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Editorial: Re-electrification technology and application of the energy consumption terminal

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Editorial on the Research Topic
Re-electrification technology and application of the energy consumption terminal

Introduction

With the continuous development of the economy and society, the greening, digitization, and convenience of energy terminals are gradually becoming concerns for the public. In addition, the consumption of fossil energy is increasing the burden of environmental purification, and the re-electrification of energy consumption terminals is imminent.

This Research Topic highlights emerging technologies related to the re-electrification and utilization of energy consumption terminals, such as energy harvesting, wireless power transfer (WPT), and energy regulation that can make technological innovations and bottleneck breakthroughs. With contributions from over 11 authors, three original research articles have been published on this Research Topic, providing innovative conclusions from three aspects: the influences of metal foreign objects in WPT systems, the wireless power supply for high-voltage monitoring equipment, and the low-carbon operation of integrated energy systems. The Research Topic has garnered adequate attention. As shown in Figure 1 below, at the time of writing, there have been 1188 total views, 695 article views, 98 article downloads, and 395 Research Topic views recorded across the globe. The published articles cover several Research Topic that can be combined into three main categories, the conclusions and main points of which are outlined below.

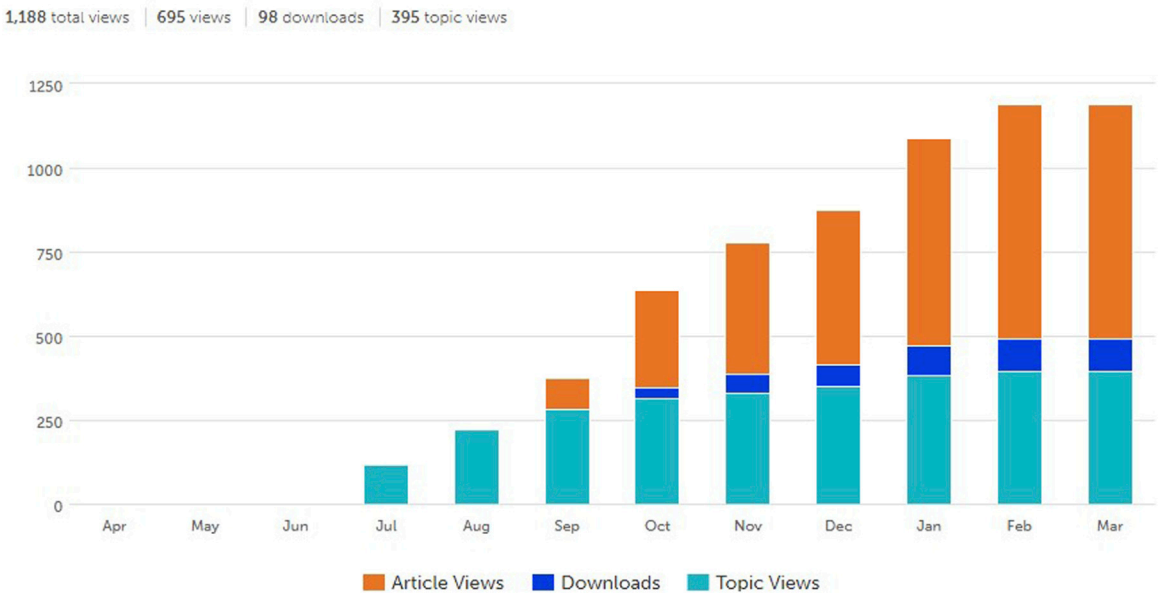

FIGURE 1
Research Topic impact views.

Influences of metal foreign objects on wireless power transmission

With the development of a WPT system, foreign objects in energy transmission channels will greatly affect the transmission of system energy. Hence, by analyzing a magnetic coupling WPT system in the actual application process, Li and Huang, analyze the effects of foreign objects in the transmission channel on the system performance. In the article, a WPT system without and with foreign objects is constructed. The effects of foreign object height, radius, coil transmission distance, and number of coil turns are specifically analyzed, and then the effects of self-inductance and mutual-inductance of the coupled coils are studied. Therefore, by constructing the circuit topology of the series structure, the final analysis proposes that the invasion of metal foreign objects will reduce the transmission efficiency of the system; when the foreign objects are large, the impact of foreign objects on the system will be greater. When the transmission distance between the coils is very large, the system transmission efficiency will also be reduced. However, when the number of coils increases, the system transmission efficiency will be improved. Moreover, the results of this article can provide a reference for foreign body detection and identification.

Coil configuration scheme of wireless power transmission

With the continuous development of the smart grid, the power supply problem of monitoring equipment needs to be solved urgently. As an important part of the transmission line, high-voltage insulators have taken an important role. The power supply problem of monitoring equipment on the insulator has become the key to technology development. Wang et al. further discuss the optimized structure of the insulator string of the coil. Compared with the traditional domino coil, the article further discusses the effects of the performance parameters such as the arrangement position, quantity, and number of turns. It is found that by optimizing the configuration of relay coil parameters, non-uniformly arranged domino coils can achieve better transmission performance than traditional domino coils. Hence, through simulation and experiments, the feasibility of the idea is proved, and the specific coils configuration solution is given. Moreover, experiments show that when the length of the insulator is 1.015 m, in the high-voltage transmission of 110 kV, through parameter optimization, the transmission capacity and efficiency of the WPT system can be increased to 1.81 W and 60.11%, respectively, providing new ideas for medium- and long-distance WPT systems.

Low carbon and efficient operation of integrated energy systems

Integrated energy systems (IESs) have excellent carbon reduction capabilities that can be further exploited. Ye et al. optimize a scheduling strategy that incorporates both integrated demand response and stepped carbon trading. An integrated demand response pricing approach accounts for variations in load properties and a stepped carbon trading pricing regime encourages IESs to reduce their carbon footprint. Then, an optimization scheduling model is developed to optimize the

objective integrated cost minimization including energy purchase, carbon trading, and operation and maintenance. Lastly, a modified differential evolutionary approach is used to solve this complex high-latitude, nonlinear model. Further, the impact of the parameters in stepped carbon trading on the results of integrated energy system dispatch is analyzed in depth by the authors. The proposed method can reduce carbon emissions from 6.28% to 3. 24%, and the total cost from 1.24% to 0.92%, respectively, compared with the single IDR model and single-stepped carbon trading. This strongly indicates that the proposed model has great applicability and economy. Moreover, the carbon emissions of IESs can be effectively reduced by setting reasonable stepped carbon trading parameters.

Author contributions

WW finished the main content of this article, ZJ finished the part of "Low carbon and efficient operation of integrated energy systems", WH, ZAJ, YW, MX and LT assisted in inspection and polishing of this article. All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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