

Review of Solar Thermal Power Generation Technology

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Abstract. As we all know, solar energy resources is almost inexhaustible and the solar power generation technology is environmentally friendly. In this paper, we enumerate five Solar thermal power generation systems, include the solar parabolic focusing system, the central receiver or the solar tower focusing system, the disk paraboloid focusing system, the solar pool power generation system and the solar energy Stirling thermal power generation system, to introduce the solar thermal power generation technology. Among them, the first three kinds of solar thermal power generation systems are concentrating solar thermal power category. The latter two is a new field of solar thermal power technology research. This paper expounds the advantages and disadvantages of various power generation way. At the same time, it briefly introduces the development of solar power technology in China. And this paper points out the advantageous conditions of our country to develop solar power systems and natural space.

Introduction

Due to the shortage of energy at a time, the environmental pollution and the global climate warming. To seek a new way of energy utilization and make full use of clean energy has become a global research subject.

Among various kinds of new energy, solar energy should be vigorously developed. For now, the use of solar energy in power generation is given priority to with solar photovoltaics and solar thermal power generation. In this paper, we will introduce the Solar Thermal Power Generation Technology. Solar thermal power generation is an important technology to utilize solar energy in large scale.

This article selects several typical solar thermal power generation system and introduces the principle of them and the advantages and disadvantages respectively.

Concentrating Solar Power

As the power efficiency of traditional silicon-based solar cell is low and also it costs high, concentrator photovoltaic systems with high conversion efficiency will become the main direction [1].

Parabolic trough Solar Thermal Power. The solar parabolic trough power is one of the ideal and competitive solar thermal power technologies, with its advantages of largest installed capacity and being commercialized over 15 years in US [2].

Parabolic trough solar thermal power consists of five subsystems: Concentrated heating subsystem, Heat transfer subsystem, Power generation subsystem, Heat storage subsystem and auxiliary energy subsystem, shown in Figure 1.

Tower Power Generation System. Tower system is also called the centralized system. It is in large area ground is equipped with many sets of large-scale solar reflectors, often called heliostats. The heliostat is an important kind of equipment in the tower power generation system, which is used of tracking the sun and collecting the solar energy [3].

Tower system consists of five subsystems: Concentrated heating subsystem, Heat transfer subsystem, Power generation subsystem, Heat storage subsystem and auxiliary energy subsystem, shown as Figure 2.

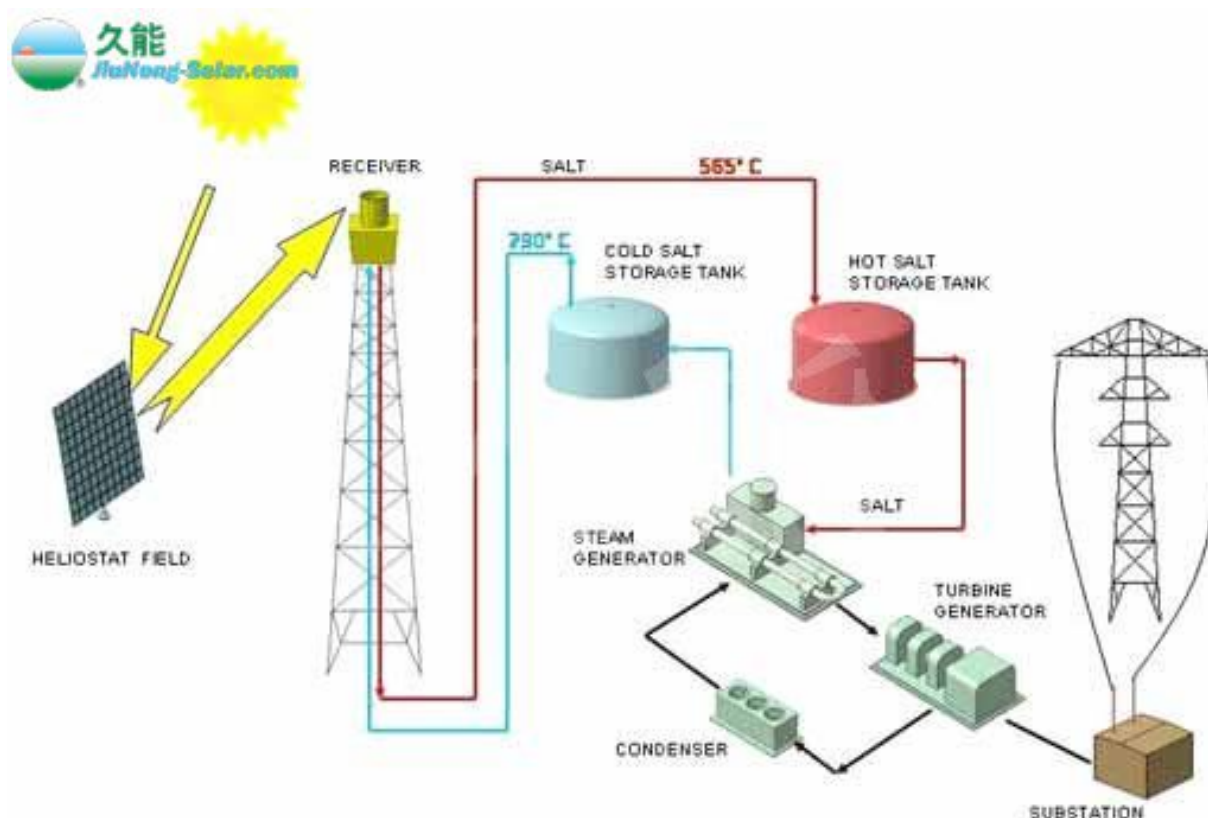


Fig.1.Parabolic trough Solar Thermal Power

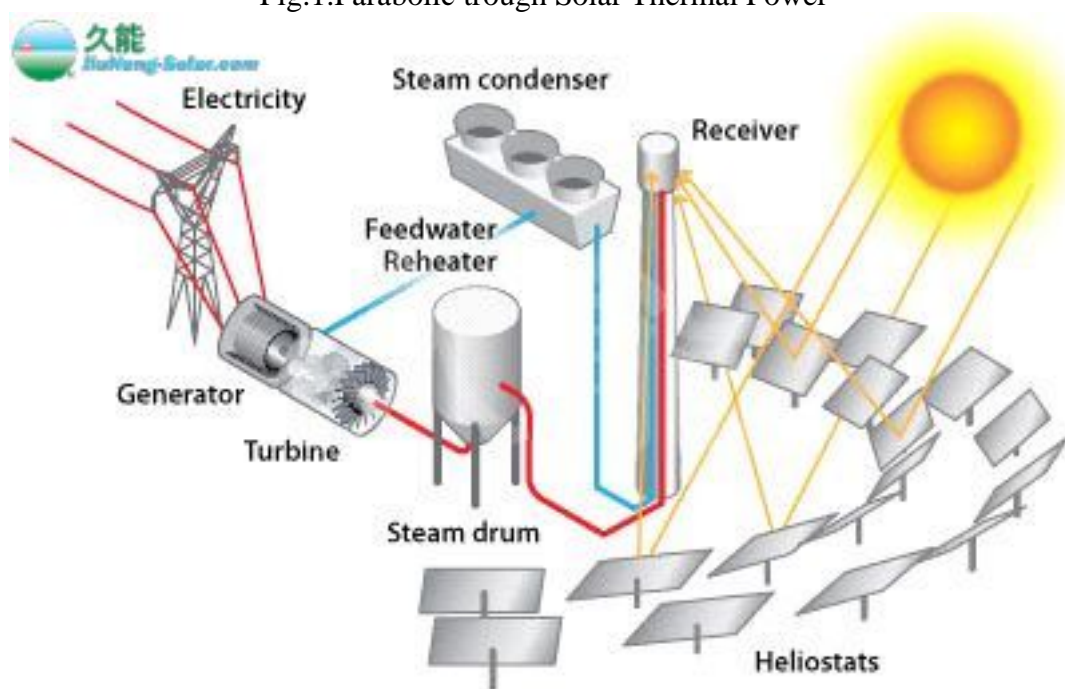


Fig.2.Tower Power Generation System

The Dish Solar Energy Hot Power Generating System. The Dish Solar Energy Hot Power Generating System is a complicated system. Although China has made some achievements in developing dish stirling solar energy power generating technology, overall no substantial progress has been made and research is still in the early stage [4].

The Dish Solar Energy Hot Power Generating System generally consists of four parts: parabolic reflector, receiver, tracking systems, generate electricity subsystem, shown as Figure 3.

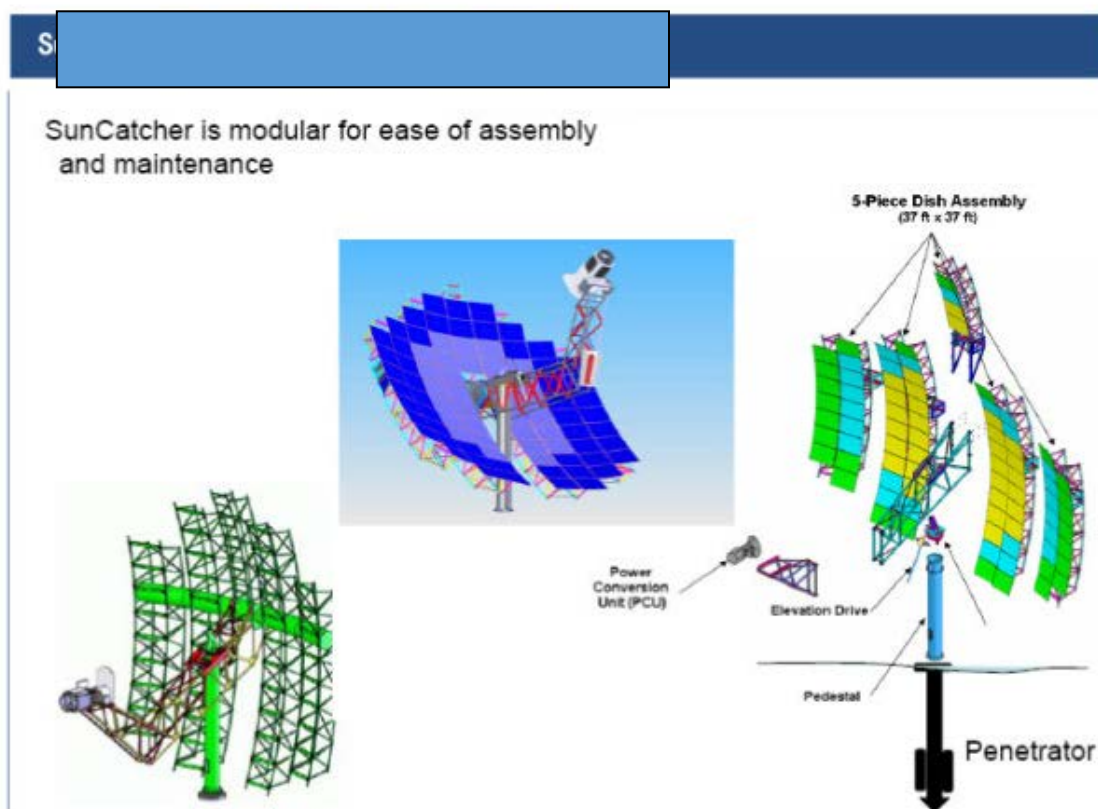


Fig.3.The Dish Solar Energy Hot Power Generating System

The Other Solar Thermal Generation System

Solar Cell Power System. The sun pool is a saltwater pool. Brine along the depth of the pool has a certain concentration gradient. The water on the surface of the pool is water, and the concentration gradually increases, and the bottom is close to the saturated solution [5]. Due to the lower concentration gradient of the brine, the lower brine is relatively heavy, so it can prevent or reduce the natural convection of the liquid in the pool due to the temperature gradient in the pool, thus stabilizing the water. In the solar radiation under the bottom of the water temperature rise, the formation of the temperature up to about 90 °C hot water layer, and the upper layer of the water layer has become an effective layer of insulation. At the same time, because the salt solution and the pool of soil around the heat capacity, so the solar pool has a lot of heat storage capacity.

Stirling Solar Thermal Power Generation. Stirling Solar thermal power generation is a technology that uses thermal power generation. This technology through the thermoelectric material, the thermal energy directly into kinetic energy, and the mainstream power generation different, no waste emissions, no noise, safe and reliable work, is the recycling of heat. Dish stirling solar thermal power generation is a way of the dish solar thermal power generation technology [6]. Although China has made some achievements in developing dish Stirling solar energy power generating technology, overall no substantial progress has been made and research is still in the early stage.

The Application Situation and Development Status of Our Country

Although China's solar thermal power generation technology research started late, but in recent years the government of solar thermal power technology to give a lot of policy support. In 2007, renewable energy medium and long-term planning", provided by 2020, solar thermal power generation installed capacity should reach 200MW. Suggested that China in the development of

solar thermal power generation, should be based on China's solar radiation intensity and other climatic conditions, the availability of land resources and financial investment capacity and other aspects of the start.

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