Summary of Clean Energy Utilization in Water Transport Industry

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Abstract. Firstly, this paper compares the situation of clean energy utilization and standard formulation in domestic and foreign transportation industry, and finds out the differences. On this basis, it puts forward the future development direction of clean energy utilization technology and standard in China.

1. Introduction

At present, thermal power is still the main source of electric power production in China, and the environmental problems caused by thermal power generation are becoming increasingly prominent. Coal-based non-renewable energy is not suitable for long-term development and utilization, so various types of clean energy gradually become ideal resources[1]. In recent years, the awareness of energy saving and emission reduction in water transport industry has been increasing. With the construction of intelligent ports[2] and stricter requirements for pollutant discharge in ports[3], the use and proportion of water transportation and port power have gradually increased. Therefore, it is necessary to gradually increase the proportion of clean energy use and reduce the environmental pollution caused by thermal power generation.

At present, there is a lack of clean energy utilization technology and standards in China's water transport industry. Based on the comparison of the current situation at home and abroad, this paper puts forward corresponding suggestions for improvement.

2. Current Situation and Analysis of Clean Energy Utilization in China

China is rich in wind and solar energy resources. According to China's "Renewable Energy Medium and Long-term Development Plan", China's wind and solar power installed in 2020 is expected to reach 200 million kW and 50 million kW, respectively. However, the local absorption capacity of new energy-rich areas in China is limited. Large-scale centralized development of wind and solar power needs to be transferred to regional power grids or even cross-regional power grids for absorption.

The above problems can be effectively alleviated by the application of distributed energy, but at the same time, higher requirements are put forward for the entire power grid system, and smart distribution network with fault self-healing ability must be adopted. At the same time, users have the dual roles of power suppliers and consumers. It is necessary to establish a perfect information platform and price mechanism between users and power grids in order to effectively guarantee the effective implementation of distributed energy.
In terms of standard-setting, the international standard-setting bodies related to renewable energy are ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission).

Table 1. IEC, ISO Technical Committee on Renewable Energy.

| Serial number | Name                                                      |
|---------------|-----------------------------------------------------------|
| IEC/TC114     | Ocean Energy-Wave, Tide and Other Hydroenergy Conversion Equipment |
| IEC/TC117     | Solar thermal power plant                                 |
| IEC/TC4       | Hydraulic turbine                                         |
| IEC/TC88      | Wind turbine                                              |
| ISO/TC180     | Solar energy                                              |
| ISO/TC86      | Refrigeration and air conditioning                        |
| ISO/TC238     | Solid biofuels                                            |
| ISO/TC208     | Industrial Thermal Turbine                                |
| ISO/TC28/SC7  | Petroleum products and lubricants                         |
| ISO/PC248     | Guidelines for Sustainable Development of Bioenergy       |

China actively participates in the formulation of international standards in the field of renewable energy. At the beginning of 2013, the New Technology Commission of power grids for large-capacity renewable energy (led by China State Grid Corporation) was approved by IEC, marking a major breakthrough in the formulation of international standards in China.

3. Current Situation and Analysis of Clean Energy Utilization in Foreign Countries

In recent years, the global level of renewable energy technology research and development and equipment manufacturing has made significant progress, technology research and development to large-scale, efficient and low-cost direction.

Due to the increasing efficiency and decreasing cost of solar photovoltaic crystalline silicon solar cells, it is expected that the mass production of photovoltaic conversion efficiency will rise to 22% and the cost will drop more than 80% in the next decade.

With the increasing capacity of wind turbines and the development of offshore wind farms towards large-scale and deep-sea, countries are developing floating offshore wind turbines to meet the needs of the construction of deep-sea wind farms.

Geothermal power generation is developing towards enhanced geothermal system, and unconventional geothermal resources such as dry hot rock will be further developed.

Ocean energy is developing towards the construction of large-scale tidal power stations, tidal and wave power plants, research and development of new generation technologies and comprehensive utilization [5-6].

Table 2. Clean Energy Utilization Plan of Major Developed Countries

| Country Name | Plan name              | The proportion of clean energy |
|--------------|------------------------|-------------------------------|
|              |                        | 2020  | 2030  | 2050  |
| U.S.A        | Clean Electricity Plan | 28%   |       |       |
| Germany      | New Energy Program     | 35%   | 50%   | 80%   |
| Japan        | Basic Energy Plan      | 24%   |       |       |

4. Current Situation and Analysis of Clean Energy Utilization in Foreign Countries

4.1. Differences at the technical level
There are some problems in China's bio-energy industry, such as poor R&D capacity, small-scale enterprises and low degree of localization. There is a certain gap between China and the international advanced level. The main manifestations are as follows:

4.1.1. safety problem
Taking wind power as an example, the overall safety of units needs to be improved due to the inadequate reform of power generation technology, which has a great impact on normal operation and is not conducive to the sustainable development of the industry.

4.1.2. Incomplete industrial chain
At present, in the renewable energy industry, the degree of localization of all kinds of mechanical parts is very high, but foreign technology is still needed in the core components. Our country does not have the overall design ability of generating units, and there is a certain gap in transportation, maintenance, testing and other aspects, which greatly hinders the development of the renewable energy industry.

4.1.3. Power generation forecasting technology needs to be improved
Through power generation forecasting, energy enterprises can realize the rational arrangement of power generation plans for conventional power plants, thereby reducing the system spinning reserve, reducing the operation cost of power system and improving economic benefits. Based on this, reasonable strategies are adopted to effectively improve the stability and security of the whole system.

4.2. Differences at the technical level
Compared with the European and American countries, China's renewable energy promotion policy is stronger, and market-oriented behavior is less, which causes some investment behavior is sometimes too blind, rather than proceeding from the actual situation of the industry.

Taking Germany as an example, the new Renewable Energy Law (EEG-2017) issued in 2017 stipulates that the bidding and bidding mechanism for renewable energy projects will be implemented. Instead of purchasing green power at a specified price, the government will adopt a complete market behavior, thus enabling the development of renewable energy to enter a new stage of market competition. Germany encourages the development of clean energy through market-oriented means, so that the development of renewable energy forms a virtuous closed-loop chain. It mainly includes the following aspects: First, renewable energy suppliers are encouraged to take the initiative to make accurate prediction of the power generation situation, so as to improve the trading value of renewable energy. The second is to encourage renewable energy suppliers to install power remote monitoring and control devices, which promotes the technological progress of related industries. Thirdly, the system integration suppliers are allowed to act as agents for all kinds of small power suppliers to sell electricity, which promotes the electricity transactions of small power suppliers.[7]

5. Development Direction of Renewable Energy

5.1. Technology demand

5.1.1. Increase technology research and development, reduce power generation costs and impact on Power Grid
(1) We will increase the research and development of key technologies and intelligent control systems for renewable energy generating units, reduce equipment operating costs and improve power generation efficiency.

(2) Support the research and development of renewable energy generation forecasting technology, monitoring and control technology, and reduce the impact on power grid system.

(3) Strengthen the research of renewable energy generation and energy storage technology, issue relevant technical standards, and improve the stability of grid-connected.
5.1.2. Promoting local consumption of electricity generated by renewable energy sources

(1) Increase the proportion of distributed micro-grid power access, set up renewable energy generation equipment according to local conditions, and achieve the basic balance between local power generation and production energy.

(2) We will vigorously develop power battery substations and off-grid lighting for automobiles, and adjust peaks and troughs.

(3) Gradually improve the process of marketization and realize the market-oriented electricity pricing mechanism.

5.2. Standard Development Direction

5.2.1. Promoting local consumption of electricity generated by renewable energy sources

At present, all kinds of international standards related to renewable energy power generation mainly focus on equipment level; basic general technology requirements mainly exist at the national level. In the future, it is necessary to upgrade all kinds of basic general technology standards to international standards, improve compatibility and promote international integration.

5.2.2. Technical Requirements for Grid-Friendly Renewable Energy Connection

Requirements for grid-friendly performance such as high voltage traversing and multiple fault traversing are put forward, and corresponding technical standards are formulated.

6. Results and Discussion

In terms of clean energy utilization, there is still a certain gap between China and the international advanced level. Therefore, we should vigorously promote the use of clean energy according to the characteristics of our national conditions.

Acknowledgment

Fund Project, National Key R&D Program of China 2016YFE02044800, Water Transport Engineering Standard Projects JTSBD2017-05-210, Ministry of Transportation Science and Technology Demonstration Project 2016011

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