Research on Data Application Framework and Key Technologies of Intelligent Regulation and Control of Wind Power New Energy Based on Computer

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Abstract. At present, large-scale wind power with random, intermittent or even anti-peaking characteristics is connected to the grid, but domestic wind farms cannot provide effective wind power output forecasts and wind turbines and wind farms do not have online control. Adjustment function. The output of power sources other than wind power in the grid must not only be adjusted with load changes, but also must be adjusted to adapt to changes in wind power output. As the installed capacity of wind power increases, the impact of wind power output fluctuations on the grid is also increasing. At present, there is no clear definition and standard calculation method recognized by authoritative authorities regarding the ability of the grid to intelligently regulate wind power. In view of this, it is urgent to study a set of standard grid smart regulation wind power capacity evaluation system based on computer, which is analyzed and discussed in this paper.

Keywords: Wind Power Technology, Intelligent Control, Application Architecture

1. Introduction

Wind power is developing rapidly around the world and has produced good social and environmental benefits. However, wind power has the characteristics of random fluctuations on multiple time scales. As the penetration level gradually increases, it is more difficult for the grid to absorb wind power. At this stage, mainly due to the constraints of the power grid's peak-shaving capacity and transmission capacity, a serious wind abandonment problem has emerged in my country's power grid, which has aroused widespread concern in the whole society. Based on this, a scientific and reasonable assessment of the smart regulation and control capabilities of grid wind power will not only help the planning and development of wind farms, solve the problem of wind abandonment from the source,
but also provide a useful reference for system dispatch and ease the control of wind power from the operational control level.

2. Wind power technology analysis

In recent years, China's industry has entered a stage of great development and due to the large population of our country, the demand for power resources is also rising. This also shows that the single power supply method in the past has long been unable to meet the development of the entire society. Therefore, China's power companies are vigorously developing clean energy such as wind power, but the difficulty coefficient of installation and management of wind power equipment is very large. The structure of wind power system has certain complexity and high difficulty[1]. The development and use of wind power resources have caused certain difficulties.

Generally speaking, the equipment system of wind power generation mainly includes important equipment such as nacelle, rotor blades, hydraulic system, cooling components, wind vane and gear box. However, it is precisely because there are so many devices in the composition of electrical equipment and most of the devices are precision equipment, so this puts higher operating requirements on the relevant staff, making the work The personnel must carry out scientific and reasonable installation in accordance with the operating specifications. If the staff is not mature and professional, there is absolutely no way to install the entire equipment after the installation. After the installation, it is necessary to conduct a regular inspection of the equipment in time. And maintenance to ensure that the equipment can operate normally for a long time and can extend the service life of these equipment as much as possible, so that various benefits can be obtained in time. Wind power equipment can work smoothly. In addition to the pre-precise installation, precise inspection after installation is also an indispensable task[2]. That is to say, the staff need to carry out some more accurate tests for the equipment to ensure that it can be put into the wind power generation work normally. Not only that, when carrying out related testing and maintenance work, the staff should also pay attention to regular, rather than no fixed time inspections. Long-term use without timely maintenance and protection will affect the equipment to a certain extent. On the damage, so that the service life of the entire equipment has been reduced. Before conducting the test work, the staff should improve and cultivate their professional ability in a timely manner. That is to say, they must have extremely high professional ability and rich test experience when conducting the test, so that they can guarantee the work During the test, the personnel shall promptly deal with, repair and replace the welding and replacement of various problems in the equipment.

3. Research on Smart Regulation Architecture of Wind Power Data

From the current research on intelligent control technology of wind turbines in various countries around the world and the current degree of attention to wind power generation, the failure of intelligent control of wind turbines can be described as a worldwide problem. Not only need the national conditions of each country to conduct separate and effective research considerations, but also specific analysis of factors such as regional environment and habits, which makes the research on the intelligent regulation of wind turbines more difficult[3]. In order to better improve the ability of intelligent control of wind turbines, effective technical improvements are very necessary and are currently urgent problems to be solved. According to the specific description of this article, it is feasible for the domestic mainstream double-fed and full-power inverters in China to control the high
voltage ride-through fault of wind turbines. It can also be achieved through technical transformation of
the wind turbines that are already in operation and the corresponding installation Auxiliary equipment
to achieve high voltage ride through and low voltage ride through functions, according to the actual
hardware equipment status of the wind farm, to select and assemble the auxiliary equipment and at the
same time to deal with the details of the dynamic voltage coordination of the grid and to control the
wind turbine from the technical aspect The occurrence of intelligent control faults will finally realize
the perfection of wind turbines.

4. Wind power new energy intelligent regulation technology

4.1. Application of intelligent control technology in improving system power fluctuation

The volatility of the wind power system will have a negative impact on the stability of the grid and at
the same time, the uncontrollable nature of the wind power system will also increase the difficulty of
grid dispatch. In wind power grid integration, the introduction of intelligent control technology and
the corresponding control strategies can effectively reduce the impact of wind power output fluctuations
and suppress wind power system output power fluctuations[4]. For example, supercapacitors are
connected in parallel on the DC bus of the unit and fuzzy theory is used to coordinate the control, so as
to suppress the power fluctuation of the wind turbine. This method needs to accurately predict the
output of the wind turbine. However, for a single unit in a large wind farm, it suffers It is difficult to
predict the output of wind turbines due to various influences such as flow effect and tower shadow
effect. At the wind farm level, currently two-level ESS is commonly used for coordinated control, that
is, the method of short-term intelligent control and medium-term intelligent control coordination,
which may be well suited for online control and can effectively solve problems such as capacity and
response speed. In addition, there is also a hybrid method of energy-based intelligent regulation and
power-based intelligence regulation, which also has a better ability to smooth power fluctuations. The
system power adjustment mode is shown in the figure below.

![System power adjustment mode](image)

**Figure 1.** System power adjustment mode

4.2. Application of Intelligent Control System in Improving Power Quality of Grid

The power system needs to have high stability. When it is subjected to large or small disturbances, it
must be able to quickly recover to a stable state, including large disturbance stability and small
disturbance stability[5]. In wind power grid integration, wind turbines are different from synchronous
generators and the fundamental reason for their stability is mainly due to the imbalance of the
instantaneous power of the system. Using the rapid response capability of the intelligent control
system can effectively improve the stability of the wind power system. In terms of large disturbance stability control, it mainly focuses on the change of the power angle of the synchronous generator and the speed of the wind turbine and uses the intelligent control system to control according to the pitch angle and braking resistance\[6\]. For the stability of small disturbances, the characteristic analysis method is mainly used, considering that the wind power access has a small influence on the stability of the small disturbances of the grid system and the applications in this area are relatively few at present. On the whole, although the intelligent control system can improve the stability of the wind power system, due to the nonlinear operation of the wind power system, there are still great difficulties in the parameter configuration of the intelligent control system and the overall application level is still low. The power quality control equipment is shown in the figure below.

![Power quality control equipment](image)

**Figure 2.** Power quality control equipment

5. Conclusion

At the same time, prior to the operation of wind turbines, technicians should conduct quality inspections and equipment debugging to ensure that the units can work normally; during the operation of the units, they should always pay attention to their operating status, formulate a reasonable control plan and regulate adjustments. Operation, regular inspection of equipment in normal operation and repair of damaged equipment. In the case of good operation of the entire system, it is possible to increase the research and development of new technologies, introduce more advanced operation modes, improve the operating efficiency of the unit and improve the accuracy.

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