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### Wind Potential

- Nebraska lies in area of high wind energy potential.
- Wind can vary significantly over space and time.
- Accurate wind forecasts at turbine height are underutilized.

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### Goal and Objectives

**GOAL**  
Provide a reliable and timely wind forecasting tool for use in energy production applications.

**OBJECTIVES**

- Incorporate Nebraska Mesonet data into weather forecasting model and document change in skill.
- Develop specialized wind forecast product for NPPD.

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**Observations:**

- Air temperature
- Humidity
- Wind speed, direction
- 9' (3m) and 30' (10m)
- Liquid precipitation
- Solar radiation
- Soil temperature
- 4" (10cm)
- Soil moisture
- and temperature at 2", 4", 8", 20" and 40" (5, 10, 20, 50, 100cm)
- Barometric pressure

Rogers Farm (Lincoln)

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Methods

## WRF Model

All Mesonet stations assimilated into WRF model.

- ✓ WRF run every 3 hours out to 72 hours.
- ✓ 22.4mile x 22.4mile (22.4miles = 36km) grid resolution (horizontal).
- ✓ 49 terrain-following levels (vertical) up to 12.4miles (20km).
- ✓ 3DVAR used to assimilate air temperature, wind, humidity, air pressure.
- ✓ 197feet (60m) altitude closest to wind turbine height.

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**Results: Wind speed comparison**

- ✓ Regional model **overestimates** wind speed by **3.4 mph** (1.5m/s).
- ✓ **Bias improves** with Mesonet assimilation to **1.3 mph** (0.6m/s) overestimate.
- ✓ Best improvement with Mesonet assimilation seen in central, eastern Nebraska.

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**Results: Wind speed comparison**

- ✓ The greatest benefit to locally generated numerical wind speed forecast with inclusion of Nebraska Mesonet data is at lower wind speeds, well below name-plated generation potential.
- ✓ Focus on local "MOS" – model output statistics – to take current NOAA generated numerical forecast and use near-historical generation profiles on a per-tower basis to enhance forecasts

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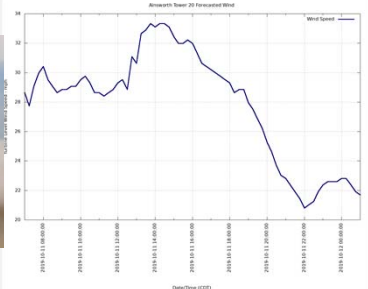
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**Wind speed forecast at turbine level**

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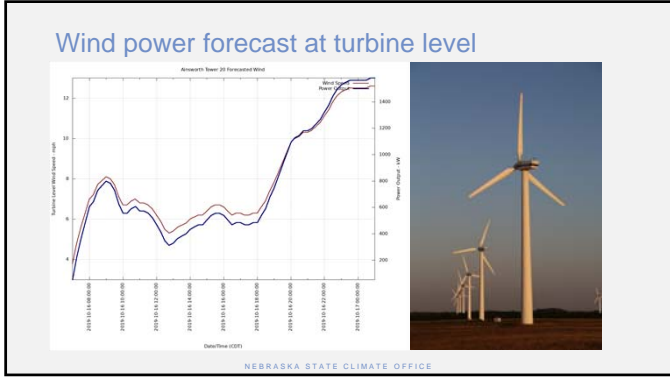
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Power Summit October 17, 2019

## Questions? An Integrated Approach to Improved Wind Forecasting in Nebraska

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