*CREW Seminar Series: Spring 2011*

# Modeling Airflow Over Buildings for Rooftop Wind Turbine Applications


## *Abstract*

Placing wind turbines on, or integrating them into, buildings to provide local power generation has been an intriguing idea for quite some time. After all, the old Dutch wind mills were essentially building integrated wind mills. More recently, New York City and San Francisco have made the incorporation of wind energy into the city's sky scrapers a major part of their plan to develop renewable energy. The success rate for modern wind turbines placed in these environments, however, has been less than stellar. Generally, one or two things happen; the turbine fails to meet even the most pessimistic production estimates; or the turbine simply fails. Either event is almost entirely due to a misunderstanding of the wind environment in and around buildings. This results in turbines that are either sheltered from winds from certain directions, or subject to high turbulence levels due to local vortex shedding that can literally tear a turbine apart.

This presentation will show how physical simulations of airflow on a reduced scale model in an atmospheric boundary layer can be used to define the local wind environment. The results will show the locations of recirculation cavities, corner vortices, and areas of accelerated air flow. This information, when combined with local wind statistics and certified wind turbine power curves, can used to identify whether or not the wind environment is sufficient to support wind energy production, locate an appropriate location on the roof, and accurately estimate the annual energy production.



By **Brad Cochran** from **CPP**


On **Monday, March 28, 2011,** at **2:00pm**

**Natural Environmental Sciences Building, Room B101**

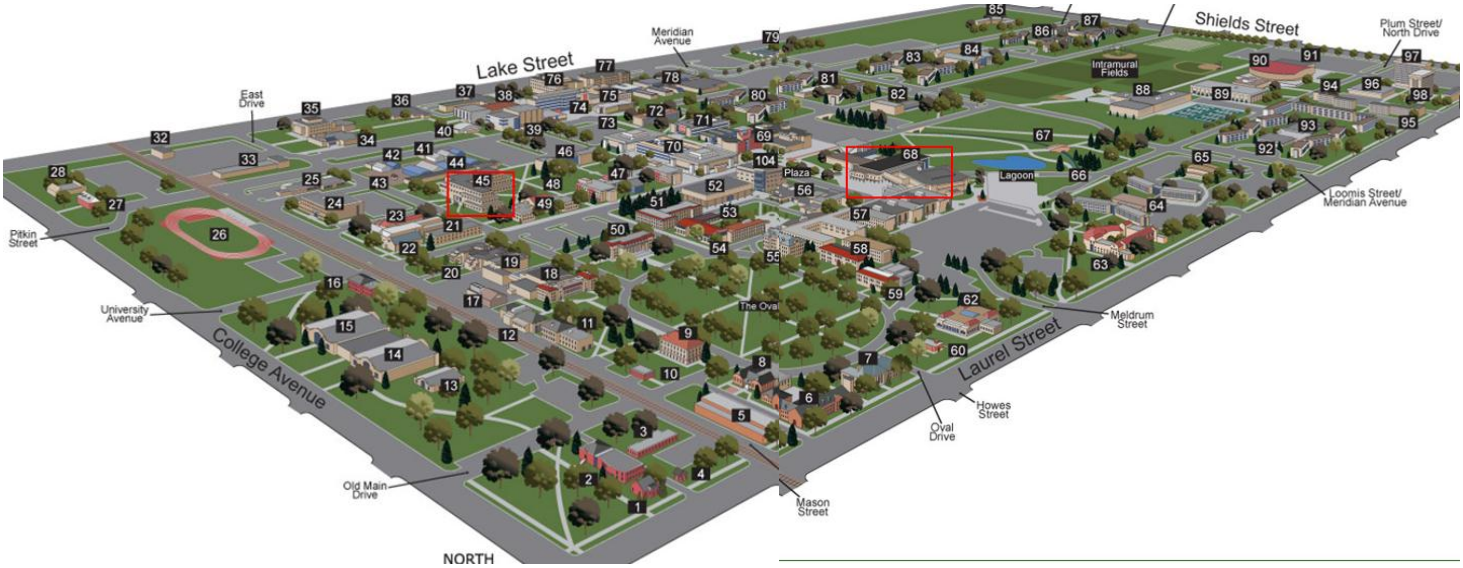
**Colorado State University**

Mr. Cochran is a registered Professional Engineer in the State of Colorado and has nearly 20 years of experience conducting wind tunnel and numerical modeling studies. He is a member of the American Wind Energy Association (AWEA) Small Wind Turbine Committee. He was a contributing editor for the International Electrical Commission (IEC) wind turbine performance standard (IEC 61400-12) and is currently a member of the AWEA Certification Standards Committee for small wind turbine installations (rated power less than 250 kW). He has conducted numerous wind-tunnel and field performance evaluations for small wind. For the utility sized wind energy, he has conducted numerous wind resource assessments for wind farm development, developed CPP's hybrid approach for wind resource assessments in complex terrain. Mr. Cochran also developed CPP's capabilities to conducted noise assessment for wind farm applications. Mr. Cochran has presented papers at IEA, AIAA, ASME and AWEA national conventions on such topics as small wind turbine power performance testing and wind resource assessment for building integrated wind turbines.

CREW
Center for Research and Education in Wind

# Colorado State University Campus
# Fort Collins, CO

*Building 45 is the 'Natural and Environmental Sciences' building*




**Directions to suggested parking, i.e.,** Directions to the **Lory Student Center (building 68)**

From Interstate 25, exit at Prospect Road (#268). Travel west on Prospect approximately 4 miles to College Avenue (passing major intersections at Timberline Road and Lemay Avenue). At College Avenue, turn right (north). Continue north approximately three-quarters of a mile to Laurel Street, turn left (west), and travel west three-quarters of a mile to Meldrum Street (the second stop light), and turn left into the Lory Student Center parking lot.

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## Looking forward to your attendance!

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