

ABSTRACT

The work describes the possibility of forecasting electricity generation from renewable sources using artificial intelligence methods. The paper reviews forecasting methods that could be an alternative to proposed neural networks. Particular attention was paid to wind farms and photovoltaic plants, which are characterized by significant production variability depending on meteorological conditions. Due to the specificity of the work, technical and location differentiation four wind farms and two photovoltaic farms were selected for the analysis. Data for the PV2 photovoltaic power plant was obtained by the author of the study during a visit to the Center for Renewable Energy Sources and Saving (CRESES) in the Attica area in Greece as part of the ERIGrid project - European Research Infrastructure supporting Smart Grid. Using the collected data, the influence of weather factors on the amount of energy produced was investigated. Apart from wind speed and solar radiation intensity, additional influencing factors such as temperature, pressure and wind direction were also analyzed. As a result of the research, the most favorable input data structures for forecasting models were selected.

Various structures of neural networks were proposed and tested in order to select the most favorable variant independently for each object. The proposed forecasting models are characterized by simple construction, a short learning process and network adaptation for power plants that differ in terms of installed capacity, location and technical. Selected models were tested on registered data from the tested objects. The study uses long-term measurement data for a period of more than 1 year, thanks to which it was possible to take into account the variability of weather conditions characteristic for individual seasons. Thanks to the automation of the process, the models have been repeatedly taught by determining the connection weights allowing to minimize the average absolute forecast error. The models proposed in the study were compared with alternative ones developed by two external research institute specializing in forecasting.

Data from numerical weather forecasts constituting the basic source of information for forecasting models of electricity generation from renewable energy sources are usually affected by an error and inaccuracy resulting from the limited resolution of the forecast grid. A method of increasing this accuracy has been proposed to match the actual conditions in the immediate vicinity of the power plant. Numerical weather forecasts from six points and two different portals were collected and verified. The work investigates the operation of the proposed method of multi-point correction of numerical weather

forecasts, allowing to increase the accuracy of power plant power prediction.