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Analysis for marketization development prospect of large-scale solar heating combisystems in China

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Abstract

In recent years large-scale solar heating combisystems developed very faster in Europe and got better economical efficiency. In some countries such as in Denmark it seems that the solar district heating can have a clear future for marketing developing. However in China although development for solar water heating systems is to depend on the market requirement totally, but the case of solar heating combisystems is different with it. As more investment and longer pay-back years, the economical efficiency of solar heating combisystems is not very well now in China.

In this paper it is given the background of development for large-scale solar heating combisystems in China, comparison of the different cases between Denmark and China and analysis for economical efficiency of large-scale solar heating combisystems in China. According to analysis and evaluation results China's marketing developing prospect of large-scale solar heating combisystems is given in the paper.

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Keywords: large-scale solar heating combisystems; solar heating cost; common heating cost; economical efficiency; marketing developing prospect

1. Background for development of large-scale solar heating combisystems in China

For promoting the renewable energy application in buildings and raising the effect of solar heating in energy efficiency of buildings, in recent years China central and local governments give a more attention to application of solar heating combisystems, so solar heating combisystems have been developed faster than past in China and a technical supporting system including technical code, computer design software and design handbook has been formed. At the same time many demonstration projects of solar heating combisystems have been completed in China. But as higher primary investment cost, the large-scale solar heating combisystems can still not develop by marketing now in China. So we should search the main developing obstacles and solve them.

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1.1. Technical supporting system

Fig. 1. National standard and computer software

In 2009 national standard “Technical Code for Solar Heating System” GB 50495-2009 was issued by the Ministry of Housing and Urban-Rural Development of P.R.C and General Administration of Quality Supervision, Inspection and Quarantine of P.R.C (Fig.1 left). The issue date is 19, March 2009 and the implementation date is 1, August 2009. The contents of the standard have 5 clauses, 7 annexes and explanation of the provisions. In the clause of Solar Heating System Design some design parameters such as recommendation range of collector flow rate and volumes of water storage tank of per m^2 collector etc and formula for calculation of collector areas are given. For insuring system safety a requirement is stipulated in the code that when seasonal heat storage is over, the reachable highest water temperature in water storage pool should be evaluated and this temperature must be lower than 5℃ from the water boiling point at the corresponding working pressure in water pool.

“Design Software for Solar Heating and Cooling System” is developed by China Academy of Building Research and it was one of the tasks of China’s national research projects. The software can be used for design of solar water heating systems, solar heating combisystems and solar cooling systems. For solar heating combisystems which is according to stipulation of GB 50495 and there are three databases and four function modules in the software. The starting surface of the software is shown in Fig.1 right. The output of the software is selected system and collector types, collector areas, volume of storage tanks or pools, the reachable highest water temperature in water storage pool when seasonal heat storage is over, model and capacity of pumps and heat exchangers, solar heat-cost, payback years for increased solar system investment, decreased quantity of CO_2 emissions and node-structure drawings of CAD type.

“Technical Handbook for Solar Heating System” is a detail guideline for design, construction, acceptance and evaluation to solar heating combisystems meeting the requirement of national standard “Technical Code for Solar Heating System” GB 50495 and it has been published by China Architecture & Building Press in March, 2012. Some important design parameters and computation methods are given in the handbook, such as an experience formula for evaluation of the highest water temperature in water storage pool when seasonal heat storage is over, evaluation methods for energy saving effect and environment effect etc. Three real projects including two systems with short-term heat storage and one system with seasonal heat storage are introduced in the last chapter of the handbook, so the engineers can understand the design measures of solar heating combisystems very directly.