

Research on Regional Energy Planning Practice in Industrial Park Mode –Taking the Civil-Military Integration Industrial Park of Mianyang as an Example

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Abstract. Under the current urgency circumstances of energy saving and emission reduction, the comprehensive utilization of various forms of energy and others strengths, together to realize the environment protection and resources conservation has become a research hotspot. This paper focuses on the energy supply of civil-military integration industrial park of Mianyang. Combining with planning and design of the industrial park, this paper carries on a detailed planning practice research analysis from the aspects of energy demand, supply and construction conditions, and at the same time, put forward reasonable regional energy planning and bring thoughts on the current large-scale industrial park energy planning.

1 Background

With the acceleration of industrialization and urbanization, Chinese energy demand is increasing, and the energy crisis has become increasingly visible with the imbalance between supply and demand, environmental pollution and the greenhouse effect, which seriously restricts the sustainable economic and social development of our country. Regional energy system planning can make use of renewable energy and clean energy on a massive scale, which is considered as an effective way to solve the energy crisis. Nowadays, regional energy planning has become an indispensable part of urban development planning with a strategic height.

Since reform and opening up, our economic development is greatly promoting the progress of urbanization, and the construction of the industrial park has been vigorously conducted around. However, park construction and development of energy saving society did not go hand in hand yet. At present, there exists lots of problems on the energy planning of most industrial parks in China. First, in the industrial park, with the lack energy use of the park internal environment has become increasingly prominent, leading to these indicators that closely relates to the environment, such as air quality, water environment quality, solid waste disposal decreased year by year. Second, energy and environmental issues are closely related to the human production and living in the park, with longevity and inertia. Because of lack of reasonable planning and the unsustainable rapid expansion, it results in the construction of large density with serious environmental and health problems. Third, for a long time, China's water, electricity, gas and other departments operate independently in the planning and construction phases, which brings serious duplicate infrastructure construction and low efficiency.

In order to improve the operation level of regional construction, it is significant to construct of energy-conserving and environmentally-friendly society, for the development direction of the industrial park energy planning, ideas and energy supply mode and other issues.

2 Project Overview of the Civil-military Integration Industrial Park

Civil-military integration Industrial park of Mianyang is a national experimental demonstrative base for dual-use technology research and development, transformation and industrialization, which is the iconic park of Mianyang science and technology city with technology innovation system.



Figure 1. The space frame of the industrial park



Figure 2. the locations of the industrial park

The planning area of civil-military integration Industrial park in Mianyang has a size of about 246.23ha, with the

planning structure of overall layout "one axis, two areas, three centers". The park intends to construct a axis: civil-military integration industrial axis; two zones: new industrial development zone, health industry zone; three centers: nuclear power development center, nuclear medical development center and technology service center. And it has four space development strategy "breaking the limits" "strengthening the centers" "developing the zones", "gathering the industry" (Figure 1).

The layout location of civil-military industrial park is the Science and technology development forefront of Youxian District, Mianyang (Figure 2), to develop high technology industry and new energy, basic industrial, modern logistics industry. Industrial Park is divided into three functional plates. The first is the scientific and technological service function plate, which is based on the technology research and development and the public technical service, characteristic with the innovation business incubator, and with the education training for the auxiliary function as the multi-level technology transfer research and development base. The second is the nuclear medical function plate, as the consolidation of scientific and technological strength to train doctors, scientists and other talents with professional skills. The third is the advanced manufacturing function plate, which is an important area to improve the innovation ability to bring more economic benefits and development power for the future development of the park. Energy demand in the park is mainly teaching, scientific research and life services with electricity, air conditioning refrigeration, hot water, no industrial load.

3 The Related Construction Conditions Analysis of Energy Planning

3.1 Hydrological and Meteorological Conditions

3.1.1 Hydrological Conditions

Industrial park planning area is located on the west of Furong Creek. It is the left bank small tributaries of Fujiang River, a total of two sources, the source of West Dujia River and east named Zhengyuan River . The length stretches 90.7 km and the basin area is 594.9 square kilometers. The river of the planning area is 0.96 kilometers long and 20 meters wide.

3.1.2 Meteorological Conditions

The industrial park belongs to the subtropical monsoon climate, annual average temperature of 16.5°C, 1298 sunshine hours, free frost period of more than 280 days, about 990 mm average annual rainfall, rainfall concentrated from June to September every year. Southerly winds reign in summer, while northerly winds reign in winter. It has summer without the intense heat, winter with no cold, four distinct seasons, and major feathery of year in the district with rain heat in the same quarter, year-round small wind, long frost free period.

3.1.3 Water Source Conditions

The project is located among rich water resources, around lakes and rivers. In the west of the industrial park, Furong Creek goes through the area. The summer temperature of surface water is lower than that of air temperature, while winter is higher than the air temperature, and contains much low grade energy. So the water source heat pump technology can be used to provide cold source for the service construction in summer, and provide heat source in winter, which can not only realize the cost saving, low carbon emission reduction, renewable energy, but also at the same time, the water can be used as cooling water of air-conditioning cooling tower.

3.2 Resource Construction Condition

3.2.1 Solar Energy Utilization

Solar energy is an inexhaustible clean energy. According to the size of the exposure of the sun, Chinese Academy of Meteorological Sciences divide China into 4 zones of solar energy resources. Through the analysis of the annual exposure of 4 zones of solar energy resources, the Industrial Park belongs to the barren region. The analysis of the solar radiation situation: It belongs to a subtropical monsoon climate. The solar radiation is about 3900mJ/(m² a). The average sunshine time is short. According to the solar radiation, civil-military integration industrial park of Mianyang can take different using modes of solar energy.

3.2.2 The Utilization of Water Source Heat Pump

Water yield, water temperature, water quality and water supply stability of water source, are important factors to influence the operation effect of water source heat pump air conditioning system. The water source requirements of the water source heat pump air conditioning system are: adequate amounts of water, water temperature, water quality, water supply stability. Enough water flow is the prerequisite for the application of water source heat pump air conditioning system. The industrial park plans to intend to use the water of Furong Creek as the source of cold heat of the water source heat pump to realize the energy conversion heating air-conditioning system. Taking water as a cold heat source, water temperature is relatively stable, which is very beneficial to the work of the heat pump, and the water itself is clean renewable energy, with high efficiency and energy saving unit COP reaching 6-7, that is, the use of 1Kwh 6-7Kwh energy can produce the heat, with obvious energy saving effect.

As most of the intakes and outlets are set as a deep shallow drain, so that the air conditioning system with high temperature and water temperature of 5 degrees is confined to the local area of the lower surface of the drainage outlet, and the temperature can be quickly and evenly mixed with the water flow. For the water intake of less than 5% of the average diameter of the project, the temperature rise of the envelope at 1 degrees Celsius in the range of several hundred square meters of the

drainage mouth. According to the field survey and future planning, the width of the river is 20 meters, 3 meters deep. The calm, slow water flow, as the water source heat pump can meet the conditions.

4 Energy Planning Programme

4.1 distributed energy supply system

The adoption of gas-steam combined cycle power cooling triple for the technology, power generation, the total installed capacity is about 126MW. Natural gas is used as fuel of the system, through the 100MW gas turbine to generate directly, gas turbine exhaust into the waste heat boiler, 4.0MPa medium pressure steam into the pumping unit power generation; from the gas turbine exhaust part of 1.0MPa low pressure steam for the steam and used to make cold station absorption type refrigeration unit; boiler tail gas waste heat as the heat source; energy production of power station for the supply of compressed refrigeration air conditioning system and as a part of the daily use of electricity to power grid. Energy efficiency of the whole system can reach more than 80%. By adjusting the operating conditions of gas turbine, waste heat boiler and steam turbine, it can meet the needs of different seasons and climates, and has high flexibility.

4.2 renewable energy systems

As the Furong Creek goes through the West of the industrial park, and Fujiang River flows in the north, it is very convenient to drill for water. Water comes from Furong Creek and then runs into the downstream river--Zhanqi River. The direct use of low grade energy of the water and the way of the water source heat pump can supply heat in winter and cooling in summer. The specific cooling and heat source selection strategy is electric driven water source heat pump and ice storage. It is available on making full use of the low renewable energy of Zhanqi River and the peak and valley time price policy at the same time. Ice storage is used in a low electric valley period during summer night in order to achieve the power peaking and reduce operating costs. In full use of electricity as power, the system is simple and easy to operate.

4.3 optimization design of the main body of the energy side

The energy-efficient design standards should be taken the use of reasonable architectural design about the construction of industrial park. It emphasizes the construction of natural ventilation cooling function and improves the building envelope insulation performance and air-conditioning energy efficiency ratio, and other energy saving measures. In order to ensure the same indoor thermal environment, compared with the current building external shading, construction natural ventilation and other conditions with poor and the use of low efficiency air-conditioning of the construction, the air-

conditioning energy consumption of the annual buildings should be reduced by 65%.

5 Thinking on regional energy planning of the industrial park

5.1 Focus on the highly fitting on energy planning and the overall planning of the park

The functional orientation of the civil-military integration industrial park energy planning and the positioning of the ecological sensitive areas in the spatial development pattern should be very accurate. The guiding ideology of energy planning should be put forward, that is energy saving, efficiency, ecological and environmental protection.

5.2 Operating mechanism of energy system

The system should be invested, constructed and operated according to the social and market mechanism. It is suggested that the Energy Service Companies should operate in the franchise model under the control of the government, allow foreign investments to participate and encourage the participation of independent legal persons in the operation of the market mechanism. Through the government - Energy Service Companies - users - the network Quartet agreement, relying on high-tech and modern scientific management, the "four win" goal-user, the company, the power grid and society can be achieved.

5.3 It is an important part of energy planning to grasp the characteristics of energy load and predict the accuracy of load size

The main groups of energy consumption in Mianyang civil-military integration industry park is its staffs. Therefore, the industrial park's energy load characteristics are the peak and valley difference, the disequilibrium between day and night. According to the load characteristics, the gas turbine equipment in the power station should choose aeroderivative light machine. The aeroderivative light machine can start and stop quickly and obtain higher efficiency under different load operation, so it has the ability to meet the heating load demand better. Cold storage technology is used to achieve peak shifting and valley filling of the load. According to the analysis of the geographical environment, ecological and environmental conditions and meteorological conditions in the industrial park area, local conditions to choose the supply of energy products, such as the region within the district heating supply.

5.4 regional energy planning and implementation cannot do without the support of national energy policies and regulations.

Taking the environmental benefits and other social benefits brought by the regional cooling and distributed

energy into account, the government should give appropriate incentives to the natural gas price, and lead the users to use products provided by the distributed energy system. That will be strong supports for the distributed energy.

6 Summary

The concept of energy planning in the industrial park has become a hot point in research and practice under the background of world ecological protection and environmental awareness increasingly awakening. This paper takes the civil-military industrial park of Mianyang as an example, through the analysis of the industrial park's energy planning practice, proposes that the industrial park needs to build efficient and reasonable energy supply plan and provide effective protection mechanism on the industrial park energy planning and the use of renewable energy, so as to make a certain reference on other areas' ongoing industrial park energy planning and construction in China.

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