

Function

Calculation and documentation of the visibility of WTGs from any point in the landscape or from radar(s). The cumulative visual impact of wind farms can also be calculated as well as a planning map of non visibility of WTGs for radars.

Calculation Model

The calculation is made from a digital height model generated from digital height contour lines. Obstacles and areas with a height (e.g. forests, hedges etc.) are also included. In principle, each calculation point sends a beam towards each WTG. Afterwards ZVI checks if the ray hits a hill, an area (with a defined height) or an obstacle and counts how many beams have reached their destination WTG. The calculation model takes into account the curvature of the earth (corrected in the case of radar calculation by the refraction constant).

Necessary Input Data (objects)

Please note, that the necessary objects (WTGs, Radars, Areas, Line Objects) are entered in the WindPRO module BASIS. Please read the BASIS description for further details.

Wind Turbine (position and type):

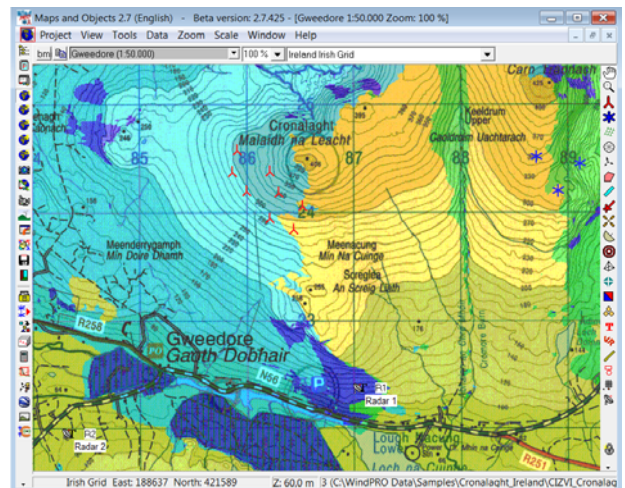
One or more WTGs are entered. Normally, the WTGs can be found in the WTG Catalogue, which contains more than 700 different types and models. WTG height and rotor diameter are included in the calculation. Wind farms are defined on different layers.

Line Object (height contour lines):

Height contour lines can be digitized directly on-screen or a file with height contour lines can be imported or downloaded (SRTM data). WindPRO can read formats like dxf xyz, shp, hgt, grd, map, asc and ntf files.

Area Object (area with a height):

Areas can be digitized directly on-screen or a file with areas can be imported (e.g. .shp files). Each area type is given a height, e.g. forest with low or high trees, urban areas etc.. You can define an arbitrary number of area types and give them individual heights.



Obstacles:

Obstacles (which can also be used in WAsP calculations) are boxes created on the map for buildings or hedges. ZVI treats the obstacle as a massive box if the porosity is below 0,4.

Radar:

One or more radars can be entered. They are defined by their effective height above the ground level which is the height of the radiation centre.

Description

ZVI enables users to analyze the long distance visual effect of WTGs and to evaluate how several groups of WTGs affect the visual impact in a region or if they have a cumulative impact. A visibility calculation can distinguish between partly and full visibility by selecting the top of the turbine as hub height as or blade tip height. The Radar ZVI calculates whether given WTGs are visible from one or more radars and gives the corresponding clearance height. The radar ZVI planning map shows the areas where a WTG with specific dimensions could be installed while not being in the line of sight of radar(s).

Calculation Report

The calculation report gives two printout possibilities:

Summary, with the most important assumptions such as map section and WTGs included in the calculation. A pie diagram and tables show the distribution of areas with different numbers of visible WTGs or with the cumulative impact of wind farms. Similar results are provided for the radar planning map. With Radar ZVI, the clearance height between the tip height of the turbines and each radar beam is presented in a table.

Map. A map with raster presentation of visible WTGs or clearance height for the radar planning map. The categories of visible WTGs or clearance height can be given a separate color or a color scale arranged by number.