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Features of Modernization of Fuel and Energy Complex in Uzbekistan

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ABSTRACT: The article deals with the modernization of the electric power industry in modern conditions. It is shown that all sectors of the electric power industry are subject to modernization: thermal power, electric power, and their equipment accordingly. The need for the development of distributed energy is noted.

KEYWORDS: innovation, investment, power industry, energy, energy, capital expenditures, modernization, power grid.

I. INTRODUCTION

The increased interest in energy in recent years is a reflection of its economic, social and environmental importance for the entire world community. The world economy is a dynamic system that is in continuous development and is undergoing a constant restructuring of the individual components that make it up and the links between them, which is achieved through continuous innovation in individual sectors and at individual structural levels of the economy [1].
The strategic goal of the state energy policy is the creation of a sustainable national innovation system in the energy sector to provide the fuel and energy complex with highly efficient technologies and equipment, scientific, technical and innovative solutions in the amounts necessary to maintain the country's energy security. Consider the state of this issue in the context of the world and Uzbekistan.

II. RESEARCH METHODOLOGY

This paper is diagnostic and exploratory in nature. Development of the Republic of Uzbekistan. Statistically, the government of the country of national law of the country. of Uzbekistan, etc. Investment number, investment sources, investment sources, directions of investment streams is analyzed. This is a method of expert estimation of cost efficiency.
DISCUSSIONS [1-4, 11,12]
Currently, the world energy sector has formed a circle of top-priority problems related to the reduction of reserves of fossil hydrocarbon fuel, significant changes in energy prices, as well as the preservation of the ecological safety of the planet in conditions of growing energy consumption.

In the world energy sector, scientific foundations were created, innovative technologies and experimental designs of equipment and materials were developed, including [1-4]:

- New effective methods of mineral exploration, including exploration of deposits;
- technologies for the production of synthetic liquid fuels from natural gas, coal and biomass;
- promising technologies and new types of electrical equipment for the transmission, distribution and consumption of electrical energy;
- installation of energy and transport purposes, running on alternative fuels;
- model range of cogeneration plants (mini heat and power plants) of modular type;
- energy-saving and environmentally friendly lighting devices of the new generation with LEDs and mercury-free gas-discharge lamps;
- technological bases of on-line diagnostics of electrical equipment;
- technological foundations of the elements of the heat supply system of the new generation, providing a significant reduction in energy losses;
- technological solutions for the capture and disposal of carbon dioxide using modern technologies of fuel combustion;

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- pilot production of power plants on fuel cells (solid polymer and solid oxide) for autonomous, standby, emergency power engineering and vehicles;
- scientific bases and technologies of large-scale development of inexhaustible reserves of renewable energy (RES).

The positive dynamics of changes in the areas of science and technology cooperation of science and the energy business, the restoration of personnel training centers to meet the scientific and technical needs of the energy sector were ensured.

To achieve the strategic goal of innovation and science and technology policy in the energy sector, the following tasks need to be solved [3-9]:

- Recreation and development of scientific and technological potential, including applied research and development, modernization of the experimental base and the system of scientific and technical information;
- the creation of favorable conditions for the development of innovation, aimed at a fundamental renewal of the production and technological base of the fuel and energy complex, resource conservation, increased efficiency, reliability

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- creation of favorable conditions for the development of innovative activities aimed at fundamentally updating the production and technological base of the fuel and energy complex, resource conservation, improving efficiency, reliability, safety and environmental friendliness of power plants and systems, accelerated development of the use of renewable energy sources and improving consumer properties of fuel energy complex;
- creation of a system of state support and stimulation of energy companies in the development and implementation of investment projects that ensure the innovative development of the fuel and energy complex industries, as well as similar projects implemented abroad;
- improvement, as applied to energy, of all stages of the innovation process, increasing the demand for and effectiveness of the use of the results of scientific, design and engineering, inventive and rationalization activities;
- protection of rights to the results of scientific and technical activities;

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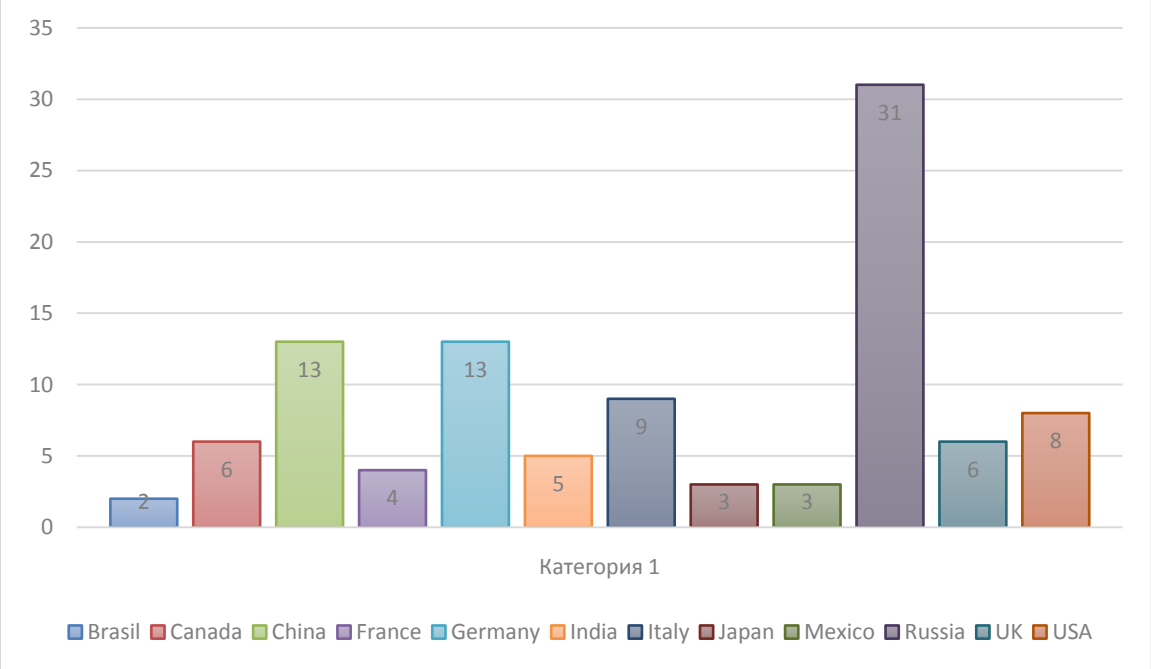
- using the potential of international cooperation to apply the best world achievements and bring the development to a higher level;

- preservation and development of personnel potential and scientific base, integration of science, education and innovation activity.

The innovative focus of the development of the fuel and energy complex also presupposes the creation of conditions for the development of a continuous search process and the practical implementation of new scientific, technical, technological, organizational and economic decisions within the framework of national regulation and a clear system of interaction between all participants in the innovation process.

In the current situation, renewable energy based on the use of inexhaustible energy sources acts as an alternative for further sustainable development. 7-9]. The use of renewable energy does not contradict alternativeness, which means that it is an innovation in the energy sector and leads to the formation of an innovative structure of world energy. The forecast of the growth of the share of cogeneration in the world in the future until 2030 is shown in Fig.1.



A-2005

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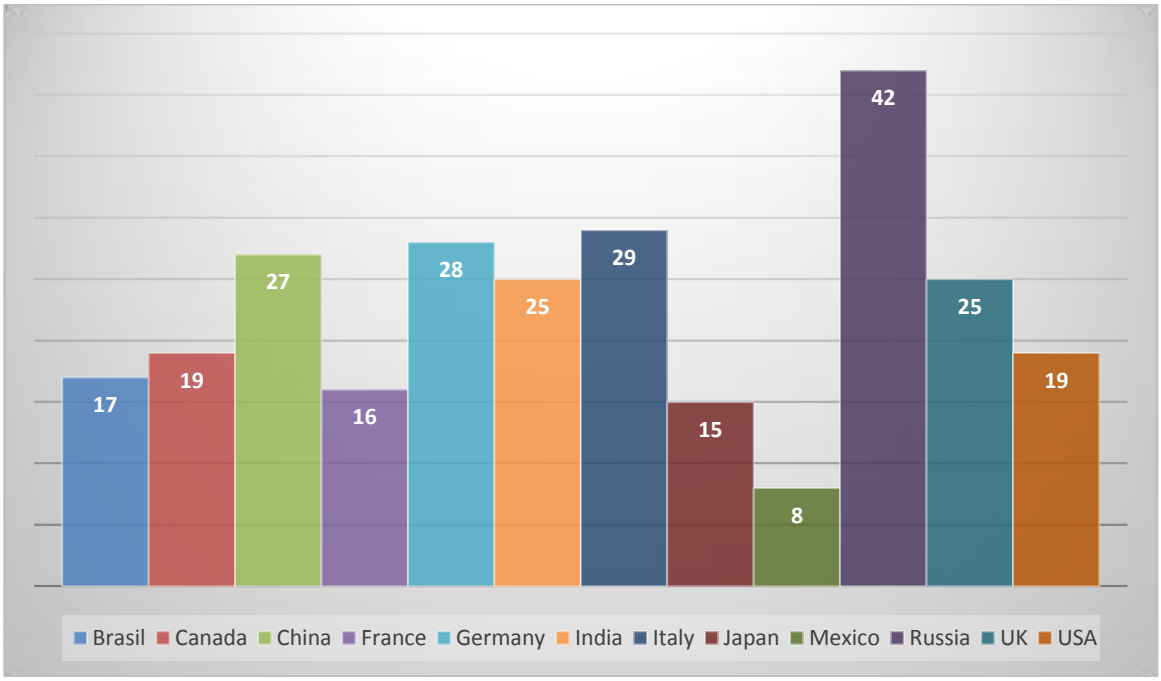

B-2030

Fig. 1. Prospective growth forecast for the share of cogeneration in power generation of some countries of the world [4]

As the analysis [3,4] shows, the entire basic energy industry serves for the development of the electric power industry. Techniques of electric power generation can be divided into two groups - technologies that have reached maturity and technologies that are in the formative stage - for them the rapid progress of technical and economic indicators of the implemented innovative technological solutions is expected.

Technologies that have reached maturity include gas, wind, bio and hydropower technologies, as well as nuclear power thermal reactors.

As a result of an innovative approach to solving energy problems, the following promising forward-looking indicators were obtained.

In gas electric power industry, by 2030 capital costs for the construction of combined-cycle plants with a condensation cycle will decrease in comparable prices relative to the current level from 690 to 610 dollars, by 2050 - to 550 dollars per 1 kW. Efficiency can increase from 57% to 64%.

By 2030, capital expenditures for the construction of wind power plants can be reduced from the current 1500 level to 1200 dollars, by 2050 - up to 1000 dollars per 1 kW. Technological progress is associated with an increase in the diameter of the blades, increasing the efficiency of energy conversion, control systems.

By 2050, the capital costs for the construction of condensing power plants on biomass will be about $ 2,400. Biogas production requires additional investments, but allows using “uncomfortable” types of raw materials and used gas energy technologies.

MicroHPPs with a capacity of less than 1 MW are playing an increasing role in the modern energy supply system. Tidal and geothermal power plants are likely to play a significant role only in local power systems.

Atomic power engineering is currently dominated (90% of power) by 2nd generation thermal neutron reactors developed in 1970-1980. In the future, a gradual transition of world nuclear power engineering to the 3rd and then 4th generation reactors is expected. The first reactors of the 3rd generation are already under construction (US-Japanese AP-1000 reactors are in China, European PWRs are in Finland). Reactors of the 4th generation can be developed until 2020, and from 2030 their active construction will begin.

The technologies that are in the formative stage include fast neutron reactors, new coal power generation technologies, tidal and other new hydropower plants, as well as solar photovoltaics.

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Coal power industry is expected to introduce a whole range of new technologies. By 2030, the efficiency of coal-fired power units may increase from 45 to 53%. Prospects for the technological development of the coal industry are associated with several areas:
- with power units with supercritical and super-supercritical steam parameters;
- with new ways of burning coal (in a fluidized bed, in coal dust, with cyclic gasification);
- with coal gasification technologies;
- carbon capture and disposal.
New ways of burning coal (in a circulating fluidized bed, in coal dust, with intraframe gasification) are currently at the stage of pilot operation. After 2020, the integrated technology of coal gasification (IGSS) can become the main technology. Carbon capture and disposal (CCS) technologies are focused only on reducing C0 emissions. Currently, there are several CCS demonstration projects. Industrial technologies with CCS will appear only after 2020 and they can become commercially attractive after 2030.
The development of solar photovoltaics (direct conversion of solar energy into electricity) in the future will be very rapid. By 2030, the capital costs of their construction can be reduced from the current level of $ 3,700 to $ 1,800, by 2050 - to $ 1,000 for 1 kW. The maximum efficiency of solar batteries in 2008 reached 47%, with average values in used installations of 10-15%. Among the most promising technological options are thin film technology, multisite technology, semiconductor dyes.

Compared to other types of generating power, renewable energy sources are characterized by very low values of the installed capacity utilization factor (ICUF) - (10-20%), compared to nuclear power units (70-95%) and thermal energy (60-80%).). In 2010-2050 The KIUM RES will increase as a result of the optimization of both the operation of individual plants and the power grid as a whole. The key problem is the instability of wind and solar energy production and the mismatch of generation peaks with load peaks. This problem can be solved by the development of energy storage systems [4]. In addition, it will naturally soften as the scale of renewable energy grows and its geographical distribution increases.
In addition to the already known methods of electrogeneration, an innovative approach will require the development and development of direct methods for obtaining electrical energy from the environment through the use of accumulating charges of the ionosphere, the energy of the earth's rotation and other yet little-known technologies for transforming cosmic-planet energy [4].

III. MODERNIZATION IN THE FUEL AND ENERGY COMPLEX OF UZBEKISTAN [1, 13-16,18]

The energy strategy of Uzbekistan sets the goal of ensuring energy independence and security, increasing energy efficiency, and reducing the impact of energy on the environment.
Solving these problems requires the development and introduction of new, innovative technologies based on scientific achievements that provide a safer, cleaner energy.
The main consumers of energy, including electricity, both now and in the future will be industry, agriculture and the housing and utilities sector. Electricity and power engineering have high investment inertia and greater capital intensity. So that the fuel and energy factors do not become a serious constraint on the growth of the country's economy, it is necessary to link the possible development of the country (energy demand) with the possible development of the electric power industry.
Economic reform and the restructuring of the financial system in the Republic of Uzbekistan have significantly affected the power industry. In order to implement the Decree of the First President of the Republic of Uzbekistan I.Karimov "On the deepening of economic reforms in the energy sector of the Republic of Uzbekistan" (2001), the power industry is being reformed and the management structure of the multifunctional industry is improved.
The phased restructuring of the industry, the incorporation of energy enterprises will create favorable conditions for the development of a competitive environment in the energy sector and will help to fully meet the needs of all sectors of the economy and population in high-quality electrical and thermal energy
Uzbekistan has developed the main directions for modernization, technical re-equipment and further development of the electric power industry for the period up to 2030. Their implementation will provide:
- creation of additional generating capacity in the amount of 3602.9 MW, including at TPPs - 2,418 MW, hydroelectric power stations - 1,074.15 MW, wind-solar power plants - 110.75 MW;
- increase in the share of coal in the fuel and energy balance from 4% to 16% (from 2.6 million tons - in 2009 to 9.4 million tons - in 2020);

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- improving the efficiency of energy production, reducing specific fuel consumption for electricity supply in 2014 to 52.66 g / kWh (from 383.58 g / kWh - in 2009 to 330.92 g / kWh - in 2014), in 2020, at 59.12 g / kWh (up to 324.46 g / kWh). On the amount of fuel due to the reduction of unit costs, it is possible to additionally generate 6,290 million kWh of electric power annually (or 718 MW of capacity) since 2014, and 7,476 million kWh (853 MW) from 2020;
- development of 110-500 kV electrical networks in the amount of 2,057 km of power transmission lines and 2,879 MVA of transformer capacity at substations, ensuring a reduction in electric power losses of 437 million kWh;
- creation of additional jobs;
- improving the sustainability of the energy system, meeting the full demand for electricity in industries and the population, increasing the export potential of electricity, ensuring the country's energy security.

IV. CONCLUSION

Uzbekistan has rich primary energy resources, which allows to provide current and future generations with the necessary energy. For this, it is necessary in the long term on an innovative basis to optimize the structure of the fuel and energy complex, introduce promising energy equipment and technologies, and realize the potential of energy saving based on an integrated approach to this major problem. Uzbekistan has everything necessary to ensure energy security and the sustainability of its development and, accordingly, the state's economy.

Thus, in the long term, the world and the Uzbek energy sector will undergo radical changes. First, the structure of generating capacities will change due to the rapid growth in the share of gas turbine technologies and renewable energy. Secondly, the principles of the organization of electric power systems will radically change due to the creation of their new generation. The dynamics of energy development will correspond to both new technological trends and the tasks of reliable energy supply of the state.

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