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Chapter 1

State of the art

1.1 Technical and physical basics

Wind energy has been used by humans for thousands of years, but the generation of electrical power has only been possible since the 19th century with the beginning of industrialization and is now the subject of constant research and development in the context of the energy transition @Wikipedia.2021. A wind turbine usually consists of the three main components rotor blades, nacelle and tower. The nacelle contains besides other elements the gearbox, the generator, the transformer and the control system @MladenBosnjakovic.2013. The mostly three rotor blades are attached to the rotor hub and absorb the kinetic energy of the wind and convert it into a rotary motion. If the winds are too strong, the rotor blades can be "taken out of the wind" by adjusting the blades, thus protecting the system from damage. Mainly the gearbox and the generator convert the kinetic energy into electricity. However, there are also systems with direct drive and without gear. The nacelle can be rotated to an optimal position when the wind conditions change, and an electromagnetic brake helps to shut down the system when the winds are too strong or during maintenance work. In addition to its load-bearing function, the tower also contains the power lines that conduct electricity to the grid connection of the distribution network @NetzKonstrukteur.16.11.2020.

- Present the underlying economic model/theory and give reasons why it is suitable to answer the given problem[1].

[1] Here is an example of a footnote.