EFFECTS OF UPWIND ROUGHNESS CHANGES AND IMPACTS ON HUB-HEIGHT WINDS

Title

Effects of Upwind Roughness Changes and Impacts on Hub-Height Winds

Purpose of the Presentation

Topography and surface properties have a strong influence on hub height wind speeds. This is especially true for wind farms near shorelines, both onshore and offshore. Improved modelling approaches for internal boundary layers over changes in surface roughness are becoming available.

Attendees can learn to appreciate the effects of surface roughness changes on the wind energy potential of sites affected by upstream roughness changes such as shorelines or forest boundaries.

Abstract

Based on the 1-D Planetary Boundary Layer model of Weng and Taylor with E –l turbulence closure, a 2-D numerical model is developed to study the atmospheric boundary-layer flow over single or multiple changes in surface conditions. These changes include surface roughness, thermal and moisture properties. A constant flux wall layer is used within which approximate forms for the velocity, temperature, moisture and turbulent kinetic energy profiles are obtained by analytic solution with the assumption of production equal to dissipation of turbulent kinetic energy. A simple, analytic model dealing with the surface roughness change effects in neutral stratification is also developed by using the concept of an Internal Boundary Layer.

These model results are discussed and compared with other approaches and with published field data. Impacts of roughness changes on wind energy potential and siting issues will be discussed.

Preferred Presentation Format

Either Podium or Poster

Please specify the language that you would like to present in (note that simultaneous translation services will be provided):

English

Main Topic for Presentation

TECHNICAL (TRACK 4)

Wind Resources Assessment

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Membership Status

Non-member

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