



Editorial

# Advancing energy innovations: Reflections on 2024, prospects for 2025

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**Abstract:** This editorial reflects on key points in the energy transition during 2024, including renewable energy growth, advancements in energy storage, and the rise of electric mobility. It also introduces special sections featuring research from the 2023 IEEE Colombian Caribbean and ICARGET Conferences. Looking ahead to 2025, it highlights the transformative roles of artificial intelligence, green hydrogen, and smart cities in shaping a sustainable energy future, reaffirming the journal's commitment to driving innovation and global energy progress.

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The year 2024 has been a landmark period for advances in the energy transition. The increasing concern about climate change, combined with rapid technological progress and supportive government policies, has accelerated the adoption of renewable energy and innovative energy storage solutions.

Globally, renewable energy capacity has grown exponentially in the past two decades. According to the International Renewable Energy Agency (IRENA), global capacity increased by 415% between 2000 and 2023. Among the leaders in this expansion is China, which achieved a remarkable 26% growth in 2023, significantly outpacing Europe (10%) and the United States (9%) [1]. This remarkable progress has been driven in part by substantial cost reductions in photovoltaic and wind technologies. BloombergNEF reports that in 2023, the levelized cost of energy (LCOE) for solar photovoltaic reached an all-time low of \$41/MWh, a 22% decrease from 2022 [2, 3]. This downward trend is projected to continue, cementing solar energy's position as one of the most competitive energy sources available.

Simultaneously, energy storage technologies have undergone transformative advancements. Lithium-ion batteries, now more efficient and cost-effective than ever, have facilitated the deployment of large-scale storage systems, enabling seamless integration of renewable energy into power grids [4]. Additionally, emerging technologies such as green hydrogen and thermal energy storage are gaining traction as promising solutions for future energy challenges.

The electric mobility sector has also seen exponential growth, driven by a wider range of electric vehicle models, expanded charging infrastructure, and supportive governmental incentives. Global sales of electric

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vehicles in 2023 increased by 35% compared to the previous year, marking a significant milestone in the transition toward sustainable transportation [5].

This new edition of the journal delves into several of these topics. Featured articles explore advances in battery technology, solar charging systems for electric vehicles, and innovative approaches to improving power grid efficiency. Furthermore, we present two special sections: the first highlights research from the 2023 IEEE Colombian Caribbean Conference, and the second focuses on peer-reviewed studies from the ICARGET 2023 Conference. These sections showcase cutting-edge findings on key topics.

Looking ahead, 2025 promises to be a pivotal year for the energy sector's evolution. Artificial intelligence is expected to play an increasingly transformative role in managing power grids, optimizing energy production, and ensuring efficient distribution. Innovations in materials science and energy storage technologies will enhance the autonomy and flexibility of energy supplies. Meanwhile, smart cities—seamlessly integrating digital technologies with renewable energy—will serve as exemplars of efficient energy management.

Green hydrogen, in particular, is set to emerge as a versatile energy solution, with applications spanning industrial processes, transportation, and electricity generation. Its adoption will pave the way for a more sustainable and decarbonized future.

Through this journal, we reaffirm our commitment to supporting these advancements by publishing high-quality, impactful research. Our mission is to foster the adoption of technologies that not only meet growing energy demands but also contribute to improved environmental sustainability and enhanced quality of life worldwide.

Oscar Acevedo  
Deputy Editor, TESEA

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