Research on the Development of Key Technologies of Energy-Saving Campus Information-Based Energy-Saving Supervision Platform Based on Building Energy Consumption Characteristics

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Abstract. At present, building an energy-saving campus supervision platform is one of the best energy-saving methods for colleges and universities. In order to improve the effect of supervision and energy saving better, we must continuously analyze and summarize the test data. This paper analyzes the needs of energy-saving campuses.

Keywords: Construction Project Supervision, Cloud Platform, Cloud Computing, Cloud Storage

1. Introduction
Institutions of higher learning are the main positions for cultivating talents and promoting technological progress. Carrying out an economical campus can promote the school's resource conservation, reduce school costs, and it plays a leading and exemplary role in society. This can promote teachers and students to establish awareness of energy conservation and environmental protection, it has a profound impact on our country's economic and social development [1].

2. The concept and content of energy-saving campus construction
Energy-saving campus construction refers to following the scientific development concept in school running and campus facility construction and operation management, and forming a good saving education concept and a conservation-oriented campus cultural atmosphere. The construction of a conservation-oriented campus includes:

1) Strengthen energy-saving and water-saving operation supervision, strengthen energy and water consumption monitoring, statistics, analysis and auditing, and establish an energy efficiency publicity system;

2) New buildings strictly implement the mandatory standards for energy and water conservation, and the construction unit must plan, design, and supervise the project in accordance with the corresponding building energy and water conservation standards;

3) Carry out low-cost, energy-saving and water-saving transformation;

4) Actively promote the application of new technologies and renewable energy [2].
3. System function analysis of energy-saving campus building energy-saving supervision platform

At present, the energy consumption of colleges and universities is mainly water and electricity. The construction of an energy-saving campus is to promote new energy-saving technologies under the premise of low cost, and conduct online energy consumption monitoring, statistics, analysis and audits to achieve the purpose of strengthening energy use supervision [3]. Most colleges and universities that have carried out the construction of energy-saving campuses basically install online monitoring equipment on existing energy-efficient buildings to classify and sub-monitor hydropower energy consumption, and follow The requirements of the Regulations are uploaded to the supervision platform in real time, and the main functions are as follows:

   Classified energy consumption statistics: refers to the energy consumption data collected and statistically sorted according to the main energy consumed by campus building facilities

   Itemized energy consumption statistics: refers to the energy consumption data collected and statistic according to different energy consumption systems in campus building facilities, such as air-conditioning electricity, power electricity, lighting electricity and special electricity consumption.

   Energy consumption query: displays energy consumption monitoring data in various forms and classification methods. Each unit can display it according to their needs and conventions, such as query by building, query by unit, query by branch, query by household, etc.

   Energy consumption analysis: It can compare the energy consumption of each branch in the same building during working hours and non-working hours, as well as the comparison of different time periods of sub-item, household, and branch data among different buildings.

   Energy consumption settlement: Calculate energy consumption information, display it in a variety of ways such as curves, tables, and pie, and automatically generate energy consumption reports to achieve the purpose of energy consumption publicity [4].

   Energy consumption alarm: Find the abnormal situation of energy consumption of the building through certain query conditions, so as to find and maintain in time, and view the cumulative alarm situation of the selected building in the selected time.

4. Main function design of energy-saving campus building energy-saving supervision platform

Based on the above analysis of the main functions, we carry out the basic design of the campus energy-saving supervision platform. The overall system function diagram is shown in Figure 1.

![System function overall diagram](image)

**Figure 1. System function overall diagram**

4.1. Energy consumption monitoring function design

The energy consumption monitoring function should face all key energy-consuming buildings and students, through the installed online monitoring equipment, and after logging in to the interface, select the corresponding building in the map for online monitoring, as shown in Figure 2 [5].
4.2. Design of energy consumption query function

Energy consumption query users include students and administrators. Student users can only query related records of the user itself, such as deduction record query, meter reading record query, collection and refund record query, subsidy payment record query; while administrator users support multi-user record query and system log query And equipment record query, as well as by building, by unit, sub-model, sub-data, branch model, branch data, household data, water and electricity branch data, water branch longitudinal comparison and other advanced functions.

After the student user logs in according to the account number and password, the displayed information includes the account number, account status, account name, address, number of dunning of the unit, certificate type, certificate number, fixed phone, mobile phone, prepaid token, account opening time, and cash balance, Subsidy balance and other data.

Administrator users can perform different queries according to different needs, such as searching by building. According to the building list, you can concisely view the function classification, quantity, area, data information, building number, etc. of the building. The system function structure diagram is shown in Figure 3 [6,7].

**Figure 2.** Flow chart of energy consumption monitoring function

**Figure 3.** System functional structure diagram
4.3. Energy consumption analysis function design
The specific function design of energy consumption analysis includes horizontal and vertical comparison of branch, sub-item, and household data of each building, and loss comparison.

The horizontal comparative analysis function is to compare the selected time and selected sub-items among selected different buildings [8].

The longitudinal comparison analysis function compares the power consumption data of the same branch of the selected building on different dates, and displays it in the form of tables, graphs, and histograms. The main functions are the daily power consumption comparison of the working hours and non-working ratios, weekly power consumption comparison, monthly power consumption comparison, and annual power consumption comparison of each campus building or branch in the building. It is convenient Managers can perform functions on the situation, so as to compare and analyze the energy consumption of the branch. Conduct analysis and discover unreasonable energy use in a timely manner.

The main function of day and night energy consumption comparison is to analyze and compare the energy consumption data of the currently selected building (one or more) during the same working hours and rest periods, and display it in the form of a table or a bar graph [9]. This item is subdivided There are four functions of daily power consumption comparison, weekly power consumption comparison, monthly power consumption comparison, and annual power consumption comparison. It realizes the comparison of the energy consumption of each building or branch road in the entire campus during working hours and non-working hours, which is convenient for management personnel to analyze the situation and discover unreasonable energy use in time.

4.4. Energy consumption publicity function design
The energy consumption publicity function includes an overview of school district energy consumption, building power consumption publicity, and a summary of yesterday’s power consumption, showing the total energy consumption of the school, the proportion of energy consumption of various buildings, the total monthly energy consumption of each building, the energy consumption per capita, and the consumption per unit area The energy consumption ratio of various types of buildings is displayed in the form of tables and charts [10].

5. Conclusion
In summary, we will continue to promote the construction of an energy-saving supervision platform. We must gradually expand the scope of monitoring to all energy-using instruments and individuals. We should not only distinguish equipment energy use and personnel energy use, but also separate necessary energy use from non-essential energy use. We also need to concretize and refine energy consumption data. We must prepare for the establishment of a standard system of energy consumption quotas for colleges and universities.

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