SHORTCOMING OF AEP CALCULATION AS DEFINED IN IEC61400-12-1

1. Description of Problem

The MEASNET Power Curve Experts Group has recently identified a possible source of discrepancies in the standard IEC 61400-12-1. It is regarding the calculation of the AEP as defined in chapter 8.3 of the standard.
It is said there: “AEP-measured shall be obtained from the measured power curve by assuming zero power for all wind speeds above and below the range of the measured power curve.”
This formulation did lead to confusion in a MEASNT round robin test. There is a small difference in AEP-measured when the power is set to zero for all wind speeds above the bin averaged wind speed of the highest covered bin and when power is set to zero only for the bin centres of the bins not covered by the power curve test (see illustration in Figure 1).
This methodology for the calculation of the AEP should be corrected in the frame of the on-going revision of the standard.

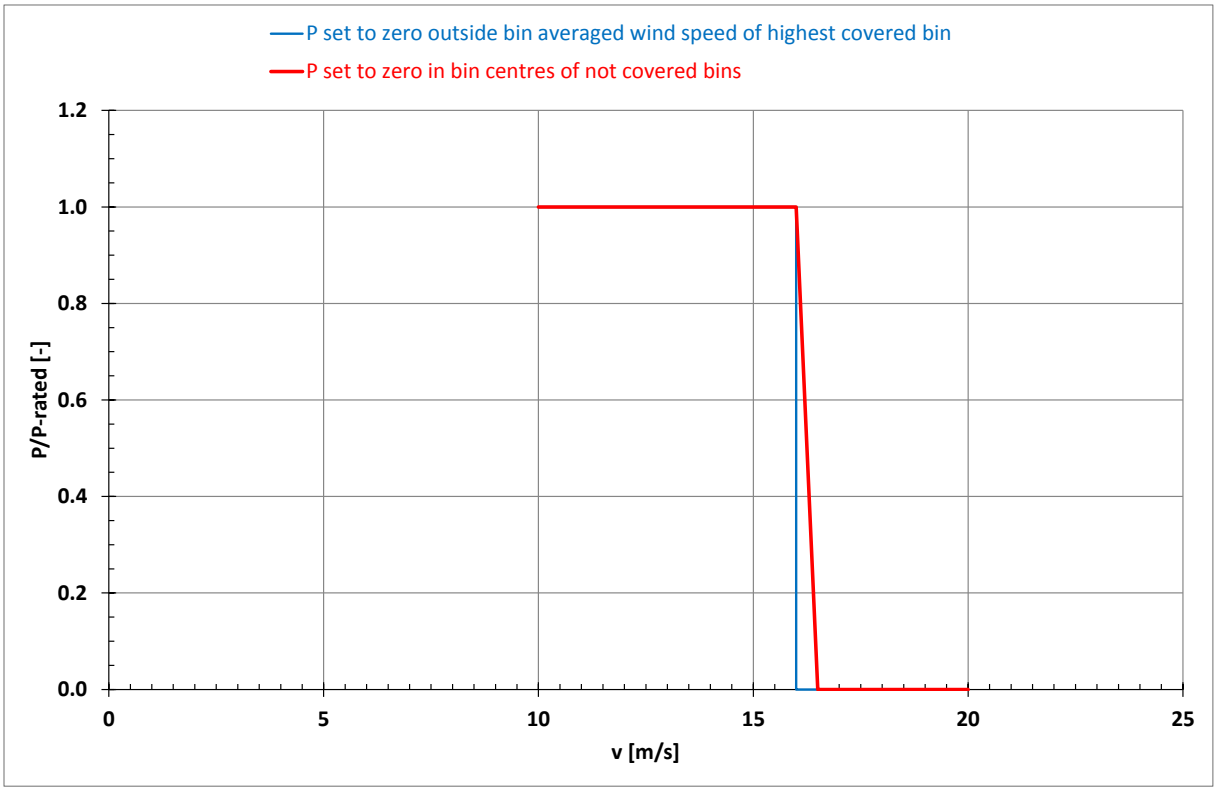

Figure 1: Difference in assumed power curve for calculation of AEP-measured when setting power values to zero in not covered bins (red) and when considering only covered bins (blue). The highest covered bin is here 16,0 m/s.

2. Proposal

The MEASNET Power Curve Experts Group suggests to perform the integration of the measured power curve only up to the bin averaged wind speed of the highest wind speed bin (blue curve in Figure 1), because the extension of the measured power curve by linear interpolation to zero in the next higher bin is not backed by the measurement.
For the same reason, the MEASNET Power Curve Experts Group suggests removing the extension of the measured power curve to zero power at a wind speed 0.5 m/s below the lowest covered wind speed bin as defined in the standard by the sentence in chapter 8.3: “The summation is initiated by setting V_{i-1} equal to V_i-0,5 m/s and P_{i-1} equal to 0,0 kW.”

Both of them can be achieved by applying the following changes to chapter 8.3:

1. Start of the summation in equation (6) with i=2 instead of with i=1
2. Change of the description of N in the legend of equation (6) to: "N is the number of bins covered by the power curve test"
3. Deletion of the sentence: "The summation is initiated by setting V_{i-1} equal to V_i-0,5 m/s and P_{i-1} equal to 0,0 kW."
4. Change of the 2 sentences: "AEP-measured shall be obtained from the measured power curve by assuming zero power for all wind speeds above and below the range of the measured power curve. AEP-extrapolated shall be obtained from the measured power curve by assuming zero power for all wind speeds below the lowest wind speed bin in the measured power curve and constant power for wind between the highest wind speed in the measured power curve and the cut-out wind speed."
   by: "AEP-measured shall be obtained from the measured power curve by performing the summation according to equation (6) only for the bins covered by the power curve test. AEP-extrapolated shall be obtained from the measured power curve by extending the summation according to equation (6) with constant power for wind between the highest wind speed in the measured power curve and the cut-out wind speed."