Special Issue

Advances in Heat Pump Technologies for Energy Efficiency Enhancement and Decarbonization

Message from the Guest Editors

The building and industrial sectors are among the largest energy consumers and contributors to global greenhouse gas emissions. As the world accelerates its transition toward low-carbon and energy-efficient solutions, heat pump technologies have emerged as a key enabler for decarbonizing heating, cooling, and hot water production. Recent advancements in refrigerants, system integration, control strategies, and hybrid renewable energy systems have enhanced the efficiency and environmental sustainability of heat pumps. However, critical challenges remain, including cost-effectiveness, scalability for large-scale and industrial use, integration with district energy networks, and the adoption of next-generation low-GWP refrigerants. Additionally, the potential of heat pumps in high-temperature industrial processes and their synergies with thermal storage and smart grid interaction require further exploration to unlock their full decarbonization potential. This Special Issue aims to present and disseminate the latest research on heat pump technologies that advance energy efficiency and carbon emission reductions in both building and industrial processes.

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Energies is an international, open access journal in energy engineering and research. The journal publishes original papers, review articles, technical notes, and letters. Authors are encouraged to submit manuscripts which bridge the gaps between research, development and implementation. The journal provides a forum for information on research, innovation, and demonstration in the areas of energy conversion and conservation, the optimal use of energy resources, optimization of energy processes, mitigation of environmental pollutants, and sustainable energy systems.

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