Editorial

Special Column for the Distributed Energy System with Renewable Energy and Natural Gas

With the rapid growth of urban population, the contradiction between energy consumption and environment protection has begun to restrict the development of the ecological civilization. The distributed energy network system, which combines the advantages of renewable energy and distributed energy, has gradually emerged and become one of the main development directions of the next-generation energy system. Distributed energy network system is a new type of intelligent energy network system that has evolved from the distributed energy system with integration of multiple energy networks and information networks. By connecting multiple renewable energy and natural gas in the region with end users in a distributed way, it can realize the instant and bidirectional transmission of cold, heat and electricity, and achieve ordering of the entire network through integration and cooperative control of the material flow, energy flow and information flow.

Through the long-term research projects on the distributed energy network system, Prof. GAN Zhongxue has summed up three key scientific topics on the distributed energy network system: firstly, structural ordering of the distributed energy network, that is, how to design and optimize the physical energy network so as to improve the stability of the whole distributed energy network and to realize the self-organization and self-balance of the regional energy; from scientific point of view, it is an entropy generation reduction process of the entire distributed energy network; secondly, mechanism of the energy grade improvement and energy efficiency increase of the distributed energy network system, that is, under the dynamic environment where multiple types and different grades of energy input meet multiple types of energy needs by various end users, how to improve the quality of energy input so as to increase the energy utilization efficiency of the entire distributed energy network; finally, principle of cooperative control on the distributed energy network system with coordination and regulation of the energy network by using information technology, that is, how to maximize the usage of renewable energy, to eliminate network disturbance and to acquire and adjust end users' energy consuming

behaviors so as to realize the intelligent use of energy.

This special column of the Journal of Thermal Science (JTS) focuses on the reporting of the research progress of the distributed energy network system integrated with renewable energy and natural gas, as studied in the National Key Basic Research Program of China (2014CB249200). With Prof. GAN Zhongxue as the chief scientist, the team has done extensive research on the above-mentioned three scientific topics. To solve the problem of lacking sufficient theoretical support for the current practical development of distributed energy network systems, this research provides theoretical foundation and technical support for the construction of an intelligent distributed energy network that integrates both information and energy, with verification of demonstration projects based on the development of technology platforms by energy enterprise. This project has effectively alleviated the constraints on the sustainable economic development caused by the low energy efficiency and environmental pollution problems in China, and conformed to the future development trend of China's energy production and consumption ecology. Besides what mentioned above, we have also invited colleagues from Xi'an Jiaotong University and Tsinghua University, to contribute their research progress on related topics in the fields.

There are eight papers in this special column, including seven original research articles and one literature review. We sincerely hope these articles are of great use for the community of the distributed energy network system, including researchers in academia, engineers in industry and policymakers in government.

Finally, we would like to thank all the authors in this special column for contributing such good articles and for their patience during the reviewing and editing process. Then, we also want to send our gratitude to all the reviewers for their useful comments and suggestions for improving the papers' quality. Last but not least, we would like to thank the Executive Editor-in-Chief, Professor ZHANG Na, for giving us the opportunity to develop the special column, and for her support and effort in this achievement.

Guest Editors:**Prof. HAN Wei**

Institute of Engineering Thermophysics, CAS, Beijing, China

E-mail: hanwei@iet.cn

Prof. ZHU Tong

School of Mechanical Engineering, Tongji University, Shanghai, China

E-mail: zhu_tong@tongji.edu.cn

Prof. GAN Zhongxue

ENN Science and Technology Development Co., Ltd., Hebei, China

E-mail: ganzhongxue@fudan.edu.cn