Research on key technologies and application scenarios of energy big data

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Abstract. Big data technology is a new concept in the development of today’s society. With the current development of the Internet and information technology, the increase in data volume has become a common feature of the development of many industries, which further highlights the need for big data technology applications. As the foundation of the national economy, the trend of changes in energy big data, to some extent, determines the development direction of the entire national economy. This article starts with the relevant concepts and characteristics of energy big data, conducts research on the key supporting technologies and application scenarios of energy big data, and draws corresponding conclusions and suggestions.

1. Introduction
Big data technology is a new concept in the development of today’s society. It mainly focuses on the collection, analysis, processing and application of massive data to ensure that massive data can show stronger application value. With the current development of the Internet and information technology, the increase in data volume has become a common feature of the development of many industries, which further highlights the necessity of the application of big data technology.

2. Related concepts and characteristics of energy big data

2.1. The concept of energy big data
Energy big data is the application of big data to energy, which covers the sum of energy flow, information flow, physical logistics, and value flow: on the one hand, data on power, oil, gas and other energy fields as well as population, geography, meteorology, etc. The comprehensive collection, processing, analysis and application of data in other fields has improved the energy industry’s ability to discover and solve problems. On the other hand, energy big data is an in-depth application of big data technology in energy-related fields, and it also integrates energy production.

2.2. Characteristics of energy big data

2.2.1. Large volume
Large volume is an important feature of power big data. With the informatization of power companies and the comprehensive construction of smart grids, the scope and frequency of data collection have increased significantly, and power data has developed rapidly.

2.2.2. Many types

Energy big data involves many types of data, including structured data, semi-structured data and unstructured data.

2.2.3. Fast

Mainly refers to the speed of power data collection, processing and analysis. Businesses in the energy system have relatively high requirements for processing time.

2.2.4. Data is energy

Energy big data has the characteristics of no wear, no consumption, no pollution, and easy transmission, and can be continuously refined and added value during use.

2.2.5. Data is interaction

Energy big data has a wide and close relationship with the national economy and society. Its value is not only limited to the power industry, but also reflected in the operation of the national economy, social progress, and innovation and development of various industries.

2.2.6. Data is empathy

The fundamental purpose of the enterprise is to create customers and create demands, and establish emotional connections by fully exploring and satisfying the needs of power users.

3. Key supporting technologies for energy big data

3.1. Data communication technology

Data communication technology is a communication system that uses "data" as its business. Data is a pre-appointed number, letter or symbol with a certain meaning and their combination.

3.2. Data storage technology

According to different storage contents, databases can be divided into relational databases, non-relational databases, and distributed file systems. The system is used to store unstructured data.

3.3. Data interaction technology

Interactive analysis refers to the analysis database service, which is a real-time and high-concurrency online analysis and calculation service for massive data.

3.4. Data analysis technology

Data analysis is the process of detailed research and summary of data in order to extract useful information and form conclusions.

4. Application scenarios of energy big data

4.1. Multiple service scenarios
This model integrates various data on energy supply, consumption, and related technologies by building an analysis and application platform, and provides big data analysis and information services for different types of participants including governments, enterprises, schools, and residents. In this model, the power grid and related upstream and downstream enterprises have advantages in capital, technology, data resources, etc., and have the conditions to become a comprehensive service platform provider.

Typical application cases include the smart community project in Austin, USA, and the smart city project with power line carrier technology as its core. This type of project is based on smart grid equipment, collecting detailed electricity consumption data including urban street lighting equipment, indoor lighting equipment, central air-conditioning and split air-conditioning equipment, solar photovoltaic, etc., as well as gas, water, heating equipment data, and forming a comprehensive service platform for energy data analysis and intelligent management and control. The project has played an important platform service support role in energy conservation and environmental protection, new technology promotion, research and development and testing.

4.2. Coordinated interactive scene
This model mainly combines energy big data, information communication and industrial manufacturing technology. Through comprehensive analysis of data from different data sources such as energy supply, consumption, and mobile terminals, the design and development of energy-saving and environmentally friendly products provide users with low payment and high energy efficiency. Energy use and lifestyle.

Taking smart home products as an example, this model can not only provide residential users with energy-saving and fee-reduction services and a fast and convenient user experience, but also play a role in improving user-side demand management and reducing power generation installations for energy companies, especially power companies. In this model, power grid companies may not necessarily have advantages in product research and development, but they can use their advantages in power data collection and analysis to improve user demand-side management through cooperation with equipment manufacturers, or through joint research and development and product sales. Get income.
4.3. Intelligent analysis scenarios

Energy big data can integrate data from different industries to provide comprehensive and three-dimensional data drawings, understand and reshape the needs of users from a system perspective, and provide them with intelligent solutions. For example, more business, transportation, communications, energy, environment and other data resources can form an ecosystem of universal connections, common development, and mutual influence, and various organizational management institutions, organizational models, and business models will also be rebuilt. As long as data can be integrated and flowed, industry data of different dimensions can be used according to a unified interface, and the value of data will be upgraded in three dimensions.

Energy big data also has important value to energy companies themselves. By combining energy production and consumption data with internal smart equipment, customer information, power operation and other data, it can fully explore customer behavior characteristics, improve the accuracy of energy demand forecasts, discover power consumption patterns, and improve corporate operating efficiency. For power grid companies, this model can increase the breadth and depth of data required in business decision-making, enhance insight and forward-looking of business development trends, and effectively support decision-making management.
5. Conclusion
From the initial chain structure, the energy industry chain has gradually become a network structure from electricity, gas, and oil products at the energy production end, through exploration and mining, to transmission and quantification of intermediate links, and to the use of power units. That is the Internet of Energy.

In the future, the energy Internet must be mutually cooperative and interconnected. A very important point in the application of the energy Internet is to accurately portray each node, centering on energy users, and digitizing all energy-consuming equipment and links.

6. Suggestions

6.1. Mining the potential value of energy data
Unified processing, analysis and optimization of energy big data from different sources, feedback or cross-feedback to the Internet of Things, mobile Internet, digital homes, and social networks for application to further improve the user experience and create greater commercial and economic value and social value.

6.2. Integration of digital revolution and energy revolution
Establishing a digital platform for energy big data focuses on creating a data ecology, sharing open data resources, and improving the collection and utilization of smart city information resources. As far as the energy industry is concerned, the important basis for the government to formulate energy development strategies is the energy industry-related basic energy data, derivative data and many other data. Moreover, the in-depth integration of the energy revolution and the digital revolution is the general trend, and the energy system is increasingly showing digital and intelligent attributes.

6.3. The foundation of energy big data platform construction
As a digital platform, energy big data will give full play to the role of "connection", combining with power grid companies, natural gas companies, water companies, manufacturing companies, electric...
vehicle companies, research institutions, consumers and other stakeholders to develop smart applications. Way to form an energy big data ecosystem and provide infrastructure services for the society. Its application prospects are very broad. Strengthen informatization construction and focus on building a data ecology. Digital platforms and smart applications are important directions for energy big data to break through business barriers and build a business ecology and data ecology.

6.4. Energy big data and policy innovation
As an increasingly important national basic strategic resource, energy big data requires full attention and attention due to its special attributes related to national energy strategy and energy security. At present, the country is still at the exploratory stage in terms of policies, laws and regulations, and industry standards for energy big data, and has not formed a preliminary and complete system. Enterprises and the public have insufficient understanding of energy big data, and it is difficult to achieve steady development only by relying on the power of energy enterprises.

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