

### Function

Calculation of the energy production of a wind farm including array losses and wind farm induced turbulence. The PARK calculation is based on the following modules:

METEO  
MODEL

### Calculation Method

The wind distribution at each WTG position is calculated /given from one of the 2 modules mentioned above. This means that the wind model can be based on either direct measurements, WAsP model calculations for each WTG location or a wind resource map from WAsP, CFD or other sources. The wind distribution is then adjusted for array losses using one of three different models: the PARK model (N.O. Jensen, RISØ), The eddy viscosity model (Ainslie, 1988) or the IWTS II (G.C.Larsen, 1999). This requires information on the Ct curves of the WTGs and a wake decay constant. Both can be adjusted in the user interface. Finally the adjusted wind distribution is integrated with the power curve of the WTGs for the energy yield calculation.

### Necessary Input Data (Objects)

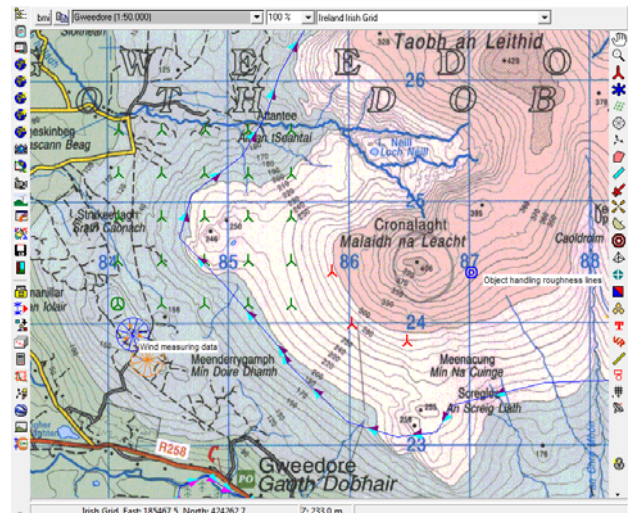
Please note that the objects (WTG, Line, Site data and Meteo Objects) are entered in the WindPRO module BASIS. Please read the BASIS description for further details.

#### Wind Turbine (Position and type):

Normally, the Power Curve and Ct curve of the WTGs selected can be found in the WTG Catalogue - otherwise they can be added. There are many advanced features for designing a wind farm layout. To mention some: creation of rows with equal distance, cloning of these for fast parallel rows, use of distance circles around each WTG. PARK layout coordinates can also be imported simply from ASCII files or spreadsheets simply by using the "copy/paste" function.

#### Wind Data:

The wind data are given as output from one of the 2 modules mentioned previously. Multiple sets of wind data can be used in a PARK calculation, e.g. measurements for different places in a wind farm area. The PARK calculation automatically takes the nearest set of wind data. When using the WAsP interface, individual wind data can be calculated for each WTG position with just one site data object, which is linked to digitized height contours and roughness lines. Local obstacles are treated individually relative to each WTG position.



### Description

PARK is probably the most flexible tool for calculating wind farm production. There is almost no limit in the way data input can be prepared and used in the calculation module. The module ties together the wind model, the wake model and the turbine layout into one operation. WTGs can be entered as both existing and new WTGs and treated separately in the printout, while all are included in the calculation. Even the loss of existing WTGs caused by the new WTGs is calculated automatically in one process if required. There are no limits in using different WTG types or hub heights in same calculation. With the WindPRO layer structure, several different layouts can be tested against each other fast and easily.

The Park calculation includes a RIX analysis, where the layout calculated is examined for complex terrain problems. With temporal variation data (wind measurement time series) the distribution of the production output over the day and year can also be calculated.

### Calculations report

The report generator includes a number of printouts and analysis options. The following printouts are usually available: Main Printout, Reference WTGs, Energy Production Analysis, Power Curve Analysis, Terrain Analysis, Wind Data Analysis, Park power curve, RIX calculation, Wind speeds inside wind farm, Turbulence reports and Maps

**Data to file** - all the WTG with coordinates and calculation results can be printed to a text file for further processing.