

Wind Tunnel Experiments on Spacing Dependence of Wind Farms

A proposal submitted to the Faculty Development Committee at
Portland State University for the Faculty Enhancement Grant

Raúl B. Cal

Department of Mechanical and Materials Engineering,
Portland State University, Portland, OR 97201

Project Summary:

The number of wind turbines (WT) in a park is usually restricted to be placed within a fixed, limited geographical area. The distance between the turbines is among other things dependent on the recovery of wind energy behind the neighboring turbines and the increased wind load.

Intellectual Merit: *The proposed research is a wind tunnel experimental study of flow and energetics in wind turbine arrays, and motivated specifically to address the cross and streamwise interaction between turbines in the wind turbine array where understanding the turbine to turbine interaction is essential for wind turbine array design. A series of experiments will be carried at the Portland State University (PSU) wind tunnel. The obtained data using Particle Image Velocimetry will be used address the following issues for the various configurations: (i) quantify and analyze energy fluxes within the WT array and (ii) obtain power performing curves for the wind turbines.*

Broader impact: *The proposed research will contribute to advance the understanding of the long-term sustainability of wind energy extraction from the atmospheric environment. Graduate and undergraduate students will be exposed to state-of-the-art research in the area of wind energy. The PI will mentor students and will motivate them to further the education in the areas of science, technology, engineering and math.*