Research on the Application of Energy Planning in Prefectures and Cities Under the New Situation of Energy Transition

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Abstract. The energy Internet era has revealed the inevitability of energy in the social and economic development of clean, efficient and intelligent transformation, and has accelerated the transformation and upgrading of the social industrial structure. In order to give a planning application research on the combination of urban energy planning and city conditions at prefecture-level cities, this article combines national strategic deployment, location advantages, urban development main lines and other factors that affect urban energy planning to comprehensively integrate the energy planning basis of L city, and give the energy development plan of the prefecture-level city. It focuses on introducing the five new technologies of the CIM-based urban energy planning platforms. The data of enterprises, population, water, electricity, gas, and carbon emissions required for urban energy planning are used to establish multi-dimensional urban energy planning related data resources and adopt visible display method of the energy flow. It also gives detailed application scenarios. Engineering application scenarios are taken and provide a technical research theoretical basis for cities to carry out energy planning application demonstrations.

Keywords: Energy Planning · Energy Consumption · Data Fusion · Application Scenarios

1 Introduction

Urban energy planning is based on the principles of development concepts, scientific calculations, and expert decision-making. According to the requirements of changes in domestic and foreign situations, the development of the urban energy supply system, energy consumption system, energy industry system, and energy management system is designed and planned. It is to coordinate the distribution of urban energy, Varieties, facilities, industries and other elements form a systematic and reasonable development. However, most of the current energy planning of prefecture-level cities is mostly based on theoretical research to form implementation plans or policy actions. The application scenarios in cities are still relatively limited because of the lack of application research on

J. Sun et al. (Eds.): SSESD 2022, ASSEHR 684, pp. 16–23, 2023.
https://doi.org/10.2991/978-2-494069-13-8_3

scene display and urban energy planning Xiejie. Urban energy planning is of great significance to promote the implementation of the energy revolution in cities and promote the upgrading of urban competitiveness ranking [9, 13]. The author compares and conducts research on energy development planning at the prefecture-level and city level from the research on energy planning in the 14th Five-Year Plan carried out by 13 prefectures and cities in Jiangsu Province, combining local energy resource endowments, location advantages, urban development main lines and other types of cities that are involved in influence The factors of energy planning are comprehensively considered, and the energy development plan of the prefecture and city is given. It focuses on introducing the new technologies of the five CIM-based urban energy planning platforms. The data of enterprises, population, water, electricity, gas, and carbon emissions required for urban energy planning are used to establish multi-dimensional urban energy planning related data resources and adopt visualization Show method of energy flow, and give detailed application scenarios.

2 Current Status of Energy Planning in Prefectures and Cities

Energy planning is a type of special planning in the national planning system. According to public information, the energy industry includes coal, oil and gas, electric power, renewable energy, hydropower, wind power, photovoltaics and other special plans that involve the development of important resources. They are divided into national-level special plans. And local government two-level planning. Currently, there are 73 cities for which local governments have issued energy development plans for the 13th Five-Year Plan, including the 4 municipalities directly under the Central Government, Beijing, Tianjin, Shanghai, and Chongqing, and the number is less than 1/3 of all prefecture-level cities in the country. There are only 5 cities in Jiangsu Province that have formulated energy plans during the 13th Five-Year Plan period.

At present, the political status, economic level, and resource endowment of a prefecture-level city determine the necessity of the city's energy planning. For example, Xuzhou's economic aggregate ranks first among the cities in the core area of the Huaihai Economic Zone and the five cities in northern Jiangsu. Coal resources account for about 92% of the province's total. The direction of energy development. At the same time, five special plans including supporting natural gas, comprehensive utilization of resources for power generation, cogeneration, coal, and new energy (renewable energy) have formed a "1 + 5" energy planning system.

Although the existing prefecture-level energy plans have been formulated to the greatest extent in accordance with the principle of subordinate planning subordinate to superior planning, subordinate planning serving superior planning, and equal planning, it is still difficult to adapt to the current complexities in solving urban energy problems. Current status of urban energy. Urban energy planning mostly stays at the level of urban strategy, and there is a certain disconnection from the application scenarios of urban planning, and it lacks key technical support to support the application of actual scenarios.

3 The Development Trend of Urban Energy Planning

With the transformation of my country's energy development strategy and the gradual deepening of the impact of energy supply and use on my country's economic, social development and environment, the formulation and implementation of sustainable energy strategies are no longer a certain sector and a certain industry has to face. It is a major strategic issue that requires the participation of the whole society from the country to the locality, from industrial production to people's lives.

The integration of green, low-carbon, and energy-saving concepts in urban energy planning has continued to deepen. In 2006, the Chinese Academy of Sciences published the 'China Sustainable Development Strategy Report' which proposed to build a resource-saving and environment-friendly society. At the same time, it summarized five supporting systems from the current problems faced by cities, and transformed the resource- and energy-intensive economic growth model to a conservation-oriented society. Develop into the consensus of the whole society. Some provinces and cities have combined energy-saving and emission-reduction policies and started to promote low-carbon and energy-saving life concepts by advocating low-carbon travel and other measures. Shanghai has improved the efficiency of building energy use through monitoring, statistics, and analysis of building energy consumption; Baoding has explored the urban low-carbon development model by developing the comprehensive application of new energy and the development of renewable energy industries. Under the path of modern energy system construction, it is more urgent to pay attention to the integrity, systematic and sustainable development of energy, environment, and economy. Special urban power planning, thermal special planning, gas special planning, and other energy plans are all based on overall planning to promote the urban foundation Facilities, emerging industrial systems, and environmental and ecological friendliness are the key points. While paying attention to the green growth of the urban economy, it also pays attention to the restriction and influence of energy, a production factor, on sustainable development [1, 10, 12].

The energy planning of prefectures and cities pays more and more attention to the coordinated development of people-oriented energy governance. The "urban disease" brought about by climate change has seriously endangered the quality of life and even the safety of urban residents. Combining advanced governance concepts with advanced technical means is an effective strategy adopted by prefectural energy planners [6]. In the industrial field [3], traditional industrial enterprises are accelerating the use of a new generation of information technology empowerment to promote the digital transformation of enterprises, linking energy and resource data throughout the life cycle of production, operation, and market, and continuously improving their competitiveness. In the transportation field, promote electric vehicles as a flexible resource to participate in demand-side response, optimize the operation mode of the power system, and improve the overall investment efficiency and operating efficiency of the system. In the field of architecture, energy consumption monitoring and adaptive management of urban buildings are carried out through intelligent management systems to achieve energy conservation and emission reduction [7].

4 New Technology of Urban Energy Planning Platform Based on CIM

4.1 Multi-source Energy Data Fusion Technology

This technology realizes the integration of all elements of energy planning and energy management, and realizes the urban CIM data base, urban energy status data, urban energy planning data, urban energy use management data, and carbon emissions with the needs of business scenarios such as carbon emissions and energy supply as the core. All-element correlation of online monitoring data. This technology can establish the fusion of various business data and CIM spatial data such as terrain, images and three-dimensional models; from the data type, it can support the fusion of spatial data and non-spatial data, the fusion of structured data and unstructured data, and various spatial data. Own data fusion, fusion of streaming media data and spatial data, fusion of IOT data and spatial data, etc.

4.2 Energy Data Spatialization Engine

Build a location analysis engine, establish spatio-temporal semantic iteration rules based on geographic entity coding specifications and place name address coding specifications, adopt artificial intelligence word segmentation algorithms and named entity recognition algorithms to realize automatic analysis from CIM spatial location descriptions to spatial location coordinates, and realize each The spatialization of information such as the location of the energy-like business data and the location of the description object. In addition to the locating capabilities of addresses, administrative divisions, streets and gates, and intersections, the forward resolution capability also supports pinyin input, Chinese character error correction, and synonym matching processing capabilities. The reverse geocoding engine can convert geographic coordinate values into recognizable Chinese address or the nearest standard address that matches it.

4.3 Energy Data Spatio-Temporal Analysis Algorithm

This technology can build spatio-temporal analysis algorithms for business application scenarios such as city operation, energy distribution, carbon emission distribution, energy planning distribution, etc., including: spatial analysis, classification analysis, regression analysis, cluster analysis, correlation analysis, time series analysis, etc. Mainly realize heat map analysis based on discrete points, point event-based spatiotemporal change analysis and land parcel analysis, spatial migration change analysis, spatial influence range analysis, etc.

4.4 Carbon Emissions Smart Accounting Calculation Engine

Build an indicator calculation engine for online carbon emission monitoring and intelligent accounting. This indicator system should include: indicator type, indicator name, indicator connotation, indicator source, calculation rule, access path, presentation method, etc. Index calculation rules come from urban energy planning, energy use monitoring, energy use management related planning and design results, technical guidelines, standard specifications, related policy documents, etc.

4.5 Multi-source Data Two-Dimensional and Three-Dimensional Integrated Visualization Engine

This technology can realize the integrated visualization of 2D and 3D data in different business scenarios based on the CIM platform, provide a high-rendering visualization engine, realize the reconstruction and lightweight processing of 3D model data in different business scenarios, and support the realization of the integration of three-dimensional space above and below ground Browse to realize the integrated browsing of continuous space from outdoor to outdoor. Visualized browsing of lightweight data of large-scale BIM models of buildings, roads, bridges, etc., to achieve dynamic data such as IOT data, carbon footprint trajectory data, and mobile phone signaling data for rendering visualization in a three-dimensional scene, presenting full-space three-dimensional data and information.

5 Urban Energy Development Planning Case Application Display

5.1 Research on the Characteristics of L City Energy Development

It focuses on studying the characteristics of the L city energy system from 8 dimensions, including energy supply, energy consumption, energy technology, infrastructure, energy management, energy industry, ecological environment, and demonstration projects [2, 4, 5, 8, 11]. The characteristics of the energy supply and demand side mainly start from the factors that affect the total energy consumption. From the perspective of economic structure, there is a one-way relationship between the economy and energy growth of China's overall cities. The total energy consumption is basically in the same ranking. In addition, the higher the proportion of the secondary industry, the higher the level of urbanization will lead to high growth in energy consumption. The energy characteristics of the supply side also need to grasp the total amount of import and export of primary energy and high-grade energy in the city and judge the degree of dependence of the city on external energy. On the consumption side, it is measured under the three major energy consumption sectors of industry, construction, and transportation that are used internationally. Industrial energy consumption accounts for the highest proportion, and the dominant position is obvious; building energy consumption mainly comes from public building energy consumption and residential consumption; clean transportation and electrification are features that need attention.

5.2 Research on the Energy Flow Direction of L City Energy System

In the statistical yearbook published by the Urban Statistics Bureau, the main energy consumption of industrial enterprises, the comprehensive energy consumption of industrial enterprises by industry, and the consumption of main energy products by industry can all be converted into standard coal. Figure 1 shows the energy flow of L city more intuitively.

Figure 1 clearly shows the energy flow direction of L city's primary energy after processing and conversion into secondary energy, and finally flowing to the terminal in different energy situations.

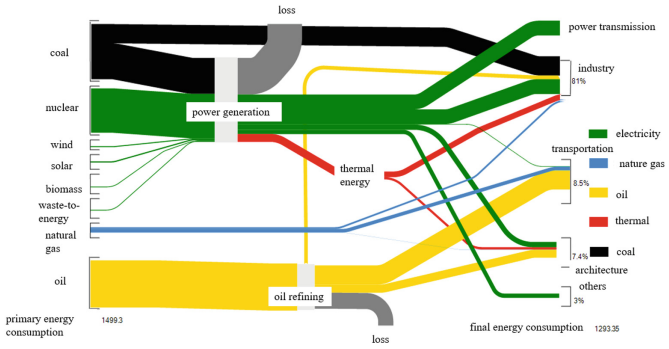

Fig. 1. Energy flow diagram of L city.

5.3 CIM-Based Application Cases and Results

Based on the CIM-based urban energy system planning, monitoring, analysis, and display platform, the data on enterprises, population, water, electricity, gas, underground pipelines, carbon emissions and other data required for urban energy planning have been established to establish multi-dimensional urban energy planning related data resources and The spatial and temporal relationships of urban CIM's spatial element objects (districts, roads, plots, buildings, street lights, etc.) provide computing service interfaces and related statistical charts, which can quickly realize data visualization based on the external output data services and capabilities of the CIM platform Show, provide the city's full-space three-dimensional visualization, dynamic data visualization, analysis result visualization, lightweight big data visualization and other capabilities, supporting various data applications related to urban energy planning.

Through the application of multi-source energy data fusion technology, it has broken through the urban CIM data base and urban energy planning management and other multi-source data technical barriers; applying the energy data spatialization engine to transform various types of text information into coordinate conversion and spatial position data conversion to solve The automatic matching of various business calibers and various types of data in energy planning with urban CIM data. The platform has a built-in indicator calculation engine application for online carbon emissions monitoring and smart accounting, which can automatically generate physical indicators that reflect the city's carbon emissions operation, facilitating the visualization and accuracy of online carbon emissions monitoring and smart accounting.

6 Conclusion

For the local government, with the national economic development transformation and the introduction of high-quality urban development requirements, the conflicts between local economic and social development, ecological environmental protection and energy consumption control have become prominent, and the formulation of local energy plans has gradually become necessary and urgent. This article it can better fill the gaps in the lack of fine local energy planning by local governments. In addition, the new technology

of the CIM-based urban energy planning platform mentioned in this article can provide technical support for energy planning, energy monitoring, urban carbon metering, urban energy Internet, urban smart energy management and other scenarios.

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