measnet

CALCULATION OF SPECIFIC SITE AEP

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If an AEP based on site specific wind speed distribution defined in tabular form is calculated and reported as it is considered in clause 8.3 of IEC 61400-12-1, and given that the average wind speed measured at each wind speed bin will not usually correspond to the site specific wind distribution bin centre, a correction of the measured and extrapolated power curve will therefore be calculated in order to obtain a power curve whose wind speed bin centre match the site specific wind distribution bin centre.

This is necessary in order to obtain a value of power for each bin which can be directly multiplied by the number of hours occurring in its respective bin. Otherwise, the value of the power for each speed bin corresponds to a wind speed value which is different from that at which the site wind distribution is referred.

In this process it is required that the measured power curve is evaluated using the same bin width than the wind speed distribution table is defined. Thus, if the bin width of the wind speed distribution table is 1 m/s, i.e. bin centres expressed as 1.0 m/s, 2.0 m/s, ..., the measured power curve shall be evaluated for a bin width of 1 m/s, too. The method of bins as described in IEC 61400-12-1 shall be applied within this regard. Furthermore the bin completeness criteria of IEC 61400-12-1 shall be valid.

The recommended method for the calculation of the power curve centred at wind speed bin centre is a linear interpolation of the bin averaged measured and extrapolated power curve as it is explained in 9 f) 1).

$$P = P_m + (U - U_m)\frac{(P_1 - P_m)}{(U_1 - U_m)}$$

Where:
P = the interpolated power value (kW)
P_m = the measured power in the bin of interest
P_1 = the measured power in the adjacent bin used for interpolation
U = the centre of the wind speed bin of interest (e.g., 6.50 m/s)
U_m = the average wind speed in the bin of interest (e.g., 6.47 m/s)
U_1 = the measured wind speed in the adjacent bin used for interpolation (e.g., 7.02 m/s)
In the case of the highest wind speed bin, the following formula should be used:

$$P = P_1 + (U - U_1)\frac{(P_1 - P_m)}{(U_1 - U_m)}$$

Where:
P = the interpolated power value (kW)
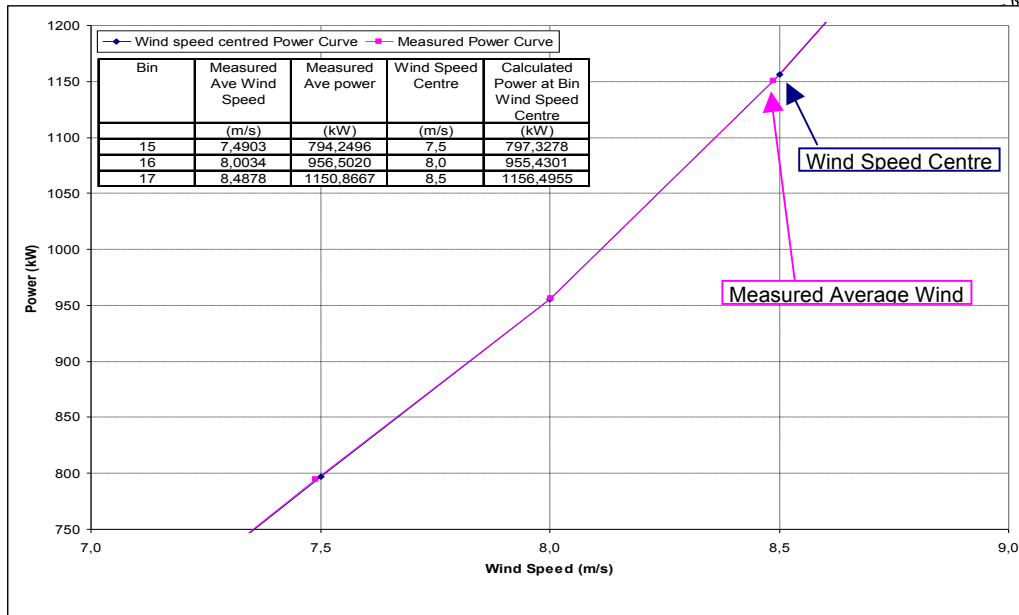P_m = the measured power in the second highest bin
P_1 = the measured power in the highest bin
U = the centre of the highest wind speed bin
U_m = the average wind speed in the second highest bin
U_1 = the measured wind speed in the highest bin

Wind speed centred Power Curve — Measured Power Curve

Bin	Measured Ave Wind Speed	Measured Ave power	Wind Speed Centre	Calculated Power at Bin Wind Speed Centre
	(m/s)	(kW)	(m/s)	(kW)
15	7,4903	794,2496	7,5	797,3278
16	8,0034	956,5020	8,0	955,4301
17	8,4878	1150,8667	8,5	1156,4955

Wind Speed Centre

Measured Average Wind

Power (kW) vs Wind Speed (m/s)

Once this wind speed centred bin power curve is obtained, the Site Specific AEP can be calculated by multiplying the value of the power at each bin by the hours at each bin in the site specific wind distribution.

For the uncertainty calculation linked to the Site Specific AEP the following approach should be applied:
- Category A uncertainty in electric power: This value has to be calculated for the wind speed centred bin power curve by linearly interpolation.
- Category B uncertainty: The calculation has to follow IEC 61400-12-1 Annex E for the wind speed centred bin power curve.
- The combined uncertainty has to be calculated following equation (E.4) of IEC 61400-12-1, using the Category A and Category B uncertainty as described above.

If the site specific wind speed distribution is provided in terms of "A" and "k" factors of a Weibull distribution, the above procedure is not required. However, the frequency (Fi) of each of the wind speed bins will be calculated for the measured bin averaged wind speed (not for the wind speed of the bin centre). The equation (12) of IEC 61400-12-1 can be used for the calculation of the Site Specific AEP. The equation (E.4) of IEC 61400-12-1 will be used for the calculation of the uncertainty corresponding to this AEP.