

Abstract

Wind energy continues to stand out as a more established and mature technology to offset a large proportion of power. Efforts aimed at improving wind energy use to meet the energy demand in turbulent urban wind environment have been the main technical focus. In previous studies on wind resource and behavior in urban environment, different designs of horizontal axis wind turbines (HAWTs) and vertical axis wind turbines (VAWTs) have been reviewed. This paper vividly captures the fact that wind resource has a great potential to be fully explored and developed in the urban environment. Varying ways of application and application techniques being applied for electrical generation, ventilation and pollution dispersion, onshore cooling and dehumidification of coastal urban cities, and economics and environmental benefits of applying wind energy in urban environments are summarized. Although many new ideas and solutions that factor technical, economical and environmental sustainability in urban areas are coming up every day, challenges in design are gradually being solved to take advantage of urban low and turbulent wind speed characteristics, installation space challenges, vibration and noise reduction, among others. Some of the unique solutions that have been and are being developed in the applications of wind energy technology in urban environments are also reported in this paper.