



Site Evaluation

Shadow Impact Projection

The site and size of a wind energy system (WES) and the respective position of the sun are essential factors for the effect of the so-called shadow impact. In sun light the rotating rotor causes varied brightness effects / shadows at different so-called immission sites, which can result in significant problems for the persons involved. Particularly in spaces that are lit by only one window, the cast shadow pulsating at the triple rotational speed of the rotor, can result in strong brightness fluctuations, which have a very disrupting effect.

The BundesImmissionschutzGesetz (German Federal Immission Control Act) defines for example in § 5 subsection 1, no. 1 and 2 and § 22 subsection 1, that residential homes must not be exposed to shadow impact for more than eight and a half hours. A longer period of shadow impact leads to the shut-down of a WES. Considering the size of today's conventional WES the possible shadow impact within a radius of 1,000 m must be taken into account, depending on the site's topology. Decisive for the evaluation however, is not the fact of how long a WES casts shadows, but the question of how long any immission site is exposed to this effect.

The following spaces are considered areas worthy of protection:

- Living spaces, including lounges
- Sleeping spaces, including rooms in hotels and similar as well as rooms with beds in hospitals and sanatoria
- Class rooms in schools, universities and similar facilities
- Office rooms, surgery rooms, working spaces, training rooms and similar working spaces

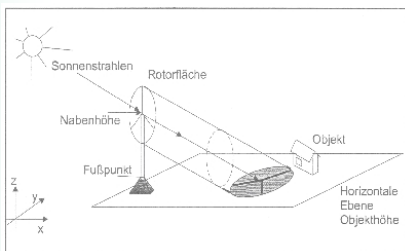
Spaces Worthy of Protection

Frimmersdorfer Str. 73a
D-41517 Grevenbroich
Tel.: +49 (0) 2181 – 22 78-0
Fax: +49 (0) 2181 – 22 78-11
Info@windtest-nrw.de
www.windtest-nrw.de



- Terraces and balconies are treated as such spaces worthy of protection
- Defined as such spaces are also undeveloped areas at a datum elevation of two meters above ground on the edge of areas most strongly affected, where buildings with spaces worthy of protection are allowed under the construction or planning laws.

Implementation



Whether and when a WES casts a shadow on a window, is a question of geometry. If the sun and the rotor of a WES are in line with the immission site, the sun will be obscured by the WES's rotor from the point of view of the immission site. Therefore the immission site is located in the shadow range of the rotor (see illustration) and shadow impact is generated. Using simulation programmes, it is calculated for how long on which day the shadow of the WES will be cast upon the respective immission site. The calculations use the precise coordinates of the WES and the immission sites. The programme then calculates a shadow impact calendar for the individual immission sites. This indicates the maximum shadow impact duration per year and day.

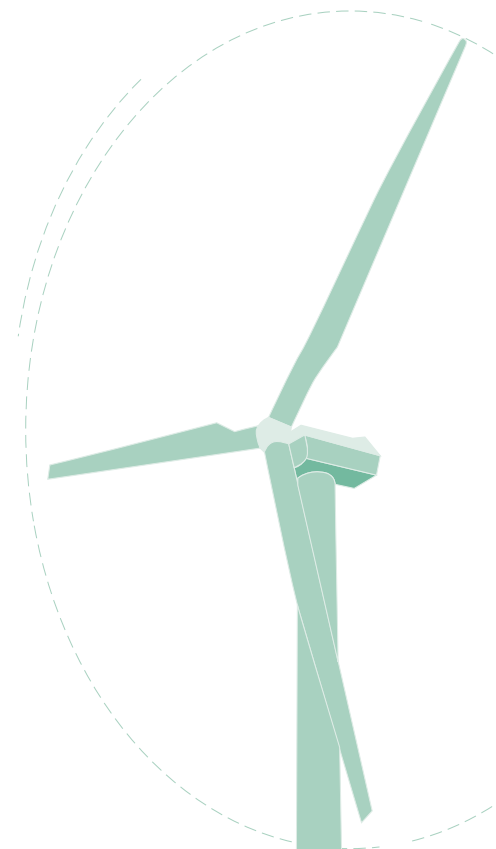
The following limiting values are defined in Germany:

- no longer than 30 hours per year,
- no longer than 30 minutes per day.

The limiting values have been included in most of the regulations of the Federal States, for example the Windenergieerlass.

If a WES or a wind park exceeds the limiting values, steps must be taken to reduce the shadow impact, which generally means the shut-down of the WES. Today this is carried out using intelligent shut-down modules that are installed in the individual WES and control the shut-down and start-up of the WES autonomously.

wtg is accredited for shadow impact projections according to ISO EN 17025.



Frimmersdorfer Str. 73a
D-41517 Grevenbroich
Tel.: +49 (0) 2181 – 22 78-0
Fax: +49 (0) 2181 – 22 78-11
Info@windtest-nrw.de
www.windtest-nrw.de