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RNRG #40C Vs Class 1
Comparison of Operational Characteristics

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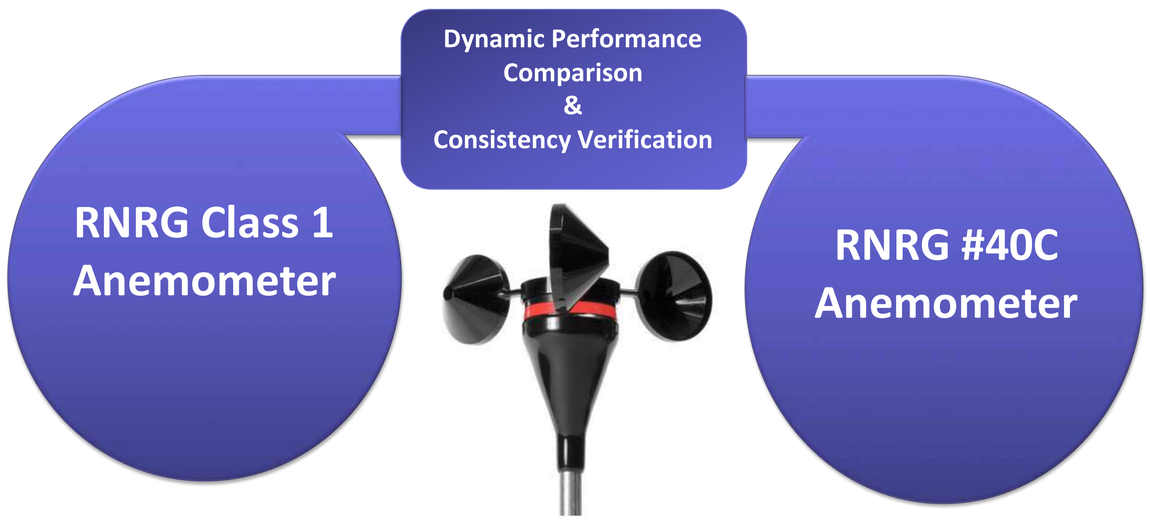
Introduction

Knowing the right wind characteristics is a key to the evaluation of wind energy resources. Cup anemometer, a standard instrument used for wind speed measurement, is being used extensively across the world on weather monitoring stations for wind energy assessments which includes energy estimation, power performance measurements and in the areas of research & development. Uncertainties in each aspect of measurement, such as uncertainty in sensor design, calibration, operational characteristics, etc., will add up to the total uncertainty associated with the wind speed measurement. Hence the improvement of accuracy in wind speed measurements is tough row to hoe. The RNRG #40C was one of the first anemometers designed exclusively for the wind industry and RNRG Class 1 anemometer is a ball-bearing version of RNRG #40C by keeping the same form factor and similar inclined flow performance characteristic as that of its peer.

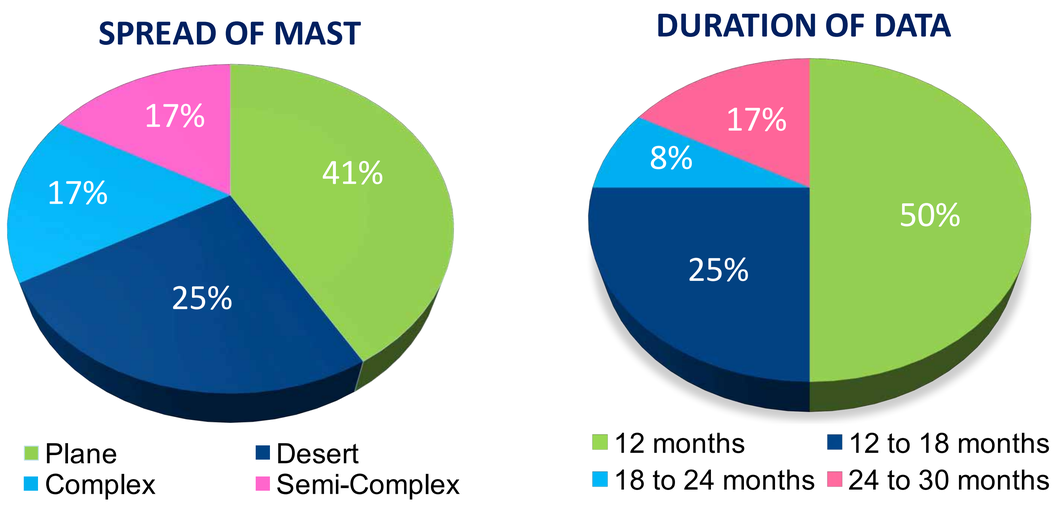
Objective

Investigating the performance deviation and consistency between RNRG's Class 1 anemometer and #40C type anemometer.



Approach

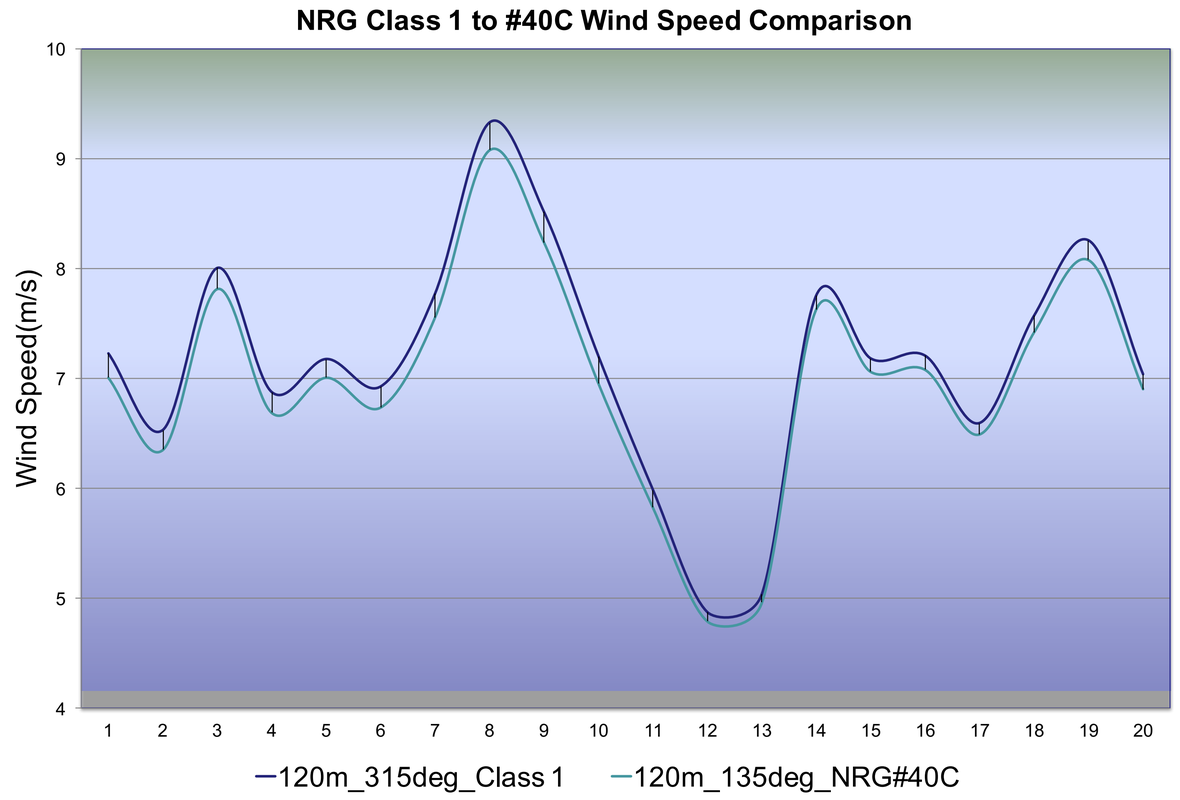
This synopsis primarily focuses on analogizing the dynamic performance and consistency of RNRG's Class 1 anemometers against #40C type and also an investigation on significant known factors responsible for the performance variation. Wind speed, correlation and turbulence intensities of 16 pairs of anemometers placed at same height (with different geographical exposures) were compared. Data comparison were carried out using different quantitative and graphical analysis schemes.



Twelve weather monitoring stations (lattice type) having data periods ranging from 12 to 30 months with #40C and Class I anemometers at one height and another pair of Class 1 at another height are used for this assessment. All the sensors were calibrated and new at the time of deployment and the booms were mounted on each mast with orientations designed to mitigate the effects of tower-induced flow distortions on the measurements from the most frequent wind directions. The mounting arrangements of all the masts are consistent with IEC recommendations. Wind Data is used after screening to eliminate the effect of tower shadow.

Results

Ratio of wind speeds (Class 1 to #40C) at same height is plotted as a function of direction using scatter plot. Typical ratio should be close to one, however relatively large scatter over all directions above one was observed which is a sign of variation in performance between class 1 & #40C anemometer.



Also a comparison study has been undertaken between all the anemometers available at different heights i.e. 3 class 1's and one #40C. Differences in the dynamic response of the class 1 anemometer and the NRG #40C are well documented which includes the comparison of wind speed, turbulence intensity and correlation coefficient of both anemometers. Data of two monitoring stations were not included in the final results as they were not in the typical expected range.

Inference

Based on post-deployment field investigation followed by analysis, it was inferred that there is a variation in performance of #40C & class 1 anemometers. For the same height, wind speed recorded by using class 1 was higher than that recorded by using #40C .It was found that on an average, the class 1 recorded wind speeds were 2% higher than that recorded by #40C with no significant difference in turbulence intensity. However the correlation was around 99%. Since RNRG Class 1 anemometer is an advanced version of RNRG #40C anemometer, the performance improvement can be expected. More data is required to further judge the performance/characteristics of Class 1 anemometer against #40C .The investigation will be resumed once when more data is available for analysis.

Conclusion

Based on post-deployment field investigation followed by analysis, it was concluded that there is variation in performance of #40C & class 1 anemometers.

References

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