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SOCIAL AND ENVIRONMENTAL RISKS OF SUSTAINABLE DEVELOPMENT OF GAS PRODUCING REGIONS OF THE RUSSIAN FEDERATION AND WAYS TO REDUCE THEM

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ABSTRACT

One of the most discussed and relevant topics in the energy sector is the prospect of reducing environmental risks in the development of energy sources. This is due to the growing production of shale gas, processing of associated petroleum gas, etc. As many major energy corporations have become more active in acquiring land in Europe and Asia for exploration of gas-export deposits, which is connected with their strategy to diversify gas supplies, develop new markets in conditions of acute competition, energy security issues have emerged. This assumption is typical for all countries, including Russia - as it is before the gas industry of the Russian Federation that new tasks arise, due to the exacerbated geopolitical component and the extensive territory from Barents to the Okhotsk and Caspian Seas. Accordingly, the different climatic conditions of these regions suggest characteristic geo-ecological features. Since mining technology requires safer and cleaner methods of development as well as active investment, the energy market has recently been disrupted, which has not only affected energy security, but has also adversely affected the stability of the world oil and gas industry.

Keywords: Ecology, risk, shale, traditional sources, environment

1.Introduction

Hydrocarbon deposits are currently being developed in three areas: traditional field oil and gas production on the mainland; Hydrocarbon production (mainly petroleum) in the oceans, margins and inland seas; and finally shale gas production on continents. Each type of mineral extraction is characterized by its own specificity, but they all carry with them a potential environmental threat.

The biggest environmental risk today. Carries industrial shale gas production. At the moment, shale gas production and environmental damage is an environmental disaster. It is the environmental problem, together with the use of large amounts of water for hydraulic fracturing, that is the most acute problem for the development of shale mining in densely populated regions of the world. Although hydraulic fracturing is carried out far below groundwater levels, the soil layer, groundwater and air are contaminated with toxic substances. This is due to the leakage of chemicals through cracks formed in the thickness of sedimentary rocks, in the surface layers of the soil.

Note also that the most successful shale deposits belong to the Paleozoic and Mesozoic eras, and, have a high level of gamma radiation that correlates with the thermal maturity of the shale deposit. As a result of hydraulic fracturing, radiation enters the upper layer of sedimentary rocks and in the areas of shale gas production, there is an increase in the radiation background.

Studies conducted, given the high level of uncertainty in estimates, highlight the need for further improvements in shale gas production technology in order to better control methane emissions, soil and groundwater pollution. Unfortunately, against the background of the depletion of traditional gas reserves, shale gas will not be able to become a worthy alternative to natural gas in the near future, as it does not meet modern environmental requirements for energy resources and its extraction conditions. Prospects for large shale gas production are currently available only in poorly populated areas and in countries that agree to reduce environmental safety.

Shale gas deposits in the subsoil of the earth are huge, but the estimate of reserves can be considered conditional, as it differs depending on the methods of assessment. Thus, according to the version of the renewable shale gas, methane in shale is formed constantly, from deep antiquity to modern times, due to the reaction of hydrogen, which rises from the depths of the earth with kerogen - the organic shale. Figure 1 shows an approximate estimate of shale gas reserves (see Figure 1).

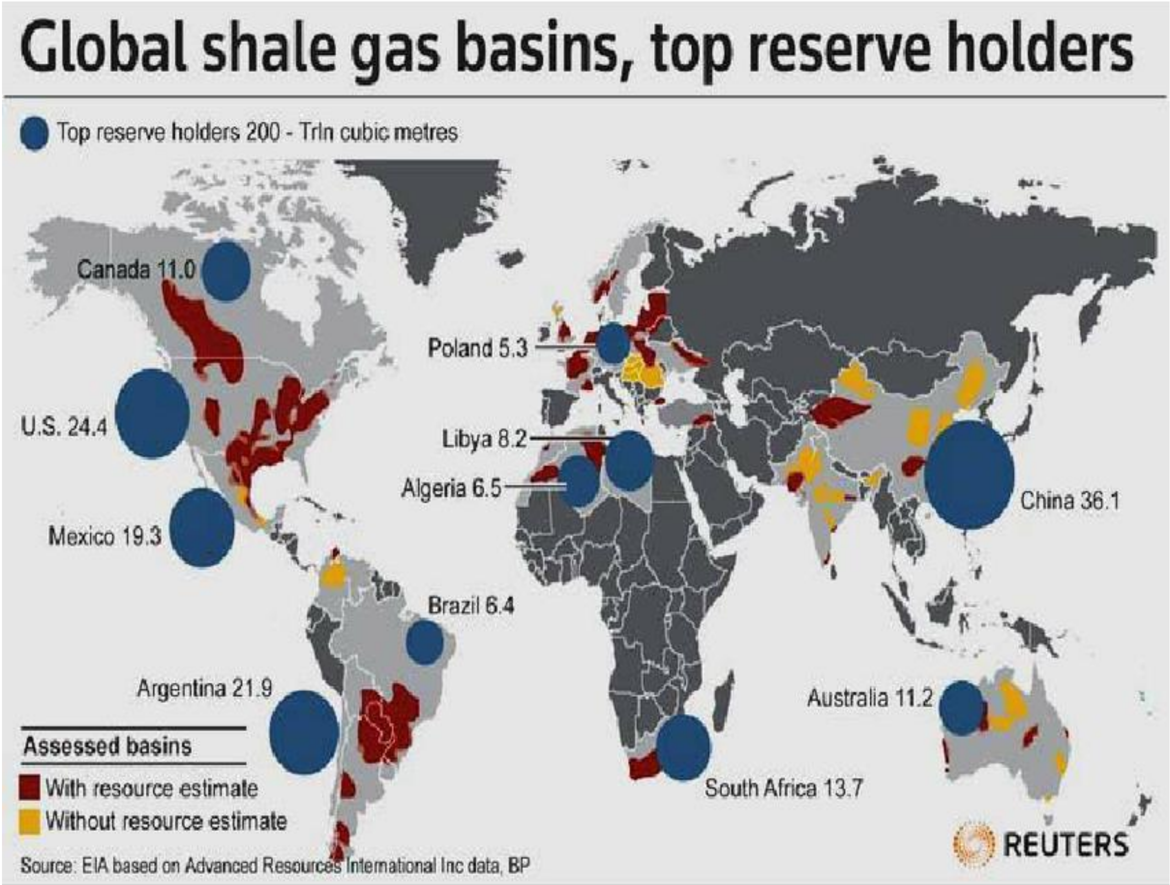

Fig. 1. World estimate of shale gas reserves
Source: [1]

Given the negative factors associated with imperfect mining technology and environmental pollution, shale gas has increased over the past 10 years and is currently estimated at 456 trillion cubic meters.

2.Theoretical Framework

According to Energy Information Administration (EIA), the US shale gas reserves for 2018 are 340 trillion cubic meters [2], of which technically recoverable reserves - 22 trillion cubic meters [3]. According to the report of the Institute of Energy Strategy of the Russian Federation in 2018, the volume of shale gas production amounted to 180 billion cubic meters. According to the estimate of East European Gas Analysis this year - 2020, production will be about 160 billion cubic meters. l.; At the same time, according to the IEA forecast, shale gas production by 2030 will not exceed 150 billion cubic meters. Under a favorable development scenario.

Shale gas exploration is most active in countries with insufficient natural gas reserves (not taking into account recent RE trends). The main gas channel fields under development are concentrated in the United States. The comprehensive assessment of shale gas deposits allows to focus on the volume of proven technical recoverable deposits in 48 US states from 7.1 to 24.4 trillion cubic meters according to the versions of different agencies. At the same time, it is necessary to take into account reserves and opportunities of shale sector development in Canada, Europe, Australia, Israel, as well as in Russia.

Shale oil resources in the PRC are estimated at about 46 billion tons. The main reserves are located in the northeast of the country. But although the Black Sea has some experience of extracting shale gas from the subsoil, it is not in a hurry to start active production of shale oil.

In the Middle East, a large shale oil producer, Israel, may emerge. According to Israel Energy Initiatives (IEI), the resources of oil shale in the country amount to about 34 billion tons. At the same time, IEI claims that in Israel it is possible to apply a new technology of oil extraction from kerogen, a method of internal production using electric and gas heaters.

Since 2009, shale deposits in Argentina have been under development. EIA estimates that this country ranks fourth in the world in terms of technically recoverable resources of hard-to-recover oil after Russia, the United States, and China. At the same time, the recoverable oil resources of shale formations in Argentina amount to 27 billion barrels, or 8% of the world 's reserves. Moreover, as experts note, the Argentina slate formation of Vaca Muerta ("A dead cow") on the main characteristics - concentration of the general organic carbon, to thickness of productive layer, reservoir pressure - is similar, to actively developed American fields in Haynesville, Marcellus, Eagle Ford and Wolfcamp.

In Australia, shale-related processes are just beginning. According to IEA, technically recoverable oil reserves from shale amount to 1.64 billion tons of oil [3]. At present, there are three projects in the country to extract oil from shale formations (recently, which suffer minor but development-affecting losses related to social and environmental risks).

There are countries in Europe with experience in shale stock mining but "not eager" to join the shale race. Thus, Estonian shale deposits have been developed on an industrial scale since the beginning of the 20th century, and as of 2008, shale oil reserves amounted to 250 million tons. Today Estonia does not seek to dramatically increase production, preferring to export technology to China, Jordan and the United States, acting as a "consultant" on shale mining issues. Moreover, another slowing "anchor" is the EU 's strict environmental legislation, which today is almost incompatible with the country 's fairly "dirty" oil shale production (see Figure 2).

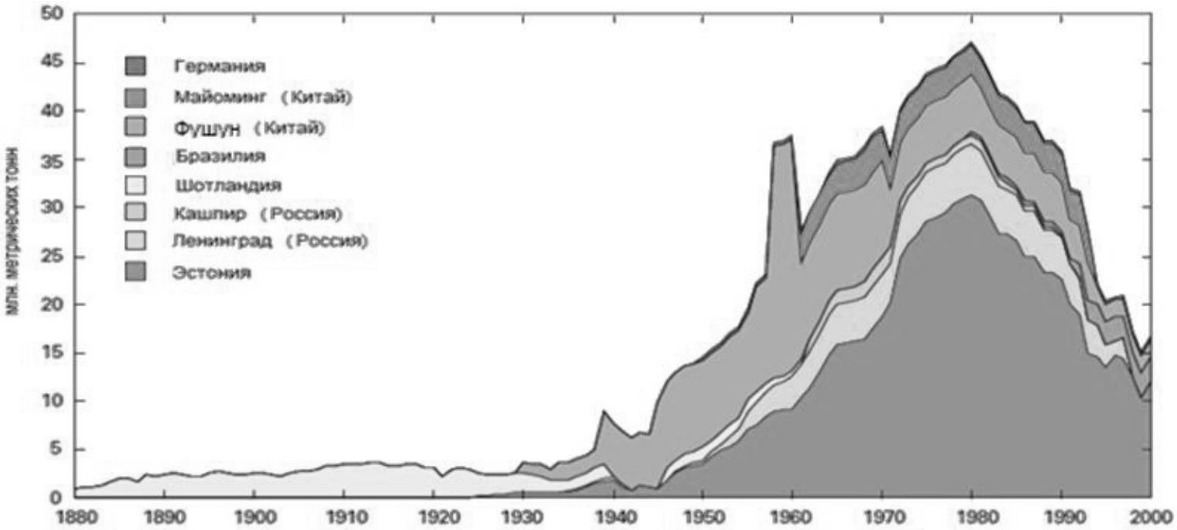

Fig. 2. Historical development of shale formations in countries with production dynamics, million tons
Source: [4]

More than 80 oil shale deposits are known in Russia, which are located in the Volga, Baltic, Pechoro-Timan and Vichegoda basins. The explored fields include the largest in Russia Leningrad field in Leningrad region, as well as Yarengsky and Ayuvinsky in Komi, Kashpir and Ozinskoye in Samara region and General in Orenburg region.

The total reserves of the Baltic field are estimated at 1.1 billion tons, equivalent to approximately 200 million tons of oil. The previously operating company "Leningrad shale" (liquidated in 2018) - was the only one that until recently produced fuel shale at two mines "Leningrad" and "Kirovskaya" (about 167 million tons). The only consumer of Leningrad shale was Estonian JSC "Harv Power Plants" under the Cooperation Agreement between the Ministry of Energy of Russia and the Ministry of Economy of Estonia in 1997. Since 2005, Narv Power Plants has terminated the contract for the supply of shale, which provides for the processing of 1.2 million tons of fuel and the supply of all electricity in the network of JSC "Lenenergo" [4]. As a result, production stopped. In 2006 the majority shareholder of JSC "Leningrad shale" became the group of companies "Renova". In 2007, mine work resumed for a while, but the company never recovered.

Meanwhile, in Russia there are scientific developments of a world class. For example, the Saratov State Technical University (SSTU) and "New Researches and Technologies" non-profit partnership agreed about cooperation in realization of works of SSTU in production and processing of the Volga region shale. The Saratov project involves the production and integrated use of these raw materials in EAEU member countries, including Kazakhstan. This project involves the creation and introduction into industrial operation of highly efficient technologies for the production of synthetic fuel from bituminous shale and oil sands, which fill part of the world 's energy needs.

If in Russia there were attempts to find a practical solution, in other countries began with prohibitions. In 2011, the French Parliament passed a law prohibiting the use of hydraulic fracturing of geological formations in the country. In 2013, the Dutch government introduced a temporary ban on the use of hydraulic fracturing technology for gas extraction. In 2014, Great Britain lifted the ban on shale gas production by hydraulic fracturing imposed after two small earthquakes in 2011 near Blackpool caused by shale gas extraction. A similar decision was taken by the South African authorities in 2012 [5].

Thus, the proliferation of shale gas technologies, mainly hydraulic fracturing and horizontal drilling, has long begun to raise concerns among ecologists and the population, first in the United States and now around the world.

3.Methods and data

Both traditional field production and shale drilling are characterized by the following risks and ways to reduce them:

1. Risks of subsoil structure change.

First of all, shale gas production involves an impressive coverage of drilling areas, while the drilling process itself means a significant disruption of subsoil integrity.

Proponents of shale development argue that the method of horizontal drilling, allows to minimize the scale of impact on the landscape and environment, as it opens access to large reserves of gas, which gives an opportunity to reduce the number of wells, as one well, is used to the maximum.

2. Risks of surface water and soil contamination.

The transport, storage and disposal of chemically hazardous wastes (mainly liquid) left behind by shale well drilling to avoid contamination of surface waters (lakes, water bodies, rivers) and soil were highly environmentally sensitive. According to experts, liquids used for hydraulic fracturingoperations usually consist of water and chemicals by 95-98%.

Water and soil testing in the immediate vicinity of the work will help to reduce, but not eliminate, risks. As precautions, for storage and cleaning of spent liquids, closed sealed tanks are provided [6].

3. Risks of methane, carbon dioxide emissions into the atmosphere.

The fact is that gas can be released during drilling operations, or during pumping through leaks in the gas pipeline. The gas emissions from wells in Pennsylvania and West Virginia during drilling operations at the Marcellus Gas Field highlight the public and environmental risks associated with drilling in the high pressure zone and injection under pressure of liquids for hydraulic fracturing.

Measures to reduce so-called uncontrolled emissions to the atmosphere, which are known to date, are limited to two options: controlled combustion of natural gas released from oil and gas production, and controlled release of gas directly into the atmosphere [7].

Also, one of the significant pollutants of atmospheric air in oil production is associated gas. Millions of cubic meters of associated gas have been burned in flare plants for decades, which has led to the formation of hundreds of thousands of tons of nitrogen oxide, carbon monoxide, sulphur dioxide and partial combustion products, which eventually entered the atmosphere.

Historical examples confirm this fact: the accumulation of hydrocarbon vapours along the railway due to the accident on the condensed hydrocarbon pipeline in Bashkortostan. Specific environmental problems arise in oil refining, especially with regard to the primary purification of oil and the removal of sulphur therefrom. The content of associated gas combustion products in the ground-level atmosphere can negatively affect the health of personnel and residents of nearby settlements [8].

At present, there are various estimates of the economic benefits associated with the rational use and processing of associated petroleum gas. For example, the report of the Global Partnership to Reduce the Combustion of Associated Petroleum Gas indicates that the additional annual revenues of the Russian economy from the production of electricity, gas and oil processing of associated petroleum gas and the sale of dry, stripped, gas under appropriate government measures could be between $2.3 billion and $7.1 billion per year.

Such assessments are based, inter alia, on the consideration of alternatives to the use of PNG in various ways. Figure 3 shows the options for recycling 15 billion cubic meters. Based on calculations of Gazprom. As mentioned above, 15 billion cubic meters is the volume that is burned on torches according to official statistics. At the same time, the volume of total combustion in the oil fields taking into account energy generation, according to expert estimates, can actually be three times more (see Figure 3).

Fig. 3. Possibilities of use of associated petroleum gas
Source: [9]

4.Conclusion

Given the complexity of the problem, it is considered advisable to create special scientific and production structures at the federal and sectoral level to monitor the entire cycle of oil and gas production. Such structures will be more dynamic and therefore open to international cooperation, which is very important when emergencies reach the regional, national or global levels, as they will help to address the warming climate on planet Earth, the most global problem of today 's global community, caused by intensive energy extraction in all regions of the world. The environmental risks to the planet associated with these processes can only be addressed through the joint efforts of the entire world community.

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ОСОБЕННОСТИ СТРАТЕГИИ И ТАКТИКИ ВЫХОДА НА МЕЖДУНАРОДНЫЕ РЫНКИ АМЕРИКАНСКИХ КОМПАНИЙ

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SPECIFICITIES OF THE STRATEGY AND TACTICS OF ENTERING THE INTERNATIONAL MARKETS OF AMERICAN COMPANIES

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АННОТАЦИЯ

В статье проанализированы задачи, с которыми связан процесс принятие решения относительно целесообразности выхода компании на международные рынки. Освещены способы выхода на международный рынок, к которым относятся экспорт; предоставление зарубежным фирмам лицензий и франшиз; создание совместных предприятий; создание нового предприятия на территории нового рынка; приобретение действующего предприятия для обслуживания местного рынка. На основе теоретического анализа выявлены преимущества и риски вышеперечисленных способов выхода компании на международные рынки. Дается анализ обоснования стратегий выхода американских компаний на международные рынки. Эта статья заключает, что перед компанией встает большое количество вопросов, и только тщательно проведенные исследования и правильно выбранный рынок могут создать работающую стратегию выхода предприятия на международные рынки.

ABSTRACT

This article analyzes the tasks associated with the decision-making process regarding the feasibility of entering the international markets. It highlights methods to enter the international market, which include exports; granting licenses and franchises to foreign firms; creating joint ventures; creating a new enterprise on the territory