

Research on Tax and Fee Support Policies for the Green Development and Utilization of Shale Gas Resources in Sichuan

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Abstract: Green is the distinctive background color of Sichuan, and at this stage, Sichuan is further promoting the development of clean energy. As a region rich in shale gas resources and the earliest area in China to carry out shale gas exploration, development, and utilization, Sichuan's exploration and practice in the green development and utilization of shale gas resources have important demonstration significance for the development of shale gas resources and industrial development nationwide. This article aims to sort out the relevant policy measures for the green development and exploitation of Sichuan's shale gas industry, analyze the existing deficiencies based on the existing policy framework, and propose targeted countermeasures and suggestions from adjusting fiscal subsidy methods, establishing special funds, increasing tax and fee incentives, and coordinating the interests of all parties, in order to effectively reduce enterprise burdens, improve the utilization rate of shale gas resources, and promote efficient and sustainable industrial development.

Keywords: Shale Gas; Green Development and Utilization; Tax and Fee Support Policies.

1. Introduction

Energy, water, and food jointly constitute the three essential elements for human survival. General Secretary Xi Jinping has emphasized that "the rice bowl of energy must be held in our own hands," highlighting the importance of energy security for China. With the increasing global awareness of environmental protection and the transformation of energy structure, shale gas, as one of the clean energy sources, its efficient development is conducive to enhancing China's international energy competitiveness and influence, ensuring China's energy security. In the current critical period of profound adjustments in the global energy structure, China must regard the innovation of energy production and the transformation of consumption patterns as long-term national policies, elevating energy to a strategic level that is crucial to national security and development. However, in 2023, China's dependence on foreign natural gas reached 42.2%, an increase of 1.8 percentage points year-on-year, indicating that China's energy security situation is becoming increasingly serious.

As the earliest province in China to engage in shale gas exploration and development, Sichuan Province has accumulated considerable data resources through years of diligent efforts. The green development and utilization of shale gas resources not only contribute to the prosperity and development of the shale gas industry in the region, significantly enhance natural gas supply capacity, effectively alleviate supply and demand bottlenecks, but also optimize the energy consumption structure and catalyze new economic growth drivers. According to data statistics from the National Energy Administration, China's annual shale gas production was only $25 \times 10^6 \text{ m}^3$ in 2012. After the implementation of direct subsidies for shale gas production, the output reached $153 \times 10^8 \text{ m}^3$ in 2019. Due to the impact of the COVID-19 pandemic, data for the period from 2020 to 2022 is not available for reference. In 2023, the output reached $25 \times 10^9 \text{ m}^3$, achieving a significant increase in shale gas production.

In 2023, Sichuan Province's shale gas production reached $128 \times 10^8 \text{ m}^3$, accounting for 51.2% of the total national shale gas production. Currently, over 95% of China's shale gas production comes from the Sichuan Basin and its surrounding areas.

In this context, analyzing the development journey of the shale gas industry reveals that fiscal and tax support policies have played a crucial role. These policies not only alleviate the financial pressure faced by enterprises during exploration and development but also foster technological advancement and healthy industrial growth. Looking ahead, as shale gas exploration and development technologies undergo upgrading and shale gas production further increases, it will enhance the proportion of shale gas resources in China's energy mix, thereby promoting a cleaner transformation of China's energy structure.

2. Combing Policies Supporting the Development of Shale Gas Resources

2.1. Fiscal Subsidy Policy

Since 2012, China has implemented fiscal subsidies for the shale gas industry to promote the development and utilization of this unconventional natural gas resource. Initially, the fiscal subsidy policy was implemented in a fixed amount, with a subsidy standard of 0.4 yuan/ m^3 . However, after two reductions, it was lowered to 0.2 yuan/ m^3 . In June 2019, China adjusted the subsidy policy, eliminating the fixed subsidy and implementing an incremental subsidy policy. "More subsidies for more" and "winter subsidies for winter" are the incremental subsidy policies during this period. Moreover, China regards technological innovation and industrial upgrading as the key driving forces for the development of the shale gas industry. At the same time, China vigorously advocates diversified investment, especially attracting the participation of private enterprises, to promote the comprehensive development of the shale gas

industry. At the local level, Sichuan Province has improved the paid use system of mineral resources, promoted the

protection and rational development of mineral resources, and set the transfer income of shale gas mining rights at 0.8%.

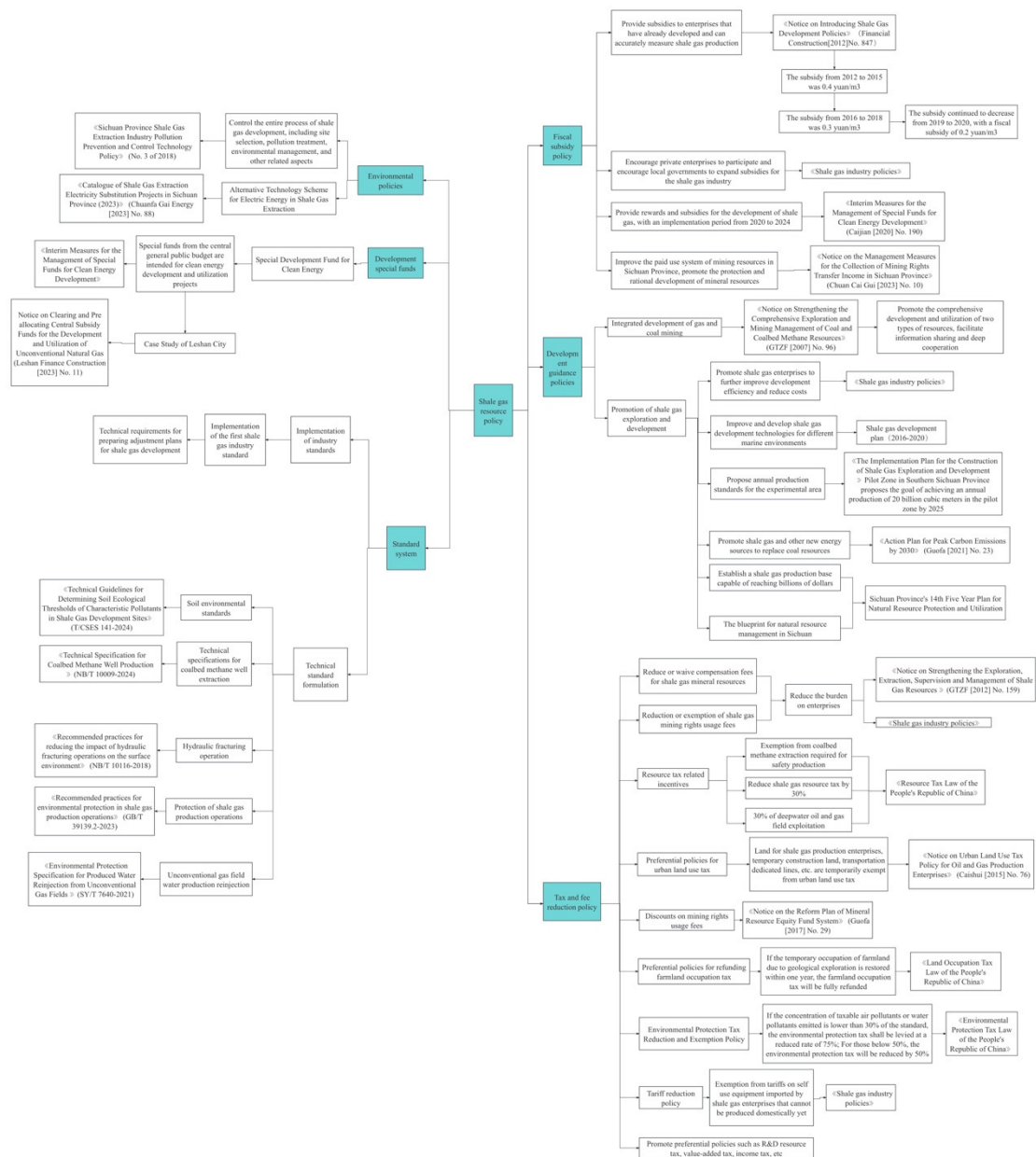


Figure 1. Framework of shale gas resource support policies

Overall, China's fiscal subsidy policy for the shale gas industry has undergone a shift from fixed subsidies to incremental subsidies, making fiscal subsidies more targeted. At the same time, it encourages technological innovation and industrial upgrading, improves the supporting measures of local governments, and promotes the healthy growth and sustainable development of the shale gas industry.

2.2. Development Guidance Policies

The Chinese government has introduced a series of policies guiding development, effectively promoting the rapid growth of the shale gas industry. These policies include promoting the joint exploitation of shale gas resources with other resources, such as the development of "integrated coal mining and gas extraction"; encouraging breakthroughs in technological innovation in shale gas development, such as improving and breaking through shale gas exploration and development technologies for marine, deep-sea, continental, and transitional marine-continental facies; setting production

targets, proposing that the annual output of shale gas in pilot areas should reach 20 billion cubic meters by 2025; promoting the substitution of coal resources with new energy sources such as shale gas; establishing production bases with a capacity of hundreds of billions of dollars, etc. In addition, the Chinese government has also launched programmatic documents for the shale gas industry to provide guidance, promoting shale gas enterprises to further improve mining efficiency and reduce costs, enhancing the market vitality and competitiveness of shale gas resources.

2.3. Tax Relief Policy

Given the significance of shale gas extraction in reducing China's reliance on overseas natural gas, expanding domestic natural gas supply, promoting a deep transformation of the energy structure, and ensuring long-term stability of national energy, as well as considering its significant technical challenges and substantial initial capital requirements, the Chinese government has implemented a relatively

comprehensive set of tax and fee reduction and exemption policies targeting shale gas exploration, extraction, production, transportation, and environmental protection. These policies include: exemption from shale gas mining rights royalties and mineral resource compensation fees; exemption from resource tax on coalbed methane extracted for safety needs during exploration and development, a 30% reduction in the resource tax rate for shale gas, which has been extended twice and will remain in effect until 2027; temporary exemption from urban land use tax for land used by shale gas production enterprises, temporary construction land, and dedicated transportation routes; reduction or exemption of environmental protection taxes based on pollutant emission concentrations; exemption from tariffs on self-use equipment and accompanying technologies imported by shale gas enterprises that cannot be manufactured domestically; reduction or exemption of shale gas resource compensation fees and mining rights royalties; and full refund of farmland occupation tax for farmland temporarily occupied for geological exploration and restored within one year.

2.4. Environmental Protection Policies

China has set relevant environmental protection goals during the exploration and development process of shale gas. In terms of Sichuan Province, relevant environmental protection mining technology policies have been formulated to control the entire process of shale gas development, involving development site selection, pollution disposal, environmental management, etc. Additionally, a technical plan for replacing electric energy with shale gas mining has been implemented to ensure project construction quality, environmental protection, safety management, etc., and to ensure the timely completion of construction goals and tasks.

China has clearly set environmental protection goals in the field of shale gas exploration and development. Taking Sichuan Province as an example, it actively responds to the national call and carefully formulates specialized environmental protection and extraction technology policies. These policies comprehensively cover the entire process of shale gas development, from initial development site selection to later pollution disposal, and to environmental management throughout the process, with detailed norms and guidance established. In addition, Sichuan Province actively promotes the electric energy substitution technology plan for shale gas extraction, aiming to reduce dependence on traditional energy sources and reduce environmental pollution. At the same time, Sichuan Province has strengthened the supervision of project construction quality, the implementation of environmental protection measures, and the construction of safety management systems, ensuring that every shale gas extraction project can complete the established construction goals on schedule while ensuring safety and quality, achieving a win-win situation of economic benefits and environmental protection.

2.5. Standard Setting

China has formulated and implemented a series of extensive shale gas industry standards, including but not limited to technical specifications for coalbed methane well extraction, recommended practices for environmentally friendly hydraulic fracturing operations, recommended practices for environmental protection in shale gas production operations, environmental protection specifications for the reinjection of produced water from unconventional gas fields,

and soil ecological thresholds for characteristic pollutants in shale gas development plots. The formulation of these standards provides technical guidance for shale gas exploration, extraction, safety assurance, and environmental protection, reducing environmental pollution. In November 2024, the "Technical Requirements for the Preparation of Shale Gas Development Adjustment Plans," led by Sinopec Jiangnan Oilfield, was officially implemented. This milestone marks the first officially recognized industry standard in China's comprehensive shale gas development field, promoting standardized and standardized development in the industry.

2.6. Special Fund Support

The establishment of special funds in the central general public budget provides economic support for the optimization of China's energy structure and clean development. These funds are used for clean energy development and utilization projects, and a special use and management system is implemented to ensure efficient and precise allocation of central special funds. This is clearly reflected in the practice of Leshan City, Sichuan Province, where the central government provided special subsidy funds. Specifically, the subsidy scope covers multiple areas such as Wutongqiao District, and the funds are clearly designated to support the exploration, development, utilization, and related technology research and promotion of unconventional natural gas resources.

Considering the cycle of shale gas development and the huge upfront investment, this special fund provides sufficient financial support to help enterprises accelerate capital turnover, expedite exploration and development, and enhance the utilization efficiency of shale gas resources. As one of the important clean energy sources, the development and utilization of shale gas is crucial for enhancing the diversification and security of China's energy supply. Through this government measure of special funds, it can accelerate the maturity of the shale gas market and resource development, providing a more stable and reliable energy guarantee for our country.

3. Problems Existing in the Current Shale Gas Policy

3.1. The Pertinence and Flexibility of Tax Preferential Policies are Insufficient

At present, the updating of shale gas industry policies is slow, and the response at the policy level is far less rapid than market changes. There is an urgent need to strengthen the customization and adaptability of tax preferential policies to promote the sustainable development of shale gas. Although the current shale gas policy framework already covers a wide range of areas, such as exploration, development and extraction, and environmental protection, the fragmented tax system lacks systematic integration and synergistic effects. The coherence and consistency among various policies need to be improved, and there are often instances of inconsistency or conflict. The current situation is that when formulating and implementing policies related to shale gas extraction, the balance between tax incentives and environmental policies has not been fully considered. This may lead to enterprises enjoying relief from resource taxes on one hand, while being constrained by high environmental protection taxes on the other hand, making shale gas enterprises hesitant and

conflicted during the development and extraction process.

3.2. Tax Relief and Exemption Need Further Optimization

In terms of resource tax, coal has a higher carbon emission than shale gas and causes far more environmental pollution than shale gas. However, in terms of tax rates, the resource tax rate for coal ranges from 2% to 10%, with the specific tax rate determined based on the raw ore, beneficiation, and different provinces. However, in recent years, except for Inner Mongolia, which implements a tax rate of 9%, most provinces implement a coal resource tax rate lower than 6%, while shale gas is subject to a uniform national standard of 6% for payment. Due to factors such as complex geological conditions, technical difficulties in mining, environmental protection and safety risks, and development costs, the exploration and mining of shale gas is extremely difficult. At the same time, considering that coal causes far more environmental pollution than shale gas and shale gas plays an important role in China's future energy structure, the current resource tax rate for shale gas is higher than the actual tax rate for coal. This situation may weaken the incentives for the development of the shale gas industry and hinder its development.

To accelerate the promotion of preferential tax policies such as value-added tax, income tax, and customs duty for shale gas resources, among the taxable resources that require resource tax, the value-added tax rate for geothermal and natural gas is 9%, while for others it is basically 13%. However, there is no clear value-added tax rate for shale gas, and there is also a lack of specific customs duty rates for shale gas resources, which is not conducive to the rapid development of China's shale gas industry. For shale gas enterprises, there is also a lack of specific corporate income tax incentives.

3.3. Insufficient Implementation of Ecological Protection in Tax and Fee Support Policies

Currently, most energy powers have successfully integrated into a diversified energy system, while China still has a significant gap in building a diversified energy system.

China has certain limitations in the environmental protection regulatory system for shale gas exploration, with a relatively simple system structure. Although relevant regulations such as the "Environmental Quality Standards of Sichuan Province" and "Local Pollutant Emission Standards" of Sichuan Province are involved, there are still gaps in laws or policies specifically targeting the environmental management of shale gas exploration and development. With the continuous improvement of environmental awareness in China, the influence of environmental policies in the field of shale gas exploration is increasing and receiving much attention. It is urgent to formulate detailed and targeted environmental regulatory regulations and policies for shale gas to fully play its guiding and constraining role in industrial environmental protection.

At present, water resources play a crucial role in the extraction process of shale gas to ensure efficiency. However, on one hand, water resources are particularly precious in Sichuan, where despite abundant precipitation, the complex terrain results in uneven distribution of water resources, making effective collection and utilization challenging. On the other hand, excessive exploitation or improper use of water resources may cause irreversible damage to the local ecological environment, such as groundwater pollution, excessive metal content (such as manganese, iron, chromium, etc.), and even serious impacts on human health. The waste of water resources subject enterprises to the pressure of water resource taxes and environmental protection taxes. Furthermore, the commonly used hydraulic fracturing method in shale gas development technology may also trigger earthquakes, causing irreversible harm to China's environment and economy. Currently, the main disposal methods for shale gas produced water in Sichuan are reuse or discharge, but there is no unified standard for the discharge of produced water in gas fields in China, posing significant environmental protection issues. Considering its sensitive ecological environment, especially the potential water resource pressure caused by development, this undoubtedly poses a major challenge to the efficient development of shale gas, and water resource shortage may become a key bottleneck limiting the rapid expansion of shale gas extraction in Sichuan.

Table 1. Disposal Methods of Produced Water from Shale Gas Fields in Sichuan

Main oil and gas fields	Disposal methods
PetroChina Changning-Weiyuan Gas Field (Southern Sichuan)	Internal Reuse, External Discharge
PetroChina's Chuanxi Gas Field	Originally for reinjection, now mainly for external discharge
PetroChina Chuanzhong Gas Field	Mainly focusing on reuse and external discharge, with reinjection as a secondary measure
PetroChina's CDB Gas Field	Mainly focusing on reuse and external discharge, with reinjection as a secondary measure
Sinopec Yuanba Gas Field (Northern Sichuan)	Recycles all water (circulating cooling water) to achieve zero emissions

4. Suggestions for Improving Tax and Fee Support Policies

4.1. Adjusting the Method of Fiscal Subsidies

In 2019, the Ministry of Finance abolished the fixed fiscal subsidies implemented since 2012 and adopted a flexible "tiered subsidy policy", which enables the linking of fiscal subsidies with the development effectiveness of shale gas. Moreover, the shale gas subsidy funds are allocated in advance and settled later, facilitating the timely and flexible

utilization of government funds. However, based on the current actual situation of the shale gas industry, direct production subsidies are the most effective incentive measures for the shale gas industry.

Therefore, it is suggested to introduce a composite subsidy mechanism of "basic subsidy based on benchmark yield + floating subsidy" to ensure that enterprises obtain stable operating funds, while providing additional incentives based on the effectiveness of their investment in shale gas development to encourage them to increase their investment. The basic subsidy based on benchmark yield refers to the

enterprise's comprehensive consideration of its total development investment and total development revenue, comparing whether the enterprise can achieve the industry benchmark yield, and deciding whether to grant subsidies and the amount of subsidies based on the actual achieved proportion. Specifically, if the actual proportion reaches or exceeds the set target proportion, no subsidy will be granted. Conversely, if the actual proportion does not reach the target proportion, the government needs to provide subsidies. The specific amount of subsidy is determined based on the gap with the target proportion. The larger the gap, the higher the subsidy amount, and the smaller the gap, the lower the subsidy amount.

The current shale gas subsidies primarily adopt the principles of "more production, more subsidies" and "winter production, winter subsidies" for incremental subsidies, implementing a tiered subsidy system. However, considering the improvement of shale gas development technology, it is recommended to strengthen subsidies for deep shale gas development, adopting a "deep extraction, generous subsidy" policy. Surveys show that for every 0.1 yuan/m³ increase in the shale gas fiscal subsidy standard, the internal rate of return for enterprises can increase by 0.8% to 1.5%. Regarding whether subsidies are needed for deep shale gas development, the subsidy standard is determined according to the extraction depth. The "deep extraction, generous subsidy" policy is not applicable to extraction depths less than 3500m, while subsidies are provided for extraction depths greater than or equal to 3500m. The specific subsidy standard increases incrementally according to the extraction depth, with each additional 500m of extraction depth constituting a tier. The specific subsidy standard for each tier is determined considering the development costs and revenue distribution of enterprises.

4.2. Establish a Special Fund

Although China has already established special funds for the development of its shale gas industry at this stage, these funds are relatively limited. To promote the rapid development of the shale gas industry, it is necessary to cover multiple aspects such as technological research and development, infrastructure construction, and environmental protection measures, to ensure the healthy, efficient, and stable development of the shale gas industry.

Firstly, it is recommended to establish a special fund for research and development and innovation of shale gas technology. This fund is primarily intended to support the research and development and innovation in exploration and extraction technology by shale gas enterprises. It can be used to provide support after the approval of research and development projects, and also to reward successfully developed technologies. The rewards and subsidies from the technology fund can be used for technologies that enhance recovery efficiency, cost reduction, environmental protection, etc.

Secondly, it is suggested to establish a shale gas infrastructure construction fund to support the infrastructure construction for shale gas extraction, including shale gas transmission pipelines, gas storage facilities, processing plants, etc. Finally, it is suggested to set up a special fund for shale gas environmental protection, primarily used to support shale gas enterprises in adopting environmental protection measures and reducing potential environmental damage caused by development activities. The establishment of this

special fund not only aids in supporting the research and development of environmental protection technologies, promoting ecological restoration, and strengthening environmental supervision during the development process, but also helps shale gas enterprises restore the ecology and reduce environmental pollution during the disposal of oil and gas fields after development is completed.

4.3. Increase Tax and Fee Incentives

Regarding the current preferential tax policies implemented by shale gas enterprises, it is suggested that the reduction of resource tax, the exemption and reduction of environmental protection tax, and the preferential tax for farmland occupation can be extended. To further expand support for the development of the shale gas industry, other preferential tax policies can also be considered, such as value-added tax, urban construction and two surcharges, corporate income tax, etc. The suggestions are as follows:

It is recommended to reduce the tax rate of shale gas resource tax, using the 6% tax rate of crude oil as a benchmark. The carbon emission coefficient of shale gas is approximately 0.76 times that of crude oil, and its reasonable tax rate is around 4.6%. It is suggested to change the tax rate from 6% to 4%, reducing the burden on shale gas development enterprises and reflecting the emphasis on the development of shale gas resources, in order to further promote the development of the shale gas industry.

It is recommended to clarify the VAT and tariff rates for shale gas. As shale gas is usually transported and traded in the form of LNG after extraction, the VAT rate for LNG, which stands for liquefied natural gas, is 9%, the MFN tariff rate for imports is 0%, and the general tariff rate is 20%. Given the strategic position of shale gas in China's future energy development, it is recommended to clearly stipulate that the VAT rate for shale gas should be implemented at the 9% VAT rate for LNG, and correspondingly reduce the urban maintenance and construction tax, education surcharge, and local education surcharge that need to be paid. Additionally, the same tariff rate should be implemented for shale gas as for LNG.

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References

- [1] Tan Cong. Analysis and Suggestions on the Impact of Shale Gas Fiscal and Tax Policies on the Industry [J]. *Natural Gas Technology and Economics*, 2022, 16(2): 61-65.
- [2] Leshan Municipal Finance Bureau Announcement of the Finance Bureau of Leshan City on Clearing and Pre allocating Central Subsidy Funds for the Development and Utilization of Unconventional Natural Gas.
- [3] Liu Hu Research on Improving China's Green Tax System [J]. *Tax Research*, 2024, (04): 48-56. DOI:10.19376/j.cnki.cn11-1011/f.2024.04.018.
- [4] ANNEVELINK M P J A, MEESTERS J A J, HENDRIKS A J. Environmental contamination due to shale gas development[J]. *Sci Total Environ*, 2016, 550: 431 - 438.

- [5] BAKKE T, KLUNGSØYR J, SANNI S. Environmental impacts of produced water and drilling waste discharges from the Norwegian offshore petroleum industry[J]. *Mar Environ Res*, 2013, 92: 154 - 169.
- [6] RUBINSTEIN J L, MAHANI A B. Myths and facts on wastewater injection, hydraulic fracturing, enhanced oil recovery, and induced seismicity[J]. *Seismol Res Lett*, 2015, 86 (4): 1060 - 1067.
- [7] Zhang Benyan, Wang Yongfei, Zhu Jing Research on reservoir damage caused by reinjection of produced water from a certain gas field [J] *Environmental Protection of Oil and Gas Fields*, 2020, 30(3): 31 - 34.
- [8] Hu Zhiqiang, Liu Changsheng, Li Xiangwei, etc The current status of treatment methods and processes for produced water from unconventional gas fields in China [J] *Chemical Environmental Protection*, 2024, 44 (01): 11-20.
- [9] Huang Yuming, Song Kunpeng, Zhang Yang, etc Research on differentiated subsidy methods based on shale gas resource endowment characteristics [J/OL] *China Mining Industry*, 1-8[2024-07-13]. <http://kns.cnki.net/kcms/detail/11.3033.td.20240709.1151.002.html>.
- [10] Yang Jiyuan, Li Haitao, Zhang Jin, etc Economic feasibility study on three-dimensional development of shale gas in southern Sichuan Basin [J] *Natural gas exploration and development*, 2019, 42 (02): 95-99.
- [11] Shen Feilong, Chen Puxin, Chen Junyue Research and Suggestions on Financial and Tax Support Policies for Deepwater Natural Gas and Tight Sandstone Gas Development in China [J] *Natural Gas Technology and Economy*, 2022, 16 (1): 73-81.
- [12] Wang Jiwei, Song Liyang, Nie Haikuan Suggestions for Deep Optimization of Subsidy Policies for Shale Gas Development and Utilization [J] *Contemporary Petroleum and Petrochemical*, 2023, 31(4): 4-8.