How Can Energy-Importing Countries Guard Against Geopolitical Risks - Take Japan as an Example

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Abstract. With the gradual decline of global economic growth, the world economic cycle is facing an important turning point at present, and various geopolitical crises have occurred one after another. Under this background, energy security risks of energy-importing countries have become increasingly serious. Therefore, it is particularly important to study the function principle and risk avoidance means of geopolitical events affecting energy security. This paper selects Japan, which has a very low energy self-sufficiency rate but achieved good economic development and energy security after World War II, as the research object, and selects the second oil crisis, the Great East Japan earthquake and nuclear leakage, and the novel coronavirus epidemic as the representatives of three geopolitical events to analyze the changes in Japan's energy structure and the policies and measures of the Japanese government. It is found that geopolitical events can affect a country's energy structure and energy strategy from three aspects: energy supply, energy demand and international relations. Finally, based on the experience of Japan, this paper provides reasonable suggestions for energy-importing countries to prevent and resolve the energy security risks caused by the geopolitical crisis.

Keywords: Geopolitical risk, Energy security, Energy economics, Energy structure of Japan.

1. Introduction

1.1. Background

Energy has always been an indispensable factor for social development, but the current global political and economic situation is changing rapidly, and the commodity market represented by traditional fossil energy is also experiencing drastic and unpredictable fluctuations. Among them, the geopolitical crisis is an important trigger for this risk. The Fourth Middle East War, the Gulf War, the Iraq War, the Arab Spring, and the Ukraine crisis, although there is no large-scale war worldwide, there has been at least one geopolitical crisis in every decade in the past 50 years that can seriously affect the international energy market and world economic growth. The serious uncertainties and economic losses brought about by these events have promoted the world's major economies to seek energy transformation and improve the domestic energy structure with low-carbon fossil energy and renewable energy to cope with the corresponding risks. In this context, it is of great significance to examine the relationship between geopolitical relations and the international energy market and learn from the policy experience of other countries in dealing with corresponding crises.

Among the world's major economies, the characteristics of the island nation and the geological volcano have led to Japan's inherent lack of energy resources, which also determines that Japan will be more dependent on imports than other major economies in the world. When commodity markets are hit by geopolitical risks, Japan will be more affected than other major world economies. On the one hand, this vulnerability has brought great challenges to Japan to cope with the risk of energy price fluctuations, and on the other hand, it also provides an objective impetus for Japan to seek an active and effective energy security strategy.

1.2. Related research

The research consensus is that geopolitical crises can harm energy security. The study of Beatriz, Javier and Enrique further pointed out that the impact of this impact on developed economies is different, and countries with insufficient energy resources are more susceptible to the impact [1].

Umer further complements the mechanism of this effect, his article states that this impact on energy security is due to the existence of global connectivity Geopolitical crises not only affect energy supply but also affect precious metals markets as a transmission through the energy market, which in turn affects the overall economic situation of countries around the world [2]. However, Kim's research points out that the impact of geopolitical crises on energy security, while objective, is far less powerful than other articles and media have portrayed [3].

There is no consensus on how a country's energy mix will change when faced with the risk of geopolitical events. The prevailing view is that the existence of geopolitical risks provides sufficient reason and motivation for the energy transition and renewable energy consumption in various countries. Osama D. studied the United States, the country with the greatest geopolitical interests, and found that geopolitical risk is an important driving factor for the spread of clean renewable energy [4]. Both Khalid and Li H. took environmental footprint data as an entry point to study the impact of geopolitical risks on environmental degradation and environmental sustainability. Studying emerging economies, Khalid finds that geopolitical risks increase the use of renewable energy and thus increase the environmental footprint, which means that geopolitical risks impede environmental degradation [5]. H. Li took BRICS countries as research objects and found that geopolitical risks could improve environmental sustainability [6].

However, the results of some studies suggest a different view of the above. In Floros's study, he points out that geopolitical crises can significantly reduce renewable energy production in both the short and long term, and this negative impact increases with the increase in related energy production [7]. Zubair's research also points out that due to the existence of geopolitical risks, the energy structure transformation of various countries will be hindered [8].

Given the divergence of views on this issue, some scholars have conducted research to explore the reasons. In their research, both Khalid and Li pointed out that some governments tend to maintain the uncertainty of economic policies due to the existence of geopolitical risks, and the uncertainty of economic policies will lead to the degradation of the natural environment and the decline of environmental sustainability. In addition, Syed's research points out that the impact of geopolitical risk and economic policy uncertainty varies according to the carbon emissions of different countries: geopolitical risk can reduce the carbon emissions of high-carbon emitting countries and increase the carbon emissions of low-medium and low-carbon emitting countries [9]. Therefore, different conclusions can be drawn when different countries are selected.

As the world's third-largest economy, Japan's carbon emissions are the fifth in the world. As a developed country with high carbon emissions, it is difficult to find a suitable position for it according to the existing research. In addition, J. Zhang pointed out that since the two oil crises in the last century, Japan's energy policy has been seeking an energy structure that can guarantee energy security, starting from the "oil substitution policy" after the two oil crises until the first decade of the 21st century. Japan has formed an energy policy with coal as the center, natural gas as the auxiliary, and renewable energy and nuclear energy as the supplement [10]. However, after the Fukushima nuclear accident in 2011, the proportion of nuclear energy in Japan once approached 0%. Farha's study found that the elasticity of oil consumption in some economic sectors of Japan has declined in absolute terms. This means that Japan's dependence on oil consumption has increased, which is contrary to Japan's national energy security strategy, and Japan has entered the transition of energy structure once again [11].

1.3. Objective

Combined with the research results of other scholars, this paper takes Japan as the research object and selects three geopolitical events that the author considers to be representative of the development of Japan's energy structure after World War II for analysis. The second chapter will study the impact of three geopolitical events on Japan's energy structure and economic situation. The third chapter will classify these three geopolitical events and focus on the Japanese government's response policies to provide some rational policy recommendations for other countries in the same situation.

2. Geopolitical Events and Japanese Energy

Energy is an essential factor of production for national development and an important driver of global economic growth. However, the vulnerability of the oil-dominated global energy supply system is becoming more and more prominent in the current era of increasingly complex geopolitics and deepening environmental constraints. As an island country, Japan is short of natural resources and has a very low energy self-sufficiency rate. For a long time, Japan's energy supply mainly relied on overseas imports, and the dependence rate of fossil energy imports represented by oil and liquefied natural gas is as high as 90%. However, the energy issue has not become a binding bottleneck restricting Japan's economic take-off after the war, which is because Japan has maintained a long-term flexible energy strategic policy since the oil crisis in the 1970s, and actively explored the adjustment of fossil energy structure, nuclear energy and various renewable new energy sources from the supply side. Especially in the 1990s, after the bursting of the Japanese bubble economy, Japan's economic growth slowed down, and the domestic need for the development of new industries, and the new energy industry received considerable attention from the Japanese government at this time. After the Great East Japan earthquake in 2011, Japan's nuclear energy safety myth was shattered, nuclear energy, which originally accounted for 20% of Japan's energy consumption, plummeted to zero, several nuclear power plants in Japan permanently shut down, and Japan ushered in a major reshuffle of the energy structure. Since the implementation of the Paris Agreement in 2016, Japan, as the world's fifth largest carbon emitter, has attracted the attention of the United Nations for its excessively high proportion of fossil energy in its energy structure, and the Japanese government has further increased its emphasis on energy strategies in order to achieve its 2050 carbon neutrality goal.

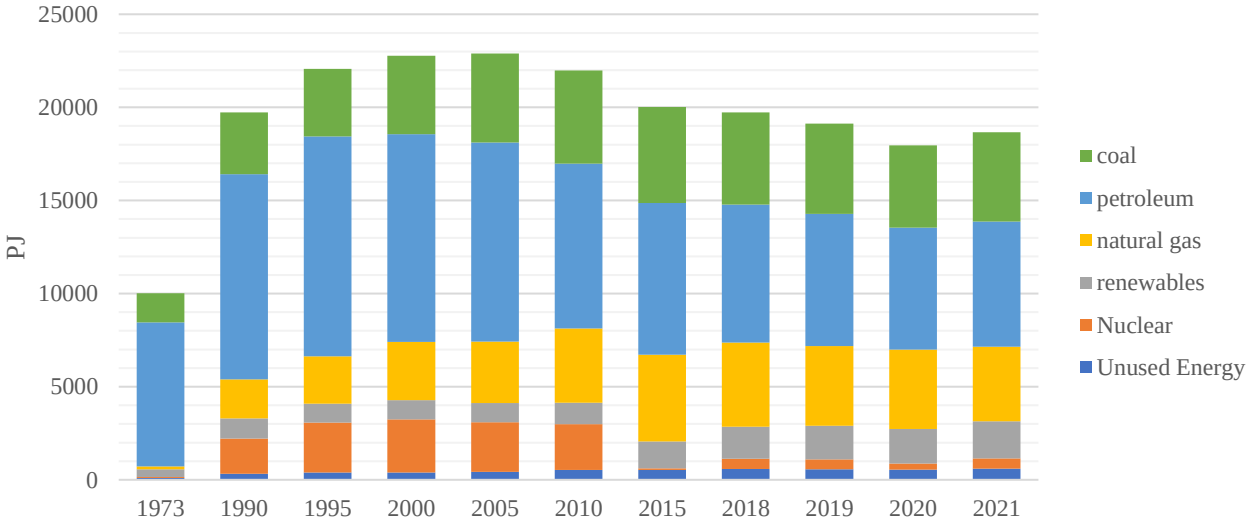


Figure 1. Share of Japan's Primary Energy Supply

As can be seen from Fig.1, Japan has maintained an energy structure dominated by fossil energy for a long time. Next, the impact of several typical geopolitical events on Japan's energy will be analyzed by period.

2.1. The Second Oil Shock - Japan's Energy Policy for the Next Four Decades

The 1978 Islamic revolution in Iran, listening to oil exports, caused a short-term imbalance between supply and demand in the international oil market. The outbreak of war between Iran and Iraq in September 1980 pushed the crisis to its peak, and the international oil market price soared all the way. In 1979, the price of Arab light oil was $14.55 per barrel, but in January 1981, it was as high as $36 to $40 per barrel. Japan was relatively unaffected, though, by its policy of stabilizing Middle Eastern oil supplies after the first oil shock. However, Japan is still seeking policy tools to reduce its dependence on Middle Eastern oil. Japan responded with a three-pronged policy. First, China has adopted energy-saving policies, adjusted the production structure, and developed low-energy

industries. Second, to develop and utilize energy sources that can replace oil, develop new energy sources such as nuclear energy and solar energy, and develop renewable energy sources such as water power, wind power and biological energy, in particular, to restore obsolete coal energy sources; Third, expand new sources of oil imports, increase oil imports from the Asia-Pacific region, and plan to jointly develop new oil fields in the Far East with the Soviet Union.

Table 1. The amount of petroleum Japan imports from the Mideast

Year	Import from Mideast	Ratio	Year	Import from Mideast	Ratio
1975	3610	79.5%	1982	2619	71.7%
1976	3703	80.2%	1983	2561	71.8%
1977	3765	78.5%	1984	2591	70.7%
1978	3660	78.5%	1985	2405	71.2%
1979	3710	75.8%	1986	2246	69.0%
1980	3267	74.5%	1987	2165	68.0%
1981	2756	70.3%			

It can be seen from Table 1 that both the Middle East oil import volume and the proportion of Middle East oil imports have shown a trend of continuous decline. Combined with the data in Fig.1, it can also be found that the proportion and consumption of oil in Japan's energy structure have also continued to decline. At the same time, Japan's coal imports restarted and increased for a long time, forming Japan's unique coal-centered fossil energy system as a developed country, as shown in Table 2.

Table 2. The amount of domestic coal and imported coal in Japan

Year	1965	1970	1975	1980	1985	1990	2000	2005	2010
Domestic	50113	38329	18597	18095	16454	7980	6317	3126	1114
Imported	16936	50950	62339	72711	93691	104835	124170	145278	180808
Self-sufficiency	74.70%	42.90%	23.00%	19.90%	14.90%	7.10%	4.80%	2.10%	0.60%

2.2. The Great East Japan Earthquake - The Collapse of the Myth of Nuclear Safety and the Adjustment of Energy Structure

On March 11, 2011, a massive earthquake and tsunami hit northeastern Japan, resulting in explosions, damage to control rooms and nuclear leakage accidents at two nuclear power plants in Fukushima Prefecture. The international community and Japan have paid close attention to the relevant events, and the nuclear leakage crisis has had a huge impact on international relations and nuclear energy.

The reason why the Fukushima nuclear crisis in Japan is called a geopolitical event that has a huge impact on Japan's energy structure is that the crisis has three main characteristics. First, the impact of the disaster is uncertain, because the Japanese government has long insisted that the safety of Japan's nuclear power plants is indestructible, but the disclosure of information shows that the International Atomic Energy Agency has long warned of the "irreparable harm" caused by the earthquake. The uncertainty caused by this information contradiction makes it difficult for the Japanese people and the international community to obtain transparent and credible information; Second, the crisis is extremely threatening, and the threat to the interests of Japan and the international community is fundamental. The international public opinion is generally worried that the crisis will cause irreparable disastrous consequences. Many countries have raised the level of security warnings and asked their citizens in Japan to evacuate. Third, the urgency of the time, nuclear leakage crisis response is very temple, and delaying the opportunity will cause a huge disaster.

Against this backdrop, the level of nuclear energy in Japan has plummeted to near zero, and the discussion of nuclear energy in Japan has also entered a fever pitch. In 2012, the Japanese government proposed a "zero nuclear energy target by 2030", which can be seen as a response to domestic public opinion and international relations pressure, although in 2014 Japan's fourth energy benchmark plan

proposed to restart nuclear power. However, it is very clear from the following charts of Japan's primary energy structure in 2010 and 2015 that nuclear energy in Japan is still far from reaching the pre-crisis level of more than 10% four years after the earthquake, as shown in Fig.2 and Fig.3.

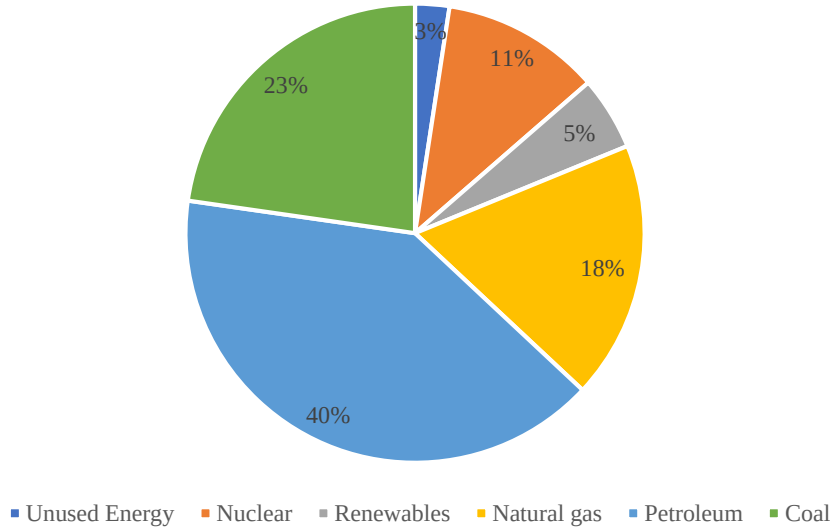


Figure 2. Japan's primary energy structure in 2010

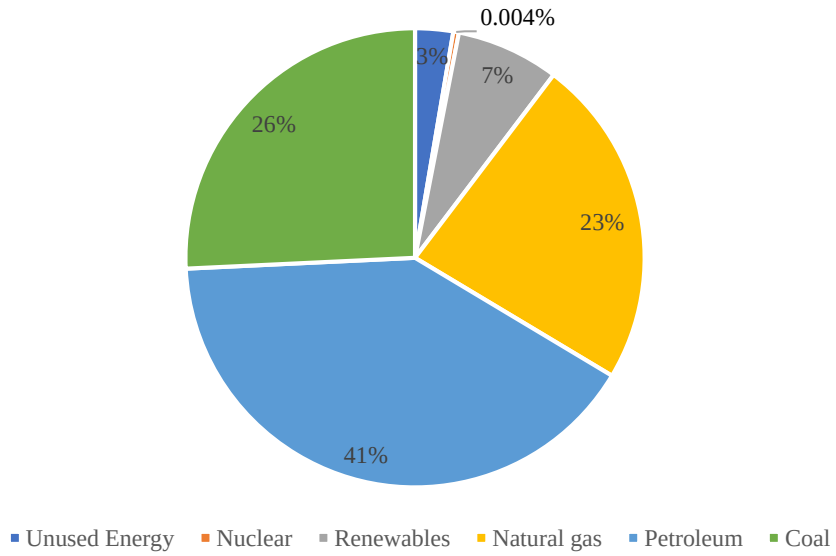


Figure 3. Japan's primary energy structure in 2015

2.3. Post-fukushima: Energy security, carbon neutrality goals and the impact of the pandemic

After the Fukushima nuclear crisis, Japan's already low energy self-sufficiency rate dropped from 19.1% in 2010 to 12.5% in 2011, and the Japanese authorities urgently need to find an alternative to nuclear energy, and the Japanese government has set its eyes on renewable energy. As can be seen from Fig.4, the proportion of renewable energy in Japan's primary energy consumption began to rise rapidly in 2012 after the Fukushima nuclear leakage crisis, and renewable energy increased from 5.3% of primary energy in 2012 to 10.7% in 2021.

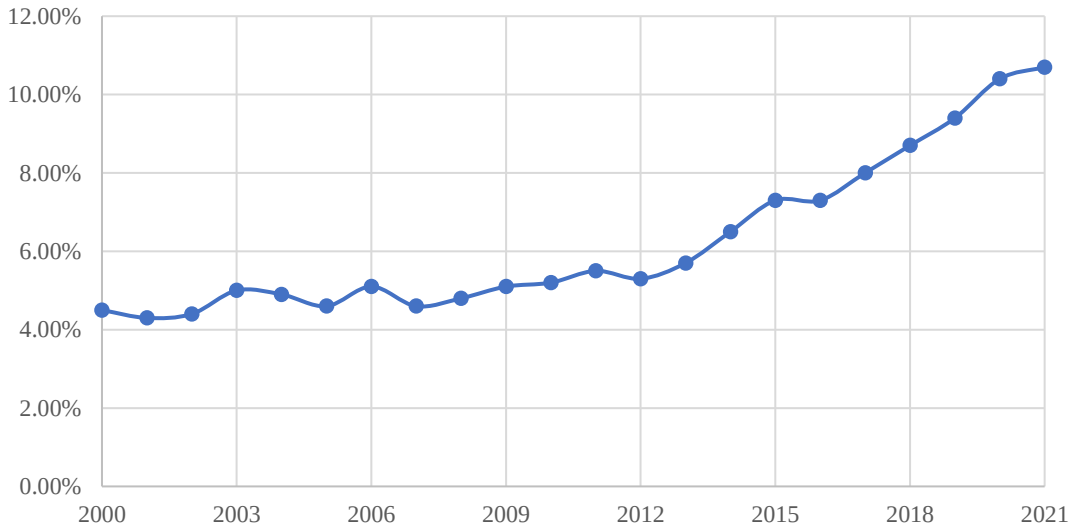


Figure 4. Share of Renewables in Primary Energy Supply

However, Japan's power conversion faces two difficult problems, which also foreshadowed the problems of electricity and energy prices during the COVID-19 pandemic. First, Japan's nuclear energy policy had lasted for a long time before the earthquake. As a high-quality energy source, a large amount of human and material resources had been invested in nuclear power for a long time, which resulted in great losses for Japan to completely abandon nuclear energy on the one hand; on the other hand, the long-term policy of supporting nuclear energy suppressed the living space of other renewable energy power generation industries. In 2010, Japan's power structure, including wind, solar, geothermal and other renewable energy accounted for 1% of Japan's total power generation, and hydropower accounted for 8% to 9%, which restricted the diversified development of Japan's power and energy utilization structure, and also led to the development of renewable energy in Japan is bound to invest a lot of financial expenditure to guide. Japan has greatly promoted the development of solar energy through the policy of large government subsidies; Second, the restoration of nuclear power still needs to face great public pressure in the short term. It is difficult for Japan to avoid using fossil energy to make up for the loss of nuclear power, but this runs counter to Japan's advocacy of energy conservation and emission reduction and the goal of carbon neutrality. Especially after the signing of the Paris Agreement, Japan, as a developed country with the highest dependence on fossil energy in the world, will inevitably attract international attention to its energy structure.

At the end of 2019, the novel coronavirus epidemic broke out worldwide. In the face of the black Swan event, in order to control the spread of infection, many countries adopted restrictive measures such as city blockade, which greatly restricted international freight and travel, resulting in a sharp decline in global energy demand, whose impact is reflected in the sharp decline in global fossil energy prices. The cost of power supply in Japan, which is famous for high electricity prices, fell by 15% during the epidemic, while the cost of renewable energy generation such as wind and solar power in Japan also continued to plummet, and renewable energy represented by solar energy in Japan maintained rapid and stable development during the epidemic. According to the forecast of Wood Mackenzie Consulting, the superimposed cost reduction and the release of production energy demand after the end of the epidemic, Japan's renewable energy industry in the next decade will receive more than 100 billion US dollars of investment, Japan is expected to achieve the goal of 22%-24% of green energy power generation in 2030, as shown in Fig.5.

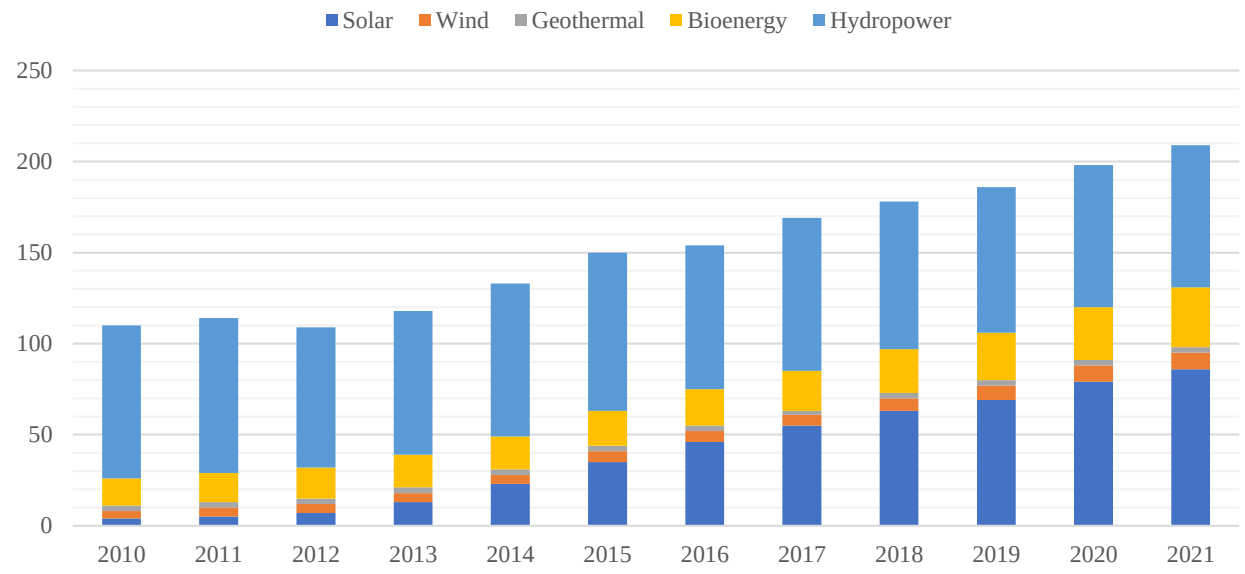


Figure 5. Trends of Electricity Generation from Renewable Sources (TWh/Fisical Year)

3. Discussion and Policy Advice

Three geopolitical events experienced by Japan and the corresponding changes in its energy structure have been discussed above. As a resource-deficient country with a low energy self-sufficiency rate, Japan's energy security has been greatly affected by these geopolitical events. At the same time, Japan, as the world's third-largest economy, has a lot to learn from its government's approach to addressing geopolitical risks to its energy security. In the following part, the author will discuss the reasons for these differences and make suggestions to the Japanese government in a similar situation of energy security based on its policies.

3.1. Geopolitical Risks Affecting the Supply of Traditional Fossil Fuels

The main impact of the second oil crisis is reflected in the sharp reduction of oil supply resulting in a surge in global crude oil market prices, which affects the energy import cost of oil-importing countries, threatens a country's energy security, and then affects a country's foreign exchange reserves and the overall economic situation. The author believes that the geopolitical events affecting the supply of fossil energy can be divided into the same category, such as the Gulf War, the Iraq War and the Russia-Ukraine war, etc. Such geopolitical risks worsen the economic conditions of energy-importing countries and threaten the energy security of a country.

After the second oil crisis in Japan, the signature policy of Japan was to promote energy conservation policies throughout the country, and set up an energy conservation countermeasures department under the Cabinet of the Chief Secretary, to limit energy consumption to curb energy demand and reduce the impact of the oil crisis on the Japanese economy in the short term. At the same time, Japan promulgated the "Petroleum Alternative Energy Law" in 1980, Japan began to restart the use and import of coal, because coal as a solid energy water transport price is relatively low and is less affected by geopolitics, and coal is the center of stable fossil energy security in Japan. In addition, Japan has coordinated Energy Security, Environment Protection and Economic Growth and formulated a new energy policy with the 3E as the core, which refers to Energy Security, Environmental Protection and Economic Growth. In 1994, Japan officially announced the development of new energy and renewable energy for the first time with the "New Energy Promotion Outline". In 1997, the New Energy Law was promulgated to promote the development and utilization of new energy sources and ensure the stability of the domestic energy supply. Finally, in terms of foreign policy, Japan vigorously carries out single energy diplomacy to the Middle Eastern countries,

trying to reduce the impact of Japan in the energy crisis by establishing stable and friendly diplomatic relations.

As for the geopolitical risks affecting energy supply, the author believes that the government should curb its energy demand in the short term to reduce the impact on its economy and energy security. In the long run, a country's excessive dependence on a certain or a certain source of energy imports will lead to potential energy security risks. Therefore, it is necessary to develop new energy and enrich the energy structure. And building a stable and diversified energy import route through diplomacy is a useful approach.

3.2. Geopolitical Risks Affecting Energy Demand

The coronavirus pandemic has caused many countries around the world to adopt policies such as city closures and entry restrictions, which has led to a decline in trade, and shipping and economic downturn. In this context, energy demand has plummeted on the one hand, and energy transportation has been blocked. As a result, energy prices, especially those of traditional fossil fuels, have fallen sharply during the COVID-19 pandemic. On April 20, 2020, there were several crude oil futures contracts where the price fell below zero dollars. Such geopolitical events affect a country's energy structure by affecting energy demand, which is mainly reflected in the reduction of energy costs caused by the decline in the price of traditional fossil energy, thereby crowding out the market share of other new energy with higher costs. Such geopolitical risks may lead to the unification of a country's energy structure under the conditions of a market economy.

In order to achieve the goal of reducing carbon emissions by 46% in 2030 compared with 2013, Japan has put forward quite specific targets for its energy structure in its Energy Basic Plan. However, under the impact of COVID-19, Japan, known for its high electricity prices, has also cut electricity prices by 15%. In order to ensure the realization of the goal, the Japanese government has provided considerable subsidies to the new energy industry. Japan adopts a fixed subsidy policy for new energy power generation, and the purchase price of renewable energy such as photovoltaic power generation is much higher than that of traditional fossil energy to enhance the market competitiveness of renewable energy.

As for the geopolitical risks affecting energy demand, the author believes that the government should provide subsidies for new energy with relatively high costs in the short term to prevent new energy from being squeezed out of the market due to the price reduction of fossil energy, which will make the government's long-term goal of diversifying the energy structure fail, thereby increasing potential energy security risks in the future.

3.3. Geopolitical Risks Affecting the Country's International Relations

As nuclear safety issues are related to global environmental issues, the Fukushima nuclear leakage incident led many countries in the world to question Japan's nuclear safety and crisis-handling ability, which triggered a dual crisis of Japanese diplomacy and domestic public opinion. In this regard, Japan has adopted a very active diplomatic and publicity policy, actively cooperating with the International Atomic Energy Agency, the International Red Cross and other relevant international organizations, and disclosing information through third-party international organizations in exchange for international trust. In addition, Japan has actively engaged in diplomatic activities with international powers and geo-related countries to seek help in resolving conflicts. After the incident, Japan's nuclear energy was greatly reduced due to safety issues. In order to restart nuclear energy, Japan adopted the form of nuclear diplomacy, establishing non-single energy diplomatic relations with other countries, especially fossil energy exporting countries, through the export of nuclear energy technology and economic interests, on the one hand, to provide an international reputation for its nuclear energy safety. On the other hand, it also further stabilized the stability of its own fossil energy import channels.

The author believes that for the geopolitical risks that may affect the international relations of the country, on the one hand, it may be nuclear energy, large-scale water conservancy projects and other

energy projects that may have a serious impact on nature, on the other hand, it may also be economic exchanges or energy transactions with countries in sensitive geopolitical conflicts, the government should actively adopt foreign policies. Strengthen credibility through third-party international organizations, win support from major countries, and eliminate conflicts among relevant countries in the region, thus reducing possible risks to energy security.

4. Conclusion

This paper examines the impact of the second oil crisis, the Fukushima nuclear leak, and the COVID-19 pandemic on Japan's energy structure and policies. Combined with Japan's fossil energy import data, Japan's primary energy consumption structure and new energy consumption structure, this paper analyzes the ways that geopolitical risks affect a country's energy structure from three aspects: energy supply, energy demand and international relations. This study finds that geopolitical events directly stimulate the diversification of a country's energy structure through the deterioration of energy supply, and indirectly promote the development of national new energy. If geopolitical events reduce energy demand, the share of fossil energy in energy-importing countries will increase, and the diversification of the energy mix and the development of new energy sources will be harmed. In addition, countries in energy-related geopolitical events, whose energy structure and energy security will be affected by foreign relations, may be forced to change their own energy structure in order to ensure the stability of international relations.

Based on the study of this paper, the author of this paper puts forward constructive suggestions on the energy security of energy-importing countries. A country can resolve the energy security risks of energy-importing countries in geopolitical events through the diversification of energy structure, diversification of import channels, financial subsidies for certain types of energy and active diplomatic means.

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