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Construction of a Comprehensive Energy Planning Mathematical Model Coupled with Dynamic Natural Gas and Electric Energy

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Abstract

The power-energy coupling system has many advantages such as high energy utilization efficiency. It is an important development direction of energy technology and has become an important part of my country's response to climate change and energy security. At present, my country's electric energy coupling system is mainly used in the combined cooling, heating and power supply of natural gas, solar energy and wind energy. As my country's 5G construction is in full swing, the performance indicators of 5G mobile communication technology have greatly improved, but the power consumption of base station equipment has increased rapidly. The power consumption of a single 5G base station system (the sum of the power consumption of the base station equipment and the sky) is 2 to 3 times that of the 4G base station system, so the original power supply system of the base station faces great challenges. The introduction of power and energy coupling systems based on centralized power supply is a general trend. This article analyzes the system architecture of power and energy coupling systems based on centralized power supply, the energy supply relationship of various types of energy, the technical route implemented by the energy management system and the overall system architecture to finally achieve energy Intelligent management and centralized control.

Keywords: *Natural Gas, Energy, Planning;*

1. Introduction

In the process of operation and management of natural gas projects, in order to further enhance the effectiveness of management, a management plan can be formulated in accordance with the principles of science, rationality and practicability, combined with the characteristics of natural gas projects and based on relevant information. First of all, from the perspective of the safe, stable and reliable operation of natural gas projects, according to the construction content of natural gas projects, safety production management can be strengthened and personnel can be reasonably arranged and dispatched based on project commissioning, maintenance, repairs and emergency repairs. At the same time, it collects and sorts out various problems arising in the construction and operation of the project, finds out the causes of the problems through a comprehensive and systematic analysis and takes targeted measures to prevent similar situations. Secondly, according to the scale of the natural gas project and the importance of the equipment, a maintenance plan can be formulated, through regular maintenance and effective maintenance, to reduce the probability of equipment failure and improve its operational efficiency. Engineering general contracting and project management are the implementation methods of construction projects that the state vigorously promote, which can improve the level of project management, ensure construction quality and

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maximize investment benefits. Electric power design companies have been participating in general contracting projects for a long time. They have rich experience in design, procurement and construction management. They can leverage the advantages of survey, design, construction and supervision companies to adjust their business structure and improve their competitiveness. Electric power design enterprises adopt a design-based general contracting model to closely integrate engineering design, equipment procurement and construction and realize the optimization of project cost and construction period under the fundamental principle of ensuring projectquality[1]. The electric management system is in the figure below.

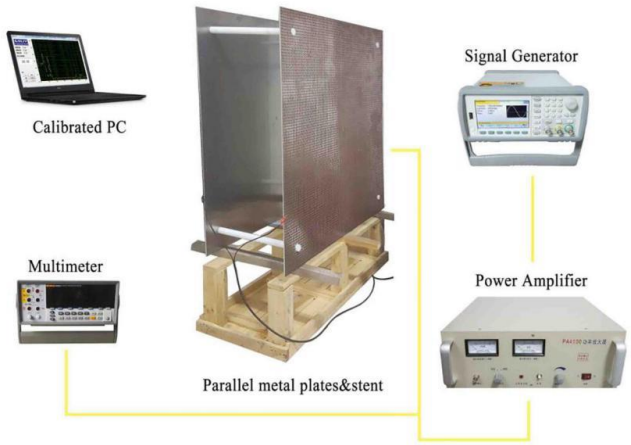

Figure1. Electric management system.

2. Analysis of natural gas management system

2.1. Establish a maintenance and management system for natural gas transmission equipment

According to the safety requirements of natural gas transmission sites, formulate a strict maintenance system for natural gas transmission equipment, establish a management responsibility system for natural gas transmission equipment, strengthen the daily maintenance and management of the equipment and perform regular overhaul procedures for the equipment to ensure that The safe operation of natural gas transmission equipment provides natural gas with sufficient pressure and temperature for long-distance pipeline systems[2]. The electric design system is in the figure below.

Figure2. Electric design system.

2.2. Improve the quality of maintenance of natural gas transmission equipment

For the maintenance of natural gas transmission equipment, it is necessary to adhere to the cross operation method, strengthen the maintenance and management procedures for the gas transmission equipment and discover problems in the equipment in time. In addition, the severely corroded and aging equipment should be upgraded to avoid the failure of gas transmission equipment and affect the smooth progress of long-distance pipeline gas transmission. Measuring instruments and pressure vessels must be maintained in accordance with relevant national regulations and the measuring instruments must be regularly checked to ensure the integrity of various natural gas transmission equipment, so as to promote the best efficiency of natural gas transmission and meet long-distance Technical requirements for pipeline transportation.Promptly deal with hidden safety hazards arising from natural gas transmission equipment. Reasonably solve emergency accidents, maintain the safe operation of various natural gas transmission equipment, such as the safe operation of natural gas compressors, increase the pressure for the separation and processing of qualified natural gas and make it enter the long-distance gas pipeline system to reach the designed transmission distance. Provide sufficient natural gas supply for users along the route[3]. The electric structure system is in the figure below.

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Figure3. Electric structure system.

2.3. Forecast the development trend of natural gas transmission equipment management measures

Only by improving the level of maintenance and management of natural gas transmission equipment, continuously improving the quality of equipment maintenance and replacing damaged parts, can the superiority of natural gas transmission equipment occur and make it better for long-distance pipeline gas transmission. Technical Support.Optimizing the natural gas transmission equipment, combining the actual conditions of the natural gas transmission site, selecting and applying high-efficiency gas transmission compressor units and selecting energy-saving electric motors to ensure that the natural gas delivered has sufficient pressure. At the same time, the energy consumption of the gas compressor is reduced. Strengthen the maintenance and management of compressor equipment. In the daily operation process, timely adjust the operating parameters of the compressor to ensure the intake and exhaust of natural gas and give enough pressure to meet the technical standards of boosting. The pipeline transportation of natural gas achieves the best benefits.The test and application of various automatic control systems have improved the automatic control ability of long-distance pipeline gas transmission systems. Maintain and manage automated instrumentation and equipment, establish a maintenance and management system for various natural gas transmission equipment and try every means to maintain and manage natural gas transmission equipment based on improving the quality of equipment maintenance and management. It also has an interlocking alarm device. When the natural gas transmission equipment is in operation, when there is a safety hazard, it will immediately give an alarm and urge the staff to deal with it in time to avoid serious equipment failures and inability to provide better services for pipeline gas transmission[4]. The electric management system is in the figure below.

Figure4. Electric management system.

3. United power energy coupling system

3.1. Data processing technology

First of all, the big data processing system in the Internet of Energy has higher requirements for operation and data processing. Cloud computing not only has strong data processing capabilities, but also can transmit and store safely. Therefore, cloud computing The processing capacity of the platform can meet the data processing needs of the changing times. Its essence is to take the virtual processing of physical resources and computing resources as the leading factor to realize the scientific allocation and utilization of data resources. It can be said that the cloud computing platform has relatively more elastic indicators. Ideally, it can reasonably reduce operating costs based on the use of its own data computing capabilities and promote continuous reduction in energy consumption. In addition, the security index of cloud computing platforms is generally high, which can protect user data and reduce the risk of leakage. Secondly, data visualization is based on the principle that while

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using computer image processing technology, the original abstract data information is transformed into visual image information and then the data is completely presented on the screen, which can relatively improve the quality of interactive processing. , The modern technology and disciplines applied in data visualization technology are relatively rich, whether it is image design or computer-aided design, which can provide basic guarantee for the visualization of data[5]. The electric management display system is in the figure below.

Figure5. Electric management display system

3.2. Distributed data mining technology

Any abnormality or failure of the equipment must be discovered and corrected in time. This requires us to cluster the status data of the device and we also need to determine whether the device is in a normal state or an abnormal state. Using the clustering method, we can divide the data into different clusters. Although the differences between different clusters are relatively large, the differences between the same clusters are relatively small. Because the amount of data in the energy Internet is very large, we can take a step-by-step method to process clusters and execute the entire cluster as a hadoop task and then effectively reduce it through iterative computing and distributed computing Calculation time. Practice has proved that the application of electric power big data in all aspects of the power industry, from the location of wind farms of power companies, to the construction of power distribution networks and daily management, all play an important role. With the acceleration of my country's smart grid construction , The development trend of electric power big data is presented as follows: First, electric power big data technology is becoming more and more perfect and the scope of application is getting wider and wider. With the construction of smart grids, the application of big data technology in power companies has become more and more extensive, which has promoted the production mode of power companies and increased the accuracy of power companies' forecasts; second, online monitoring has been realized and smart technology has become more and more The more perfect. The working environment of wind turbines in the power system is relatively harsh. It not only has to bear high-load working pressure, but also needs to withstand the impact of various natural phenomena. Therefore, monitoring the operating status of wind turbines is an important factor to ensure power work. Wind power based on big data The early warning system realizes real-time online monitoring of the equipment. The equipment hypersphere model is created through the device attribute configuration definition and the model is used to evaluate the equipment condition in the online hypersphere model. The output of the online evaluation model is the similarity curve for correlation points Sorting, state warning and prediction of measured point values; the third is the application of big data technology in power grid disaster warning[6]. The electric machine system is in the figure below.

Figure6. Electric machine system

4. Comprehensive energy planning model

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4.1. Resource coordination development planning design and model

In combination with the specific planning plan, when designing the integrated energy coordinated optimization development plan, the overall planning of the area can be carried out according to the specific energy supply rated amount in the area, the energy demand in the new area, etc., to ensure that the plan is in line with the integrated energy The basic goal of coordinated development. According to the specific characteristics of the new area, relevant energy information platforms, energy transmission systems and thermal energy supply channels can be established in the planned area of the new area. The photovoltaic power generation system, wind turbine power generation system, natural gas supply system and hydropower supply system will provide energy, including thermal energy, Electric energy, water energy and natural gas energy are continuously delivered to energy terminals, including smart buildings, public buildings, residential areas and data centers, so as to fully supply energy while supervising and planning the energy supply process intelligently and in real time. While meeting the development and demand of the new district, it realizes the synergy and optimization of integrated energy.

4.2. The specific planning process for the integrated energy system

First, according to the integrated energy coordinated optimization development plan designed in the above design, specific calculation and data analysis of the existing power grid distribution status, existing resource demand and supply in the new area are carried out and some areas of the new area are divided according to specific conditions. As a demonstration area, analyze the specific utilization conditions and usage requirements of the electric energy and other energy in the demonstration area; second, divide the demonstration area according to the regional characteristics and distribution and examine and adjust the rationality of the division method. The characteristics of rivers and mountains in the area are reasonable to plan the grid area to ensure that the energy supply of each area is relatively independent. At the same time, after the start of supply, the area load and the comprehensive energy demand of each grid area in the demonstration area are targeted Carry out real-time observations and compare the observed data on a regular basis; third, during the observation period, the GIS system needs to be used to comprehensively evaluate the grid specific energy utilization and energy saving and adjust the division plan according to the actual situation. Complete, comprehensive consideration of regional constraints, target planning frameworks and important user protection plans, etc. and formulate a comprehensive and scientific comprehensive energy coordination and optimization specific planning plan. According to the plan, the social generated in each grid area during this period Comprehensive evaluation of effects, economic effects and various index data and final planning strategies are determined based on the results of achieving their goals.

5. Conclusion

At the same time, the equipment is upgraded and transformed, the transformation design of natural gas transmission equipment is increased and the innovative consciousness of equipment management personnel is developed, based on improving the operating efficiency of the equipment. The structural transformation and treatment of various natural gas transmission equipment is carried out and the basic starting point is to improve the gas transmission efficiency and the equipment management procedures are continuously improved. Improve the automatic control and management capabilities of natural gas transmission equipment and reduce the influence of human misoperation factors. Maintain the integrity of various natural gas transmission equipment. Once hidden troubles are found in the equipment, emergency measures are taken to immediately solve the equipment problems, so as to ensure the safe operation of natural gas transmission equipment and provide reliable pressure for natural gas to enter smoothly To the pipeline system, meet the technical requirements of long-distance pipeline

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