

FOREWORD

Energy resources are needed to ensure the full functioning of any socioeconomic system. At the same time, a significant risk factor for the disruption of this process is the limited, inaccessible, inconsistent, nonpreserved, or depleted resources. Considering this, the issues of obtaining access, ensuring, and efficient use of energy resources are in the interests of both national security and global (transnational) interaction.

Energy security is considered a component of national security, and the energy sector is included in the critical infrastructure of strategic importance for the country's life. The consequences of climate change lead to introduce climate-neutral and smart technologies in energy security based on the intersectoral cooperation and the circular use of renewable energy sources (RES).

Given this, **this monograph is devoted to** the study of the peculiarities of the transition to climate-neutral policy in the energy market, the integration of smart technologies in the energy sector, and the development of innovative components of the climate-neutral policy in the energy market based on the intersectoral circular interaction of agricultural, energy, transport, energy service, and household spheres.

The concept of the study is that the production and transition to the recycling of agro-bioresources is both a way to neutralize the negative impact on the climate (growing photosynthetic plants) and an alternative source of energy (biofuels). The importance of strengthening the ability to develop intersectoral partnerships to create climate–energy clusters based on a closed cycle of using energy resources and the development of smart technologies has been proved.

The monograph aimed to discover the peculiarities and experience of the post-COVID renewal of the energy sector in different countries and determined the development prospects of climate-neutral innovation in the energy security. The authors determined the factors of positioning “green” energy as a climate-neutral product in the energy market and developing a model for positioning “green” energy based on the segmentation of the energy market.

The main novel results of the study are following:

- *Integrated segment approach to modeling the estimating of “green” energy as an innovative product in the energy market*, which will help increase the green energy demand and reduce climate change. As an indicator of the “green” energy, estimating as an innovative product in the energy market is to choose the indicator of the energy consumption from RES.
- *Factor modeling the interaction of agricultural enterprises and enterprises producing “green” energy*. The factors of the dynamics of biomass production (agricultural raw materials) and the logistics of supplying biomass to enterprises producing “green” energy are taken as a basis. The indicator of the efficiency of the algorithm of interaction between agricultural enterprises and enterprises producing “green” energy to optimize the supply chain of biomass is the cost indicator of the produced “green” energy.
- *Communication model of energy service market participants*, which will help increase the eco-transport demand and reduce the anthropogenic impact on the environment
- *Methodology of determining the sustainability indicators for developing climate-neutral technologies in energy security*, which will be a tool for further research on the developing organizational and innovative support and justifying the economic feasibility of introducing climate-neutral technologies based on the clustering of industries and a circular economy in the energy security sphere. The complexity of integrating the principles of climate neutrality into the energy sector is that the result is not an economic effect but primarily an environmental effect (energy decarbonization). The prospect of developing climate-neutral technologies in energy security lies in the transition to cross-sectoral interaction based on a closed cycle of energy consumption from renewable sources and the use of Industry 4.0 technologies, based on the clustering of industries and a circular economy in the energy security sphere.
- *Methodological approach to assessing the effectiveness of the management model for promoting “green” energy services at energy enterprises*, which will help ensure a balance between production, distribution, supply of “green” energy, and rational consumption of energy by different segments of consumers. The determination of optimization criteria for assessing the effectiveness of the management model for promot-

ing “green” energy services has been established. The determination of the optimization criteria for assessing the management model is based on obtaining an ecological effect, which made it possible to single out such criteria as maximizing the decarbonization rate of the environment and minimizing energy consumption costs.

- *Smart circular approach to climate-neutral management of the energy transmission chain*, which will lie in forming the basis for substantiating the economic and technological advantages of developing climate policy in the energy market through intersectoral cooperation on circular and carbon-neutral use of energy resources (e.g., agricultural, energy, transport, energy service, and household spheres).

Energy sector in Europe faces huge challenges related to energy sources. RES are developing at a rapid pace. Thus, it is essential to introduce sustainable development as a management strategy. One of the most important decisions of any government, business owner, and citizen should be the conscious and comprehensive implementation of changes in the country, the company, and the immediate environment, using the sustainable development principles. The sustainability goal will be achieved when all decision makers, managers, employees, and citizens will be guided by a common idea and using one of the best tools to achieve a given goal, paying particular attention to efficiency, people, and the environment in which they work. Moreover, it will be possible to significantly improve operations and avoid mistakes, or increase flexibility in responding, e.g., during the pandemic. Our expectations toward energy acquisition, the pace of RES development, innovation of energy projects, changes, and energy storage are changing. It is done through the introduction of new technologies and processes in the energy sector, renewable energy, prosumers, cognitive technologies, and continuous improvement of efficiency and competitiveness. Therefore, it is worth analyzing the possibilities and relations between the management of RES development and the energy system issues (Czarnecka, 2014). These analyses and solutions will help assess management effectiveness and whether RES development is sustainable, despite political and regulatory turmoil. It is worth checking what loads the energy system has when it has to keep up with the changes in generating electricity from renewable sources and the simultaneous implementation of sustainable development principles. Does the pursuit of modern clean energy bring us the expected results?

FOREWORD

In addition, the authors analyzed the energy system in Poland as well as the energy market and the capacity market in Poland. This allows achieving a broad view of the problems in both study areas.

The monograph is the result of many years cooperation between Ukrainian and Polish scholars for promoting the implementation of EU statement of climate-neutral transition in different spheres.

The authors are grateful to all who supported these project activities of development the climate-neutral innovation in energy security sphere.

The monograph will be useful for all who interested in climate change, using of RES, introducing of climate-neutral innovation.