Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Numerical Simulations of a Roof-Top Wind Turbine[1] SHAHAB MOAYEDIAN[2], CEERS/CSULB, HAMID RAHAI[3], MAE Dept./California State University, Long Beach — Unsteady numerical simulations of a high efficiency roof-top wind turbine have been performed. The wind turbine cross section design was based on geometrical optimization study of Rahai and Hefazi for increasing contributions of the lift force to the torque, resulting in significant improvements in the performance of a vertical axis wind turbine. The wind turbine was 30 cm in diameter and 75 cm length, with 45 cm diameter end-plates, placed in the spanwise direction above a 26 degree slanted roof at 20 percent from the roof's highest elevation and one turbine diameter away from the roof surface. The approaching wind velocity was 30 m/sec and the wind turbine RPM was 233. Results indicate nearly 20 percent improvements in the power output, when compared with the corresponding results for a free standing wind turbine. However, the wind turbine operation imposes oscillatory stress on the roof, which could results in structural vibration and damage and noise generation.

[1]The study was performed with a grant from the National Science Foundation.
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Date submitted: 06 Aug 2010 Electronic form version 1.4