Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical Investigation of Buoyancy-Induced Columnar Vortices[1] NICHOLAS MALAYA, ROY STOGNER, ROBERT MOSER, University of Texas at Austin — Buoyancy driven columnar vortices arise naturally in the atmosphere. A new energy harvesting approach makes use of this phenomenon by creating and anchoring the vortices artificially and extracting energy from them. In this talk, we explore the characteristics of these "solar vortices" through numerical simulation. Computational models of the turning vane system used to generate the solar vortex and the turbine used to extract energy have been developed. The formulation of these models and their validation against available experimental measurements will be discussed, as will the details of the columnar vortex structure and its interaction with the turbine. In addition, the computational models are being used to optimize the turning vane configuration and the turbine characteristics to maximize the power extraction, and to characterize the effects of environmental conditions such as cross winds and topography. Preliminary results from these studies will also be presented.

[1]This work supported by the Department of Energy [ARPA-E] under Award Number [DE-FOA-0000670].

Nicholas Malaya
University of Texas at Austin

Date submitted: 01 Aug 2014 Electronic form version 1.4