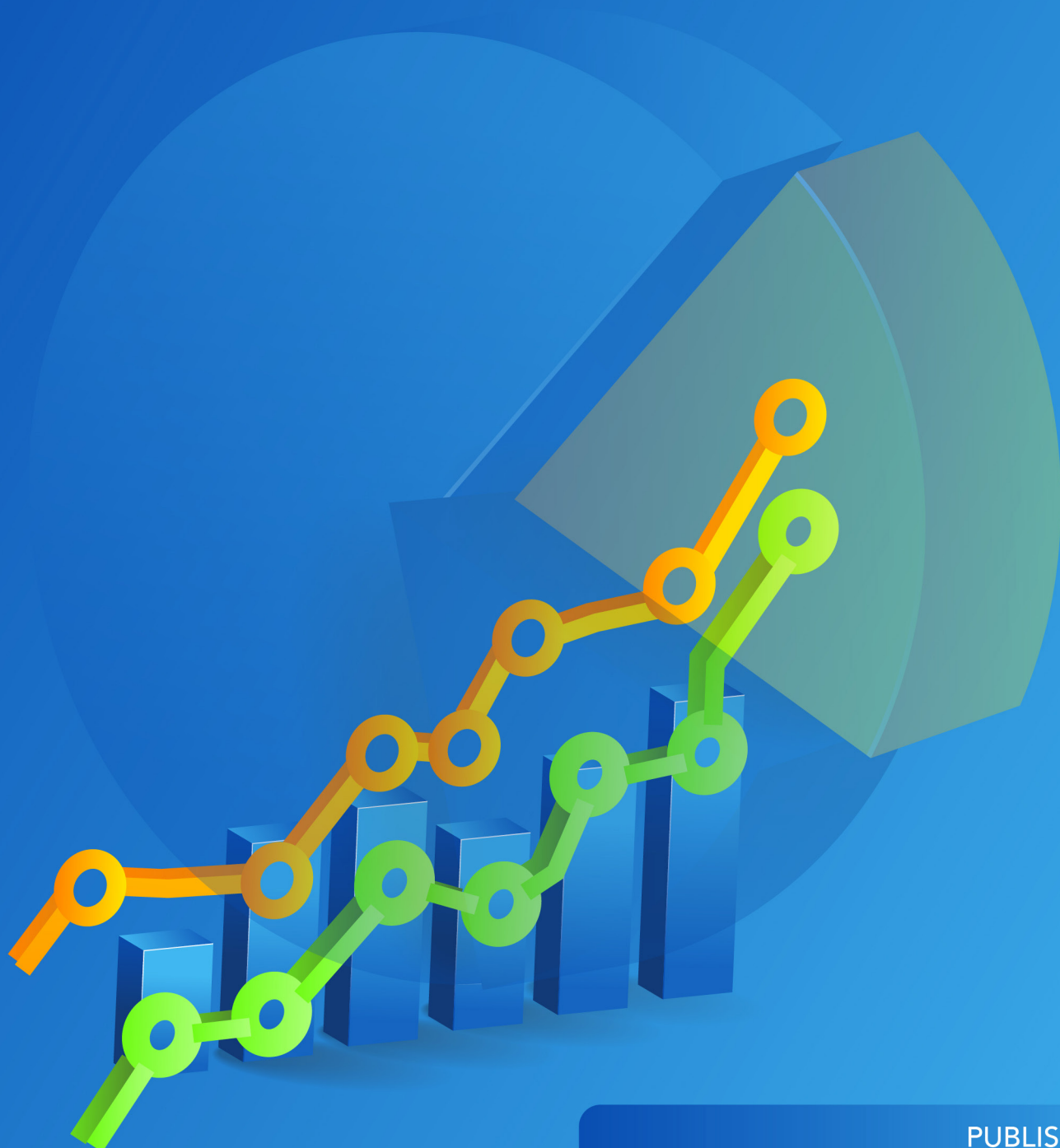


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## Contemporary Resource-Based Energy Financial Trade

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### ABSTRACT

Currently, faced with the rapid increase in energy demand and insufficient energy supply, as well as the two major contradictions between energy consumption in production and living and comprehensive sustainable development, countries and regions have chosen to cooperate to jointly cope with development problems, and use the “Belt and Road” energy cooperation and global climate Energy cooperation represented by negotiations is not uncommon. The transformation of the resource-based economy has entered a critical period, and it is necessary to find strong theoretical support and feasible practical measures. Therefore, combining the proposition of energy cooperation with the transformation needs of the resource-based economy and studying the role of energy cooperation in the transformation of the resource-based economy from the perspective of factor combinations can not only lay a micro-foundation for issues related to energy cooperation at the meso-level in theory, opening up a new perspective for academic research related to resource-based economy; it can also guide the practice of resource-based economic transformation and explore breakthrough paths for it.

### INTRODUCTION

Since the impact of the first oil crisis in the 1970s, when then-U.S. President Richard Nixon first raised the issue of energy security, the international energy market has undergone profound changes. The most prominent feature is that the financial attributes of the international energy market have significantly increased. In the context of the new era, energy and finance, two core issues in today's world economic development, are gradually moving from cooperation to mutual integration. In the context of today's energy transformation, how to combine energy finance with trade and achieve better transformation and development is an important research topic in various countries today. The era is of great significance. Feng Baoguo analyzed the related issues of energy finance: he proposed the concept that the development of energy finance is closely related to national development, energy security, and economic security; and emphasized that the energy finance center can gather financial markets, financial institutions and Financial capital plays the functions of energy investment and financing, energy pricing, energy financial product development, and energy financial risk management to promote the positive interaction and coordinated development of the energy industry and the financial industry, thereby further serving the development of the real economy. (Feng Baoguo, 2023)

### LITERATURE REVIEW

#### A Review of Domestic and Foreign Research on Resource-Based Energy Financial Trade Cooperation Chinese Scholars' Research on Resource-Based Energy Financial Trade

Academic research on resource-based economies began with the concept of “mining towns” proposed

by Auronssean in 1921. On this basis, (Locus, 1971) proposed that the development of resource-based cities will go through a construction period, a development period, a transformation period, and a maturity period. “Four Stage Theory”. (Bradbury, 1983) On this basis, the decline stage and closure stage were added to further develop and improve the research on the development process of resource-based cities. (Auty, 1993) proposed the phenomenon of “resource curse” in which areas rich in natural resources are subject to resource constraints, hindering economic development. It also started a climax of research on the transformation of resource-based economy. Since the 1990s, domestic scholars have gradually introduced many foreign theories on resource-based economic issues, and further discussions have been made based on the actual domestic situation. (Zhang Fuming, 2002) comprehensively considered economic, resource, environmental and other factors to construct a transformation index, and divided the resource-based economic transformation into four stages: the resource-based economic stage, the initial stage of transformation, the transition stage, and the critical transformation stage. The economic development of typical resource-based areas is highly consistent with its transformation process. (Wu Minmin, 2011) divides it into the early stage of economic structural adjustment, the period of rapid development of energy and heavy chemical industry base construction, the period of equal emphasis on infrastructure and energy base construction, and the period of economic structure strategy. Four developmental periods, including the sexual adjustment period. (Lu Shuo, 2020) uses city light image data to divide the development of resource-based cities into five stages: rise, growth, maturity, decline, and regeneration. (Li Ping, 2007) divides resource-based economic transformation into three models: market-

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led, government-led and laissez-faire. (Sun Xiaohua & Zheng Hui, 2019) summarized foreign resource-based economic transformation models and summarized them as the American model (industrial diversification + orbital transition), the Norwegian model (industrial regulation + green economy), and the Indonesian model (supply and demand adjustment + export Upgrading + diversified investment), etc. (Yang Huajia & Zhang Bo, 2019) Through research based on the Krugman C-P model, they concluded that the model of open market promotion of transformation can effectively promote the transformation efficiency of various factors in resource-based regions.

### Foreign Scholars' Research on Resource-Based Energy Financial Trade

(Hoek, 2000) took the resource-based economic transformation of the Netherlands as the research object and concluded that moderate wages, reduction of public expenditures, reduction of tax burdens and lower welfare levels are important institutional measures to get rid of its development dilemma. (Dianlov *et al.*, 2004) found that differences in institutional effectiveness will lead to significant differences in transformation effects. Therefore, the government should choose policies carefully. (Cappelen & Miset, 2009), (Frankel, 2010) and (Dyrstad, 2016) all systematically analyzed the tax and social welfare system implemented by Norway in the transformation of resource-based economy and its impact on the harmonious development of economy, society and natural resources. The role played has been studied. Regarding the practice of economic transformation in resource-based regions, in terms of innovation-driven transformation paths, (Papyrakis & Gerlagh, 2004)

concluded that the lack of innovation is an important reason for the slow development of resource-based economies, and even for them to get into trouble. (SEveren Tok, 2020) conducted a study on micro-level innovation practices in the transformation of Qatar's resource-based economy and found that the single resource structure, unique demographic structure and lack of innovation experience have led to the country's corporate innovation being more dependent on opportunities provided by the government.

### MATERIALS AND METHODS

Based on determining the explanatory variables, explained variables, intermediary variables and control variables of the quantitative test, in order to clearly verify the role of energy cooperation in the transformation of resource-based economy, this article draws lessons from (Baron & Kenny, 1986) used the hierarchical regression method to establish a baseline regression model and a mediation effect test model for four types of energy cooperation on the transformation of a resource-based economy, in order to preliminarily verify the impact of different types of energy cooperation on the transformation of a resource-based economy. Whether the role exists, that is, whether the basis for the existence of the intermediary effect is established; if it is established, it proves that energy transformation and financial capital operations are inseparable.

In order to analyze the impact of energy trade cooperation, energy investment cooperation, energy technology cooperation and energy governance cooperation on the transformation effect of resource-based economy, this article established benchmark regression models respectively, as shown in Models 1.1 - 1.4.

$$\text{Eco\_Tran}_{i,t} = \alpha + \beta_1 \text{Ln\_Transfer}_{i,t} + \beta_2 \text{GEL}_{i,t} + \beta_3 \text{Fiscal}_{i,t} + \beta_4 \text{Market}_{i,t} + \beta_5 \text{Private}_{i,t} + \beta_6 \text{Techno logy}_{i,t} + \varepsilon_{i,t} \quad [1.1]$$

$$\text{Eco\_Tran}_{i,t} = \alpha + \beta_1 \text{Ln\_Invest}_{i,t} + \beta_2 \text{GEL}_{i,t} + \beta_3 \text{Fiscal}_{i,t} + \beta_4 \text{Market}_{i,t} + \beta_5 \text{Private}_{i,t} + \beta_6 \text{Techno logy}_{i,t} + \varepsilon_{i,t} \quad [1.2]$$

$$\text{Eco\_Tran}_{i,t} = \alpha + \beta_1 \text{Ln\_Tech}_{i,t} + \beta_2 \text{GEL}_{i,t} + \beta_3 \text{Fiscal}_{i,t} + \beta_4 \text{Market}_{i,t} + \beta_5 \text{Private}_{i,t} + \beta_6 \text{Techno logy}_{i,t} + \varepsilon_{i,t} \quad [1.3]$$

$$\text{Eco\_Tran}_{i,t} = \alpha + \beta_1 \text{Gover}_{i,t} + \beta_2 \text{GEL}_{i,t} + \beta_3 \text{Fiscal}_{i,t} + \beta_4 \text{Market}_{i,t} + \beta_5 \text{Private}_{i,t} + \beta_6 \text{Techno logy}_{i,t} + \varepsilon_{i,t} \quad [1.4]$$

### RESULTS AND DISCUSSION

Correlation analysis can show the interrelationship between variables and determine whether there may be serious multicollinearity problems between variables. This article conducts correlation analysis on variables, and the results are shown in Table 1. It can be seen that, first, the explanatory variables Ln - Transfer (energy transfer amount), Ln vest (frequency of energy investment cooperation activities), Ln - Tech (frequency of energy technology cooperation activities), Ln - Gover (frequency of energy governance cooperation activities)

and The explained variable Eco - Tran (resource-based economic transformation effect) has a significant positive correlation at the 10% significance level ( $r=0.478$ ,  $p<0.01$ ;  $r=0.138$ ,  $p<0.10$ :  $r= 0.135$ ,  $p<0.10$ ;  $r=0.156$ ,  $p<0.10$ ), which preliminarily shows that provinces with higher frequency and larger scale of various energy cooperation activities will have better results in resource-based economic transformation. Second, at the 5% significance level, the intervening variables Rev (energy resource industry income), E CK (factor product elasticity), TFP (total factor production) and Sub

-ela (energy factor substitution elasticity) are related to the explained variable Eco - Tran (resource-based economic transformation effect) has a significant positive correlation ( $r=0.512, p<0.01$ ;  $r=0.015, p<0.05$ ;  $r=0.178, p<0.05$ ;  $r=0.029, p<0.05$ ), which preliminarily shows that the greater the value of each positive intermediary variable, the stronger the intermediary effect and the better the resource-based economic transformation effect; RS (energy industry structure), Ratio (proportion of energy industry) and the explained variable Eco - Tran (resource-based economic transformation effect) There

is a significant negative correlation ( $r=-0.248, p<0.01$ ;  $r=-0.255, p<0.05$ ), which preliminarily shows that the smaller the value of each negative intermediary variable, the stronger the intermediary effect, and the resource-based economy The better the transformation effect. At the same time, the correlation coefficients between the variables in the model are all lower than 0.8, indicating that there is no multicollinearity problem between the models. This also provides a good foundation for studying the role of various types of energy cooperation in the transformation of a resource-based economy.

**Table 1:** Variable correlation analysis results

	Eco- Tran	LN-Transfer	LN-Invest	LN-Tech	LN-Gover	LN- Rev	RS
Eco-Tran	1						
LN-Transfer	0.478***	1					
LN-Invest	0.138*	0.196**	1				
LN-Tech	0.135*	0.191**	0.966***	1			
LN-Gover	0.165*	0.137*	0.856**	0.895***	1		
LN -Rev	0.512***	0.851***	0.332*	0.344***	0.259***	1	
RS	-0.248***	-0.276***	-0.002	-0.01	0.001	-0.029	1
Ratio	-0.255**	0.499***	0.084	0.141*	0.085	0.668***	-0.009
E-CK	0.015**	0.015	0.254***	0.270***	0.339***	0.111	0.261***
TFP	0.178**	0.036	-0.128	-0.178**	-0.176**	-0.098	-0.128
Sub - she	0.029**	-0.153*	0.057	0.024	0.031	-0.166**	0.046
GEI	-0.293***	-0.337***	-0.455***	-0.430***	-0.372***	-0.534***	-0.098
Supervisor	-0.276***	-0.486***	0.086	0.101	0.045	-0.449***	-0.094
Market	0.303***	0.289***	-0.369***	-0.384***	-0.309***	0.188**	-0.168**
Privatc	0.195**	0.237***	0.557***	0.563***	0.548***	0.354***	-0.103
Technology	0.272***	0.098	0.093	0.071	0.069	0.167**	0.108

**Continued table**

	Ratio	E - CK	TFP	GEI	Prosecutor	Market	Privatec	Technology
Ratio	1							
E - CK	-0.132	1						
TFP	-0.067	0.025	1					
Sub-that	-0.268***	0.065	-0.206**	1				
GEI	0.062	-0.242***	0.071	-0.022	1			
Fiscal	-0.198**	-0.037	0.073	0.03	0.140*	1		
Market	0.206**	-0.186**	-0.008	-0.055	0.153*	-0.591***	1	
Privatc	0.014	0.296***	-0.066	0.005	-0.581**	0.045	-0.393***	1
Technology	-0.102	0.071	0.003	0.045	-0.412**	0.123	-0.326***	0.272**

\*  $p<0.10$ , \*\*  $p<0.05$ , \*\*\*  $p<0.01$

Data source: (Kang, 2021) <http://www.cnki.net>

This article uses Eco-Tran (resource-based economic transformation effect) as the explained variable, Ln -Transfer (energy transfer amount), Ln -Invest (energy investment cooperation), Ln -Tech (energy technology

cooperation), Ln -Gover (energy Governance cooperation) is the explanatory variable and is substituted into models 1.1 - 1.4 for baseline regression. The results are shown in Table 2.

**Table 2:** Baseline regression results

	(1)	(2)	(3)	(4)
	Eco - Tran	Eco - Tran	Eco - Tran	Eco - Tran
LN - Transfer	0.0218*** ( 3.94)			
GEI	-0.00271 ( -0.28)	-0.00249 ( -0.25)	-0.00245 ( -0.24)	-0.00572 (-0.58)
Fiscal	0.286 (1.52)	0.0705 (0.38)	0.0527 (0.28)	0.0643 (0.35)
Market	0.0377*** (4.93)	0.0469*** (5.88)	0.0472*** (5.95)	0.0452*** (5.75)
Private	0.118** (2.40)	0.112** (2.14)	0.104* (1.97)	0.105* (1.94)
Technology	2.909*** (4.16)	3.540*** (4.79)	3.626*** (4.89)	3.451*** (4.71)
LN-Invest		0.0144** (2.27)		
LN-Tech			0.0174** (2.52)	
LN-Gover				0.0151** (2.22)
-cons	-0.438*** ( -2.75)	0.0896 (1.37)	0.0778 (1.18)	0.109* ( 1.74)
N	150	150	150	150
r <sup>2</sup> - a <sub>-</sub>	0.369	0.325	0.330	0.324

*t* statistics in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Data source: (Kang, 2021) <http://www.cnki.net>

It can be seen that in the regression results where Ln-Transfer (energy transfer amount) is the explanatory variable, the coefficient of Ln-Transfer is positive and passes the 1% significance level test ( $r=0.0218$ ,  $p < 0.01$ ). It shows that the amount of energy transfer has a significant positive effect on the transformation effect of the resource-based economy, and an increase in the amount of energy transfer can promote the transformation and development of resource-based provinces (regions). According to the previous analysis, in energy trade cooperation, whether energy elements are used as commodities or secondary energy commodities or higher-quality energy commodities, trade cooperation can stimulate resource-based economic energy products and the extension of the industrial chain. This kind of The demand-side pulling effect will not only be reflected in the improvement of the output level of the resource-based economy, but also affect regional income, which may in turn affect the society and people's livelihood of the resource-based economy. The positive impact of energy trade cooperation on the resource-based economy will be more obvious in the early stage of the transformation of the resource-based economy. As the transformation and development of the resource-based economy continues

to advance, more attention needs to be paid to increasing the proportion of high-tech products in energy trade cooperation. The above relationship is verified in the baseline regression.

In the regression results where Ln-Invest (frequency of energy investment cooperation activities) is the explanatory variable, the coefficient of Ln-Invest is positive and passes the significance level test of 5% ( $r=0.0144$ ,  $p < 0.05$ ), indicating that energy Investment cooperation has a significant positive effect on the transformation of resource-based economies. Resource-based provinces (regions) can promote the transformation of resource-based economies by strengthening energy investment cooperation. Energy investment cooperation not only promotes the mechanization and large-scale development of the energy resource-based economy, but also promotes the technological progress of the industry to a certain extent, improves the production efficiency of the resource-based economy, and is conducive to the transformation of the resource-based economy. In addition, previous studies have shown that there is a certain substitution effect between capital and energy factors in production, and one of the tasks of the transformation of an energy and resource-based economy is to reduce

the proportion of energy and resource-based industries in the overall economy. Therefore, the importance of energy investment cooperation Development is also conducive to the realization of the goal of optimizing the industrial structure in the transformation of a resource-based economy. The above relationship is verified in the baseline regression.

In the regression results where Ln-Tech (frequency of energy technology cooperation activities) is the explanatory variable, the coefficient of Ln-Tech is positive and passes the significance level test of 5% ( $t=0.0174$ ,  $p<0.05$ ), indicating that energy Technical cooperation has a significant positive effect on the transformation of resource-based economies. Resource-based provinces (regions) can promote the transformation of resource-based economies by strengthening energy technology cooperation. Analysis shows that technological factors will improve the production efficiency of energy factors and other factors, thereby promoting the transformation of the resource-based economy. At the same time, the introduction of technology helps to acquire the innovation capabilities of the resource-based economy. Energy technology cooperation is the most important and critical type of energy cooperation. Energy technology cooperation can only truly enter the stage when it develops. At the advanced stage, the development mode of resource-based economy is truly transformed.

In the regression results in which In-Gorer (frequency of energy governance cooperation activities) is the explanatory variable, the coefficient of Ln-Gorer is positive and passes the significance level test of 5% ( $t=0.0151$ ,  $p<0.05$ ), indicating that energy Governance cooperation has a significant positive effect on the transformation of resource-based economies. Resource-based provinces (regions) can promote the transformation of resource-based economies by strengthening cooperation in energy governance. Model analysis shows that resource-based economies can absorb high-quality external institutions through energy governance cooperation. It must be closely combined with the energy, capital, and technology that it already possesses to regulate and improve many aspects of the problem in the transformation of a resource-based economy. This in itself will have the effect of reducing the transaction costs of economic activities and improving economic efficiency. At the same time, Energy governance cooperation will have a profound impact on all aspects of the economy, society, and environment of resource-based regions by improving the formal and informal systems of the resource-based economy, which is conducive to their transformation and healthy development.

Among the control variables, at the 10% significance level, Fscal (the ratio of fiscal revenue to GDP), Markel (marketization index), Prnale (the ratio of employees in private individual units), Technology (technology market turnover to GDP Proportion) has a significant positive effect on the effect of resource-based economic transformation, while GEI (energy intensity) has an

insignificant impact on the effect of resource-based economic transformation. According to the model analysis, the ratio of fiscal revenue to GDP, marketization index, The proportion of employees in private individual units and the proportion of technology market turnover in GDP have a positive effect on energy cooperation, while energy intensity has a negative effect. At the same time, the ratio of fiscal revenue to GDP, the marketization index, the proportion of employees in private individual units The ratio and the proportion of technology market turnover to GDP respectively affect the capital stock, institutional environment factors, economic vitality and development level of the resource-based economy, and have a positive effect on the transformation of the resource-based economy. However, energy intensity itself is a limiting factor for the resource-based green and clean economy. Development factors have a negative effect on the transformation of a resource-based economy.

## CONCLUSION

A quantitative benchmark regression model was used to analyze the impact of energy trade cooperation, energy investment cooperation, energy technology cooperation, and energy governance cooperation on the transformation of a resource-based economy. The analysis showed that the above relationships were verified in the benchmark regression. Therefore, the transformation of energy has an inseparable direct relationship with finance. With the development of futures markets and financial markets, energy and finance have been integrated. The relationship between energy and finance is getting closer and closer. The understanding of energy should be effectively improved. Understand finance, fully analyze and grasp the issues affecting energy finance, start from accelerating the construction of the energy finance system, and improve the use of energy finance to solve energy transformation issues.

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