

THE IMPACT OF LONG-TERM CHANGES IN AIR TEMPERATURE ON RENEWABLE ENERGY IN POLAND

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Abstract

This paper analysed from the statistical point of view the trends in observed air temperature in major Polish cities and presented a qualitative analysis of their potential impact on the operation of the selected renewable energy sources. It also reviews the relation between the air temperature and observed electrical load as well as changing numbers of cooling and heating degree days. The method involved a statistical analysis of historical mean daily temperature observed in 19 major Polish cities over the 1968–2018 period. The air temperature change impact on renewable energy sector in Poland, by affecting the heating and cooling demand, the electrical load and the renewables working conditions both, on supply and demand side. The analysis reports that the mean daily temperature in all major Polish cities is exhibiting a statistically significant increasing trend, up to 0.52 °C/decade. The observed increase in air temperature reduces the heating demand in Poland, beneficially for the environment and renewable supply. Increasing cooling needs in summer raises the energy consumption and indoor thermal stress. The climate warming affects the operation conditions, energy source, driving force, capacity and efficiency of renewable energy sources. The investigated changes were favourable and unfavourable depending on the renewable technology and operation mode, and were stronger on the demand side than on the supply side.

Keywords

Climate change, Renewable energy, Power demand, National power system