

## Research on Promoting Energy Generation Efficiency

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**Abstract:** In order to improve the utilization rate of energy generation, the operation rate of power generation devices should be improved, so the conversion efficiency of power conversion devices must be improved. Under the environment of power market, power enterprises become independent legal entity, forming the main body of competition in the power market. Power generation efficiency is positively correlated with China's economic development. The distribution of power system is complex, and the dispatching department of power enterprise plays the main role in controlling the operation mode of the whole power system. Ensure that the supply of electricity can meet the needs of rapid economic development. On the other hand, it can help the power industry to keep abreast of changes in power generation efficiency and adjust the power supply in a timely manner. Based on the analysis of energy storage efficiency improvement methods and principles, this paper draws a variety of models for energy efficiency assessment, to optimize and improve the energy efficiency assessment model and explore ways to improve the efficiency of energy generation in China.

### 1. Introduction

Due to the change of solar and wind power, the power generation capacity of energy power generation changes greatly, so it needs to supplement the storage battery and general power supply. In order to improve the utilization rate of energy generation, the operation rate of power generation devices should be improved, so the conversion efficiency of power conversion devices must be improved [1]. China's overall electricity consumption level is rising, and the power industry has become an important basic energy industry in the development of national economy. On the one hand, the prediction of future generation efficiency provides a basis for making reasonable power development planning. Under the environment of power market, power enterprises become independent legal entity, forming the main body of competition in power market [2]. Power generation efficiency is positively correlated with China's economic development. The distribution of power systems is more complicated, and the power enterprise dispatching department mainly controls the operation mode of the entire power system. Thereby ensuring the reliability and economy of the operation of the power system, so that the supply of electric energy is arranged in an orderly and reasonable manner [3]. The energy consumed by power plants has become the focus of improving energy conversion efficiency. Obviously, this focus can be used as a breakthrough to maximize the energy conversion efficiency of thermal power plants [4].

The important criterion for measuring the quality of energy power generation forecasting technology is to see whether the management mode of the power system enterprise sector is closely related to the development of modernization [5]. Ensure that the supply of electricity can meet the needs of rapid economic development. On the other hand, it can help the power industry to keep abreast of changes in power generation efficiency and adjust the power supply in a timely manner [6]. Compared with the traditional power industry monopolizing, the electricity market is open and competitive. Compared with the ordinary commodity market, electricity needs to be transmitted over the network and cannot be stored in large quantities [7]. The digital characteristics of the time series of power generation will vary over time. After the non-stationary data is smoothed, the mathematical model is built and the future prediction is more in line with the essential characteristics of historical data [8]. At present, coal and other fossil fuels are still the main energy sources of thermal power generation in China, and the increase of power generation efficiency

directly drives the rise of coal demand [9]. Based on the analysis of the methods and principles of energy generation efficiency improvement, this paper adopts a variety of models to evaluate energy efficiency. Several single energy efficiency evaluation models were optimized and improved, and a comprehensive optimization prediction model based on optimization genetic algorithm was combined.

## 2. Technical Route for Improving Energy Conversion Efficiency of Power Plant

### 2.1. Transmission technology

In energy generation forecasting, when constrained design optimization is encountered, it is necessary to divide it into linear programming and non-linear programming according to the specific characteristics of constrained objective function or constrained conditions. Due to the obvious and trend characteristics of the generation efficiency data over the years, two time series models with different modeling principles are used to model and analyze the same generation efficiency sequence. On the one hand, the forecasting results of the two models are compared horizontally. On the other hand, the advantages of the two models are brought into play and the final forecasting values are obtained by combining the forecasting results with weighted average coefficients. In a fully competitive market, power generation companies will bid at marginal cost to maximize profits. However, in a market that is not fully competitive, the quotation curve of a power generation company with market power may completely deviate from the cost curve, and increase the market electricity price by withdrawing a part of the electricity or raising the quotation.

Most of the problems of power generation efficiency improvement are nonlinear programming problems. The solution is to solve the problems of maximal and minimum values of multivariate nonlinear functions in mathematical functions. In terms of short-term scheduling, due to the randomness and uncontrollability of power, it will cause an increase in the system's rotating reserve capacity and a change in the conventional unit start-stop strategy after entering the network, which may lead to an increase in the operating cost of energy generation. The algorithm evolution curve is shown in Figure 1.

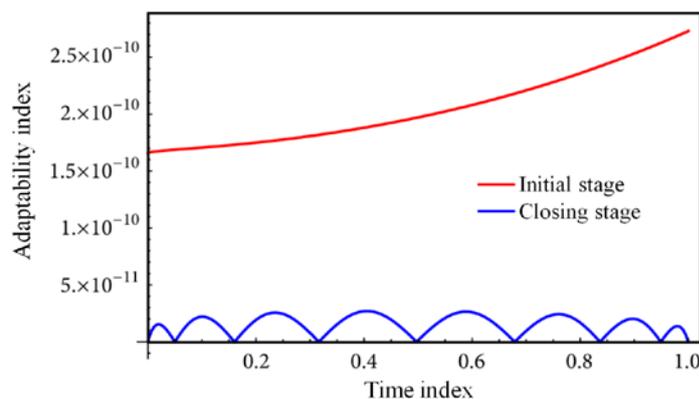


Fig.1. Algorithm evolution curve

### 2.2. Energy storage technology

The adjusted model is used to separate the adjusted sequence from which the influencing factors are removed. Finally, the monthly growth rate of the power generation efficiency is calculated and compared with the original year-on-year growth rate index. In the context of continuous reform of the power enterprise market, ensuring the improvement of energy efficiency is a prerequisite for implementing energy power generation strategies. The trend cycle component can reflect the direction of the overall trend of the time series, which is mainly influenced by long-term factors and assumes that the effect will continue throughout the sequence [10]. The whole power generation efficiency improvement system should realize data processing automation, meet the prediction conditions of power generation efficiency, and automatically integrate and analyze a large amount of input information.

Power plant is the passive executor of the unified dispatching system. In the electricity market, power generation companies have the autonomy of production and operation, and become the main body of market competition. It will adopt different bidding strategies to maximize profits by adjusting the quotation curve. Fig. 2 is the scanning speed modulation architecture of the power prediction model.

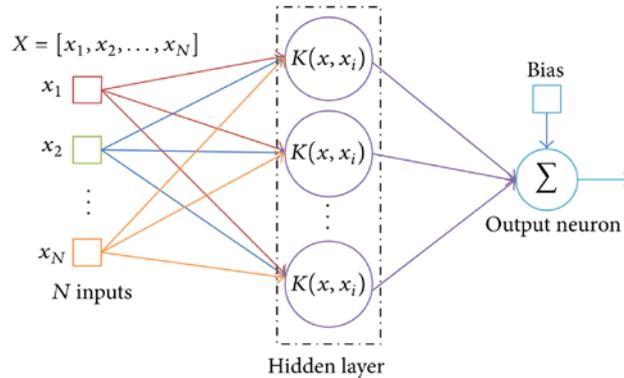


Fig.2. Scanning speed modulation architecture of the power prediction model

### 3. Problems to be solved in Improving Energy Generation Efficiency

In recent years, the situation of tight supply and demand of electricity in China has been alleviated to a certain extent, but it is not possible to relax investment in the power industry. It is necessary to predictably promote the development of the power industry and resolve the contradiction between imbalanced supply and demand. The risk of expecting a large profit quotation strategy is also large. Therefore, for power generation companies, it is necessary to analyze and evaluate the corresponding risks of the quotation strategy. In order to continuously promote the steady growth of power generation efficiency, the dual city people's government should actively promote the economic development of the secondary and tertiary industries. This is very beneficial to the increase of electricity consumption in power enterprises. In reality, different decision-makers have different attitudes towards risk, which also determines their different priorities in making decisions. We should centralize and standardize the electricity and coal market, strengthen the supervision of coal prices, and give priority to allocating new coal resources to large power generation groups. Supporting the joint venture and merger of power generation enterprises and coal enterprises, and comprehensively supervising the whole process of coal supply.

In order to improve the utilization rate of clean energy, the allocation method that the emission quota is proportional to the generation capacity is adopted for different types of generating units. During peak load period, in order to meet load demand and obtain power generation benefits, power plants need to reduce energy consumption to increase net output. At this time, the exhaust gas from power plants is continuously absorbed, the rich liquid generated is sent to liquid-rich memory for storage, the energy consumption of regeneration tower is reduced to a lower level, and the energy consumption of power system as a whole is reduced. Decrease, and vice versa. Input system raw data, including load size in each period, average output power of electric field in each period, upper and lower limits of generator active output, cost coefficient of generator consumption, upper and lower limits of generator climbing rate, parameters of electric field membership and consumption Cost membership parameter. Before the electric field is connected to the system, the spare capacity mainly includes load standby and accident standby. After the wind farm is connected to the grid, the randomness of the system increases because the power prediction capability is far less than the power generation efficiency. Although the electrical system brings a certain loss of power generation efficiency, the power plant has stronger peak shaving characteristics. With better peak shaving depth and faster response speed, it can improve the peaking ability and flexibility of energy generation.

#### 4. Conclusions

Constantly tracking new international methods in energy conservation, researching and mastering core technologies will be an important way to improve China's energy efficiency. The month-on-month growth rate index obtained from the power generation efficiency adjustment model is also more sensitive than the year-on-year growth rate index of the unadjusted sequence, and can quickly capture past and future power efficiency inflection points. We must constantly improve and improve the energy conversion efficiency of power plants, and reduce energy waste and loss after reasonable planning. China has just begun the reform of the power industry system, first introducing competition on the power generation side, and power generation companies are bidding online. Under the environment of electricity market, power generation enterprises will face many uncertain factors in the process of bidding strategy selection. Some unavoidable human factors or objective factors often cause serious deviations in historical data, thus reducing the prediction accuracy. The application of advanced technology and DSM can greatly improve the energy efficiency level of power system and electrical equipment. This will play a great role in achieving sustainable economic development and building a resource-saving society in China. It will also make a positive contribution to improving the environment and reducing pollutant emissions.

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