

# **Research on Operational Innovations of Demand Side Management Platform of Foshan Electric Power under the Background of Internet plus**

**Cانبiao Xian**

Guangdong Polytechnic of Environmental Protection Engineering, Foshan, 528216, China

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**Abstract:** In recent years, the power supply of Foshan power grid is seriously inadequate, and the construction of power grid is becoming more and more difficult. As a result, Foshan power grid is facing a severe power consumption situation. Therefore, based on internet technology, Foshan has built a comprehensive, professional and open power demand side management platform. The platform has many functions of orderly consumption, consumption analysis, online monitoring and demand response. It can comprehensively analyze the power consumption situation in Foshan, and improve the level of power demand side management.

## **1. Introduction**

At the end of 2012, Foshan, together with Beijing, Tangshan and Suzhou, became one of the four pilot cities of national power demand side management (DSM) [1]. Based on the actual situation of the electricity demand market in Foshan area, the project aimed at the application functions of “internet+”, such as online monitoring, orderly power consumption and power saving project management of the DSM platform in Foshan. Starting from the theoretical analysis of DSM, the platform provides a basis for practical analysis to optimize the allocation of power generation side resources and to enhance the energy-saving, economic and security of power grid purchasing market through the analysis of the operation status of DSM. The qualitative analysis of the influencing factors of DSM provides a rational reference for improving the efficiency and efficiency of DSM in power grid companies. According to the status quo of Foshan DSM long-term mechanism, and compared with foreign advanced urban management experience, the long-term countermeasures are put forward. We should grasp the characteristics of management demand, innovate the system, mechanism and methods of power demand side management, and put forward feasible countermeasures under the new normal economic situation, and create a set of Foshan “internet + power” model which can be popularized and replicable [2].

## **2. Construction of Demand Side Management Platform of Foshan Electric Power**

After Foshan became a comprehensive pilot city of DSM, the Foshan municipal government set up a DSM technology research and development team to develop the DSM platform of Foshan [3]. DSM platform is the technical support to promote the extensive and in-depth development of DSM by means of information technology. It can build public communication service bridges among power users, power service providers, power grid enterprises and government departments, provide the most comprehensive and authoritative DSM information to the whole society, and give better play to DSM in security. The positive role of electric power supply, improving the efficiency of electric energy utilization and strengthening the monitoring and analysis of economic operation will serve the economic and social development of our province. The platform can accurately reflect the situation of power supply and demand, analyze the operation situation and trend of various industries and related economic indicators, and facilitate government departments to formulate policies and measures such as power demand response and power supply guarantee in time. Through data collection, integration and analysis of access users, the platform can support power service providers to carry out power optimization service. To improve the fine management level of electric energy, reduce the cost of electricity consumption, promote energy saving and scientific use of electricity, and improve the

economic operation of the power grid and the level of balance between supply and demand.

Demand side management refers to the related activities carried out to improve the utilization efficiency of power resources, improve the mode of power consumption, and realize scientific, economical and orderly use of electricity. DSM information platform is an important part of DSM technology system. Its main function is to provide practical information service and decision support for power marketing and customer service through dynamic monitoring, data acquisition and in-depth analysis of power consumption through field terminal equipment based on computer, automatic control, communication and network technology. DSM information platform can realize power supply and consumption reliability analysis, line loss statistics and analysis, load forecasting, abnormal power consumption analysis, power consumption situation analysis, user-side power consumption data release, etc. It plays an important role in power production and operation activities. The structure of Foshan DSM platform is shown in Figure 1.

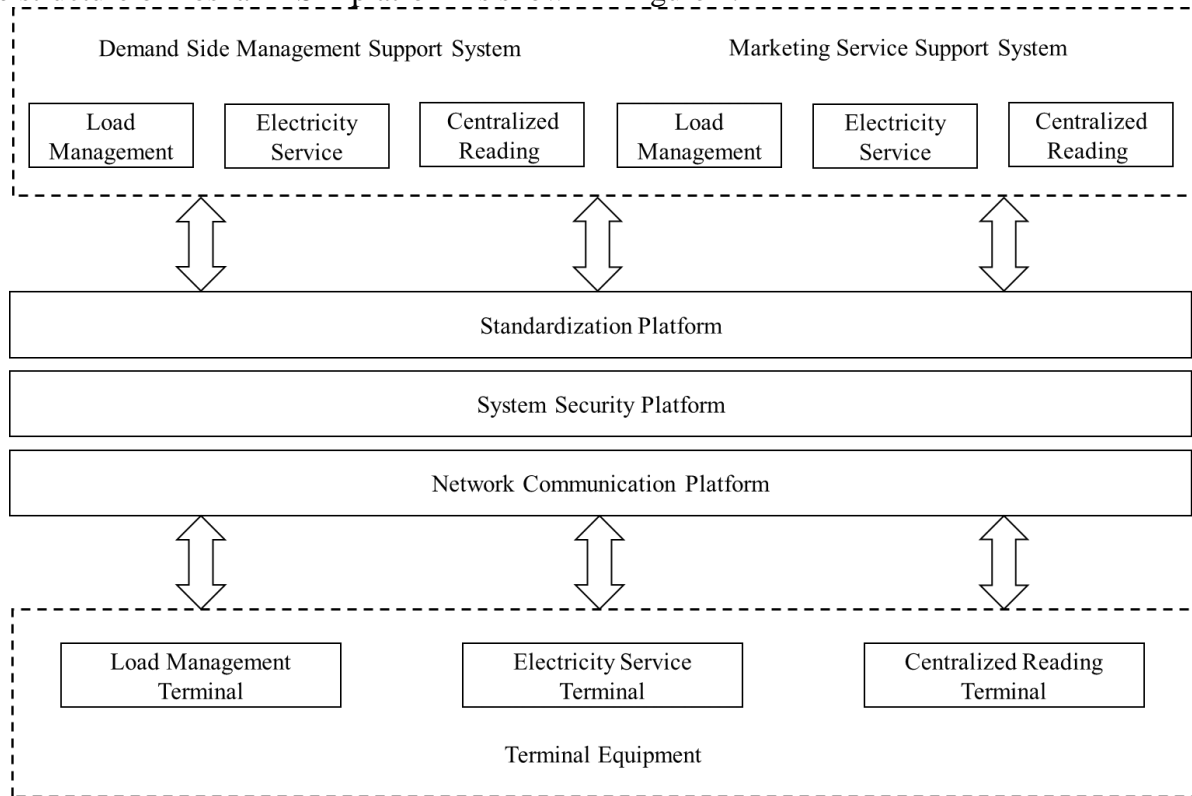


Figure 1. Structure of Foshan DSM information platform

Foshan Power Demand Side Management Platform was built and officially put into operation in January 2014. It has functions of portal, responsibility assessment, power saving project management, on-line monitoring, orderly power consumption, macroeconomic analysis and derivative analysis. It has 19 functional modules and 55 functional modules. At present, the daily visits of Foshan DSM platform reach 10,000 people, and more than 17,000 pieces of industrial user gateway data have been accessed [4].

### 3. Operational Innovations of Demand Side Management Platform of Foshan Electric Power under the Background of Internet plus

#### 3.1 Orderly Consumption.

The orderly power consumption management module of Foshan DSM platform achieves the release of the government's orderly power consumption scheme, provides a set of solutions for the public to understand orderly power consumption information, and improves the accuracy, effectiveness and openness of orderly power utilization. The grid assessment module of the platform helps the government to grasp the development of demand side management platform of regional power grid enterprises in real time, track and analyze the implementation of typical demand side

management platform projects, change the extensive situation of target responsibility assessment of demand side management platform in the past, and realize the pre-process, in-process and after-process management and control of target responsibility assessment of demand side management platform. Orderly power management refers to the management of controlling part of the demand for electricity according to law and maintaining the order of power supply and consumption under the circumstances of predictable power supply and demand tension through administrative measures, economic means and technological methods, including orderly power information release, orderly power consumption execution monitoring, orderly power consumption statistics and other business. The management platform provides an overview page for the government to view orderly electricity consumption. The management platform displays the load characteristics of the region or industry in the form of charts, and monitors the load of the region by the government. Power grid enterprises implement load adjustment and formulate relevant measures to provide auxiliary support management platform to provide business support for government departments at all levels and power grid enterprises to use electricity orderly. The management platform provides real-time monitoring of supply and demand for government authorities, assists users of power grid enterprises to compile orderly daily power consumption according to orderly power consumption performance and provides orderly daily power consumption query function. Demand side management platform assists orderly power users who have completed the survey to participate in orderly power users for orderly power related industries, indicators, power information registration and maintenance.

### **3.2 Consumption Analysis.**

The macroeconomic analysis module of Foshan DSM platform provides the functions of regional power consumption analysis, industry power consumption analysis, industrial power consumption analysis, residential power consumption analysis and other analysis functions. It can be classified according to the region and industry of Foshan city, and can analyze the power consumption situation. It can help the decision makers of Foshan municipal government to analyze the power consumption situation of the whole province from various angles, so as to improve the decision-making of the government. Provides the basis. Among them: through the analysis of industrial power consumption, enterprise start-up analysis function analysis of regional economic trends; through the analysis of regional economic structure, we can understand the regional industry migration, industrial economic structure, structural adjustment and regional industry economic differences. The platform provides data basis for the government to understand the proportion of electricity users in various regions through the analysis of the proportion of residents in cities and towns with zero electricity consumption, and reflects the vacancy rate of housing to a certain extent. Through the analysis of residential ladder electricity consumption, the number of households with different grades of electricity consumption is analyzed according to the per-household electricity consumption, which provides data support for the government to formulate the ladder electricity price; and through the analysis of urban and rural residential electricity consumption, it provides support for the government to fully understand the gap between urban and rural electricity consumption. The analysis of commercial electricity consumption provides the government with the general analysis of commercial electricity consumption, the occupancy rate or full occupancy rate analysis of hotels and catering industries, which reflects the change of electricity consumption proportion of different types of enterprises in different regions and the difference of electricity consumption among enterprises in different regions, and reflects the trend of commercial economy in the region. Basic data maintenance is mainly used to support macroeconomic analysis of other functional sub-items required for the classification and classification of basic electricity data, industry users, classification and so on. Foshan electric power users can configure the relevant data according to the actual situation.

### **3.3 Online Monitoring.**

The user energy service module of DSM platform integrates the functions of collection, monitoring, analysis, benchmarking and consultation. It realizes real-time monitoring and abnormal alarm from enterprise as a whole to plant area, production line, equipment and other levels. Through

online monitoring and analysis service, it helps enterprises to grasp their own energy consumption status and can assist them. To help users intuitively understand the operation of each link of their own production process, real-time discovery of abnormal production process, implementation of corresponding measures, energy-using enterprises for energy saving, efficiency, online management to provide value-added services, has been praised by energy-using enterprises. We can see the basic information of the whole enterprise, including the latest monthly electricity consumption, annual electricity consumption, electricity consumption curve, electricity consumption curve, load curve of the latest thirty days, and the ranking of power consumption of each equipment unit last month. Electric energy services include on-line monitoring, energy consumption and target analysis, energy efficiency diagnosis and analysis and other sub-items, to help government users grasp real-time enterprise energy information, master the overall level of energy efficiency to help enterprise users achieve safe production and reduce energy costs. On-line energy monitoring can realize all-round on-line energy monitoring through the functions of enterprise energy overview, enterprise energy monitoring, process monitoring, power quality monitoring and so on. Energy consumption and benchmarking analysis optimizes the energy consumption structure by monitoring and displaying the overall energy consumption, recommending the working hours of enterprises, energy consumption analysis of energy-saving projects, energy efficiency benchmarking analysis, product unit consumption analysis and other functions, so as to provide support for government and enterprise energy consumption decision-making. Energy efficiency diagnosis and analysis is based on the establishment of energy efficiency model and energy consumption analysis of equipment. On the basis of all kinds of energy consumption analysis data, it can automatically generate comprehensive energy consumption diagnosis report on a monthly basis, which can guide enterprises to formulate reasonable power consumption plans.

### **3.4 Demand Response.**

The “Internet + power” demand side management platform realizes multi-party interconnection and win-win. Foshan builds a demand side management platform not only to cope with the power shortage, but also to reduce the demand of clients and seek a long-term mechanism to solve the power shortage. Energy saving and emission reduction is a major direction for future urban development, the improvement of the citizen’s happiness, and the building of a government with people's satisfaction. More importantly, demand response achieves multi-win through the interconnection of customers in the Internet era. For power companies, joining the platform can be clearer about their electricity consumption. In the era of big data, data itself is value. Platform can help them fully understand their own electricity usage, effectively improve the level of energy lean management of power utilities, and save electricity costs. In addition, enterprises can get corresponding subsidies when they participate in demand response. Foshan's demand response implements a dual incentive policy. Enterprises participating in demand response are given a one-time economic subsidy. The subsidy funds are paid through the special funds of the national demand side pilot cities. At the same time, Foshan has also formulated an administrative incentive policy, and enterprises involved in automatic demand response are no longer included in the annual orderly peak staggering list. This policy has greatly increased the enthusiasm of enterprises to participate in the pilot work. For power supply enterprises, demand response is actually equivalent to a virtual power station, which reduces investment. And power supply enterprises can see the monthly and daily load and power consumption of all large industrial power customers from the platform, which effectively improves the load rate of the power grid and strengthens the refinement of power demand side management of power supply enterprises. For the government, DSM platform can provide data support for the government to formulate regional macroeconomic policies and regulate power supply and demand plans, and is a powerful attempt to build a government of people's satisfaction and promote government service-oriented government. Foshan's main industrial enterprises include ceramic enterprises, aluminum profile enterprises, food, chemical fiber enterprises and plastic enterprises. This paper analyses the production processes of various industries and presents typical peak load reduction strategies for these industries, which is shown in Table 1.

Table 1. Electricity demand response strategies in various industries in Foshan

Industry	Maximum response time	Advanced notification time
Ceramics	1 hour - 3 hours	1 day -3 days
Aluminum Profiles	1 hour - 2 hours	1 day
Food,	2.5 hours	1 day
Chemical Fibers	Random	Random
Plastics	1 hour - 4 hours	1 day -3 days

#### 4. Conclusion

The application of DSM ensures the quality of DSM in power supply enterprises, improves the level of DSM, and ensures the safety of power users, so as to achieve the goal of high efficiency and energy saving. The operation innovation of Foshan DSM platform has created favorable conditions for the extensive and in-depth development of DSM in Foshan area, and also provided reference for other cities in China.

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