At the same time, for regulated ESOs, the authorized body approves average selling tariffs, which are differentiated by consumer groups: individuals (population), legal entities and individual entrepreneurs, budgetary organizations. As a rule, in order to prevent social tension, tariffs for individuals are set below the average selling price by subsidizing tariffs for legal entities and budget organizations.

Guaranteed suppliers have higher tariffs for legal entities than unregulated ESOs, which can offer more attractive tariffs, which fundamentally excludes equal competition. The outflow of legal entities leads to an increase in tariffs for legal entities and budgetary organizations due to the impossibility of increasing tariffs for the population. In turn, unregulated ESOs are not interested in concluding contracts with individuals due to low tariffs.

Currently, in pursuance of the instructions of the Head of State, the Agency for the Protection and Development of Competition of the Republic of Kazakhstan is working to gradually reduce and eliminate differentiated tariffs between groups of consumers for electricity supply services in order to create equal conditions for competition between ESOs.

2.5 Thermal power engineering

Thermal energy production

Thermal energy production in Kazakhstan is carried out by over 2,500 heat sources, of which 118 with a capacity of over 100 Gcal/h and sources of individual consumers.

Heat sources in centralized and local heat supply systems are divided into combined heat and power plants (hereinafter - CHP) and boiler houses.

As of January 1, 2023, there are 37 thermal power plants operating in Kazakhstan, 15 of which are state-owned (the cities of Semey, Kostanay, Kentau, Uralsk, Arkalyk, Shakhtinsk, Astana, Kyzylorda, Taraz, Aktau, Almaty).

The total installed capacity of thermal sources is 43231 Gcal/h.
The available power of heat sources was 37566.7 Gcal/h.

Thermal energy production in 2022 in Kazakhstan amounted to 94 million Gcal/h (2020 – 91 million Gcal/h, 2021 – 93 million Gcal/h).

Types of fuel for thermal energy generation are coal from Kazakhstan fields (~80%), natural gas (~15%) and fuel oil (~5%).

Thermal energy transfer

The total length of heating networks in two-pipe calculation in the republic is about 12,680 km. At the same time, about 49.2% or 6246 thousand km of networks require replacement. The average wear and tear of heating networks is 57%.

The heating sector is characterized from production to consumption of thermal energy by low efficiency (on average 75% for boilers, 58% – for the entire system), high emissions and heat losses (18-42% at the stage of heat transportation and distribution).

Thermal energy supply

The thermal energy supply sector is represented by ESOs, which purchase thermal energy from heat-producing organizations and subsequently sell it to consumers. In most regions, energy transmission organizations carry out energy supply activities. Energy supply with thermal energy carried out only in centralized and local heat supply systems.

Centralized heat supply systems based on thermal power plants have received the greatest development in the Northern zone of Kazakhstan - 64% of the total available thermal capacity of thermal power plants of the Republic of Kazakhstan, in the Southern zone - 19%, in the Western zone - 17%.

The majority of heat and power organizations are on the balance sheet of local executive bodies and, due to insufficient tariff funds, it is possible to allocate subsidies from the budget in order to ensure the safe passage of the heating season.

2.6 Digitization of industries

Digitalization of the industry affects all levels of the electricity industry: generation, transmission, distribution, supply, consumption and system operating.

At the beginning of 2023, the implemented Smart Grid elements in Kazakhstan are automatic frequency and power control systems (ARFM), automated system for commercial metering of electricity (ASKUE), substation monitoring and control systems (SMiU), automated system process control system (APCS), centralized emergency automatic system (CSPA), supervisory control and data acquisition system (SCADA/EMS), monitoring and control system based on synchrophasor technologies (WAMS/WACS, Wide Area Monitoring System/Control), geographic information system (GIS), billing information system (BIS), balancing system electricity market (SBRE), monitoring and diagnostic systems for substation equipment (SM PS), fiber-optic communication line (FOCL), flexible alternating current transmission system (FACTS, Flexible Alternating Current Transmission System), partially smart electricity meters (Smart Meter).

However, the above technologies are not implemented at all levels of production. , transmission and consumption of electrical energy and/or with limited coverage.

2.7 Markets in the electricity industry

There are wholesale and retail markets in Kazakhstan.

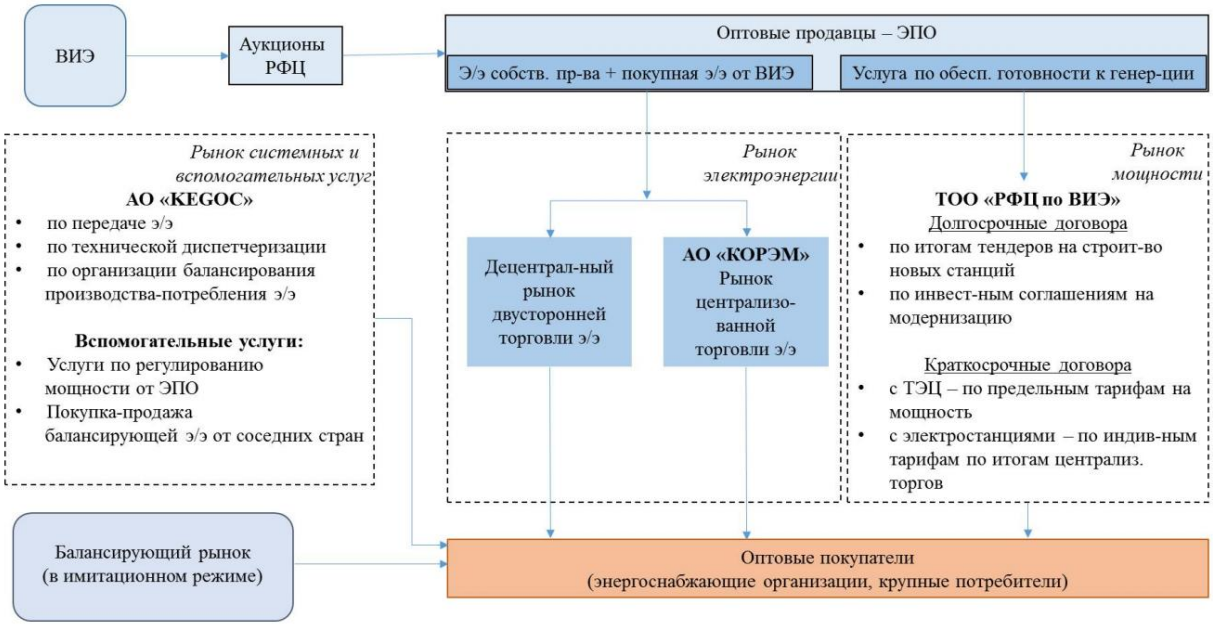
The wholesale electric energy and capacity market consists of a wholesale electric energy market, a balancing electric energy market, an electric power market, and a market for system and auxiliary services (Figure 1).

The wholesale electricity market includes decentralized and centralized markets for the purchase and sale of electricity, operating on the basis of agreements concluded between market participants on prices and delivery conditions established by agreement of the parties and based on the results of centralized trading of electrical energy in spot trading of electrical energy for the medium and long term.

The balancing electricity market has been operating in a simulation mode for more than 15 years, that is, without financial settlements (real monetary settlements for imbalances).

The electric power market is a market model with a Unified a purchaser carrying out centralized purchase and sale of services for maintaining and ensuring the readiness of electrical power, respectively. The capacity market operates under the terms of long-term contracts within the framework of investment agreements with the authorized body, as well as short-term contracts with energy-producing organizations, which include thermal power plants, and

the results of competitive selection (at centralized auctions) among existing energy producers



Rice. 1 – Wholesale market

organizations for the right to sell their power service for the upcoming calendar year.

The market for system and auxiliary services functions as a market for services provided by the system operator to subjects of the wholesale electricity market for transmission, technical dispatch, organizing balancing of production and consumption of electrical energy, power reservation, as well as services purchased by the system operator from subjects of the wholesale electrical energy market to ensure the necessary volumes and structure of regulatory reserves of electrical power, regulation of active and reactive power, for launching the energy system from a de-energized state.

Wholesale electricity market

Currently, an energy-producing organization sells electrical energy no higher than the selling price, defined as the sum of the marginal tariff for electrical energy of the energy-producing organization and a premium to support the use of renewable energy sources. At the same time, the values of marginal tariffs are not indexed to the level of inflation. At the same time, the establishment of individual price regulation for energy producing organizations from 2019

minimized and almost completely eliminated the conditions of competition between them

In conditions of the absolute predominance of bilateral contracts for the purchase and sale of electrical energy over centralized trade, there is limited access of energy supplying organizations and wholesale consumers to the electrical energy of energy-producing organizations that have a low level of marginal tariff. Under these conditions, the above-mentioned entities are forced to purchase electrical energy from energy sources that have a high level of marginal tariff.

Currently, there are several large entities operating in the electricity market (Samruk-Energy JSC, Eurasian Group LLP, CAEPCO JSC,
Kazakhmys Corporation), which own a significant part of traditional power plants, energy transmission and energy supply organizations.

Diagram 3 – Electric power distribution

At the same time, access of third parties to the electricity generated by the above groups is limited. There is a dominance of a limited circle of persons, whose total share in the installed capacity exceeds 75% (

diagram 3). The remaining share of 24% falls on owners who own more than 30 energy-producing organizations.

In fact, prices for electrical energy among end consumers in the country, as a basic good, vary greatly between regions, which in turn creates unequal conditions for the population and business. Moreover, the main reason for the difference in
prices for electric energy, in addition to individual price regulation for energy producing organizations, is the policy of local executive bodies and the body for regulating natural monopolies on tariff differentiation.

Centralized trading

An analysis of the organization and conduct of centralized electricity trading shows that over the past five years (Table 1) the demand for electricity from consumers and ESOs in the Northern and Southern zones of the UES of the Republic of Kazakhstan
significantly exceeds what is put up for auction by energy producing organizations
electrical energy and the number of participants reached a minimum level; accordingly, the volume of transactions for this period decreased to historical
minimum.

Table 1 – Comparative table of demand and supply volumes, million kWh

On Name new anni is	Spot trading					Long term and mid-term trading					
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	North-South zone of the UES of the Republic of Kazakhstan

About um before earth wife has	1042	480	221	962	165		26006	17334	1425	2338	2066
Etc Oh yeah vci . a hand .	6	8	4	5	5	198			8	5	5
About um ref wasp	539	1163	631	1400	398	126614	293118	36995	31005	9561	
Po a bunch and those do you a hand .	26	39	24	20	12	84	82	69	39	50	
About um here loc	98	345	190	794	109		21049	17598	749	2460	1254
IN refos to IN before earth wife to wash	52%	243%	285%	145%	241%	5once	17once	26once	13once	4,6once	
Where lki / ref axis	18%	30%	30%	57%	27%	17%	6 %	2 %	8 %		13%
Western zone of the UES of the Republic of Kazakhstan											
About um before earth wife has	0	0	0	107	762	0		0	0	0	0
Etc Oh yeah vci	0	0	0	1	1	0	0	0		0	

. a hand .									0	
About um ref wasp	0	0	0	0	0	0	0	0	0	0
Po a bunch and those do you a hand .	0	0	0	0	0	0	0	0	0	0
About um here loc	0	0	0	0	0	0	0	0	0	0
IN ref os to IN before earth wife to wash	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Where lki / ref axis	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %

In 2022, at centralized spot trading in the North-South zone of the UES of the Republic of Kazakhstan, demand amounted to 398 million kWh, supply - 165 million kWh, volume of transactions - 109 million kWh, in the Western zone there is no demand, supply - 762 million kWh, no transactions took place .

Analysis of the functioning of the centralized trade market shows that energy producing organizations in general are not interested in participating in the market due to the high concentration of vertically integrated energy companies in Kazakhstan; they do not strive for direct and open competition among themselves, dividing the market (consumers).

Retail electricity market

The retail electricity market is a system of relations operating based on public energy supply contracts between retail market entities electrical energy outside the wholesale market.

The retail electricity market in its modern form arose in 2004, when, in addition to the wholesale market, this market segment was liberalized electricity. For these purposes, in particular, a division was carried out

activities of regional electric grid companies for the transmission of electricity from energy supply activities and the creation of ESOs in the form of legally separate enterprises.

The introduction of a competitive market model assumed that ESOs would be created privately, which would compete with guarantee suppliers and among themselves for the supply of electricity to retail consumers, and thus on

competition will be ensured in the market.

As can be seen, many private ESOs have been created on the market, but have not yet succeeded in Finally, organize the optimal structure of the product market to develop competition between ESOs.

At the same time, the development of competition in the retail market between ESOs is conceptually limits:

the current structure of monopoly affiliation in the market;

price regulation mechanisms in the form of cross-subsidies;

unformed activity of retail consumers, especially in the matter of

change of suppliers.

2.8 International electricity market

As part of cross-border trade in electricity, the Republic of Kazakhstan in

Currently involved in the creation of two markets.

1. Common electric power market of the Eurasian Economic Union (hereinafter

– OER EAEU).

This market is being formed as a regional market based on the integration of the wholesale electricity markets of the 5 EAEU member states, which have very different designs and rules for the wholesale trade of electricity.

Taking into account the peculiarities of national markets, the parties reached an agreement when forming the EAEU OER to preserve the existing

national electricity markets.

The methods for carrying out mutual trade in electrical energy between participants in the common electric power market of the Union will be:

free bilateral agreements;

centralized trading in futures contracts (week, month, quarter, year);

centralized trading for the day ahead;

settlement of hourly deviations of actual balance flows

electrical energy from planned values.

The capabilities of each subject of the internal wholesale markets of the member states when participating in the EAEU OER will primarily depend on the energy

stability in the participating countries and the economic situation in the world, the development of generating capacities, and of course the ongoing policy in the field
electric power industry.

2. Regional Electricity Market of Central Asian Countries (CAREM – Central
Asia Regional Electricity Market).

The project provides technical assistance to five Central Asian states (hereinafter referred to as CA) and supports building their capacity to form a regional market. Such a market is expected to strengthen the region's energy security, attract private investment in each country's energy sector and contribute to economic growth, and facilitate electricity trade between Central Asia, Afghanistan and Pakistan.

The main purpose and benefits of the Regional Electricity Market of Central Asia
are to improve the efficiency of electricity markets by:

optimizing the use of primary energy resources;

increasing the reliability and efficiency of the corresponding energy systems due to
sharing reserves and support in emergency situations;

improving conditions for integrating constantly growing volumes of unstable generation based on renewable energy sources into energy systems by combining balancing resources.

An important circumstance for the integration of electricity markets of Central Asian countries is that the energy systems of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan are already united, and Turkmenistan intends to join the United Central Asian Energy System after disconnection in 2003.

2.9 Professional staff issues

In the electric power industry, the level of remuneration of production personnel remains low, and therefore there is an outflow of qualified personnel to related industries, where in most regions the wage level is 1.5 - 3 times higher.

Diagram 4 – Average salary

Chart 4 displays a summary of the average wages of CHP production personnel compared with average wages by
region and in the industrial sector across the region.

In comparison with the average salary in the region, satisfactory levels of salary for the production personnel of thermal power plants are only in Almaty, Almaty
, East Kazakhstan, Kostanay, Pavlodar and North Kazakhstan regions.

In the remaining 2 cities of republican significance and 12 regions, the average salary at thermal power plants does not reach the level of the average salary in the region. At the same time, the situation is critical in the Kyzylorda region (44% of the regional level) and Abay region (49% of the regional level).

In comparison with the average wage in the industrial sector in the region, the wage levels of production personnel of thermal power plants are satisfactory only in Almaty, Almaty, Kostanay, Pavlodar and North Kazakhstan regions.

In the remaining 2 cities of republican significance and 13 regions, the average wage at thermal power plants does not compete with the average wage in the industrial sector in the region. At the same time, the situation is critical in Atyrau (30% of the level of the industrial sector in the region), West Kazakhstan (34% of the level of the industrial sector in the region) and Mangistau (37% of the level of the industrial sector in the region) regions.

Diagram 5 – EPO personnel shortage

According to the EPO survey, there is a shortage of personnel, which also negatively affects the reliable functioning of the organization. Diagram 5 shows information on the shortage of production personnel at stations across the country at the end of 2022. At the same time, Aktobe CHPP JSC, Ridder CHPP JSC, Stepnogorsk CHPP LLP, Pavlodarenergo" (CHP-3), State Enterprise "Teplokommunenergo", LLP "Ekibastuzenergo" have the greatest shortage of working personnel.

2.10 Main problems of the electric power industry

High accident rates. In 2022, 1,789 technological violations occurred at power plants, which is 23% more than in 2021 (1,456). It is worth taking into account the major accidents that occurred at the Petropavlovskaya CHPP-2, Ekibastuz, Ridder CHPP.

There were 20,017 technological violations on electrical networks, which is 48% more than in 2021 (13,525).

The main factor in the growth of accident rates and the level of wear and tear of capital equipment are:

lack of responsibility of shareholders (founders) and top managers of energy enterprises for the quality of ongoing repair campaigns;

reduction of qualifications of authorized bodies and employees of energy companies and production discipline in general;

a decrease in the investment attractiveness of the industry, and as a consequence, a limitation in the possibility of carrying out reconstructions, modernizations and major repairs of energy assets, which led to their physical and moral deterioration.

Shortage of electrical energy and power. Due to the insufficiency of generating capacity, according to the Forecast balances of electrical energy and power for 2023 - 2029 (approved by Order No. 20 of January 20, 2023), a deficit is predicted:

electrical energy: in 2023 – 0.8 billion kWh, in 2024 – 1.6 billion kWh, 2025 – 1.6 billion kWh, 2028 – 1.3 billion kWh, 2029 – 5.5 billion kWh;
electric power: in 2023 – 1414 MW, 2024 – 1239 MW, 2025 – 1354 MW, 2026 – 454 MW, 2027 – 1184 MW, 2028 – 2158 MW, 2029 – 3076 MW.

At the same time, a number of planned projects to commission new capacities are being implemented with lag of more than 5 years, or completely suspended.

The need to create the integrity of the energy system. With the commissioning of new generating capacities, it is necessary to strengthen and develop the national electrical grid and utilize the potential of the regulatory power of the West countries.

Poor development of thermal power engineering. Despite its social importance, the country's thermal power industry is not being properly developed. At the beginning of 2023, the technical condition of the thermal infrastructure of many regions is in an unsatisfactory condition, and the legal gaps in industry legislation regulating relations in the field of thermal power engineering and control issues have not been resolved. There are no schemes (plans) for the development of heat supply in the regions. In addition, the market is characterized by low tariffs for thermal energy, low investment attractiveness, and lack of qualified personnel. At the same time, there is a problem locally with the lack of complete and reliable information about the technical condition and performance of centralized systems

heat supply, which does not allow assessing the state of the industry for quality planning and development.

Insufficient level of digitalization of the industry. At the beginning of 2023, the low level (limited coverage) of digitalization and automation in the processes of production, transmission and consumption of energy leads to:

the absence of a unified system for collecting and verifying the reliability of data, the predominance of manual data collection;

low observability of electrical modes in real time and limiting the efficiency of power system management;

limiting consumers in managing their own energy consumption modes.

Limitations to achieving environmental commitments. In order to achieve carbon neutrality, the country has set a course for decarbonization of the industry. Due to which marks the beginning of the fulfillment of environmental obligations through development

renewable energy sources (RES) and alternative energy. However, for the purposes of energy security, given the decline in proven reserves of natural gas and the limited gas transportation infrastructure (the rate of commissioning of gas stations will be reduced), in the medium term, coal stations will retain their presence in the generation sector. The implementation of the best available techniques (hereinafter referred to as BAT), an automated system for monitoring emissions into the environment (hereinafter referred to as AFM), carbon capture and storage, direct atmospheric capture (DAC, Direct Air Capture) are capital-intensive, and data costs

the measures are not provided for in the existing tariff setting methodology. Thus, at the moment there is no mechanism and source of financing environmental activities (introduction of ASM and BAT, financial support for eliminating the consequences of the operation of category I facilities). In addition, there are no

coordinated plans for the commissioning and decommissioning of generating capacities in the long-term prospects of the transition to carbon neutrality.

Ineffective tariff system. Due to the containment of tariffs for a long time, there was a low level of investment in the industry, which led to the above problems. Solving these problems is not possible without

a sufficient amount of funds poured into the industry, which in turn requires a revision of the tariff policy. In modern conditions, indexing tariffs to the level of inflation is not enough, since for many years there was an artificial containment of tariffs, which led to deterioration of networks, as well as an outflow of qualified personnel due to low wages. Besides,

There are no government support measures for preferential lending for capital-intensive investments in the electric power industry.

Ineffective energy control system. The industry needs measures to improve the efficiency of the current energy control system, such as reciprocal obligations, increasing the responsibility of energy sector entities and their top managers, enforcement of regulations, transparency of procurement procedures for energy enterprises and natural monopoly entities (hereinafter referred to as CEM).

The need to develop a wholesale market model. The existing wholesale market model has the following gaps: speculative operations when buying and selling
electricity, unproductive intermediaries, lack of equal and non-discriminatory access to electrical energy, functioning of the balancing market in a simulation mode, lack of obligations of energy producing organizations on the intended use of funds in the power market,

the market for system and support services is not developed and is almost completely tied up
in import supplies, a high concentration of vertically integrated companies remains.

Lack of institutional framework. At the beginning of 2023, there was a weak institutional basis for the energy industry, due to the lack of an Energy Development Institute to conduct analytical work, develop strategies and proposals for improving legislation. In addition, there is a lack of investment support for research and new developments.

Low wages and lack of qualified personnel in the industry. One of the critical problems of the electric power industry is the low level of remuneration of production personnel. In this regard, there is a sharp outflow of qualified personnel into related industries. It should be noted that the wage fund of energy enterprises is limited by the tariff estimate, and accordingly by tariffs.

Conclusions from the analysis of problems and trends

Most problems are common to specific areas
electric power industry and are intersectoral in nature, these include:

1) Technical condition and limitations:

predicted shortage of electrical energy and power;

high level of wear, and as a consequence, high accident rate of energy
assets of the UES of the Republic of Kazakhstan (generating and energy transmission);

capacity limitation between individual NPP power nodes and
isolation of the western zone of the UES of the Republic of Kazakhstan;

low level of digitalization and automation of the industry.

2) Investment costs:

reduction in investment in energy assets due to the current tariff regulation system, which also does not provide incentives to reduce own costs and increase efficiency;

lack of long-term state tariff setting policy,
taking into account the indexation of tariffs to the level of inflation;

lack of government support measures for preferential lending for capital-intensive investments in the electric power industry.

3) Market disadvantages:

contradictions between the market basis of the rules and design of the electricity market and the policy of price regulation of market segments (electricity production and supply).

4) Regulatory issues:

a large number of energy transmission organizations;

lack of an independent Market Council.

5) Limitations to achieving environmental obligations:

inconsistency between environmental policy and tariff regulation policy
industries;

lack of mechanisms and sources of financing environmental activities (introduction of ASM and BAT, financial support for eliminating the consequences of the operation of category I facilities);

lack of coordinated plans for the commissioning and withdrawal of generating capacities in the future of the transition to carbon neutrality.

6) Institutional issues:

lack of an institute and (or) scientific and technical council for the development of the electric power industry (carrying out analytical work, economic modeling and calculations of the impact of the electric power industry on the economy, developing proposals for improving legislation and the strategic vision of the industry).

7) Socio-economic issues:

deterioration in the overall production discipline of energy companies;

low wages in the industry and, accordingly, a shortage of personnel;

reduction in the qualifications of government bodies and energy sector employees companies.

Section 3. Review of international experience

3.1 Electricity market models

Summarizing the global experience of reforming the electric power industry, we can highlight four basic models of functioning of the electric power industry:

1) vertically integrated model - the cycle from production to sales of electricity is carried out within an integrated company, while sales are carried out at regulated tariffs;

2) the model of independent producers – essentially a vertically integrated model, subject to the existence of competition among producers;

3) single buyer model – competition between producers to obtain a contract for the supply of electricity to a single buyer, who sells electricity to sales companies at regulated tariffs;

4) competitive model – competition between electricity producers within wholesale electricity market, the main buyers of which are sales companies that directly interact with consumers.

Each of the listed models has both advantages and disadvantages, the combination of which, in combination with internal factors characteristic of a particular country, influences the choice of the target model for the functioning of the electric power industry. The advantages and disadvantages of each of the four models are presented in Table 2.

Table 2 – Advantages and disadvantages of electric power industry models

Models	Advantages	Flaws
Vertically integrated model	maintaining the existing structures; predictability for consumers and states	lack of economic incentives to improve efficiency; the need for the state to control prices - participation in industry financing or passing on costs to consumers
Manufacturers independent model	attracting private investors with minimal structural changes; ability to control prices – predictability for consumers and states	need to attract private capital industry state guarantees in terms of price levels and policies regarding other market components
Single buyer model	attracting private investors with limited structural changes; the ability to control prices; predictability for consumers and states	the need to ensure transparency in the work of the “single purchaser”; occurrence of a cash gap energy producing organizations in view of late receipt electricity payments from a single purchaser"
Competitive model	attractiveness for private investors; availability of incentives to improve efficiency; stimulation of self-development industry	lack of control for prices; the need for significant structural changes; correction of the price level to an economically justified level level

Models for organizing economic relations in the electric power industry of different countries were built in accordance with the main goal and based on the availability of initial economic conditions (sufficiency of generating capacity, relative volume of electricity production, level of transmission integration within the country with neighboring countries, ratio of prices on the wholesale market to economic cost
, access to the stock market, etc.), and depending on the reasons for the restructuring, its specific paths and directions were chosen.

The specific ways of market transformation of the electric power industry are different in different countries. At the same time, each country was solving common fundamental problems, without which restructuring would not have been possible. To such tasks include: technology for transferring electricity into private hands, determining the types of independent market entities, choosing the form of organization of the electricity market, developing a mechanism for trading and settlements in the electricity market, determining the degree, form and methods of regulation of the electricity market.

The transition to a market-based, more or less competitive model of the functioning and development of the national energy sector is associated with certain problems, the need to solve which, one way or another, is faced by each of the countries that have taken the path of restructuring enterprises in the electric power industry:

division of the industry by function, i.e. separation of electricity generation from its transportation and distribution;

creation of a competitive generation market;

formation of electricity infrastructure;

application of more restrained government regulatory policies;

price regulation only through limiting it from above, a departure from regulation by limiting the rate of profit;

separation of the electricity transmission function from its distribution and sales;

gradual creation of conditions for competition in the field of electricity trade;

attracting foreign investment in the national electric power industry;

creation of independent system operators.

Solving problems and choosing a way to restructure enterprises in the electric power industry of an individual country is primarily associated not only with national specifics, but also with the investment opportunities of each specific individual states.

As a result of the analysis of the essence and content of the processes restructuring of national energy companies on the basis of functional division and the introduction of a competitive mechanism for its existence and development, we can conclude that in the modern period, a wholesale electricity market has emerged to one degree or another, and in most countries

positive results have been achieved, such as increased reliability of power supply to consumers, increased operating efficiency power industry and lower prices for industry products.

Thus, based on world experience, Kazakhstan will reform model of the wholesale electricity market.

3.2 Experience in organizing and functioning of self-regulatory organizations in electric power industry

International experience of four self-regulatory organizations in the field of electricity - the Russian Federation, the European Union, the state of Texas in the United States of America (ERCOT - Electric Reliability Council of Texas), as well as the North American Electric Reliability Council (NERC -

North American Electric Reliability Corporation) was taken from a report on the Kazakhstan Market Council - a new model prepared by TETRA TECH ES, INC for

USAID (United States Agency for International Development) project "Energy in Central Asia".

Market Council (Russian Federation). The Market Council was created to ensure
the functioning of the commercial infrastructure of the electricity market, the effective relationship between the wholesale and retail markets, the creation of favorable conditions for attracting investment in the electricity industry and the development of a common position of participants in the wholesale and retail markets on issues

electricity industry and promoting self-regulation in the electricity market.

The Market Council maintains a register of wholesale market entities; develops forms of wholesale market regulations and standard contracts; organizes processes for pre-trial settlement of disputes (mediation) between wholesale market entities and others
subjects of the electric power industry; establishes a system and procedure for applying property and existing penalties to wholesale market entities, including exclusion from the Wholesale Electricity Market; participates in the preparation of draft rules for the wholesale and retail markets and proposals for changing them; exercises control over compliance with the rules and regulations of the wholesale market by wholesale market entities; confirms the volume of production based on renewable energy sources by qualified generating facilities; monitors price

situations in the wholesale and retail markets; conducts assessments of the economic consequences for consumers in the wholesale and retail markets of electrical energy (capacity) caused by the possible decommissioning of a power plant, in respect of which the owner has submitted an application for decommissioning.

ERCOT (Texas, USA). Texas operates a power grid with dozens of affiliated wholesale and retail electricity suppliers operating on the open market. ERCOT is an independent, non-profit organization that

manages the operation of the State's power grid and the operation of the wholesale and retail markets while ensuring non-discriminatory open access to the transmission system. ERCOT is regulated by the state Regulatory Utility Commission
services.

ERCOT's primary responsibility is to balance supply and demand to ensure reliable operation of the power grid and manage the flow of electricity to the state's approximately 26 million people.

ERCOT also ensures that it remains competitive in the electricity market by monitoring and managing exchange transactions between
electricity suppliers and energy generating organizations, ensuring that their operations comply with ERCOT's rules and regulations. In addition, like other organized markets, ERCOT has a designated market monitor whose role is to evaluate market competitiveness and potential or actual abuses.

on the part of market participants and developing recommendations to improve the functioning of the market. In addition, regulators also monitor the market to ensure that results, including prices, are fair and reasonable.

received on the market.

As of April 2021, ERCOT states that it is funded by a system administration tariff of 55.5 cents per MWh, which is
0.0555 cents per kWh. For most Texans, that means about 50 to 60 cents of their electric bill each month goes toward funding ERCOT.

NERC (North American Electric Reliability Corporation). NERC is an international organization created to ensure the reliability of North America's high-voltage power system (Bulk Power System or BPS). Its mission is to provide efficient and effective risk reduction to ensure the reliability and safety of power system operation, for which it "develops and applies reliability standards; annually evaluates seasonal

and long-term reliability; monitors power systems at the high voltage level and provides education, training and certification to industry personnel." NERC's area of responsibility covers the continental United States, Canada and northern Baja California in Mexico. NERC is an Electric Reliability Organization (ERO).) in North America, overseen by the US Federal Energy Regulatory Commission (FERC) and Canadian government agencies. NERC has jurisdiction over customers, owners and operators of high-voltage electrical systems that serve nearly 400 million.

Human.

NERC's annual business plan and budget are subject to approval by FERC, and once approved, NERC's annual funding comes primarily from contributions from consumer service organizations. These contributions are distributed on the basis of "electricity demand". Similar funding mechanisms are provided in Canada under the specific laws and regulations of each province. Regional organizations' funding requirements are addressed separately in their respective business plans and budgets, which must be reviewed and approved by NERC and FERC. The assessments for regional organizations in the United States are included in NERC's total assessments for consumer service organizations. NERC is also funded by third party funding, fees for training, testing, seminars, software services, and interest on fines for violations of electrical grid reliability.

Nord Pool (Northern Europe). The Nord Pool Group operates the leading European electricity market in terms of electricity trading, clearing,
concluding contracts and providing related services in day-ahead and intraday markets in 16 European countries. Interconnections between the Nordic countries, the European continent and the Baltics have created a large market, which has increased the reliability of energy supply and also opened up access to various sources of energy generation. Around 360 businesses from 20 countries trade on Nord Pool markets in the Nordic and Baltic regions, the United Kingdom (UK), Central Western Europe (covering Austria, Belgium, France, Germany, Luxembourg and the Netherlands) and Poland.

Nord Pool refers to markets where only electricity is traded (markets without capacity trading), as opposed to markets in which there is payment and trading of capacity, such as in Russia. In the Nord Pool electricity markets, consumers do not pay for the availability of generating capacity, and electricity suppliers do not receive payments for capacity.

The Nord Pool market system consists of four independent markets - spot, futures, options and basic. The Scandinavian electricity market has the following features: uniform trading rules, absence of cross-border duties on the purchase and sale of electricity, trading of electricity on a centralized market in two forms (physical supply of electricity, that is, direct supply of electricity from producer to consumer, and financial instruments).

In Kazakhstan, taking into account global experience, the Market Council will be reformed and improved.

3.3 Digitization

Internet of Things

According to PricewaterhouseCoopers (PwC), when implementing the Internet of Things in the Russian electric power grid complex, the focus should be on improving the controllability of substations, power lines and other network elements through remote monitoring. Such projects will help reduce operating and maintenance costs, while simultaneously preventing technological and commercial

losses.

As for the electricity production sector, the use of the Internet of Things (hereinafter referred to as IoT) will reduce fuel consumption, the purchase of which currently accounts for more than half of the operating costs of stations

. The overall economic effect from the introduction of IoT in the electric power industry until 2025,
according to expert forecasts, will reach 532 billion rubles, of which 180 billion will be
prevented energy losses.

IoT-based solutions in the energy sector are increasingly being combined with the functionality of artificial intelligence (hereinafter referred to as AI) and machine learning for processing and analyzing large data arrays generated during equipment operation. Technologies help to identify non-obvious patterns in the operation of objects, literally “hear” the enterprise and build a dialogue on a new level based on this information. In world practice, power plants are already appearing that can effectively monitor and manage basic work processes in a completely autonomous mode using data collection and analysis tools. For example, the capabilities of AI and machine learning are quite sufficient to cope with the monitoring and adjustment of gas turbines - these tasks are already automated in one way or another in thousands of enterprises around the world.

An example of successful IoT projects in the Russian electric power industry is the project at Inter RAO Electric Power Plants. The company's system for collecting, transmitting and calculating technological information helps reduce fuel burnouts and increases operational reliability. The payback period of the project is estimated at 5–7 years, taking into account the fact that the system allows saving 130 billion rubles on fuel annually.

Where it is not technically possible to install sensors, the problem is solved by equipping personnel with eSOMS (electronic Shift Operations Management System) systems. Rosenergoatom Corporation implemented such solutions at the Smolensk and Voronezh Nuclear Power Plants (hereinafter referred to as NPPs), where with their help it was possible to optimize the tasks of inspecting facilities, compiling reports and reconciling historical data with the ability to create predictive models.

Robotization

In the power industry, investments are growing to create a new level of safe working environment for power plant personnel, and one of the leading trends here is the commercial introduction of robots that are resistant to extreme working conditions and controlled remotely. Such solutions are also based on AI/IoT technologies, and recently augmented reality functionality has been added to their capabilities, with the help of which images from cameras on the robot
gets an interactive component.

In the West, robots are being developed and implemented to perform the functions of diagnostics and maintenance of high-voltage power lines. Such mechanisms are suspended from the line wires, and their actions are controlled from the ground using a controller by the operator. The robots are equipped with sensors and video cameras that allow them to identify problem areas on the wires.

In areas with long winter periods, robotic cleaners are used to remove snow and ice from power lines, and some models are capable of
unscrew and tighten bolts and nuts, remove foreign objects from wires.

Nuclear power plants are also being robotized: for example, robots are given the task of checking the primary circuits of reactors using ultrasound.

Smart Grid

The problem of continuous operation of power grids remains unresolved throughout the world: even in countries that are relatively prosperous in this sense, 100% fault tolerance of networks cannot be achieved. In the US this figure is 99.97
%, just a few failures in a year can lead to losses of $100-150 billion.

To solve this problem, technologies from the Smart Grid family are used - a smart power grid." In essence, this is a less centralized, more controlled automated infrastructure, built on the basis of several concepts that are actively being developed today. These include an advanced infrastructure for consumption metering and various solutions for visualization of distribution loads and
available network resource in real time.

In the European Union, the adopted Smart Grid concept involves the full integration of distributed small-scale generation into energy systems using modern telecommunications and information technologies. There are also interpretations of the Smart Grid concept with an emphasis on electrical distribution networks, including distributed generation with the formation of active and adaptive properties of networks through the development of a distributed adaptive automation system, the widespread use of computer technologies and modern control systems

One of the main properties of power systems in the Smart Grid concept is self-healing in case of emergency disturbances and resistance to negative
influences.

Two clear and effective examples of mastering the Smart Grid concept are the Jeju Smart Grid Demonstration Project in South Korea and the Smart Grid Smart City (SGSC) in Australia.

Jeju Smart Grid Demonstration Project. South Korea imported up to 97% of its energy and the climatic features of the country increased the need for autonomy: in the fall, Pacific typhoons pass near the coastal areas, most often off the coast of Jeju Island. The Jeju Smart Grid Demonstration Project launched in 2009 and was tested until 2013 on Jeju Island, whose sunny and windy climate makes the island an ideal location for the implementation of the Micro Grid concept. The project, covering 6,000 homes, is being overseen by the Korean Ministry of Trade, Industry and Energy (MOTIE). By 2030, the island is planned to be CO2 neutral and energy independent. In the implementation of the project

169 companies are participating.

On target, South Korea is expected to generate 11% of its total energy from renewable energy sources by 2030 (up from 2.1% in 2012)

, will eliminate 230 million tons of CO_2 . will create 50 thousand jobs, receive 74 trillion won ($64

billion) on domestic demand for new technologies, will save from 47 trillion won ($40 billion)
that are spent on importing energy will no longer need to build new
factories worth 3.2 trillion won ($2.8 billion) and will earn 49 trillion ($42 billion) from exporting its developments.

Smart Grid Smart City (SGSC). The Smart Grid Smart City (SGSC) project in Australia is developed and funded by the Australian Government in collaboration with Ausgrid, Energy Australia and their partners: IBM Australia, GE Energy Australia, Sydney Water and Newcastle City Council. Funding for the project consisted of a $100 million government grant and a $400 million project consortium. The project began in 2010 and was officially completed in 2014.

Analysis of the results of the system suggests an economic benefit of $9.5
up to 28 billion over 20 years, private consumers will save from $156 to 2 thousand per year.

In Russia, Smart Grid technology is being implemented by Rosseti as part of 10 pilot projects: this is the company's own solution, which is expected to reduce electricity losses by 225.3 million kWh and achieve a level of optimization of repairs worth 35.8 billion rubles.

One of the first "digital" substations (hereinafter – substation) 110 kV opened in Krasnoyarsk in 2018. The substation is made on the basis of the iSAS software and hardware complex - an integrated substation protection and control system for providing relay protection, emergency automation and automated control systems. Thanks to digitalization, it was possible to reduce the amount of cable for various purposes by 10 times: from 150-160 km to approximately 15 km. In general, the substation cost 5% cheaper than analogues of the previous generation, and in the future, taking into account the increased reliability of its operation due to a high degree of automation, new quality of monitoring and controllability, as well as due to the absence of operational personnel, over 30 years of operation the substation should provide an economic effect of about 75 million rub.

Electricity demand management

The development of telecommunications, the widespread use of automation systems and automation, as well as the evolution of developed electricity markets, have led to the emergence of the concept of demand management, which involves increasing the elasticity of demand through targeted influence on consumer equipment when appropriate economic or technological conditions arise.

The cheapest power on the energy market is available to consumers in the form of
ability to manage its demand, it does not cost the market anything in terms of investment, but it solves current problems, for example, in terms of regulation, better than

any generation, not to mention the serious savings on the construction of peak energy infrastructure that demand management can provide when reaching a certain scale.

The main goals of electricity demand management are to reduce peak load in the power system, which is necessary both to reduce prices on the electricity market and to prevent excessive capital-intensive construction of power plants and electrical networks, optimize energy system management, and integrate renewable energy sources.

Various types of equipment can be involved in demand management industrial, agricultural, commercial and residential consumers.

The main opportunities for consumers to participate in demand management are related to shifting the consumption schedule to periods of lower prices, stopping or reduction in the intensity of the production process, complete or partial turning off lighting, ventilation and air conditioning systems, as well as using your own sources, including starting backup power supplies or disconnecting from the network for isolated operation, covering your own consumption from a backup power source.

The potential for reducing peak load in the power system through the use of demand management programs is, according to various estimates, 10-15% of the peak load.

The creation of aggregators as a new function in the electricity market is a key impulse that ensures an increase in the volume of managed demand, attracting private investment and increasing competition.

Practice shows that an important element of the regulatory design is the admission of independent aggregators to the market: for example, in some markets in the United States, over 80% of demand management volume is provided by independent aggregators (82% in PJM according to 2015 data), despite the fact that suppliers can also act as aggregators.

Automation of maintenance and repair

Repair work and maintenance of facilities (MRO) is one of the basic components of business processes of the largest systemically important companies in the energy segment. The FSA area (field service automation systems) today can be called one of the most dynamically developing in the electric power industry - IT solutions in this area allow you to quickly receive data on the status of a task after the team has visited the site, avoid duplication of tasks when fixing network defects, and strengthen control over the execution of work and remove typical shortcomings from the work processes of service engineers and repair teams.

Modern solutions in this area have ample scalability and integration with other industrial information systems: ERP, EAM and CMMS, support compatibility with mobile platforms (Android, Windows 8.1/10), are NFC compatible and provide rapid data exchange via any wireless communication channels in mode

real time.

At the end of 2018, PJSC began to use such a system in its practice.
Kubanenergo", connecting about 800 employees to it.

Centralized monitoring

In the segment of thermal power plants and hydroelectric power plants, there is a high demand and relevance for solutions for centralized monitoring of the technical condition of power units, compliance with industrial safety rules and monitoring of personnel work.

It is clear that control rooms at such facilities have always existed, but
the real embodiment of the concept of centralized monitoring became possible relatively recently, thanks to the development of data exchange protocols (FC, iSCSI, etc.), which together made it possible to reliably connect geographically remote systems
monitoring from a central point. An important role in the development of centralized
Monitoring also played a role in virtualization technologies, which make it possible to reduce the load on local IT resources of the facility, and solve critical tasks of working with data in a remote data center.

Based on global experience, further digitalization is needed in Kazakhstan
industry, in connection with which the “Intelligent Energy System” will be introduced.

3.4 Development of generation by type of energy resources used

France. In November 2021, a strategic decision was made to resume the construction of nuclear reactors in order to ensure the country's energy security and the main emphasis for the period until 2050 will be on

nuclear power plants.

It is planned to extend the operating life of the 56 existing nuclear reactors to 50 years; before this, a period of 40 years was considered safe. Six new EPR-2 generation reactors will also be built. Their construction will begin in 2028, and commissioning
commissioning is scheduled for 2035. At least 50.5 billion euros will be invested in the project. More
In addition, eight more such units are provided, they will appear later.

Regarding renewable energy sources, the place of which in the energy balance of France is still small, the emphasis will be made using solar energy compared to wind generators.

The volume of energy received from the sun is planned to increase 10 times, and from the wind - by twice, for which 50 offshore wind parks will be created. Currently, nuclear power plants generate more than 70% of all electricity consumed in the country (

it is planned that there will be 80%). The share of the sun is up to 2%, wind – 8%, gas and coal – up to 9% of all generation. At the same time, thanks to the large capacities of nuclear power plants, France produces more electricity than it consumes, exporting it to Germany and Italy.

Germany. According to the German government, in 2022 the country imports about 35% of its natural gas from Russia (55% in 2021), using most of it for heating and industry.

In 2021, electricity production using natural gas accounted for about 15% of Germany's total electricity production. In 2022, the share of gas in electricity production will decrease. Germany has outlined a number of steps that should accelerate the reduction in the share of gas in

energy complex and create reserves for next winter.

The government will give companies the opportunity to expand the use of coal-fired power plants as an alternative energy source, given the delay in meeting environmental targets to reduce greenhouse gas emissions. Law on

The use of coal will be valid until March 31, 2024, by which time the government hopes to create a sustainable alternative to Russian gas.

The government plans to introduce an auction system that will encourage industry to reduce gas consumption. Coal-fired thermal power plants have

in Germany, the total capacity was 45 GW and produced approximately a third of the country's total electricity. By 2022, it was planned to disconnect thermal power plants with a capacity of 12.5 GW from the power grid.

Previously, Germany had already decided to abandon nuclear energy by 2022. But in order for the country to meet national and international climate protection targets, Germany must accelerate the transition to clean electricity. By 2050, the country's carbon dioxide emissions should be 80-95 percent of 1990 levels.

Japan. Japan intends to reduce energy dependence by resuming the operation of nuclear power plants that were shut down after the accident at the Fukushima-1 nuclear power plant in 2011. Requirements for nuclear facilities have been tightened; out of 30 nuclear power units, only a few are operating. Before the accident at the nuclear power plant in Fukushima Prefecture, nuclear power accounted for about 30% of Japan's energy balance, while now this figure is about 4%, and the main burden fell on thermal power plants. The country's government expects a partial restart of the nuclear power plant in the near future.

Japan will increase its own energy independence not only for

account of nuclear power plants, but also by developing green energy, as well as diversifying sources of energy supplies.

It plans to attract 150 trillion yen ($1.16 trillion) of new investment through 2030 to implement a roadmap that includes the following initiatives: making the most of growth-oriented carbon pricing, which increases predictability for companies while promoting growth and innovation; using investment promotion measures that integrate regulation, such as energy efficiency standards, and financial support, such as helping to promote long-term large-scale investment, as a package; reducing greenhouse gas emissions by 46% by 2030; achieving carbon neutrality by 2050.

USA. U.S. nuclear power plants produce more than half of carbon-free electricity, so support is being given to keep these plants running to meet clean energy goals. The United States will provide $6 billion to support commercial nuclear power plants threatened with closure due to financial difficulties.

British and American companies are developing electronic platforms and design solutions for projects to convert coal power plants into nuclear ones. It is proposed to install modular reactors at thermal power plants and thermal power plants instead of coal boilers and begin re-equipment by 2030. It is planned that the installation of small modular reactors (hereinafter referred to as SMR) at thermal power plants and thermal power plants will reduce costs by 35% compared to the construction of new nuclear power plants, and the first reactors will appear by 2027, the conversion process can begin in 2030. For now, project participants plan to work in the United States, where coal generation is second only to gas.

According to the International Atomic Energy Agency, the construction of SMRs is the most promising option for the development of nuclear energy. The main advantages of SMRs, whose capacity is up to 300 MW per power unit, are the speed of construction (depending on the technology 3-5 years), compactness (the required area is about 6 hectares), efficiency (refueling every 3-7 years, in some cases up to 30 years), disposal (less disposal costs).

China. China, which ranks first in the world in air emissions
carbon dioxide, is also a leading investor in alternative energy sources. In 2016, roughly two-thirds of China's electricity came from coal and a quarter from clean sources, with nuclear power accounting for 3.4 percent of total electricity production. Over the past year alone, China has increased the total capacity of nuclear power plants from 27 to 34 GW - this is the most significant increase in the country's history.

The goal of the Chinese leadership: 110 nuclear power plants in 2030 with a capacity of 130 GW, which will allow the implementation of plans to reduce greenhouse gas emissions. To this end, Beijing will annually commission four to six new

reactors. Reactors produced in China will be located not only on the territory of the PRC itself, but also in neighboring countries - along the so-called new “Silk Road” passing through the countries of Central Asia and Pakistan.

India, Pakistan and South Korea. Other countries in the region are also in no hurry to abandon the peaceful atom. The Indian economy is growing at 6-7 percent a year, but power outages and aging infrastructure are hampering the country's development. Like Beijing, Delhi is also focusing on the development of alternative energy. At the same time, the country's political elite is convinced that India

must use all opportunities for electricity production, including

nuclear power plants. In May, the Indian government decided to build ten new reactors. Currently, there are 21 nuclear power plants operating in the country.

Neighboring Pakistan is also struggling with power outages and aging infrastructure. The country currently operates four small reactors; the government plans to build seven more by 2030. China will also participate in the construction of new nuclear power plants.

At the same time, in a small territory of South Korea, as many as 25 nuclear power plants are now operating. Three more are under construction, two should be operational by 2029. According to the authorities' plans, the share of nuclear energy in the country's energy balance should increase from 30 to 40 percent.

There are also active discussions on this topic in other countries in Southeast Asia. Vietnam intends to build eight, and Thailand – five new reactors. Both Malaysia and the Philippines are planning to launch one reactor each.

Taking into account the global experience of the generation structure, in addition to the further development of renewable energy sources,

in Kazakhstan it is advisable to develop alternative energy, in particular nuclear

Section 4. Vision for the development of the electric power industry

Taking into account global challenges and constant changes in the world economy, as well as taking into account international experience, the Republic of Kazakhstan needs accelerated and a complete transition to a sustainable, efficient and flexible electricity industry, capable of being ready to take on challenges and threats at any time.

The development of the electric power industry is focused on the following:

technical re-equipment will ensure coverage of the forecast demand for electrical and thermal energy, reliability of energy and heat supply, strengthening the transit potential of electrical networks, reducing losses in electrical networks through the modernization of existing and construction of new generation, the integration of the energy system of Western Kazakhstan with the UES of Kazakhstan;

digital transformation will ensure the organization of primary data collection without human participation, the creation of an infrastructure for transmission/storage/protection/processing of data, the creation of a system for managing and monitoring the reliability of energy supply, and the development of customer services for consumers;

improvement of the tariff setting system will make it possible to cover the costs of energy enterprises, which will subsequently improve the technical condition of assets

. will increase the security of energy supply (reduce accident rates), will allow the introduction

the best available technology will improve the socio-economic situation of industry workers;

reforming the wholesale electricity market in terms of introducing a model of centralized purchase and sale of electricity and introducing a real-time balancing market for electricity will ensure the principle of full competition between market participants, averaging the tariff for electricity

for consumers, equal conditions for subjects of the wholesale market, reduction of deviations in the production and consumption of electrical energy of subjects,

improvement of the market for system and support services, development of export

potential. At the same time, based on the results of successfully solving problems within the framework of the concept of a single purchaser, the issue of further liberalization of the electricity market will be considered with the exception of the mechanism of a single purchaser of electricity

energy;

improvement of the Market Council will ensure strengthening of the institutional framework

electric power industry and consolidation of interests of energy enterprises, consumers of electric energy and potential investors;

Taking into account global challenges and constant changes in the world economy, environmental obligations, as well as taking into account international experience, the Republic of Kazakhstan needs an accelerated and complete transition to a sustainable, efficient and flexible electricity industry, capable of being ready at any time

accept challenges and threats;

fulfillment of environmental obligations in the electric power industry is carried out through the further development of renewable energy (with the parallel development of maneuverable capacities) and distributed generation, the application of energy saving measures, the use of AFM and technologies for

carbon capture and storage at coal plants;

expanding the functions and powers of the Industry Center for Technological Competence will make it possible to conduct a comprehensive study of the problems of development of the electric power industry and develop systemic measures to solve them. In addition, centralized analytical work will be ensured,

economic modeling and calculations of the impact of the electric power industry on the economy, developing proposals for improving legislation and forming a strategic vision for the development of the industry.

Section 5. Basic principles and approaches to development

The development of the electric power industry will be based on compliance
the following principles:

unity of management of the electric power complex of the Republic of Kazakhstan, as a particularly important life support system for economic and

social complexes of the country;

increasing technical and economic performance indicators
and management of the UES of Kazakhstan under given parameters of reliability, environmental friendliness and availability of power supply for the consumer

customer focus – full satisfaction of the demand of energy consumers with given reliability parameters, and protection of the rights of participants in the electricity market
and thermal energy by creating competitive conditions in the market, guaranteeing consumers the right to choose suppliers of electrical and thermal energy;

development of the institutional framework of the electric power industry in terms of developing a balanced and long-term strategy for the development of the industry and policy based on
data;

diversification and digital transformation of the industry, as a result of which full transparency, openness and quality of all processes in the electric power complex will be ensured, the efficiency of all sectors will be increased, an intelligent system of accounting and operational and technological management will be created, the role of the consumer will be increased, low-carbon and distributed energy will receive large-scale development energy, increasing the role of the electric power industry in the country's economy;

environmental friendliness of the operation of energy sources in the light of the transition of the Republic of Kazakhstan to a green economy, the creation of conditions and the introduction of environmental and economic mechanisms to fulfill environmental obligations in the electric power industry to stimulate the use of the best available techniques and attract investment.

The vision, principles and approaches contained in the Concept are aimed at ensuring the demand of consumers of electrical energy and protecting the rights of participants in the electrical and thermal energy market, ensuring advanced development, safe and stable functioning of the electrical power complex of the Republic of Kazakhstan.

Thus, taking into account the analysis of the current situation, international experience and
global trends contained in the Concept, the vision for the development of the electric power industry and the basic principles for achieving the set goal
The goals involve the implementation of tasks in the following areas:

Direction 1. Technological re-equipment

1. Development of a promising layout of electrical capacities
Kazakhstan

A promising layout of Kazakhstan's electrical capacities will be developed. This will make it possible to form the structure of generating capacities (with the identification of retiring facilities) and power grid facilities for the long term, to create conditions for ensuring a long-term balance of electricity production and consumption and preventing shortages of electricity and capacity

in the most effective ways.

2. Modernization of existing and construction of new generating capacities,
including the future development of nuclear power plants

The modernization of existing and construction of new capacities will be carried out (as part of the further development of coal plants, investment agreements, holding auctions for the construction of generating plants with a flexible generation mode), which is a key task in light of the emerging shortage of energy capacity and lack of flexible generation. According to the Energy Balance until 2035, promising sites will be identified and developed, and measures will be taken to ensure the implementation of certain projects for the further construction of energy capacities, including nuclear power plants.

The issue of promising use of small modular
nuclear reactors in Kazakhstan.

3. Strengthening electrical connections and unifying a single electric power system
systems of the Republic of Kazakhstan

The modernization and construction of electrical networks will be carried out in order to complete the formation of the unified energy system (UES) of the country, increase the country’s energy security and increase the transit potential of the UES of the Republic of Kazakhstan by strengthening electrical connections in the Southern and Western zones, including the implementation of projects:

unification of the energy system of Western Kazakhstan with the UES of the Republic of Kazakhstan;

modernization and expansion of the regional electrical network;

major repairs, modernization and reconstruction of electrical networks
energy transmission organizations.

4. Development of master plans for the development of regional heat energy

A methodology will be approved for the development of master plans for the development of thermal power engineering, which will contain a set of measures for the development of thermal power engineering, including heat supply schemes and heat sources in the relevant territory in order to meet the long-term need for the provision of services for the provision of thermal energy, taking into account the characteristics of the relevant territory.

Master plans for the development of thermal power engineering will include:

actual state, performance indicators;

development of heat supply schemes and heat sources;

a set of measures to achieve strategic goals, bring optimal combinations of various heat supply systems (current and future demand);

planned values of key performance indicators;

optimal solutions taking into account the requirements for ensuring reliability, safety of heat supply, minimal harmful impact on the environment, development of energy-saving and resource-saving technologies, expanding the use of renewable energy sources, ensuring financing and other factors;

determination of methods to achieve (including through tariff regulation, financial support), determination of mandatory areas for the use of centralized heat supply.

5. Implementation of the "Intelligent Energy System" system

As part of the digital transformation, the intelligent energy system of Kazakhstan will be implemented, this will ensure the organization of the collection of primary data from the equipment and consumer level, the infrastructure of transmission, storage, protection and processing of information, the development and implementation of solutions for decentralized control of the modes of regional energy systems (including regulation of power, voltage, frequency , as well as maintaining the required level of reliability)
, timely provision of participants with the required information to stimulate their activity, assessing the capabilities of the power system and making operational decisions based on synchrophasor measurements, reducing technical barriers to the integration of distributed generation, including renewable energy sources, development and implementation of intelligent analysis and decision support systems (including
means of forecasting, prevention, localization and elimination of emergency situations), implementation of FACTS devices with their involvement in regulation.

Digitalization on the end consumer side is very important. From passive and largely uninformed users, they become active and insightful actors in the electricity system, raising their own energy consciousness as well as being able to act as “local sources of energy and demand management.”

Direction 2. Development of clean energy

6. Construction of new RES electrical capacities

This task will be accomplished through the implementation of the approaches of the RES Energy Zones concept, which provides for identifying the most promising sites with high resource potential (wind, solar

radiation), preparation of sites by the Government (construction of the necessary infrastructure), creation of “clear and transparent” rules of the game for potential investors, competitive selection through electronic auctions.

According to the order of the Head of State to achieve carbon neutrality by 2060, specific target indicators are provided for achieving a 15% share of renewable energy sources by 2030, 50% by 2050, taking into account alternative energy sources.

In addition, the adoption of a new Environmental Code, which involves the introduction of new standards and the imposition of penalties on those who do not comply with them, will require a number of expensive environmental measures, which will increase the cost of electricity from traditional plants. In this regard, the competitiveness of green energy will increase. 7. Implementation of ESG principles

Relevant legislative acts or separate strategic documents will be developed that will be aimed at addressing issues of energy transformation, low-carbon development and climate change issues.

The main directions for the implementation of ESG principles will be determined, which is a system for sustainable investments, in which investors evaluate not only the financial and operational performance of a business, but also social, environmental and governance risks. The transition to ESG principles should stimulate

energy companies in the country to rebuild their management structure in
environmental concerns, and also pay close attention to improving the quality
services provided.

Thus, taking into account the analysis of global experience, requirements for energy producing organizations will be determined and regulated at the legislative level according to ESG principles with implementation from 2026. Energy producing organizations will need to develop measures to assess and reduce negative impacts on the environment and provide reports on their implementation. Based on the data obtained, conditions will be created to ensure priority access to government support measures for energy producing organizations that meet ESG requirements.

The development of long-term strategies and policies for companies to comply with ESG principles, as well as the determination of the corresponding rating, will allow investors (including foreign ones) to evaluate the activities of energy companies in terms of environmental and social indicators, and cash flows.

The following planned indicators characterizing compliance will be fixed
ESG principles:

environmental impact reduction levels;

indicators of the quality of services provided;

reducing injuries at the country's energy enterprises;

growth in wages and social benefits;

transparency and accessibility of economic and financial indicators of companies, in including on the expenditure of attracted investments.

Direction 3. Market development of the electric power industry

8. Introduction of the “Tariff in exchange for investment” program

The program will provide for a long-term tariff policy with indexation to the level of inflation with a projected increase in costs, an increase in maximum capacity tariffs, and an increase in limits on investment agreements with a return of 10 years.

At the same time, the role of owners of energy-producing organizations will be strengthened by identifying priority projects based on technical audits of stations, investing their own funds in investment projects, fulfilling target indicators and measures (reducing wear and tear on main generating equipment

reducing specific fuel consumption, improving environmental performance), increasing transparency in the use of funds (open procurement of entities, holding public hearings), and bearing responsibility for the quality of repair work.

In the area of transmission, the program provides for the introduction of the practice of conducting technical audit of the assets involved, individual assessment of the economic and technical conditions of monopolists, optimization of the activities of small monopoly companies by merging them into a single regional

company, transfer of monopolists to specialized management companies for terms of long-term trust management agreements, introduction of the CEM Technical Regulation mechanism", elimination of intermediary transmission monopoly companies.

The transformation of the market model will be accompanied by an improvement in investment climate through effective and economically sound investment attraction in the electric power industry, including within the framework of the formation of a clear and predictable tariff policy, indexation of tariffs to the level of annual inflation by eliminating cross-subsidization of heat and electric energy tariffs (improving the competitiveness of thermal power plants in the electricity market), developing targeted assistance measures, as well as attracting credit

funds on preferential terms for the purchase of basic generating and network assets.

State policy on tariff regulation will be focused on determining tariff levels over a horizon of up to ten years, with provision for their indexation to the level of inflation. In modern conditions, indexing

Tariffs for the inflation rate are not enough, since for many years there was an artificial containment of tariffs, which led to deterioration of networks, as well as an outflow of qualified personnel due to low wages.

It will be possible to increase the salary level of power engineers to the regional level. Reducing staff turnover and increasing wages for power engineers is only possible if equal conditions are created in terms of wage levels within the region. The current approach to curbing heat tariffs and differentiating tariffs among consumer groups, including by increasing the electricity tariff, will remain a thing of the past. The owner will invest part of the investment on the terms of repayment using his own or borrowed funds, and the tariff will be formed based on the principle of recoupment of activities and repayment of funds from the owners.

Moreover, to protect certain categories of consumers from the impact of rising tariffs, conditions for targeted subsidies will be created, taking into account today's experience. At the same time, issues of energy saving and active implementation of energy efficiency principles among the economy and population of the country will be stimulated, within the framework of which about 10-20% reduction in consumed volumes is achievable energy.

Taking into account the social aspect of the thermal power industry, a hybrid model will be introduced to stimulate the attraction of investments and provide guarantees of return on investment, which will include existing financing mechanisms

thermal power engineering.

Changes in tariff regulation will ensure the fulfillment of environmental obligations. Achieving sector decarbonization targets will be achieved by revising the support mechanism for energy companies to incentivize the adoption of best available technologies (which will increase costs).

9. Elaboration of the issue of preferential lending at an interest rate of no more 7% of annual energy and energy infrastructure development projects

The issue of financing energy and energy infrastructure development projects through JSC "Development Bank of Kazakhstan" will be worked out.
interest rate of no more than 7% per annum for final borrowers, for a period of no more than 20 years, with the enterprise’s own participation of at least 20% of the project amount.

The source of financing will be budgetary funds and market funding.

in a ratio of 85/15. Budget funds will be allocated in the form of a budget loan and an increase in the authorized capital of Development Bank of Kazakhstan JSC to ensure compliance with the covenants established by the Law “On the Development Bank of Kazakhstan”.

To receive financing, an energy industry entity will submit to Development Bank of Kazakhstan JSC a package of documents, the list of which is approved

internal acts of Development Bank of Kazakhstan JSC. The procedure and terms for providing financing will be determined by the internal regulations of Development Bank of Kazakhstan JSC.

10. Transition to centralized purchase and sale of electrical energy

The principles of complete competition based on the abandonment of bilateral agreements and the transition to centralized purchase and sale of electrical energy, with the exception of bilateral agreements between energy producing organizations and consumers belonging to the same Group of persons.

At the same time, for individual market entities, the possibility of maintaining direct contracts with counter-obligations of a technical and financial nature will be considered, which will not lead to an increase in the price of the weighted average price of selling electricity to wholesale consumers from a single purchaser.

The transition to centralized purchase and sale of electrical energy will ensure:

creating a favorable investment environment for the timely modernization of existing and construction of new generating capacities, taking into account increasing the efficiency of the industry and the transition to modern environmental standards;

optimization of the composition of generating capacities, including from the point of view of electricity independence, as well as the development of renewable energy sources and their integration into energy system;

eliminating the opportunity for market power of individual market participants;

a single and weighted average price for electricity for all wholesale consumers at a specific hour of the day, and, accordingly, equal conditions for them market;

maintaining the competitiveness of industrial goods at foreign markets;

development of market mechanisms, incentives for consumers to actively participate (demand management), full transparency and strengthening the role of consumers in market.

11. Reform and launch of a balancing electricity market in real time

In order to ensure the stable functioning of the electric power system in the short term, a balancing market for electric energy will be introduced in real time (with financial mutual settlements)

. and improving the systems services market. This step will require entering relevant changes in legislation, adoption of new rules, setting up the necessary software, determining the settlement center of the balancing market, balance providers. This will require a transition to the purchase and sale and payment of planned volumes of electrical energy included in

daily schedule, all deviations from it will be settled by balancing
electricity market.

12. Creating conditions for strengthening Kazakhstan's position in the global energy sector, including development of export potential

The advantage of parallel operation will be taken advantage of through the further development of regional electrical networks and the integration of the markets of the Central and South Asia. The increase in energy capacity and efficient consumption of energy resources within the country will ensure the entry of domestic energy enterprises into the energy markets of neighboring countries. The main emphasis will be placed within the framework of the planned creation of the Common Electricity Market of the EAEU and the regional electricity market of the countries of Central Asia, with promising supply directions in Europe and Southeast Asia.

13. Development of a plan to meet the needs of the electricity industry professional staff

A plan will be developed to meet the needs of the electric power industry with professional personnel, within the framework of which an effective system of monitoring and analysis of personnel needs for the medium and long term will be developed. The implementation of professional standards will be completed
, cooperation between energy enterprises and foreign universities and partners has been expanded.

14. Improvement and transformation of the Market Council as a body providing the institutional foundations of the electric power industry

In order to increase efficiency, a new Market Council model will be introduced based on an analysis of the local context, best practices from international experience. Enshrining the specific functions of the Market Council in national legislation, creating a strong governance structure and culture of implementation of rules and procedures, strengthening the decision-making powers of members of the organization, as well as introducing a dispute resolution (mediation) procedure for market participants will contribute to the effective performance of the duties of the Market Council.

15. Expanding the functionality of the Industry Center for Technological Competence at JSC "KOREM" in terms of research activities

The functions and powers of the Industry Center for Technological Competence will be expanded to carry out developments and research on problems of development of the electric power industry, ensuring reliability, efficiency, accessibility,
safety and environmental friendliness, taking into account the country's climate obligations.

At the same time, funding for the activities of the Industry Center for Technological Competence will be provided from extrabudgetary funds.

Section 6. Target indicators and expected results

Target indicator 1.

The volume of commissioned electrical capacity with storage is 11.7 gigawatts by 2029 year.

Expected results:

1. Covering the needs of the economy and population for electrical energy by 100%

;

2. Covering the needs of the economy and population for thermal energy by 100%;

3. Operation of the unified energy system of the Republic of Kazakhstan.

4. Equipping with modern systems for recording, collecting and processing data on production and consumption of electricity by 100%.

Target indicator 2.

The share of electricity from renewable energy sources is 12.5% of total production by 2029.

Expected Result:

Increasing the volume of electricity generation from renewable energy sources by 2.8 times compared to 2022.

Target indicator 3.

The volume of total return on potential investments in the generation sector is up to 2.8 trillion tenge by 2029.

Expected Result:

Reducing the wear and tear of the main assets of the existing generating capacity infrastructure by 10% compared to 2022.

Application
to the Development Concept
electric power industry
Republic of Kazakhstan
for 2023 – 2029

Implementation Action Plan
Concepts for the development of the electric power industry
Republic of Kazakhstan for 2023 – 2029

ÿ	Designation reforms/key activities	Completion form Completion date		Responsible performers
1	2	3	4	5
Direction 1: Technological re-equipment Target indicator. The volume of introduced electrical capacity, with accumulation – 11.7 gigawatts by 2029 year: 2023 – 0.5 gigawatts; 2024 – 1.6 gigawatts; 2025 – 3.5 gigawatts; 2026 – 4.8 gigawatts; 2027 – 6.8 gigawatts; 2028 – 9.3 gigawatts.				

1	Development of a promising layouts electrical power	layout electrical power	July 2023	AD, MEPR, energy enterprises of the Republic of Kazakhstan (by agreement), JSC "KEGOC" (by agreement)
2	Modernization existing and construction n about you generating capacity including:	acts of entry into exploitation	December 2029	AD, energy enterprises of the Republic of Kazakhstan (by agreement)
2.1	Consideration question promising use small modular reactors	proposal to the Government	December 2026	AD, A O " F N B Samruk-Kazyna" (by agreement)
2.2	Volume of input electrical capacity of the CCGT plant (Almaty) Turkestan and Kyzylorda regions)	acts of entry into exploitation	December 2026	AD, energy enterprises (by R K agreement)
2.3	Volume of input electrical capacities through the implementation of 12 investment agreements with energy producing mi organizations	acts of entry into exploitation	December 2027	AD, energy enterprises of the Republic of Kazakhstan (by agreement)
3	Strengthening the Southern and Western zones, merger of the Western zone with the UES of the Republic of Kazakhstan including:	acts of entry into exploitation	December 2028	ME, JSC "KEGOC" (by agreement)
3.1	Construction of the second 220 kV transit circuit m e zh d u West-Kazakhstan Koy, Atyrau and Mangystau regions	acts of entry into exploitation	December 2023	AD, A O " F N B Samruk-Kazyna" (by agreement), JSC "KEGOC" (by agreement)
3.2	Reconstruction of cable networks d. Almaty	acts of entry into exploitation	December 2025	AD, MNE, AO " F N B Samruk-Kazyna" (po agreement)

3.3	U s i l e n i e electrical network of the Southern zone of the UES Kazakhstan. Construction electrical grid facilities 500-220 kV in Zhambyl, Kyzylorda, Turkestan, Zhetysu and Almaty regions (implementation period 2023- 2027)	acts of entry into exploitation	December 2027	ME, JSC "NWF" Samruk-Kazyna" (by agreement), JSC "KEGOC" (by agreement)
3.4	An association energy systems of Western Kazakhstan with the Unified Energy System Kazakhstan. Construction electric grid facilities (implementation period 2023- 2028)	acts of entry into exploitation	December 2028	ME, JSC "NWF" Samruk-Kazyna" (by agreement), JSC "KEGOC" (by agreement)
4	Development METHODS master plans development thermal power engineering regions	method	December 2024 AD	
5	Creation of the Intelligent Energy System system"	acts of entry into exploitation	2023-2029	ME, JSC "KEGOC" (by agreement), JSC "KOREM" (by agreement), energy enterprises of the Republic of Kazakhstan (by agreement)
Direction 2: Development of alternative energy Target indicator. The share of electricity from renewable energy sources is 12.5% of total production by 2029: 2023 – 5%; 2024 – 5.5%; 2025 – 6%; 2026 – 7%; 2027 – 8%; 2028 – 10%.				
6	Construction n about you RES electrical capacity including:	acts of entry into exploitation	December 2025/ December 2029	AD, energy enterprises R K (by agreement)

	Volume of input RES electrical capacity			
7	Roadmap development implementation of ESG principles	road map	December 2026	ME, MEPR, MNE, A O " F N B Samruk-Kazyna" (po agreement), MFC "Astana" (by agreement)
Direction 3. Market development of the electric power industry Target indicator. The volume of total return on potential investments in the generation sector is up to 2.8 trillion tenge by 2029 year: 2023 – up to 400 billion tenge; 2024 – up to 400 billion tenge; 2025 – up to 400 billion tenge; 2026 – up to 400 billion tenge; 2027 – up to 400 billion tenge; 2028 – up to 400 billion tenge.				
8	Introduction of the principle "Tariff in exchange on investments"	road map	March 2023	MNE, ME, AZRK, MEPR, NPP Atameken" (by agreement)
9	Elaboration of the issue preferential lending by with t a v k e remuneration no more than 7% per annum development projects energy and energy infrastructure	proposal to the Government	December 2023	MNE, MF, ME, NPP "Atameken" (by agreement)
10	Implementation mechanism centralized purchase and sale of electrical energy	p r i n i a t i e legislative amendments	July 2023	AD, MN, JSC "KEGOC" (by agreement), LLP "RFC for RES" (by agreement)
11	Starting the balancing market electricity in real time	p r i n i a t i e legislative amendments	July 2023	AD, MNE, AZRK, JSC "KEGOC" (by agreement)
12	Entering general electric power who the EAEU market	EAEU rules	December 2025	AD, MNE, AZRK, JSC "KEGOC" (by agreement), JSC "KOREM" (by agreement)
13	Developing a plan to meet the needs electric power which branches	plan	December 2024	AD, OUL (by agreement),

	professional and personnel			energy enterprises of the Republic of Kazakhstan (by agreement)
14	Reform of the Market Council	draft Law	December 2023	AD, MNE, AZRK, Market Council (by agreement)
15	View Extension activities JSC "KOREM" in h a s t i research work	alteration to the Company's Charter	December 2024	ME, MF, AO " KOREM" (as agreed), Market Council (by agreement)

Explanation of abbreviations:

JSC – joint stock company;

AZRK – Agency for the Protection and Development of Competition of the Republic of Kazakhstan;

LLP – Limited Liability Partnership;

"RFC for RES" - "Settlement and financial center for support of renewable energy sources";

ALE – association of legal entities;

MIID – Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan;

MF – Ministry of Finance of the Republic of Kazakhstan;

NWF – National Welfare Fund;

NCE – National Chamber of Enterprises;

MNE – Ministry of National Economy of the Republic of Kazakhstan;

MFC – international financial center;

ME – Ministry of Energy of the Republic of Kazakhstan;

MENR – Ministry of Ecology and Natural Resources of the Republic of Kazakhstan;

"KOREM" - "Kazakhstan operator of the electric energy and capacity market";

"KEGOC" - "Kazakhstan Electric Grid Management Company" (Kazakhstan Electricity Grid Operating Company).