

How to Finance the New Energy Technology in China?

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Abstract: New energy is fast-growing in China. However, new energy cannot develop without financial instruments that are different from the traditional financing of existing energy projects. Therefore, this paper, theoretically, studies how to find the optimal financing vehicles, and qualitatively analyzes the possible financial operations for the new energy. To this end, we, specifically, propose the risks of financing investment in new energy, the advantages of financing it, and how we could balance the risks and advantages of financing behaviors in new energy. This paper provides insightful comments on the above-mentioned policies, which are of great relevance to government, enterprises, and residents. We substantially advance the understanding of financing new energy.

Keywords: New Energy, Financing, Policy, China.

1. Introduction

Today's industrial development is inseparable from the supply of energy, traditional fossil energy has non-renewable and environmental pollution and other problems, so new energy is increasingly favored by countries, new energy compared to traditional fossil energy has environmental protection, clean, sustainable and other incomparable advantages.

Traditional energy sources include natural gas, coal, oil, water, wood, etc. New energy sources refer to new energy sources that are not yet used on a large scale and have great potential for future development. At present, domestic and foreign institutions and the definition of new energy differs, but the general direction is the same. In 1990s, the United Nations Development Programme divided new energy into large and medium-sized hydropower; new renewable energy, the definition of new energy as: "new energy for a clean renewable energy, to distinguish the traditional fossil energy, including solar energy, wind energy, biomass, water energy Ocean energy, geothermal energy, and other clean energy.

Combing the domestic definition of new energy can be found, the definition of domestic and foreign authoritative organizations are roughly the same, the main difference between the two is whether water energy is classified as a new energy category.

In 2006, China promulgated the Renewable Energy Law, and since its implementation, China's new energy industry has continued to develop, and industrialization has become increasingly mature, with remarkable achievements, but also shortcomings in development. First, the supply side of high-quality development. 2020, China's new energy installation of more than 530 million kilowatts, the scale of new energy development and utilization ranks first in the world, while China's new photovoltaic power generation machine accounted for 52.8% of the total new installations, the world's first for 11 consecutive years, photovoltaic modules in the

world's top ten companies in China occupies seven.

In 2020, China's solar photovoltaic power generation exceeded the total solar power generation of the United States, Germany, India, and the United Kingdom of the four countries, China has not only achieved localization in the important aspects of photovoltaic manufacturing but also become a global manufacturing base. In the field of wind power generation, China's wind power generation is close to the total wind power generation of the United States and Germany, the mastery of low wind speed wind power technology makes China's wind power generation ranks among the world's top, and more than 90% of the domestic wind power installation using domestic wind turbines.

Once again, the support for the new energy industry will be increased through dual coordinated industrial and monetary policies. In terms of industrial policies, there are three main categories: total target policies, financial subsidy policies, and targeted policies in key areas. Total target policy is for the demand side, set a quantitative price target for end products, such as feed-in tariff restrictions, new energy vehicle subsidies after price regulations, etc.; fiscal subsidy policy is the central or local measures to increase tax incentives and financial subsidies for new energy enterprises; key areas of targeted policy is from the actual, key areas to give targeted support.

As people pay more attention to environmental protection and policies focus on sustainable development, new energy sources will be regarded as the dominant energy source in the future. New energy sources include solar, wind and tidal energy. Compared with traditional fossil energy, new energy has a minimal negative impact on the environment. This is also an opportunity for us to invest because of adequate energy capacity and increasing electric vehicle market share. According to Figure1, China's installed renewable energy capacity reached 1063 gigawatts (GW) in 2021, accounting for 44.8 percent of China's total power generation capacity. Moreover, figure 2 represents that China made up 13.3% of electric vehicle market share in 2021.

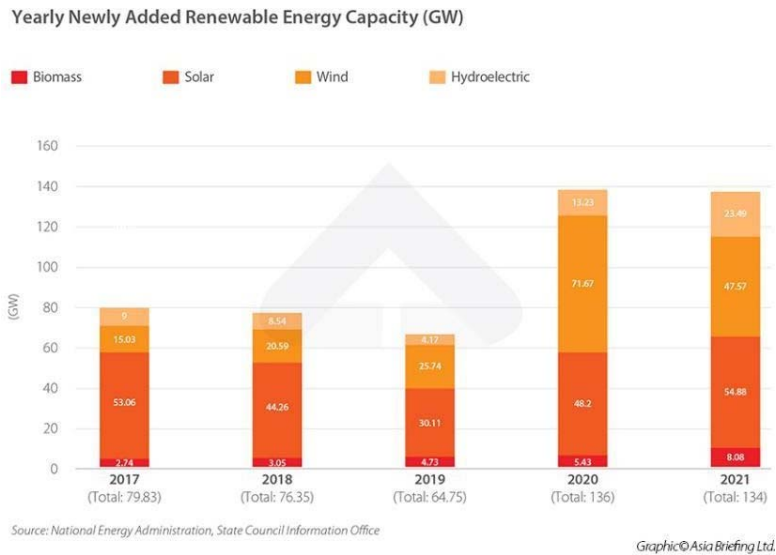


Figure 1. Yearly Newly Added Renewable Energy Capacity

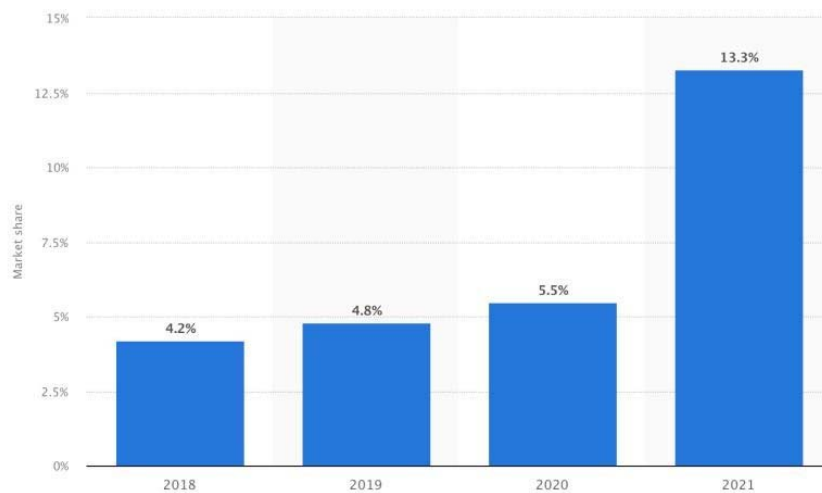


Figure 2. Electric vehicle market share in China 2018-2021

However, we find that There is a high risk of financing or operating in the new energy industry, unfamiliar with the new technology. Thus, it is noteworthy to study new energy by statistics and explore a potentially optimal pathway to the development of the new energy industry. To this end, this paper, theoretically, studies how to find the optimal financing vehicles, and qualitatively analyzes the possible financial operations for the new energy. There are three aspects that we will explore in order to achieve the objective. Firstly, we need to find extra benefits of investing new energy instead of other industries. Secondly, suggestions for reducing the potential risks are necessary. Lastly, there is a pathway to the optimal choice which can trade off or balance the risk and benefit, minimizing the risk while maximizing the benefit.

Compared to existing methods, we improve in the following ways. First, we propose new inspiration for people who invest in new energy; Second, we fix the issues in the policy proposed by Strategic Choices for Renewable Energy Investment by adding methods that can be used to balance the risk and benefits.

China, the world's largest energy consumer, plans to reduce its CO₂ emission to 5,150 million tons by 2035 and 2,600 million ton by 2050. Moreover, the Chinese government plans

to increase the share of renewable energy in its energy mix to nearly 37% by 2035 and 58% by 2050. We hope to recap and compare comprehensively, and thoroughly, evaluate multiple solutions to protecting the ecosystem and environment.

The remainder of this paper is organized as follows. Section 2 briefly reviews the relevant literature about renewable energy. Section 3 introduces the background and data in this empirical study. Empirical strategies and results are contained in section 4. The last section discusses some policy implications and provides some concluding remarks useful to the inclusion of financing tools in renewable energy.

2. Literature Review

New energy generation is more like a new product that is gradually replacing traditional power plants, and the end product they produce is the same for the end user, both are electricity. But new energy is more in tune with the times and is more beneficial to the long-term development of all mankind. In a more general way, new energy generation beats traditional fossil fuel power plants. But the supply of new energy itself is not stable, and in addition to using new energy to supply electricity, other new energy derivatives also have certain problems, such as the range of new energy vehicles.

This means that if new energy products are to be implemented on a large scale, the technical problems are a major problem that requires both money and time to overcome.

2.1. Benefit of the new energy

Gao and Zhao(2018) suggests the idea that In recent years, the government has paid attention to and supported PPP projects for new energy construction. This is because it not only reduces the government's pressure on the financial side, but also enhances the new energy technology. [1] Christian et al., (2021)

The decarbonization of global power generation is an opportunity for investors who need a sustainable impact. Having demonstrated the additional benefits of the economic resilience of sustainable infrastructure assets, the move into sustainable infrastructure is supported by global political winds of designated fiscal incentives to upgrade existing and new green infrastructure, and increasingly mandatory disclosure of progress by regulators. Finally diversification into neighboring renewable technologies to sustain the upcoming renewable power network and thus optimize the portfolio's risk-return profile are of benefit to investors. [3]

Likewise, Helm (2005) mentioned in response to structural increases in oil prices, aging assets, network failures, and greater import dependence. The shift in focus from asset retirement to investment has been accompanied by a paradigm shift in energy policy objectives - toward security of supply and climate change. The shift in government goals and the growing emphasis on environmental protection have become advantages for the new energy sector [4]

2.2. Risk of the new energy

Kerim argues that risk is high that investors need to diversify across three renewable energy asset subcategories - generation, flexibility and connectivity - that may have different revenue streams and are not correlated with each other. Investors need to improve risk-adjusted returns by reallocating a well-constructed renewable energy portfolio. And the reallocation process is when the risk arises [5]

Ronald J. Sutherland suggests that A conventional investment model suggests that business investments in energy efficiency are made with the same decision rules as any other investments [6].

Joel N. Swisher mentioned little of the energy-efficiency potential identified by technical studies will be realised in the absence of policies to reduce barriers to energy-efficiency investments. [7]

Tradeoff between Risk and Development Lee et, al metioned that unless there is a paradigm shift in the current energy use, Asia will struggle to deliver the inclusive growth needed to lift millions of its citizens out of poverty. [8] Moreover, Akcay(2017) provide the idea that investors can consider relevant risk factors before investing through a methodology that can be used to predict the profitability of hydropower investments, identified the risk factors involved in new energy projects, assessed the impact of these risk factors on cash flow parameters, and performed Monte Carlo simulations to estimate the net present value (NPV) of hydropower investments. The proposed methodology was tested on a hydropower investment located in Turkey and produced credible results that could be of great benefit to potential investors operating under similar conditions. This approach, allows investors to better measure the risks and benefits of their investments by using stochastic methods to

assess the profitability of hydropower investments.[2]

3. Background and Data

The richness of China's water resources has laid a realistic foundation for the development of hydropower, coupled with the early start of hydropower development in China, the role of the two reasons is that hydropower has become the "dominant" new energy industry in China. The three impressive figures of 220 million kilowatts, 75 million kilowatts and 0.2 billion kilowatts are the installed capacity of large and medium-sized hydropower, small hydropower, and pumped storage in China by the end of 2015.

The new installed capacity of wind power is unbalanced across regions, with the three northern regions accounting for 4/5 of the national total, with 104 million kW of new capacity, and North and Central China and the South together accounting for 1/5 of the total, the difference between these two regions is not still significant, with the former adding 14 million kW of new installed capacity and the latter 11 million kW. By the end of 2015, China's installed capacity of solar generators reached 3% of the country's total motor capacity, at 43.18 million kilowatts, leading the global solar sector. Similar to the case of wind power, the development of solar energy has seen an imbalance across regions, with the western region having an installed share of more than 2/3, and the eastern and central regions together accounting for less than 1/3.

According to the analysis, China's energy consumption structure has not changed significantly since 2001. Petrochemical energy, especially coal consumption, has been dominant in primary energy consumption, accounting for more than 90% and 60% of the total, respectively.

For the new energy sector, this is seen as providing a boon. A comprehensive look at China's stock market sector also illustrates this point, with Chinese green energy stocks soaring in price and more idle capital pouring into the new energy as well as environmental sectors. At the same time, China is poised to surpass Europe as the world's largest alternative energy growth market. In this context, the new energy industry should seize this opportunity to actively develop wind power and solar energy to increase the proportion of new energy.

According to estimates, the annual radiation to the earth's solar energy is 1.78 billion kilowatts, of which 50 to 100 billion degrees can be developed and used. But because of its distribution is very scattered, can use very little. Geothermal energy resources refer to the total heat content of rocks and water bodies within a depth of 5,000 meters below the land. Among them, the

high-temperature geothermal energy resources within 3 km depth of the global land part and above 150℃ is 1.4 million tons of standard coal, and some countries have started commercial development and utilization.

The world's wind energy potential of about 350 billion kilowatts, since the wind is intermittently scattered, it is difficult to use economically, future transmission and storage technology such as a major improvement, wind energy use will increase. Ocean energy, including tidal energy, wave energy, seawater temperature difference energy, etc., theoretical reserves are very considerable. Limited by the level of technology, is still in the small-scale research stage. At present, because the utilization of new energy technology is not yet mature, it only accounts for a very small part of the world's total energy needs, and there is a great deal of future

development before the coating

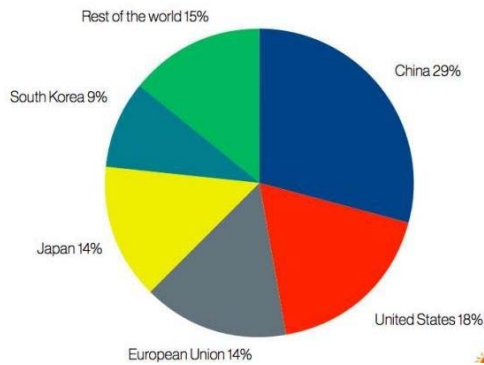


Figure 3. Cumulative share of renewable energy patents end 2016

source: 2022, website¹ Figure 3 shows that the number of new energy patents in China accounts for 29% of the world, and China's patents account for a larger part of the market. Take the new energy vehicle industry as an example. Azera ranks 7th with 1,103 patents, and its Shanghai Azera is in 11th place with 574 patents. Founded in 2014, the new carmaker sold 43,728 units of its three models on sale (ES8, ES6, EC6) last year, up 112.63% year on year. On April 30, 2021, cumulative deliveries exceeded the 100,000 mark, reaching 102,803 units.

Both in terms of sales and patents, Azera is in the first echelon of new car manufacturing forces. Its patents cover the full range of vehicle manufacturing and design, triboelectric (battery, motor, electric control) technology, power exchange and charging technology, autonomous driving technology, digital cockpit technology, and connected vehicle technology.

Results and Proposed Policies:

China's new energy resources are abundant and generally have renewable characteristics for sustainable use; for example, the wind energy resources on land are estimated to be 253GW, while only 0.57GW was exploited as of 2003, and it is expected to reach 4GW by 2010 and 20GW by 2020.

New energy sources have some common advantages, such as environmental protection, reducing greenhouse gas emissions, and carbon neutrality. Moreover, new energy can improve public health. Emissions from fossil energy sources such as coal and natural gas plants and water pollution from chemical plant effluents cause a range of human illnesses such as respiratory problems, neurological damage, heart attacks, and other serious problems. This pollution affects everyone. A Harvard University study estimated the life-cycle costs and public health impacts of coal to be about \$74.6 billion per year. That's the equivalent of 4.36 cents per kilowatt hour of electricity produced - about one-third of the average price of electricity for a typical U.S. household. (<https://www.ucsusa.org/resources/benefits-renewable-energy-use>)

Take hydro and nuclear energy, for example hydroelectricity can protect the environment. And it has a low cost of power generation and strong peak regulation capacity, while Nuclear power has the following advantages: it can generate large amounts of electricity. It has the disadvantage of hydroelectric power.

However, new energy has some disadvantages, such as risk in storage, huge initial cost, and unaffordable investment upfront. to specific, hydro power requires high pre-construction costs and long time. The annual supply of

hydroelectric power is not stable. In addition to this, the annual supply of hydroelectric power is unstable, while nuclear energy requires high construction costs in the early stage and has high technical requirements. Once a big failure (such as nuclear leakage) occurs, it will be a devastating disaster.

Based on the above analysis of risks and benefits, we aim to propose some optimal pathways and make some trade-offs to balance the risks and benefits.

In order to minimize the risks, advancing technology in manufacturing, production, transportation, and storage is very necessary

In addition to this, China also needs to overcome the difficulties of high cost-related barriers To address this issue, we offer the following two recommendations

One is to expand financial investment in new energy technologies in China.

The second is that the government should provide subsidies to companies that are committed to new energy technology advances, which can help accelerate the development of new energy industries. State incentives such as exemption from purchase tax, subsidies, charging facilities to enjoy support tariffs, and the improved performance and cost of new energy vehicles, but we can see that without subsidies, it may not sell as many cars, and it also involves government promotion, looking at the current performance of the sales market, mainly buses and cabs; and the rental market, which may involve them Their own production of cars, bought by their own leasing companies, received state subsidies and then go to rent to users. It should be said that subsidies are a big driving force.

The third is to speed up the technological upgrading of new energy electric vehicle batteries. One of the bigger factors that people are reluctant to use new energy vehicles is the problem of batteries. The charging time of pure electric vehicles is long. 6-10h is needed to complete one charge, although there is fast charging equipment, using high current charging, which generally takes 10-20 minutes to charge to about 70% of the power, but the fast charging is detrimental to the service life of the battery. Secondly, the battery life is short. At present, the battery technology needs to be innovated, and the life of the power battery is short, and it has to be replaced in a few years.

4. Conclusion

Generally speaking, new energy is the future trend in energy development. Although new energy technologies are not yet mature, for example, there are not enough sites for wind power generation, the potential risks of nuclear energy remain high and there is currently not sufficient awareness of the need for new energy use. Also recently the US has released a large amount of funding for new energy projects, which may have an impact with the sales of new energy products exported domestically. However, the prospects for the development of the new energy sector are good. For the development of new energy, the government needs to provide certain subsidies for new energy companies and consumers of new energy products, and improve some policies for environmental protection. The government can use this financial support to make people aware of the need for new energy.

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