Unhindered access to the electric energy is one of the most important factor ensuring dynamic development of the countries and civilizations. Since the middle of nineteen century fossil fuels have been considered as a most common energy carrier which has established rapid development of European civilisation. Very similar processes can be observed nowadays in China, India or Brazil, intensive development of these countries is accompanied with constantly increasing consumption of fossil fuels. However, due to ecological and economical issues many countries are introducing new regulations regarding fossil fuels utilisations and carbon dioxide emissions. The new European Union regulations put great pressure on the minimisation of the carbon dioxide emission. According to this regulations, EU countries are obligated to increase the fraction of the renewable sources of energy in the total installed electric power to 15 per cents until year 2020. The wind energy may be a good alternative for the fossil fuels which can help us reducing fossil fuels consumption and flue gasses emission and to keep energetic sector and economy competitive. It is confirmed that wind energy is the lowest-priced renewable energy source available today, that is why it is one of the fastest growing energy sector in the World. The amount of installed wind power is increasing by around 20 per cent each year in the world. The installed capacity of the wind power generation had increased by 54.6 GW during year 2016 across the whole world. This is followed by the great interest of researchers from different disciplines.

The main efect of the project will be development of innovative and effective computational tool for optimisation of the shape of vertical axis wind turbines. Although, initially the algorithm will be built to optimise wind turbines, it will have wide range of applications and could be applied to optimise other devices.

Results of the project will open the way to built next generation of highly-effective wind turbines for domestic applications. Household electrical energy consumption in European Union rates around 30%, while in Poland it is around 20%. Hence, it is one of the most important sector in the energy consumption structure, widespread utilisation of autonomous renewable power generators would be significant contribution in reducing carbon dioxide emission and utilisation of fossil fuels for whole Poland and EU.