Digital Energy Saving System of Electric Renewable Energy Based on Internet Information Technology

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Abstract: With the development of science and technology, renewable energy for electricity plays an increasingly important role in people's lives. In order to provide users with high-quality services and environmentally friendly and energy-saving products, the use of Internet technology is particularly meaningful for the research of renewable electricity resources. This paper first constructs the renewable energy electrical digital intelligent system of Internet information technology, analyzes its performance, and then designs a digital energy-saving system, and obtains the final result through experimental data testing. The test results show that the performance of the digital energy-saving system of electric renewable energy can stably query historical data and process energy-saving data of renewable energy to meet the actual needs of users.

Keywords: Internet Information Technology, Electric Renewable Energy, Digital Energy Conservation, Energy Conservation System

1 INTRODUCTION

With the rapid development of China's economy, the power industry is also making continuous progress, especially in recent years, the country has increased the development of hydropower energy resources. However, due to the problems of immature technology and high cost, some existing small and medium-sized power generation projects cannot meet the needs of users[1]. Therefore, in view of these current situations, an Internet based information technology is proposed to build an intelligent electric vehicle control system with digital energy saving system as the core power and multiple functions in one, so as to achieve the goal of low carbon environmental protection in renewable energy and common development between smart grid and power industry, thus solving a series of problems such as energy shortage[2].

Many foreign scholars have made extensive and in-depth analysis on the digital energy-saving design and system research of electric power renewable energy under the Internet environment. The United States, Japan, Denmark and other developed countries have all established corresponding network models and achieved a high level of simulation calculation methods and technologies, but have not yet formed a perfect system. Domestic scholars have done more in-depth analysis and simulation of the multi-level renewable energy in the power

EMIS 2023, February 24-26, Chengdu, People's Republic of China
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DOI 10.4108/eai.24-2-2023.2330634

system. At the same time, due to the large defects of the power industry, the grid operation efficiency and economy are poor. Some scholars have built a set of smart grid models suitable for digital power generation based on the transmission characteristics of various resource data information and energy consumption models in the power network. This method can solve the problems existing in traditional energy and reduce system energy consumption, achieving a double harvest of economic benefits and environmental benefits. Therefore, based on Internet information technology, this paper studies and designs the digital energy saving system of electric power renewable energy[3].

With the increasing demand for electric power, China has put forward higher requirements for the development of renewable energy power generation system. This paper aims at the energy consumption problem caused by current users in the process of using thermal power equipment, and it is of great significance to design and implement an intelligent solution based on Internet information technology that is suitable for users and can efficiently use power resources, reduce energy consumption and carbon emissions[4].

2 DISCUSSION ON THE DIGITAL ENERGY SAVING SYSTEM OF ELECTRIC RENEWABLE ENERGY BASED ON INTERNET INFORMATION TECHNOLOGY

2.1 Electric Renewable Energy

Electric renewable energy refers to power generation through electric energy, which can be directly converted into new energy, also known as clean fuel or renewable resources. In the power transmission and distribution system, it is mainly used for distributed power generation (including energy storage devices), distributed distributed central heating and power supply system and power consumption for long-distance transmission of large capacity loads. At present, photovoltaic cells are widely used as the main source for power generation to provide power supply in China. However, this form has the characteristics of high cost and large investment, so it has caused pollution to the environment to a certain extent. In the power system, renewable energy refers to the energy form composed of solar energy, wind energy and biomass power generation devices. The sunlight is converted into harmless gas through photosynthesis. It has the characteristics of universality, clean environmental protection and non pollution, making it one of the richest and cheapest new energy sources in the world. Wind power generation technology is mainly developed and used by the United States as a renewable energy - wind turbine, which plays an important role in the power system and is the foundation and core equipment for large-scale application of wind power. Among them, wind turbine (referred to as full wave generator) has been widely used in power grid as a new and efficient energy alternative. Compared with traditional fossil fuels, its main characteristics are pollution-free, clean and environment-friendly, low-carbon economy and other advantages are considered to be one of the most important power system technologies with the most applications, the widest prospects and the greatest potential.

2.2 Digital Energy Conservation

Digital energy conservation refers to the control of the operating state of the power system to enable it to achieve the development goals of energy and environment, economic and social benefits, etc. on the basis of meeting the needs of users, and the combination of traditional power generation methods and computer communication technologies to achieve efficient utilization of multiple energy resources. It is an intelligent method to simulate the power consumption and operation cost required under different conditions by establishing corresponding models, and then determine the best scheme according to the calculation results, and control the effect to achieve the optimal state to complete the whole process. Smart grid has the characteristics of high stability and strong adjustability, and also has the advantages of strong network resource sharing ability and low energy consumption. Therefore, big data technology can be used to analyze and solve the problems and shortcomings in traditional power grids, and establish a digital energy saving model based on Internet information technology. With the rapid development of the Internet, various forms of energy are emerging, among which electric energy, wind energy and solar energy are widely used in the power system. A large number of smart grid management modes have been widely used in the power industry. The system is based on distributed control. It uses the combination of advanced communication networks and the Internet to achieve remote control and monitoring purposes. At the same time, it can also complete the setting of energy conservation goals by collecting, processing and analyzing various information. It can also provide personalized services according to different user needs[5].

2.3 Internet Information Technology

With the rapid development of Internet information technology and the increasing demand of people for related technologies, these two factors affect various application technologies and service levels in this field, thus making it face huge challenges and opportunities in the future development. Various intelligent terminal devices are also rapidly popularized. The Internet is a carrier of information. Its essence is to use computer network technology to process and transmit data. Information technology based on computers and communication networks includes sensors and embedded systems, as well as application software provided by these information processing devices. In the Internet environment, it is possible to share and complement various types of resources. By integrating a variety of energy sources into a new energy source, such as solar cells and other renewable energy sources, we can convert a variety of energy sources into heat energy as a new form to use in all aspects around us, such as solar water heaters, etc. We can flexibly choose the functional equipment needed according to actual needs, and also provide users with rich, diverse and personalized services. At present, there are many cloud computing platforms and service systems with various types, perfect performance and complete functions in China. However, due to the late start of Internet technology research in China, it is still in the primary stage and lacks relevant talents, leading to its inability to meet users' needs for various resources in the network environment. A large amount of hardware resources are required in this platform. Therefore, it must have communication, storage and computing capabilities to a certain extent, which depend on the corresponding software systems, databases and other infrastructure construction and operation management systems. The use of association rules in the data mining of electric power renewable energy digital energy saving system can easily find the frequency of each

renewable energy digital use. The single dimension association rule is an expression in the form of A=B, which means that A is associated with B. If D represents the set of transactions in the database, the condition that A=B is true in transaction set D needs to meet certain support S and confidence C. Support S refers to the ratio of the number of transactions containing A and B to the number of transactions containing D, and confidence C refers to the ratio of the number of transactions containing A and B to the number of transactions containing A. Namely:

$$\text{Support}(A \Rightarrow B) = P(A \cup B) \tag{1}$$

$$\text{Confidence}(A \Rightarrow B) = P(B \mid A) = P(A \cup B)/P(A) \tag{2}$$

The rules that meet the minimum support and minimum confidence are called strong rules[6].

2.4 Application of Internet technology in the electric power system

(1)communication technology

The development of power system needs to promote the improvement of power distribution level, use computer technology, data transmission technology and control technology, scientifically and reasonably optimize the management, improve the overall work effect, avoid the influence of certain factors, and solve the problems faced. Intelligent power distribution helps to improve power quality, ensure power supply efficiency, and control the overall cost of power distribution.

(2) Control technology

In the application stage of modern control technology, in order to realize the effective control of power system, we should pay attention to the innovation of application concept, promote the wide application of modern control technology in the control of power system, fully show its application value, promote the intelligent and systematic development of power system, and ensure the control effect of power system.

(3) Video and image technology

In the mature stage of Internet technology, video image technology has developed rapidly, which can effectively show its role in the field of electric power, has a broad development prospect, and the practical application effect has been fully guaranteed. In the process of using image information technology, it can provide guarantee for the automation and intelligent development of power system and play an important role.

3 EXPERIMENTAL PROCESS OF DIGITAL ENERGY SAVING SYSTEM OF ELECTRIC RENEWABLE ENERGY BASED ON INTERNET INFORMATION TECHNOLOGY

3.1 Power Renewable Energy Digital Energy Saving System Based on Internet Information Technology

The intelligent energy system described in this paper (as shown in Figure 1) is mainly based on Internet information technology to transmit the processed data information required in renewable energy to the power grid management department through the network. The system includes the control of fans, pumps and other equipment and the detection of power quality. Wind turbines, battery packs and inverter stations all have their own independent operation characteristics and are complementary to each other, which play a significant role in the energy consumption of the entire power grid[11]. Renewable energy access points mainly refer to the distributed energy system connected to the power grid through the Internet. This system is mainly composed of power supply, fan control modules and data acquisition and processing parts, including power supply, Operation of wind turbine and monitoring of wind power generation. Power supply includes power grid voltage fluctuation monitoring and adjustment and electricity regulation. In the system, remote operation and control are carried out through real-time change-over switch and automatic shutdown function is used to realize power grid load information interaction and other functions to complete the regulation and control of the whole system on wind turbines, photovoltaic power plants and power transmission and distribution lines[7].

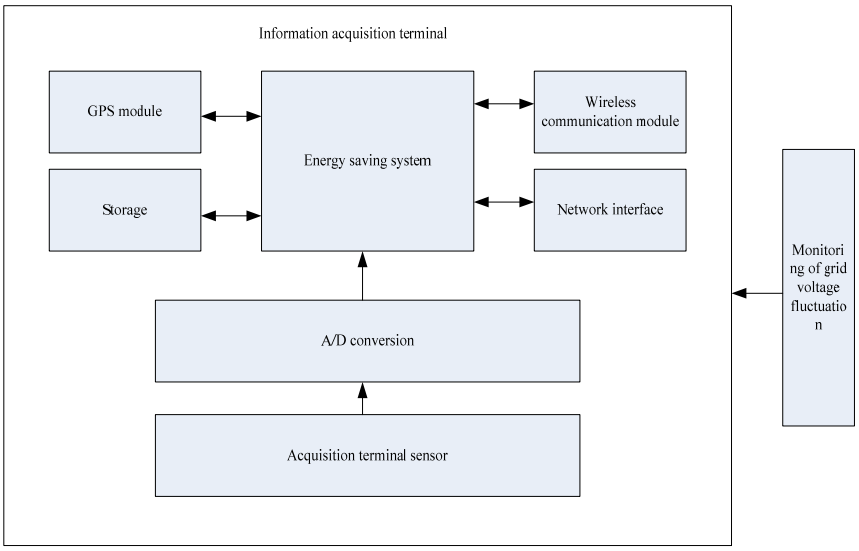

Figure1. Digital energy saving system for power renewable energy

3.2 Performance Test of Power Renewable Energy Digital Energy-saving System Based on Internet Information Technology

In the whole system testing process, it is mainly divided into two parts, one is simulation operation. The simulation operation is to realize the digital energy saving design and calculation of power renewable energy computer aided energy through the user's operation of the model[10]. The second is data processing and analysis. According to the actual situation, the intelligent terminal technology and cloud platform are used to test the information transmission, power quality detection and other work processes between the functional modules of the electric renewable energy system. After completing the design task, the Internet information technology is used to upload the test results to the remote PC terminal for real-time monitoring. The digital energy conservation of renewable energy has been realized in the whole power industry, and it has been applied to the grid operation for simulation analysis. At the same time, the characteristics and relevant parameters of renewable energy access points and distributed energy generation modules have been introduced in detail. Finally, the corresponding methods have been adopted for the comparison and verification of system performance test results under different conditions[8].

4 EXPERIMENTAL ANALYSIS OF DIGITAL ENERGY SAVING SYSTEM OF ELECTRIC RENEWABLE ENERGY BASED ON INTERNET INFORMATION TECHNOLOGY

4.1 Performance Test and Analysis of Power Renewable Energy Digital Energy-saving System Based on Internet Information Technology

Table 1 shows the performance test data of the digital energy saving system of electric renewable energy.

Table1. Energy saving system performance

Electricity renewable sources	Time of the database query(s)	Historical data query time(s)	Stability prediction accuracy rate(%)
Wind power	31	21	98
Tide	23	25	94
Hydraulic power	45	42	96
Solar energy	26	34	92
Biomass	37	35	97

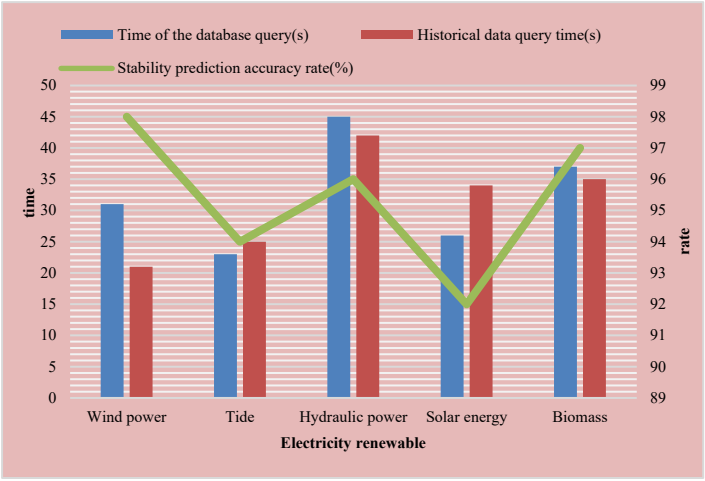

Figure2. Power renewable energy digital energy saving system performance

The test adopted in this design is mainly to simulate the operation of each functional module in the system, and then analyze whether the real-time alarm of electric power renewable energy computer works normally under different parameters[10]. In the whole process, users need to use renewable energy Internet information technology to achieve the performance index requirements of energy resource management and utilization, as well as information transmission and interaction between various devices, select appropriate schemes according to the actual situation, and determine corresponding strategies according to the grid load and related factors. This design mainly carries on the simulation operation test analysis to the system function module. It can be seen from Figure 2 that the performance of the electric renewable energy digital energy-saving system can stably query historical data and process the energy-saving data of renewable energy[9].

5 CONCLUSION

With the rapid development of economy and the enhancement of people's awareness of environmental protection, China's energy resources are decreasing. Therefore, the digital energy-saving technology of renewable energy has been widely studied. This paper will build a green low-carbon intelligent operation system of power system based on Internet information technology. The system consists of data acquisition, wind power generation model, micro grid and other parts. Through sorting out and analyzing relevant literature, it is found that its main function is to collect the energy required by wind turbines, solar panel power supply systems and battery packs by using the conversion of electrical energy storage devices, and design corresponding auxiliary services according to the needs of different types of users.

5.2 System Reliability

In this paper, the fuzzy neural network model is used to analyze the reliability of the system. In order to verify the accuracy of the results, the historical power data of wind power in 2021

is selected for network model training, and the later data are applied to verify the prediction results. The comparison between the prediction results and the true value is as shown in Figure 3.

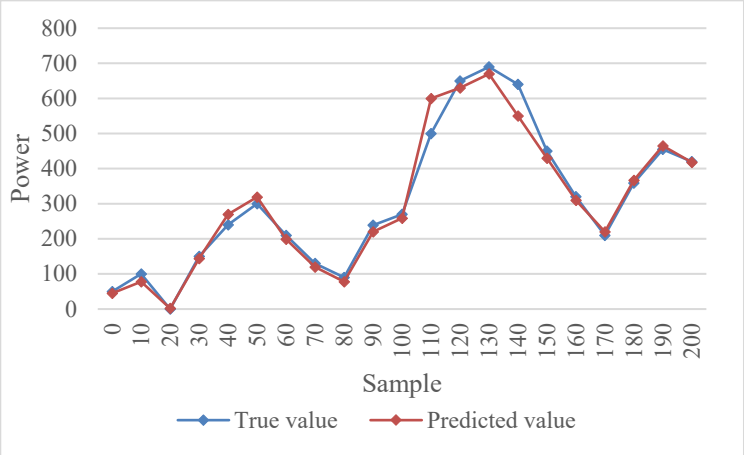

Figure 3. System reliability test results

From the comparison of the fluctuations between the two forecast data and the real value, it can be seen that the predicted results can basically meet the needs of the real results prediction, and the rolling prediction of wind power output power has a good effect.

Acknowledgements: This work was supported by center of mass entrepreneurship and innovation state grid zhejiang electric power co., Fund: State Grid Zhejiang Electric Power Co., Zhejiang Electric Power Co., LTD. (Research and Innovation of Provincial Renewable Energy Digital Ecological Service Platform, B711JZ21000Z)

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