Micro Wind Turbines for Energy Gathering in Build Up Areas

Duong Minh Bui and Wim J.C. Melis

School of Engineering
University of Greenwich
Central Avenue
Chatham Maritime
Kent ME4 4TB; United Kingdom
duong.1041030@yahoo.com, Wim.J.C.Melis@greenwich.ac.uk

Abstract

In a city environment, wind direction is often not predictable and is easily re-directed in different ways by all kinds of obstacles. Consequently, large size wind turbines do not work effectively, not to mention the requirement for planning permission often needed for their installation. In an attempt to overcome these problems, this paper proposes the design of vertical-axis micro turbines with a maximum diameter of 30cm, which generate electric power for low voltage DC loads. The paper looks at the design, simulation and construction of a combination of Savonius-type, H-type and Darrieus-type blade turbines. A variety of mechanical and electrical aspects of the turbine design are studied in detail to enhance the electrical output efficiency of the turbines. The results indicate that the most efficient turbine makes use of a combination of different blade designs, resulting in a power coefficient of 42% and an average total efficiency of about 32%. Additionally, the turbine has a high electric power output, a good self-starting characteristic, and low starting and cut-in wind speeds of 2.25m/s and 2.75m/s respectively. It also benefits from a simple mechanical structure and can therefore be produced cheaply.