This chapter presents a dynamic discrete time piecewise affine (PWA) model of a wind turbine. This can be used for the advanced optimal control of a wind farm, in approaches such as model predictive control (MPC). The nonlinearity identification is based on a clustering-based algorithm, which combines clustering, linear identification, and pattern recognition techniques. The chapter focuses on the identification of a PWA wind turbine model for wind farm control applications. The wind turbine model developed by US National Renewable Energy Laboratory (NREL) consists of several subsystems, including representations of the aerodynamics, drivetrain, tower, generator, pitch actuator and the wind turbine controller. The chapter also presents a case study of the developed PWA model that was verified by the comparison with the 5-MW NREL non-linear wind turbine model. The developed PWA model is suitable for advanced optimal control at wind farm level, including MPC and the linear-quadratic regulator.