

Commonwealth Center for Coastal Physical Oceanography  
Old Dominion University  
Spring 2013 Seminar Series



**“USING TRANSMISSION AND STORAGE TO PRODUCE  
RELIABLE ELECTRICITY FROM EAST COAST OFFSHORE WIND  
AND OTHER FLUCTUATING GENERATION”**

**WILLETT KEMPTON**  
University of Delaware

**Monday, February 25, 2013**  
3:30 PM

***Room 1202, Engineering and Computational Sciences Building***

Abstract

We model offshore electric transmission connecting offshore wind power generation to understand how synoptic weather patterns can be employed to substantially reduce wind power fluctuations in the aggregate. Then, we model many combinations of renewable electricity sources (inland wind, offshore wind, and photovoltaics) with electrochemical storage (batteries and fuel cells), incorporated into a large grid system (72 GW). The purpose is twofold: 1) although a single renewable generator at one site produces intermittent power, we seek combinations of diverse renewables at diverse sites, with storage, that are not intermittent and satisfy need given a fraction of hours; and 2) we seek minimal cost, calculating true cost of electricity without subsidies and with inclusion of external costs. Our model evaluated over 28 billion combinations of renewables and storage, each tested over 35,040 h (four years) of load and weather data. We find that the least cost solutions yield seemingly excessive generation capacity — at times, almost three times the electricity needed to meet electrical load. This is because diverse renewable generation and the excess capacity together meet electric load with less storage, lowering total system cost.

Biography

Dr. Willett Kempton is a Professor in the College of Earth, Ocean, and Environment and the Department of Electrical and Computer Engineering at the University of Delaware. He earned a B.A. in Sociology and Anthropology from the University of Virginia and a Ph.D. in Anthropology from the University of Texas at Austin. Dr. Kempton is the Director of Research and External Affairs for the Center for Carbon-Free Power Integration at the University of Delaware. His research interests include offshore wind, vehicle to grid power, lay environmental beliefs and values, environmental movements, and integration of large-scale renewables.

*Reception before seminar at 3:00 PM*