

Exploration of the Development Direction of China Power Design Institute

Man Yi Zhou (✉ zmy_web@163.com)

Northwest Electric Power Design Institute Co., Ltd., Xi'an 710075, China

Original Article

Keywords: Power design, transformation and development, new energy, intelligence, whole-process consulting

Posted Date: January 28th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-151157/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

With the high-quality development of the global economy, China's power industry is accelerating its upgrading and transformation in accordance with the requirements of building a clean, low-carbon, safe and efficient manner. As the front-end industry of the power industry, related Power Design Institutes are also facing the challenge of transformation pressure. This study believes that the Power Design Institute should be market-oriented to change its concept, mainly from three aspects: transform from traditional coal-fired power generation business to new energy power generation business, and develop photovoltaic, wind power, biomass power generation and other new energy power generation businesses; The traditional design method is transformed into a digital and intelligent design method, and advanced technologies such as BIM and blockchain are fully utilized in the design process; from a simple design business to a whole-process consulting business, Transition from a simple design business to a whole-process consulting business, horizontally expand the design business to the entire process from pre-planning to post-project evaluation, and initially expand the business types to include project management, investment consulting, bidding consulting, and general contracting services, supervision business, procurement consulting, etc.

Introduction

At the current stage of the high-quality development of the global economy, China's power industry is accelerating its upgrading and transformation in accordance with the requirements of building a clean, low-carbon, safe and efficient manner. The market has gradually reflected the requirements of high-quality environmental protection. Relatively speaking, because of the serious pollution of coal-fired power generation, the business volume of coal-fired power generation has been shrinking year by year, causing relevant Power Design Institutes to face the challenge of great transformation pressure. As a leading company in the industry, a large-scale electric power design institute should have the courage and ideas to continuously carry out value innovation and create a blue ocean market, constantly rebuild market boundaries and create new demands, explore and cultivate new market opportunities. While obtaining high profits, lead the development of industry and technology [1]. China's electric power design industry must adapt to the situation and keep up with the trend, in order to remain invincible under the survival rule of the survival of the fittest.

Current Situation

1.1 Development and changes in energy and power

In 2011, the power consumption of developed countries declined. The total power consumption of OECD (Organization for Economic Cooperation) countries was 10.25kWh, a year-on-year decrease of 0.6%. The electricity consumption of the whole society in China is 46928 kWh, surpassing the United States for the first time to become the world's largest electricity consumer [2]. Since 2012, the electricity consumption and installed power generation capacity of China's entire society has increased year by year. As the

largest non-OECD country, China's electricity demand will increase significantly in the future. According to IEA forecasts, China's electricity demand will reach 9.07 trillion kWh in 2035, with an average annual growth rate of 4.0%. However, with the future adjustment of economic structure and industrial layout, the growth rate of China's power demand will slow down [3].

According to statistics from the China Electricity Council and the National Bureau of Statistics, China's installed power generation capacity reached 2.01 billion kilowatts in 2019, a year-on-year increase of 5.8%. The development of China's installed power generation capacity from 2013 to 2019 is shown in Figure 1. The continuous annual growth rate of about 5.5% reflects the steady development of China's economy.

From the perspective of the installed capacity of different power generation methods, China's power generation is still dominated by coal-fired power generation. In 2019, the installed capacity of coal-fired power generation reached about 1.19 billion kilowatts, the installed capacity of hydropower reached about 0.36 billion kilowatts, and the installed capacity of nuclear power was about 0.05 billion kilowatts. The installed capacity is about 0.21 billion kilowatts, and solar power generation is about 0.2 billion kilowatts. The comparison of different power generation methods in 2018 and 2019 is shown in Figure 2.

With the deepening of the energy revolution, the supply side vigorously adjusts the energy production structure and increases the proportion of clean and low-carbon energy. The power industry is at the center of the energy system. Clean energy power generation instead of coal-fired power generation is an important measure to promote the energy revolution. New energy, also known as unconventional energy, refers to various forms of energy other than traditional energy. Generally speaking, conventional energy refers to energy that is technologically mature and has been used on a large scale, such as coal, oil, natural gas, and large and medium-sized Hydropower; and new energy usually refers to the energy that has not been used on a large scale and is actively researched and developed [4, 5]. Conventional energy power generation projects are mainly coal-fired power generation, and new energy power generation projects mainly refer to the use of wind, light, and biomass power generation. It can be seen from the above figure that the annual growth rate of coal-fired power generation is about 4.3%, and the annual growth rate of new energy power generation is about 11%, indicating that the growth rate of new energy power generation is about 2.5 times that of coal-fired power generation. Because wind power is more economical than other renewable energy sources, it has become the fastest growing renewable energy source in the world [6].

From the perspective of major countries and regions in the world, the growth in power generation mainly comes from non-OECD countries. In 2035, the power generation of non-OECD countries will be nearly 70% higher than that of OECD countries. The average annual growth rate of power generation in OECD countries such as the United States, the European Union, and Japan is below 1% [7]. China and India's power generation has increased rapidly.

From the perspective of changes in the composition of the world's power generation, the proportion of non-aqueous renewable energy power generation such as wind power will increase rapidly, and the

proportion of coal-fired power generation will decline. According to the forecasts of major energy agencies, the proportion of coal power, hydropower, and oil power in the total power generation will decrease. The proportion of nuclear power generation will increase slightly, and countries such as the United States, the United Kingdom, and China will continue to develop nuclear power.

The strategic development of the Electric Power Design Institute should be adjusted and optimized to meet the business development needs of the new energy market, and the focus of coal-fired power generation design should be gradually shifted to the direction of new energy power generation design.

1.2 Development and changes in design technology

In the past, major Power Design Institutes also used drawing boards to design drawings in China, and gradually developed to use computer-aided design tools for design. With the rapid development of science and technology in recent years, "digitalization" is the foundation of the "intelligent" industrial revolution. Blockchain technology has been widely used in various industries, such as finance, charity, medical, energy, logistics, agriculture and other industries [8]. Blockchain technology has developed rapidly and has become a hot spot in scientific research. Many industries face problems of low trust and reliability [9-12].

The digital transformation of the power industry is inevitable. Electric Power Design Institute needs to intensify innovation, carry out digital and intelligent transformation, and promote the application of concepts such as "Internet +, smart energy, smart grid, and ubiquitous power Internet of Things" in the design process.

1.3 Development and changes in business forms

The main direction of the transformation and upgrading of the Electric Power Design Institute is to transform to an international engineering company. The main business of high-end international engineering companies is not limited to design business, but develops to the entire engineering consulting business, such as RWE in Germany, Worley Parsons in Australia, and Black Veatch in USA and others have participated in the project construction as the owner's engineer in many international projects. The whole-process consulting business of the project requires high management and technical capabilities in terms of project management, project preliminary evaluation, survey and design, etc., and also have large profits space.

The emergence of the whole-process consulting business has changed the construction mode of the five parties responsible for the construction unit, survey unit, design unit, supervision unit and construction unit in the existing engineering construction system. The Electric Power Design Institute needs to increase investment in the whole process of consulting business.

Theory

2.1 SWOT concept

The so-called SWOT analysis refers to the situation analysis based on internal and external competition conditions. It enumerates the main internal advantages, disadvantages, external opportunities and threats that are closely related to the research object through investigations, and arranges them in a matrix form to compare various factors with each other. Match them to analyze and draw decision-making conclusions. The SWOT analysis model is shown in Figure 3.

The following uses the SWOT model to analyze the situation of the China Electric Power Design Institute in order to obtain guiding opinions on the development direction of the Electric Power Design Institute.

2.2 SWOT analysis

2.2.1 Strength analysis.

- 1) Strong technical force, coal-fired power generation design performance is rich.
- 2) There is a relatively perfect technology innovation management system.
- 3) Talent intensive enterprises have obvious advantages in human resources.
- 4) The business type is mainly coal-fired power generation, expanding various new energy businesses.
- 5) Its business scope is mainly design business, expanding general contracting and other business.

2.2.2 Weakness analysis.

- 1) Matrix management organization, decision-making process is complex and time-consuming.
- 2) The main business type is design business, and the development of project management consulting business started late.
- 3) The scale of new energy business is small and the amount of profit is small, so enterprises do not pay enough attention to it.
- 4) The design means are solidified, and the application of new intelligent technology is insufficient.

2.2.3 Opportunity analysis.

- 1) China strongly advocates the development of new energy sources.
- 2) In terms of science and technology, China advocates intelligent development, which is at the international advanced level.
- 3) In China's power construction, design enterprises have more advantages than other participating enterprises in the whole process of consulting business.

2.2.4 Threat analysis.

- 1) Traditional coal-fired power generation design business is gradually reduced, and the business volume cannot meet the demand of Electric Power Design Institute.
- 2) The scale of new energy project is small and needs a lot of business to meet the demand of Electric Power Design Institute.
- 3) With the rapid development of digital science and technology, the knowledge structure of technical personnel in Electric Power Design Institute is out of date.
- 4) Domestic electric Power Design Institutes started late in the whole process of consulting business.

2.3 Strategic choices

SO strategy: Transform the whole process consulting business and new energy power generation design business into star business.

WO strategy: Adjust the organizational structure and establish the organizational form to adapt to the characteristics of new business.

ST strategy: Actively reserve talents for technological innovation and adopt new science and technology.

WT strategy: Do a good job in project research and prediction, choose to reduce the scale of non-performing businesses, or even merge related businesses, in order to tide over the difficulties [13] and maintain or shrink the proportion of traditional coal-fired power generation design businesses.

It can be seen that the SO strategy is the most ideal strategy, so that the company will develop rapidly, and it is also a strategy that is very willing to take in the smoothest situation [14]; ST strategy and WO strategy are a bittersweet strategy, require companies to take specific measures based on specific circumstances, which are strategy taken under general circumstances [15]; WT strategy are one of the most pessimistic strategy, which are the measures that companies have to take when they are in the midst of life and death.

The SWOT analysis method plays an important role in the current development of the company. It has a clear plan for the current development direction of the company. According to the company's own situation, it formulates the most beneficial plan for the company's development, and according to the social environment and market environment at the time The SWOT analysis method plays an important role in the current development of the company. It has a clear plan for the current development direction of the company. According to the company's own situation, it formulates the most beneficial plan for the company's development and according to the social environment and market environment at the time wait for some external conditions to make corresponding changes. Enable enterprises to give full play to their own advantages and seize opportunities to maximize corporate benefits and minimize losses [16].

Results And Discussion

3.1 New energy market development

From the perspective of energy consumption per unit of GDP, there is still a gap between China and the world average, which is 1.5 times the world average. The task of further reducing energy consumption and reducing pollutant emissions is still under tremendous pressure. From the perspective of total coal consumption, China consumes more than 4 billion tons of standard coal each year, of which electricity coal consumes 57%, and steel, chemical, building materials and other industries also have a large coal consumption; from the perspective of energy conversion efficiency, with the continuous improvement of technology, the energy-saving level of coal-fired units has improved by leaps and bounds. At present, the coal consumption of newly built units over 600,000 kilowatts has been reduced to within 300 g/kWh, reaching the world's advanced level. Under the current situation, it is the general trend to increase the proportion of renewable energy used and achieve clean energy. Improving energy efficiency and reducing energy consumption are the primary tasks for the future development of the energy industry. China's 14th Five-Year Plan and for a long time to come, China's energy structure will continue to transition to green and low-carbon.

To vigorously develop wind, solar, oil shale, hydrogen energy, biomass and other new energy power generation and energy storage business, we mainly consider making changes in the following aspects.

In the aspect of enterprise internal system management, the workflow of new energy business is simplified to adapt to the characteristics of low threshold and short and quick operation of new energy business.

From the aspect of market research, we should take the initiative to grasp the latest information in the market.

In the design process and scheme decision-making, simplify the process of professional cooperation and drawing countersignature to facilitate the fastest decision-making.

In terms of project management organization structure, it adopts the compound organization structure with flexible organization mode, and gives full play to the advantages of project and human resources.

3.2 Change and development of intelligent level

The electric Power Design Institute needs to actively promote scientific and technological innovation and management innovation, actively implement China's energy strategy and planning policies, and constantly improve management ability, management level and management effectiveness. Digital companies in the United States before the construction stage of about 80% improvement in the design phase. This figure may have changed today, and may not be fully applicable to domestic projects, but the trend revealed by it still has guiding significance - the benefits brought by digitization for construction are much greater than those at the design stage.

3.2.1 Strengthen the application of information technology

3D design and BIM system and other information technology means are applied in the design management, procurement management and project management of Electric Power Design Institute. It can not only improve the efficiency of project management, but also save the construction cost for investors.

Specifically, BIM Technology is a data-based tool applied in the whole process of engineering construction. Through information technology such as 3D design, it can realize 3D full information management and application in the whole process of project planning, design, construction and later operation and maintenance, which can provide an information collaborative platform for all parties involved in project construction. BIM has two advantages: one is that it can closely connect with traditional design and construction, and enhance the concept of integrated project management; the other is to improve production efficiency, save cost and shorten construction period.

3.2.2 Blockchain Technology

At present, according to the existing blockchain publishing standards, they are distributed in different standardization organizations, and relatively scattered. With the gradual attention paid to the development of blockchain industry in China, the standardization work will move to a new level. Among them, platform architecture standards and power transaction standards are the core to support the power trading business based on blockchain. However, considering the differences with traditional power trading, relevant testing and verification standards and communication and information security standards are still needed to support.

There are three forms of blockchain, namely public chain, alliance chain and private chain. Blockchain technology is widely used in foreign countries [17-20]. In the logistics field of Singapore Yojee can track the logistics status in detail and record the logistics information on the blockchain completely; the UK philanthropy, start network and disperse use the blockchain technology to track the flow of each charity fund; the point-to-point banking system Vault OS and Hought Machine finance company uses blockchain technology to ensure the safe storage of transactions. The application of blockchain technology in China mainly includes: in December 2019, the Bank of China launched the first domestic bond issuance system based on blockchain technology, which was successfully applied to the issuance of BOC's 20 billion special financial bonds for small and micro enterprises; in April 2020, China's national blockchain network, i.e., the blockchain based service network (BSN), will be fully launched after the test, which is the first time that the Chinese government will launch the system Step up the adoption and specialization of blockchain is an important milestone.

Power generation enterprises, power sales companies and power users use intelligent terminals to upload the information to the power trading center through the Internet, and the power trading center will send the processed information to the application server of the information extranet, and then the application server will transmit it to the power generation enterprises, power sales companies and power user terminals [21]. The application of blockchain technology in the process of power transaction will also effectively promote the development of power design technology.

3.3 Development of consulting business in the whole process

Extend the simple design business to the whole process consulting business, horizontally expand the design business to the entire process from pre-planning to post-project evaluation, and initially expand the business types to include project management, investment consulting, bidding consulting, and general contracting services, supervision business, procurement consulting, etc. The status and responsibilities of the consulting enterprise in the project construction process should be clarified, and the government construction acceptance procedures should also be matched with it.

The Power Design Institute has its inherent advantages in the process of participating in the whole process of construction project consultation, such as complete enterprise qualification, complete registration personnel of various types of enterprises, and prominent advantages of design leading. However, in terms of national policies, as the pilot areas of the whole process consulting business are concentrated in the fields of construction, municipal administration, environmental protection and rural construction, less in the power market. If the Electric Power Design Institute itself does not have business expansion in the non-electric field, it is still very difficult to carry out the whole process consulting business. At the same time, because of the strong professional ability of the investors in the field of power construction and the obvious dominant position in the market, the investors reject the whole process consultation of Electric Power Design Institute. Therefore, electric Power Design Institute should grasp the needs of power investment enterprises and vigorously develop the whole process consulting business in non-electric field.

In the domestic market, with the influence of domestic electricity price reform, promotion of coal-fired power pool, and the opening of Hao-Ji railway, coal-fired power and gas turbine projects have development space in some provinces. This year is the window period for the preparation of the energy and power planning of the 14th five year plan. The demand for the preliminary work of large-scale coal-fired power generation projects is increasing, which creates favorable conditions for the Power Design Institute to carry out investment consulting business. The conditions for carrying out construction consulting projects of large-scale coal-fired power generation projects in the domestic market are not mature, and it takes time for investors to change their concepts and innovate their construction modes. The Power Design Institute can actively operate the prepackaged service projects of development projects. In the international market one area, especially one belt, one road, large coal fired power generation projects have the needs of owner engineers. The owners of the former mainly invited the European and American companies, and the actual operation results were not cost-effective, which provided an opportunity for the domestic electric Power Design Institute to carry out the whole process of consulting services in the international coal-fired power generation projects.

For the Power Design Institute of coal-fired power generation project, the whole process consultation can be divided into investment consultation and construction consultation. Investment consulting business can be simply understood as the preliminary service in the stage of project proposal and feasibility study. The work content is to prepare various reports and review, so as to make the project approved smoothly.

Investment consultation can be understood as the expansion of work and service scope of Electric Power Design Institute on the basis of feasibility study stage.

Construction consulting is a new format for investors. It is necessary to understand the relationship between construction consulting and EPC as well as the collaborative development trend in the future. Construction consulting routine can be understood as “1 + N”, “1” represents project management business, and “N” represents preliminary design, survey, engineering supervision, special consultation, cost consultation, bidding agency and other businesses.

If the Electric Power Design Institute wants to develop the whole-process consulting business, it should carefully study national and local policies, especially to meet the policy requirements of the place where the project is located. In general, power design institutes with strong EPC business capabilities have a strong advantage in whole-process consulting. In general, power design institutes with strong EPC business capabilities have a strong advantage in whole-process consulting. Electric Power Design Institute general EPC business has a strong ability to have a strong advantage in terms of the whole consultation process. Therefore, the Electric Power Design Institute should rely on its own ability to carry out the whole process consulting business and vigorously cultivate the whole process consulting ability. Therefore, the Electric Power Design Institute should rely on its own ability to carry out the whole process consulting business and vigorously cultivate the whole process consulting ability. It can also cooperate in-depth with some equipment manufacturers, construction companies, engineering agencies and window units with high qualifications and good cooperation records to jointly develop markets and establish joint ventures [22].

3.4 Personnel training and reserve

If the electric Power Design Institute wants to develop the new energy market business, intelligent level and whole process consulting business mentioned above, it is necessary to create new talents. The electric Power Design Institute should not only strengthen the cultivation of employees' innovative consciousness, but also actively introduce new design technologies, organize electric power designers to carry out skill training and learning, and strengthen the cultivation of compound design talents. Strengthen the analysis of the status quo of human resources, and carry out research on job setting, professional configuration, enterprise development, and personal career development. Timely adjust the organization and rationally deploy internal human resources. Improve the talent training system centered on capacity building, continue to do a good job in the construction of three teams of high-level enterprise management talents, high-quality project management talents, and high-level professional technical talents to form a complete talent structure. Steadily promote the salary performance incentive mechanism, revise the evaluation methods of department and company leaders, and do a good job in the research and preparation for the full implementation of the performance evaluation of all employees [23].

Transform from traditional personnel management to modern corporate human resource management; from human resource management focusing on solving current problems to systematized and strategic human resource management focusing on solving long-term problems; from mechanism management to

equal emphasis on cultural management Transformation, from in-depth training of professional talents to an equal emphasis on cross-professional compound professionals [24].

Conclusions

Due to the limitation of information, environment and cognitive ability in the formulation of business objectives and strategic plans, the prediction of the future will not be very accurate, and the strategic plan formulated is not optimal, and in the process of implementing the strategic plan, The enterprise is subject to great changes in the internal and external environment, therefore, as long as the strategic target is basically completed, the formulation and implementation of the strategy should be considered successful [25].

Under the background of high-quality development of China's economy in the new era, the Power Design Institute needs to actively find its own high-quality development path. We should continue to work on new energy market layout, intelligent technology improvement, whole-process consulting business expansion and talent training, etc., and promote the transformation of electric Power Design Institute to knowledge-based, intelligent and comprehensive. Combining with the professional advantages of the power energy industry, the Power Design Institute will truly become an international engineering company with core competitiveness that can resist risks.

Declarations

☒ The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☒ The author declares that he has completed the research concept, analysis and manuscript preparation, data analysis and manuscript writing alone. This manuscript is not applicable for the follow section.

- Availability of data and materials
- Competing interests
- Funding
- Authors' contributions
- Acknowledgements

☒The author declares the following financial interests/personal relationships which may be considered as potential competing interests

References

[1] [Arazi Idrus, Muhd Fadhil Nuruddin, M. Arif Rohman](#). Development of Project Cost Contingency Estimation Model Using Risk Analysis and Fuzzy Expert System☒J☒☒ Expert Systems with Applications☒

2011;38(3) : 1501-1508

[2] IEA. Energy Balances of OECD Countries 2011 [J]. Paris, 2011: 73-81.

[3] IEA. Energy Balances of Non-OECD Countries 2011 [J]. Paris, 2011: 31-32.

[4] I Dikmen, MT Birgonul, JHM Tah, AH Ozer . Web based Risk Assessment Tool Using Integrated Duration-cost Influence Network Model[J]. Journal of Construction Engineering and Management, 2012, 138(9) : 1023-1034

[5] Samuel Laryea, Will Hughes. How Contractors Price Risk in Bids: Theory and Practice[J]. Construction Management and Economics, 2008, 26(9) : 911-924

[6] International Energy Agency [J]. World energy outlook, 2011: 36-42.

[7] ENRC. 2011 Long-Term Reliability Assessment November [J]. Berlin, 2011: 7-12.

[8] YUAN Yong, WANG Feiyue. Blockchain: the state of the art and future trends [J]. Acta Automatica Sinica, 2016, 42(4):481-494.

[9] ZHENG Z B, XIE S A, DAI H N, et al. An overview of blockchain technology, architecture, consensus, and future trends[C]//2017 IEEE International Congress on Big Data - Big Data Congress, June 25-30, 2017, Honolulu, HI, USA, IEEE, 2017, 564

[10] ZHANG Bo, The application of foreign blockchain technology and related enlightenment [J]. Fintech era, 2016, 24(5):35-38

[11] YAN Yong, ZHAO Junhua, WEN Fushuan, et al. Blockchain in energy systems, concept, application and prospect[J]. Electric Power Construction, 2017, 38(2):12-20

[12] LI Bin, CAO Wangzhang, QI Bing, et al. Overview of application of block chain technology in ancillary service market[J]. Power System Technology, 2017, 41(3):736-744

[13] Porter M, E. Competitive Strategy [M]. Techniques for analyzing industries and competitors. New York: Free Press, 2011.

[14] Mikko Kurttila, Mauno Pesonen, Jyrki Kangas. Utilizing the analytic hierarchy process (AHP) in SWOT analysis-a hybrid method and its application to forest-certification case. Forest Policy and Economics. 2000(1), 41-52.

[15] HH Chang, WC Huang. Application of a quantification SWOT analytical method. Mathematical and Computer Modelling, 2006: 158-169.

[16] Yang Zhi. Dual-matrix SWOT fuzzy analysis strategic decision-making model and its application research[D]. Huazhong University of Science and Technology Master's Thesis, 2003, 4.

- [17] ZHENG Z B, XIE S A, DAI H N et al. An overview of blockchain technology architecture, consensus and future trends[C]//2017 IEEE International Congress on Big Data (BigData Congress), June 25-30, 2017, Honolulu, HI, USA, IEEE.
- [18] OUYANG Xu, ZHU Xiangqian, YE Lun et al. Preliminary applications of blockchain technique in large consumers direct power trading[J]. Proceedings of the CSEE, 2017, 37(13): 3737-3745.
- [19] NAKASUMI M. Information sharing for supply chain management based on block chain technology[C]//2017 IEEE 19th Conference on Business Informatics (CBI), July 24-27, 2017, Thessaloniki, Greece, IEEE, 2017, 140-149.
- [20] TAPSCOTT D, TAPSCOTT A. How blockchain technology can reinvent the power grid[EB/OL], 2016-05-15, <http://fortune.com/2016/05/15/blockchain-reinvents-power-grid/>.
- [21] HU Weidong, GU Yugui, XU Liang et al. 2016 annual report on power trading[J]. Electric Power, 2017, 50(4): 35-38.
- [22] Henry Mintzberg, James Brian Quinn. The strategy process: concepts, contexts, cases, 3rd ed [J]. Upper Saddle River, N. J: Prentice Hall, 1996: 137-139.
- [23] Richard Teece. Harvard Business Review on Strategic Alliances [M]. Harvard Business School, 2008:203-205.
- [24] Gary dessler. Human Resource Management [M]. Beijing: Chinese People's University Press, 2010:517-519.
- [25] Quinn, James Brian. Strategy for change [J]. Dow Jones Irwin, 1980: 34-35.

Figures

2013-2019 Statistics of China's installed power generation capacity(100MW)

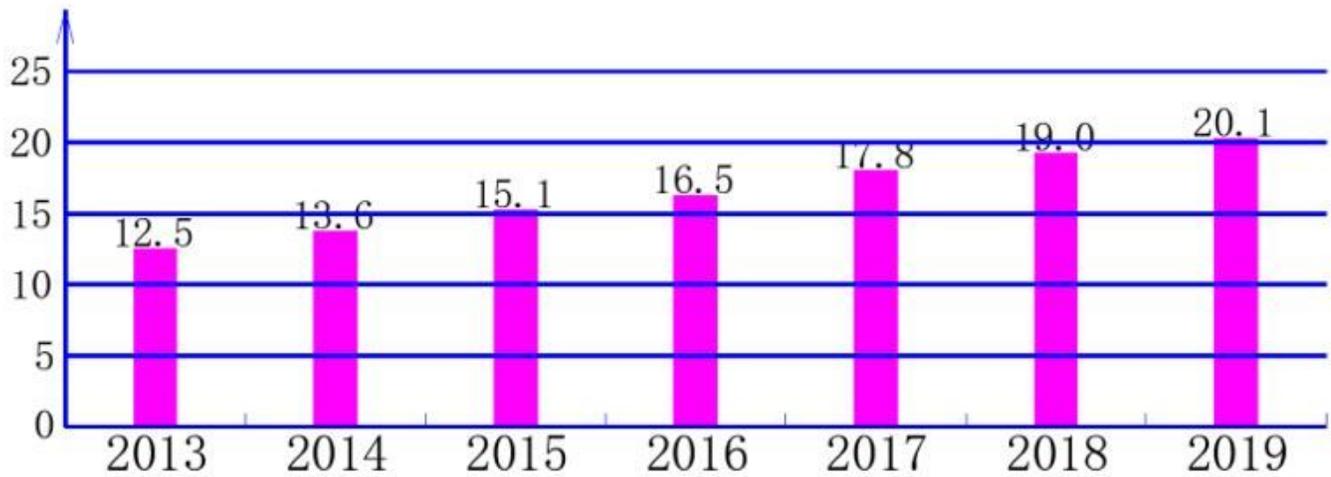


Figure 1

2013~2019 Statistics of China's installed power generation capacity

2018-2019 China's installed power generation capacity in different ways(100MW)

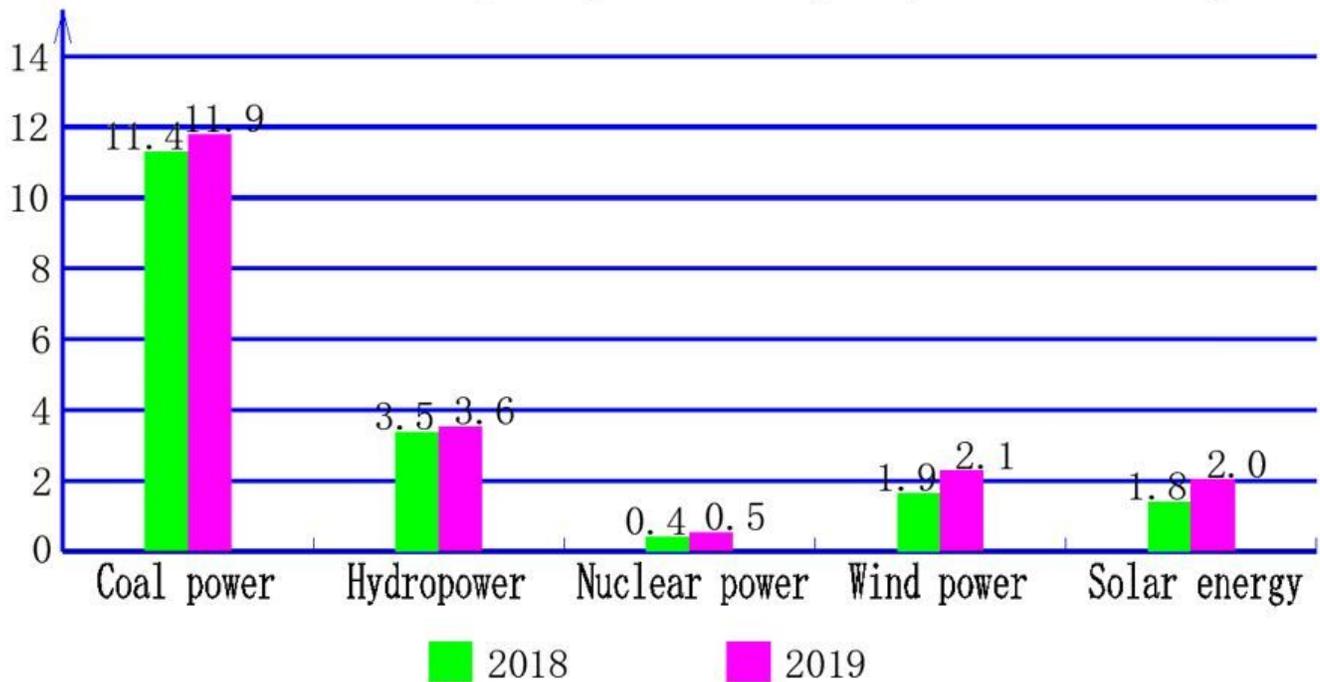


Figure 2

2018&2019 Statistics of China's installed power generation capacity in different ways

SWOT ANALYSIS



Figure 3

SWOT analysis chart