

Legal regulation of environmental protection and ensuring environmental safety when using underground resources at regional and local levels

Elena Voskresenskaya^{1*}, *Lybov Vorona-Slivinskaya*², *Dmitry Mokhorov*¹ and *Anatolii Ponomarenko*¹

¹Peter the Great St.Petersburg Polytechnic University, Polytechnicheskaya, 29, St. Petersburg, 195251, Russia

²Saint Petersburg State University of Architecture and Civil Engineering, 2nd Krasnoarmeyskaya Str., 4, 190005, St. Petersburg, Russia

Abstract. The article deals with environmental and legal problems of using underground resources, particularly associated petroleum gas. Today regional legislation develops unsystematically and inconsistently, because the powers of the constituent entities of the Russian Federation are regulated insufficiently in the sphere of environmental protection and ensuring environmental safety, when using underground resources. Some cases contain direct contradictions to federal legislation. Some constituent entities of the Russian Federation have a tendency for normative legal regulation of this area of public relations within the framework of "advanced standard-setting". These tendencies show the need to specify the powers of the constituent entities of the Russian Federation in federal legislation. Disposal of associated petroleum gas is becoming a serious problem today. A great part of this gas is wildly flared getting into the atmosphere, whereas there is a more decent and even profitable way of its disposal. The article analyzes the corporate structure of associated petroleum gas production in Russia and determines the directions for improving the legal framework. Based on their research, the authors propose to develop a Program of implementing a set of measures aimed at increasing the extraction and subsequent processing (disposal) of associated petroleum gas by independent oil companies, which could serve as measures for state stimulation of oil production development.

1 Introduction

The effectiveness of the implementation of state powers set by federal legislation in the field of environmental protection and ensuring environmental security at the regional and local levels is a demanded factor for creating favorable living conditions for the population living in the certain territory. Sphere of environmental protection and environmental safety ensuring has the problem, which lies in fact that the legal capacity of authorities of constituent entities

* Corresponding author: elenvoskr@mail.ru

of the Russian Federation and local governments to regulate these relations is still sufficiently limited by federal legislation.

The formation of environmental legislation of the subjects of the Federation is mostly influenced by the ecological situation in the country and in its certain territories. This situation promotes the creation of effective legal mechanisms for regulating relations in the sphere of interaction between society and nature.

Many researchers have repeatedly noted that the constituent entities of the Russian Federation cannot fully ensure the effectiveness of the implementation of state environmental policy in this area. This actually makes them free from responsibility for the state of natural resource potential and the environment in general in a certain territory [1-5]. The authors of the article have studied this problem and concluded that in a number of constituent entities of the Russian Federation there is a certain positive experience of regulation in the field of environmental protection and ensuring environmental safety in the use of underground resources. This experience can become a basis for improving the federal legislation [6-10].

2 Materials and Methods

The environmental programs of a number of constituent entities of the Russian Federation imply certain measures of economic regulation in the field of environmental protection in the use of underground resources. These measures include developing a public-private partnership system and investment projects, providing tax and other benefits when implementing the best available technologies, non-traditional types of energy and recycling, the maximum and effective use of mineral resources, increasing the efficiency of using associated petroleum gas, reducing volumes of gas flaring, etc.

Some constituent entities of the Russian Federation have adopted the regulatory acts in the field of environmental insurance when carrying out activities related to the use of underground resources. Among those acts, the following programs are worth mentioning: program for the insurance of natural hazards (floods, hurricanes, fires), liability insurance program for organizations operating potentially hazardous facilities (oil and gas storage facilities, hydraulic structures, nuclear energy facilities, water intake and water treatment facilities, sewage disposal plants, etc.), programs for insurance of key assets of industrial enterprises; programs for the insurance of environmental risks (gas and oil pipelines, slag storages, etc.). The legislation of a number of constituent entities of the Russian Federation has attempted to resolve the current federal level problem of regulatory support for the disposal of associated petroleum gas.

3 Results

Investigation of the issue of legal regulation of underground resources use has shown that a number of entities have normative legal acts that contain provisions for reducing the flaring of associated gas by increasing the degree of gas disposal in the fields and using it for energy production. In some cases, the solution of this problem is comes down to the necessity of constructing the facilities for associated petroleum gas disposal, creating an oil and gas complex to accelerate the socio-economic development of regions or introduction of new technologies for associated gas disposal.

To solve the problems of associated petroleum gas disposal, the legislation of some constituent entities of the Russian Federation implies the use of tax and financial instruments of state policy. This comes in the form of subsidies provided from the constituent entity's budget or the budgets of territorial state extra-budgetary funds. The subsidies are granted to oil and gas enterprises implementing projects of solving the problems of associated petroleum

gas disposal, to developers of technological innovations in the field of associated petroleum gas disposal who created new or improved products or developed a technology, which is ready for introduction in the market.

In the legislation of certain constituent entities of the Russian Federation, legal measures for associated petroleum gas disposal are formalized in special targeted programs of state support of oil and gas producing companies implementing investment projects on increasing the level of associated petroleum gas use, proposals for the use of associated petroleum gas. The purpose of this is to include them in the National Standard of the Russian Federation "Oil and Gas-oil Fields. Reservoir Engineering Rules». If such an associated petroleum gas classifier based on the determination of the component composition and volumes of associated gas from various fields is introduced, the mechanism for financing in the framework of Kyoto Protocol will be more commonly proposed with the aim of introducing technologies that will ensure the fuller disposal of associated petroleum gas.

A comprehensive analysis of the condition of associated petroleum gas in Russia is required as well as the provision of recommendations for its further rational use. In particular, one of the helpers in the solution of the problem under consideration is the development of a targeted program of increasing the efficiency of associated petroleum gas use, which is aimed at the consolidated implementation of corporate programs for the use of associated petroleum gas not only by large but also small oil companies. In addition, the program will consider alternative options with the substantiation of selecting methods for the use of associated petroleum gas. (Transportation to gas processing plants, gas cleaning at the extraction site and its use for generation of heat and electric energy, the isolation of light methane-propane fractions for household needs, the use of thermochemical methods for the production of synthetic petroleum products, the secondary processing of associated petroleum gas, which allows to obtain liquefied propane-butane technical, diesel fuel, unstable gasoline, with the use of secondary processes of gas chemistry, which allows to obtain synthetic fuel using GTL (gas-to-liquids) technology, methanol and propylene).

In order to stimulate the development of oil production in the context of the research conducted by the authors, the Program should be elaborated that implies the introduction of a set of measures aimed at increasing the collection and subsequent processing (disposal) of associated petroleum gases by independent oil companies. Based on this Program, a number of investment projects should be implemented, aimed at the promising area of energy saving and energy efficiency increase. In particular, the following steps should be taken: the introduction of power stations for gas disposal in oil producing wells, maximizing processing APG, including the selection of petrochemical fractions, construction of gas engine power plants that use liquefied petroleum gas as fuel; search and introduction of new technologies for processing and disposal of associated petroleum gas, development, search and implementation of effective environmentally friendly technologies for disposal and processing of associated petroleum gases, use of associated petroleum gas to generate electricity and heat for the company's technological needs.

4 Discussion

In 2015, gross output of APG in Russia was 67.8 billion m³, of which 16.3 billion m³ was flared. 51.2 billion m³, or 75.5% was used, approximately 30.3 billion m³ (44.7% of the total production) was supplied to gas processing plants; 21.2 billion m³ (31.3%) was used for the needs of oil companies for injection into the reservoir and production of electric power.

Table 1 provides information on the production and use of associated gas in Russia for 2016-2017 [8].

Table 1. Production and use of associated gas in Russia for 2016-2017, billion cubic meters.

Underground resources' user	Efficient use		Flared gas		Total production	
	2016	2017	2016	2017	2016	2017
Totally in Russia	51.6	53.6	16.4	18.4	65.9	71.8
- - Gazprom Group	4.3	4.7	2.1	2.2	6.5	6.9
- oil companies "Lukoil", "Rosneft", "Surgutneftegaz"	42.9	44.1	12.8	14.2	55.8	58.3
- independent producers	2.1	2.2	1.5	1.7	3.6	3.9
- PSAs	2.3	2.6	-	0.3	-	2.7

If analyzing the dynamics of production and use of associated petroleum gas for the period of 2012-2017, it can be definitely concluded that the percentage of gas flaring has decreased from 33% to 24%, so the level of use has increased from 67% to 76%. At the same time, associated gas production in Russia as a whole increased due to the development of new oil fields. Thus, even against the background of increased oil production, the share of associated gas in a number of oil companies is steadily increasing. Nevertheless, not all subsoil users are ready to the complete disposal of associated petroleum gas (at least 95%). Today, one of the main factors affecting the disposal of associated gas is the development of new fields, which are far from the existing transport infrastructure and associated petroleum gas processing facilities.

The degree of associated gas processing to valuable chemical products is negligible in Russia. For example, only 1.5% of this raw material serves for the production of gas motor fuel. The oil gas contains a large number of homologues of methane (ethane, propane, butanes, etc.), in contrast to natural gas, in which usually methane prevails. Therefore, the usability of petroleum gas is much broader. It is possible to obtain products of petroleum gas, the value of which is much higher than that of products obtained from natural gas. Therefore, their cost will also be higher. Table 2 shows the directions of use of associated petroleum gas [8].

Table 2. The main directions of using associated petroleum gas

As fuel (energy gas)	As raw material for oil and gas chemistry
for the generation of thermal and electric energy necessary for the own needs of the industry	processing with obtaining a wide range of products:
	- dry stripped gas
	- stable gasoline
	- gas motor fuel
	- liquefied petroleum gas
	- ethane
	- wide fraction of light hydrocarbons
- nitrogen, helium, sulfur compounds	

It is obvious that even partial use of petroleum gas would give a powerful impetus to the development of the innovative economy. According to the calculations, a ton of ethane (a component of natural gas) costs approximately 80-90 dollars, and of ethylene - 600 dollars. Polyethylene of low density is 20 times more expensive than ethane. The cost of end products from polyethylene reaches 2500-3700 dollars per ton. The growing value of associated petroleum gas has stimulated a number of developed countries to actively commercialize products from associated gas to meet domestic demand and enter international markets.

5 Conclusions

According to the results of the study of regional legislation in the area of environmental protection and ensuring environmental security when using underground resources, it should be noted that today the legal opportunities of state authorities of the constituent entities of the Russian Federation and local governments to participate in resolving these issues are significantly limited by federal legislation.

In accordance with the requirements of the Main Provisions of regional policy in the Russian Federation, the definition of the competence of local self-government authorities should proceed from the principle of complementarity. Local authorities should get the powers that they are able to fulfill. At the same time, the current underground resources legislation actually excludes the possibility of participation of local self-government authorities in the management of the state fund of underground resources, whereupon the powers of local authorities require either major specification and bringing into compliance with the current legislation, or an actual exclusion from the legislation. In this regard, it is proposed to legislatively expand the powers of state authorities of the constituent entities of the Russian Federation in the area of environmental protection and ensuring environmental safety in the use of underground resources. Only entrusted authorities of the constituent entities of the Russian Federation can implement the principle of considering natural and socio-economic characteristics of the territories when planning and implementing economic and other activities, since the constituent entities are the most interested in protecting the environment and ensuring environmental safety in their territories.

References

1. E. Voskresenskaya, V. Snetkov A. Tebryaev and Z. Askarov, MATEC Web of Conferences, **106**, 08055 (2017)
2. E. Voskresenskaya, V. Snetkov and A. Tebryaev, E3S Web of Conferences **33**, 03051 (2018) <https://doi.org/10.1051/e3sconf/20183303051>
3. E. Voskresenskaya and L. Vorona-Slivinskaya, E3S Web of Conferences **33**, 03052 (2018) <https://doi.org/10.1051/e3sconf/20183303052>
4. E. Voskresenskaya, D. Mokhorov and A. Tebryaev, **170**, 01058 (2018) <https://doi.org/10.1051/mateconf/201817001058>
5. E. Voskresenskaya, N. Zhilskiy and E. Shariapova, **170**, 01057 (2018) <https://doi.org/10.1051/mateconf/201817001057>
6. P. K. Sun, L.Vorona-Slivinskaya, E. Voskresenskaya, IOP Conference Series: Earth and Environmental Science, **90**. <https://doi.org/10.1088/1755-1315/90/1/012073>
7. E. Voskresenskaya, I. Vorona-Slivinskaya, S. Panov, MATEC Web of Conferences, **193**, 02025 (2018) doi.org/10.1051/mateconf/201819302025
8. Regiony Rossii/ Sotsial'no-ekonomicheskie pokazatel. R32 (2017)
9. A. Mottaeva, MATEC Web of Conferences, **170**, 01053 (2018) [doi:10.1051/mateconf/201817001053](https://doi.org/10.1051/mateconf/201817001053)
10. A. Mottaeva, A. Zheltenkov, MATEC Web of Conferences, **170**, 01022 (2018) [doi:10.1051/mateconf/201817001022](https://doi.org/10.1051/mateconf/201817001022)