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A New Framework for Fujian's "Double Carbon" Strategy Based on Digital Finance Theory

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Abstract So far, there is no realistic and feasible path way to achieve the "double carbon" strategy of carbon peaking and carbon neutralization in Fujian, although everyone is focusing on tapping the potential of traditional energy such as hydropower and thermal power generation models, developing and utilizing new energy such as wind energy, solar energy, nuclear energy and other renewable energy utilization models, and reforming and improving the green environment. However, the existing energy utilization model and environmental improvement model still have a big gap to achieve the "double carbon" strategy on schedule. By establishing digital finance theory, from the perspective of financial inclusiveness characteristics of digital finance to solving the thorny problem of "financing constraints" in traditional finance, this paper aims to fully utilize small and medium-sized wind energy with huge amount and wide distribution on the surface, break through the shortcomings of existing wind energy utilization models, accelerate the process of technological innovation, and gradually step on the road to achieving the "double carbon" strategic goal of Fujian in the foreseeable future decades along a feasible way, forming a new framework for the strategy. That is, the new path guidance diagram is implemented. Digital finance theory refers to the theory that studies the dynamic relationship between the closed-loop or multi link jump movement of digital finance and the projection radiation of financial activities. Digital finance theory, almost a non-dissipative system, is a new stage in the development of traditional financial theory, which is a new financial theory based on digital technology, big data, blockchain and many other cutting-edge technologies today.

Keywords Finance, Digital Finance/Financial Theory, Utilization of Small and Medium-Sized Wind Energy, Technological Innovation, Magnetic Energy

1. Introduction and Literature Review

1.1. Introduction

On September 22, 2020, the Chinese government proposed at the 75th United Nations General Assembly that: China will enhance its national independent contributions, adopt more effective policies and measures, strive to reach the peak of carbon dioxide emissions by 2030, and strive to achieve carbon neutrality by 2060. That is, China's "double carbon" strategy. On March 5, 2021, the government work report of the State Council in 2021 pointed out that we should do a solid job in carbon peaking and carbon neutralization, formulate an action plan for carbon emissions peaking by 2030, and optimize the industrial structure and energy structure. As one of the provinces with rapid economic development in China[1], Fujian's GDP has exceeded 4 trillion yuan (Renminbi) in 2019, its total energy consumption is 137.183 million tons of standard coal, and its total carbon emissions are 256 million tons of carbon dioxide. According to the "Fourteenth Five Year" National Economic Planning

1 In 2021, the GDP of Fujian reached 4.88 trillion yuan, increasing 500 times in the past 40 years, which has exceeded 90% of the world's countries. https://www.sohu.com/a/518425776_100199564

Outline of Fujian Province, and based on the existing energy structure and energy consumption mode, by 2030, the total energy consumption will reach 200 million tons of standard coal, and the carbon dioxide emissions will exceed 500 million tons. The task of carbon emission reduction will be very arduous. In order to achieve the goal of carbon emission reduction[2], it is a measure to vigorously promote the capacity building of marine carbon sink and forestry carbon sink. However, the annual carbon sink capacity of 10 million tons cannot meet the provincial carbon dioxide emission demand of 100 million tons.

According to the current and even expected future, the energy consumption structure of Fujian is still mainly determined by thermal power generation, hydropower generation, wind power generation, nuclear power generation and solar power generation. In this energy consumption structure, thermal power generation is still the leading role in carbon emissions! According to the energy consumption structure of Fujian in 2020, the scale of thermal power generation accounts for about 61% of the total power generation, with an annual scale of 156.1 billion kWh, while the annual scale of wind power generation is only 11.15 billion kWh. According to the proportion of energy in December 2019, January-February 2020, and March-December 2020, the proportion of thermal power generation per month ranges from 0.55 to 0.68, while the proportion of wind power generation per month ranges from 0.02 to 0.08[3].

In 2020, it is reasonably estimated that the carbon dioxide emitted by thermal power plants throughout the year has reached 135 million tons. In the next ten years, in order to reduce the scale of thermal power generation, the potential of hydropower, nuclear power and solar power generation is extremely limited. The only thing available is wind power generation, that is, improving the capacity of wind power generation can fill some of the gaps in thermal power generation.

Under the condition that the existing economic development scale remains unchanged, if the thermal power generation scale is reduced to half of the existing thermal power generation scale, that is, about 80 billion kWh, there will be a vacancy of about 70 billion kWh. How can we make up for such a large power gap? Our answer is to continue to promote wind power generation.

In 2020, the annual contribution rate of wind power generation will be about 5% on average, which is not a small difference from 70 billion kWh. The coastal cities of Fujian often see large wind turbines working, namely megawatt wind power units. For example, there are many megawatt wind farms on the coast of Pingtan Comprehensive Experimental Area. Generally speaking, the rated wind speed of 1.5MW wind power generation is about 11m per second, that is, about force six wind. As far as the distribution map of wind energy in Fujian is concerned, the places that need to reach the sixth wind level or more are mainly concentrated in the coastal areas of coastal cities and counties, such as Ningde City, Fuzhou City, Putian City, Quanzhou City, Xiamen City and Zhangzhou City, plus a small number of mountainous cities and counties, such as Nanping City, Sanming City and Longyan City. In most cases, Fujian has 2-5 wind power, which means that due to the structure limitation of traditional wind turbines, it is almost difficult to make full use of this wind power. However, this part of wind energy is extremely huge.

According to the current development mode of wind power generation, the use of all these high-quality wind farms is difficult to make up for the gap caused by the large reduction of thermal power generation scale. One of the most important reasons is the inhibition of the energy storage capacity of wind power generation and the significant limitation of the technical and economic costs of wind power transmission on the HV or UHV transmission network. This part is just the disadvantage or deficiency of the traditional wind power generation. Our paper is an attempt to propose efficient ways to make up for these shortcomings, and efficiently use the wind energy of the whole province. Whether it is a good wind farm in the coastal area or a sub high-quality wind farm in the inland far away from the coastal area, it will be fully utilized to give play to the advantages of green energy.

To achieve the medium and long-term social and economic development strategic goals of carbon peaking in 2030 and carbon neutralization in 2060, it is a realistic and feasible path to make full use of wind energy through technological innovation. Its scientific significance is significant, and its application prospect is also very broad, which is consistent with the sustainable development strategic goal of mankind.

1.2. Literature Review

The Fourteenth Five Year Plan and the Vision Development Goals for the year 2035 put forward by the state further highlight the weight of scientific and technological innovation, especially the innovation of energy technology! The organic combination of wind energy and magnetic energy is an important breakthrough in the current world of energy technology innovation, and also one of the important paths to breaking through the "bottleneck" of traditional energy technology innovation. The utilization effect of new energy based on this new energy technology innovation will be greatly improved, which effectively makes up for the limitations of traditional energy utilization, helps promote the rapid development of green society, and accelerates the medium and long-term development strategic of goals of carbon peaking and carbon neutralization in Fujian and even China.

Wind power generation is one of the important pillars of

2 Fujian Province is expected to have a peak carbon emission scale of 329 million tons in 2030

3 Sources: National Bureau of Statistics, China Economic Industry Research Institute

the development of new energy in the world today [1]. In China, the proportion of wind power generation in the utilization of new energy is about 21.18%, the proportion of power sources in the whole country is about 2%, and the power supply from new energy accounts for about 9.3% in the national power supply distribution map. There is no doubt that its development prospects and space are huge, and it has achieved rapid development in 2020 [2], Targeted policies issued by the state are conducive to the full and effective utilization of wind energy [3].

How to improve the utilization ratio of wind energy is a hot issue in the world today. It is also a difficult problem in technology, such as the construction of smart grid [4,5,6], and even a practical problem that needs to be broken through in theory, such as the market problem [7].

Large wind turbines are generally distributed in the regions with the highest wind energy density in China, such as remote areas such as Inner Mongolia, Gansu, Xinjiang and Northeast China. But one of the biggest problems is that if the electric energy produced in regions with abundant wind energy is to be transmitted to regions with large power consumption in China, such as the southeast coast and even the central region, it needs to build ultra-high voltage transmission lines or super large energy storage equipment, which is still the "bottleneck" of the technology or economy that plagues the world's energy storage or transmission today [8,9,10,11]. It is the existence of these "bottlenecks" that causes a large number of local wind power generation to be wasted. In addition to the waste of wind energy that has already been generated, the damage to the environment caused by large wind turbines has become increasingly prominent, such as the disappearance of biological populations and the physical and mental health of surrounding residents.

The International Energy Agency (IEA) pointed out in the World Energy Expo 2006 that: the current energy consumption mode of mankind is unsustainable. In the long run, in the next 20 years, the energy supply system that meets the needs of world economic development will be very fragile, facing the challenges of insufficient investment, environmental disasters and supply interruption. The development of new energy is intrinsically linked with the issue of sustainable development, which is the proper meaning of promoting sustainable development. The development and utilization of new energy also has a positive significance in promoting poverty alleviation and employment [12]. According to IEA prediction, new energy will account for 20% - 40% of the global primary energy consumption in 2040. In 2018, China's energy consumption accounted for 59%, crude oil consumption accounted for 18%, natural gas consumption accounted for 8%, and new energy consumption accounted for 14.1%. From a strategic and long-term perspective, China needs to plan to accelerate the realization of the "production revolution" of conventional or unconventional oil and gas, the "clean revolution" of coal development and the "speed revolution" of new energy development, and strive to achieve the transformation of the energy structure from "one big three small" to "three pillars" around 2050. By then, coal will account for about 40% of primary energy consumption, oil and gas for 30%, and new energy for 30% [13].

New energy is the most important source of social energy today and even in the future. New energy, such as solar energy, wind energy, biomass energy, geothermal energy, ocean energy, hydrogen energy, natural gas hydrate, nuclear energy, nuclear fusion energy, etc., is an important means to control the global "greenhouse effect". The Paris Agreement in 2015 set the goal of controlling the temperature rise at 2℃ degrees, which means that the total global greenhouse gas emissions must be reduced by about 50% by 2050, and the world must achieve zero carbon emissions in the second half of the 21st century [14].

However, new energy technology is the "bottleneck" that restricts the full use of new energy. The development of new energy is a new technological reform, which must be based on technological innovation. From the current situation, China is leading in the development of new energy industry, but its innovation ability is obviously insufficient [15]. Looking at the global distribution map of new energy development, wind power generation is one of the most important means of using new energy. For example, China in Asia, Europe, and America are using wind energy in full swing. So far, the United States ranks first in the world in wind energy utilization, while China ranks second. The top ten countries are mainly European countries such as Germany, France, Italy, Britain, Denmark, North America such as Canada, and Asia such as India. It shows that wind power generation will play an increasingly important role in the development of new energy today and in the future, which is an indisputable development trend of new energy in the world.

In wind power generation, the aerodynamic torque is proportional to the wind shear. The greater the wind shear, the greater the aerodynamic torque, the greater the torque of the wind turbine, and the greater the speed acceleration [16]. When the wind speed is greater than some input wind speed, the wind turbine starts to output active power, and its output of active power increases with the increase of wind speed, until the wind speed is greater than the cut out wind speed, the output power suddenly drops to zero. The higher the rated power of the wind turbine, the greater its cut in wind speed, and vice versa. However, the penetration rate of grid connected wind power generation in the power grid is increasing, and its inherent volatility and uncertainty bring new challenges to the dispatching operation of the power grid, which is also one of the important reasons for the instability of the power grid. At the same time of the development of new energy, there are still some problems in some regions, such as the scale of new energy installed units exceeding the carrying capacity of the power grid, which affect the healthy development of new energy in China [17]. This is one of the defects or shortcomings of wind energy utilization so far. This defect or weakness is

caused by the rigidity of the current wind turbine mode using wind energy.

With the development and utilization of megawatt wind turbine, the stability of the mechanical structure of the current wind turbine becomes more and more fragile. Under the complex dynamic motion, the mechanical structure with cracks at the edge of fatigue hot mechanical fatigue extrusion affects the structural dynamic stability of the machine [18].

Due to the contradiction between material structure and mechanical movement, with the development of large wind turbines becoming more and more prominent, people are forced to find more promising alternatives. Developed on the basis of existing mature technologies, the scheme proposed in our paper is one of the most excellent alternatives that are technically and economically feasible.

The starting point of this alternative is to find magnetic materials and optimize the mechanical structure design.

After magnetic materials are magnetized, their magnetic domains all point in the same direction and are magnetic, showing S and N poles. Sensibly magnetic materials have an inflection point for temperature, that is, when the temperature exceeds the inflection point, the magnetic strength decreases sharply, even degaussing. In addition, the arrangement direction of magnetic domains of highly magnetic permanent magnetic materials will be disordered when they are impacted, which will lead to magnetic loss. At present, the rare earth permanent magnet of rubidium iron boron material, namely rubidium iron boron magnet, has relatively strong magnetic force and significant magnetic advantages, except that it is relatively sensitive to temperature. When the magnetic drive motion is sinusoidal, Wang and Mann [19] studied the dynamics of a non-contact magnetic transmission system that transforms translation motion into rotation. Theoretical and practical studies revealed that various interesting behaviors, such as harmonic, non harmonic and chaotic behaviors, magnetic drive is a resonant motion formed by vibration, and passive drive magnets are fixed on a rotating axis with a certain mass, thus obtaining magnetic torque. However, the influence of magnetic leakage has not been measured here. This idea is mainly derived from the study of mechanical motion mode. As a result, magnetic torque is often overestimated, which will greatly reduce the application effectiveness. We have confirmed this in actual tests. In fact, the non-uniform rotation of the disc is due to the time-varying angular velocity [20]. This provides a research and development idea to make up for the shortage of magnetic torque.

How to make full use of the magnetic force of permanent magnetic materials is to solve the transformation from the traditional wind power generation model driven by wind energy to the wind power generation model with wind energy as the auxiliary force and magnetic energy as the main power.

Therefore, in order to obtain the strong magnetic energy that can replace wind energy in high-power wind power generation, it is necessary to find a breakthrough in scientific methods in the design of mechanical structure dynamics. Proper structure design can form a strong magnetic force. For example, placing a suitable super annular field coil structure in the Alberts Tokamak device can generate a strong magnetic confinement field [21]. In addition, the strength of permanent magnetic force is changed by adjusting the gap distance, so as to achieve the effect of controllable magnetic force [22]. The external magnetic field regulates the permeability of ferromagnetic materials, thus regulating the size of the abnormal spin of its surface wave, because its surface wave is spin-abnormal and spin-orbit locked [23]. In this way, the controllable utilization of magnetic energy can be realized in theory.

Under the existing conditions, only the effective utilization of small and medium-sized wind energy with extensive adaptability is the most realistic and possible gold key to solve the problem.

A key problem faced by the utilization of small and medium-sized wind energy is the financing dilemma, or serious financing constraints. The traditional financial theory has been unable to effectively solve this thorny problem for a long time. However, digital finance is not. The development of digital finance can effectively alleviate the financing difficulties of enterprises [24], thereby significantly releasing the financing constraints [25], making financing for enterprises from difficult to easy, so that enterprises can get enough funds to accelerate technological innovation [26,27], solve the financing difficulties of small and medium-sized wind energy utilization, promote the full and effective utilization of small and medium-sized wind energy, and achieve the "double carbon" development strategic goal [28].

1.3. Summary of this Section and Subsequent Arrangements

In the 40 year process of striving to achieve peak carbon neutrality from 2020 to 2060, the proportion of fossil energy and non fossil energy will change from the current "8 : 2" (the "14th Five Year Plan") to "2 : 8" (the "21st Five Year Plan").

As far as the current work in the province is concerned, the expansion potential of nuclear energy, hydropower, solar energy and carbon sink capacity is very limited. According to our rough research, wind energy is the most potential and practical resource to increase the proportion of new energy. Unfortunately, there are too many megawatt wind turbines installed, which causes the problem that wind energy accounts for only 5% of the total energy; on the other hand, a large amount of wind energy is abandoned and cannot be fully and effectively used. Our job is to make full use of this abandoned wind energy to form a carbon peaking and carbon neutralization optimization path based on real science and technology.

The remaining part is arranged as follows: Section 2 defects of existing wind energy utilization models, Section

3 conception of enhancing wind energy utilization models based on digital finance theory, Section 4 results and discussion, and Section 5 conclusion summary

2. Defects of Existing Wind Energy Utilization Mode

The full use of wind energy is the first realistic means to achieve carbon peaking and carbon neutralization in the world today. At present, the wind power generation station adopts the manufacturing and installation of high-power and even super high-power generators to realize the efficient utilization of wind energy. The theoretical basis is that in the traditional wind power generation structure, only by increasing the wind blade radius can we obtain more green energy output. To this end, large wind turbines need to be installed in areas with abundant wind energy, and support measures need to be built, such as the construction of power transmission network and energy storage equipment. Throughout the world, countries or regions that can meet the requirements of building large wind farms and have economic strength to support their effective operation are still very limited.

The mode of wind power generation advocated by all parts of the world today is to build large wind farms, which look magnificent and spectacular on the surface. The defects of this centralized academic thought are the waste of resources, the sharp increase of costs, and even the unfriendly and uneconomical environment. What this paper advocates is decentralized independent energy increasing power generation units, which can make full and effective use of energy and have a wide range of environmental adaptability. Its academic thought is actively leading and positively guiding, which is a beneficial supplement to existing new energy research and practice, and has remarkable scientific and progressiveness nature.

The traditional wind power generation mode has significant weaknesses in the use of wind resources in various regions, that is, the high construction and maintenance costs of establishing wind power plants in areas with high-quality wind energy, coupled with the waste of resources, are very serious; In areas where wind energy resources are relatively scarce, their wind energy resources cannot be effectively used and left to die. This is why, so far, the proportion of wind energy in the overall energy consumption structure is obviously low. The current wind energy consumption in Fujian Province accounts for about 5% of the energy consumption in the same period, although it is far higher than the national average of about 2%.

What this paper discusses is that it has a wide range of environmental adaptability, low construction and maintenance costs, and has significant environmental friendliness. Whether it is Level I wind energy zone, Level II wind energy zone, Level III wind energy zone, or Level IV wind energy zone, its wind energy can be fully and effectively used. In addition to demanding environmental requirements (Level I first, Level II second), traditional wind power generation also has high construction and maintenance costs, is not friendly to the environment, and its power generation efficiency tends to lead to "power abandonment" and insufficient utilization of wind energy.

In accordance with the requirements of the Notice of the National Energy Administration on Matters Related to the Construction of Wind Power and Photovoltaic Power Generation Projects in 2020 (Guo Neng Fa Xin Neng [2020] No. 17) and the relevant deployment of the State Grid Corporation of China, in order to promote the coordinated development of clean energy, new energy and the power grid in Fujian Province, the State Grid Fujian Electric Power Co., Ltd. organized the preparation of the Analysis Report on the Consumption of New Energy in Fujian Province from 2020 to 2022, and proposed that it would mainly develop offshore wind power projects from 2020 to 2022, In combination with Fujian onshore wind power projects, according to the "13th Five Year Plan" and "14th Five Year Plan" issued by Fujian Provincial Government, the total installed capacity should reach more than 5 million kilowatts, and be equipped with the construction of high-voltage or ultra-high voltage power transmission network supporting projects. Most of these wind power plants are located in the eastern coastal area of Fujian Province, including onshore wind power and offshore wind power, and most of their units are MW level. For the relatively inland areas far away from the coast, these large-scale wind power projects are very rare. Although the wind resources in these areas are inferior to those in the coastal areas, the scale of wind energy is still very considerable, and the average annual wind power in these areas is mostly 2 wind or above. Why do we mainly choose large-scale wind turbines to form wind farms? This is directly related to the theory on which traditional wind power generation is based.

According to the fundamental theory of wind power generation, the rated power of the wind turbine is proportional to the swept area of the impeller and the third power of the wind speed. The swept area of the impeller is proportional to the square of the radius of the impeller. According to the formula of rated power of wind turbine generator, in order to obtain greater power output of wind power generation under a certain wind farm, as the wind speed is restricted by the wind farm environment, the possibility of increasing the wind speed is very small, except that it is possible to build a suitable artificial wind tunnel for non-human purposes. Here, the only variable factor is the blade radius of the generator. In other words, in order to achieve higher power output of wind power generation, theoretically, the only way is to extend the wind blade radius. This is the main reason why the single wind turbine generator is becoming larger and larger. However, the extension of the blade radius is strictly restricted by the material characteristics. Due to the

limitation of material properties, it is impossible to create the desired single machine size at will, and it can only be built within a certain range. In this way, it is difficult to break through the upper limit of power output of a single wind turbine. Only by establishing a wind farm formed by a wind turbine array can we achieve the scale effect of wind power generation. However, according to the current research, the drawbacks of wind farms with a certain scale cannot be avoided, that is, serious "power abandonment", unstable online output, high energy storage requirements, huge operating costs, and serious environmental pollution, especially low noise pollution.

In order to avoid the disadvantages of large wind farms and make full use of the effective wind resources in the province, only technological innovation is the right way. The path of technological innovation is to improve the torque of the generator without increasing the blade radius of the wind turbine, so as to achieve higher power output. The middle link is the rational application of energy increasing dynamic technology.

The working mode of traditional wind turbines is mainly applicable to the land and sea in coastal areas with excellent wind energy resources. Ningde, Fuzhou, Putian, Quanzhou, Xiamen and Zhangzhou are all located along the coast of Fujian. Theoretically, due to the technical "bottleneck", one quarter of the land area, namely 31000 square kilometers, is available, one quarter of the ocean area, namely 34000 square kilometers, and three quarters of the land area, namely 93000 square kilometers, and three quarters of the ocean area, namely 103000 square kilometers, cannot be effectively used. In particular, the land covering an area of 93000 square kilometers has huge potential for wind resources. From the perspective of wind power generation, it is basically in a "barren" state, which is a waste of huge wealth. Besides, the coastal areas with excellent land wind energy resources are densely populated areas in the province. In reality, many places have been planned and utilized, leaving few places for building large wind farms. At present, Fujian Province is planning to expand its wind farms to the sea. The difficulties faced by offshore wind power generation are very huge, for example, the challenges faced by the research and development of materials that meet the marine environment are very large, as well as the development of energy storage batteries, the construction and improvement of high-voltage or ultra-high voltage power grids, and various problems caused by the disturbance of the marine climate due to the wind field, including natural disasters, all of which are scientific and technological challenges.

The best wind power generation mode is a decentralized independent wind power generation unit with a power of no more than 10000 watts, which can basically meet the daily electricity consumption of residents, rural electricity and small factories. Take the 5000 watt wind power generation project for example. The radius of the wind wheel is 2.5 meters, the starting wind speed is 3 m/s, and the rated wind speed is 10 m/s, that is, the wind can be used in the environment of level 2 to 5 wind. In household use, it can basically meet the power supply of household electrical appliances, such as TV, daily lighting, electric fans, washing machines, refrigerators, water pumps, air conditioners and other household electrical appliances. Although the 5000 watt wind turbine can be installed and used for the provincial environment, it can also be vigorously promoted in theory. However, throughout the province, there are few widely used scenes of the application of such small or micro wind turbines wherever they are. Why is this? This is caused by the structural problems of traditional wind turbines. Throughout the world, the structure of wind turbine is involved in the utilization of passive wind energy, which is also the limitation of traditional wind power generation theory.

If an energy increasing structure is added to the traditional wind power generation structure, the wind turbine with a diameter of about 1.5 meters can achieve the output of 5000 watts of wind power. In this way, the new wind energy utilization mode can be widely used, and the province's wind energy can be fully used, so that the vast number of household users, small enterprises, etc. can choose this new type of wind turbine to realize the full and effective use of wind energy, greatly reduce the consumption of thermal power generation, thereby inhibiting the scale of thermal power generation, and playing an early role in the realization of carbon peaking and carbon neutralization throughout the province.

3. Conception of Enhancing Wind Energy Utilization Mode Based on Digital Finance Theory

At present, the realization path of carbon peaking and carbon neutralization mainly adopts hydropower, nuclear power, wind power, solar power, geothermal power, forest carbon sink, marine carbon sink, carbon trading market and other means. However, according to the energy demand of the medium and long term development plan of Fujian Province, there is still a huge gap to achieve the strategic goals of carbon peaking and carbon neutral development of Fujian Province on schedule under the limitations of existing technology. According to the previous analysis, the effective utilization of wind energy is the most effective practical way to achieve the "double carbon" strategy, and only the appropriate innovation of the existing wind energy utilization mode can be done.

Compared with the traditional wind energy utilization technology, the new wind energy utilization technology is an innovation of the original technology, and its biggest "weakness" is that it is difficult to break through the financing dilemma. It is difficult for the traditional financial model to provide new technical financing support for wind energy utilization, because it will experience the financing risk of technological innovation. According to our research findings, the mainstream of wind power

utilization around the world today is the installation of large-scale wind farms consisting of megawatt wind turbine units. The financing channels and scale of such new energy projects are basically guaranteed, but their drawbacks are also obvious. As for the full utilization of environmentally friendly and widely distributed small and medium-sized wind energy, the biggest problem is the difficulty of financing, that is, the lack of sufficient attention and financial support from traditional financial institutions, which inhibits the full utilization of small and medium-sized wind energy on a large scale. The availability, decentralization, security, efficiency, and repeatability of digital finance have filled the gap in traditional finance and met the financing needs of small and medium-sized wind power utilization. In fact, the recently developed digital finance is inherently financial inclusive, which effectively breaks through the dilemma and financing inhibition of traditional finance on new technology innovation financing [25,26,29,30] to obtain financial support.

3.1. Digital Finance Theory

The current research on digital finance is mainly reflected at the level of information diffusion, which is due to the digital expansion process caused by the progress of digital technology. Many current researches on digital finance mainly combine traditional financial activities with the latest digital technologies, such as Internet technology, blockchain technology, big data technology, etc. to form digital technology applications in the financial field, which are mainly reflected at the technical level. The theoretical basis is traditional financial theory [27,31,32]. In fact, the theory of digital finance is not a simple digital technology plus traditional financial theory, but a new financial system with self consistent or semi self consistent characteristics. It is a new stage of the development of traditional financial theory, with distinctive characteristics of the times.

Digital finance theory can be divided into the narrow digital finance theory and generalized digital finance theory.

The narrow digital finance theory studies the dynamic relationship between the closed-loop jump movement of digital finance and the projection radiation of financial activities. The generalized digital finance theory refers to the theory that studies the dynamic relationship between the single or multi link linkage jump movement of digital finance and the projection radiation of financial activities. Digital finance theory overcomes the defects of traditional financial theory, that is, the financial crisis risk contained in the existing traditional financial theory is automatically avoided under the framework of digital finance theory, because the cornerstone of digital finance theory is the issuance and widespread use of legal digital currency [33].

An important application of digital finance theory is to provide financing support for new technology R&D adaptively, and this financing support is sustainable.

However, digital finance is a new financial development direction emerging with the progress, promotion, and popularization of digital technology at the beginning of this century. The development of its concepts and theories is not yet mature, and it has been in the dynamic evolution process of keeping pace with the times. Therefore, it seems premature to provide a systematic and clear description of digital finance from concept to theory. These parts are bound to be the hot academic frontier issues that the academic community continues to pay attention to.

3.2. Composite Power Drive Technology

The traditional wind power generation technology is a set of mature single wind driven passive power generation technology. The current development trend is to manufacture megawatt wind power generator units to form a wind power farm of a certain scale, and then transmit power to users through grid connection. Its financing channels are smooth, and there is basically no financing obstacle. These large-scale wind farms are often constructed by large companies with government background. The biggest "bottleneck" of their operation is the technical "bottleneck", not the financial problem. However, the previous analysis has already known that the disadvantages of such large-scale wind farms are not only reflected at the technical level, but also at the financial level. However, the biggest "bottleneck" of small and medium-sized wind energy development is the financing barrier, not the technical "bottleneck" on which it is based. In fact, the traditional small and medium-sized wind energy utilization technology is consistent with the large-scale wind energy utilization technology, and there is no essential difference in the technical route of wind catching. In terms of technology, the main reason for the insufficient financing capacity of small and medium-sized wind energy is its low output capacity, which leads to the lack of investment interest in such projects by investors seeking to maximize profits, including venture investors, ordinary shareholders and market participants. Large wind farms will bring investors the temptation to expect rich profit returns, thus driving investors' investment impulses, thereby reducing the difficulty of financing such projects. This is the connection and difference between the two.

The traditional small and medium-sized wind energy utilization lacks the glamour of high profit expectation to attract funds, which leads to the dilemma of wind energy utilization today: a large amount of widely distributed level-2 to level-5 wind energy is not fully utilized, and the strange phenomenon of "abandoning wind and electricity" is widespread in large wind power plants.

How to avoid this waste of wind energy? The answer is to develop a hybrid power drive technology based on wind energy drive, namely, magnetic iteration technology, wind power generation drive technology. The core of hybrid power drive technology is to combine wind energy and

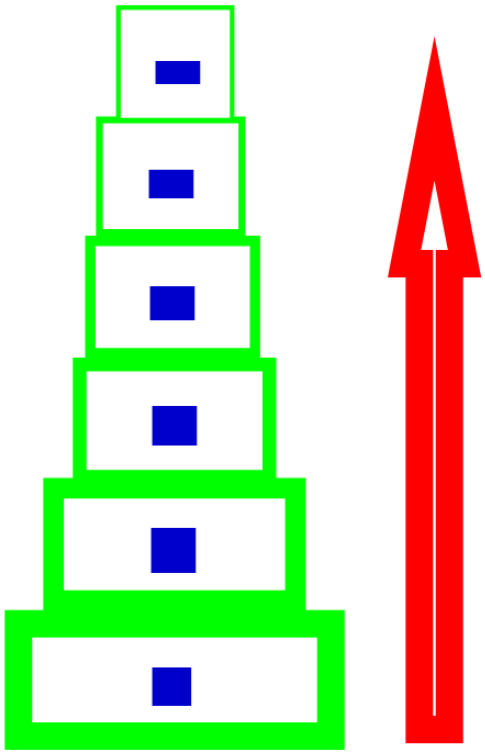
magnetic energy[4] to form a powerful composite energy, so as to obtain a hybrid power driven generator that combines wind energy and magnetic energy for power generation. In this way, the passive situation of the traditional wind power generation mode has been changed, and a new active mode of wind power generation with active use of wind energy has been formed.

Traditional finance cannot provide sufficient financial support for the research and development of hybrid power drive technology. However, digital finance is not. It is actually the best way to break through its "financing obstacles".

3.3. Fujian's "Double Carbon" Strategy Path Design

The idea of the "double carbon" strategy design is to highlight the full and effective use of small and medium-sized wind energy, so as to replace the efficiency of thermal power generation, and reduce the proportion of thermal power generation in the entire energy consumption structure to 30% or less. At present, the proportion of thermal power generation in the energy consumption structure of Fujian Province is about 60%. According to the traditional wind power generation mode, the share of thermal power generation is reduced, and wind energy cannot make up for its vacancy, because of the "bottleneck" of traditional wind energy utilization technology. However, with the support of hybrid power drive technology, the provincial onshore wind energy resources of level 2 to 5 will be fully and effectively utilized, and this part of clean energy will be sufficient to fill the energy gap caused by the reduction of the share of thermal power generation, form a sustainable energy supply mode of green and environmental protection, and then realize the "dual carbon" strategy of Fujian Province as soon as possible. To this end, the "dual carbon" strategy implementation path map can be described as follows.

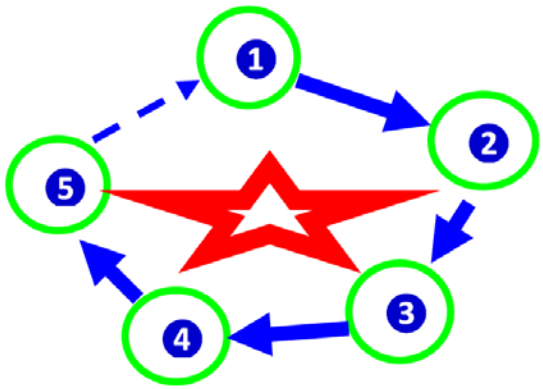
Figure 1 shows that digital finance theory is the basic theoretical foundation for Fujian's "double carbon" strategy. Through the above road map, the following more specific action plans can be obtained. The hybrid power drive technology has a wide range of environmental adaptability and significant environmental friendliness. Whether it is a Level I wind energy zone, a Level II wind energy zone, a Level III wind energy zone or a Level IV wind energy zone, its wind energy can be fully and effectively utilized, which can accelerate the realization of the "double carbon" development strategy goal. In addition to the more stringent environmental requirements of traditional wind power generation (priority is given to Level I, followed by Level II), its construction and maintenance costs are also very high, and it is also not very friendly to the environment. Its power generation efficiency is prone to lead to "power abandonment" and insufficient utilization of wind energy, which is detrimental to the realization of the "double carbon" development strategy. Therefore, compared with the traditional financial theory and wind energy utilization technology, the digital financial theory catalyzed hybrid power driven technology can be summarized into the following simple five pointed star action plan.



Establishment and improvement of a new financial service system based on the theoretical framework of digital finance. New financial services provide sufficient financial support for research and development of hybrid power driven technology. Establishment and popularization of new small and medium wind energy utilization mode based on hybrid power drive technology. Replace thermal power generation with green energy, and continuously reduce the share of thermal power generation. Achieve the "double carbon" goal of the province by substantially improving green energy. The establishment and continuous improvement of the provincial sustainable development system with green energy as the main driving force

Figure 1. Six layer pyramid "double carbon" strategy implementation framework

4The technology front end is derived from Magnetically Augmented Rotational System, US Patent#: US6356000 B1 (Tien-see Chow et al)and Wind power generation device driven by magnetic power, Patent#: ZL 201210395735.X (Tien-see Chow and Sheng Wang)



1 Development of digital finance 2 Break through financing constraints 3 Improve the level of enterprise innovation 4 Promote the full and effective utilization of small and medium-sized wind energy 5 Achieve the strategic goal of "double carbon" development. The dotted line indicates starting a new cycle at a higher level.

Figure 2. Five-point Star Action Plan

4. Results and Discussion

4.1. The Path of Fujian's "Double Carbon" Strategy is Diversified, but According to the Existing Model, it is still Far from the Carbon Neutral Development Strategic Goal before 2060

In order to achieve the medium-term and long-term development strategic objectives of reaching the peak of carbon and carbon neutrality, we have constantly explored many means such as energy conservation and emission reduction and green energy utilization. These methods and measures are scattered in various documents or online public reports. In terms of the energy conservation and emission reduction projects currently adopted in Fujian, the current situation is summarized into five themes as follows.

(1) In the use of nuclear energy, Ningde Nuclear Power Station and Fuqing Nuclear Power Station are in operation, and Zhangzhou Nuclear Power Station and Xiapu Demonstration Fast Reactor are under construction.

(2) In hydropower generation, large scale hydropower stations include Shuikou Hydropower Station, Gutian I to I Hydropower Station, Shaxikou Hydropower Station, Mianhuatan Hydropower Station and Hua'an Hydropower Station.

(3) In terms of wind power generation, the scale of wind power generation in Fujian accounts for about 1.8% of the whole country, which is not suitable for the status of a large province with abundant wind energy, and its potential is still very large.

(4) In terms of solar energy utilization, the State Power Investment Corporation has put 17 photovoltaic power stations into operation in Fujian, with an installed capacity of 195000 kilowatts. Mainly distributed in: Ningde region (2 photovoltaic power stations), Fuzhou region (4 photovoltaic power stations), Xiamen region (1 photovoltaic power station), Quanzhou region (3 photovoltaic power stations), Zhangzhou region (6 photovoltaic power stations), Longyan region (1 photovoltaic power station)

(5) In terms of ecological carbon sink, Fujian's forest coverage rate is 66.8%, and its total carbon reserves exceed 420 million tons; Fujian has 136000 square kilometers of marine territory, with great potential for "blue carbon" resources. It has rich blue carbon in coastal zone, fishery and microorganism, and has a total ecological carbon sink potential of more than 80 million tons.

The total amount of these measures to reduce carbon emissions is still very limited, and the distance from the "double carbon" strategy is still not small. The next task is still very difficult. However, if the small and medium-sized wind energy on the land of the province can be fully and effectively utilized, then the realization of the "double carbon" strategic goal is just around the corner.

Therefore, accelerating the research and development of hybrid power drive technology and making it industrialized as soon as possible will dramatically reduce the consumption of fossil resources, and at the same time, the level of sustainable development of society can be improved year by year.

4.2. The Ongoing Practice of Digital Finance is only Reflected at the Technical Level and Lacks a Theoretical Framework

The current digital finance only stays at the level of financial technology, and the financial theory it relies on is the traditional financial theory [34,35,36]. Such digital financial practice has many drawbacks, such as the lack of logic in the selection of empirical models, the lack of explanatory power of regression models for samples, and the ubiquity of writing styles that emphasize form over content, etc. [33].

In order to avoid many disadvantages faced by the existing digital finance practice, this paper takes the lead in constructing the digital finance theory with the essential characteristics of digital finance, and applies it to the field of technological innovation, giving play to the irreplaceable inherent advantages, making up for the disadvantages of traditional finance, and realizing the sustainability of technological innovation.

5. Conclusions

First, digital finance theory is based on digital technology, big data technology, blockchain technology and other related financial technologies. It studies the theory of the dynamic relationship between the closed-loop

or multi link jump movement of digital finance and the projection radiation of financial activities. It avoids the financial crisis risk under the framework of traditional financial theory, that is, the financial crisis risk caused by bank runs, moral hazard and currency issuance [37].

Digital finance theory can be divided into the narrow digital finance theory and generalized digital finance theory.

The narrow digital finance theory studies the dynamic relationship between the closed-loop jump movement of digital finance and the projection radiation of financial activities. The generalized digital finance theory refers to the theory that studies the dynamic relationship between the single or multi link linkage jump movement of digital finance and the projection radiation of financial activities.

The second is the financing obstacles of traditional finance to technological innovation of SMEs, namely financing constraints and other financing difficulties. According to digital finance theory, these financing obstacles do not exist. This is why the industrialization of the hybrid power driven technology obtained in this paper can be expected under the conditions of easy access to financing and facilitation. According to the research and theoretical analysis of Chinese and American experts in the laboratory, the investment in research and development of this technology is not large, but financing is not easy, which is caused by the limitations of the traditional financial system.

However, under the theoretical framework of digital finance, the investment obtained by such technology research and development is fully guaranteed. In fact, under the traditional financial system, the problem of compound power driving technology R&D is the appropriate financing support, rather than the "bottleneck" problem of technological innovation. Regarding the financing dilemma, from the perspective of digital finance, there was no problem at that time.

Third, the hybrid power drive technology is the "golden key" to solve the path problems faced by Fujian's "double carbon" strategy, and is the driving force to accelerate the province's early realization of the "double carbon" strategy. With the support of hybrid power drive technology, the role of fossil fuel power generation system will gradually change from the current leading role to supporting role, and the use of wind energy will gradually change from the current supporting role to the leading role, providing endless green energy for the sustainable development of society.

Fourth, the realistic and feasible optimization waymap to realize the "double carbon" strategy in Fujian Province is: based on the establishment and improvement of a new financial service system based on the theoretical framework of digital finance; Provide new financial services to provide sufficient financial support for the research and development of hybrid power-driven technology; The establishment and promotion of new small and medium-sized wind energy utilization mode based on hybrid power drive technology will be realized with financial support; Then realize full green energy substitution for thermal power generation; Then, we will greatly improve green energy to achieve the "double carbon" goal of the province; Finally, the establishment and continuous improvement of the provincial sustainable development system with green energy as the main driving force will be realized.

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REFERENCES

[1] K. Singh, N. Singh, R. Negi, "Short-Term Wind Power Prediction Using Hybrid Auto Regressive Integrated Moving Average Model and Dynamic Particle Swarm Optimization," International Journal of Cognitive Informatics and Natural Intelligence, Vol.15, Issue 2. PP 124-15, 2021.

[2] Q. Tian, "Wind power development needs rational face," People's Political Consultative Conference Daily, February 9, 2021, Version 007.

[3] Taylor & Francis, "Estimation of wind energy power using different artificial intelligence techniques and empirical equations," Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, Vol.43, Issue 7, PP 815-828, 2021.

[4] Taylor & Francis, "The effectiveness of China's renewable energy policy: An empirical evaluation of wind power based on the framework of renewable energy law and its accompanying policies," Emerging Markets Finance and Trade, Vol.57, Issue 3, PP 757-772, 2021.

[5] B. Zhou, H. Duan, Q. Wu, H. Wang, K. Chan, Y. Meng, "Short-term prediction of wind power and its ramp events based on semi-supervised generative adversarial network," International Journal of Electrical Power & Energy Systems, Vol.125, PP 106411, 2021

[6] L. Wang, R. Tao, H. Hu, Y. Zeng, "Effective wind power prediction using novel deep learning network: Stacked independently recurrent autoencoder," Renewable Energy, Vol.164, PP 642-655, 2021.

[7] G. Wu, H. Wang, Q. Wu, "Wind power development in the Belt and Road area of Xinjiang, China: Problems and solutions," Utilities Policy, Vol.64, PP 101024, 2020.

[8] N. Hong, "Study on the influence of new energy generation grid connection on power quality of power grid," Water Conservancy and Electricity, Science and technology trend

in August 2020, 139.

[9] J. Xu, “Impact of new energy grid connection on power quality,” Communication Power Supply Technology, Vol.37, No.5, 267-268, 2020.

[10] Q. Wang, C. Wang, “Impact of wind power generation on power system and its solutions,” Inner Mongolia Science and Technology and Economy, No.16, 112-114, 2020.

[11] J. Song, “Discussion on the development of new wind energy and grid connection technology,” Yangtze River Technology and Economy, No.7, 173-175, 2021.

[12] F. Li, R. Wang, Y. Cheng, “Research progress of new energy economics,” Renewable Energy, 11(4), 31-35, 2018.

[13] C. Zou, “Where will China's energy transformation go,” China Petroleum and Petrochemical, Semimonthly, Issue 14, 16-19, 2019.

[14] A. Gu, X. Meng, B. Liu, J. Zhou, “The position and role of hydrogen energy in Japan's energy development strategy,” China Economic and Trade Guide, 35-37, 2019.

[15] H. Lei, “Research on the strategic development of China's new energy industry driven by low-carbon economy,” Guangxi Quality Supervision Guide, 9(2019), 198, 132, 2019.

[16] W. Ayrir, M. Ourahou, B. Hassouni, A. Haddi, “Direct torgue control improvement of a variable speed DFIG based on a fuzzy inference system,” Mathematics and Computers in Simulation, 167(2020), 308-324, 2020.

[17] B. Yuan, Z. Xu, J. Liu, J. Zong, “Research and application of multi-area new energy integration capability evaluation model,” Electric Power, 2019-07-05, 1-8, 2019. DOI: 201808120,http://kns.cnki.net/kcms/detail/11.3265.tm.20190704.1739.021.html

[18] F. He, M. Khan, B. Zai, “Material mechanics of crack growth in structural dynamics,” Procedia Structural Integrity, 17(2019), 72-79, 2019.

[19] X. Wang, B. Mann, “Nonlinear dynamics of a non-contact translational – to –rotational magnetic transmission,” Journal of Sound and Vibration, 459(2019), 1-17, 2019.

[20] B. Chentouf, N. Smaoui, “Exponential stabilization of a non-uniform rotating disk-beam system via a torque control and a finite memory type dynamic boundary control,” Journal of the Franklin Institute, https://doi.org/10.1016/j.jfranklin 201908011

[21] S. Koohestani, R. Amrollahi, “TF coil structure in Alborz Tokamak, from design to mounting,” Fussion Engineering and Design, 137(2018), 104-111, 2018.

[22] N. Wang, G. Jin, S. Yang, “Installation and application of magnetic coupling and permanent magnet speed regulation equipment,” Equipment Management and Maintenance, 9(2019), 114-115, 2019. DOI: 10.16621/j.cnki.issn1001-0599.2019.09.55

[23] J. Zhang, X. Wang, “The spin of magnetic material surface waves,” Journal of Capital Normal University (Natural Science Edition), 40(5), 26-29, 2019.

[24] R. Huang, X. Lai, “Can digital finance ease the corporate financing difficulties? Utility identification, feature mechanism, and regulatory evaluation,” China Economic Studies. 52-66, 2021.

[25] X. Gao, L. Lei, F. Ma, “Digital finance, financing constraints and business growth,” Communication of Finance and Accounting, No.2, 68-71, 2022.

[26] J. Wan, Q. Zhou, Y. Xiao, “Digital finance, financial constraint and enterprise innovation,” Eco Rev. No.1, 71-83, 2020.

[27] Y. Zheng, R. Yang, H. Mohammad, “Does digital finance promote breakthrough innovation or incremental innovation?” J Yunnan University of Finance and Eco. No.2; 49-69, 2022.

[28] W. Wang, C. Hu, “Digital finance, scientific and technological innovation and carbon emission: empirical study based on provincial panel data,” J Tianjin University of Commerce, 42(3), 40-48, 2022.

[29] H. Jiang, Y. Liu, “Res on the relationship among digital finance, supply chain finance and financing constraints: Based on empirical evidence of listed companies on SME board,” Techno Economics and Management Studies, No.3, 73-77, 2021.

[30] X. Xie, S. Yan, “Research on the path of digital inclusive finance to promote technological innovation of small and medium-sized enterprises from the perspective of financing constraints,” Exploration of Financial Theory, No.4, 1-15, 2022.

[31] L. Teng, H. Zhang, S. Tang, “Digital financial innovation and rural eco development from an inclusive perspective,” The World of Survey and Res., No.12, 34-42, 2021.

[32] T. Zhu, Y. Zhang, “Research on the operation mode of financial digitalization,” J Financial Development Res., No.5, 3-10, 2022.

[33] S. Wang, “An Analysis of Studying Model for Digital Finance in China,” SunText Rev Econ Bus 3(4): 171-181, 2022.

[34] F. Guo, J. Wang, “Measuring China’s digital financial inclusion: Index compilation and spatial characteristics,” China Economic Quarterly, 19(4), 1401-1418, 2022.

[35] X. Ding, “From Internet finance to digital finance: Development trends, technical characteristics and design concepts,” J Nanjing University (Philosophy, Humanities and Social Sciences), No.6, 28-44, 2021.

[36] K. Wang, B. Zhao, “Research on the impact of digital finance on energy efficiency under the dual-carbon target,” Southern Finance, 20-31, 2021.

[37] Y. Huang, “Three Theories of Financial Crisis and Its Enlightenment to China,” 2022-11-03, https://idf.pku.edu.cn/, 2022.