

Managing Production Risks of Gas Industry Infrastructure Organizations under Resource Constraints

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Abstract: The economic problem characteristic of the production infrastructure of the gas industry is the need to improve the efficiency of the system of centralized allocation of financial resources for the operation, restoration and replacement of production fixed assets (OS), the operation of which is associated with high production risks, in the context of a shortage of financial resources associated with increased costs due to wear - on the one hand, and the dependence of the holding's income on the geopolitical situation, regulated tariffs and other factors, on the other. The creation of the necessary tools for solving this problem will increase the efficiency of the functioning of both gas companies with state participation and the entire economic system of the country. The article identifies the main features of the gas industry infrastructure organizations, formulates the features of the formation of the gas industry infrastructure system, and suggests an approach to the formation of this system in the gas industry infrastructure organizations.

1 INTRODUCTION

In the Russian Federation, production infrastructure is represented mainly by natural monopolies of the federal (for example, trunk electric networks (PJSC FSK UES), gas transmission system (PJSC Gazprom) and the regional level (for example, State Unitary Enterprise Vodokanal of St. Petersburg, JSC Mosvodokanal). Natural monopolies of federal level are a component of the fuel and energy complex (FEC) including also objects of the oil, coal, slate and peat industry and heat supply. At the same time, the gas industry or gas supply system is an activity to provide gas to consumers, including activities to form a fund for explored gas fields, production, transportation, storage and supply of gas.

The vast majority of the gas industry is concentrated in Gazprom (Gazprom Group), a vertically integrated holding company representing a global energy company, whose main areas of activity are exploration, production, transportation, storage, processing and sale of gas and gas condensate, sale of gas as motor fuel, as well as the production and sale of heat and electricity. As of the end of 2019, PJSC Gazprom controlled 71% of gas reserves and produced 69% of all Russian gas production. The next Gazprom PJSC in terms of gas production and sale in

the domestic market are independent companies - PJSC NOVATEK, PJSC NK Rosneft (a company with state participation) and PJSC LUKOIL. Gazprom has the world's largest gas transmission system, the bulk of which is part of the Unified Gas Supply System (ESG) of Russia. The ESG is a unique technological complex that includes facilities for the production, processing, transportation, storage and distribution of gas in the European part of Russia and Western Siberia, providing a continuous cycle of gas supply from the well to the final consumer.

The production infrastructure of the gas industry in PJSC Gazprom is represented by: 1) a gas transportation system; 2) a gas distribution system of organizations of various organizational and legal forms, inextricably connected with the production, processing and land storage of gas and gas condensate. The gas transmission system is concentrated mainly on the balance sheet of PJSC Gazprom and transferred to its 100% subsidiaries (Gazprom Transgaz St. Petersburg LLC, Gazprom Transgaz Ugorsk LLC, etc., a total of 17 operating organizations). The gas distribution system is operated by a subholding - Gazprom Mezhhregiongaz Group, which includes the parent company Gazprom Mezhhregiongaz LLC, and 53 regional gas companies selling gas, as well as 167 gas distribution organizations supplying gas to consumers.

The author, as a result of the analysis and synthesis of existing definitions of the concepts of "utilities" "gas industry," the features of the domestic gas supply system, formulated the following definition: "gas industry production infrastructure is a property complex that provides the main production processes of the gas industry through the transfer of gas through networks and product pipelines as part of a single technological process." For the purposes of the study, a definition of "infrastructure organization" has been formulated. "Infrastructure organization - a gas industry production infrastructure enterprise operating a property complex designed to transport gas through gas pipelines and/or distribution networks."

Given the complexity and multidimensional nature of the concept introduced, reflecting the development processes of the exploited property complex in conditions of instability of socio-economic processes, the problem of increasing the efficiency of the oil and gas industry, which is currently the basis for the formation of the profitable part of the Russian budget, is quite large in setting and requires a solution both strategically and operationally tactically.

2 STUDY METHODOLOGY AND CONTENT

Traditionally, the main focus is on exploration, production and directly transportation of hydrocarbons (gas and oil). At the same time, in our opinion, not enough attention is paid to the problems of production infrastructure. Currently, under the influence of scientific and technological progress and depletion of relatively easily accessible fields, the technological structure of the industry is becoming more complicated, investments in the production infrastructure of the industry are significantly increasing, and the task of operational management of the production infrastructure is becoming more complicated. Risk management of production infrastructure is an important problem of practical management, the importance of which is growing in such capital-intensive industries and technological intensive industries as the gas industry, which is even more complicated due to the fact that the latter is an industry that requires increased safety due to the possible negative impact on the environment and public health.

Risk management of production infrastructure is a management procedure that allows to increase

stability and ensure efficiency of gas industry enterprises in conditions of objective increase of risk exposure. At the same time, there is a gap in the methodological provision of risk management of the production infrastructure in the gas industry of Russia, in the context of the above trends.

The classification of production risks as significant for infrastructure organizations is due to the fact that these organizations are capital-intensive, and their main production processes focus on the operation of production OS in order to ensure uninterrupted gas or electricity supply, unlike other organizations of the gas industry, for example, selling gas for export or to domestic consumers for whom market, political or government regulatory risks are recognized as the main. As a result, infrastructure organizations have a high share of operating system maintenance and recovery costs.

Table 1: Distribution of the length of gas main pipelines of Gazprom Group gas transmission companies in Russia by service life as of 31.12.2019

Life	Length, thousand km	Share, %
Up to 10 years (inclusive)	17,3	10
From 11 to 20 years (inclusive)	16,2	9,5
From 21 to 30 years (inclusive)	40,9	23,8
From 31 to 40 years (inclusive)	55,2	32
From 41 to 50 years (inclusive)	24,8	14,4
More then 50 years	17,7	10,3

Source: compiled on the basis of: Official website of PJSC Gazprom - URL: www.gazprom.ru (circulation date: 10.02.2020).

Table 1 shows that at the end of 2019, almost 57% of the main gas pipelines operated by PJSC Gazprom in Russia are more than 31 years old. According to Rosstat data, the average depreciation rate of fixed assets of the production infrastructure is 56%. All this leads to an increase in production risks, since the impact of failures and accidents at production facilities can not be underestimated. The number of failures of PJSC Gazprom's gas transmission system facilities in the last decade ranges from 2 to 5 cases per 1000 km [Source: PJSC Gazprom's official website - URL: www.gazprom.ru (circulation date: 10.02.2020)].

The listed internal and external factors, which entail a shortage of financial resources in enterprises,

imply the introduction of risk management tools in the system of management of industrial assets of infrastructure organizations in order to take into account the risk factor when making decisions regarding limits of costs for maintenance and restoration of fixed assets.

Thus, the peculiarity of forming the risk management system of the production infrastructure of the gas industry is to develop and integrate the production risk management model into the fixed asset management system while centrally limiting the cost of servicing and restoring fixed assets by prioritizing the entire demand for costs.

In the course of the study, the author developed the main stages of the formation of the production risk management system (PRMS), which is a subsystem of the higher level system into which it is integrated. The starting point of the said system formation is determined depending on whether a high-level risk management system exists in the organization at the time of the decision to create it, since the PRMS is a subsystem and is formed by developing the already existing risk management system, focused mainly on financial, market and other risks.

At the first stage, after the decision on the implementation of the PRMS, it is determined responsible for developing and maintaining a risk management system structural division. This unit shall identify the production risks, as well as their detailed description and classification. Identified production risks are analyzed and ranked. At the same time, since at the initial stage of formation.

As a rule, the PRMS does not have the necessary consolidated statistical information on failures, accidents, etc., the level of risks is determined using qualitative methods through expert assessments.

At the second stage (generation of PRMS), existing ones are developed or specified:

- regulatory documents of the organization on the procedure of industrial risk management, including a detailed description of the stages and their dates,

- responsible departments/employees, as well as all incoming and regulatory documents containing methodological approaches to the management of production risks, including a description of the main types of production risks, methods of their assessment and means of control.

After the implementation of organizational measures to create a structural subdivision, identification and initial assessment of production risks, as well as the development/addition of regulatory and methodological documents for the successful implementation of PRMS, it is necessary to test the system by implementing at least one cycle

of industrial risk management (selection of control tools, information and communication, monitoring) and integrating this system into the processes of approval of management decisions.

Integration of PRMS and fixed assets management system involves the use of risk information in the current activities of structural divisions implementing the task of managing the fixed assets, i.e. the use of risk reporting (risk register, risk matrix, etc.) when making decisions on allocation of financial resources for maintenance and recovery of the fixed assets, taking into account the risk factor.

At the stage of implementation of PRMS in the organizations of the gas industry infrastructure, qualitative and combined methods of risk assessment are most applicable both in terms of probability and consequences, and in terms of calculating the level of risk and comparative analysis due to the lack of expert competencies, the lack of special software products, as well as the lack of a database, aggregated and systematized in the required analytical sections.

Based on the results of one or more management cycles and the organization of statistical data collection, quantitative methods based on retrospective data are recommended to assess the probability and consequences of production risk in order to reduce the influence of subjective factors on the calculation result.

Most domestic industrial enterprises are at the stage of forming the system, without using the obtained formalized information on risks when making management decisions within the framework of functional production units. These findings, according to the author, confirm the significance of the integration of PRMS into the existing management systems of infrastructure organizations. The efficiency of implementing the production risk management model consists in improving the quality of decisions made in the face of a shortage of financial resources, and thus is organizational in nature, as it is a tool to support informed decision-making when allocating cost limits for repair and replacement work.

3 CONCLUSIONS

Modern organizations of the production infrastructure of the gas industry are characterized by a high level of moral and physical depreciation of fixed assets, as well as a lack of financial resources with a centralized allocation of limits for the maintenance and restoration of these funds. Accordingly, there is a need to improve approaches to

managing the production risks of the infrastructure in order to prevent supply interruptions to end users of the gas industry as a result of the realization of risks associated with the fixed assets.

As a result of the study, the main features of the organizations of the gas industry infrastructure were identified, the features of the formation of PRMS were formulated and an approach to the formation of this system in the organizations of the gas industry infrastructure was proposed.

Based on the analysis of the methods of identification, assessment and management of production risks, a corresponding classification was developed taking into account the peculiarities of the functioning of infrastructure organizations and a model for managing production risks in organizations was developed gas industry infrastructure, including an algorithm for centralized allocation of financing for fixed assets repairs and restoration by prioritizing the entire demand for fixed assets costs based on the index of the fixed assets facility production risk.

REFERENCES

- Mitina Yu. A., 2015. Analysis of the experience of Russian enterprises in the formation of a risk management system in infrastructure companies. *In collective scientific monograph "Modern Entrepreneurship in an Innovative Economy: Theory and Practice "*. PERO PUBLISHING HOUSE. MOSCOW.
- Bezdejnih V. M., 2020. Why is it important to create a state risk management system and formulate a risk management policy. *In the collection: Poly transport systems. Materials of the XI International Scientific and Technical Conference*. NOVOSIBIRSK.
- Mitina Yu. A., 2015. Risk Management System in Foreign and Russian Business Management Practices. *In the collection: Materials of the III International Scientific Congress "Entrepreneurship and Business in Conditions of Economic Instability" (June 24-25, 2015)*. FINANCIAL UNIVERSITY UNDER THE GOVERNMENT OF THE RUSSIAN FEDERATION, DEPARTMENT OF ORGANIZATION ECONOMICS. PUBLISHING HOUSE "SCIENTIFIC CONSULTANT." MOSCOW.
- Avdiysky V. I., Deuteronomy V. M., Liechtenstein V. E., Ross G. V., Solodovnikova K. I., 2015. Financial and economic security of economic agents. *In Bulletin of the Financial University*. MOSCOW.
- Chaldaeva L. A., Masyukova, 2016. Financial and economic resources of modern entrepreneurship: foreign experience and Russian practice. *In monograph*. CHU VO "MGTA," MOSCOW.
- Kostina Yu. A., 2010. Features of the formation of a risk management system in infrastructure companies. *In Finance and credit*. MOSCOW.
- Avdiysky V. I., Deuteronomy V. M., 2018. On the Formation of Principles for the Organization of a Federal Integrative Risk Management System (FIRMS). *In the collection: The Concept of a Federal Risk Management System in the Field of Economic Security. Collection of materials of the All-Russian symposium "Problems of strategic management."* MOSCOW.
- Bezdejnih V. M., Dadalko V. A., 2009. Economic security, financial stability and stability as the quality of efficiency of the economic entity. *In Economic sciences*. MOSCOW.
- Bezdejnih V. M., Sinyavsky N. G., 2018. On high-level socio-economic systems as objects for ensuring economic security. *In Economics and management: problems, solutions*. MOSCOW.
- Bezdenezhnykh V., Bezdenezhnykh A., Karanina E., 2020. Synergy of interaction of control and supervisory structures in ensuring the stability of the socio-economic system: principles and organization. *In the collection: E3S Web of Conferences. "International Scientific and Practical Conference "Environmental Risks and Safety in Mechanical Engineering"*. MOSCOW.