Digital technologies for managing the turnover of fuel and energy resources within the framework of an expanded international energy association

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Abstract. The paper proposes to form a coordinated energy supply system by creating and developing an expanded international energy association (Russia+). Digital approaches to organizing, on the principles of the Unified Energy System of Russia, synchronous parallel operation of territorially distributed facilities for generating electricity, extracting and supplying fuel and energy resources based on a digital information platform are considered.

Introduction

It is necessary to create a toolkit that ensures fast and convenient use of information on the turnover of fuel and energy resources so that the operator [and regulator] of the expanded international energy association can perform a set of functional tasks that can be quickly adapted to it.

It is proposed that the considered information and analytical services for monitoring trade turnover in distributed electronic markets of fuel and energy resources be placed in the information systems that service electronic trading platforms. Such services should be available to the operator [and regulator] of the expanded international energy association, as well as to the bodies that manage fuel and energy activities. Some of the services may be available to companies participating in trades.

On this basis, it will be possible to optimize relations between interconnected energy companies and buyers of fuel and energy resources in managing the processes of extraction, transportation, processing and marketing (supply) of fuel and energy resources with an exit to the cumulative effect of socio-economic development.

Solution to the problem

The proposed policy should allow for a sharp expansion of the use of modern automation tools for management processes and the ability to coordinate the work of production (mining, etc.) and transport capacities in the industries of the countries participating in the expanded international energy association.

Here, strategic segmentation is required within the expanded international energy association as a group of national infrastructure segments servicing the turnover of certain volumes of fuel and energy resources and the added value associated with them, tied to specific fuel and energy resource markets [1].

The economic and technological parameters of these infrastructure segments are the basis for choosing options for state support for companies (technical and economic agents) with the aim of developing the aggregate structure of production (mining, etc.) and transport capacities [2].

A similar principle of identifying the system-forming aggregate structure of production (extractive, etc.) and transport capacities interconnected by specializations and resources as a group of infrastructure segments tied to specific markets (including consumer groups) is applicable to both territorially isolated and interconnected national economic systems and facilitates the possibility of a coordinated energy supply system. The fundamental feature of the proposed

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mechanism is the ability to optimize the process of compiling fuel and energy and economic balances taking into account the flows of input information from available sources in the corporate-industry and territorial context [3-4].

The set of functional tasks for information and analytical services for monitoring trade turnover in distributed electronic markets of fuel and energy resources can be expanded by the following points:

1. Data collection and analysis: development of mechanisms for automatic collection of data on prices, trading volumes and the number of participants on electronic platforms. Integration with external sources of information, such as the gas, electricity and other energy resource markets, is also necessary.

2. Monitoring market dynamics: creation of tools for tracking changes in the market situation, including price fluctuations, changes in supply and demand, as well as identifying patterns and trends.

3. Forecasting and modeling: implementation of machine learning and artificial intelligence algorithms to predict market events, which will allow market participants to plan their actions in advance.

4. Risk assessment: development of models for assessing risks associated with trading operations and potential market fluctuations, which will help participants minimize losses.

5. Creation of analytical reports: generation of regular reports for operators and regulators, which will contain key market indicators, analysis of changes and recommendations compared to historical data.

6. Interaction management: providing a platform for information exchange and coordination between market participants, including the ability to quickly respond to changing market conditions.

7. User training: developing educational programs for service users so that they can effectively use the tools and technologies provided.

8. Regulatory functions: integrating modules that allow regulators and supervisory authorities to monitor and analyze compliance with standards and legal requirements, as well as identify unfair practices.

9. Sustainable development: taking into account environmental aspects and implementing mechanisms to assess the impact of trading operations on the environment, which is an important aspect of modern energy resource management.

On this basis, it will be possible to optimize relations between interconnected energy companies and buyers of fuel and energy resources in managing the processes of extraction, transportation, processing and marketing (supply) of fuel and energy resources with an exit to the cumulative effect of socio-economic development. These integrated approaches will create a more transparent and efficient market, which in turn will strengthen trust between all market participants and improve the security and sustainability of the energy system as a whole.

10. Sustainable development: taking into account environmental aspects and principles of sustainable resource management. This includes analyzing the impact of trading operations on the environment, as well as recommendations for reducing the carbon footprint and optimizing resource use.

11. User interfaces: developing intuitive interfaces that will allow users to easily navigate the system, access the necessary data and quickly respond to changes in the market situation.

12. Data security: ensuring a reliable information protection system, including data encryption, as well as user authentication and authorization mechanisms to prevent unauthorized access.

13. Competition analysis: implementing tools for studying the competitive environment in distributed markets, which will allow participants to better understand each other's positions and develop strategies to improve their competitiveness.

14. Blockchain Integration: Explore possible integration with blockchain technologies to increase transparency and trust in trade data, as well as to protect against fraud.

15. Cross-Marketing Opportunities: Explore opportunities for cross-selling and sharing experiences between different sectors of the economy, which can lead to new forms of cooperation and accelerate innovation processes.

16. User Analytics: Develop tools to analyze the behavior and preferences of service users. This will improve the quality of service and tailor products and services to specific customer needs.

17. Mobile Applications: Create mobile solutions for accessing monitoring services, which will allow users to stay informed about trade operations at any time and from anywhere.

These functional tasks will help to create a multifaceted approach to monitoring and analyzing trade turnover, ensuring reliability, a high level of service and promoting the development of distribution electronic markets in the fuel and energy sector.

On this basis, it is possible to more accurately identify the national and cross-border movement of arrays of added value from the export-import of fuel and energy resources, formed within the framework of the work of distributed infrastructure systems [5].

It is possible to implement the establishment of stable operational and communication links between a complex of information systems of government agencies and socially significant commercial structures within the framework of an expanded international

energy association (Russia+) with a common organizational and information platform and a system of coordinated management of information exchange [6]. The development of the system must be carried out on the principles of the Unified Energy System of Russia, which have proven their effectiveness, with synchronous parallel operation of territorially distributed facilities for generating electricity, extracting and supplying fuel and energy resources [7].

This will not only optimize production and distribution processes, but will also strengthen the competitiveness of participating countries in the global energy market. It is important to take into account that during the implementation of this policy, it is necessary to ensure active cooperation between government agencies, the private sector and scientific institutions in order to accumulate and process experience, produce analytical data and develop innovative solutions that meet modern challenges.

Adaptation to changing market conditions and technological trends should become a continuous process. To this end, platforms for the exchange of information and best practices should be created, as well as regular seminars and conferences should be held where participants can share knowledge and experience. An important aspect is also the integration of new technologies, such as digitalization, automation and the use of artificial intelligence, which can significantly improve the efficiency of energy resource management.

This policy should include elements of forecasting and risk analysis, which will allow participating countries to respond more flexibly to changes in the global economic situation and the needs of domestic and foreign markets. A systematic approach to designing energy infrastructures will ensure sustainable development and avoid duplication of resources, which in turn will facilitate more efficient use of all available capacities and resources within the association.

For the exchange of information and technologies that would facilitate rapid response to changes in supply and demand in global markets. These platforms should unite producers, consumers, scientific and research laboratories, as well as government agencies, which will ensure an integrated approach to solving emerging issues.

One of the key aspects of such a policy is the need to create a unified system for monitoring and analyzing data on the state of the energy market. This will allow for changes in needs to be anticipated and production and transport processes to be adapted accordingly. With the use of modern technologies such as artificial intelligence and big data, it will be possible not only to promptly process information, but also to predict trends in the development of the industry.

It is also important to develop infrastructure to support the transportation and storage of energy resources. In this context, it is necessary to consider the possibility of introducing environmentally friendly and modern technologies, which corresponds to global trends in reducing the carbon footprint. Support for such initiatives can become part of government policy aimed at sustainable development.

Another goal should be to create incentives for companies engaged in energy innovation. This could include financial support for start-ups, research projects and companies developing alternative and efficient energy sources. Improving legislation on tax incentives and subsidies would also be an important step in supporting these initiatives.

Education and training are also critical to the successful implementation of new technologies and practices. It is necessary to create educational programs and courses aimed at training specialists with relevant knowledge and skills in the field of new technologies, project management and sustainable development. In the long term, it is worth considering the possibility of forming an energy strategy of the participating countries based on cooperation and mutual interests. This will not only optimize internal processes, but also create effective external relations between countries, which will ultimately contribute to greater energy security and stability.Thus, the implementation of the proposed policy implies a comprehensive approach that includes innovative technologies, educational initiatives and active cooperation at all levels, which in the long term will lead to the creation of a sustainable and competitive energy system within the framework of an expanded international energy union.

This integration will create a single field for the exchange of data and information between various market participants, which will increase the transparency and efficiency of decision-making. An important aspect is the use of advanced information technologies, such as blockchain, to ensure the security and integrity of data, which is especially critical in the face of the risk of cyberattacks and unauthorized interference. In addition, the creation of the Russia+ platform involves not only coordination of actions at the domestic level, but also active international cooperation, which can be achieved through the exchange of experience and best practices with other countries. This will also take into account regional characteristics and potential threats, as well as create mechanisms for rapid response in situations requiring coordinated actions by participating countries.

For the successful implementation of this system, it is also necessary to pay attention to the training of qualified personnel capable of working in the conditions of new technologies and actively participating in the

digitalization processes of the energy sector. Retraining and advanced training programs for specialists in the field of information technology and energy resource management will help ensure the sustainability and efficiency of the unified system.

Thus, the creation and development of an international energy association not only contributes to strengthening energy security, but also promotes sustainable development, innovation and the implementation of environmentally friendly technologies in the energy sector, which are key points in the context of global climate change and the transition to a green economy.

Thus, the creation of an integrated information platform and a coordinated data exchange management system will form the basis for more efficient functioning of the energy sector in the "Russia+" format. This will not only affect internal processes, but will also expand opportunities for international cooperation related to energy security and sustainable development.

An important point in this strategy should be the development of a system for monitoring and analyzing data coming from various sources. The use of modern analytical tools and machine learning algorithms will allow not only to quickly respond to changes in the market situation, but also to predict possible crisis scenarios, which will significantly increase the level of preparation and risk management.

To ensure the sustainability and security of the system, it is also necessary to pay attention to information protection and cybersecurity. The development of comprehensive data protection solutions, as well as the implementation of multi-level security systems, will help minimize the risks of cyber attacks and leaks of confidential information. This is especially important in the context of globalization, when potential threats can come from outside. In addition, one of the key success factors will be interaction with regulatory authorities and key stakeholders. It is important to create conditions for an open dialogue between government agencies, businesses and the scientific community. This will allow taking into account the interests of all participants in the process and more effectively address emerging issues.
Harmonization of standards and regulations regarding data exchange will also have a positive impact on the creation of a single energy market. The introduction of uniform standards will simplify the process of integrating various systems and reduce the costs of their support and maintenance. This, in turn, will increase the competitiveness of market participants and attract new investors interested in a stable and transparently functioning segment.

As a result, the implementation of the integrated system "Russia+" will become a strategic step towards the creation of a sustainable, efficient and secure energy infrastructure that will be able not only to satisfy the country's domestic needs, but also to become an important player in the international arena, contributing to the development of global energy security.

Conclusion

Thus, the overall result of the implementation of the project under consideration is the possibility of synchronous parallel operation of territorially distributed facilities for generating electricity, extracting and supplying fuel and energy resources. That is, based on the principles of the Unified Energy System of Russia, it is possible to coordinate the work of the system-forming aggregate structure of national production (extracting, etc.) and transport capacities within the framework of an expanded international energy association (Russia+) interconnected by specialization and resources as a group of infrastructure segments generating certain volumes of fuel and energy resources and the added value associated with them, tied to specific markets (including consumer groups).

In addition, the implementation of this project will improve the efficiency of operation of both existing and new capacities, thanks to the introduction of modern monitoring and control technologies. The control system will be based on the principles of digitalization, which will allow real-time monitoring of production processes and prompt response to changes in operating conditions.

Another important component of the project will be the development of a single platform for the exchange of information between all participants in the process - from manufacturers to end consumers. This will create a transparent and predictable market, where each decision will be made on the basis of relevant and reliable data, which will significantly reduce risks and increase the safety of the energy infrastructure.

Moreover, the project involves active interaction with neighboring countries and international partners, which will create additional opportunities for cooperation in the field of energy exchange, the development of joint infrastructure projects and the exchange of technologies. This approach will not only strengthen Russia's position in the international arena, but will also contribute to the sustainable development of the energy sector as a whole, including environmental aspects such as reducing greenhouse gas emissions and switching to cleaner energy sources.
Thus, the Russia+ project will become an important milestone in the evolution of the country's economy and will open up new horizons for the development of both domestic and international energy systems.

The introduction of renewable energy sources, such as solar and wind power plants, will also be an important part of this project. This will allow for the diversification of generation sources and reduce dependence on traditional fossil resources.

One of the key aspects will be the development of programs for training and advanced training of personnel in the field of new technologies and management methods. The training of qualified specialists will provide support for the implemented solutions and will help to integrate them into existing systems as effectively as possible. It is important to create conditions for the exchange of knowledge and experience not only within the country, but also abroad.

Thus, the project is not limited to technical aspects. It involves the integration of social, economic and environmental components, which will contribute to the creation of a more sustainable energy ecosystem. This will not only increase the reliability of energy supplies, but will also contribute to improving the quality of life of citizens, which is ultimately of strategic importance for the country. In addition, sustainable development of this project involves the development of measures to ensure energy security, including capacity backup and the creation of rapid response systems for possible emergencies. Given global challenges such as climate change and geopolitical instability, the development of such aspects will become a necessity.

Successful implementation of the project will require active cooperation with government agencies, businesses and scientific institutions. This will ensure an approach based on multidisciplinary approach, which in turn will open new horizons for innovation and further development of the industry.

In conclusion, the implementation of this project provides a unique opportunity to transform the energy system. The synergy of all the above components will create a powerful foundation for sustainable growth, allowing Russia to take a leading position in the global energy market. Thus, work on the implementation of this program will contribute not only to energy independence and security, but also to the socio-economic development of the entire country.

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