Measured:

1) Power output
2) Wind speed (20 ft below hub height)
3) Gen Hz
4) Air temperature
5) Barometric pressure

Used NREL methods to standardize wind speed to standard sea level air density (1.225 kg m^{-3}) and temperature (15 C). At the MSC site I also had a met tower with an anemometer at hub height.
All sites have an anemometer mounted on the turbine tower at 20 ft below hub height. This lower anemometer allows measurement of a PCC (power correlation curve). The PCC differs from a PC (power curve) in that wind speed at hub height is underestimated by a few percent. If the average wind shear is 0.3, the wind speed at 20 ft lower than hub height (122 ft) would have to be multiplied by about 1.05 to equal wind speed at hub height (5% correction).

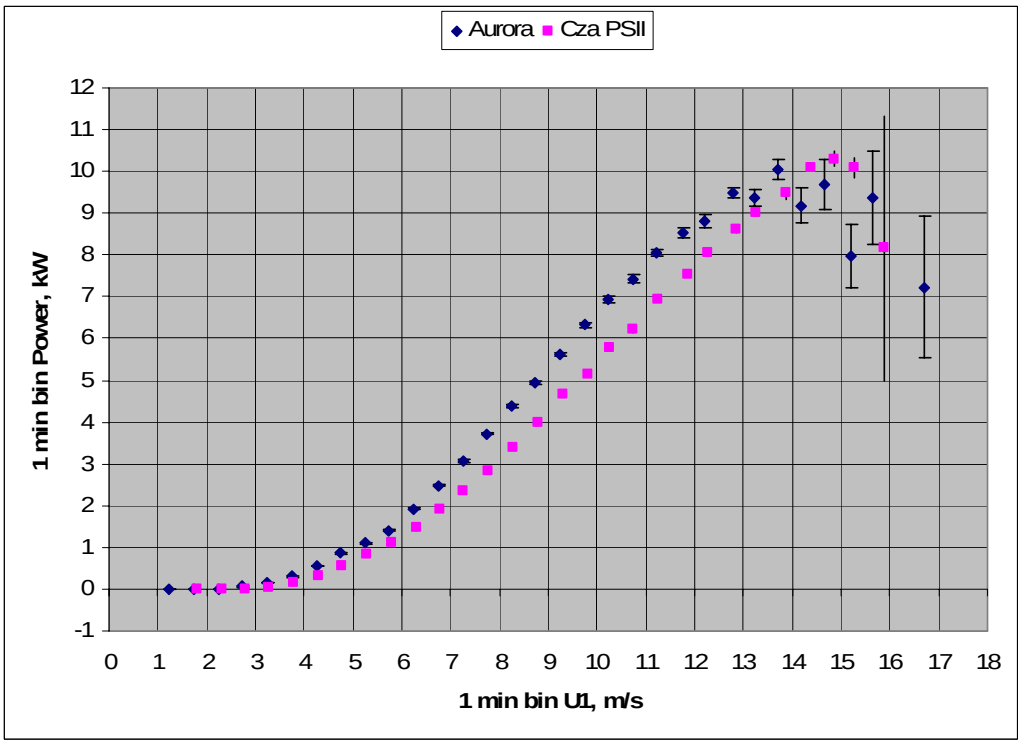

Fig. 1: Comparison of Aurora = BWC Excels connected to two stacked Aurora PVI-6000 inverters to power curve from Cza PSII = BWC Excels connected to PowerSync II inverter. All bin values are means ± sem (standard error of the mean). Wind speed at both sites measured on anemometer mounted on turbine tower 20 ft below hub height.

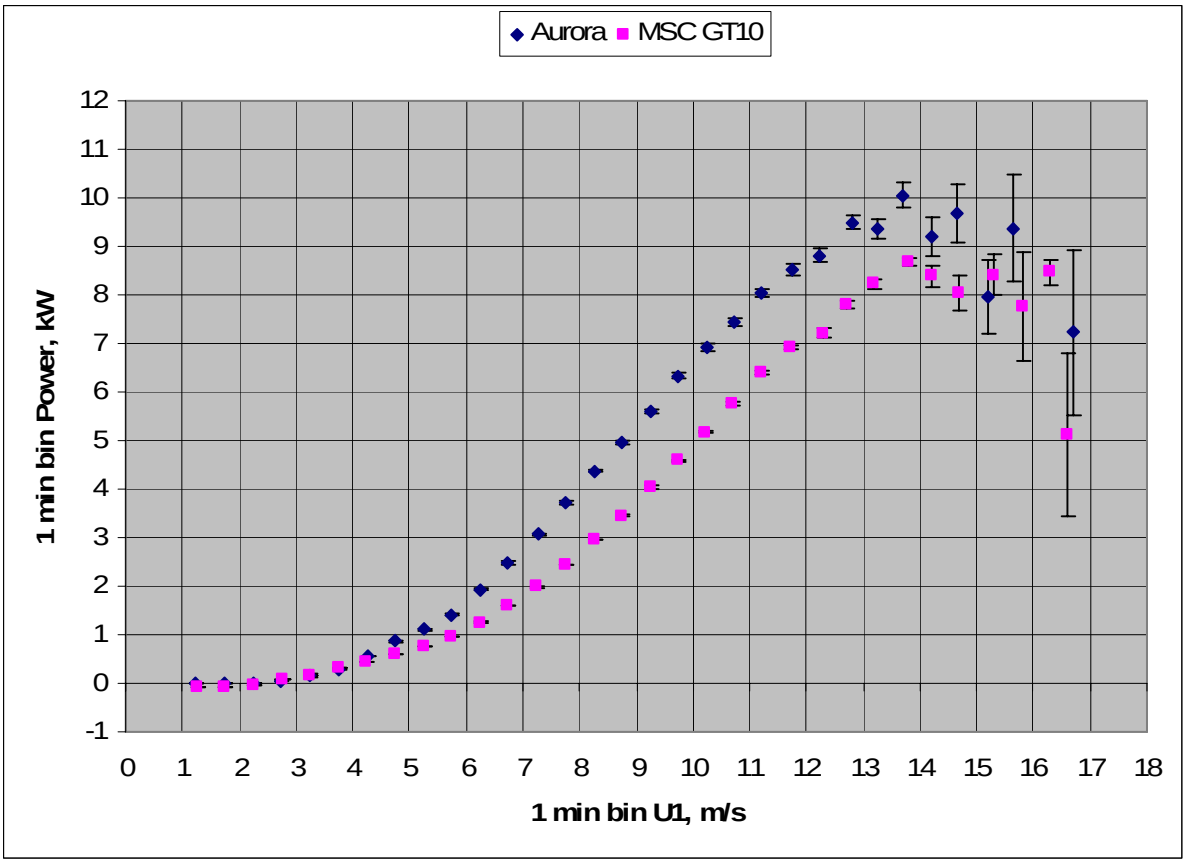

Fig. 1: Comparison of Aurora = BWC Excels connected to two stacked Aurora PVI-6000 inverters to power curve from MSC = BWC Excels connected to GridTek10 inverter. All bin values are means ± sem (standard error of the mean). Wind speed at MSC measured from met tower 3 blade diameters from turbine at hub height. The power curve measured from anemometer on turbine tower at 20 ft below hub agreed within 1 %. Because of topography the site would need calibration to get wind speed at hub height. Aurora site measured on anemometer mounted on turbine tower 20 ft below hub height.

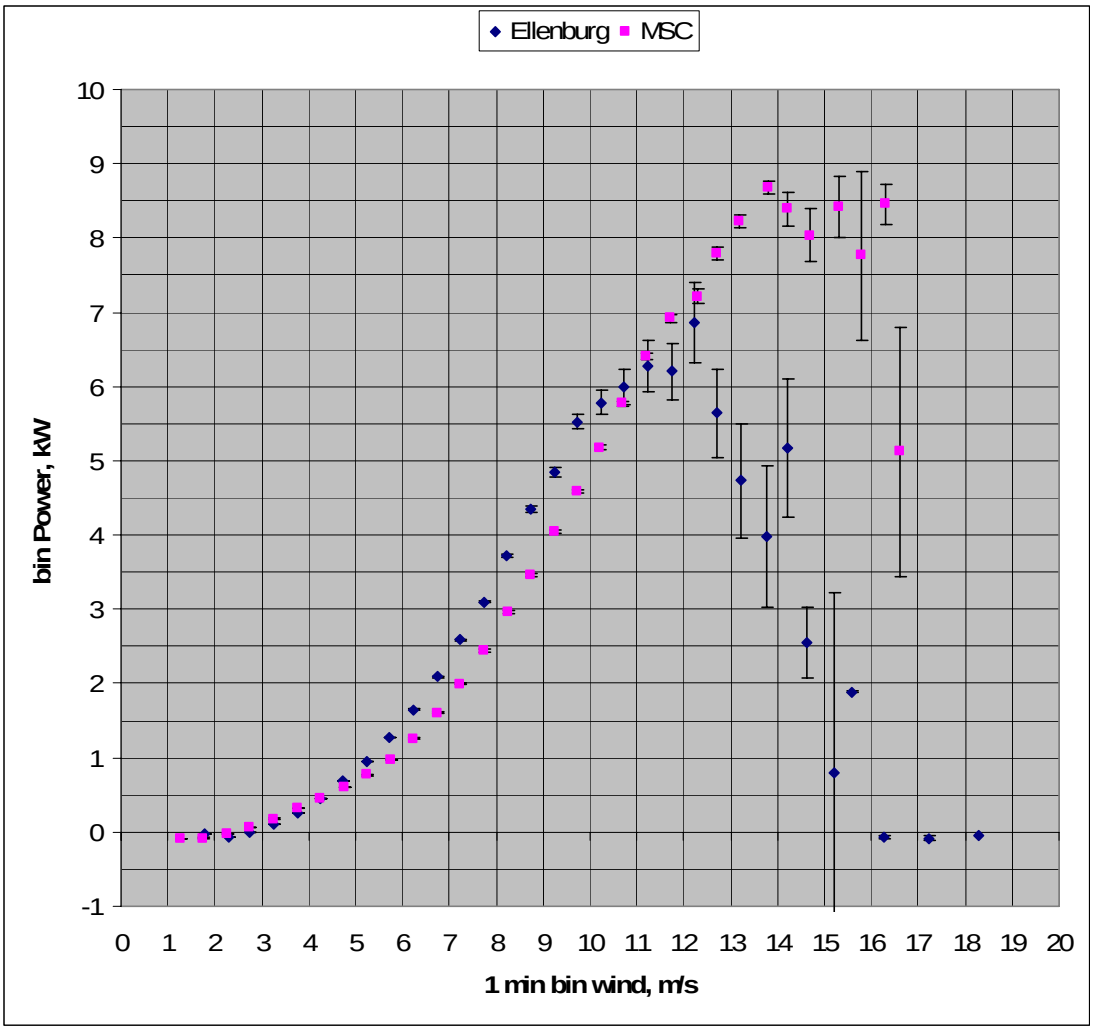

Fig. 3: These power curves demonstrate that there is something different about the equipment in Ellenburg vs MSC. Ellenburg: power curve for BWC Excels connected to my GridTek10. Data are means and sem for 10.5 months of wind data. MSC: power curve for BWC Excels connected to GridTek10 at MSC site (data for 30 Oct 09 to 26 Jan 10). In both curves the anemometer is mounted on the turbine tower 20 ft below the hub height.

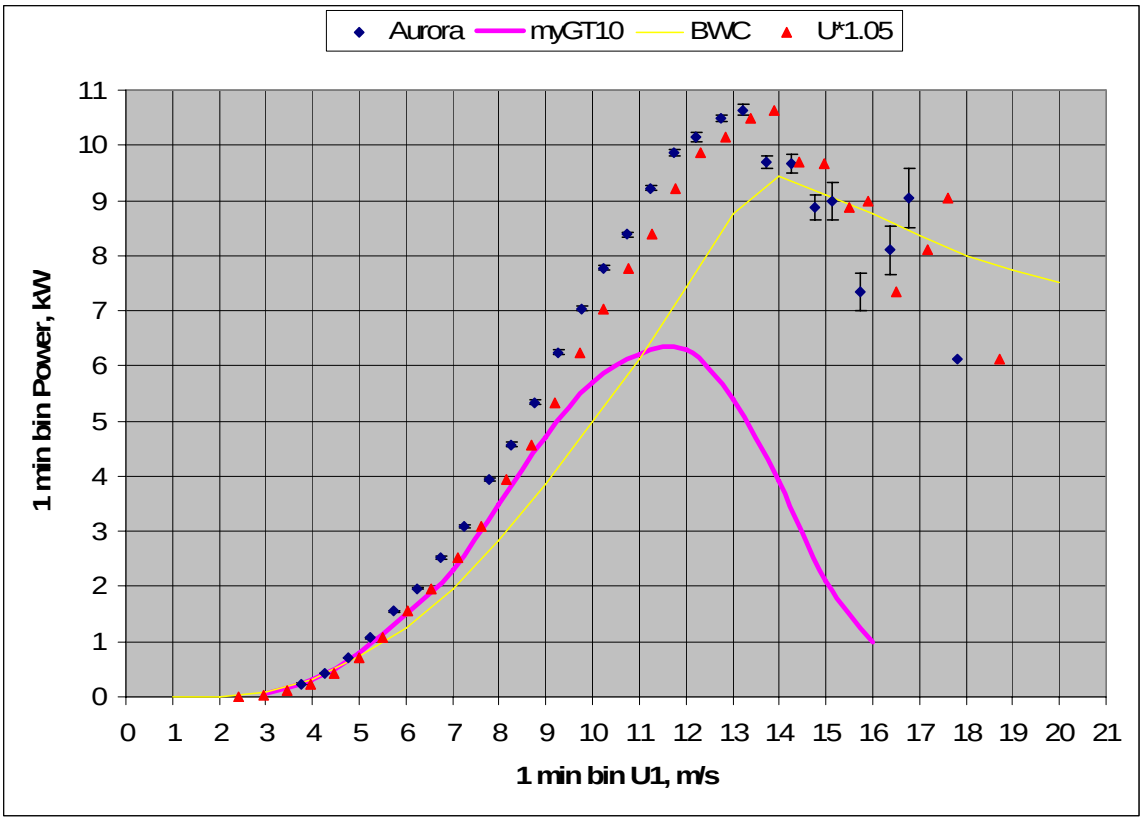

Fig. 4: Aurora: PCC that results from the MPPT proposed by Rob Beckers. myGT10: PCC from my GridTek10 based on 10.5 months of data. BWC: Bergey's official power curve for their Excels connected to a GridTek10. U*1.05: Shifed the PCC about 5% to the right on the x-axis to correct for hub height wind speed.

Estimated annual energy production:

Last year my site in Ellenburg, NY, had a mean annual wind speed of 4.3 m/s @ 100 ft (only fair). Based on myGT10 power curve in Fig. 4, the standard WindCad model predicts an annual energy production of 8,200 kWh (measured 8,002). Based on the new power curve (Aurora) I am expecting 10,400 (a 26% increase). This WindCad model does not include the down-time when my GT10 needs a manual reset. The new Aurora inverter does not need manual resets (see R#61). Hence I am expecting a 36% to 40% increase.