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Study on The Impact of Shanghai Crude Oil Price Volatility and Stock Indices of China's Oil-related Industries

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Abstract: This paper takes Shanghai crude oil futures price and the industry stock index related to it as the research object, and selects the daily data from March 26, 2018 to December 31, 2022, and adopts the BEKK-GARCH model. To explore the correlation between Shanghai crude oil futures price volatility and different segmented industry stock markets. It is found that there is a significant asymmetric volatility spillover effect effect between the vast majority of oil-related industry markets and the Shanghai crude oil market. Based on the relationship between Shanghai crude oil futures prices and oil-related industry stock indexes, investors can make investments based on the fluctuations of Shanghai crude oil futures prices, rationally study the changes in the stock prices of oil-related industries, and do not follow the market panic operations using futures to control risk. And with the oil industry chain related to a higher degree of industry, by increasing the asset allocation method, can effectively reduce risk.

Keywords: Shanghai crude oil futures, BEKK-GARCH, Spillover impacts.

1. Background to the Selection

Crude oil is known as "industrial blood", is one of the most important fuel resources in industrial production, and its importance exceeds that of many common fuels, playing an irreplaceable role in promoting industrial development. Its importance exceeds that of many common fuels and plays an irreplaceable role in promoting industrial development. Modern The development of modern civilization can not be separated from industrial development, to a certain extent, and the degree of prosperity of the country or region has a close connection, as an important strategic As an important strategic resource, its price is often affected by supply and demand, other financial markets, political and other factors. As an important strategic resource, its price will often be affected by supply and demand, other financial markets, political factors and other aspects of the performance of violent fluctuations, the fluctuations will be extended along the industrial chain to all levels of the national economy. For example, in recent years, the trade friction between China and the United States, the new crown epidemic and other events have led to the price of crude oil For example, in recent years, events such as the trade friction between China and the United States and the new crown epidemic have all led to substantial fluctuations in crude oil prices, which have increased the uncertainty of the crude oil investment market and have had varying degrees of impact on the economic sector. Because China's demand for crude oil has been increasing with the development of China's industrial economy, it is found that the fluctuations generated by the price of crude oil will have a significant impact on China's economy (Ren Ruoyen and Fan Maoqing, 2010), and some scholars have found that this impact has been even more significant since the global financial crisis of 2008 (Zhao Danting and Zhao Jun, 2016). Another crude oil as an important commodity, its futures investment attributes continue to strengthen, the role of this investment tool is gradually played, which makes the investment funds between the markets enhance the flow of transfer, which in turn makes the link between the futures market and other investment markets is also increasingly close. Therefore, in order to better cope with the impact of crude oil price changes and uncertainty on the economy, it is of great significance to take the crude oil market as the object of research.

The oil crisis in the early 1970s brought a huge impact to the world oil market, and the drastic fluctuation of oil prices directly led to the emergence of oil futures. After the birth of oil futures, its trading volume has been showing rapid growth trend, has exceeded the metal futures, become an important part of the international futures market, in the many oil futures contracts, the most traded varieties of crude oil futures, and at present the world's most liquidity of the crude oil futures benchmark product is the Brent crude oil futures (Brent) and the United States of America West Texas Intermediate oil futures (WTI), and is also one of the benchmark prices in the world crude oil market. It is also one of the benchmark prices in the world crude oil market, and they are both denominated in U.S. dollars. As for crude oil, China has a long-term imbalance between supply and demand of crude oil, and is now the world's largest oil importer and second largest oil consumer. Therefore, the need to establish futures reserves to maintain China's oil security, to mitigate the impact of short-term oil price fluctuations on the domestic market, the need to understand and master the international market competition law, the law of price changes. In China's oil strategy, the establishment of China's own oil futures market, all-round participation in the international market competition, the use of market-oriented means to achieve sustainable development, China's oil economic security is of pivotal strategic significance. 2004, the Asia-Pacific region's oil consumption has exceeded that of North America and Europe, and has become the world's largest oil consumption market, but the

Asia-Pacific does not have a mature However, Asia-Pacific does not have a mature futures market to provide pricing benchmarks and risk avoidance tools for crude oil trade, and has long failed to form an authoritative crude oil pricing benchmark. At the same time, China's crude oil has long referred to international oil prices, but it does not well reflect the real supply and demand relationship in China's crude oil market. In this context, on March 26, 2018, China's Shanghai crude oil futures (INE) in the Shanghai Futures Exchange officially listed for trading, its listing for two "first" marking China's entry into a new stage of financial openness, is China's first crude oil futures contract, is also the world's first yuan-denominated crude oil futures, and also It is the first futures contract in China, the first RMB-denominated crude oil futures in the world, and the first futures variety in which foreign investors can directly participate. Since the listing of Shanghai crude oil futures, it has been running relatively smoothly and ranks third in the world in terms of market size among crude oil futures after WTI and Brent crude oil futures. Therefore, in order to better assess the effectiveness of INE and promote its better and more stable development, it is of great significance to take INE as an object of academic research.

2. Literature Review

2.1. Impact of oil prices on stock prices

2.1.1. A study of the correlation of spillovers from the crude oil futures market to the stock market

Liu Kang et al. (2012), using international crude oil futures prices, industry-level indices of China's stock market, and market index data, find that the impact of crude oil futures prices on the stock prices of various industries in China is becoming more and more significant against the backdrop of the gradual liberalization of refined oil product prices and will have a reverse impact on the stock prices of some industries.Dayong (2017) adopts the connectivity measure proposed by Diebold and Yilmaz (2009 , 2012, 2014) proposed connectivity measure to study the relationship between oil shocks and returns in six global stock markets from a new systemic perspective. It is shown that the contribution of oil shocks to the world financial system is limited. The fact that oil shocks occasionally have a significant impact on the stock market also proves that only large shocks matter.Chikashi (2018) adopts a global perspective and uses six international oil and gas sector stock index returns for North America, Latin America, Developed Europe, Emerging Europe, the Far East, and the BRIC countries as well as the WTI oil futures returns and obtains the following findings:Reveals that the relationship between stock market returns and oil shocks in Developed Europe, Emerging Europe, Far East and BRIC countries unidirectional return transmission from oil futures to oil stocks.Bai (2018) studies the time-varying relationship between real oil prices, exchange rate changes and stock market returns in China and the U.S. Lean et al. (2020) study the volatility spillovers between the crude oil market and the stock market in the U.S. and China using copula and VAR-BEKK-GARCH models. The study shows that the oil market stimulates rapid and sustained market-dependent volatility, which became most pronounced after the 2007-08 financial crisis, suggesting an increasing interdependence between oil and stock markets. Li Qiang et al.(2020) study the dynamic conditional correlation between the international crude oil futures price index and China's futures, and the empirical results show that:there is a significant dynamic conditional correlation between the international crude oil futures price volatility and China's futures market in both sample phases.Bouazizi et al.(2021) use the BEKK model to study the volatility characteristics of the oil imports among the three countries, namely China, India, and Indonesia. prices, the volatility characteristics of oil yields, and the volatility of stock market returns, and found that there is a correlation between these three variables.

2.1.2. A study of the volatility spillover correlation of crude oil futures on the industry.

Liu Jianfeng (2020) studied the correlation between the international crude oil price index and China's 11 industry indexes based on the results found that the correlation between the energy sector, the materials sector and the international crude oil index will rise significantly during the financial crisis. Wang Sanxing et al. (2020) measured the dependence structure between the international oil price and China's industry stock market from the perspective of the industry, and the empirical results showed that the international oil price fluctuations in the last three years have produced a large risk spillover effect on China's industry stock market, which shows a large difference between different industries. International oil price volatility has the largest impact on the correlation coefficient and risk spillover effect between WTI and the stock market of raw materials industry, the smallest impact on the correlation coefficient between WTI and the stock market of financial industry, and the smallest risk spillover effect between WTI and optional consumption industry.

2.1.3. Study on the spillover impact of crude oil futures on the new energy industry.

Henriques et al. (2008) conducted a study based on the U.S. market and concluded that crude oil prices have a positive impact on new energy stock prices, and Kumar et al. (2012) study expressed a similar view. Wen Xiaoqian et al. (2012) studied the volatility spillover effect between China's new energy industry stock market and the international crude oil futures market, and found that there is a significant effect of the pre-market volatility of the international crude oil futures market on the volatility of China's new energy industry stock market, but the pre-market residual of the international crude oil futures market does not have a significant effect on the volatility of China's new energy industry stock market.Sinha (2015) found that that increased crude oil price volatility has a positive effect on renewable energy production.Juan et al.(2015) investigated based on the relationship between oil prices and some global renewable energy indices and found a significant tail correlation.Yufeng et al.(2020) investigated, using the VAR-BEKK(DCC)-GARCH model, the crude oil, new energy and rare earth markets between the volatility spillovers and dynamic correlations as well as asymmetric effects of volatility spillovers. The study shows that there is an indirect volatility transfer pathway between the oil and new energy markets. Chai et al. (2021) investigated the overall correlation between crude oil and natural gas yields in the North American market based on a Bayesian DCC-GARCH model, and the results show that the dynamic correlation between oil and gas yields in the North American market is always positive, and the time-varying characteristics of the linkage between oil and gas, but the magnitude of change in its correlation interval is small and there is no significant correlation.

2.2. BEKK-GARCH modeling

Lean et al. (2020) use copula and VAR-BEKK-GARCH models to investigate the dependence between crude oil and stock markets in the US and China and the volatility spillovers between 1991-2016. The study shows that the oil market stimulates rapid and sustained fluctuations in market dependence, which became most pronounced after the financial crisis of 2007-08, suggesting increasing interdependence between the oil and stock markets.Yufeng et al. (2020) utilize a VAR-BEKK(DCC)-GARCH model to investigate the international crude oil, new energy, and rare earth markets in China between the volatility spillovers and dynamic correlations as well as asymmetric effects of volatility spillovers. The study suggests that there is an indirect volatility transfer pathway between the oil and new energy markets, and that the establishment and development of rare earth futures may be beneficial for risk control in financial markets. In addition, the dynamic correlation between rare earth and new energy markets remained at a high level during the study period. Hou Yi-Boggy, Wang Lun, Guo Biao (2021) use the BEKK-GARCH model to study the price causality and spillover effects between Shanghai crude oil futures price (INE) and three crude oil futures markets, WTI and Brent. It is found that there is a unidirectional volatility spillover effect from the WTI and Brent crude oil futures markets to the INE crude oil futures market.

3. Research Design

The software utilized was Eviews10 and WinRATS, and the BEKK-GRACH model was selected with the following mean equations:

$$Tt=\mu t+aTt\text{-}1+\varepsilon t \quad \text{..... Equation 1}$$

$$\varepsilon t \sim N(0,Ht)$$

The variance equation is as follows:

$$Ht=CTC+ATet\text{-}1\varepsilon_{t-1}^{T}\ A+BTHt\text{-}1B \quad \text{..... Equation 2}$$

$$\begin{vmatrix} H11 & H12 & H13 & H14 & H15 & H61 \\ H21 & H22 & H23 & H24 & H25 & H26 \\ H31 & H32 & H33 & H34 & H35 & H36 \\ H41 & H42 & H43 & H44 & H45 & H46 \\ H51 & H52 & H53 & H54 & H55 & H56 \\ H61 & H62 & H63 & H64 & H65 & H66 \end{vmatrix} C= \begin{vmatrix} C11 & 0 & 0 & 0 & 0 & 0 \\ C21 & C22 & 0 & 0 & 0 & 0 \\ C31 & C32 & C33 & 0 & 0 & 0 \\ C41 & C42 & C43 & C44 & 0 & 0 \\ C51 & C52 & C53 & C54 & C55 & 0 \\ C61 & C62 & C63 & C64 & C65 & C66 \end{vmatrix}$$

$$\begin{vmatrix} A11 & A12 & A13 & A14 & A15 & A61 \\ A21 & A22 & A23 & A24 & A25 & A26 \\ A31 & A32 & A33 & A34 & A35 & A36 \\ A41 & A42 & A43 & A44 & A45 & A46 \\ A51 & A52 & A53 & A54 & A55 & A56 \\ A61 & A62 & A63 & A64 & A65 & A66 \end{vmatrix} B= \begin{vmatrix} B11 & B12 & B13 & B14 & B15 & B61 \\ B21 & B22 & B23 & B24 & B25 & B26 \\ B31 & B32 & B33 & B34 & B35 & B36 \\ B41 & B42 & B43 & B44 & B45 & B46 \\ B51 & B52 & B53 & B54 & B55 & B56 \\ B61 & B62 & B63 & B64 & B65 & B66 \end{vmatrix}$$

where H11, H22, H33, H44, H55, and H66 in matrix Ht represent the conditional variances of the industrial sector index (LNGY), energy sector index (LNNY), materials sector index (LNCL), utilities index (LNGG), new energy index (LNXNY), and the Shanghai crude oil futures (INE), respectively, and C denotes the lower triangular matrix matrix, A is the ARCH coefficients of the model, A11, A22, A33, A44, A55, A66 represent the ARCH effects of the volatility of the six markets, reflecting the impact of external shocks on volatility, and the off-diagonal elements represent the transmission effects of the shocks between the markets.The ARCH term denotes the conditional variance of the residuals of the day-t-1, εt-1, on day t *h*t, matrix B is the GARCH coefficients of the model, B11, B22, B33, B44, B55, B66 are the GARCH effects of the five markets themselves, reflecting the persistence of market volatility, and the off-diagonal elements represent volatility spillovers across markets.The GARCH term represents the conditional variance of day t-1 *h*t-1 on the day t conditional variance *h*t.

4. Empirical Results and Analysis

4.1. Selection and processing of sample data

In this paper, according to the wind level 1 industry classification standard, it is divided into oil production industry, oil consumption industry, and both oil consumption and oil substitution industry, and the industrial industry index (LNGY), energy industry index (LNNY), materials industry index (LNCL), utilities index (LNGG), and new energy index (LNXNY) are selected as the oil production, consumption, and substitution industry indicators, and Shanghai crude oil futures (INE) are selected, the data of this study are all from the wind database, because on March 26, 2018, China's Shanghai crude oil futures (INE) was officially listed and traded on the Shanghai Futures Exchange, so the sample data period selected for this study is specifically from March 26, 2018 to March 31, 2023, with the frequency of days, excluding the trading time is not consistent data, a total of 1220 sets of sample observations are obtained.

In order to avoid too large a price gap, this paper uses the logarithmic difference for all returns to measure the degree of volatility between crude oil prices and oil-related industries, i.e., the returns are obtained by the following formula:

$$Ri,\ t = \ln\frac{P_{i,t}}{P_{i,t-1}} \quad \text{..... Equation 3}$$

where t is time, Ri,t is the market return of market i on day t and Pi,t is the market price of market i on day t.

4.2. Descriptive statistics

Table 1. Descriptive statistics

	INE	LNGY	LNNY	LNCL	LNGG	LNXNY
Average value	0.000231	0.000154	0.000242	0.000233	0.000131	0.000517
Upper quartile	0.000718	0.000667	0.000382	0.001145	0.000496	0.000921
Maximum values	0.101111	0.050450	0.057913	0.055748	0.060625	0.072879
Minimum value	-0.143214	-0.93808	-0.086505	-0.094447	-0.073213	-0.100448
(Statistics) Standard deviation	0.027471	0.014137	0.016226	0.015685	0.012082	0.019826
Skewness	-0.334349	-0.635421	-0.360857	-0.615575	-0.413070	-0.199693
Kurtosis	5.751641	6.689087	5.445303	5.701419	6.878572	4.810917
JB Inspection	407.6164**	773.9069**	330.4358**	448.0142**	799.3961**	174.8124***
ADF test	-35.76667	-34.37881	-35.73898	-33.25689	-35.17560	-34.61676

Table 1 gives the descriptive statistics of the indicators. In terms of skewness and kurtosis, INE, LNGY, LNNY, LNCL, LNGG, and LNXNY are all spiky and left skewed, implying that all the sequences do not conform to the characteristics of normal distribution. The distribution of the sample data was further analyzed using the JB test, which showed that all sample data significantly rejected the original hypothesis at the 1% level, i.e., all sample data did not obey a normal distribution. The ADF test was conducted and found that all the indicator series are smooth.

4.3. BEKK-GARCH(1, 1) estimation results

Table 2. BEKK-GARCH(1, 1) estimation results

original sequence	estimated coefficient	(statistics) standard deviation	t-statistic	P-value
C(6, 1)	0.007564619	0.001214940	6.22633	0.00000000
C(6, 2)	0.016465802	0.000850681	19.35603	0.00000000
C(6, 3)	0.004905235	0.001844431	2.65948	0.00782604
C(6, 4)	-0.000416996	0.000725866	-0.57448	0.56564249
C(6, 5)	-0.002070711	0.000853673	-2.42565	0.01528101
A(1, 1)	0.213906999	0.018630987	11.48125	0.00000000
A(2, 2)	0.134404745	0.021241170	6.32756	0.00000000
A(3, 3)	0.267140846	0.025559719	10.45163	0.00000000
A(4, 4)	0.056965633	0.019064195	2.98810	0.00280722
A(5, 5)	0.161965808	0.029637136	5.46496	0.00000005
A(1, 6)	0.648998704	0.119805230	5.41711	0.00000006
A(2, 6)	-0.299473566	0.079048575	-3.78848	0.00015157
A(3, 6)	0.013927878	0.092638759	0.15035	0.88049155
A(4, 6)	-0.061979879	0.110824693	-0.55926	0.57598392
A (5, 6)	-0.156674432	0.092716796	-1.68982	0.09106294
A(6, 1)	0.028299887	0.005841492	4.84463	0.00000127
A(6, 2)	0.028653638	0.005768430	4.96732	0.00000068
A(6, 3)	0.021921134	0.005193989	4.22048	0.00002438
A(6, 4)	0.011040959	0.005227944	2.11191	0.03469396
A(6, 5)	0.014006544	0.008776672	1.59588	0.11051485
B(1, 1)	0.723146383	0.006717232	107.65541	0.00000000
B(2, 2)	0.973584739	0.009913264	98.21031	0.00000000
B(3, 3)	0.973806464	0.018359236	53.04178	0.00000000
B(4, 4)	0.989382668	0.005868142	168.60236	0.00000000
B(5, 5)	1.065004386	0.017062638	62.41734	0.00000000
B(1, 6)	-0.634924239	0.061468628	-10.32924	0.00000000
B(2, 6)	0.221624494	0.035578881	6.22910	0.00000000
B(3, 6)	0.138712296	0.038663642	3.58767	0.00033365
B(4, 6)	-0.120190229	0.039969774	-3.00703	0.00263815
B (5, 6)	0.162919992	0.040522762	4.02046	0.00005809
B(6, 1)	-0.005306545	0.005896981	-0.89987	0.36818683
B(6, 2)	-0.022566769	0.009086017	-2.48368	0.01300322
B(6, 3)	-0.002400914	0.006582713	-0.36473	0.71531291
B(6, 4)	-0.003821887	0.006744535	-0.56666	0.57094228
B(6, 5)	0.011409170	0.010519311	1.08459	0.27810202

Table 2 gives the parameter estimation results of the BEKK-GARCH(1,1) model calculated using WinRats software. First, the A matrix is significant, indicating that the ARCH effect between Shanghai crude oil futures and the

industrial sector index, the energy sector index, the materials sector index, the utilities index, and the new energy index is very significant, and the market volatility aggregation characteristics are obvious. Second, observing the cross-market volatility spillover effect, as far as the A matrix is concerned, α16 and α61, α26 and α62 are all significant at least at the 5% level, indicating that the new information shock in the previous period of the Shanghai crude oil futures and the industrial sector index and the energy sector index will be transmitted to each other's market, and since α61 > α16, it means that the new information shock of the Shanghai crude oil futures market to the industrial sector market is much larger than that in the opposite direction, meanwhile, α61>α11 indicates that the volatility from the Shanghai crude oil futures market is greater than the volatility caused by the industrial market's own shock, while α62>α22 indicates that the volatility spillover from the Shanghai crude oil market to the energy market is greater than the volatility caused by the energy market's own shock, and α63 is significant at least at the 5% level, which suggests that the previous period's new information shock of the Shanghai crude oil futures will be be transmitted to the materials industry index. As far as the B matrix is concerned, the GARCH effects of β16, β26 and β62, β36, β46, β56 are very significant, also significant at least at the 5% level, indicating that Shanghai crude oil futures will be affected by the fluctuations of the previous period of the industrial industry index, the energy industry index, the materials industry index, the public utilities index, the new energy index, and the volatility spillover effect is persistent, and Shanghai crude oil futures also will have a fluctuation effect on the energy industry index. Since β62>β26, the volatility spillover effect of Shanghai crude oil market on the energy market is greater than the spillover effect in the opposite direction, and because the β value between the two markets is greater than its own β value, it indicates that the impact of the historical volatility spillover effect between the markets is greater than the impact of its own historical volatility, and that the persistence of the historical volatility between the markets has a stronger effect.

4.4. Wald test

In order to comprehensively consider the existence of volatility spillovers between financial markets and their asymmetric effects, this paper applies the Wald test.

Table 3. Wald test results

original hypothesis	Wald statistic	P-value
The industrial sector index does not have a single Shanghai crude oil futures on the Spillover effects to volatility	116.307018	0.00000000
Shanghai crude oil futures on the energy sector index does not have a single Spillover effects to volatility	42.779657	0.00000000
Materials Industry Index to Shanghai Crude Oil Futures does not have a single Spillover effects to volatility	13.226234	0.00134264
The utility index does not have a single against Shanghai crude oil futures Spillover effects to volatility	10.473760	0.00531682
New energy index does not have one-way to Shanghai crude oil futures Fluctuation spillover effects	16.180277	0.00030655
Shanghai crude oil futures on the energy sector index does not have a single Spillover effects to volatility	24.303960	0.00000528

From the results of wald test, it can be seen that the original hypothesis αij=βij=0(i=1, 2...5,, j=6) is significantly rejected at 1% level, indicating that there is a volatility spillover effect of the industrial market, the energy industry market, the material industry market, the utility market, and the new energy market on the existence of the Shanghai crude oil market. And α62=β62=0 indicates that the Shanghai crude oil market to the energy market to the existence of the existence of volatility spillover effect.

5. Conclusions and Recommendations

Based on the relationship between the Shanghai crude oil futures market and the stock markets of oil-related industries, this paper selects Shanghai crude oil futures, industrial industry index, energy industry index, materials industry index, utilities index, and new energy index as the research variables, and combines with the BEKK-GARCH model to study the spillover effects between Shanghai crude oil futures and these oil-related industries. The study shows that, firstly, there are significant asymmetric volatility spillover effects between the Shanghai crude oil market and the majority of oil-related industry markets. Second, there are also significant symmetric spillovers between the Shanghai crude oil market and the energy industry market, with the two markets interacting with each other. Overall, there are asymmetric widespread volatility spillover effects between financial markets in China.

The conclusions of this paper suggest the following: For investors, when making investment decisions, they need to pay attention to information about the underlying, but also should pay attention to information about the different markets related to it. Investors investing in Shanghai crude oil futures need to pay close attention to the information of other markets such as the industrial sector, energy sector, materials sector, utilities, new energy, etc., in addition to the futures themselves. Similarly, when investing in oil-related industries, when the industry's stock prices fluctuate, you can observe and analyze the changes in Shanghai crude oil futures prices and rationally analyze the changes in their stock prices to avoid the "herd effect" that can cause losses due to the panic of other investors. For example: when investors buy stocks in the energy industry, when the energy industry stock price fluctuations, because of the discovery of Shanghai crude oil futures prices and energy industry stock prices should be positively correlated, if the Shanghai crude oil futures prices did not fall, so it is reasonable to suspect that this time the decline in stock prices may be caused by other factors, such as market sentiment, then investors should not follow the emotions of panic decision-making, and should rationally analyze the changes in the stock price to make the correct judgment. correct judgment. In addition, securities investors

can also use futures tools to increase asset allocation, hedging to reduce portfolio risk. For example, if a securities investor buys stocks related to the public utilities market and is afraid of the risks associated with the future decline in public sector stock prices, the investor can choose to invest in Shanghai crude oil futures, which can effectively reduce portfolio risk by increasing asset allocation.

For the industry with a high degree of oil-related industries, the industry should increase the training of relevant professional investment personnel, the effective use of Shanghai crude oil futures products, which can be used as a tool to reduce investment risk, take to increase the asset allocation approach, can effectively reduce the risk of the industry. For example: industry and other industries, there is an essential demand for crude oil, when the price of crude oil rises, it will cause an increase in the cost of its industry, resulting in a series of price increases. However, it is possible to lock in future operating costs and control business risks by purchasing Shanghai crude oil futures.

In addition, China needs to strengthen its research and development of renewable and new sources of energy, thereby replacing the importance of petroleum resources, in order to achieve a win-win situation for both the economy and the environment. With the development of China's economy and science and technology, as well as technological advances, coupled with China's vast territory, there is a wide range of renewable resources can be utilized, such as water, wind, light and other natural renewable energy sources, the use of these sources of energy for power generation, and then utilize these renewable energy sources to replace petroleum energy. In addition, the development of new energy sources is imperative, which, to a certain extent, not only reduces dependence on oil, but also reduces carbon emissions and environmental protection.

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