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Research on the Construction of Carbon Emissions Trading MRV System in Power Grid Enterprises

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ABSTRACT. *Based on the actual operation and management of power grid enterprises, this paper proposes a framework for MRV management system of power grid enterprises, and deeply analyzes the system elements such as MRV management system, technical support system and key guarantee mechanism, and proposes feasible suggestions to assist grid enterprises to implement greenhouse gas emission monitoring, accounting, reporting and verification work, high-quality and efficient access to carbon emissions data, but also promote the establishment of a fair, just and transparent unified carbon market.*

KEYWORDS: *Carbon Emission Trading Market, Power Grid Enterprise, MRV System*

1. Introduction

As a power transmission and transformation construction and operation unit, the power grid enterprise connects the power generation and user hubs, and its energy conservation and emission reduction has received increasing attention [1]. At present, State Grid Beijing, Shanghai and Fujian Power Company have been included in the pilot carbon market, and emissions from transmission and distribution line losses are under control. At the same time, the eight key emission industry enterprises including the power grid have carried out historical carbon emission data accounting, reporting and verification work, laying a data foundation for the national unified carbon market construction[2,3].

In response to the greenhouse gas emission reporting mechanism and the upcoming national carbon trading market, the primary problem facing all grid companies is how to clarify the main sources of emissions of enterprises and effectively control the greenhouse gas emissions of enterprises[4]. Based on the above considerations, this paper will carry out the MRV (Monitoring, Reporting and Verification) system construction and research based on greenhouse gas emission trading, and take the actual operation and management of power grid enterprises as the starting point. The MRV management framework and key management and technical mechanisms are proposed to assist grid companies to adopt a systematic

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approach to implement greenhouse gas emissions monitoring, accounting, reporting and verification, thereby ensuring the quality of emissions data, laying a solid foundation for energy conservation and emission reduction, and promoting national carbon trading. Market construction and improvement work.

2. Carbon trading mechanism requirements for power grid enterprises MRV

National carbon market MRV management mechanism. The Interim Measures for the Management of Carbon Emissions Trading, which was promulgated at the end of 2014, outlines the national carbon market construction framework and clarifies the national and local management models. As the basis for the nationwide unified carbon market construction, the National Development and Reform Commission has organized in 2016 the accounting, reporting and verification of historical carbon emissions to be included in key emitters, covering petrochemical, chemical, building materials, steel, nonferrous metals, paper, and electricity. The main participants of the MRV include not only the management departments at the management level, but also the key emission units and verification agencies at the specific implementation level. They also involve some affiliated parties such as technical support departments and expert consulting teams. The key emission units prepare and submit an emission monitoring plan before the start of the annual monitoring work, and carry out annual emission monitoring work according to the requirements of the competent department and the submitted monitoring plan. After the end of the annual monitoring work, the emissions of the previous year are accounted for and an annual emissions report is submitted. The third-party verification agency shall verify the emission report submitted by the enterprise, prepare a verification report according to the verification situation, and submit the final emission report and verification report to the competent department.

As the core basic factor of the carbon trading mechanism, with the launch of the national carbon market, the MRV management mechanism is gradually improved and perfected, and the implementation of MRV is gradually normalized and standardized. In the face of external carbon market control risks and greenhouse gas emission reporting management requirements, grid companies are also in urgent need of clearing their emissions to identify energy saving and emission reduction potentials as early as possible, improve energy efficiency and promote energy conservation technology advancement to achieve energy conservation and emission reduction targets. Under such dual requirements of internal and external environment, how to assess the status of carbon emissions and the performance of energy conservation and emission reduction are one of the urgent tasks faced by power grid enterprises. Therefore, based on the MRV management mechanism of China's carbon market and the requirements for power grid enterprises, from the actual situation and operability of power grid enterprises, construct a feasible and effective MRV system, which is to obtain carbon emission data with high quality and efficiency, and to reasonably assess the emission status and reduction. Real and accurate data is the basis for emission target formulation and quota allocation, the foundation for carbon management strategies and measures, and promotes the

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establishment of a fair, just and transparent unified carbon market.

3. Grid enterprise MRV management system framework

The grid enterprise MRV management is mainly composed of monitoring, accounting report and verification. The monitoring refers to the monitoring, measurement, collection and summary statistics of greenhouse emissions related data to ensure the accuracy and scientificity of greenhouse gas emission data. The accounting report refers to the selection of applicable accounting and reporting guidelines, accounting for annual carbon emission data based on the monitored activity levels and selected emission factor data, and reporting annual carbon emissions. Verification refers to the periodic verification of greenhouse gas emission data by third-party verification agencies, the credibility of greenhouse gas emission report results and the management level of enterprise carbon emission data, and the fairness of the carbon market. In order to alleviate the pressure of external verification, enterprises can conduct internal verification within the enterprise.

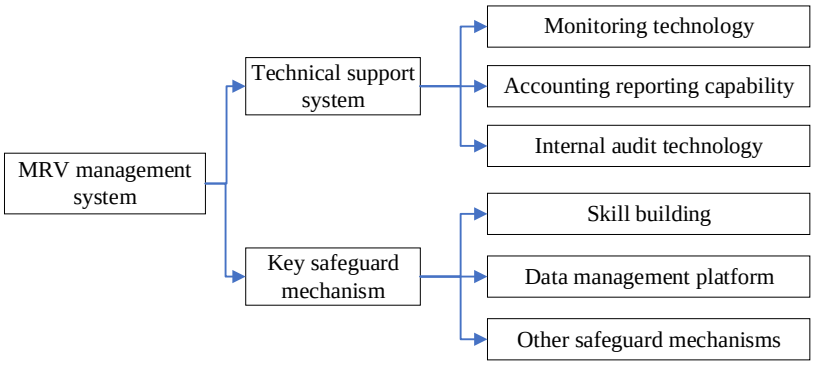

Figure.1 MRV management system framework

In order to ensure the authenticity, accuracy, reliability and efficiency of data monitoring, accounting reporting and verification under the MRV management system, grid companies can plan the MRV management system from the management system and technical rules. First, the MRV management system will be developed at the group level to clarify the key work, management structure and management processes in the field of greenhouse gas emissions monitoring, reporting and verification. In terms of technical rules, according to the requirements of the guideline standards, combined with the characteristics of the power grid industry, the grid enterprise emission data management system is proposed to make the guideline standards more instructive and practical. At the same time, the design of the guarantee mechanism is carried out from multiple aspects such as capacity building and data management system, as shown in Figure 1.

4. MRV management system construction design

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The MRC management system construction design mainly include the MRV management architecture and MRV management process.

4.1 MRV management architecture

The stability and reliability of the MRV system has a lot to do with the enterprise MRV management architecture. A highly efficient organization that can effectively control costs is essential for the smooth implementation of the MRV system. The MRV management framework design can combine the energy data management work with the greenhouse gas emission data management and the current management status of the grid enterprise MRV, and coordinate the MRV system with energy management and carbon management to reduce the number of newly established institutions. A large amount of upfront investment and personnel capacity building. Taking State Grid Corporation as an example, its municipal or provincial power companies need to report their greenhouse gas emissions in accordance with the annual cycle, and accept the verification of third-party agencies and the supervision of the competent authorities. As early as 2014, the company has clearly defined energy conservation and emission reduction. Therefore, large-scale power grid enterprises can integrate the MRV management structure with the existing energy-saving and emission-reduction management structure, and determine the three-tier organizational system structure including the emission management leading group, the management department, and the executing unit according to the principle of hierarchical management.

4.2 MRV management process

Another important design factor of the MRV management system is the monitoring, reporting and verification process. First, it is necessary to sort out the list of MRV management enterprises in the grid enterprise. If the subordinate units of the grid enterprise are required by the local competent authorities to report the greenhouse gas emission data. They must be timely reported to the group management department, and listed in the list of MRV management companies. The MRV management process will also be designed from three important aspects of monitoring, reporting and verification.

5. MRV technical support system

The MRV technical support system mainly include three aspects, as shown in Figure 2.

5.1 Monitoring plan development

The monitoring plan serves as a core document throughout the data management effort to plan data flow and data quality management activities. Relatively mature

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greenhouse gas reporting mechanisms, such as the EU's Greenhouse Gas Emissions Trading Mechanism (EU-ETS), also place monitoring programs at the core and gradually improve their integrity and operability. The competent authorities in China also explicitly require enterprises to develop feasible monitoring plans based on accounting parameters and publish templates for monitoring plans. A complete monitoring plan should include basic information of the enterprise, accounting boundary and main emission facility information, data source of each parameter, measurement and data acquisition methods, frequency of data monitoring and recording, monitoring equipment information, data missing processing method and data quality control method.

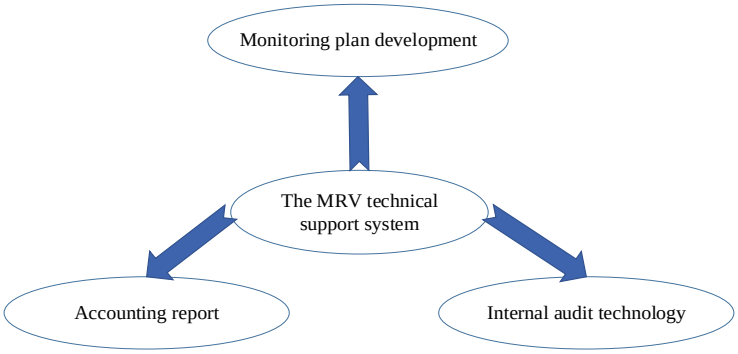

Figure.2 MRV technical support system

5.2 Accounting report

From data monitoring to final reporting, the GHG emissions reporting process involves multiple operations involving multiple steps, including data collection and aggregation, emission factor selection, emissions accounting, emissions reporting, quality control, and document archiving. In order to facilitate the standardization of data collection and improve data collection efficiency, the "original record-statistical account-statistical report" can be established internally to collect and report the greenhouse gas data, and establish an internal communication mechanism for greenhouse gas emission data and information collection. At the same time, care should be taken to ensure the accuracy and completeness of the activity level data. Under normal circumstances, each municipality or provincial power company (executive unit) has multiple statistical sources for power supply, power sales, and line loss rate, or is statistically aggregated by multiple departments. When selecting activity level data, you should select the most. Data that reflects actual power consumption is used as a source of activity level data for accounting and reporting.

5.3 Internal audit technology

Through internal audit, identify enterprise data management vulnerabilities and

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improve the quality of data. At the same time, we can straighten out the verification workflow and prepare for the external verification work in advance. Based on the third-party verification guide (Emissions Monitoring Program Audit and Emission Report Verification Reference Guide), the internal audit process can be basically divided into the preparation phase, the implementation phase and the reporting phase.

6. The key safeguard mechanism

The key safeguard mechanism mainly include two aspects, as shown in Figure 3.

6.1 Capacity building

Improve the capacity reserve of MRV related parties in power grid enterprises through education and training, cooperation and exchanges. Improve the understanding of the importance of MRV work by management and staff at all levels, ensure the accuracy of emissions data and the effectiveness of MRV activities, and provide effective protection for full participation in the carbon market.

In terms of training cooperation, the multi-level, sub-regional and sub-subject training activities will promote the improvement of MRV management capabilities and the construction of talent teams in power grid enterprises. For the technical personnel of the execution units of the grid enterprises, the training of the accounting guidelines, monitoring plans, emission reports and reporting processes will be carried out in a targeted manner.

In terms of cooperation and exchanges, we can actively carry out foreign exchanges and cooperation, and learn from the advanced experience of other large-scale central enterprises' carbon asset management (including MRV management). Strengthen communication and exchange with government agencies such as the State-owned Assets Supervision and Administration Commission and the carbon market authorities, and make recommendations on the various elements of the national carbon market (laws and regulations, technical guidance documents, direct reporting systems, trading platforms, etc.) in response to the actual situation of enterprises, and feedback the needs of enterprises.

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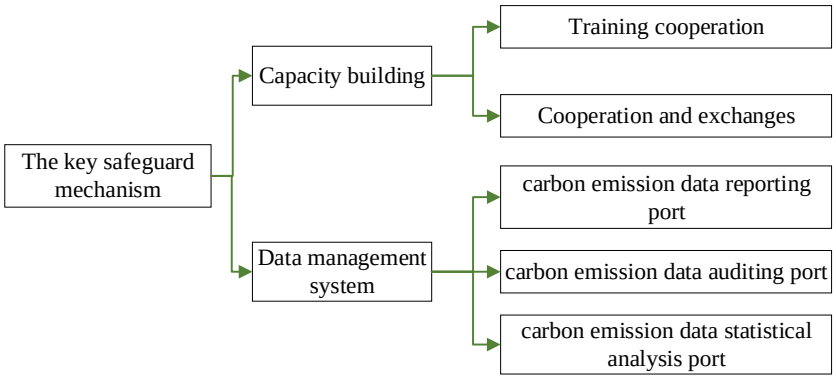

Fig.3 The key safeguard mechanism

6.2 Data management system

Large-scale power grid enterprises report a large number of enterprises, and the number of enterprises participating in the carbon market is also increasing. In order to facilitate statistics and management data, find out their own carbon emissions, clarify the potential of emission reduction projects, and improve the market-based carbon asset management decision-making process. A greenhouse gas emission data management system can be established, and multi-functional modules can be embedded in combination with regulatory requirements to improve the efficiency of all parties.

The system can set ports such as “carbon emission data reporting port”, “carbon emission data auditing port” and “carbon emission data statistical analysis port”. The “carbon emission data reporting port” is mainly used for reporting carbon emissions data. The “carbon emission data auditing port” is mainly used for internal auditing organizations to review carbon emission data. The “carbon emission data statistical analysis port” is mainly used for group management. A summary analysis of the carbon emissions data and vertical and horizontal comparisons.

7. Conclusions

The establishment and implementation of enterprise MRV management system is not a short-term behavior that can be achieved overnight, and it needs to be improved and improved continuously according to practical experience. During the implementation process, it is necessary to carry out internal and management review of MRV system regularly, evaluate the effectiveness of MRV system, collect feedback opinions on MRV implementation, pay attention to good practice experience of other key enterprises, summarize optimization measures, and gradually improve and improve its own MRV system.

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