Research on Power Trading Platform Based on Big Data and Artificial Intelligence Technology

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Abstract. We achieve an integration of the power trading business with new technologies by rationalizing the convergence path of new technologies and transaction services. To realize the personalized customization of electricity market information services and form automated and flexible expansion capabilities, we build a new architecture of cloud-based power trading platform which establishes and applies power market big data resources, improving platform capacity and business application level. The architecture built in the article achieves the decentralization, real-time processing, high concurrency, high availability, easy maintenance, and convenience and efficiency of the power trading platform.

1. Introduction
The development of the electricity market is inseparable from the research and application of related technologies. The core technology research and information technology supporting the power market technology research in the power market should be combined with the development pattern of the power market to solve the existing problems [1]. On the one hand, there will be more participants in the power market in the future, and the number will increase by more than 100 times. At the same time, diverse distributed energy sources and micro-grids will be connected to the power system, and the shape and mode of the power system will also change in the future [2]. On the other hand, with the rapid development of information technology, China's power market technology will continue to change, especially the integration of information technology such as artificial intelligence, big data, Internet of Things, mobile Internet, blockchain and power market. Promote changes in the power trading model.

2. The integration of existing power trading platform and new technology
Through the rationally plan the convergence path of new technologies and transaction services, the integration of the power trading business with new technologies is realized. The new technology and power trading platform have 5 fusion points, as follows.

(1) Big data technology [3]
In the power trading platform, big data technology can be applied to build the power market data resource centre, which can store and process the structured information in the original database, as well as store and process unstructured information.
(2) Mobile Internet technology [4]
   The platform can be applied to mobile trading applications based on mobile Internet technology to meet the needs of members of the electricity market.

(3) Micro-services technology [5]
   In the micro-service layer, the power trading business is re-atomized according to business processes, micro-service components that meet different requirements are defined, and then micro-services are assembled into power transaction service applications.

(4) Cloud computing technology [6]
   In the power trading platform, cloud computing virtualization technology and management technology can be applied to build a power trading infrastructure resource platform. All hardware resources are virtualized into devices and used in a unified manner.

(5) Block-chain technology [7]
   The use of blockchain technology in power trading platforms ensures that data is safe, reliable, and authentic [8].

3. POWER TRADING PLATFORM ARCHITECTURE BASED ON NEW TECHNOLOGY
The new architecture of the power trading platform is based on the Internet of Things as the information source, the big data platform as the business analysis foundation, and artificial intelligence is used as the analytical aid to realize the power trading platform. Decentralized, real-time processing, high concurrency, high availability, easy maintenance, convenient and efficient technical goals.

3.1 Integration of big data technology and future power market
(1) Big data-based power market supply and demand forecasting and active service key technologies
   Apply big data technology to establish a big data centre in the pan-power market, explore the relationship between supply and demand in the electricity market and various related factors such as electricity price, weather and economy, and establish a power balance model optimized by the whole network in the market environment.

(2) Intelligent compliance monitoring technology for power market based on big data
   Under the support of the dynamic monitoring infrastructure of power system operation, based on the big data analysis mining concept and visual display technology, an integrated management system for intelligent compliance monitoring in the power market is established.

(3) Information security technology for power market operation under big data environment
   Study the unified account, authentication, authorization, auditing, encryption and confidentiality management systems in the power market under the big data environment, and study big data security protection technologies such as anti-tampering, anti-leakage, anti-lost and anti-theft of power transaction information.

(4) Power market big data service technology for market members
   Research on the storage and management technology of massive multi-source heterogeneous data in the power market, trusted data analysis technology, and computational engine technology such as flow calculation and graph calculation, and build the ability of information storage, information processing, information mining and value discovery in the whole market.

3.2 Integration of artificial intelligence technology and future power market
Figure 1 The application frame of new technology
In the future, the power market will involve many types of large-scale market members such as transmission and storage, and the scale of users will grow rapidly. The complex market environment will pose more challenges to the operation of the power market. It is particularly important to analyse and simulate the operation of the power market. The integration of artificial intelligence technology and the electricity market can solve the above problems to some extent. To this end, the following will be studied:

1) Multi-type large-scale market resource optimization configuration technology based on swarm intelligence
   Research on technologies such as knowledge resource management and open sharing based on large-scale collaboration, establish a group knowledge representation framework, and support group perception, synergy and evolution of multi-type large-scale market members.

2) Power market customer service technology based on knowledge computing engine and natural language processing
   Construct a professional knowledge base of the power market, study the knowledge computing and visual interaction engine, and research knowledge discovery technology with innovative design, digital creativity and visual media as the core to realize the knowledge discovery of large-scale electricity market related data.

3) Power trading operation analysis technology based on machine learning
   Research and build a variety of learning models based on historical data and behavioral classification, such as deep reinforcement learning and active learning, establish a basic analysis report library, propose the core content of power transaction operation analysis, construct an analysis topic autonomous learning model, and realize multi-type analysis topics. Human-computer intelligent interaction.

4) Artificial intelligence-based power market transaction simulation technology
   Research theories and methods of uncertainty reasoning and decision-making, distributed learning, brain-like learning, fully consider the rational and irrational decision-making scenarios of market participants, and build a simulation environment based on artificial intelligence for market subject transaction bidding.

Under the application of new technology, the structure of the power trading platform is shown in Figure 1. The technical architecture diagram of the power trading platform based on cloud computing is shown in Figure 2.

The new platform architecture is divided into four layers: platform layer, data layer, service layer and application layer:

1) Platform layer
   Adopt cloud computing technology and abandon the centralized technology architecture. Build the power trading cloud platform infrastructure through virtualization technology.

2) Data layer
   The business library meets business requirements and improves data reading and writing efficiency. Use the technologies such as big data association analysis and data mining to realize power market business analysis and value discovery.

3) Micro-services layer
   The power trading business service is packaged as power trading micro-services.

4) Application layer
   Relying on the expansion capability and service system of the cloud platform, the power trading business will be miniaturized and deployed.
4. Conclusion
We apply new technology and builds a new architecture of cloud-based power trading platform. The platform can support the cooperation and development of the operation and management of market trading platform, and enhance the platform's carrying capacity and business application level. The new
power trading platform is characterized by "high reliability, scalability, real-time convenience, lean personalization, and independent intelligence".

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