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ABSTRACT

Electric Power Transformation and Energy Management System (EPTEMS) is one of the key subsystems of marine renewable energy generation plant and the control center. EPTEMS transfer the unstable electric power from the output of marine renewable energy generators into stable, safe and reliable electric power, with power collection, transformation, energy storage and release, electrical distribution, system protection and overall control and management. This paper present a design idea of EPTEMS with 500kW stand-alone marine renewable energy power system demonstration project as an example by comparatively analyzing the electric power collection, transformation, energy storage, energy management and control scheme of stand-alone marine renewable energy power generation system.


INTRODUCTION

In view of the rapid growth of marine renewable energy development, it’s essential to develop and study on marine renewable energy power generation system electric power transformation and energy management system (EPTEMS).

ETPEMS is the control center of stand-alone marine renewable energy power generation system. The EPTEMS mainly transform the unstable electric power output from marine renewable energy power generators into stable electric power. EPTEMS also manage and control the storage, release, transformation, distribution of the electric power.

Variety of marine renewable energy generators combined together and complement each other is the trend of ocean renewable energy development. At present study of marine renewable energy power generation system EPTEMS mainly focus on one ocean renewable energy, such as tidal current or wave energy. Most of the EPTEMS for marine renewable energy power generation refer to the onshore wind farm. It’s singularly to study on combination of variety of marine renewable energy for generation.

This paper will discuss the technology of EPTEMS for marine renewable energy power generation system using more than 3 kinds of marine renewable energy (Tidal current energy, Wind energy and solar energy) by taking the 500kW stand-alone marine renewable energy power system demonstration project as an example.

This project has been carried out since 2010 by China National Offshore Oil Corporation Research institute, the purpose of the project is to build one 500kW stand-alone marine renewable energy generation system with 50kW solar cells, 3 sets 50kW wind turbines, 2 sets 50kW tidal current generators and 2 sets 100kW tidal current generators. EPTEMS is charge for the electric power transformation and system control. All the equipments were installed in 2013, and now are under test and trial operation.

A typical EPTEMS consists of input electric power convertor, output electric power convertor, common bus for electric power collection, energy storage, energy management and control system, and system monitoring (Fig. 1). All of the basic part of EPTEMS will be discussed in this paper.

Fig. 1 A Typical ETPEMS Block Scheme