



MONTE CARLO SIMULATION OF MATHEMATICAL MODELS ARISING IN RENEWABLE ENERGY SYSTEMS

GULIEV JAMIL *

Azerbaijan Architecture and Construction University
Baku, Azerbaijan
(E-mail: camil.quliyev@azmiu.edu.az)

KOSTIANTYN PREDUN †

Kyiv National University of Construction and Architecture
Kyiv, Ukraine
(E-mail: predun.km@knuba.edu.ua)

and

MAMMADOV NURMAMMAD ‡

Azerbaijan Architecture and Construction University
Baku, Azerbaijan
(E-mail: nurmammad.mammadov@azmiu.edu.az)

Abstract. The paper deals with mathematical modelling of the formation and development processes of the fuel and energy complex, which represent an important problem for modern society, particularly in Ukraine. To this end, the results of Monte Carlo simulation in the Python programming environment are employed. Taking possible risks into account, the model proves the possibility of constructing a carbon-neutral and decentralized energy system completely free of fossil fuels. The numerical results offer strategic recommendations on possible scenarios for sustainable energy development in Ukraine.

*ORCID ID: 0000-0002-3442-0906.

†ORCID ID: 0000-0002-2634-9310.

‡ORCID ID: 0000-0002-0508-0439.

Communicated by Messoud Efendiyev; Received July 6, 2026

AMS Subject Classification: 65C05, 65C20, 90B50, 91B74.

Keywords: mathematical modelling, Monte Carlo simulation, stability, statistical methods, data analysis, power change index, sustainable and renewable energy.