Research and Implementation of Wind and Solar Energy Storage and Charging Scheme

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Abstract. In this paper, according to the characteristics of tourist attractions, the old station area and the heavy load station area which is difficult to increase capacity are reconstructed, and the energy saving and loss reduction treatment scheme is proposed. The wind and wind power generation equipment is used and the energy storage equipment is added to realize the power supply stability of the intelligent substation area distributed system. The transformer overload problem in the peak load period of the substation area is solved, and the energy-saving and loss reduction effect of the distribution line is realized.

Key words: wind and solar energy, storage and charge.

1. Introduction
According to the plan of the national development and Reform Commission, by 2020, there will be more than 12000 centralized charging stations and more than 4.8 million distributed charging piles, so as to meet the charging demand of 5 million electric vehicles in China. The charging of charging vehicles will be as convenient as refueling. In order to deepen the "four points" management of line loss, realize the "optimal technical line loss and minimum management line loss" in 10kV substation area, and further improve the lean management level of line loss in demonstration area, the project plans to select typical station area, develop line loss deep treatment work in booth area, and put forward typical energy-saving and loss reduction treatment schemes for conventional old station area and heavy load station area with difficulty in capacity increase.

2. Existing Problem and Solutions
The installation of charging pile will bring peak load period for the substation area. When the charging pile is charged at the same time, the capacity of the substation area will be insufficient, resulting in overload of the distribution transformer in the substation area, and the loss of the lines and transformers will be increased. In order to realize the coordinated development between the smart station area vehicle charging and power grid, the scheme uses wind and solar power generation equipment and increases energy storage equipment. When the load peak needs to be charged, the scheme uses wind power generation equipment and increases energy storage equipment. When the load peak needs charging, the combination of energy storage equipment and new energy generation can provide stable power supply, ensure the balance of supply and demand of grid side and electric vehicle charging, and reduce the...
adverse impact on the grid. To achieve the power supply stability of the intelligent substation area
distributed system; to solve the problem of transformer overload during peak load period; to achieve the
effect of energy saving and loss reduction of distribution lines in intelligent substation area.

3. Composition of the System
In the scheme, AC / DC charging piles are installed in the parking lot, thin-film photovoltaic panels are
laid on the top of the sunshade of the charging piles, and wind turbines are installed. The energy storage
power station and intelligent station area constitute a distributed wind and solar energy storage and
charging system. It can realize a series of functions, such as local consumption of new energy power
generation, coordinated control of vehicle charging, island protection, demand control, peak shaving
and valley filling, system power smoothing, energy saving and loss reduction, etc., which plays an
exemplary role in the promotion of new energy + charging pile application project in intelligent station
area. Fig.1 shows the overall structure of the project:

**Figure 1. Overall system structure**

**Fan System:** Wind power generation system mainly includes wind turbine (including blade,
connecting rod, generator, tower), controller, grid connected inverter, outdoor electrical box and so on.
Fig. 2 is a sketch of the whole wind power generation system.

**Figure 2. Wind power generation system diagram**
Photovoltaic system: The photovoltaic system mainly includes the main structure of parking shed, photovoltaic module (including bracket), inverter and grid connected distribution box. The photovoltaic system of the project is combined with the parking shed to meet the structural and electrical safety of the parking shed. Due to the long operation life of photovoltaic power generation (more than 25 years), and the front-end is high-voltage direct current, so the whole system design has very high security and reliability.

Energy storage system: The energy storage system is composed of the following parts: battery pack, energy storage converter (PCS), battery management system (BMS), DC power distribution cabinet, fire protection system, air conditioning system, container body, distribution cabinet of energy storage grid and secondary system.

4. Strategy of Secondary System and Wind Solar Storage and Chargingsystem
The hardware part of the secondary system mainly includes distributed controller, monitoring terminal, cabinet, ups and switch. The distributed controller of wind and solar energy storage and charging has at least 4 RS485 communication interfaces and no less than 2 10 / 100M adaptive Ethernet ports, which can communicate with energy storage system, wind turbine system, photovoltaic system, charging pile, load and intelligent station area in various ways.

The scheme adopts distributed monitoring and energy management system, which is divided into energy management layer, system monitoring layer and equipment layer (local control layer). The real-time information of each underlying equipment is collected through the switch, and the information is processed and monitored, and the data is uploaded to the intelligent station area. The equipment system architecture diagram is shown in Figure 5.5. Through the realization of corresponding functions, it provides technical support for the distribution transformer area management and makes the management intelligent. The distributed monitoring and energy management system has the functions of data acquisition and processing, control, basic unit monitoring, data interaction with intelligent station area, and strategy function of wind solar storage and charging system.

5. Efficiency Analysis

5.1. Historical Data Analysis
The system can store the data information of wind power generation system, photovoltaic power generation system, energy storage system, electricity meter, air conditioning, fire protection and other equipment in time-sharing and classification. Users with the permission can query the historical value of each system measuring point through the historical query page of the client. With different interval query, through the query of these historical data, the real-time analysis and management of the equipment's historical running status and equipment's own condition is realized, which improves the security performance of the system.

5.2. Comparative Analysis
Users can compare and query the power and energy value through the client's comparative analysis query page. With different interval query, compare the energy change of different devices at the same time. Through the comparative analysis of these historical data, we can understand the operation of energy management strategy, and the interaction and influence between source grid load storage energy or power, and provide theoretical and data basis for further optimization of operation strategy.

5.3. Alarm Log Analysis
The system provides open and intelligent event alarm function. It supports user-defined alarm type, alarm level and alarm mode. It can correctly distinguish remote communication out of limit and recovery, telemetry overrun and out of limit recovery, and generate alarm. The alarm value, alarm value of wind energy storage system and other equipment of photovoltaic system are included.
Users can view the alarm through text, voice, flashing and other ways; can manually and automatically confirm and delete the alarm information; can query by type and alarm source.

The system classifies and stores the alarm logs according to the severity, so that users can understand the current state of the system more intuitively, and deal with important alarms in the first time, and recover the normal operation of the system.

5.4. Report Analysis
The system has the functions of report display, report release and report export. The report subsystem can easily define various report templates and flexibly generate daily, monthly and annual reports of system power consumption and power generation Excel files are fully compatible; the system provides users with friendly and convenient interface for report parameter management and report file management. Users can query and export reports through the report module of the interface, fully understand and analyze the electricity information in a certain period of time, and realize the continuous optimization of the system.

6. Concluding Remarks
With the rapid development of photovoltaic, wind power and other new energy generation technologies, the penetration of distributed energy into the grid is increasing day by day. The distribution network system with multi energy input has become a trend, which can effectively improve its economic performance.

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Liang liang, (1980-), Associate professor, Postgraduates, Liaoning Technical University. Guide students to participate in national and provincial skills competitions for many times, and be as awarded the title of "national practice expert".

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