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Editorial: Smart grids and EnergyTech as a way for sustainable and environmental development of energy economy

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Editorial on the Research Topic

[Smart grids and EnergyTech as a way for sustainable and environmental development of energy economy](#)

Introduction

Sustainable and environmental development of the energy economy remains a strategic priority of today's economy, shaped by the United Nations' environmental initiatives. This priority, indicative of a progressive society and with the enormous power of uniting the world community to overcome common problems, is underpinned by a series of Sustainable Development Goals (SDGs).

Sustainable and environmental development of the energy economy ensures universal energy security (SDG 7 "affordable and clean energy") and environmental friendliness (SDG 13 "climate action"), achieved through the economic extraction of fossil fuel energy to preserve the heritage for future generations (Popkova et al., 2021; Popkova and Sergi, 2021). Other priorities are environmentally safe transportation to care for ecosystems (SDG 14 "life below water" and SDG 15 "life on land"), responsible consumption and production, and the development of clean energy (as an energy system) (SDG 12 "responsible production and consumption") (Isiksal and Assi, 2022; Sun et al., 2022; Tang et al., 2022; Wang et al., 2022).

Smart grids and EnergyTech have enabled sustainable and environmental development, unlocking the potential of industrialization 4.0, digital innovation, and smart infrastructure (SDG 9 "industry, innovation and infrastructure"). Smart Grids optimize the production and distribution of energy in utility systems through advanced metering (smart meters) and automated Big Data Research Topic through ubiquitous computing (UC) and the Internet of Things (IoT) and their analytics by artificial intelligence (AI) (Qin et al., 2022). EnergyTech is a high-tech fuel and energy complex that uses breakthrough technologies, including robots and blockchain, to balance energy markets and ensure responsible environmental management (Li et al., 2022; Mahboob Ul Hassan et al., 2022).

This Research Topic aims to showcase that the most convenient solution is not invariably the right one. Instead, it offers Smart Grids and EnergyTech as a new, non-controversial way of sustainable and environmental development of the energy economy that balances the interests of society, economy, and governments (Popkova, 2022). What makes this path unique represents the high flexibility to keep the extraction and use of fossil fuel energy where needed and to switch to clean energy wherever possible.

Sustainable and environmental development of the energy economy in the decade of action

The Decade of Action began with the COVID-19 pandemic, the most acute phase of which occurred in 2020, the ripple effect of which continues to this day: early in the second half of 2022, the prospects for completion are uncertain. The shutdown of production under lockdown cut down energy consumption and restrictions on transport links and other measures that reduced the economy's carbon footprint. However, the effect was short-lived (Zhou and Li, 2022).

Energy companies must continually develop production facilities in which complex and injury-prone business processes are automated, and control and decision-making are performed remotely. This requires social sanitation requirements in the current energy economy, which has become more complicated because of the COVID-19 crisis that has added concerns to the global energy crisis.

Global climate change manifests in abnormal temperatures and natural disasters in all corners of the planet, representing a severe challenge of our time (Liu et al., 2022). Industry 4.0 is also in its heyday in the Decade of Action. Digital economy programs in most countries are focused on the period until 2024–2025. The Fourth Industrial Revolution is expected to be completed by 2030. Although many advanced technologies have improved energy efficiency characteristics, automation increases the economy's energy intensity and limits clean energy applications. This fact calls for further efforts in energy efficiency management.

Overview of the Research Topic

This Research Topic systematised theoretical knowledge in the sphere of energy economics and shed light on and discussed in detail the leading international experience of sustainable and environmental development of the energy economy under the influence of the Fourth Industrial Revolution. The key idea of the Research Topic is that under the conditions of Industry 4.0 and the digital economy, sustainable and environmental development of the energy economy takes place based on Smart Grids and EnergyTech. This thought was described in the papers included in this Research Topic.

In their paper, Pechancová et al. proposed a promising approach to developing renewable energy based on local communities' broad involvement and active participation in this process. The leading experience of the Czech Republic and the new "triple bottom line value proposition canvas" formed a blueprint for environmentally

responsible communities' reaching the carbon neutrality of the economy.

Roslyakova and Vechkinzova elaborated on the influence of price factors on the production of clean energy in the regions of Russia. This paper includes a non-parametric data envelopment analysis method (DEA). It states that the "green policy" leads to a slight growth of prices and significant savings of energy resources, i.e., to sustainable and environmental development of the energy economy.

Muzalev et al. performed a large-scale study using smart Russian regions, showing that EnergyTech and Smart Grid markets maintain technological and territorial borders. This allows the authors to identify the specifics of the region as an economic system in which sustainable, environmentally friendly development of the energy economy based on smart eco-innovations takes place. Due to this, the paper demonstrated a novel aspect of examining sustainable and environmental development of energy—from the position of the spatial (regional) economy.

Sozinova et al. described the intended directions of corporate social responsibility of EnergyTech companies that facilitate the sustainable and environmental development of the energy economy. These directions include increasing energy availability for the population, reducing natural rents in the GDP and reducing energy exports. Due to this, the paper provided a new view of the transition to clean energy from the position of energy companies as society's guides on the path to sustainable and environmental development of the energy economy. The paper also offered a perspective managerial tool for this—corporate social responsibility.

Osipov et al. determined the fundamental financing problems of EnergyTech amid the COVID-19 crisis and in the post-pandemic period and outlined the prospects for resolving them. The paper presented a novel view of the COVID-19 pandemic and crisis, which created challenges and threats. It established assured tendencies in the financing of green energy technologies. The authors' conclusions will help forecast the consequences of future epidemics, pandemics, and economic crises caused by them for EnergyTech and manage these consequences.

Vorozheykina et al. identified in their paper the scenario of alternative energetics development in the age of the Fourth Industrial Revolution. The author proved the trend for reducing the share of alternative and clean energy and the economy's growing dependence on fossil energy in disseminating the high technologies of Industry 4.0 (robots and artificial intelligence). The authors recommend changing this tendency and implementing the scenario of sustainable and environmental development of the energy economy in Industry 4.0.

Chutcheva et al. developed a novel institutional approach to the decarbonisation of the economy and transition to clean energy based on EnergyTech. Their paper contains a thorough overview and analysis of statistics on developed and developing countries. The authors' approach allows using the institute of state regulation and energy technologies to ensure decarbonisation.

Borisova et al. developed the marketing mix for energy companies of EnergyTech, which stimulates the maximisation of their contribution to the sustainable and environmental development of the energy economy. Viewing energy companies from the marketing position allowed the authors to demonstrate the difference between oil and gas companies and EnergyTech companies. The proposed authors' recommendations allow for empowering energy companies' environmental management.

Fokina et al. proved that marketing improves project management in EnergyTech and ensures sustainable and environmental development of the energy economy. The authors proposed methodological recommendations for the transition to a new marketing approach to quality management in EnergyTech, which ensures the most considerable support for the sustainable and environmental development of the energy economy.

Khoruzhy et al. monitored the global digital energetics development based on Industry 4.0 technologies. Their paper promotes the discussion on the energy economy's sustainable and environmental development and how leading technologies (IoT, blockchain, robots and AI) promote this development. A breakthrough conclusion is about the priority of energetics' sustainability over its digitalization and developing digital energetics based on Industry 4.0 technologies.

Mustafin et al. employed the leading international experience to specify and model (with the application of the economic and mathematical tools) and cause and effect links of Smart Grid development. The authors equally developed an algorithm for sustainable and eco-friendly development of the energy economy based on Smart Grid. The authors' algorithm allows raising the effectiveness of the management of Smart Grid development with the help of more active involvement of state regulators in this process.

Vagin et al. formulated a new conclusion in their paper: technological innovations play a role in the system of corporate social responsibility of energy companies. More significantly, the authors came up with a methodological approach to assessing energy companies' compliance with the criteria of EnergyTech. Energy companies can set their priorities in developing technological innovations, increasing innovations' management and their influence on corporate social responsibility and the transition to EnergyTech.

Yankovskaya et al. described the leading capabilities of monitoring sustainable and environmental development of the energy economy based on big data and datasets. The authors demonstrated a successful model of sustainable and green development of the energy economy in the Eurasian Economic Union (EAEU) in 2021 and the practical experience of implementing this model in Kazakhstan and Kyrgyzstan.

Bogoviz et al. presented a comprehensive overview of the leading practices of human resources management and, in particular, digital personnel in digital energetics based on the technologies of Industry 4.0. It was proposed to improve this practice through better consideration of each company's specifics: its corporate culture and organisational structure. This will make EnergyTech more accessible and successful in developed and developing countries. For this, the authors proposed a broad range of the leading methods of personnel management in digital energetics (increase in labour safety, creation of science-intensive jobs, training of personnel and stimulation of effectiveness growth) based on the technologies of Industry 4.0: AI, IoT, AR/VR, 3D printers and 3D models, big data, mobile applications and linear programming.

Popkova et al. developed and adopted an institutional approach to research the transition to clean energetics based on EnergyTech and the analysis of reducing production waste and the fight against climate change. This paper reveals the network effect of institutes and their promising role as a bridge between high technologies and sustainable development of energetics. The paper revealed the prospects for developing clean energy based on institutes of EnergyTech.

Prospective directions for smart grids and EnergyTech towards sustainable and environmental energy economy in the decade of action

The prospects for combating the noted issues in the Decade of Action are related to the spread, progress, and effective use of Smart Grids and EnergyTech in support of sustainable and environmental development. The first direction represents the development of renewable energy. This direction is set by the case experience of the Czech Republic, China, Russia and countries of the Eurasian Economic Union (EAEU), particularly Kazakhstan and Kyrgyzstan.

The second direction is related to alternative renewable energy, which received a renewed impetus for development in the context of the Fourth Industrial Revolution.

The third area remains the digital modernization of the fuel and energy complex in innovative regions because the development of Smart Grid occurs at the level of territories. The fourth direction is to increase the level of corporate social responsibility of energy companies, a vital component of which is environmental responsibility and the implementation of the SDGs.

The fifth direction is to improve the marketing management of energy companies with a focus on enhancing quality and efficiency. All identified favourable recommendations for developing Smart Grids and EnergyTech for a sustainable and environmental energy economy in the Decade of Action are reflected in this Research Topic.

Conclusion

The Research Topic "Sustainable and Environmental Development of Energy Economics based on Smart Grids and EnergyTech" developed a systemic view of technological advances in energy in the Decade of Action. The literature's Research Topic consists of developing views of the Theory of energy economy by clarifying the cause-effect relationship of its sustainable and environmental development based on Smart Grids and EnergyTech.

The theoretical significance of the Research Topic is to identify the potential of Smart Grids and EnergyTech and a methodology for sustainable and environmental development of the energy economy. The significance of the Research Topic is the extensive discussion of the best international practices of energy companies and the recommendations to public and corporate governance of Smart Grids and EnergyTech to assist an environmentally sustainable energy economy.

Author contributions

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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