

## ECONOMIC POLICY IMPLEMENTATION TRENDS IN RENEWABLE ENERGY DEVELOPMENT

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**Abstract.** Under the strong impact of COVID-19 and the continuous game of the world economy, the world economy has gradually formed a “regional economic system”. This competitive economic landscape will accelerate regional energy demand, but also exacerbate global supply and demand contradictions, so the development of renewable energy and related economic policies is crucial. In this paper, the European Union, the United States, and China are selected as the three major economic systems to compare and analyze their renewable energy economic policies, reveal their problems, analyze their characteristics and trends, to get the overall trend of global renewable energy economic policies.

**Keywords:** economic policy, renewable energy, regional economic system.

### Introduction

Since the 21st century, to cope with the global energy demand growth, oil price fluctuations and increasingly severe climate and environmental problems, many countries have carried out the practice of energy production and consumption transformation development [1]. Therefore, the development of renewable energy and related economic policies is becoming increasingly important. The development of renewable energy is largely influenced by government economic policies. Throughout the world, the economic policies adopted by countries can be generally divided into two categories: positive incentive policies, such as national debt input, fiscal discount and subsidy policies, tax preferential policies, government procurement policies, and fiscal guarantee policies. Reverse restriction policies: expand the scope of consumption tax, levy fuel tax, levy energy tax, and so on.

Countries have chosen different paths to transition from the present to the future of a low-carbon energy world. Germany attaches great importance to environmental risks, reduces fossil energy consumption, abolishes nuclear power, and takes the lead in promoting the large-scale application of renewable energy. Japan is poor in resource endowment and takes technological advantage as the main means to meet energy transformation [2]. Under the premise of pursuing “energy independence”, the United States takes natural gas as transitional energy with equal emphasis on renewable energy to promote the clean energy structure. In the process of energy transformation, countries also encounter a series of problems: at the political level, it is necessary to coordinate the relationship between different domestic stakeholders and ensure the security of energy supply from the perspective of global cooperation; in terms of economy, in addition to the cost of renewable energy, the cost of improving energy efficiency and the loss of fossil energy enterprises, there are also problems of energy market integration and the lack of new energy infrastructure construction. In terms of technology, it has long faced the demand for continuous research and development of various energy technologies. It is on the basis of the above that MI (Mission Innovation) was also launched to promote a global multilateral, multi-track network of cooperation in the clean energy sector, building bridges between academia, government, business and capital through international cooperation to increase investment in clean energy science and technology and accelerate clean energy innovation [3]. However, in 2019, the *US Information Technology and Innovation Foundation* noted a weakness in clean energy technology-related patent applications among MI members, implying that there are still bottlenecks to the commercialisation and scaling up of clean energy innovation [4]. These experiences and problems inspire energy management departments, energy enterprises, and relevant scholars to think deeply about the transformation of renewable energy based on national conditions.

### Current state of renewable energy economic policy

#### 1. The EU economic policy on the use of renewable energy in the development

The EU started very early in the policy implementation of renewable energy, with its own unique leading advantages and relatively perfect policy system. In recent years, the EU member states have

issued their National Renewable Energy Action Plans one after another [5]. The fiscal and financial instruments used in the development of renewable energy can be divided into two categories: the first category is investment support instruments, namely investment subsidies. Encourage investment in renewable energy and support renewable energy at different stages of technology development and project development. Such policy instruments include demonstration project funding, research and development grants, loans, equity funds, and concessional loan guarantees. The second type is the market promotion tool, namely operation subsidy. The carbon emission trading mechanism based on the market transaction is established. For the renewable energy that has mature technology but still does not have market competitiveness due to cost and other reasons, various measures are adopted to provide subsidies for entering the market. The most common main means of such instruments are fixed purchase prices and quotas. In addition, fiscal incentives, such as taxes on the use of high-carbon energy, subsidies, government tenders and tax breaks have given a strong boost to renewable energy in the EU.

## 2. Economic policy in the United States on the use of renewable energy development

The US government began to attach importance to renewable energy in the 1970s and has issued a series of economic policies to increase the use of renewable energy. The main measures are as follows.

- First, tax credits and financial support. The federal government will constantly adjust the scope and amount of the tax credit based on actual developments in renewable energy.
- Second, direct subsidies to producers and consumers. The U.S. Treasury and Energy Departments will subsidize renewable energy projects and facilities through direct payments, not tax breaks.
- Third is to accelerate depreciation. To enable renewable energy investors to accelerate the recovery of investment costs, some mature and commercialized renewable energy technologies are included in the accelerated depreciation scope.
- Fourth, financial support. The federal government has set up special funds to support the development of renewable energy and promote energy efficiency. Including tribal Energy Program Grants, Renewable Energy Grants, American Rural Energy Program grants, etc.
- Fifth, bonds and loan guarantees. At present, the main bonds include clean renewable energy bonds and qualified energy-saving bonds.

## 3. China's economic policy on the use of renewable energy in development.

According to the latest 14th Five-Year Plan of the Chinese National Economy, it is clear that China's economic policies for the renewable energy industry are gradually increasing in intensity and variety.

- First is the aggregate target system, with the aggregate target requirements, market subjects can get the guidance information of market development, to achieve the combination of government promotion and market guidance.
- Second, compulsory Internet access system. The purpose is to ensure the development of the renewable energy industry under the condition of monopoly and franchise of energy distribution network.
- Third is the classified (on-grid) electricity price system. The government sets the on-grid electricity price level of different renewable energy technologies in a certain period according to the requirements of the total renewable energy development target and the technological development level.
- Fourth, the expense compensation system. To solve the problem that most renewable energy industries are still in the initial stage of industrial development, restricted by technology and cost, and the development and utilization costs are relatively high, which is difficult to compete with coal and other conventional energy generation technologies.
- Fifth, the establishment of a special fund system, used for all kinds of renewable energy power generation compensation, but also other renewable energy development and utilization project subsidies, subsidies, etc.

## Issues and future trends in economic policy implementation of renewable energy

### 1. The dilemma and trend of the EU renewable energy economic policy

There are three main obstacles to implementing the EU's economic policy on renewable energy. The first is the transfer of leadership in renewable energy policy. For the EU to ensure the effectiveness of its renewable energy policies, it needs to have a greater mandate in the energy sector, which requires member states to cede ownership of their energy policies to the EU. However, as one of the most important issues in national security, all governments emphasize that they must have the power to make their energy policies and are not willing to give up this important "sovereignty" easily. Therefore, for a considerable period in the future, the EU's management power in the field of energy policy will be greatly limited, thus affecting the implementation effect of renewable energy-related policies. Second, the interests of the member states diverge. The energy situation of the EU member states is very different, so the divergence of interests on the energy issue is also very prominent. The implementation of the overall economic policy is bound to benefit some countries while leaving some countries at a disadvantage, and it is difficult to maintain the interests of all member states and the overall interests of the EU. Third, the shortage of funds caused by the European debt crisis also makes the implementation of the EU renewable energy plan difficult.

The economic policy of the EU as a whole presents a trend of "substantial double decline" and "integration". The EU's renewable energy subsidies and investment scale show a trend of "substantial double decline", which makes the EU's renewable energy development into a "boom-bubble-bust" cycle [6]. Renewable energy is expensive to develop, and subsidies were understandable in the early stages, but they are now burdensome beyond governments' means. Therefore, since 2014, Germany, the United Kingdom, Italy, and other EU countries have cancelled the subsidy system of the renewable energy industry and adopted the bidding system that encourages competition.

In the future, the European Union will highlight "integration" in the development of the renewable energy policy. The introduction of the Lisbon Treaty in 2009 provides an opportunity for further integration of the EU energy policy. First, clear goals and a common action plan have been set. In the past, the EU renewable energy policy lacked clear long-term goals, and the constant change of goals resulted in the lack of consistency of policy measures, which seriously affected the effect of policy implementation. Second, we need to take a united stand externally and diversify sources of supply. The EU's new energy policy for the first time puts forward the concept of "speaking with one voice", advocating that the EU member states adopt a unified stance on external energy affairs. Third, we will strengthen the construction of the internal energy market. As the earliest integrated measure of the EU energy policy, the construction of the EU energy market is not satisfactory, the markets of member states are still separated, and energy prices are also high. Because of this situation, the EU began to reduce the existing barriers of member states through effective legislation, enhance market transparency and non-discrimination, and gradually establish a large-scale transnational energy market centred on the EU.

### 2. The dilemma and trend of the US renewable energy economic policy

For one thing, the United States relies heavily on traditional fossil fuels for its economic growth, and the obstacles to renewable energy development are enormous. Supporting renewable energy and supporting economic policies is bound to undercut traditional fossil-fuel industry interests. The development and implementation of renewable energy economic policies have been hampered by electoral political considerations and the desire of interest groups, such as the US fossil energy capital to support the industries, in which big business groups, such as oil, gas, and coal operate.

In addition, the ideological differences between the two parties on climate change have led to different attitudes towards clean energy economic policies [7]. During the Obama administration, the Democratic Party of the United States took active measures to promote the new energy deal, reduce greenhouse gas emissions and deal with climate change. Yet, the Republican Party is bent on denying the existence of climate change. After Trump came to power, to cater to the demands of traditional energy interest groups, he rescinded some executive orders to address climate change and cut carbon dioxide emissions during the Obama era and withdrew from the Paris Climate Agreement. Since taking office, Biden has presented himself as the "gas president", repeatedly issued executive orders to implement the new energy deal, decided to re-join the Paris Agreement at the beginning of his term, and hosted the world leaders' climate summit on Earth Day, April 22, 2021. The back and forth of the climate

change policy between the Democratic and Republican parties in the United States has also led to a lack of consistency and stability in the economic policy on renewable energy.

In the process of the development of renewable energy in the United States, the formulation of the economic policy presents a trend of radiation and decentralization [8]. The formulation and implementation of policies are dominated by the government to the states, and the participants of policies are gradually dispersed from large enterprises to small and medium-sized enterprises. Over the past two decades, nearly 50 percent of renewable energy development in the United States has been directly driven by government mandates, and states, cities, communities, and businesses are increasingly acting. In the future, there will be joint procurement models, such as the formation of joint purchasing agents in multiple jurisdictions, or joint agreements between businesses and universities in a community to achieve economies of scale and overcome legal and regulatory barriers from outside the city limits, such as state governments. On the investment side, the US renewable energy procurement and project investment is expanding among current buyers and into smaller companies, oil and gas companies, and new players, such as asset managers. Smaller companies, backed by established corporate buyers, such as the technology sector, are starting to enter the renewable energy market as companies scale up their purchases.

### 3. The dilemma and trend of China's renewable energy economic policy

First, there is a single mechanism for fiscal and tax subsidies. So far, China has mainly encouraged the development of renewable energy through direct grants. Secondly, the tax incentive policy lacks pertinence and does not give special treatment to the new energy industry according to its special situation. Third, the financing method is single. Financial input can support the development of renewable energy to a certain extent, but it cannot achieve sustainable development, resulting in a low commercialization degree and insufficient investors. At present, the management of the special fund is not standardized, the use of the lack of transparency and flexibility, supervision is weak, and there has been no establishment of appropriate and stable financing channels to raise funds for supporting the development of renewable energy. In addition, the market is underdeveloped. The real market of renewable energy in China is too small to show scale effect and can only exist as a supplement to the power supply in remote areas.

The economic policy of renewable energy in China is gradually opening up from the national to provincial level and relying more on the market. In May 2019, the Chinese government formulated the Renewable energy portfolio standard, which sets annual renewable energy targets for Chinese provinces. In 2009 and 2011, China briefly subsidized wind and solar power, and installed renewable energy capacity grew exponentially. However, this rapid growth has increased the burden on the government. In January 2019, the Chinese government began to gradually correct these economic policies. Starting from 2020, renewable energy support policies will be cut one after another, and the operation mode will be changed to market. New renewable energy projects after 2021 will be as cost-competitive as coal-fired power [9].

## Conclusions

The WTO has not yet been able to fully address the problems of trade in renewable energy products caused by tariffs, differential subsidies and inconsistent technical standards across countries. Therefore, the establishment of a multi-country energy cooperation network in the short term continues to face many difficulties [10]. For example, there are currently 61 regional, national and local carbon pricing mechanisms in the world, 31 of which are carbon emissions trading mechanisms and 30 of which are carbon tax systems [11]. However, these systems all operate independently. How to achieve the integration of carbon markets among different countries and regions through multilateral negotiations requires the resolution of a series of complex legal, institutional, policy, standard and technical issues.

It is on the basis of many of these issues that in recent years it has become a policy trend in most countries to reduce feed-in tariffs or reduce financial subsidies for renewable energy, with a general weakening of support. The unity of short-term and long-term goals of economic policies of various countries has been significantly improved. The formulation of renewable energy economic policies pays more attention to flexibility and coordination, and regional coordination has also been significantly enhanced. Economic policies are increasingly reaching out not just to big energy companies, but more

small businesses and teams. Countries have realized that if they change the investment mode from large foreign enterprises to small local enterprises or residents, some costs will be significantly reduced, and the implementation of policies will be more smooth.

In addition, the focus on the establishment and formation of a wide variety of market mechanisms has also become a major goal of global renewable energy economic policy. However, the development cost of renewable energy is still high at the present stage, which requires policy support. With the rapid reduction of the development cost and continuous innovation of technology, renewable energy will gradually reach the level of routine application and achieve its own benign development.

#### **Author contributions:**

Conceptualization, Y.Z. Wang; methodology, Y.Z. Wang; validation, Y.Z. Wang and L. Xin; formal analysis, Y.Z. Wang and L. Xin; investigation, Y.Z. Wang and L. Xin; data curation, Y.Z. Wang; writing—original draft preparation, Y.Z. Wang; writing—review and editing, Y.Z. Wang; project administration, Y.Z. Wang. All authors have read and agreed to the published version of the manuscript.

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