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17 maart 2017

PRODUCTIEBEREKENING  
WINDPARK OOSTPOLDER

Provincie Groningen

Definitief





Duurzame oplossingen in  
energie, klimaat en milieu

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# 1 INLEIDING

In opdracht van de Vereniging Windpark Oostpolder is een productieberekening uitgevoerd voor een op te richten windpark in deelgebied Oostpolder in de provincie Groningen. Het windpark wordt aangeduid met de naam “Windpark Oostpolder”.

In het kader van de m.e.r. en de ruimtelijke procedure is gevraagd het windaanbod te bepalen en modelberekeningen te maken voor de jaarlijkse productie en verliezen van Windpark Oostpolder. De berekeningen worden uitgevoerd voor drie alternatieven (1b, 2b, 3b) die toegelicht zijn in Tabel 1.1.

Tabel 1.1 Drie alternatieven voor Windpark Oostpolder

| Alternatief | Referentie windturbine | Aantal windturbines | Geïnstalleerd vermogen [MW] | Ashoogte [m] | Rotordiameter [m] |     |
|-------------|------------------------|---------------------|-----------------------------|--------------|-------------------|-----|
| 1           | b                      | Enercon E-141 EP4   | 14                          | 58,80        | 165               | 141 |
| 2           | b                      | Enercon E-126 EP4   | 15                          | 63,00        | 135               | 126 |
| 3           | b                      | Enercon E-103 EP2   | 23                          | 54,05        | 120               | 103 |

Een windturbine ‘vangt’ wind om de rotor te laten draaien en hiermee elektriciteit op te wekken. De windsnelheid achter de windturbine zal afnemen waardoor er een negatief effect optreedt op de productie van nabijgelegen windturbines binnen de invloedssfeer van de voorste windturbine. Dit negatief effect op de windsnelheid achter een windturbine wordt ook wel het “wake-effect” genoemd. In het onderzoek naar productierendement worden de productie verliezen die optreden door wake-effecten en andere factoren (elektrische verliezen, stilstand door reparaties, enz.) meegenomen in de jaarlijkse elektriciteitsproductie.

De energieopbrengst van windturbines is een positief effect van een windpark. Dit effect wordt echter beïnvloed door toepassing van mitigerende maatregelen voor andere thema’s zoals slagschaduw en geluid die de energieproductie negatief beïnvloeden. De mate van beïnvloeding dient meegenomen te worden in de analyse om de energieopbrengsten goed te beoordelen. De toepassing van mitigerende maatregelen zijn meegenomen in dit rapport en er is rekening gehouden met verliezen door middel van windturbine aanpassingen zoals het stil zetten van windturbines of bronsterkte verminderingen door het toerental te verlagen en/of de bladhoek te verdraaien.

Voor de productieberekeningen is gebruik gemaakt van de rekenmodellen *WindPRO*<sup>®</sup> versie 3.1.579 en *WAsP*<sup>®</sup> versie 11.2. In *WindPRO*<sup>®</sup> is een model van de locatie opgesteld, bestaande uit een topografische kaart van de locatie en de omgeving, obstakels in de omgeving, de windturbinelocaties, de hoogtelijnen en de ruwheidskartering. *WAsP*<sup>®</sup> wordt gebruikt als berekeningspakket om het windveld (verdeling en turbulentie) om te rekenen naar de locatie op ashoogte.

## 1.1 Beschrijving locatie

Windpark Oostpolder zal worden gerealiseerd ten zuiden van het geluidsgezoneerde industrieterrein Eemshaven in de provincie Groningen, zie Figuur 1.1. Dichtbij gelegen dorpen zijn Oudeschild (circa 650 m tot dichtstbijzijnde windturbine), Koningsoord (500 m), Nooitgedacht (500 m), en op grotere afstand Roodeschool (circa 2,5 km) en Oosteinde (2,8 km). De nabije omgeving van de locatie bestaat voornamelijk uit industriële activiteiten in het noorden en oosten, terwijl het zuiden en westen bestaat uit polderlandschap met landbouwgebied met veelal verspreide woningen.

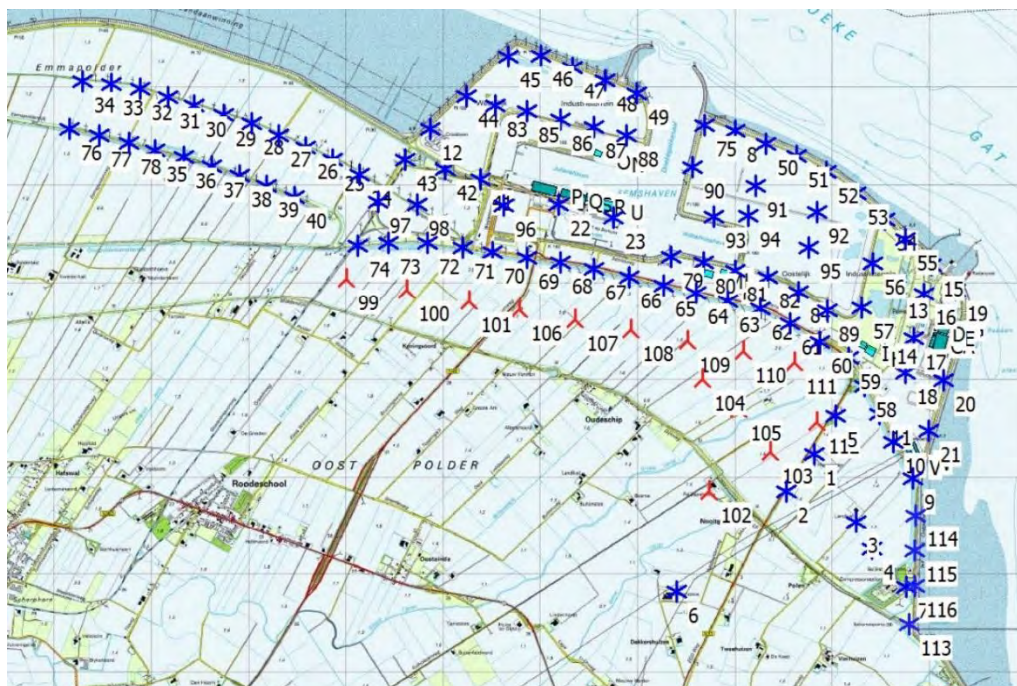
Figuur 1.1 Locatie Windpark Oostpolder



## 1.2 Bestaande windturbines in het gebied

Er zijn 93 windturbines aanwezig rondom de locatie Windpark Oostpolder. Verder worden 9 windturbines geplaatst als onderdeel van autonome ontwikkelingen in het gebied. In totaal zijn er 102 windturbines in de productieberekeningen meegenomen. De ligging van de windturbines is aangegeven in Figuur 1.2. Detailinformatie over deze windturbines (windturbintype, RD-coördinaten, ashoogte, rotordiameter) is te vinden in bijlage 1 in de WindPro rapporten. Conform de uitgangspunten van het MER zijn de windparken Eemshaven Zuidoost en Oostpolderdijk meegenomen zijnde de autonome situatie.

**Figuur 1.2 De bestaande en toekomstige windturbines (blauwe symbolen) rondom de locatie Windpark Oostpolder die meegenomen zijn in de productieberekeningen**



### 1.3 Windparkopstelling

De drie alternatieven van Windpark Oostpolder hebben verschillende opstellingen en windturbine aantallen. In Tabel 1.2 zijn de RD coördinaten van de windturbine opstellingen aangegeven en in Figuren 1.3, 1.4 en 1.5 zijn de drie alternatieven in kaart gebracht.

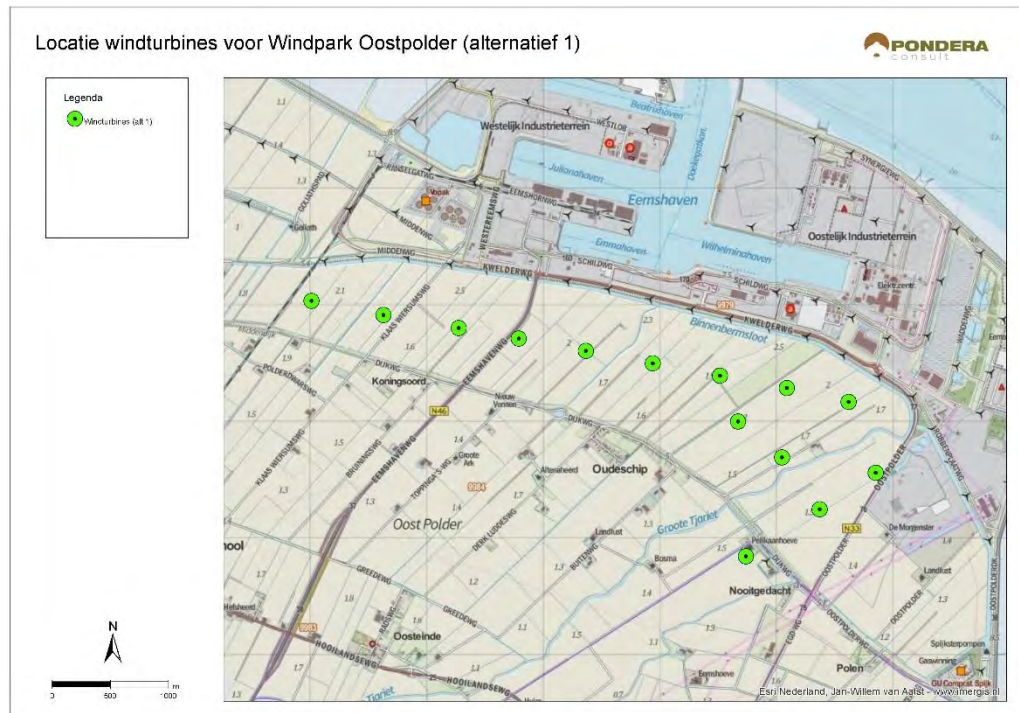
**Tabel 1.2 Coördinaten windturbines van de drie alternatieven van Windpark Oostpolder**

| Alternatief 1b  |                |        | Alternatief 2b  |                |        | Alternatief 3b   |                |        |
|-----------------|----------------|--------|-----------------|----------------|--------|------------------|----------------|--------|
| Windturbine nr. | RD coördinaten |        | Windturbine nr. | RD coördinaten |        | Windturbine nr.. | RD coördinaten |        |
| 101             | 248012         | 607033 | 201             | 251679         | 606481 | 301              | 251506         | 606506 |
| 102             | 248630         | 606913 | 202             | 252186         | 606268 | 302              | 251889         | 606391 |
| 103             | 249275         | 606800 | 203             | 252650         | 606008 | 303              | 252274         | 606282 |
| 104             | 249790         | 606711 | 204             | 252910         | 605642 | 304              | 252657         | 606168 |
| 105             | 250365         | 606604 | 205             | 247921         | 607039 | 305              | 247940         | 607100 |
| 106             | 250941         | 606498 | 206             | 248478         | 606954 | 306              | 248327         | 606997 |
| 107             | 251516         | 606392 | 207             | 249033         | 606849 | 307              | 248713         | 606893 |
| 108             | 252091         | 606286 | 208             | 249583         | 606726 | 308              | 249099         | 606789 |
| 109             | 252621         | 606167 | 209             | 250125         | 606585 | 309              | 249486         | 606686 |
| 110             | 252854         | 605560 | 210             | 250662         | 606425 | 310              | 249872         | 606582 |
| 111             | 251671         | 605999 | 211             | 251188         | 606234 | 311              | 250258         | 606479 |
| 112             | 252049         | 605693 | 212             | 251684         | 605973 | 312              | 250645         | 606375 |

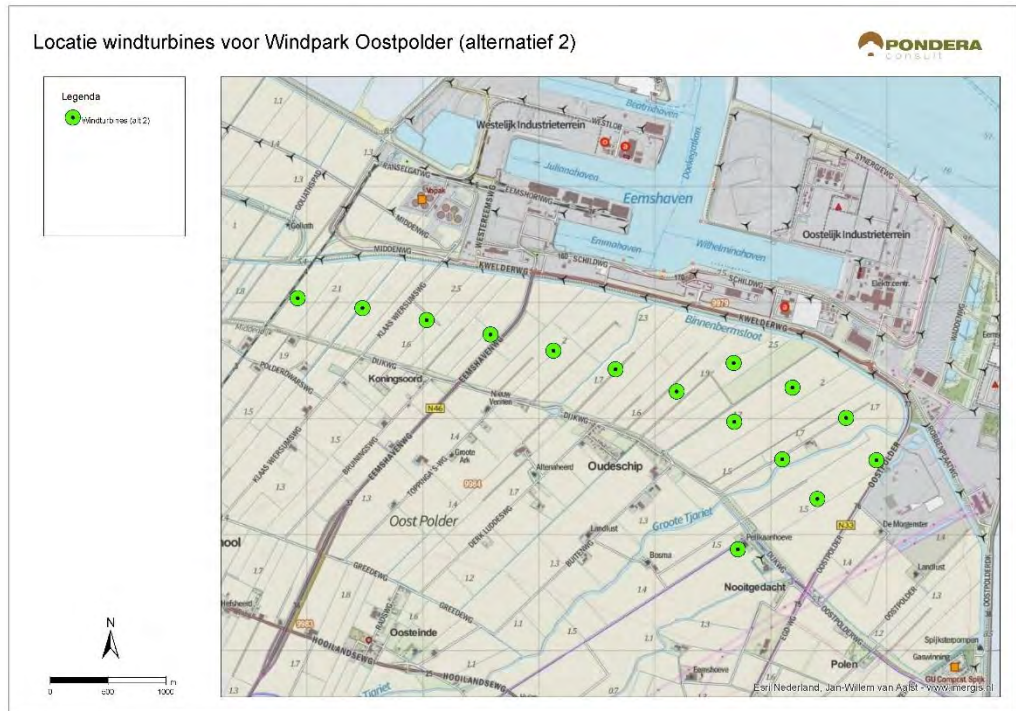


|     |        |        |     |        |        |     |        |        |
|-----|--------|--------|-----|--------|--------|-----|--------|--------|
| 113 | 252372 | 605247 | 213 | 252097 | 605651 | 313 | 251031 | 606272 |
| 114 | 251738 | 604844 | 214 | 252401 | 605310 | 314 | 251418 | 606168 |
|     |        |        | 215 | 251717 | 604875 | 315 | 251804 | 606064 |
|     |        |        |     |        |        | 316 | 252190 | 605961 |
|     |        |        |     |        |        | 317 | 252918 | 605667 |
|     |        |        |     |        |        | 318 | 251710 | 605754 |
|     |        |        |     |        |        | 319 | 252090 | 605637 |
|     |        |        |     |        |        | 320 | 252518 | 605402 |
|     |        |        |     |        |        | 321 | 251726 | 605411 |
|     |        |        |     |        |        | 322 | 252113 | 605145 |
|     |        |        |     |        |        | 323 | 251703 | 604895 |

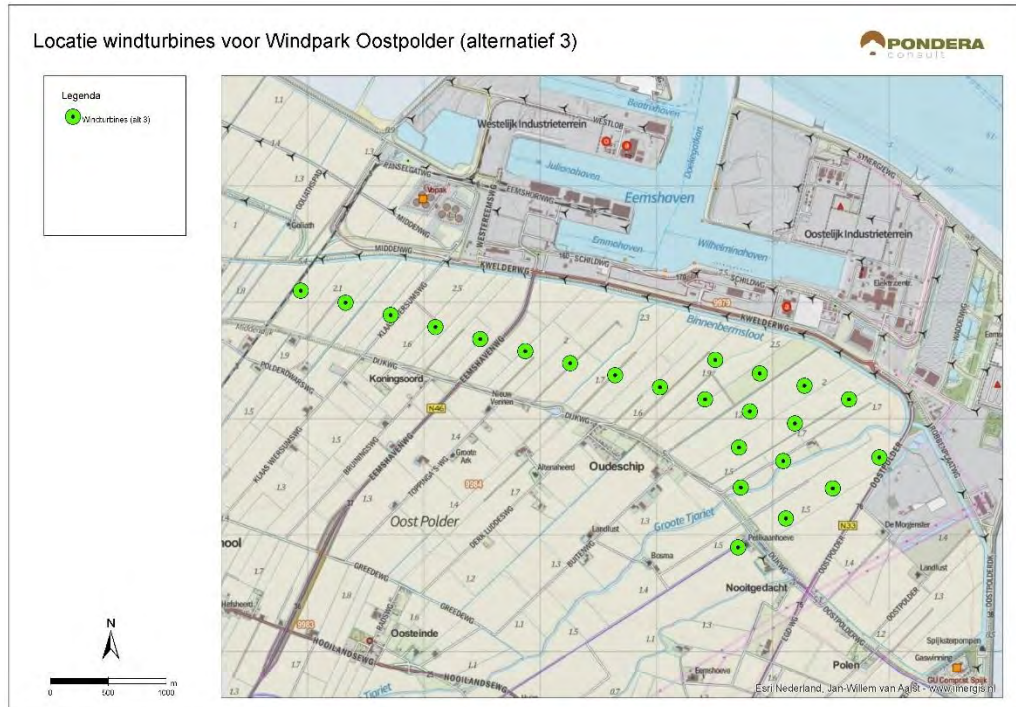
Figuur 1.3 Windpark Oostpolder opstelling voor alternatief 1b



Figuur 1.4 Windpark Oostpolder opstelling voor alternatief 2b



Figuur 1.5 Windpark Oostpolder opstelling voor alternatief 3b



## 1.4 Gegevens referentieturbines Windpark Oostpolder



### Enercon E-141 EP4 – 4,2 MW

De Enercon E-141 EP4 heeft een rotordiameter van 141 m met drie rotorbladen. Het toerental van de rotor is continu variabel tussen circa 4 en 10,6 tpm. Het nominale generatorvermogen is 4,2 MW. De windturbine wordt hier geplaatst op een conische mast waardoor de rotoras circa 165 m boven het maaiveld komt. Het hoogste punt van de rotor wordt circa 236 m hoog.

### Enercon E-126 EP4 – 4,2 MW



De Enercon E-126 EP4 heeft een rotordiameter van 127 m met drie rotorbladen. Het toerental van de rotor is continu variabel tussen circa 5 en 11,6 tpm. Het nominale generatorvermogen is 4,2 MW. De windturbine wordt hier geplaatst op een conische mast waardoor de rotoras circa 135 m boven het maaiveld komt. Het hoogste punt van de rotor wordt circa 199 m hoog.

### Enercon E-103 EP2 – 2,35 MW



De Enercon E-103 EP2 heeft een rotordiameter van 103 m met drie rotorbladen. Het nominale elektrische vermogen is 2.350 kW. Het toerental van de rotor is continu variabel tussen circa 4,8 en 15,0 tpm. De windturbines worden geplaatst op conische buismasten waardoor de rotoras circa 120 m boven het maaiveld komt. Het hoogste punt van de rotor wordt circa 171,5 m hoog. De windturbine begint te draaien bij een windsnelheid van circa 3 m/s. Bij windsnelheden boven 28 m/s wordt de rotor gestopt uit veiligheidsoverwegingen. De grootste breedte van het blad is circa 3,6 m en nabij de tip op 90% radius circa 0,83 m breed.

## 2 METHODIEK

Er zijn drie soorten gegevens nodig voor het bepalen van energieproductie uit wind. Ten eerste zijn technische kenmerken en gegevens nodig van de windturbines zoals afmetingen en vermogensproductiecurves. Meer informatie is beschikbaar gemaakt in Bijlage 1 voor de vermogensproductie- en thrustcurves van de windturbines van alle drie alternatieven. De tweede soort informatie die nodig is, is winddata afkomstig uit metingen om een windklimaat te bepalen. De laatste soort gegevens die nodig zijn, zijn landoppervlakte-eigenschappen die invloed hebben op de windsnelheid en -richting.

Op de locatie zijn windmetingen beschikbaar van april 2007 tot en met januari 2009 afkomstig van een Essent Wind Nederland B.V. (nu RWE) meetmast op 100 m boven maaiveld. De dichtstbijzijnde KNMI meetstation bevindt zich in Lauwersoog op een afstand van 34 km tot Windpark Oostpolder. Het meetstation leverde windmetingen op 10 m boven maaiveld van de jaren 1991 tot en met 2016. Het KNMI meetstation werd gebruikt om het tweejarige meetmast windklimaat te corrigeren.

In *WindPRO*<sup>®</sup> is een model van de locatie opgebouwd, bestaande uit een topografische kaart van de locatie en omgeving, de nieuwe windturbine locaties per alternatief, de hoogtelijnen van de locatie en omgeving, de ruwheidskartering van de omgeving en alle obstakels en bestaande windturbines rondom de locatie.

### 2.1 Hoogtelijnen

Voor de hoogtelijnen van de locatie is in het model SRTM online 1-arc data (Shuttle Radar Topography Mission) geïmporteerd met een raster van 100 x 100 km.

### 2.2 Oppervlakteruwheid

Voor de oppervlakteruwheid van de locatie is in het model DataForWind online data (European Roughness Contour Data) geïmporteerd met een raster van 100 x 100 km.

### 2.4 Obstakels

Er zijn in totaal 23 obstakels meegenomen als gebouwstructuren in de Eemshaven ten noorden van Windpark Oostpolder. De obstakels variëren in hoogte van 20 tot 120 m.

### 2.5 Wake-effect

Productieverliezen door de wake-effecten van zowel de nieuwe windturbines (intern wake-effect) als die van de 102 bestaande en toekomstige windturbines (extern wake-effect) zijn beide meegenomen in dit rapport.

### 3 WINDKLIMAAT

Het lokale windklimaat is gebaseerd op windstatistieken van de nabijgelegen RWE meetmast in de Eemshaven en gegevens van meteorologische KNMI station Lauwersoog (Figuur 3.1). De afstanden van de meetmast en KNMI meetstation tot het windpark bedragen respectievelijk 2 en 34 km. De wind data van de RWE meetmast bestaat uit meetgegevens van 2 jaar gedurende de periode 25 april 2007 tot en met 31 januari 2009 van onder andere de windsnelheid en -richting op 100 m boven maaiveld. Lauwersoog KNMI station bestaat uit meetgegevens van 25 jaar gedurende de periode 1 januari 1991 tot en met 1 januari 2017.

**Figuur 3.1 Locaties van de meetstations gebruikt in dit MER**



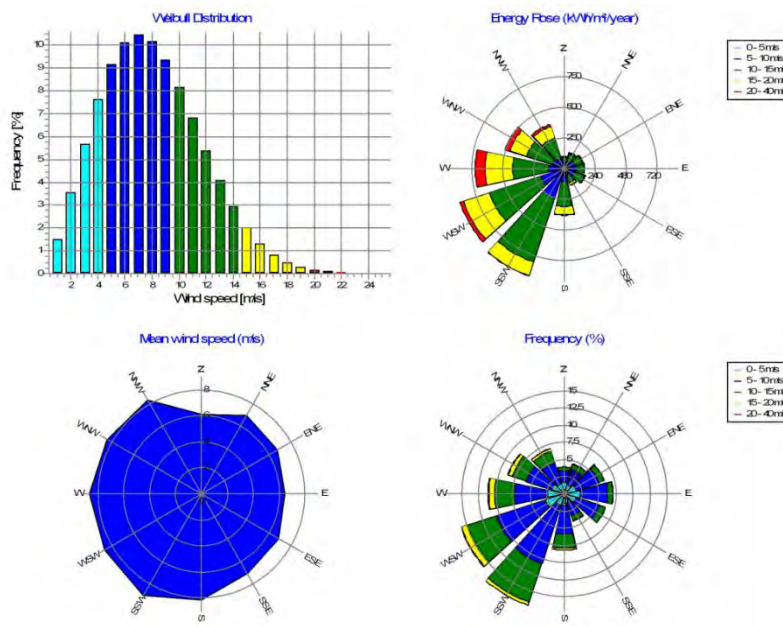
Het windklimaat van de RWE meetmast is gecorrigeerd op basis van windmeetgegevens afkomstig van KNMI meetstation Lauwersoog. De gemiddelde windsnelheid in Lauwersoog voor de tweejarige periode van 25 april 2007 tot en met 31 januari 2009 is berekend op 6,40 m/s. De 25-jarige gemiddelde is berekend op 6,34 m/s. Dit geeft aan dat de tweejarige gemiddelde 1% hoger lag dan de 25-jarige gemiddelde. Op basis hiervan is de tweejarige windklimaat van de RWE meetmast gecorrigeerd met een correctiefactor van 0,99.

Op basis van de verschillende invoerparameters is het lokale lange termijn windklimaat berekend. De gemiddelde windsnelheid op 100 meter hoogte op locatie is berekend op 8,0 m/s met Weibull verdeling parameters  $A=9,0$  en  $k=2,3$ . De heersende windrichting op locatie is zuid-zuid-west (ZZW), waarbij de hoogste windsnelheid ook in zuid-zuid-west (ZZW) wordt verkregen. In Tabel 3.1 en Figuur 3.2 is het berekende windklimaat op een hoogte van 100 m gegeven. Verder zijn de Weibull parameters van het windklimaat voor de verschillende ashogtes van de drie alternatieven in Tabel 3.2 weergegeven.

Tabel 3.1 Berekend windklimaat Windpark Oostpolder op 100 m; cijfermatig

| Windsector    | v [m/s] | A [m/s]    | k [-]      | Frequentie [%] |              |
|---------------|---------|------------|------------|----------------|--------------|
| 0             | N       | 6,2        | 6,9        | 1,9            | 4,0          |
| 1             | NNO     | 6,9        | 7,9        | 2,3            | 4,5          |
| 2             | ONO     | 6,8        | 7,6        | 2,6            | 6,1          |
| 3             | O       | 6,5        | 7,3        | 2,6            | 7,1          |
| 4             | OZO     | 6,9        | 7,8        | 2,5            | 6,3          |
| 5             | ZZO     | 7,1        | 7,9        | 2,2            | 4,2          |
| 6             | Z       | 8,1        | 9,2        | 2,5            | 8,2          |
| 7             | ZZW     | 9,0        | 10,1       | 3,1            | 17,0         |
| 8             | WZW     | 8,6        | 9,7        | 2,4            | 15,8         |
| 9             | W       | 8,7        | 9,8        | 2,1            | 11,2         |
| 10            | WNW     | 8,4        | 9,5        | 2,1            | 8,7          |
| 11            | NNW     | 8,4        | 9,4        | 2,2            | 6,9          |
| <b>Totaal</b> |         | <b>8,0</b> | <b>9,0</b> | <b>2,3</b>     | <b>100,0</b> |

Figuur 3.2 Berekend windklimaat Windpark Oostpolder op 100 m; grafisch



Tabel 3.2 Weibull parameters van het windklimaat op ashoogtes van de drie alternatieven van Windpark Oostpolder

| Alternatief | Ashoogte [m] | v [m/s] | A [m/s] | k [-] |
|-------------|--------------|---------|---------|-------|
| 1b          | 165          | 9,2     | 10,4    | 2,3   |
| 2b          | 135          | 8,7     | 9,8     | 2,3   |
| 3b          | 120          | 8,4     | 9,5     | 2,3   |

## 4 PRODUCTIE

In het onderzoek is bepaald welke opbrengsten en verliezen worden verwacht. Hiervoor zijn modelberekeningen uitgevoerd met *WindPRO*® versie 3.1.579 en *WASP*® 11.2.

De bruto energieproductie (P50) wordt bepaald aan de hand van de windsnelheidsverdeling per windrichting gekarakteriseerd door de Weibullverdeling en de Weibullverdeling parameters: de schaalfactor (A) en de vormfactor (k). Op basis hiervan is met de gecertificeerde vermogenscurve van de windturbine de bruto energieproductie van het Windpark Oostpolder bepaald. De opbrengst van de windturbines wordt, behalve door het windaanbod/ klimaat op locatie en de vermogenscurve van het windturbinetype, ook door de onderlinge afstanden tussen de overige windturbines bepaald. Doordat de (overige) windturbines turbulentie in de lucht veroorzaken ontstaan wake-effecten en een afname van de windsnelheid achter de windturbines.

### 4.1 Verliezen

De netto energieproductie (P50) wordt bepaald door rekening te houden met mogelijke parkverliezen in de bruto productie. Verliezen worden onder andere veroorzaakt door niet-beschikbaarheid, prestatie gerelateerde zaken, elektriciteitsverliezen, omgevingseffecten en door inkorten/vermindering van het vermogen van een windturbine of de tijd dat een windturbine draait.

In het onderzoek naar akoestiek en slagschaduw voor Windpark Oostpolder zijn de voorzieningen voor geluid bepaald voor alle drie alternatieven. Er is gekozen om in specifieke perioden de instellingen van specifieke windturbines te wijzigen om aan de normstelling te voldoen. De geluidsbronsterkten worden gereduceerd waardoor ook de productievermogen gereduceerd wordt. Voor alternatieven 1b en 3b zijn geluidsmitigatiewijzigingen doorgevoerd. Voor alternatief 2b was dit niet nodig. De wijzigingen voor 1b en 3b zijn respectievelijk aangegeven in Tabellen 4.1 en 4.2. In deze tabellen worden de instellingen voor geluidvoorzieningen gepresenteerd waarmee op alle toetspunten (naast de referentie toetspunten eveneens voor alle andere 202 toetspunten) wordt voldaan aan de norm  $L_{den}=47$  dB en  $L_{night}=41$  dB.

In het onderzoek naar akoestiek en slagschaduw voor Windpark Oostpolder zijn slagschaduw berekeningen uitgevoerd door het bepalen van de zonnenschijnduur en windrichtingen uit meetgegevens van KNMI meetstations. De hinderduur aan slagschaduw voor alle gevoelige objecten binnen twaalf maal de rotor diameter is bepaald voor de drie alternatieven van Windpark Oostpolder. De slagschaduw hinderduur wordt gereduceerd naar 0 uren bij gevoelige objecten die een hinderduur hebben van meer dan 6 uren. Het aantal woningen waarvoor is gemitigeerd voor slagschaduw (d.m.v. stilstand) bedraagt 89, 77 en 69 woningen voor respectievelijk de alternatieven 1b, 2b en 3b.

Voor slagschaduw is het worst-case scenario aangenomen. In werkelijkheid kan de totale stilstandsduur met een zonnenschijnsensor beperkt worden door de windturbine alleen te stoppen op geprogrammeerde tijden indien ook tegelijkertijd de zon schijnt. Een zonnenschijnsensor wordt gesimuleerd in *WindPRO*® door de berekende productieverlies door

stilstand te reduceren naar 30%, wat uit praktijkervaring leidt tot realistischer verliezen door stilstand.

Tabel 4.1 Geluidsbronsterktewijzigingen per windturbine in alternatief 1b

| Turbine nr. | Type      | dag               | avond             | nacht             |
|-------------|-----------|-------------------|-------------------|-------------------|
|             |           | 07:00 – 19:00 uur | 19:00 – 23:00 uur | 23:00 – 07:00 uur |
| 101         | E-141 EP4 | --                | --                | --                |
| 102         | E-141 EP4 | --                | --                | --                |
| 103         | E-141 EP4 | --                | --                | --                |
| 104         | E-141 EP4 | --                | --                | --                |
| 105         | E-141 EP4 | --                | --                | --                |
| 106         | E-141 EP4 | --                | --                | --                |
| 107         | E-141 EP4 | --                | --                | --                |
| 108         | E-141 EP4 | --                | --                | --                |
| 109         | E-141 EP4 | --                | --                | 1 MW              |
| 110         | E-141 EP4 | --                | --                | 1 MW              |
| 111         | E-141 EP4 | --                | --                | --                |
| 112         | E-141 EP4 | --                | --                | --                |
| 113         | E-141 EP4 | --                | --                | --                |
| 114         | E-141 EP4 | --                | --                | --                |

Tabel 4.2 Geluidsbronsterktewijzigingen per windturbine in alternatief 3b

| Turbine nr. | Type      | dag               | avond             | nacht             |
|-------------|-----------|-------------------|-------------------|-------------------|
|             |           | 07:00 – 19:00 uur | 19:00 – 23:00 uur | 23:00 – 07:00 uur |
| 301         | E-103 EP2 | --                | --                | ls                |
| 302         | E-103 EP2 | --                | --                | ls                |
| 303         | E-103 EP2 | ls                | lls               | lls               |
| 304         | E-103 EP2 | ls                | lls               | lls               |
| 305         | E-103 EP2 | ls                | lls               | lls               |
| 306         | E-103 EP2 | ls                | ls                | ls                |
| 307         | E-103 EP2 | lls               | lls               | lls               |
| 308         | E-103 EP2 | lls               | lls               | lls               |
| 309         | E-103 EP2 | lls               | lls               | lls               |
| 310         | E-103 EP2 | lls               | lls               | 0.4MW             |
| 311         | E-103 EP2 | lls               | lls               | 0.4MW             |
| 312         | E-103 EP2 | lls               | lls               | lls               |
| 313         | E-103 EP2 | lls               | lls               | lls               |
| 314         | E-103 EP2 | lls               | lls               | lls               |
| 315         | E-103 EP2 | --                | --                | --                |
| 316         | E-103 EP2 | --                | --                | --                |
| 317         | E-103 EP2 | lls               | lls               | 0.4MW             |
| 318         | E-103 EP2 | lls               | lls               | lls               |
| 319         | E-103 EP2 | lls               | lls               | 0.4MW             |
| 320         | E-103 EP2 | lls               | lls               | lls               |
| 321         | E-103 EP2 | lls               | lls               | lls               |
| 322         | E-103 EP2 | --                | --                | --                |
| 323         | E-103 EP2 | --                | --                | --                |



## 4.2 Resultaat

In de berekeningen voor de netto productie (P50) van de drie alternatieven van Windpark Oostpolder is voor de verliezen rekening gehouden met de voorgenoemde situatie in paragraaf 4.1 en onderstaande uitgangspunten en waarden in Tabellen 4.3 en 4.4. In bijlage 1 zijn de volledige berekeningsresultaten gegeven. In bijlage 2 zijn de berekende verliezen gegeven.

Tabel 4.3 Overzicht berekende energieproductie Windpark Oostpolder

| Algemene uitgangspunten    |   |                   |                    |
|----------------------------|---|-------------------|--------------------|
| Windturbintype             | Alternatief 1b Enercon E-141 EP4-4.200  |                   |                    |
|                            | Alternatief 2b Enercon E-126 EP4 TES-4.200  |                   |                    |
|                            | Alternatief 3b Enercon E-103 EP2-2.350  |                   |                    |
| Wake vervalconstante       | Berekend met N.O. Jensen model en een vervalconstante 0,062 (open landbouw gebied)  |                   |                    |
| Gebruikte winddata         | Voor windrichting en verdeling:<br>RWE Essent Wind B.V. meetmast in de Eemshaven (april 2007 – januari 2009) gecorrigeerd met KNMI data van meetstation Lauwersoog (1991-2016)  |                   |                    |
| Opmerkingen                | P50 opbrengstberekening ter vergelijking van 3 verschillende alternatieven. Berekend met verliezen door verschillende factoren, zoals wake-effect van bestaande windturbines in het gebied en effecten van slagschaduw en geluidhinder. |                   |                    |
| Specifieke uitgangspunten  |   |                   |                    |
| Alternatief                | 1b  | 2b                | 3b                 |
| Windturbintype             | Enercon E-141 EP4-  | Enercon E-126 EP4 | Enercon E-103 EP2- |
| Rotordiameter [m]          | 141   | 126               | 103                |
| Ashoogte [m]               | 165   | 135               | 120                |
| Aantal windturbines        | 14  | 15                | 23                 |
| Geïnstalleerde vermogen    | 58,8  | 63,0              | 54,05              |
| Uitkomsten                 |   |                   |                    |
| Windsnelheid op ashoogte   | 9,2   | 8,7               | 8,4                |
| Bruto productie [GWh/jr]   | 302,4   | 281,3             | 247,1              |
| Verliezen totaal [GWh/jr]  | 52,2  | 47,4              | 66,9               |
| Netto energieproductie     | 250,2   | 233,9             | 180,2              |
| Vollasturen (P50) [uur/jr] | 4.256   | 3.712             | 3.334              |

Tabel 4.4 Detailoverzicht van de verliezen voor de drie alternatieven voor Windpark Oostpolder

| <b>Verliezen</b>   |             | <b>Enercon E-141<br/>EP4-4.200</b> | <b>Enercon E-126<br/>EP4 TES-4.200</b> | <b>Enercon E-103<br/>EP2-2.350</b> |
|--|-------------|------------------------------------|--|------------------------------------|
| Wake-effecten  |             |                                    |  |                                    |
| - Wake-effecten door Windpark Oostpolder                 | Berekening  | - 4,9 %                            | - 5,1%                                 | - 8,2 %                            |
| - Wake-effecten door bestaande en toekomstige windparken | Berekening  | - 4,2 %                            | - 5,9 %                                | - 5,9 %                            |
| Niet-beschikbaarheid                                     |             |                                    |  |                                    |
| - Windturbine  | Inschatting | - 3,0 %                            | - 3,0 %                                | - 3,0 %                            |
| - Balance of plant                                       | Inschatting | 0 %                                | 0 %                                    | 0 %                                |
| - Grid   | Inschatting | 0 %                                | 0 %                                    | 0 %                                |
| - Overig   | Inschatting | 0 %                                | 0 %                                    | 0 %                                |
| Elektrisch   |             |                                    |  |                                    |
| - Netverliezen   | Inschatting | - 2,0 %                            | - 2,0 %                                | - 2,0 %                            |
| - Eigen gebruik windturbine                              | Inschatting | 0 %                                | 0 %                                    | 0 %                                |
| Omgeving   |             |                                    |  |                                    |
| - Bladdegradatie   | Aanname     | - 0,5 %                            | - 0,5 %                                | - 0,5 %                            |
| - Icing maatregelen                                      | Aanname     | - 0,5 %                            | - 0,5 %                                | - 0,5 %                            |
| - Site toegang beperkingen                               | Aanname     | 0 %                                | 0 %                                    | 0 %                                |
| - Extreme weersomstandigheden                            | Aanname     | 0 %                                | 0 %                                    | 0 %                                |
| - Bosaangroei  | Aanname     | 0 %                                | 0 %                                    | 0 %                                |
| - Overig   |             |                                    |  |                                    |
| Prestaties   |             |                                    |  |                                    |
| - High wind hysteresis                                   | Inschatting | - 0,5 %                            | - 0,5 %                                | - 0,5 %                            |
| - Power curve-aanpassingen                               | Inschatting | 0 %                                | 0 %                                    | 0 %                                |
| Inkorting  |             |                                    |  |                                    |
| - Geluid   | Berekening  | - 2,4 %                            | 0 %                                    | - 9,1 %                            |
| - Schaduw  | Berekening  | - 0,3 %                            | - 0,3 %                                | - 0,2 %                            |
| - Vogels / Vleermuizen                                   | Berekening  | 0 %                                | 0 %                                    | 0 %                                |
| - Externe veiligheid                                     | Berekening  | 0 %                                | 0 %                                    | 0 %                                |
| - Overig   | Berekening  | 0 %                                | 0 %                                    | 0 %                                |
| Overig   | Berekening  | 0 %                                | 0 %                                    | 0 %                                |
| Verliezen totaal   |             | - 17,3 % /<br>52,2 GWh/jr          | - 16,9 % /<br>47,4 GWh/jr              | - 27,1 % /<br>66,9 GWh/jr          |
| <b>Netto energieproductie (P50)<br/>[GWh/jr]</b>         |             | <b>250,2</b>                       | <b>233,9</b>                           | <b>180,2</b>                       |
| <b>Vollasturen (P50) [uur/jr]</b>                        |             | <b>4.256</b>                       | <b>3.712</b>                           | <b>3.334</b>                       |

## 5 VOORKEURSALTERNATIEVEN

### 5.1 Inleiding

Op basis van de analyses op verschillende milieuaspecten in het MER, zijn twee voorkeursalternatieven (VKA) gekozen.

Het eerste voorkeursalternatief (VKA1) bestaat uit 15 windturbines met een maximale ashoogte van 165 meter en een maximale rotordiameter van 145 meter. Het tweede voorkeursalternatief (VKA2) bestaat uit 20 windturbines met een maximale ashoogte van 165 meter en een maximale rotordiameter van 145 meter. In VKA2 worden enkele bestaande windturbines van Innogy verwijderd en worden nieuwe turbines nabij deze locaties geplaatst. De kenmerken van de voorkeursalternatieven zijn toegelicht in Tabel 5.1.

Tabel 5.1 Voorkeursalternatieven (VKA1 en VKA2)

| Alternatief | Referentie windturbine | Aantal windturbines | Geïnstalleerd vermogen [MW] | Ashoogte [m] | Rotordiameter [m] |
|-------------|------------------------|---------------------|-----------------------------|--------------|-------------------|
| VKA1        | Enercon E-141 EP4      | 15                  | 63,00                       | 165          | 141               |
| VKA2        | Enercon E-141 EP4      | 20                  | 84,00                       | 165          | 141               |

### 5.2 Windparkopstellingen

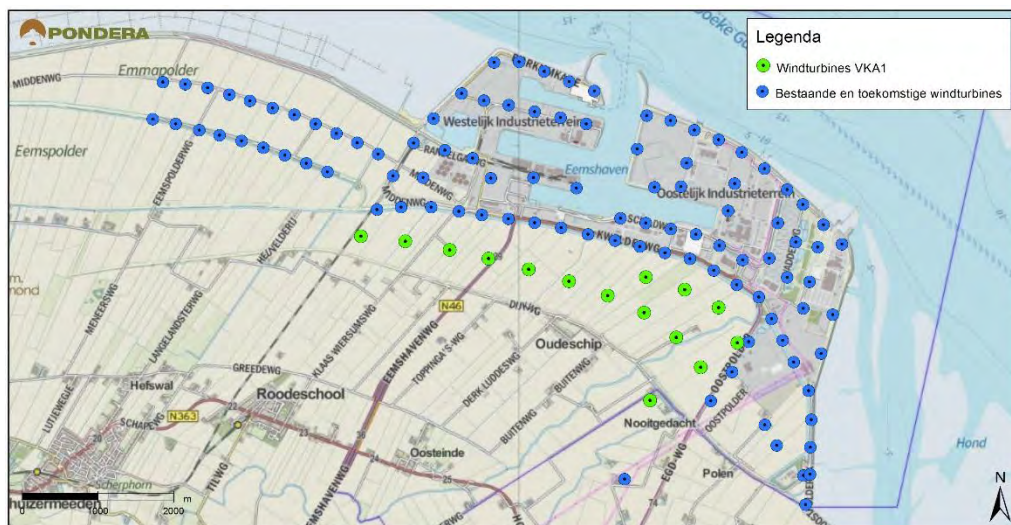
In Tabel 5.2 zijn de RD-coördinaten van de windturbineopstellingen van VKA1 en VKA2 aangegeven. In Figuur 5.1 en Figuur 5.2 zijn respectievelijk VKA1 en VKA2 in kaart gebracht.

Tabel 5.2 RD-coördinaten van de windturbines van VKA1 en VKA2

| VKA1            |                |        | VKA2            |                |        |
|-----------------|----------------|--------|-----------------|----------------|--------|
| Windturbine nr. | RD coördinaten |        | Windturbine nr. | RD coördinaten |        |
| 101             | 251679         | 606481 | 101             | 250684         | 606500 |
| 102             | 252191         | 606316 | 102             | 251170         | 606252 |
| 103             | 252640         | 606079 | 103             | 251688         | 606042 |
| 104             | 252891         | 605613 | 104             | 252082         | 605684 |
| 105             | 247910         | 607020 | 105             | 252469         | 605331 |
| 106             | 248478         | 606954 | 106             | 251732         | 604852 |
| 107             | 249033         | 606849 | 107             | 249560         | 606703 |
| 108             | 249597         | 606724 | 108             | 250117         | 606616 |
| 109             | 250131         | 606584 | 109             | 251693         | 606576 |
| 110             | 250661         | 606425 | 110             | 252197         | 606333 |
| 111             | 251175         | 606238 | 111             | 252625         | 606025 |
| 112             | 251655         | 606010 | 112             | 251157         | 606782 |
| 113             | 252082         | 605684 | 113             | 247827         | 606909 |

|     |        |        |     |        |        |
|-----|--------|--------|-----|--------|--------|
| 114 | 252404 | 605290 | 114 | 248133 | 607325 |
| 115 | 251732 | 604852 | 115 | 248805 | 607337 |
|     |        |        | 116 | 248451 | 606902 |
|     |        |        | 117 | 249405 | 607243 |
|     |        |        | 118 | 249027 | 606820 |
|     |        |        | 119 | 250512 | 607025 |
|     |        |        | 120 | 249999 | 607151 |

Figuur 5.1 VKA1 met de bestaande en toekomstige windturbines in het gebied



Figuur 5.2 VKA2 met de bestaande en toekomstige windturbines in het gebied



### 5.3 Productieberekening VKA1

In de berekeningen voor de netto productie (P50) van VKA1 van Windpark Oostpolder is voor de verliezen rekening gehouden met het wake-effect van de 102 bestaande windturbines in de omgeving, geluid en slagschaduw mitigatiemaatregelen en de onderstaande uitgangspunten en waarden in Tabel 5.3 en Tabel 5.4. In bijlage 1 zijn de volledige berekeningsresultaten gegeven. In bijlage 2 zijn de berekende verliezen gegeven.

Tabel 5.3 Overzicht berekende energieproductie van VKA1

| Resultaten                   |       |
|------------------------------|-------|
| Windsnelheid op ashoogte     | 9,2   |
| Bruto productie [GWh/jr]     | 323,9 |
| Verliezen totaal [GWh/jr]    | 50,4  |
| Netto energieproductie (P50) | 273,4 |
| Vollasturen (P50) [uur/jr]   | 4.340 |

Tabel 5.4 Detailoverzicht van de productie verliezen voor VKA1

| <b>Verliezen VKA1</b>                                    |             | <b>Enercon E-141 EP4-4.200</b> |
|--|-------------|--------------------------------|
| Wake-effecten  | Berekening  |                                |
| - Wake-effecten door Windpark Oostpolder                 | Berekening  | - 5,1 %                        |
| - Wake-effecten door bestaande en toekomstige windparken | Berekening  | - 4,3 %                        |
| Niet-beschikbaarheid                                     |             |                                |
| - Windturbine  | Inschatting | - 3,0 %                        |
| - Balance of plant                                       | Inschatting | 0 %                            |
| - Grid   | Inschatting | 0 %                            |
| - Overig   | Inschatting | 0 %                            |
| Elektrisch   |             |                                |
| - Netverliezen   | Inschatting | - 2,0 %                        |
| - Eigen gebruik windturbine                              | Inschatting | 0 %                            |
| Omgeving   |             |                                |
| - Bladdegradatie   | Aanname     | - 0,5 %                        |
| - Icing maatregelen                                      | Aanname     | - 0,5 %                        |
| - Site toegang beperkingen                               | Aanname     | 0 %                            |
| - Extreme weersomstandigheden                            | Aanname     | 0 %                            |
| - Bosaangroei  | Aanname     | 0 %                            |
| - Overig   |             |                                |
| Prestaties   |             |                                |
| - High wind hysteresis                                   | Inschatting | - 0,5 %                        |
| - Power curve-aanpassingen                               | Inschatting | 0 %                            |
| Inkorting  |             |                                |
| - Geluid   | Berekening  | - 2,6 %                        |
| - Schaduw  | Berekening  | - 0,4 %                        |
| - Vogels / Vleermuizen                                   | Berekening  | 0 %                            |
| - Externe veiligheid                                     | Berekening  | 0 %                            |
| - Overig   | Berekening  | 0 %                            |
| Overig   | Berekening  | 0 %                            |
| Verliezen totaal   |             | - 15,6 % /<br>50,4 GWh/jr      |
| <b>Netto energieproductie (P50) [GWh/jr]</b>             |             | <b>273,4</b>                   |
| <b>Vollasturen (P50) [uur/jr]</b>                        |             | <b>4.340</b>                   |

## 5.4 Productieberekening VKA2

In de berekeningen voor de netto productie (P50) van VKA2 van Windpark Oostpolder is voor de verliezen rekening gehouden met het wake-effect van 93 bestaande windturbines in de omgeving, op basis van een scenario waar 9 Innogy windturbines verwijderd zullen worden. Verder is er ook rekening gehouden met geluid en slagschaduw mitigatiemaatregelen en de onderstaande uitgangspunten en waarden in Tabel 5.5 en Tabel 5.6. In bijlage 1 zijn de volledige berekeningsresultaten gegeven. In bijlage 2 zijn de berekende verliezen gegeven.

**Tabel 5.5** Overzicht berekende energieproductie van VKA2

|                              |       |
|------------------------------|-------|
| Resultaten                   |       |
| Windsnelheid op ashoogte     | 9,2   |
| Bruto productie [GWh/jr]     | 432,4 |
| Verliezen totaal [GWh/jr]    | 76,7  |
| Netto energieproductie (P50) | 355,6 |
| Vollasturen (P50) [uur/jr]   | 4.234 |

Tabel 5.6 Detailoverzicht van de productieverliezen voor VKA2

| <b>Verliezen VKA2</b>                                    |             | <b>Enercon E-141 EP4-4.200</b> |
|--|-------------|--------------------------------|
| Wake-effecten  | Berekening  |                                |
| - Wake-effecten door Windpark Oostpolder                 | Berekening  | - 6,7 %                        |
| - Wake-effecten door bestaande en toekomstige windparken | Berekening  | - 3,2 %                        |
| Niet-beschikbaarheid                                     |             |                                |
| - Windturbine  | Inschatting | - 3,0 %                        |
| - Balance of plant                                       | Inschatting | 0 %                            |
| - Grid   | Inschatting | 0 %                            |
| - Overig   | Inschatting | 0 %                            |
| Elektrisch   |             |                                |
| - Netverliezen   | Inschatting | - 2,0 %                        |
| - Eigen gebruik windturbine                              | Inschatting | 0 %                            |
| Omgeving   |             |                                |
| - Bladdegradatie   | Aanname     | - 0,5 %                        |
| - Icing maatregelen                                      | Aanname     | - 0,5 %                        |
| - Site toegang beperkingen                               | Aanname     | 0 %                            |
| - Extreme weersomstandigheden                            | Aanname     | 0 %                            |
| - Bosaangroei  | Aanname     | 0 %                            |
| - Overig   |             |                                |
| Prestaties   |             |                                |
| - High wind hysteresis                                   | Inschatting | - 0,5 %                        |
| - Power curve-aanpassingen                               | Inschatting | 0 %                            |
| Inkorting  |             |                                |
| - Geluid   | Berekening  | - 2,2 %                        |
| - Schaduw  | Berekening  | - 0,3 %                        |
| - Vogels / Vleermuizen                                   | Berekening  | 0 %                            |
| - Externe veiligheid                                     | Berekening  | 0 %                            |
| - Overig   | Berekening  | 0 %                            |
| Overig   | Berekening  | 0 %                            |
| Verliezen totaal   |             | - 17,7 % /<br>50,4 GWh/jr      |
| <b>Netto energieproductie (P50) [GWh/jr]</b>             |             | <b>355,6</b>                   |
| <b>Vollasturen (P50) [uur/jr]</b>                        |             | <b>4.234</b>                   |



## 6 BESPREKING

De Vereniging Windpark Oostpolder is voornemens het nieuwe windpark Oostpolder te realiseren in de provincie Groningen. In totaal zijn er drie alternatieven voorgesteld met 14, 15 en 23 windturbines. De onderzochte windturbines zijn van het type Enercon E-141 EP4-4.200 (ashoogte 165 m), Enercon E-126 EP4 TES-4.200 (ashoogte 135 m) en Enercon E-103 EP2-2.350 (ashoogte 120 m) voor respectievelijk alternatief 1b, 2b en 3b.

Voor dit nieuwe windpark zijn productieberekeningen uitgevoerd om de jaarlijkse productie en verliezen te bepalen.

Het aangehouden lokale windklimaat is gebaseerd op meetgegevens van een nabijgelegen meetmast in de Eemshaven. De data is gecorrigeerd voor het langjarig gemiddelde met windgegevens uit KNMI meetstation Lauwersoog. Bij de verliezen zijn onder andere de wake-effecten van alle nieuwe en bestaande windturbines meegenomen en een geluidmanagement strategie en stilstand vanwege slagschaduw.

Op grond van de uitgevoerde productieberekeningen blijkt voor het nieuwe windpark Oostpolder

- voor alternatief 1b een opbrengst van 302,4 GWh/ jr bruto en 252,6 GWh/ jr netto P50, met een aantal vollasturen van 4.256
- voor alternatief 2b een opbrengst van 281,3 GWh/ jr bruto en 237,4 GWh/ jr netto P50, met een aantal vollasturen van 3.712
- voor alternatief 1b een opbrengst van 247,1 GWh/ jr bruto en 182,7 GWh/ jr netto P50, met een aantal vollasturen van 3.334
  
- voor VKA1 een opbrengst van 323,9 GWh/ jr bruto en 273,4 GWh/ jr netto P50, met een aantal vollasturen van 4.340
- voor VKA2 een opbrengst van 432,4 GWh/ jr bruto en 355,6 GWh/ jr netto P50, met een aantal vollasturen van 4.234

**BIJLAGE 1**  
**INVOER EN RESULTATEN**  
**MODEL PRODUCTIEBEREKENINGEN**



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 1b

Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings  
 Air density calculation mode Individual per WTG  
 Result for WTG at hub altitude 1,232 kg/m<sup>3</sup> to 1,248 kg/m<sup>3</sup>  
 Air density relative to standard 100,6 % to 101,8 %  
 Hub altitude above sea level (asl) 39,9 m to 166,4 m  
 Annual mean temperature at hub alt. 8,0 °C to 8,8 °C  
 Pressure at WTGs 994,2 hPa to 1.009,6 hPa

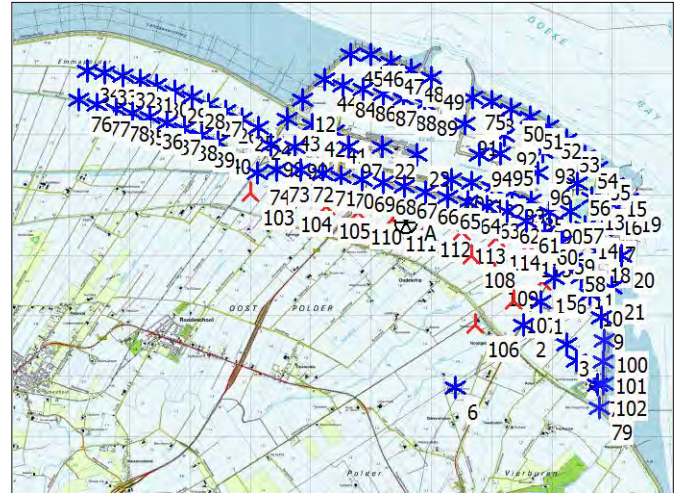
Wake Model Parameters  
 Terrain type Wake decay constant  
 HH:100m Open farmland 0,062

Displacement heights from objects

Wake calculation settings  
 Angle [°] Wind speed [m/s]  
 start end step start end step  
 0,5 360,0 1,0 0,5 30,5 1,0

Wind statistics RWE\_Oostpolder 100m-Corr099.wws

WASP version WASP 11 Version 11.05.0028



👤 New WTG  
 🌟 Site Data

Scale 1:125.000  
 🌟 Existing WTG

### Key results for height 165,0 m above ground level

Terrain Dutch Stereo-RD/NAP 2000

X (east) Y (north) Name of wind distribution Type

|  | Wind energy [kWh/m <sup>2</sup> ] | Mean wind speed [m/s] | Equivalent roughness |
|--|-----------------------------------|-----------------------|----------------------|
| A 250.596 606.527 Oostpolder site data | 7.041                             | 9,2                   | 1,1                  |

### Calculated Annual Energy for Wind Farm

| WTG combination                                | Result PARK [MWh/y] | GROSS (no loss) Free WTGs [MWh/y] | Park efficiency [%] | Specific results <sup>a)</sup> |                         |                              |                                   |
|--|---------------------|-----------------------------------|---------------------|--------------------------------|-------------------------|------------------------------|-----------------------------------|
|  |                     |                                   |                     | Capacity factor [%]            | Mean WTG result [MWh/y] | Full load hours [Hours/year] | Mean wind speed @hub height [m/s] |
| Wind farm                                      | 1.154.489,0         | 1.370.672,3                       | 84,2                | 35,0                           | 9.952,5                 | 3.070                        | 8,3                               |
| New WTGs only                                  | 274.872,9           | 302.409,7                         | 90,9                | 53,3                           | 19.633,8                | 4.675                        | 9,2                               |
| Existing park WTGs only                        | 879.616,1           | 1.068.262,5                       | 82,3                | 31,6                           | 8.623,7                 | 2.773                        | 8,2                               |
| Existing park WTGs without new WTGs            | 904.288,4           | 1.068.262,5                       | 84,7                |                                | 8.865,6                 |                              |                                   |
| Reduction for existing park WTGs caused by new | 24.672,3            |                                   |                     |                                |                         |                              |                                   |

<sup>a)</sup> Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 14 new WTGs with total 58,8 MW rated power

| Links | Valid | WTG type Manufact. | Type-generator  | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Power curve Creator | Name                                       | Annual Energy Park |                |                     |                            |
|-------|-------|--------------------|-----------------|-------------------|--------------------|----------------|---------------------|--|--------------------|----------------|---------------------|----------------------------|
|       |       |                    |                 |                   |                    |                |                     |  | Result [MWh]       | Efficiency [%] | Capacity factor [%] | Free mean wind speed [m/s] |
| 103 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 20.435,5           | 95,02          | 55,5                | 9,14                       |
| 104 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 20.121,2           | 93,70          | 54,7                | 9,12                       |
| 105 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.971,8           | 92,86          | 54,2                | 9,13                       |
| 106 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 20.320,4           | 94,86          | 55,2                | 9,07                       |
| 107 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.403,2           | 90,03          | 52,7                | 9,12                       |
| 108 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.674,7           | 91,07          | 53,4                | 9,15                       |
| 109 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.527,5           | 90,45          | 53,0                | 9,14                       |
| 110 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.914,3           | 92,21          | 54,1                | 9,16                       |
| 111 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.877,6           | 92,01          | 54,0                | 9,16                       |
| 112 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.802,0           | 91,38          | 53,8                | 9,18                       |
| 113 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.583,0           | 90,28          | 53,2                | 9,19                       |
| 114 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 18.905,7           | 86,94          | 51,4                | 9,21                       |
| 115 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.001,4           | 87,28          | 51,6                | 9,22                       |
| 116 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 18.334,8           | 84,59          | 49,8                | 9,17                       |

Annual Energy results do not include any losses apart from wake losses. For expected NET AEP (expected sold production), see report Loss & Uncertainty.



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 1b

Calculated Annual Energy for each of 102 existing park WTGs with total 317,3 MW rated power

| Links | WTG type |            | Power, rated               | Rotor diameter | Hub height | Power curve Creator | Name | Annual Energy                                       |                                   |                | Park Efficiency |                          |
|-------|----------|------------|----------------------------|----------------|------------|---------------------|------|---|-----------------------------------|----------------|-----------------|--------------------------|
|       | Valid    | Manufact.  |                            |                |            |                     |      | Type-generator                                      | Calculated prod. without new WTGs | After New WTGs |                 | Decrease due to new WTGs |
|       |          |            | [kW]                       | [m]            | [m]        |                     |      | [MWh]   | [MWh]                             | [MWh %]        | [%]             |                          |
| 1 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500          | 136,0      | 132,0               | USER | Lagerwey L136-4.5MW PV curve                        | 18.622,7                          | 17.628,6       | 994,1 5,3       | 85,98                    |
| 2 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500          | 136,0      | 132,0               | USER | Lagerwey L136-4.5MW PV curve                        | 19.349,2                          | 18.705,9       | 643,3 3,3       | 91,73                    |
| 3 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500          | 136,0      | 132,0               | USER | Lagerwey L136-4.5MW PV curve                        | 19.142,7                          | 18.863,5       | 279,2 1,5       | 92,00                    |
| 4 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500          | 136,0      | 132,0               | USER | Lagerwey L136-4.5MW PV curve                        | 19.174,0                          | 19.002,4       | 171,6 0,9       | 92,68                    |
| 5 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500          | 136,0      | 132,0               | USER | Lagerwey L136-4.5MW PV curve                        | 18.071,8                          | 16.122,6       | 1.949,2 10,8    | 78,16                    |
| 6 A   | No       | VESTAS     | V47-660                    | 660            | 47,0       | 40,0                | EMD  | Level 0 - calculated - - 07-2001                    | 1.477,2                           | 1.465,4        | 11,8 0,8        | 96,25                    |
| 7 A   | Yes      | VESTAS     | V52-850                    | 850            | 52,0       | 40,0                | EMD  | Level 0 - calculated - 104.2 dB(A) - 07-2006        | 1.989,3                           | 1.974,1        | 15,2 0,8        | 92,38                    |
| 8 A   | Yes      | VESTAS     | V117-3.45-3.450            | 3.450          | 117,0      | 93,5                | EMD  | Level 0 - Calculated - Modes 0 & 0-0S - 01-2016     | 12.967,1                          | 12.840,0       | 127,1 1,0       | 84,96                    |
| 9 A   | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.706,0                           | 7.582,6        | 123,4 1,6       | 84,61                    |
| 10 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.552,7                           | 7.367,0        | 185,8 2,5       | 82,38                    |
| 11 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.445,1                           | 7.166,0        | 279,1 3,7       | 80,19                    |
| 12 A  | No       | 2-B Energy | OTC 6 MW-6.000             | 6.000          | 140,0      | 105,0               | USER | Turbulent power curve with TI of 8.7%               | 18.447,6                          | 18.311,9       | 135,7 0,7       | 83,79                    |
| 13 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 6.913,2                           | 6.763,4        | 149,7 2,2       | 73,31                    |
| 14 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 6.891,4                           | 6.660,4        | 231,0 3,4       | 73,07                    |
| 15 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.205,1                           | 7.128,5        | 76,6 1,1        | 75,56                    |
| 16 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.086,1                           | 6.982,7        | 103,4 1,5       | 75,05                    |
| 17 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.140,3                           | 6.981,2        | 159,1 2,2       | 75,89                    |
| 18 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.071,5                           | 6.790,6        | 280,8 4,0       | 75,33                    |
| 19 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.452,9                           | 7.388,3        | 64,5 0,9        | 80,41                    |
| 20 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.655,9                           | 7.523,7        | 132,2 1,7       | 81,28                    |
| 21 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.541,7                           | 7.428,7        | 113,1 1,5       | 82,08                    |
| 22 A  | No       | Senvion    | 6.2M126-6.150              | 6.150          | 126,0      | 114,0               | USER | Calcdted power curve Senvion 6.2M126                | 18.923,9                          | 18.399,0       | 525,0 2,8       | 82,68                    |
| 23 A  | No       | Senvion    | 6.2M126-6.150              | 6.150          | 126,0      | 114,0               | USER | Calcdted power curve Senvion 6.2M126                | 18.926,8                          | 18.450,2       | 476,6 2,5       | 82,61                    |
| 24 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.673,1                           | 7.606,8        | 66,3 0,9        | 84,85                    |
| 25 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.541,6                           | 7.486,0        | 55,6 0,7        | 82,99                    |
| 26 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.392,8                           | 7.352,6        | 40,2 0,5        | 81,65                    |
| 27 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.420,1                           | 7.400,2        | 19,9 0,3        | 81,86                    |
| 28 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.484,6                           | 7.471,7        | 12,9 0,2        | 82,05                    |
| 29 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.535,0                           | 7.522,2        | 12,8 0,2        | 82,40                    |
| 30 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.476,5                           | 7.465,7        | 10,7 0,1        | 82,46                    |
| 31 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.555,8                           | 7.547,9        | 7,9 0,1         | 83,02                    |
| 32 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.750,1                           | 7.743,8        | 6,3 0,1         | 84,30                    |
| 33 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.943,6                           | 7.936,1        | 7,5 0,1         | 86,38                    |
| 34 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.428,3                           | 8.421,8        | 6,5 0,1         | 91,89                    |
| 35 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.909,3                           | 7.895,1        | 14,2 0,2        | 87,32                    |
| 36 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.889,4                           | 7.873,7        | 15,7 0,2        | 87,42                    |
| 37 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.893,4                           | 7.873,8        | 19,6 0,2        | 87,50                    |
| 38 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.866,4                           | 7.841,1        | 25,3 0,3        | 87,51                    |
| 39 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.861,8                           | 7.827,1        | 34,7 0,4        | 87,43                    |
| 40 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.904,6                           | 7.852,7        | 51,9 0,7        | 87,87                    |
| 41 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.518,0                           | 7.362,2        | 155,7 2,1       | 80,55                    |
| 42 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.268,4                           | 7.148,0        | 120,3 1,7       | 78,65                    |
| 43 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.412,0                           | 7.317,2        | 94,8 1,3        | 80,62                    |
| 44 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.803,4                           | 7.755,1        | 48,3 0,6        | 81,94                    |
| 45 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.274,8                           | 8.241,3        | 33,5 0,4        | 85,14                    |
| 46 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.204,3                           | 8.163,6        | 40,8 0,5        | 83,73                    |
| 47 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.225,9                           | 8.178,8        | 47,1 0,6        | 83,73                    |
| 48 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.993,8                           | 7.935,7        | 58,1 0,7        | 82,72                    |
| 49 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.950,5                           | 7.886,6        | 64,0 0,8        | 82,72                    |
| 50 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.822,5                           | 7.742,5        | 80,0 1,0        | 80,60                    |
| 51 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.887,4                           | 7.782,0        | 105,4 1,3       | 81,17                    |
| 52 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.861,1                           | 7.773,4        | 87,7 1,1        | 80,86                    |
| 53 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.855,6                           | 7.734,9        | 120,7 1,5       | 80,91                    |
| 54 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.716,6                           | 7.591,4        | 125,2 1,6       | 79,66                    |
| 55 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.505,1                           | 7.389,0        | 116,1 1,5       | 77,63                    |
| 56 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.270,2                           | 7.075,3        | 194,9 2,7       | 75,85                    |
| 57 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.105,1                           | 6.766,2        | 338,8 4,8       | 73,89                    |
| 58 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.258,3                           | 6.796,1        | 462,2 6,4       | 75,64                    |
| 59 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.501,0                           | 6.850,5        | 650,5 8,7       | 75,17                    |
| 60 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.562,7                           | 6.678,2        | 884,5 11,7      | 74,36                    |
| 61 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.660,4                           | 6.847,2        | 813,3 10,6      | 76,02                    |
| 62 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.561,1                           | 6.737,6        | 823,4 10,9      | 74,90                    |
| 63 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.602,4                           | 6.868,4        | 734,0 9,7       | 76,60                    |
| 64 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.691,8                           | 7.080,5        | 611,3 7,9       | 78,71                    |
| 65 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.715,1                           | 7.122,0        | 593,1 7,7       | 79,76                    |
| 66 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.859,2                           | 7.360,5        | 498,7 6,3       | 82,04                    |
| 67 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.845,8                           | 7.268,3        | 577,5 7,4       | 80,89                    |
| 68 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.779,6                           | 7.241,6        | 538,0 6,9       | 81,50                    |
| 69 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.761,8                           | 7.264,5        | 497,2 6,4       | 81,91                    |
| 70 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.711,7                           | 7.159,9        | 551,7 7,2       | 80,86                    |
| 71 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.742,1                           | 7.310,3        | 431,8 5,6       | 82,83                    |
| 72 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.697,6                           | 7.181,8        | 515,8 6,7       | 81,73                    |
| 73 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 7.781,2                           | 7.403,9        | 377,3 4,8       | 83,74                    |
| 74 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 98,4                | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.055,1                           | 7.584,9        | 470,3 5,8       | 86,52                    |
| 75 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000          | 82,0       | 100,0               | EMD  | Level 0 - official - Mode 0 - 08/2014               | 8.075,2                           | 7.989,3        | 85,9 1,1        | 83,36                    |
| 76 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300          | 112,0      | 100,0               | EMD  | Level 0 - Mode 0 - Estimated - 12-2013              | 12.800,1                          | 12.794,4       | 5,7 0,0         | 94,33                    |
| 77 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300          | 112,0      | 100,0               | EMD  | Level 0 - Mode 0 - Estimated - 12-2013              | 12.289,5                          | 12.282,5       | 7,0 0,1         | 90,80                    |
| 78 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300          | 112,0      | 100,0               | EMD  | Level 0 - Mode 0 - Estimated - 12-2013              | 11.992,1                          | 11.980,3       | 11,8 0,1        | 89,34                    |
| 79 A  | Yes      | VESTAS     | V117-3.6-3.600             | 3.600          | 117,0      | 117,0               | EMD  | Level 0 - Calculated - Modes PO1 & PO1-OS - 01-2016 | 15.257,1                          | 15.            |                 |                          |

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 1b

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| Links | WTG type |           | Type-generator | Power, rated | Rotor diameter | Hub height | Power curve |                     | Creator                 | Name    | Calculated prod. without new WTGs [MWh] | Annual Energy        |                                  | Park Efficiency [%] |
|-------|----------|-----------|----------------|--------------|----------------|------------|-------------|---------------------|-------------------------|---------|---|----------------------|----------------------------------|---------------------|
|       | Valid    | Manufact. |                |              |                |            | Creator     | Name                |                         |         |   | After New WTGs [MWh] | Decrease due to new WTGs [MWh %] |                     |
| 84 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.733,7 | 8.660,5                                 | 73,2 0,8             | 81,19                            |                     |
| 85 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.121,8 | 7.616,8                                 | 505,0 6,2            | 73,21                            |                     |
| 86 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.781,2 | 8.699,7                                 | 81,5 0,9             | 81,46                            |                     |
| 87 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.822,1 | 8.727,9                                 | 94,2 1,1             | 81,96                            |                     |
| 88 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.752,0 | 8.655,1                                 | 96,9 1,1             | 81,01                            |                     |
| 89 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.895,2 | 8.774,5                                 | 120,7 1,4            | 82,41                            |                     |
| 90 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.130,7 | 7.584,8                                 | 545,8 6,7            | 72,66                            |                     |
| 91 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 9.087,9 | 8.946,6                                 | 141,3 1,6            | 83,10                            |                     |
| 92 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.377,8 | 8.251,6                                 | 126,2 1,5            | 77,65                            |                     |
| 93 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.474,5 | 8.322,2                                 | 152,3 1,8            | 78,01                            |                     |
| 94 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.516,5 | 8.309,3                                 | 207,2 2,4            | 78,43                            |                     |
| 95 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.425,9 | 8.219,4                                 | 206,4 2,4            | 77,68                            |                     |
| 96 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.377,8 | 8.146,6                                 | 231,2 2,8            | 76,85                            |                     |
| 97 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.445,4 | 8.201,5                                 | 243,9 2,9            | 79,37                            |                     |
| 98 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.474,3 | 8.308,3                                 | 166,0 2,0            | 82,09                            |                     |
| 99 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated | - 107,0 dB(A) - 06-2009 | 8.271,9 | 8.073,5                                 | 198,4 2,4            | 79,78                            |                     |
| 100 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0    | - - 07-2013             | 8.344,3 | 8.246,6                                 | 97,7 1,2             | 87,76                            |                     |
| 101 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0    | - - 07-2013             | 8.514,6 | 8.457,6                                 | 57,0 0,7             | 90,15                            |                     |
| 102 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0    | - - 07-2013             | 8.611,5 | 8.558,7                                 | 52,8 0,6             | 91,51                            |                     |

## WTG siting

Dutch Stereo-RD/NAP 2000

X (east) Y (north) Z Row data/Description  
[m]

|          |         |         |   |
|----------|---------|---------|---|
| 1 Exist  | 252.819 | 605.227 | -0,3 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (244) |
| 2 Exist  | 252.538 | 604.846 | 0,0 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (245)  |
| 3 Exist  | 253.250 | 604.530 | 0,0 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (246)  |
| 4 Exist  | 253.410 | 604.258 | 0,2 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (247)  |
| 5 Exist  | 253.038 | 605.625 | 0,3 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (248)  |
| 6 Exist  | 251.401 | 603.815 | -0,1 VESTAS V47 660 47.0 !O! hub: 40,0 m (TOT: 63,5 m) (264)              |
| 7 Exist  | 253.765 | 603.860 | 1,8 VESTAS V52 850 52.0 !O! hub: 40,0 m (TOT: 66,0 m) (265)               |
| 8 Exist  | 252.007 | 608.545 | 1,6 VESTAS V117-3.45 3450 117.0 !O! hub: 93,5 m (TOT: 152,0 m) (266)      |
| 9 Exist  | 253.830 | 604.979 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (267)        |
| 10 Exist | 253.634 | 605.359 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (268)       |
| 11 Exist | 253.487 | 605.644 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (269)        |
| 12 Exist | 248.875 | 608.572 | 2,5 2-B Energy OTC 6 MW 6000 140.0 !#! hub: 105,0 m (TOT: 175,0 m) (270)  |
| 13 Exist | 253.662 | 606.943 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (271)       |
| 14 Exist | 253.548 | 606.476 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (272)        |
| 15 Exist | 254.026 | 607.172 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (273)        |
| 16 Exist | 253.954 | 606.875 | 2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (274)        |
| 17 Exist | 253.843 | 606.417 | 2,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (275)        |
| 18 Exist | 253.758 | 606.067 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (276)       |
| 19 Exist | 254.272 | 606.915 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (277)        |
| 20 Exist | 254.151 | 605.985 | 2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (278)        |
| 21 Exist | 253.996 | 605.473 | 0,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (279)        |
| 22 Exist | 250.194 | 607.795 | 4,3 Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (280)      |
| 23 Exist | 250.760 | 607.657 | 3,1 Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (281)      |
| 24 Exist | 248.142 | 608.104 | -1,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (282)       |
| 25 Exist | 247.865 | 608.255 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (283)       |
| 26 Exist | 247.590 | 608.377 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (284)       |
| 27 Exist | 247.311 | 608.501 | -1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (285)       |
| 28 Exist | 247.034 | 608.625 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (286)        |
| 29 Exist | 246.747 | 608.713 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (371)        |
| 30 Exist | 246.447 | 608.805 | -2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (288)       |
| 31 Exist | 246.172 | 608.890 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (289)       |
| 32 Exist | 245.885 | 608.978 | 0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (290)        |
| 33 Exist | 245.590 | 609.026 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (291)        |
| 34 Exist | 245.294 | 609.056 | -1,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (292)       |
| 35 Exist | 246.045 | 608.352 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (293)        |
| 36 Exist | 246.336 | 608.279 | 0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (294)        |
| 37 Exist | 246.622 | 608.188 | 1,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (295)        |
| 38 Exist | 246.907 | 608.088 | -0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (296)       |
| 39 Exist | 247.190 | 607.981 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (297)        |
| 40 Exist | 247.472 | 607.870 | 0,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (298)        |
| 41 Exist | 249.390 | 608.049 | 2,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (299)        |
| 42 Exist | 249.023 | 608.155 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (300)        |
| 43 Exist | 248.609 | 608.251 | 1,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (301)        |

To be continued on next page...

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 1b

...continued from previous page

Dutch Stereo-RD/NAP 2000

|     | X (east) | Y (north) | Z [m]   | Row data/Description  |
|-----|----------|-----------|---------|---|
| 44  | Exist    | 249.242   | 608.904 | -0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (302)     |
| 45  | Exist    | 249.672   | 609.314 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (303)      |
| 46  | Exist    | 250.005   | 609.324 | 2,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (304)      |
| 47  | Exist    | 250.336   | 609.195 | 4,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (305)      |
| 48  | Exist    | 250.665   | 609.061 | 1,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (306)      |
| 49  | Exist    | 250.997   | 608.936 | 3,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (307)      |
| 50  | Exist    | 252.323   | 608.418 | 1,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (308)      |
| 51  | Exist    | 252.641   | 608.293 | 1,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (309)      |
| 52  | Exist    | 252.949   | 608.128 | 2,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (310)      |
| 53  | Exist    | 253.248   | 607.910 | 0,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (311)      |
| 54  | Exist    | 253.547   | 607.637 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (312)      |
| 55  | Exist    | 253.756   | 607.438 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (313)      |
| 56  | Exist    | 253.425   | 607.194 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (314)     |
| 57  | Exist    | 253.312   | 606.728 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (315)     |
| 58  | Exist    | 253.341   | 605.928 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (316)      |
| 59  | Exist    | 253.172   | 606.215 | 4,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (317)      |
| 60  | Exist    | 252.880   | 606.379 | -0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (318)     |
| 61  | Exist    | 252.576   | 606.567 | 1,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (319)      |
| 62  | Exist    | 252.262   | 606.720 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (320)     |
| 63  | Exist    | 251.932   | 606.799 | -2,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (321)     |
| 64  | Exist    | 251.602   | 606.881 | 0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (322)      |
| 65  | Exist    | 251.272   | 606.961 | -1,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (323)     |
| 66  | Exist    | 250.915   | 607.046 | 1,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (324)      |
| 67  | Exist    | 250.558   | 607.133 | 1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (325)      |
| 68  | Exist    | 250.211   | 607.197 | -1,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (326)     |
| 69  | Exist    | 249.862   | 607.249 | -0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (327)     |
| 70  | Exist    | 249.511   | 607.301 | 0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (328)      |
| 71  | Exist    | 249.207   | 607.349 | 0,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (329)      |
| 72  | Exist    | 248.841   | 607.404 | -0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (330)     |
| 73  | Exist    | 248.444   | 607.403 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (331)      |
| 74  | Exist    | 248.125   | 607.370 | -1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (332)     |
| 75  | Exist    | 251.691   | 608.611 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 100,0 m (TOT: 141,0 m) (333)     |
| 76  | Exist    | 245.161   | 608.566 | 0,7 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (354)          |
| 77  | Exist    | 245.463   | 608.501 | 0,4 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (355)          |
| 78  | Exist    | 245.775   | 608.421 | -1,5 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (356)         |
| 79  | Exist    | 253.792   | 603.479 | 1,0 VESTAS V117-3.6 3600 117.0 !O! hub: 117,0 m (TOT: 175,5 m) (664)    |
| 80  | Exist    | 251.345   | 607.258 | 2,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (599)          |
| 81  | Exist    | 251.679   | 607.196 | 1,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (600)          |
| 82  | Exist    | 252.008   | 607.117 | 1,0 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (601)          |
| 83  | Exist    | 252.340   | 607.043 | 3,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (602)          |
| 84  | Exist    | 249.539   | 608.811 | 0,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (603)          |
| 85  | Exist    | 252.654   | 606.896 | 1,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (604)          |
| 86  | Exist    | 249.866   | 608.752 | 0,4 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (605)          |
| 87  | Exist    | 250.208   | 608.666 | 1,0 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (606)          |
| 88  | Exist    | 250.550   | 608.586 | 0,9 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (607)          |
| 89  | Exist    | 250.892   | 608.503 | 2,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (608)          |
| 90  | Exist    | 252.958   | 606.705 | 1,5 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (609)          |
| 91  | Exist    | 251.566   | 608.173 | 4,2 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (610)          |
| 92  | Exist    | 252.219   | 607.986 | -0,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (611)         |
| 93  | Exist    | 252.852   | 607.716 | 1,9 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (612)          |
| 94  | Exist    | 251.793   | 607.668 | 1,6 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (613)          |
| 95  | Exist    | 252.144   | 607.675 | 2,7 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (614)          |
| 96  | Exist    | 252.765   | 607.355 | 1,6 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (615)          |
| 97  | Exist    | 249.631   | 607.787 | 2,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (616)          |
| 98  | Exist    | 248.339   | 607.818 | -1,2 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (617)         |
| 99  | Exist    | 248.736   | 607.792 | -1,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (618)         |
| 100 | Exist    | 253.864   | 604.596 | 0,0 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (712)    |
| 101 | Exist    | 253.855   | 604.236 | 0,0 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (713)    |
| 102 | Exist    | 253.850   | 603.877 | 0,2 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (714)    |
| 103 | New      | 248.012   | 607.033 | -0,5 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (294) |
| 104 | New      | 248.629   | 606.913 | -2,2 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (295) |
| 105 | New      | 249.275   | 606.800 | -1,3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (296) |
| 106 | New      | 251.738   | 604.844 | 0,4 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (297)  |
| 107 | New      | 252.372   | 605.247 | -0,7 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (298) |

To be continued on next page...



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 1b

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Dutch Stereo-RD/NAP 2000

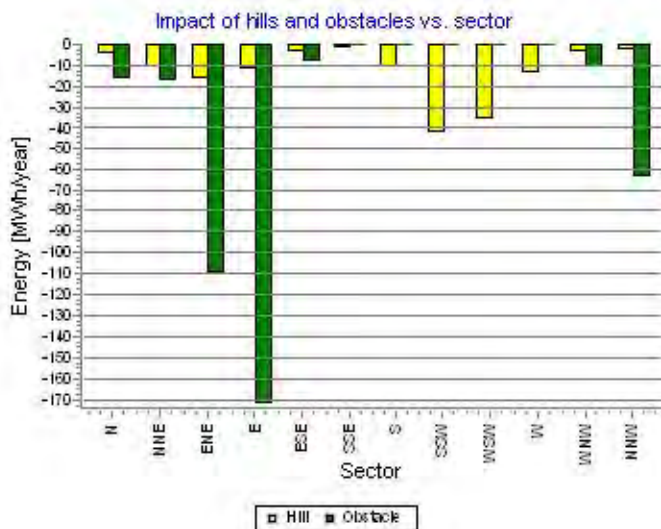
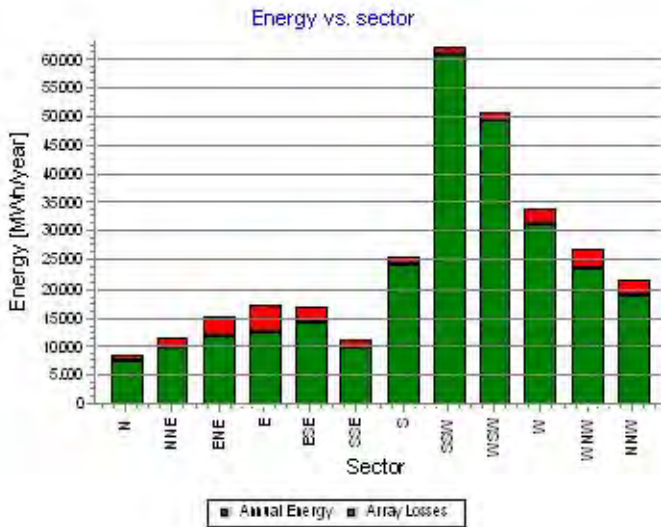
|         | X (east) | Y (north) | Z    | Row data/Description   |
|---------|----------|-----------|------|--|
|         |          |           | [m]  |  |
| 108 New | 251.671  | 605.999   | 0,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (299) |
| 109 New | 252.049  | 605.693   | -0,1 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (300) |
| 110 New | 249.790  | 606.711   | 1,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (301) |
| 111 New | 250.365  | 606.604   | -0,3 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (302) |
| 112 New | 250.941  | 606.498   | 1,4  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (303) |
| 113 New | 251.516  | 606.392   | -0,1 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (304) |
| 114 New | 252.091  | 606.286   | 0,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (305) |
| 115 New | 252.621  | 606.167   | 0,7  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (306) |
| 116 New | 252.853  | 605.560   | 0,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (307) |



## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 1bWTG: All new WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N     | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW    | 8 WSW    | 9 W      | 10 WNW   | 11 NNW   | Total     |
|---------------------------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Roughness based energy [MWh]          | 8.730,1 | 11.694,6 | 15.477,2 | 17.252,1 | 17.032,1 | 11.211,0 | 25.793,1 | 62.194,9 | 50.976,1 | 34.125,8 | 26.986,6 | 21.490,7 | 302.964,1 |
| -Decrease due to obstacles [MWh]      | 16,8    | 17,3     | 110,0    | 172,0    | 8,2      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 10,9     | 63,2     | 398,3     |
| +Increase due to hills [MWh]          | -4,6    | -10,7    | -16,2    | -11,6    | -3,2     | -1,7     | -11,3    | -41,8    | -35,6    | -13,3    | -3,4     | -2,5     | -156,1    |
| -Decrease due to array losses [MWh]   | 1.259,7 | 1.618,4  | 3.302,1  | 4.360,2  | 2.939,3  | 1.139,4  | 1.286,5  | 1.274,2  | 1.789,4  | 2.584,5  | 3.359,7  | 2.623,3  | 27.536,8  |
| Resulting energy [MWh]                | 7.449,0 | 10.048,3 | 12.048,9 | 12.708,3 | 14.081,4 | 10.069,8 | 24.495,3 | 60.878,8 | 49.151,1 | 31.528,0 | 23.612,5 | 18.801,6 | 274.873,0 |
| Specific energy [kWh/m <sup>2</sup> ] |         |          |          |          |          |          |          |          |          |          |          |          | 1.257     |
| Specific energy [kWh/kW]              |         |          |          |          |          |          |          |          |          |          |          |          | 4.675     |
| Decrease due to obstacles [%]         | 0,2     | 0,1      | 0,7      | 1,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,3      | 0,13      |
| Increase due to hills [%]             | -0,1    | -0,1     | -0,1     | -0,1     | 0,0      | 0,0      | 0,0      | -0,1     | -0,1     | 0,0      | 0,0      | 0,0      | -0,05     |
| Decrease due to array losses [%]      | 14,5    | 13,9     | 21,5     | 25,5     | 17,3     | 10,2     | 5,0      | 2,1      | 3,5      | 7,6      | 12,5     | 12,2     | 9,11      |
| Utilization [%]                       | 18,7    | 21,0     | 21,9     | 21,6     | 21,0     | 18,2     | 19,4     | 20,4     | 17,5     | 14,4     | 13,8     | 15,0     | 17,8      |
| Operational [Hours/year]              | 342     | 388      | 528      | 612      | 549      | 361      | 714      | 1.476    | 1.362    | 960      | 752      | 598      | 8.642     |
| Full Load Equivalent [Hours/year]     | 127     | 171      | 205      | 216      | 239      | 171      | 417      | 1.035    | 836      | 536      | 402      | 320      | 4.675     |



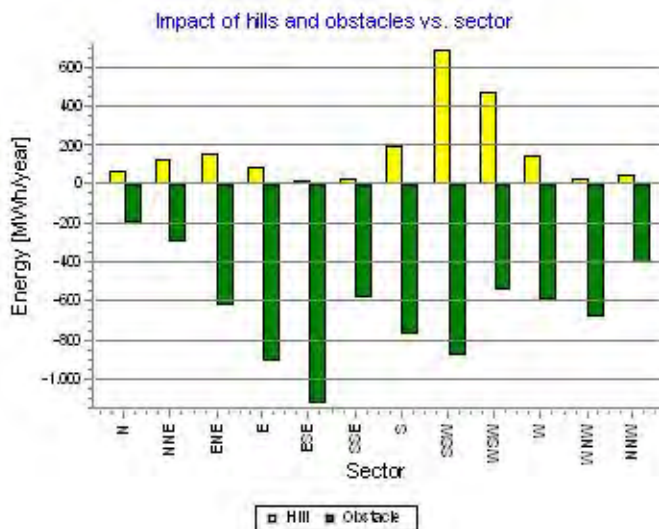
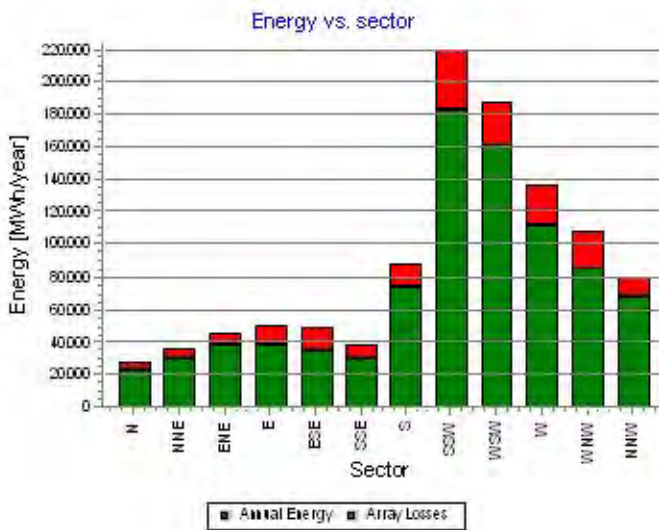




## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 1bWTG: All existing WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW     | 8 WSW     | 9 W       | 10 WNW    | 11 NNW   | Total       |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|-------------|
| Roughness based energy [MWh]          | 27.773,1 | 36.183,5 | 46.549,9 | 50.905,6 | 50.704,9 | 38.783,0 | 89.039,8 | 219.772,1 | 187.819,5 | 136.783,6 | 109.534,6 | 79.965,9 | 1.073.816,0 |
| -Decrease due to obstacles [MWh]      | 191,0    | 291,8    | 628,3    | 914,8    | 1.125,6  | 585,8    | 774,4    | 882,1     | 550,6     | 594,5     | 680,3     | 401,0    | 7.620,2     |
| +Increase due to hills [MWh]          | 65,3     | 127,8    | 154,3    | 89,5     | 24,1     | 27,0     | 193,1    | 687,6     | 469,8     | 146,2     | 31,1      | 51,4     | 2.067,3     |
| -Decrease due to array losses [MWh]   | 4.347,1  | 5.800,9  | 7.502,9  | 11.566,7 | 14.866,2 | 7.394,3  | 14.559,2 | 36.043,2  | 27.802,0  | 24.228,4  | 23.158,2  | 11.377,3 | 188.646,4   |
| Resulting energy [MWh]                | 23.300,3 | 30.218,6 | 38.572,9 | 38.513,7 | 34.737,3 | 30.829,9 | 73.899,3 | 183.534,4 | 159.936,7 | 112.106,9 | 85.727,1  | 68.239,0 | 879.616,5   |
| Specific energy [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |           |           |           |           |          | 1.340       |
| Specific energy [kWh/kW]              |          |          |          |          |          |          |          |           |           |           |           |          | 2.773       |
| Decrease due to obstacles [%]         | 0,7      | 0,8      | 1,3      | 1,8      | 2,2      | 1,5      | 0,9      | 0,4       | 0,3       | 0,4       | 0,6       | 0,5      | 0,71        |
| Increase due to hills [%]             | 0,2      | 0,4      | 0,3      | 0,2      | 0,0      | 0,1      | 0,2      | 0,3       | 0,3       | 0,1       | 0,0       | 0,1      | 0,19        |
| Decrease due to array losses [%]      | 15,7     | 16,1     | 16,3     | 23,1     | 30,0     | 19,3     | 16,5     | 16,4      | 14,8      | 17,8      | 21,3      | 14,3     | 17,66       |
| Utilization [%]                       | 28,7     | 31,1     | 33,1     | 30,8     | 26,6     | 25,9     | 27,9     | 28,9      | 25,8      | 21,2      | 20,2      | 25,0     | 25,7        |
| Operational [Hours/year]              | 333      | 375      | 509      | 592      | 531      | 354      | 688      | 1.426     | 1.324     | 945       | 738       | 584      | 8.399       |
| Full Load Equivalent [Hours/year]     | 73       | 95       | 122      | 121      | 109      | 97       | 233      | 578       | 504       | 353       | 270       | 215      | 2.773       |





## PARK - Power Curve Analysis

Calculation: 716033 WP Oostpolder alternatief 1bWTG: 103 - ENERCON E-141 EP4 4200 141.0 !-! Level 0 - official - 0 s- 4200kW - 04/2016, Hub height: 165,0 m  
Name: Level 0 - official - 0 s- 4200kW - 04/2016  
Source: Manufacturer

| Source/Date | Created by | Created   | Edited   | Stop wind speed [m/s] | Power control | CT curve type | Generator type | Specific power kW/m <sup>2</sup> |
|-------------|------------|-----------|----------|-----------------------|---------------|---------------|----------------|----------------------------------|
| 13-4-2016   | EMD        | 29-4-2016 | 9-5-2016 | 25,0                  | Pitch         | User defined  | Variable       | 0,27                             |

D0434287-5\_#\_de\_#\_Betriebsmodi\_E-141\_EP4\_\_\_4200\_kW\_mit\_TES.pdf

HP curve comparison - Note: For standard air density and weibull k parameter = 2

| Vmean   | [m/s] | 5     | 6      | 7      | 8      | 9      | 10     |
|---|-------|-------|--------|--------|--------|--------|--------|
| HP value Pitch, variable speed (2013)                                       | [MWh] | 7.749 | 11.582 | 15.194 | 18.346 | 20.965 | 23.032 |
| ENERCON E-141 EP4 4200 141.0 !-! Level 0 - official - 0 s- 4200kW - 04/2016 | [MWh] | 7.644 | 11.288 | 14.772 | 17.854 | 20.437 | 22.479 |
| Check value   | [%]   | 1     | 3      | 3      | 3      | 3      | 2      |

The table shows comparison between annual energy production calculated on basis of simplified "HP-curves" which assume that all WTGs performs quite similar - only specific power loading (kW/m<sup>2</sup>) and single/dual speed or stall/pitch decides the calculated values. Productions are without wake losses.

For further details, ask at the Danish Energy Agency for project report J.nr. 51171/00-0016 or see windPRO manual chapter 3.5.2.

The method is refined in EMD report "20 Detailed Case Studies comparing Project Design Calculations and actual Energy Productions for Wind Energy Projects worldwide", jan 2003.

Use the table to evaluate if the given power curve is reasonable - if the check value are lower than -5%, the power curve probably is too optimistic due to uncertainty in power curve measurement.

### Power curve

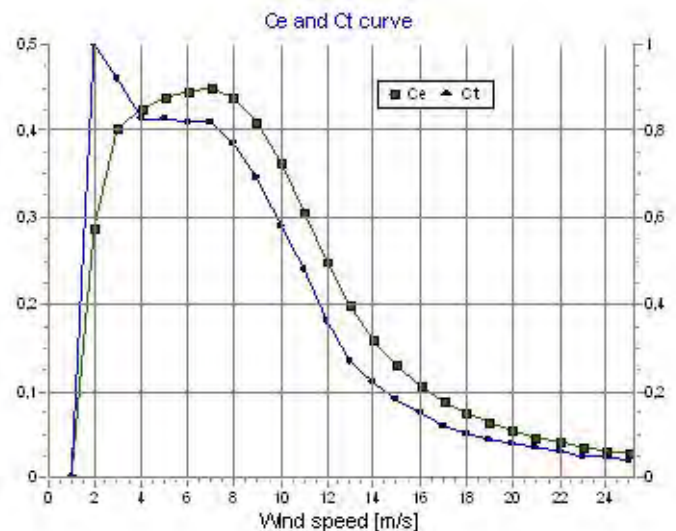
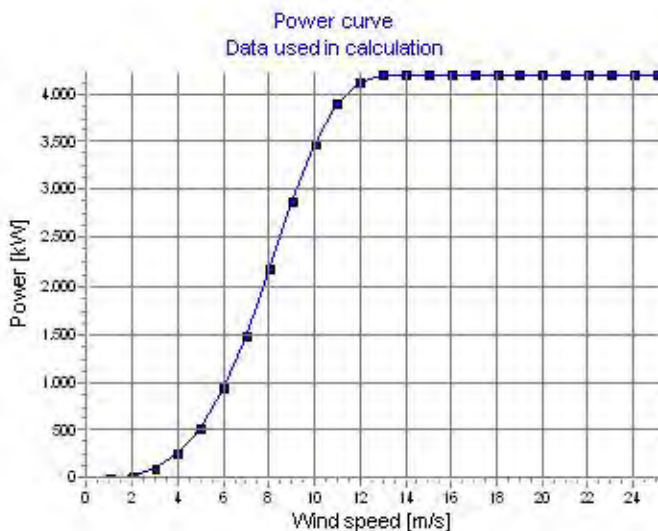
Original data, Air density: 1,225 kg/m<sup>3</sup>

| Wind speed [m/s] | Power [kW] | Ce   | Wind speed [m/s] | Ct curve |
|------------------|------------|------|------------------|----------|
| 0,0              | 0,0        | 0,00 | 0,0              | 0,00     |
| 0,5              | 0,0        | 0,00 | 0,5              | 0,00     |
| 1,0              | 0,0        | 0,00 | 1,0              | 0,00     |
| 1,5              | 0,0        | 0,00 | 1,5              | 0,00     |
| 2,0              | 22,0       | 0,29 | 2,0              | 1,16     |
| 2,5              | 54,0       | 0,36 | 2,5              | 1,01     |
| 3,0              | 104,0      | 0,40 | 3,0              | 0,92     |
| 3,5              | 171,0      | 0,42 | 3,5              | 0,87     |
| 4,0              | 260,0      | 0,42 | 4,0              | 0,83     |
| 4,5              | 376,0      | 0,43 | 4,5              | 0,83     |
| 5,0              | 523,0      | 0,44 | 5,0              | 0,83     |
| 5,5              | 703,0      | 0,44 | 5,5              | 0,82     |
| 6,0              | 920,0      | 0,45 | 6,0              | 0,82     |
| 6,5              | 1.176,0    | 0,45 | 6,5              | 0,82     |
| 7,0              | 1.471,0    | 0,45 | 7,0              | 0,82     |
| 7,5              | 1.799,0    | 0,45 | 7,5              | 0,80     |
| 8,0              | 2.151,0    | 0,44 | 8,0              | 0,77     |
| 8,5              | 2.514,0    | 0,43 | 8,5              | 0,74     |
| 9,0              | 2.867,0    | 0,41 | 9,0              | 0,69     |
| 9,5              | 3.194,0    | 0,39 | 9,5              | 0,63     |
| 10,0             | 3.481,0    | 0,36 | 10,0             | 0,58     |
| 10,5             | 3.719,0    | 0,34 | 10,5             | 0,53     |
| 11,0             | 3.903,0    | 0,31 | 11,0             | 0,48     |
| 11,5             | 4.033,0    | 0,28 | 11,5             | 0,41     |
| 12,0             | 4.119,0    | 0,25 | 12,0             | 0,36     |
| 12,5             | 4.171,0    | 0,22 | 12,5             | 0,31     |
| 13,0             | 4.196,0    | 0,20 | 13,0             | 0,27     |
| 13,5             | 4.200,0    | 0,18 | 13,5             | 0,24     |
| 14,0             | 4.200,0    | 0,16 | 14,0             | 0,22     |
| 14,5             | 4.200,0    | 0,14 | 14,5             | 0,19     |
| 15,0             | 4.200,0    | 0,13 | 15,0             | 0,18     |
| 15,5             | 4.200,0    | 0,12 | 15,5             | 0,16     |
| 16,0             | 4.200,0    | 0,11 | 16,0             | 0,15     |
| 16,5             | 4.200,0    | 0,10 | 16,5             | 0,13     |
| 17,0             | 4.200,0    | 0,09 | 17,0             | 0,12     |
| 17,5             | 4.200,0    | 0,08 | 17,5             | 0,11     |
| 18,0             | 4.200,0    | 0,08 | 18,0             | 0,10     |
| 18,5             | 4.200,0    | 0,07 | 18,5             | 0,10     |
| 19,0             | 4.200,0    | 0,06 | 19,0             | 0,09     |
| 19,5             | 4.200,0    | 0,06 | 19,5             | 0,08     |
| 20,0             | 4.200,0    | 0,05 | 20,0             | 0,08     |
| 20,5             | 4.200,0    | 0,05 | 20,5             | 0,07     |
| 21,0             | 4.200,0    | 0,05 | 21,0             | 0,07     |
| 21,5             | 4.200,0    | 0,04 | 21,5             | 0,06     |
| 22,0             | 4.200,0    | 0,04 | 22,0             | 0,06     |
| 22,5             | 4.200,0    | 0,04 | 22,5             | 0,06     |
| 23,0             | 4.200,0    | 0,04 | 23,0             | 0,05     |
| 23,5             | 4.200,0    | 0,03 | 23,5             | 0,05     |
| 24,0             | 4.200,0    | 0,03 | 24,0             | 0,05     |
| 24,5             | 4.200,0    | 0,03 | 24,5             | 0,04     |

### Power, Efficiency and energy vs. wind speed

Data used in calculation, Air density: 1,232 kg/m<sup>3</sup> New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>

| Wind speed [m/s] | Power [kW] | Ce   | Interval [m/s] | Energy [MWh] | Acc.Energy [MWh] | Relative [%] |
|------------------|------------|------|----------------|--------------|------------------|--------------|
| 1,0              | 0,0        | 0,00 | 0,50- 1,50     | 0,0          | 0,0              | 0,0          |
| 2,0              | 22,2       | 0,29 | 1,50- 2,50     | 7,9          | 7,9              | 0,0          |
| 3,0              | 104,8      | 0,40 | 2,50- 3,50     | 44,2         | 52,1             | 0,3          |
| 4,0              | 261,8      | 0,43 | 3,50- 4,50     | 139,5        | 191,5            | 0,9          |
| 5,0              | 526,5      | 0,44 | 4,50- 5,50     | 332,2        | 523,8            | 2,6          |
| 6,0              | 926,0      | 0,45 | 5,50- 6,50     | 655,2        | 1.179,0          | 5,8          |
| 7,0              | 1.479,9    | 0,45 | 6,50- 7,50     | 1.112,0      | 2.291,0          | 11,2         |
| 8,0              | 2.162,4    | 0,44 | 7,50- 8,50     | 1.645,3      | 3.936,3          | 19,3         |
| 9,0              | 2.879,3    | 0,41 | 8,50- 9,50     | 2.125,5      | 6.061,8          | 29,7         |
| 10,0             | 3.492,3    | 0,36 | 9,50-10,50     | 2.409,8      | 8.471,6          | 41,5         |
| 11,0             | 3.910,8    | 0,31 | 10,50-11,50    | 2.429,1      | 10.900,8         | 53,3         |
| 12,0             | 4.122,7    | 0,25 | 11,50-12,50    | 2.220,4      | 13.121,2         | 64,2         |
| 13,0             | 4.196,3    | 0,20 | 12,50-13,50    | 1.881,5      | 15.002,7         | 73,4         |
| 14,0             | 4.200,0    | 0,16 | 13,50-14,50    | 1.508,6      | 16.511,3         | 80,8         |
| 15,0             | 4.200,0    | 0,13 | 14,50-15,50    | 1.161,7      | 17.673,0         | 86,5         |
| 16,0             | 4.200,0    | 0,11 | 15,50-16,50    | 864,1        | 18.537,1         | 90,7         |
| 17,0             | 4.200,0    | 0,09 | 16,50-17,50    | 623,0        | 19.160,0         | 93,8         |
| 18,0             | 4.200,0    | 0,07 | 17,50-18,50    | 437,1        | 19.597,2         | 95,9         |
| 19,0             | 4.200,0    | 0,06 | 18,50-19,50    | 300,1        | 19.897,3         | 97,4         |
| 20,0             | 4.200,0    | 0,05 | 19,50-20,50    | 202,6        | 20.099,9         | 98,4         |
| 21,0             | 4.200,0    | 0,05 | 20,50-21,50    | 135,1        | 20.234,9         | 99,0         |
| 22,0             | 4.200,0    | 0,04 | 21,50-22,50    | 89,2         | 20.324,2         | 99,5         |
| 23,0             | 4.200,0    | 0,04 | 22,50-23,50    | 58,4         | 20.382,6         | 99,7         |
| 24,0             | 4.200,0    | 0,03 | 23,50-24,50    | 38,0         | 20.420,6         | 99,9         |
| 25,0             | 4.200,0    | 0,03 | 24,50-25,50    | 14,9         | 20.435,5         | 100,0        |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 14:48/3.1.597

## PARK - Terrain

Calculation: 716033 WP Oostpolder alternatief 1bSite Data: A - Oostpolder site data

Obstacles:  
23 Obstacles used

Roughness:  
Terrain data files used in calculation:  
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Min X: 219.227, Max X: 278.331, Min Y: 577.425, Max Y: 638.717, Width: 59.104 m, Height: 61.292 m

Orography:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\ObjectImports\713066 715068\_EMDGrid\_0(1).wpg  
Min X: 198.208, Max X: 300.556, Min Y: 557.205, Max Y: 659.267, Width: 102.348 m, Height: 102.062 m

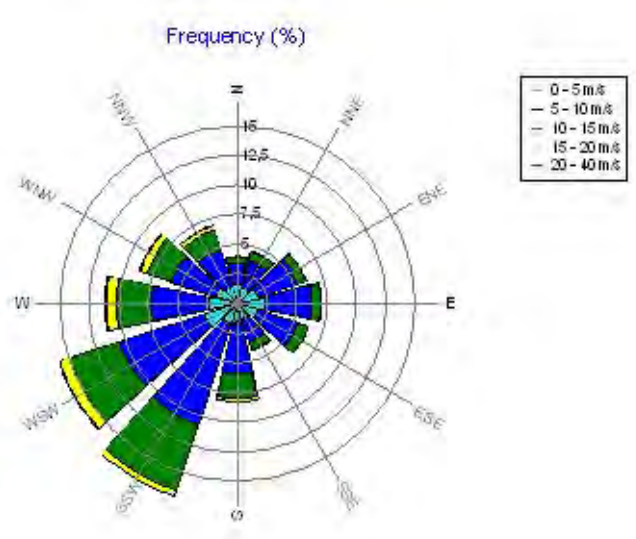
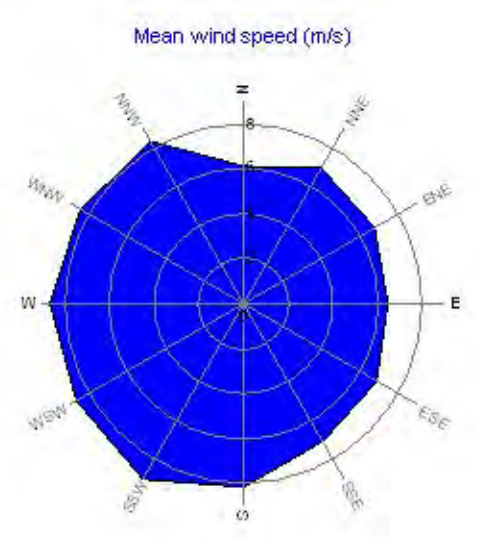
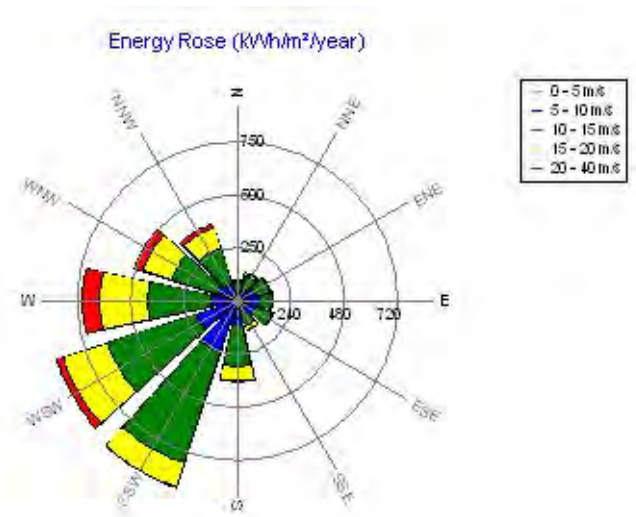
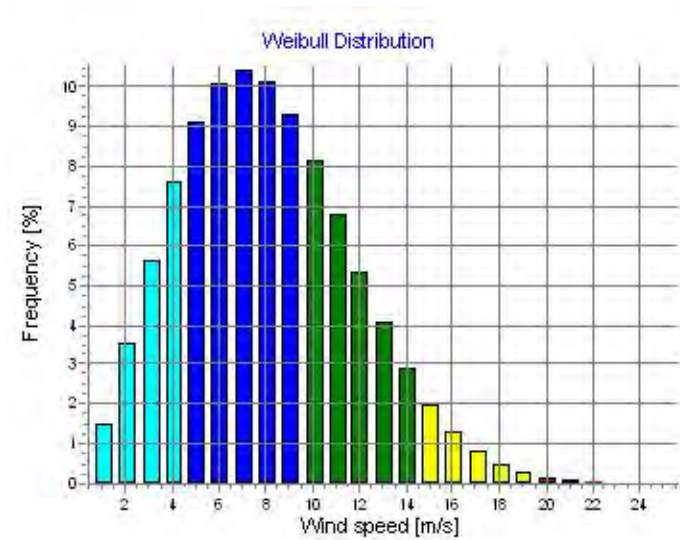
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 1bWind data: A - Oostpolder site data; Hub height: 100,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wws

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 6,90               | 6,13             | 1,854        | 4,0           |
| 1 NNE  | 7,85               | 6,95             | 2,322        | 4,5           |
| 2 ENE  | 7,60               | 6,75             | 2,545        | 6,1           |
| 3 E    | 7,30               | 6,48             | 2,553        | 7,1           |
| 4 ESE  | 7,79               | 6,91             | 2,498        | 6,3           |
| 5 SSE  | 7,97               | 7,06             | 2,115        | 4,2           |
| 6 S    | 9,18               | 8,14             | 2,486        | 8,2           |
| 7 SSW  | 10,06              | 9,00             | 3,146        | 17,0          |
| 8 WSW  | 9,71               | 8,61             | 2,393        | 15,8          |
| 9 W    | 9,77               | 8,65             | 2,068        | 11,2          |
| 10 WNW | 9,48               | 8,40             | 2,119        | 8,7           |
| 11 NNW | 9,43               | 8,35             | 2,209        | 6,9           |
| All    | 9,03               | 8,00             | 2,287        | 100,0         |



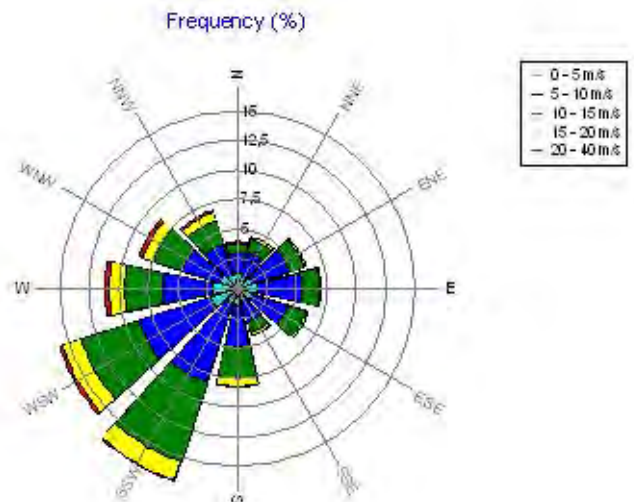
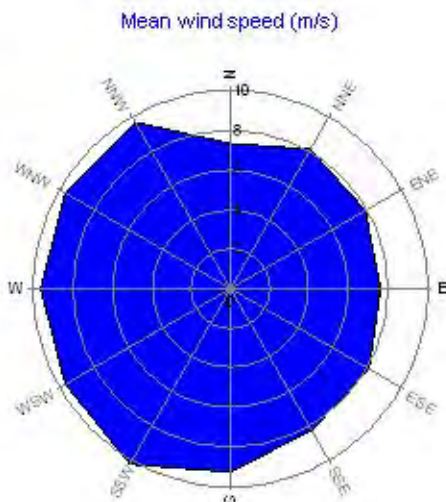
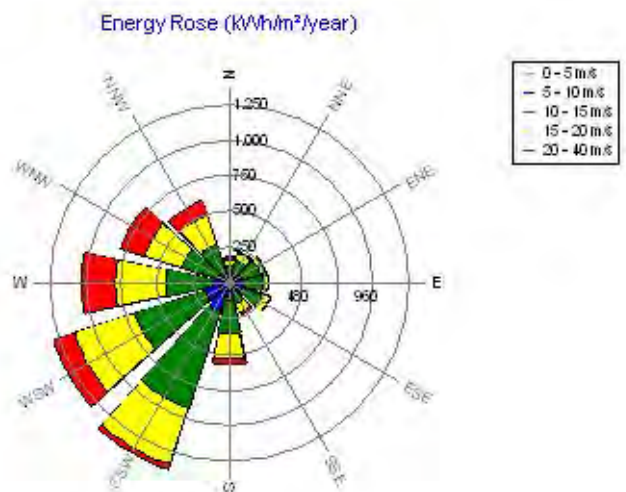
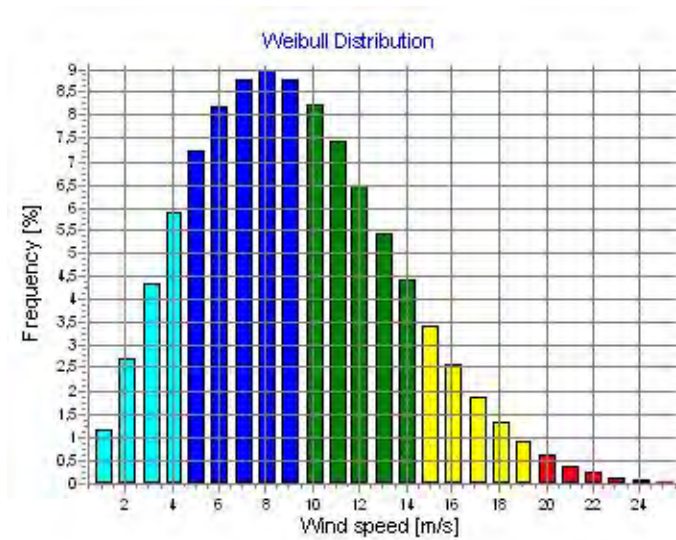
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 1bWind data: A - Oostpolder site data; Hub height: 165,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 8,26               | 7,34             | 1,795        | 4,0           |
| 1 NNE  | 9,17               | 8,13             | 2,252        | 4,5           |
| 2 ENE  | 8,91               | 7,90             | 2,467        | 6,1           |
| 3 E    | 8,54               | 7,57             | 2,471        | 7,1           |
| 4 ESE  | 9,21               | 8,16             | 2,424        | 6,3           |
| 5 SSE  | 9,31               | 8,25             | 2,049        | 4,2           |
| 6 S    | 10,47              | 9,28             | 2,420        | 8,2           |
| 7 SSW  | 11,44              | 10,22            | 3,064        | 17,1          |
| 8 WSW  | 10,93              | 9,68             | 2,334        | 15,8          |
| 9 W    | 10,92              | 9,68             | 2,029        | 11,1          |
| 10 WNW | 10,94              | 9,69             | 2,064        | 8,7           |
| 11 NNW | 10,90              | 9,65             | 2,143        | 6,9           |
| All    | 10,35              | 9,16             | 2,252        | 100,0         |



## PARK - Park power curve

Calculation: 716033 WP Oostpolder alternatief 1b

| Wind speed [m/s] | Power          |                |         |          |          |         |          |          |         |          |          |         |          |          |
|------------------|----------------|----------------|---------|----------|----------|---------|----------|----------|---------|----------|----------|---------|----------|----------|
|                  | Free WTGs [kW] | Park WTGs [kW] | N [kW]  | NNE [kW] | ENE [kW] | E [kW]  | ESE [kW] | SSE [kW] | S [kW]  | SSW [kW] | WSW [kW] | W [kW]  | WNW [kW] | NNW [kW] |
| 0,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 1,5              | 2              | 1              | 0       | 0        | 0        | 0       | 0        | 1        | 1       | 2        | 2        | 2       | 0        | 0        |
| 2,5              | 1.767          | 937            | 947     | 982      | 927      | 815     | 706      | 870      | 1.089   | 1.130    | 1.051    | 860     | 653      | 845      |
| 3,5              | 7.809          | 4.775          | 4.907   | 5.076    | 4.910    | 4.352   | 3.880    | 4.677    | 5.235   | 5.423    | 5.220    | 4.387   | 3.741    | 4.459    |
| 4,5              | 20.492         | 13.626         | 14.223  | 14.550   | 14.376   | 12.828  | 11.512   | 13.255   | 14.353  | 14.775   | 14.531   | 12.712  | 11.442   | 13.436   |
| 5,5              | 39.751         | 27.593         | 28.558  | 29.151   | 28.775   | 26.050  | 23.768   | 27.078   | 28.999  | 29.631   | 29.269   | 26.088  | 23.650   | 27.217   |
| 6,5              | 67.607         | 47.642         | 49.332  | 50.193   | 49.423   | 45.083  | 41.354   | 46.755   | 49.964  | 50.953   | 50.317   | 45.266  | 41.292   | 47.104   |
| 7,5              | 105.183        | 75.122         | 77.821  | 79.148   | 77.921   | 71.242  | 65.490   | 73.758   | 78.681  | 80.178   | 79.154   | 71.419  | 65.382   | 74.360   |
| 8,5              | 151.844        | 111.111        | 115.335 | 117.247  | 115.582  | 105.879 | 97.361   | 109.256  | 116.035 | 118.074  | 116.752  | 105.596 | 97.063   | 110.417  |
| 9,5              | 203.878        | 155.439        | 161.706 | 163.914  | 162.120  | 149.110 | 137.335  | 153.338  | 161.681 | 163.886  | 162.729  | 147.916 | 136.802  | 155.418  |
| 10,5             | 254.172        | 204.467        | 213.561 | 214.708  | 213.445  | 197.690 | 182.643  | 202.788  | 211.928 | 213.002  | 212.548  | 195.273 | 182.568  | 206.676  |
| 11,5             | 295.884        | 252.094        | 263.153 | 262.531  | 262.531  | 245.442 | 228.095  | 251.756  | 260.479 | 259.664  | 260.352  | 242.551 | 228.552  | 256.434  |
| 12,5             | 328.309        | 293.440        | 305.312 | 303.329  | 304.214  | 287.964 | 269.422  | 294.270  | 301.515 | 299.533  | 301.075  | 284.706 | 270.163  | 299.352  |
| 13,5             | 352.228        | 327.688        | 338.644 | 336.624  | 337.911  | 324.130 | 305.993  | 329.418  | 334.369 | 332.510  | 334.236  | 320.713 | 305.692  | 333.439  |
| 14,5             | 366.434        | 353.260        | 360.524 | 359.229  | 360.482  | 350.682 | 336.254  | 355.866  | 358.731 | 357.412  | 358.410  | 349.153 | 334.929  | 356.867  |
| 15,5             | 373.869        | 367.574        | 371.499 | 371.058  | 371.510  | 366.265 | 356.817  | 369.482  | 370.850 | 370.305  | 370.562  | 365.595 | 356.392  | 369.530  |
| 16,5             | 376.957        | 374.851        | 376.405 | 376.228  | 376.365  | 374.305 | 370.138  | 375.873  | 376.269 | 376.060  | 376.110  | 374.119 | 370.028  | 375.736  |
| 17,5             | 377.452        | 377.133        | 377.416 | 377.388  | 377.408  | 377.018 | 376.215  | 377.334  | 377.412 | 377.378  | 377.391  | 377.046 | 376.130  | 377.289  |
| 18,5             | 377.442        | 377.423        | 377.447 | 377.448  | 377.444  | 377.415 | 377.340  | 377.441  | 377.442 | 377.443  | 377.444  | 377.422 | 377.334  | 377.443  |
| 19,5             | 377.425        | 377.429        | 377.430 | 377.431  | 377.429  | 377.429 | 377.429  | 377.430  | 377.427 | 377.429  | 377.429  | 377.429 | 377.429  | 377.432  |
| 20,5             | 371.407        | 371.409        | 371.410 | 371.411  | 371.409  | 371.408 | 371.408  | 371.409  | 371.408 | 371.409  | 371.409  | 371.409 | 371.409  | 371.412  |
| 21,5             | 371.391        | 371.395        | 371.396 | 371.397  | 371.394  | 371.393 | 371.393  | 371.395  | 371.393 | 371.394  | 371.394  | 371.394 | 371.395  | 371.398  |
| 22,5             | 371.379        | 371.380        | 371.381 | 371.382  | 371.380  | 371.379 | 371.380  | 371.380  | 371.379 | 371.380  | 371.380  | 371.380 | 371.381  | 371.382  |
| 23,5             | 371.369        | 371.370        | 371.372 | 371.372  | 371.370  | 371.369 | 371.369  | 371.370  | 371.369 | 371.370  | 371.370  | 371.370 | 371.371  | 371.373  |
| 24,5             | 371.390        | 371.380        | 371.365 | 371.368  | 371.378  | 371.384 | 371.382  | 371.379  | 371.390 | 371.385  | 371.386  | 371.380 | 371.369  | 371.365  |
| 25,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 26,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 27,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 28,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 29,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |

### Description:

The park power curve is similar to a WTG power curve, meaning that when a given wind speed appears in front of the park with same speed in the entire wind farm area (before influence from the park), the output from the park can be found in the park power curve. Another way to say this: The park power curve includes array losses, but do NOT include terrain given variations in the wind speed over the park area.

Measuring a park power curve is not as simple as measuring a WTG power curve due to the fact that the park power curve depends on the wind direction and that the same wind speed normally will not appear for the entire park area at the same time (only in very flat non-complex terrain). The idea with this version of the park power curve is not to use it for validation based on measurements. This would require at least 2 measurement masts at two sides of the park, unless only a few direction sectors should be tested, AND non complex terrain (normally only useable off shore). Another park power curve version for complex terrain is available in windPRO.

The park power curve can be used for:

- Forecast systems, based on more rough (approximated) wind data, the park power curve would be an efficient way to make the connection from wind speed (and direction) to power.
- Construction of duration curves, telling how often a given power output will appear, the park power curve can be used together with the average wind distribution for the Wind farm area in hub height. The average wind distribution can eventually be obtained based on the Weibull parameters for each WTG position. These are found at print menu: >Result to file< in the >Park result< which can be saved to file or copied to clipboard and pasted in Excel.
- Calculation of wind energy index based on the PARK production (see below).
- Estimation of the expected PARK production for an existing wind farm based on wind measurements at minimum 2 measurement masts at two sides of wind farm. The masts must be used for obtaining the free wind speed. The free wind speed is used in the simulation of expected energy production with the PARK power curve. This procedure will only work suitable in non complex terrains. For complex terrain another park power curve calculation is available in windPRO (PPV-model).

### Note:

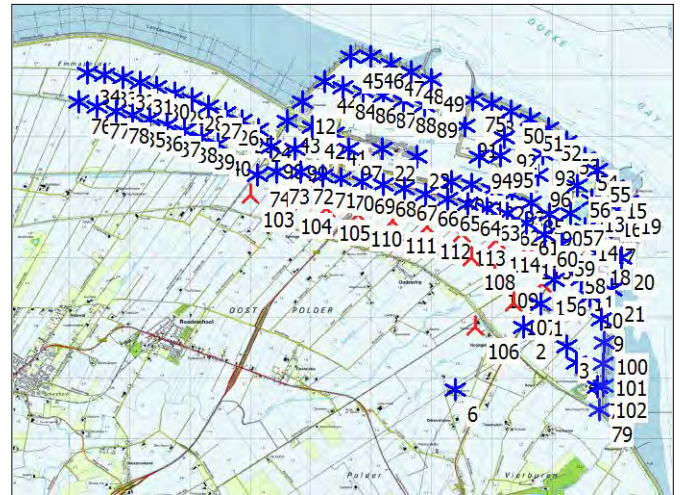
From the >Result to file< the >Wind Speeds Inside Wind farm< is also available. These can (e.g. via Excel) be used for extracting the wake induced reductions in measured wind speed.

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 1b

### WTG distances

|    | Z    | Nearest WTG | Z    | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |
|----|------|-------------|------|---------------------|-----------------------------------|-----------------------------------|
|    | [m]  |             | [m]  | [m]                 |                                   |                                   |
| 1  | -0,3 | 116         | 0,0  | 334                 | 2,5                               | 2,4                               |
| 2  | 0,0  | 107         | -0,7 | 434                 | 3,2                               | 3,1                               |
| 3  | 0,0  | 4           | 0,2  | 315                 | 2,3                               | 2,3                               |
| 4  | 0,2  | 3           | 0,0  | 315                 | 2,3                               | 2,3                               |
| 5  | 0,3  | 116         | 0,0  | 196                 | 1,4                               | 1,4                               |
| 6  | -0,1 | 106         | 0,4  | 1.082               | 23,0                              | 7,7                               |
| 7  | 1,8  | 102         | 0,2  | 87                  | 1,7                               | 0,9                               |
| 8  | 1,6  | 75          | 1,0  | 323                 | 3,9                               | 2,8                               |
| 9  | 0,1  | 100         | 0,0  | 384                 | 4,7                               | 3,8                               |
| 10 | -0,4 | 11          | 1,0  | 321                 | 3,9                               | 3,9                               |
| 11 | 1,0  | 58          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 12 | 2,5  | 43          | 1,9  | 417                 | 5,1                               | 3,0                               |
| 13 | -1,0 | 16          | 2,0  | 300                 | 3,7                               | 3,7                               |
| 14 | 1,0  | 17          | 2,7  | 301                 | 3,7                               | 3,7                               |
| 15 | 1,0  | 16          | 2,0  | 306                 | 3,7                               | 3,7                               |
| 16 | 2,0  | 13          | -1,0 | 300                 | 3,7                               | 3,7                               |
| 17 | 2,7  | 14          | 1,0  | 301                 | 3,7                               | 3,7                               |
| 18 | -0,7 | 17          | 2,7  | 360                 | 4,4                               | 4,4                               |
| 19 | 0,1  | 16          | 2,0  | 320                 | 3,9                               | 3,9                               |
| 20 | 2,0  | 18          | -0,7 | 401                 | 4,9                               | 4,9                               |
| 21 | 0,0  | 10          | -0,4 | 379                 | 4,6                               | 4,6                               |
| 22 | 4,3  | 97          | 2,8  | 563                 | 6,3                               | 4,5                               |
| 23 | 3,1  | 67          | 1,3  | 561                 | 6,8                               | 4,5                               |
| 24 | -1,2 | 25          | -0,4 | 315                 | 3,8                               | 3,8                               |
| 25 | -0,4 | 26          | -1,0 | 301                 | 3,7                               | 3,7                               |
| 26 | -1,0 | 25          | -0,4 | 301                 | 3,7                               | 3,7                               |
| 27 | -1,3 | 28          | 0,2  | 303                 | 3,7                               | 3,7                               |
| 28 | 0,2  | 29          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 29 | 1,8  | 28          | 0,2  | 300                 | 3,7                               | 3,7                               |
| 30 | -2,0 | 31          | -0,7 | 288                 | 3,5                               | 3,5                               |
| 31 | -0,7 | 30          | -2,0 | 288                 | 3,5                               | 3,5                               |
| 32 | 0,3  | 33          | 0,1  | 299                 | 3,6                               | 3,6                               |
| 33 | 0,1  | 34          | -1,1 | 297                 | 3,6                               | 3,6                               |
| 34 | -1,1 | 33          | 0,1  | 297                 | 3,6                               | 3,6                               |
| 35 | 1,8  | 78          | -1,5 | 279                 | 3,4                               | 2,5                               |
| 36 | 0,5  | 35          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 37 | 1,5  | 36          | 0,5  | 300                 | 3,7                               | 3,7                               |
| 38 | -0,2 | 37          | 1,5  | 302                 | 3,7                               | 3,7                               |
| 39 | 0,6  | 38          | -0,2 | 302                 | 3,7                               | 3,7                               |
| 40 | 0,9  | 39          | 0,6  | 303                 | 3,7                               | 3,7                               |
| 41 | 2,7  | 97          | 2,8  | 356                 | 4,3                               | 4,0                               |
| 42 | 0,2  | 41          | 2,7  | 382                 | 4,7                               | 4,7                               |
| 43 | 1,9  | 12          | 2,5  | 417                 | 5,1                               | 3,0                               |
| 44 | -0,5 | 84          | 0,1  | 311                 | 3,8                               | 3,5                               |
| 45 | 0,2  | 46          | 2,8  | 333                 | 4,1                               | 4,1                               |
| 46 | 2,8  | 45          | 0,2  | 333                 | 4,1                               | 4,1                               |
| 47 | 4,8  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 48 | 1,4  | 49          | 3,2  | 355                 | 4,3                               | 4,3                               |
| 49 | 3,2  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 50 | 1,1  | 8           | 1,6  | 340                 | 4,2                               | 2,9                               |
| 51 | 1,4  | 50          | 1,1  | 342                 | 4,2                               | 4,2                               |
| 52 | 2,1  | 51          | 1,4  | 349                 | 4,3                               | 4,3                               |
| 53 | 0,8  | 52          | 2,1  | 370                 | 4,5                               | 4,5                               |
| 54 | 0,6  | 55          | 1,8  | 289                 | 3,5                               | 3,5                               |
| 55 | 1,8  | 54          | 0,6  | 289                 | 3,5                               | 3,5                               |
| 56 | -0,4 | 13          | -1,0 | 345                 | 4,2                               | 4,2                               |
| 57 | -0,7 | 14          | 1,0  | 345                 | 4,2                               | 4,2                               |
| 58 | 1,0  | 11          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 59 | 4,7  | 58          | 1,0  | 333                 | 4,1                               | 4,1                               |
| 60 | -0,3 | 115         | 0,7  | 335                 | 4,1                               | 2,4                               |
| 61 | 1,7  | 85          | 1,3  | 338                 | 4,1                               | 3,8                               |
| 62 | -1,0 | 83          | 3,1  | 332                 | 4,1                               | 3,7                               |
| 63 | -2,9 | 82          | 1,0  | 327                 | 4,0                               | 3,6                               |



Scale 1:125.000  
▲ New WTG      ✱ Existing WTG

To be continued on next page...

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 1b

...continued from previous page

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |     |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|-----|
| [m] |             | [m] | [m]                 |                                   |                                   |     |
| 64  | 0,3         | 81  | 1,8                 | 324                               | 4,0                               | 3,6 |
| 65  | -1,9        | 80  | 2,3                 | 306                               | 3,7                               | 3,4 |
| 66  | 1,5         | 65  | -1,9                | 367                               | 4,5                               | 4,5 |
| 67  | 1,3         | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 68  | -1,2        | 67  | 1,3                 | 353                               | 4,3                               | 4,3 |
| 69  | -0,5        | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 70  | 0,5         | 71  | 0,0                 | 308                               | 3,8                               | 3,8 |
| 71  | 0,0         | 70  | 0,5                 | 308                               | 3,8                               | 3,8 |
| 72  | -0,1        | 71  | 0,0                 | 370                               | 4,5                               | 4,5 |
| 73  | 0,6         | 74  | -1,3                | 321                               | 3,9                               | 3,9 |
| 74  | -1,3        | 73  | 0,6                 | 321                               | 3,9                               | 3,9 |
| 75  | 1,0         | 8   | 1,6                 | 323                               | 3,9                               | 2,8 |
| 76  | 0,7         | 77  | 0,4                 | 309                               | 2,8                               | 2,8 |
| 77  | 0,4         | 76  | 0,7                 | 309                               | 2,8                               | 2,8 |
| 78  | -1,5        | 35  | 1,8                 | 279                               | 3,4                               | 2,5 |
| 79  | 1,0         | 7   | 1,8                 | 382                               | 7,3                               | 3,3 |
| 80  | 2,3         | 65  | -1,9                | 306                               | 3,7                               | 3,4 |
| 81  | 1,8         | 64  | 0,3                 | 324                               | 4,0                               | 3,6 |
| 82  | 1,0         | 63  | -2,9                | 327                               | 4,0                               | 3,6 |
| 83  | 3,1         | 62  | -1,0                | 332                               | 4,1                               | 3,7 |
| 84  | 0,1         | 44  | -0,5                | 311                               | 3,8                               | 3,5 |
| 85  | 1,3         | 61  | 1,7                 | 338                               | 4,1                               | 3,8 |
| 86  | 0,4         | 84  | 0,1                 | 332                               | 3,7                               | 3,7 |
| 87  | 1,0         | 88  | 0,9                 | 351                               | 3,9                               | 3,9 |
| 88  | 0,9         | 87  | 1,0                 | 351                               | 3,9                               | 3,9 |
| 89  | 2,3         | 88  | 0,9                 | 352                               | 3,9                               | 3,9 |
| 90  | 1,5         | 60  | -0,3                | 335                               | 4,1                               | 3,7 |
| 91  | 4,2         | 75  | 1,0                 | 455                               | 5,6                               | 5,1 |
| 92  | -0,8        | 95  | 2,7                 | 320                               | 3,6                               | 3,6 |
| 93  | 1,9         | 96  | 1,6                 | 371                               | 4,1                               | 4,1 |
| 94  | 1,6         | 95  | 2,7                 | 351                               | 3,9                               | 3,9 |
| 95  | 2,7         | 92  | -0,8                | 320                               | 3,6                               | 3,6 |
| 96  | 1,6         | 93  | 1,9                 | 371                               | 4,1                               | 4,1 |
| 97  | 2,8         | 41  | 2,7                 | 356                               | 4,3                               | 4,0 |
| 98  | -1,2        | 24  | -1,2                | 347                               | 4,2                               | 3,9 |
| 99  | -1,1        | 98  | -1,2                | 398                               | 4,4                               | 4,4 |
| 100 | 0,0         | 101 | 0,0                 | 360                               | 3,6                               | 3,6 |
| 101 | 0,0         | 102 | 0,2                 | 359                               | 3,6                               | 3,6 |
| 102 | 0,2         | 7   | 1,8                 | 87                                | 1,7                               | 0,9 |
| 103 | -0,5        | 74  | -1,3                | 356                               | 4,3                               | 2,5 |
| 104 | -2,2        | 73  | 0,6                 | 524                               | 6,4                               | 3,7 |
| 105 | -1,3        | 110 | 1,0                 | 522                               | 3,7                               | 3,7 |
| 106 | 0,4         | 107 | -0,7                | 751                               | 5,3                               | 5,3 |
| 107 | -0,7        | 2   | 0,0                 | 434                               | 3,2                               | 3,1 |
| 108 | 0,0         | 113 | -0,1                | 423                               | 3,0                               | 3,0 |
| 109 | -0,1        | 108 | 0,0                 | 486                               | 3,4                               | 3,4 |
| 110 | 1,0         | 105 | -1,3                | 522                               | 3,7                               | 3,7 |
| 111 | -0,3        | 67  | 1,3                 | 562                               | 6,9                               | 4,0 |
| 112 | 1,4         | 66  | 1,5                 | 548                               | 6,7                               | 3,9 |
| 113 | -0,1        | 108 | 0,0                 | 423                               | 3,0                               | 3,0 |
| 114 | 0,0         | 62  | -1,0                | 467                               | 5,7                               | 3,3 |
| 115 | 0,7         | 60  | -0,3                | 335                               | 4,1                               | 2,4 |
| 116 | 0,0         | 5   | 0,3                 | 196                               | 1,4                               | 1,4 |
| Min | -2,9        |     | -2,9                | 87                                | 1,4                               | 0,9 |
| Max | 4,8         |     | 3,2                 | 1.082                             | 23,0                              | 7,7 |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 14:48/3.1.597

## PARK - Wind statistics info

Calculation: 716033 WP Oostpolder alternatief 1b

### Main data for wind statistic

|                     |  |
|---------------------|--|
| File                | \\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\200117\24012017\RWE_Oostpolder 100m-Corr099.wws |
| Name                | RWE_Oostpolder 100m-Corr099  |
| Country             | Netherlands  |
| Source              | User   |
| Mast coordinates    | Dutch Stereo-RD/NAP 2000 East: 248.822 North: 608.196  |
| Created             | 24-1-2017  |
| Edited              | 1-2-2017   |
| Sectors             | 12   |
| WASP version        | WASP 11 Version 11.05.0028   |
| Displacement height | None   |

### Additional info for wind statistic

|                    |                        |
|--------------------|------------------------|
| Source data        | Default Meteo data RWE |
| Data from          | 25-4-2007              |
| Data to            | 31-1-2009              |
| Measurement length | 21,3 Months            |

### Note

To get the most correct calculation results, wind statistics shall be calculated with the SAME model and model parameters, as currently chosen in calculation. For WASP versions before 10.0, the model is unchanged, but thereafter more model changes affecting the wind statistic is seen. Likewise WASP CFD should always use WASP CFD calculated wind statistics.

## PARK - Map

Calculation: 716033 WP Oostpolder alternatief 1b



Map: Uithuizen , Print scale 1:75.000, Map center Dutch Stereo-RD/NAP 2000 East: 249.717 North: 606.402

- New WTG
- Existing WTG
- Obstacle

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 2b  
Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings  
Air density calculation mode Individual per WTG  
Result for WTG at hub altitude 1,236 kg/m<sup>3</sup> to 1,248 kg/m<sup>3</sup>  
Air density relative to standard 100,9 % to 101,8 %  
Hub altitude above sea level (asl) 39,9 m to 136,0 m  
Annual mean temperature at hub alt. 8,1 °C to 8,8 °C  
Pressure at WTGs 997,9 hPa to 1.009,6 hPa

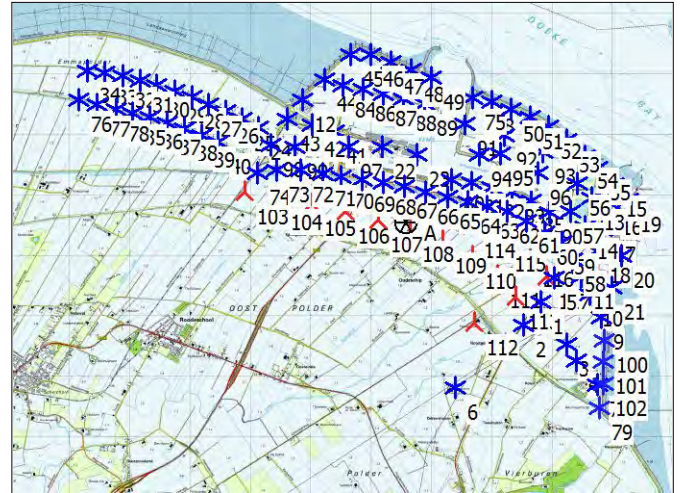
Wake Model Parameters  
Terrain type Wake decay constant  
HH:100m Open farmland 0,062

Displacement heights from objects

Wake calculation settings  
Angle [°] Wind speed [m/s]  
start end step start end step  
0,5 360,0 1,0 0,5 30,5 1,0

Wind statistics RWE\_Oostpolder 100m-Corr099.wws

WASP version WASP 11 Version 11.05.0028



▲ New WTG  
● Site Data

Scale 1:125.000  
\* Existing WTG

### Key results for height 135,0 m above ground level

Terrain Dutch Stereo-RD/NAP 2000

X (east) Y (north) Name of wind distribution Type

A 250.596 606.527 Oostpolder site data

WASP (WASP 11 Version 11.05.0028)

Wind energy [kWh/m<sup>2</sup>] Mean wind speed [m/s] Equivalent roughness  
6.048 8,7 1,1

### Calculated Annual Energy for Wind Farm

| WTG combination                                | Result PARK [MWh/y] | GROSS (no loss) Free WTGs [MWh/y] | Park efficiency [%] | Specific results <sup>a)</sup> |                         |                              |                                   |
|--|---------------------|-----------------------------------|---------------------|--------------------------------|-------------------------|------------------------------|-----------------------------------|
|  |                     |                                   |                     | Capacity factor [%]            | Mean WTG result [MWh/y] | Full load hours [Hours/year] | Mean wind speed @hub height [m/s] |
| Wind farm                                      | 1.128.342,6         | 1.349.536,7                       | 83,6                | 33,9                           | 9.644,0                 | 2.967                        | 8,3                               |
| New WTGs only                                  | 250.458,1           | 281.274,2                         | 89,0                | 45,4                           | 16.697,2                | 3.976                        | 8,7                               |
| Existing park WTGs only                        | 877.884,5           | 1.068.262,5                       | 82,2                | 31,6                           | 8.606,7                 | 2.767                        | 8,2                               |
| Existing park WTGs without new WTGs            | 904.288,4           | 1.068.262,5                       | 84,7                |                                | 8.865,6                 |                              |                                   |
| Reduction for existing park WTGs caused by new | 26.403,9            |                                   |                     |                                |                         |                              |                                   |

<sup>a)</sup> Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 15 new WTGs with total 63,0 MW rated power

| Links | WTG type |           | Power, rated [kW]   | Rotor diameter [m] | Hub height [m] | Power curve Creator | Name | Annual Energy                               |              |                     |                     |                            |
|-------|----------|-----------|---------------------|--------------------|----------------|---------------------|------|---|--------------|---------------------|---------------------|----------------------------|
|       | Valid    | Manufact. |                     |                    |                |                     |      | Type-generator                              | Result [MWh] | Park Efficiency [%] | Capacity factor [%] | Free mean wind speed [m/s] |
| 103 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.514,2     | 93,85               | 47,6                | 8,67                       |
| 104 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.165,5     | 92,15               | 46,6                | 8,66                       |
| 105 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.082,2     | 91,35               | 46,4                | 8,68                       |
| 106 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.050,5     | 91,36               | 46,3                | 8,66                       |
| 107 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.084,2     | 91,31               | 46,4                | 8,68                       |
| 108 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.052,5     | 91,03               | 46,3                | 8,68                       |
| 109 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.930,7     | 90,34               | 46,0                | 8,68                       |
| 110 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.892,9     | 90,02               | 45,9                | 8,69                       |
| 111 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.630,3     | 88,77               | 45,2                | 8,67                       |
| 112 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 17.530,0     | 94,39               | 47,6                | 8,62                       |
| 113 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.508,4     | 88,28               | 44,8                | 8,66                       |
| 114 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.254,9     | 86,04               | 44,2                | 8,73                       |
| 115 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 16.013,7     | 84,55               | 43,5                | 8,75                       |
| 116 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 15.905,1     | 83,97               | 43,2                | 8,75                       |
| 117 A | No       | ENERCON   | E-126 EP4 TES-4.200 | 4.200              | 127,0          | 135,0               | EMD  | Level 0 - official - 0 s - 4200kW - 08/2015 | 14.843,0     | 78,56               | 40,3                | 8,73                       |

Annual Energy results do not include any losses apart from wake losses. For expected NET AEP (expected sold production), see report Loss & Uncertainty.



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 2b

Calculated Annual Energy for each of 102 existing park WTGs with total 317,3 MW rated power

| Links | WTG type |            |                            | Power, rated | Rotor diameter | Hub height | Power curve Creator | Name  | Annual Energy                     |                |                          | Park Efficiency |
|-------|----------|------------|----------------------------|--------------|----------------|------------|---------------------|---|-----------------------------------|----------------|--------------------------|-----------------|
|       | Valid    | Manufact.  | Type-generator             |              |                |            |                     |   | Calculated prod. without new WTGs | After New WTGs | Decrease due to new WTGs |                 |
|       |          |            |                            | [kW]         | [m]            | [m]        |                     |   | [MWh]                             | [MWh]          | [MWh %]                  | [%]             |
| 1 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER                | Lagerwey L136-4.5MW PV curve                        | 18.622,7                          | 17.728,9       | 893,8 4,8                | 86,47           |
| 2 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER                | Lagerwey L136-4.5MW PV curve                        | 19.349,2                          | 18.825,8       | 523,4 2,7                | 92,31           |
| 3 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER                | Lagerwey L136-4.5MW PV curve                        | 19.142,7                          | 18.919,4       | 223,3 1,2                | 92,27           |
| 4 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER                | Lagerwey L136-4.5MW PV curve                        | 19.174,0                          | 19.029,9       | 144,1 0,8                | 92,82           |
| 5 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER                | Lagerwey L136-4.5MW PV curve                        | 18.071,8                          | 15.809,5       | 2.262,4 12,5             | 76,64           |
| 6 A   | No       | VESTAS     | V47-660                    | 660          | 47,0           | 40,0       | EMD                 | Level 0 - calculated - - 07-2001                    | 1.477,2                           | 1.466,4        | 10,8 0,7                 | 96,32           |
| 7 A   | Yes      | VESTAS     | V52-850                    | 850          | 52,0           | 40,0       | EMD                 | Level 0 - calculated - 104.2 dB(A) - 07-2006        | 1.989,3                           | 1.975,3        | 14,0 0,7                 | 92,43           |
| 8 A   | Yes      | VESTAS     | V117-3.45-3.450            | 3.450        | 117,0          | 93,5       | EMD                 | Level 0 - Calculated - Modes 0 & 0-0S - 01-2016     | 12.967,1                          | 12.869,3       | 103,1 0,8                | 85,12           |
| 9 A   | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.706,0                           | 7.569,1        | 136,9 1,8                | 84,46           |
| 10 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.552,7                           | 7.350,4        | 202,3 2,7                | 82,20           |
| 11 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.445,1                           | 7.085,3        | 359,8 4,8                | 79,28           |
| 12 A  | No       | 2-B Energy | OTC 6 MW-6.000             | 6.000        | 140,0          | 105,0      | USER                | Turbulent power curve with TI of 8.7%               | 18.447,6                          | 18.281,0       | 166,6 0,9                | 83,65           |
| 13 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 6.913,2                           | 6.759,4        | 153,8 2,2                | 73,27           |
| 14 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 6.891,4                           | 6.642,2        | 249,1 3,6                | 72,87           |
| 15 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.205,1                           | 7.130,5        | 74,6 1,0                 | 75,58           |
| 16 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.086,1                           | 6.976,7        | 109,4 1,5                | 74,98           |
| 17 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.140,3                           | 6.963,4        | 176,9 2,5                | 75,70           |
| 18 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.071,5                           | 6.821,8        | 249,6 3,5                | 75,68           |
| 19 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.452,9                           | 7.381,4        | 71,4 1,0                 | 80,33           |
| 20 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.655,9                           | 7.547,0        | 108,9 1,4                | 81,54           |
| 21 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.541,7                           | 7.400,7        | 141,1 1,9                | 81,77           |
| 22 A  | No       | Senvion    | 6.2M126-6.150              | 6.150        | 126,0          | 114,0      | USER                | Calculated power curve Senvion 6.2M126              | 18.923,9                          | 18.465,2       | 458,8 2,4                | 82,98           |
| 23 A  | No       | Senvion    | 6.2M126-6.150              | 6.150        | 126,0          | 114,0      | USER                | Calculated power curve Senvion 6.2M126              | 18.926,8                          | 18.412,8       | 513,9 2,7                | 82,44           |
| 24 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.673,1                           | 7.543,5        | 129,6 1,7                | 84,15           |
| 25 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.541,6                           | 7.476,8        | 64,9 0,9                 | 82,88           |
| 26 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.392,8                           | 7.343,0        | 49,8 0,7                 | 81,54           |
| 27 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.420,1                           | 7.400,3        | 19,7 0,3                 | 81,87           |
| 28 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.484,6                           | 7.470,7        | 13,9 0,2                 | 82,04           |
| 29 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.535,0                           | 7.522,9        | 12,1 0,2                 | 82,41           |
| 30 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.476,5                           | 7.467,0        | 9,4 0,1                  | 82,48           |
| 31 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.555,8                           | 7.548,6        | 7,2 0,1                  | 83,03           |
| 32 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.750,1                           | 7.744,3        | 5,8 0,1                  | 84,31           |
| 33 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.943,6                           | 7.937,1        | 6,5 0,1                  | 86,39           |
| 34 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.428,3                           | 8.422,6        | 5,6 0,1                  | 91,90           |
| 35 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.909,3                           | 7.895,7        | 13,6 0,2                 | 87,33           |
| 36 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.889,4                           | 7.874,3        | 15,1 0,2                 | 87,42           |
| 37 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.893,4                           | 7.874,0        | 19,3 0,2                 | 87,50           |
| 38 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.866,4                           | 7.840,7        | 25,6 0,3                 | 87,51           |
| 39 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.861,8                           | 7.824,8        | 37,0 0,5                 | 87,40           |
| 40 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.904,6                           | 7.850,3        | 54,3 0,7                 | 87,85           |
| 41 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.518,0                           | 7.335,5        | 182,4 2,4                | 80,26           |
| 42 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.268,4                           | 7.130,5        | 137,9 1,9                | 78,46           |
| 43 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.412,0                           | 7.308,8        | 103,2 1,4                | 80,53           |
| 44 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.803,4                           | 7.749,5        | 53,9 0,7                 | 81,88           |
| 45 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.274,8                           | 8.236,0        | 38,8 0,5                 | 85,09           |
| 46 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.204,3                           | 8.167,5        | 36,9 0,4                 | 83,77           |
| 47 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.225,9                           | 8.172,3        | 53,6 0,7                 | 83,66           |
| 48 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.993,8                           | 7.940,6        | 53,2 0,7                 | 82,78           |
| 49 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.950,5                           | 7.891,2        | 59,3 0,7                 | 82,77           |
| 50 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.822,5                           | 7.743,2        | 79,3 1,0                 | 80,61           |
| 51 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.887,4                           | 7.782,0        | 105,4 1,3                | 81,17           |
| 52 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.861,1                           | 7.768,7        | 92,5 1,2                 | 80,81           |
| 53 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.855,6                           | 7.733,6        | 122,0 1,6                | 80,90           |
| 54 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.716,6                           | 7.592,9        | 123,7 1,6                | 79,67           |
| 55 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.505,1                           | 7.375,5        | 129,6 1,7                | 77,49           |
| 56 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.270,2                           | 7.056,4        | 213,7 2,9                | 75,65           |
| 57 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.105,1                           | 6.747,9        | 357,2 5,0                | 73,69           |
| 58 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.258,3                           | 6.708,2        | 550,1 7,6                | 74,66           |
| 59 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.501,0                           | 6.743,3        | 757,8 10,1               | 73,99           |
| 60 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.562,7                           | 6.638,5        | 924,2 12,2               | 73,92           |
| 61 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.660,4                           | 6.764,5        | 896,0 11,7               | 75,10           |
| 62 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.561,1                           | 6.686,0        | 875,1 11,6               | 74,32           |
| 63 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.602,4                           | 6.665,3        | 937,0 12,3               | 74,33           |
| 64 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.691,8                           | 7.008,3        | 683,5 8,9                | 77,91           |
| 65 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.715,1                           | 7.190,6        | 524,6 6,8                | 80,52           |
| 66 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.859,2                           | 7.247,8        | 611,4 7,8                | 80,78           |
| 67 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.845,8                           | 7.288,8        | 557,0 7,1                | 81,12           |
| 68 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.779,6                           | 7.275,6        | 504,0 6,5                | 81,89           |
| 69 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.761,8                           | 7.154,2        | 607,6 7,8                | 80,66           |
| 70 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.711,7                           | 7.181,2        | 530,4 6,9                | 81,10           |
| 71 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.742,1                           | 7.120,3        | 621,8 8,0                | 80,67           |
| 72 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.697,6                           | 7.144,5        | 553,1 7,2                | 81,31           |
| 73 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 7.781,2                           | 7.305,8        | 475,4 6,1                | 82,63           |
| 74 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.055,1                           | 7.437,3        | 617,8 7,7                | 84,84           |
| 75 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 100,0      | EMD                 | Level 0 - official - Mode 0 - 08/2014               | 8.075,2                           | 7.987,3        | 87,9 1,1                 | 83,34           |
| 76 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD                 | Level 0 - Mode 0 - Estimated - 12-2013              | 12.800,1                          | 12.795,0       | 5,2 0,0                  | 94,34           |
| 77 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD                 | Level 0 - Mode 0 - Estimated - 12-2013              | 12.289,5                          | 12.283,0       | 6,5 0,1                  | 90,80           |
| 78 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD                 | Level 0 - Mode 0 - Estimated - 12-2013              | 11.992,1                          | 11.980,9       | 11,3 0,1                 | 89,34           |
| 79 A  | Yes      | VESTAS     | V117-3.6-3.600             | 3.600        | 117,0          | 117,0      | EMD                 | Level 0 - Calculated - Modes PO1 & PO1-0S - 01-2016 | 15.257,1</                        |                |                          |                 |



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 2b

...continued from previous page

| Links | WTG type |           | Type-generator | Power, rated | Rotor diameter | Hub height | Power curve |   | Creator | Name    | Calculated prod. without new WTGs [MWh] | Annual Energy        |                                  | Park Efficiency [%] |
|-------|----------|-----------|----------------|--------------|----------------|------------|-------------|---|---------|---------|---|----------------------|----------------------------------|---------------------|
|       | Valid    | Manufact. |                |              |                |            | Creator     | Name  |         |         |   | After New WTGs [MWh] | Decrease due to new WTGs [MWh %] |                     |
| 84 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.733,7 | 8.664,2                                 | 69,5 0,8             | 81,23                            |                     |
| 85 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.121,8 | 7.566,6                                 | 555,3 6,8            | 72,73                            |                     |
| 86 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.781,2 | 8.696,0                                 | 85,2 1,0             | 81,43                            |                     |
| 87 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.822,1 | 8.722,6                                 | 99,5 1,1             | 81,91                            |                     |
| 88 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.752,0 | 8.654,7                                 | 97,2 1,1             | 81,01                            |                     |
| 89 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.895,2 | 8.786,3                                 | 108,9 1,2            | 82,52                            |                     |
| 90 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.130,7 | 7.612,0                                 | 518,6 6,4            | 72,92                            |                     |
| 91 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 9.087,9 | 8.938,6                                 | 149,3 1,6            | 83,03                            |                     |
| 92 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.377,8 | 8.247,4                                 | 130,4 1,6            | 77,61                            |                     |
| 93 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.474,5 | 8.335,5                                 | 139,0 1,6            | 78,13                            |                     |
| 94 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.516,5 | 8.325,8                                 | 190,7 2,2            | 78,59                            |                     |
| 95 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.425,9 | 8.208,7                                 | 217,1 2,6            | 77,58                            |                     |
| 96 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.377,8 | 8.131,7                                 | 246,1 2,9            | 76,71                            |                     |
| 97 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.445,4 | 8.186,1                                 | 259,2 3,1            | 79,22                            |                     |
| 98 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.474,3 | 8.258,1                                 | 216,2 2,6            | 81,59                            |                     |
| 99 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 |         | 8.271,9 | 7.986,2                                 | 285,7 3,5            | 78,92                            |                     |
| 100 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                |         | 8.344,3 | 8.267,0                                 | 77,3 0,9             | 87,98                            |                     |
| 101 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                |         | 8.514,6 | 8.469,2                                 | 45,4 0,5             | 90,28                            |                     |
| 102 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                |         | 8.611,5 | 8.567,1                                 | 44,4 0,5             | 91,60                            |                     |

## WTG siting

Dutch Stereo-RD/NAP 2000

X (east) Y (north) Z Row data/Description  
[m]

|          |         |         |   |
|----------|---------|---------|---|
| 1 Exist  | 252.819 | 605.227 | -0,3 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (244) |
| 2 Exist  | 252.538 | 604.846 | 0,0 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (245)  |
| 3 Exist  | 253.250 | 604.530 | 0,0 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (246)  |
| 4 Exist  | 253.410 | 604.258 | 0,2 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (247)  |
| 5 Exist  | 253.038 | 605.625 | 0,3 LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (248)  |
| 6 Exist  | 251.401 | 603.815 | -0,1 VESTAS V47 660 47.0 !O! hub: 40,0 m (TOT: 63,5 m) (264)              |
| 7 Exist  | 253.765 | 603.860 | 1,8 VESTAS V52 850 52.0 !O! hub: 40,0 m (TOT: 66,0 m) (265)               |
| 8 Exist  | 252.007 | 608.545 | 1,6 VESTAS V117-3.45 3450 117.0 !O! hub: 93,5 m (TOT: 152,0 m) (266)      |
| 9 Exist  | 253.830 | 604.979 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (267)        |
| 10 Exist | 253.634 | 605.359 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (268)       |
| 11 Exist | 253.487 | 605.644 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (269)        |
| 12 Exist | 248.875 | 608.572 | 2,5 2-B Energy OTC 6 MW 6000 140.0 !#! hub: 105,0 m (TOT: 175,0 m) (270)  |
| 13 Exist | 253.662 | 606.943 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (271)       |
| 14 Exist | 253.548 | 606.476 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (272)        |
| 15 Exist | 254.026 | 607.172 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (273)        |
| 16 Exist | 253.954 | 606.875 | 2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (274)        |
| 17 Exist | 253.843 | 606.417 | 2,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (275)        |
| 18 Exist | 253.758 | 606.067 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (276)       |
| 19 Exist | 254.272 | 606.915 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (277)        |
| 20 Exist | 254.151 | 605.985 | 2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (278)        |
| 21 Exist | 253.996 | 605.473 | 0,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (279)        |
| 22 Exist | 250.194 | 607.795 | 4,3 Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (280)      |
| 23 Exist | 250.760 | 607.657 | 3,1 Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (281)      |
| 24 Exist | 248.142 | 608.104 | -1,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (282)       |
| 25 Exist | 247.865 | 608.255 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (283)       |
| 26 Exist | 247.590 | 608.377 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (284)       |
| 27 Exist | 247.311 | 608.501 | -1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (285)       |
| 28 Exist | 247.034 | 608.625 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (286)        |
| 29 Exist | 246.747 | 608.713 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (371)        |
| 30 Exist | 246.447 | 608.805 | -2,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (288)       |
| 31 Exist | 246.172 | 608.890 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (289)       |
| 32 Exist | 245.885 | 608.978 | 0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (290)        |
| 33 Exist | 245.590 | 609.026 | 0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (291)        |
| 34 Exist | 245.294 | 609.056 | -1,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (292)       |
| 35 Exist | 246.045 | 608.352 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (293)        |
| 36 Exist | 246.336 | 608.279 | 0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (294)        |
| 37 Exist | 246.622 | 608.188 | 1,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (295)        |
| 38 Exist | 246.907 | 608.088 | -0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (296)       |
| 39 Exist | 247.190 | 607.981 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (297)        |
| 40 Exist | 247.472 | 607.870 | 0,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (298)        |
| 41 Exist | 249.390 | 608.049 | 2,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (299)        |
| 42 Exist | 249.023 | 608.155 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (300)        |
| 43 Exist | 248.609 | 608.251 | 1,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (301)        |

To be continued on next page...

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 2b

...continued from previous page

Dutch Stereo-RD/NAP 2000

|           | X (east) | Y (north) | Z [m] | Row data/Description   |
|-----------|----------|-----------|-------|--|
| 44 Exist  | 249.242  | 608.904   | -0,5  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (302)         |
| 45 Exist  | 249.672  | 609.314   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (303)         |
| 46 Exist  | 250.005  | 609.324   | 2,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (304)         |
| 47 Exist  | 250.336  | 609.195   | 4,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (305)         |
| 48 Exist  | 250.665  | 609.061   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (306)         |
| 49 Exist  | 250.997  | 608.936   | 3,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (307)         |
| 50 Exist  | 252.323  | 608.418   | 1,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (308)         |
| 51 Exist  | 252.641  | 608.293   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (309)         |
| 52 Exist  | 252.949  | 608.128   | 2,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (310)         |
| 53 Exist  | 253.248  | 607.910   | 0,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (311)         |
| 54 Exist  | 253.547  | 607.637   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (312)         |
| 55 Exist  | 253.756  | 607.438   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (313)         |
| 56 Exist  | 253.425  | 607.194   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (314)         |
| 57 Exist  | 253.312  | 606.728   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (315)         |
| 58 Exist  | 253.341  | 605.928   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (316)         |
| 59 Exist  | 253.172  | 606.215   | 4,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (317)         |
| 60 Exist  | 252.880  | 606.379   | -0,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (318)         |
| 61 Exist  | 252.576  | 606.567   | 1,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (319)         |
| 62 Exist  | 252.262  | 606.720   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (320)         |
| 63 Exist  | 251.932  | 606.799   | -2,9  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (321)         |
| 64 Exist  | 251.602  | 606.881   | 0,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (322)         |
| 65 Exist  | 251.272  | 606.961   | -1,9  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (323)         |
| 66 Exist  | 250.915  | 607.046   | 1,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (324)         |
| 67 Exist  | 250.558  | 607.133   | 1,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (325)         |
| 68 Exist  | 250.211  | 607.197   | -1,2  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (326)         |
| 69 Exist  | 249.862  | 607.249   | -0,5  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (327)         |
| 70 Exist  | 249.511  | 607.301   | 0,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (328)         |
| 71 Exist  | 249.207  | 607.349   | 0,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (329)         |
| 72 Exist  | 248.841  | 607.404   | -0,1  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (330)         |
| 73 Exist  | 248.444  | 607.403   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (331)         |
| 74 Exist  | 248.125  | 607.370   | -1,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (332)         |
| 75 Exist  | 251.691  | 608.611   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 100,0 m (TOT: 141,0 m) (333)        |
| 76 Exist  | 245.161  | 608.566   | 0,7   | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (354)             |
| 77 Exist  | 245.463  | 608.501   | 0,4   | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (355)             |
| 78 Exist  | 245.775  | 608.421   | -1,5  | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (356)             |
| 79 Exist  | 253.792  | 603.479   | 1,0   | VESTAS V117-3.6 3600 117.0 !O! hub: 117,0 m (TOT: 175,5 m) (664)       |
| 80 Exist  | 251.345  | 607.258   | 2,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (599)             |
| 81 Exist  | 251.679  | 607.196   | 1,8   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (600)             |
| 82 Exist  | 252.008  | 607.117   | 1,0   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (601)             |
| 83 Exist  | 252.340  | 607.043   | 3,1   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (602)             |
| 84 Exist  | 249.539  | 608.811   | 0,1   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (603)             |
| 85 Exist  | 252.654  | 606.896   | 1,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (604)             |
| 86 Exist  | 249.866  | 608.752   | 0,4   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (605)             |
| 87 Exist  | 250.208  | 608.666   | 1,0   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (606)             |
| 88 Exist  | 250.550  | 608.586   | 0,9   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (607)             |
| 89 Exist  | 250.892  | 608.503   | 2,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (608)             |
| 90 Exist  | 252.958  | 606.705   | 1,5   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (609)             |
| 91 Exist  | 251.566  | 608.173   | 4,2   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (610)             |
| 92 Exist  | 252.219  | 607.986   | -0,8  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (611)             |
| 93 Exist  | 252.852  | 607.716   | 1,9   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (612)             |
| 94 Exist  | 251.793  | 607.668   | 1,6   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (613)             |
| 95 Exist  | 252.144  | 607.675   | 2,7   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (614)             |
| 96 Exist  | 252.765  | 607.355   | 1,6   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (615)             |
| 97 Exist  | 249.631  | 607.787   | 2,8   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (616)             |
| 98 Exist  | 248.339  | 607.818   | -1,2  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (617)             |
| 99 Exist  | 248.736  | 607.792   | -1,1  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (618)             |
| 100 Exist | 253.864  | 604.596   | 0,0   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (712)       |
| 101 Exist | 253.855  | 604.236   | 0,0   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (713)       |
| 102 Exist | 253.850  | 603.877   | 0,2   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (714)       |
| 103 New   | 247.921  | 607.039   | 0,0   | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (308) |
| 104 New   | 248.478  | 606.954   | -1,0  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (309) |
| 105 New   | 249.033  | 606.849   | 0,9   | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (310) |
| 106 New   | 249.583  | 606.726   | -1,8  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (311) |
| 107 New   | 250.125  | 606.585   | -0,9  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (312) |

To be continued on next page...



## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 2b

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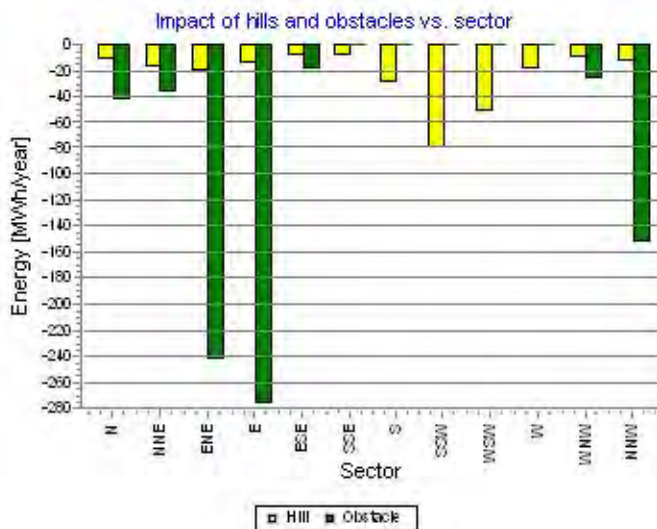
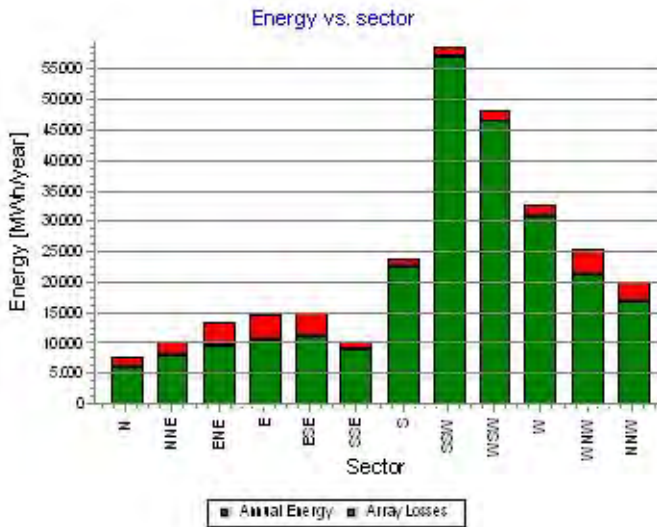
Dutch Stereo-RD/NAP 2000

|         | X (east) | Y (north) | Z    | Row data/Description   |
|---------|----------|-----------|------|--|
|         |          |           | [m]  |  |
| 108 New | 250.661  | 606.425   | -1,6 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (313) |
| 109 New | 251.188  | 606.234   | -1,0 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (314) |
| 110 New | 251.683  | 605.973   | -0,2 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (315) |
| 111 New | 252.097  | 605.651   | 0,0  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (316) |
| 112 New | 251.717  | 604.874   | -0,4 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (317) |
| 113 New | 252.401  | 605.310   | -0,2 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (318) |
| 114 New | 251.679  | 606.481   | -1,3 | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (319) |
| 115 New | 252.186  | 606.268   | 0,9  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (320) |
| 116 New | 252.650  | 606.008   | 1,0  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (321) |
| 117 New | 252.910  | 605.642   | 0,3  | ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (322) |

## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 2bWTG: All new WTGs, Air density varies with WTG position 1,236 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N     | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW    | 8 WSW    | 9 W      | 10 WNW   | 11 NNW   | Total     |
|---------------------------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Roughness based energy [MWh]          | 7.790,0 | 10.412,7 | 13.580,2 | 15.046,2 | 15.093,9 | 10.224,3 | 24.077,8 | 58.890,4 | 48.521,4 | 32.783,3 | 25.639,8 | 20.291,8 | 282.351,6 |
| -Decrease due to obstacles [MWh]      | 42,6    | 36,6     | 242,1    | 276,3    | 18,7     | 0,2      | 0,0      | 0,0      | 0,0      | 0,0      | 26,3     | 151,5    | 794,2     |
| +Increase due to hills [MWh]          | -11,0   | -17,9    | -21,1    | -14,1    | -8,7     | -8,2     | -29,5    | -79,4    | -51,6    | -18,7    | -10,1    | -12,9    | -283,2    |
| -Decrease due to array losses [MWh]   | 1.587,3 | 2.189,8  | 3.645,3  | 4.158,7  | 3.882,3  | 1.070,6  | 1.401,8  | 1.648,3  | 1.977,0  | 1.826,1  | 4.182,1  | 3.246,6  | 30.816,1  |
| Resulting energy [MWh]                | 6.149,1 | 8.168,4  | 9.671,7  | 10.597,0 | 11.184,2 | 9.145,4  | 22.646,4 | 57.162,7 | 46.492,7 | 30.938,5 | 21.421,3 | 16.880,6 | 250.458,0 |
| Specific energy [kWh/m <sup>2</sup> ] |         |          |          |          |          |          |          |          |          |          |          |          | 1.318     |
| Specific energy [kWh/kW]              |         |          |          |          |          |          |          |          |          |          |          |          | 3.976     |
| Decrease due to obstacles [%]         | 0,5     | 0,4      | 1,8      | 1,8      | 0,1      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,1      | 0,7      | 0,28      |
| Increase due to hills [%]             | -0,1    | -0,2     | -0,2     | -0,1     | -0,1     | -0,1     | -0,1     | -0,1     | -0,1     | -0,1     | 0,0      | -0,1     | -0,10     |
| Decrease due to array losses [%]      | 20,5    | 21,1     | 27,4     | 28,2     | 25,8     | 10,5     | 5,8      | 2,8      | 4,1      | 5,6      | 16,3     | 16,1     | 10,96     |
| Utilization [%]                       | 21,6    | 23,7     | 24,4     | 24,8     | 23,1     | 22,9     | 24,2     | 25,6     | 21,9     | 18,6     | 17,0     | 18,5     | 21,8      |
| Operational [Hours/year]              | 337     | 383      | 520      | 604      | 542      | 357      | 704      | 1.455    | 1.344    | 947      | 742      | 590      | 8.524     |
| Full Load Equivalent [Hours/year]     | 98      | 130      | 154      | 168      | 178      | 145      | 359      | 907      | 738      | 491      | 340      | 268      | 3.976     |

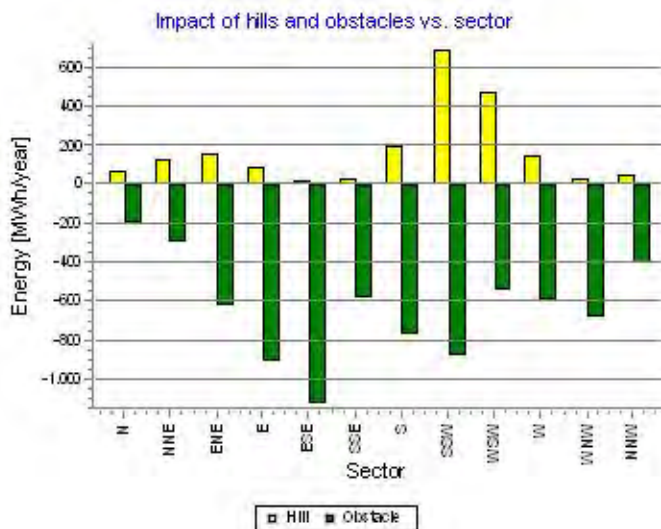
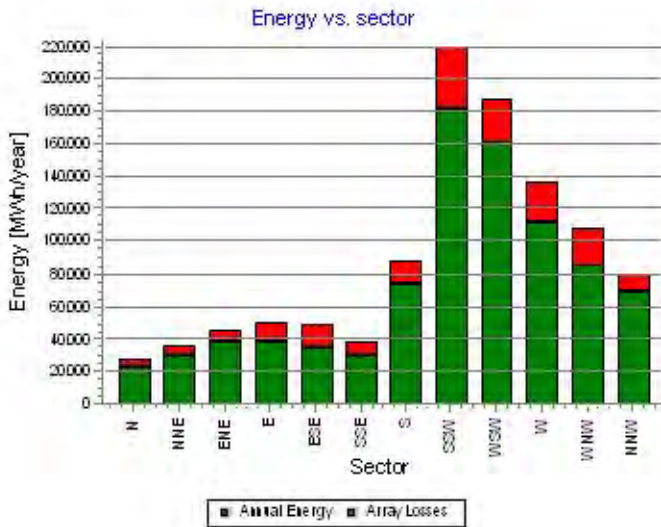




## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 2bWTG: All existing WTGs, Air density varies with WTG position 1,236 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW     | 8 WSW     | 9 W       | 10 WNW    | 11 NNW   | Total       |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|-------------|
| Roughness based energy [MWh]          | 27.773,1 | 36.183,5 | 46.549,9 | 50.905,6 | 50.704,9 | 38.783,0 | 89.039,8 | 219.772,1 | 187.819,5 | 136.783,6 | 109.534,6 | 79.965,9 | 1.073.816,0 |
| -Decrease due to obstacles [MWh]      | 191,0    | 291,8    | 628,3    | 914,8    | 1.125,6  | 585,8    | 774,4    | 882,1     | 550,6     | 594,5     | 680,3     | 401,0    | 7.620,2     |
| +Increase due to hills [MWh]          | 65,3     | 127,8    | 154,3    | 89,5     | 24,1     | 27,0     | 193,1    | 687,6     | 469,8     | 146,2     | 31,1      | 51,4     | 2.067,3     |
| -Decrease due to array losses [MWh]   | 4.320,6  | 5.803,9  | 7.502,9  | 11.566,7 | 14.754,1 | 7.396,3  | 14.883,3 | 37.208,8  | 27.683,3  | 24.395,8  | 23.586,8  | 11.275,4 | 190.377,9   |
| Resulting energy [MWh]                | 23.326,8 | 30.215,7 | 38.573,0 | 38.513,7 | 34.849,3 | 30.827,9 | 73.575,2 | 182.368,8 | 160.055,4 | 111.939,4 | 85.298,5  | 68.340,9 | 877.884,6   |
| Specific energy [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |           |           |           |           |          | 1.337       |
| Specific energy [kWh/kW]              |          |          |          |          |          |          |          |           |           |           |           |          | 2.767       |
| Decrease due to obstacles [%]         | 0,7      | 0,8      | 1,3      | 1,8      | 2,2      | 1,5      | 0,9      | 0,4       | 0,3       | 0,4       | 0,6       | 0,5      | 0,71        |
| Increase due to hills [%]             | 0,2      | 0,4      | 0,3      | 0,2      | 0,0      | 0,1      | 0,2      | 0,3       | 0,3       | 0,1       | 0,0       | 0,1      | 0,19        |
| Decrease due to array losses [%]      | 15,6     | 16,1     | 16,3     | 23,1     | 29,7     | 19,3     | 16,8     | 16,9      | 14,7      | 17,9      | 21,7      | 14,2     | 17,82       |
| Utilization [%]                       | 28,7     | 31,1     | 33,2     | 30,8     | 26,7     | 25,9     | 27,8     | 28,7      | 25,8      | 21,1      | 20,1      | 25,0     | 25,7        |
| Operational [Hours/year]              | 333      | 375      | 509      | 592      | 531      | 354      | 688      | 1.426     | 1.324     | 945       | 738       | 584      | 8.399       |
| Full Load Equivalent [Hours/year]     | 74       | 95       | 122      | 121      | 110      | 97       | 232      | 575       | 504       | 353       | 269       | 215      | 2.767       |





## PARK - Power Curve Analysis

Calculation: 716033 WP Oostpolder alternatief 2bWTG: 103 - ENERCON E-126 EP4 TES 4200 127.0 !O! Level 0 - official - 0 s - 4200kW - 08/2015, Hub height: 135,0 m  
Name: Level 0 - official - 0 s - 4200kW - 08/2015  
Source: Enercon

| Source/Date | Created by | Created  | Edited    | Stop wind speed [m/s] | Power control | CT curve type | Generator type | Specific power kW/m <sup>2</sup> |
|-------------|------------|----------|-----------|-----------------------|---------------|---------------|----------------|----------------------------------|
| 4-8-2014    | EMD        | 8-1-2013 | 15-9-2015 | 25,0                  | Pitch         | User defined  | Variable       | 0,33                             |

According to manufacturer specification document "D0387022-1\_#\_de\_#\_Betriebsmodi\_E-126\_EP4\_4200\_kW\_mit\_TES.pdf", 2015-08-04

HP curve comparison - Note: For standard air density and weibull k parameter = 2

| Vmean  | [m/s] | 5     | 6      | 7      | 8      | 9      | 10     |
|--|-------|-------|--------|--------|--------|--------|--------|
| HP value Pitch, variable speed (2013)  | [MWh] | 6.510 | 10.042 | 13.522 | 16.671 | 19.361 | 21.537 |
| ENERCON E-126 EP4 TES 4200 127.0 !O! Level 0 - official - 0 s - 4200kW - 08/2015 | [MWh] | 6.480 | 9.868  | 13.238 | 16.316 | 18.960 | 21.098 |
| Check value  | [%]   | 0     | 2      | 2      | 2      | 2      | 2      |

The table shows comparison between annual energy production calculated on basis of simplified "HP-curves" which assume that all WTGs performs quite similar - only specific power loading (kW/m<sup>2</sup>) and single/dual speed or stall/pitch decides the calculated values. Productions are without wake losses.  
For further details, ask at the Danish Energy Agency for project report J.nr. 51171/00-0016 or see windPRO manual chapter 3.5.2.  
The method is refined in EMD report "20 Detailed Case Studies comparing Project Design Calculations and actual Energy Productions for Wind Energy Projects worldwide", jan 2003.  
Use the table to evaluate if the given power curve is reasonable - if the check value are lower than -5%, the power curve probably is too optimistic due to uncertainty in power curve measurement.

### Power curve

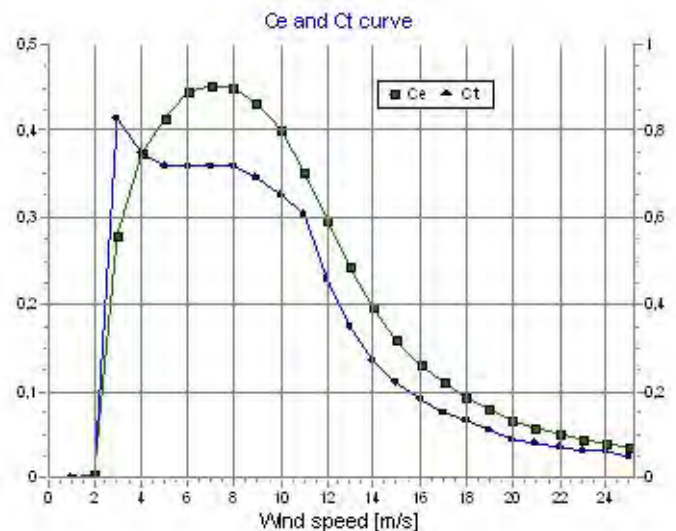
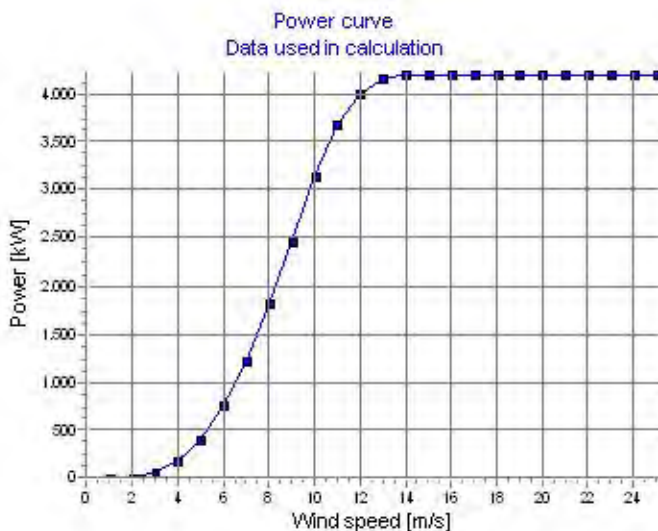
Original data, Air density: 1,225 kg/m<sup>3</sup>

| Wind speed [m/s] | Power [kW] | Ce   | Wind speed [m/s] | Ct curve |
|------------------|------------|------|------------------|----------|
| 1,0              | 0,0        | 0,00 | 1,0              | 0,00     |
| 2,0              | 0,0        | 0,00 | 2,0              | 0,00     |
| 3,0              | 58,0       | 0,28 | 3,0              | 0,83     |
| 4,0              | 185,0      | 0,37 | 4,0              | 0,75     |
| 5,0              | 400,0      | 0,41 | 5,0              | 0,72     |
| 6,0              | 745,0      | 0,44 | 6,0              | 0,72     |
| 7,0              | 1.200,0    | 0,45 | 7,0              | 0,72     |
| 8,0              | 1.790,0    | 0,45 | 8,0              | 0,72     |
| 9,0              | 2.450,0    | 0,43 | 9,0              | 0,69     |
| 10,0             | 3.120,0    | 0,40 | 10,0             | 0,65     |
| 11,0             | 3.660,0    | 0,35 | 11,0             | 0,61     |
| 12,0             | 4.000,0    | 0,30 | 12,0             | 0,46     |
| 13,0             | 4.150,0    | 0,24 | 13,0             | 0,35     |
| 14,0             | 4.200,0    | 0,20 | 14,0             | 0,27     |
| 15,0             | 4.200,0    | 0,16 | 15,0             | 0,22     |
| 16,0             | 4.200,0    | 0,13 | 16,0             | 0,18     |
| 17,0             | 4.200,0    | 0,11 | 17,0             | 0,15     |
| 18,0             | 4.200,0    | 0,09 | 18,0             | 0,13     |
| 19,0             | 4.200,0    | 0,08 | 19,0             | 0,11     |
| 20,0             | 4.200,0    | 0,07 | 20,0             | 0,09     |
| 21,0             | 4.200,0    | 0,06 | 21,0             | 0,08     |
| 22,0             | 4.200,0    | 0,05 | 22,0             | 0,07     |
| 23,0             | 4.200,0    | 0,04 | 23,0             | 0,06     |
| 24,0             | 4.200,0    | 0,04 | 24,0             | 0,06     |
| 25,0             | 4.200,0    | 0,03 | 25,0             | 0,05     |

### Power, Efficiency and energy vs. wind speed

Data used in calculation, Air density: 1,236 kg/m<sup>3</sup> New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>

| Wind speed [m/s] | Power [kW] | Ce   | Interval [m/s] | Energy [MWh] | Acc.Energy [MWh] | Relative [%] |
|------------------|------------|------|----------------|--------------|------------------|--------------|
| 1,0              | 0,0        | 0,00 | 0,50- 1,50     | 0,0          | 0,0              | 0,0          |
| 2,0              | 0,3        | 0,01 | 1,50- 2,50     | 4,6          | 4,6              | 0,0          |
| 3,0              | 59,1       | 0,28 | 2,50- 3,50     | 33,0         | 37,6             | 0,2          |
| 4,0              | 187,5      | 0,37 | 3,50- 4,50     | 116,2        | 153,7            | 0,9          |
| 5,0              | 405,0      | 0,41 | 4,50- 5,50     | 290,6        | 444,3            | 2,5          |
| 6,0              | 752,9      | 0,45 | 5,50- 6,50     | 581,1        | 1.025,4          | 5,9          |
| 7,0              | 1.211,9    | 0,45 | 6,50- 7,50     | 980,4        | 2.005,8          | 11,5         |
| 8,0              | 1.805,4    | 0,45 | 7,50- 8,50     | 1.439,3      | 3.445,1          | 19,7         |
| 9,0              | 2.468,8    | 0,43 | 8,50- 9,50     | 1.863,7      | 5.308,7          | 30,3         |
| 10,0             | 3.139,0    | 0,40 | 9,50-10,50     | 2.137,6      | 7.446,4          | 42,5         |
| 11,0             | 3.675,1    | 0,35 | 10,50-11,50    | 2.177,3      | 9.623,7          | 54,9         |
| 12,0             | 4.007,9    | 0,30 | 11,50-12,50    | 1.987,5      | 11.611,2         | 66,3         |
| 13,0             | 4.152,9    | 0,24 | 12,50-13,50    | 1.656,7      | 13.267,9         | 75,8         |
| 14,0             | 4.200,0    | 0,20 | 13,50-14,50    | 1.288,8      | 14.556,7         | 83,1         |
| 15,0             | 4.200,0    | 0,16 | 14,50-15,50    | 952,5        | 15.509,1         | 88,6         |
| 16,0             | 4.200,0    | 0,13 | 15,50-16,50    | 677,2        | 16.186,3         | 92,4         |
| 17,0             | 4.200,0    | 0,11 | 16,50-17,50    | 466,7        | 16.653,0         | 95,1         |
| 18,0             | 4.200,0    | 0,09 | 17,50-18,50    | 313,7        | 16.966,7         | 96,9         |
| 19,0             | 4.200,0    | 0,08 | 18,50-19,50    | 206,8        | 17.173,6         | 98,1         |
| 20,0             | 4.200,0    | 0,07 | 19,50-20,50    | 134,5        | 17.308,0         | 98,8         |
| 21,0             | 4.200,0    | 0,06 | 20,50-21,50    | 86,5         | 17.394,5         | 99,3         |
| 22,0             | 4.200,0    | 0,05 | 21,50-22,50    | 55,1         | 17.449,6         | 99,6         |
| 23,0             | 4.200,0    | 0,04 | 22,50-23,50    | 34,7         | 17.484,3         | 99,8         |
| 24,0             | 4.200,0    | 0,04 | 23,50-24,50    | 21,6         | 17.506,0         | 100,0        |
| 25,0             | 4.200,0    | 0,03 | 24,50-25,50    | 8,3          | 17.514,2         | 100,0        |



Project:  
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16-3-2017 14:49/3.1.597

## PARK - Terrain

Calculation: 716033 WP Oostpolder alternatief 2bSite Data: A - Oostpolder site data

Obstacles:  
23 Obstacles used

Roughness:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2015\715068 WTG Intocon Eemshaven\TO\WP\ROUGHNESSLINE\_713066 715068\_1.wpo  
Min X: 219.227, Max X: 278.331, Min Y: 577.425, Max Y: 638.717, Width: 59.104 m, Height: 61.292 m

Orography:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\ObjectImports\713066 715068\_EMDGrid\_0(1).wpg  
Min X: 198.208, Max X: 300.556, Min Y: 557.205, Max Y: 659.267, Width: 102.348 m, Height: 102.062 m

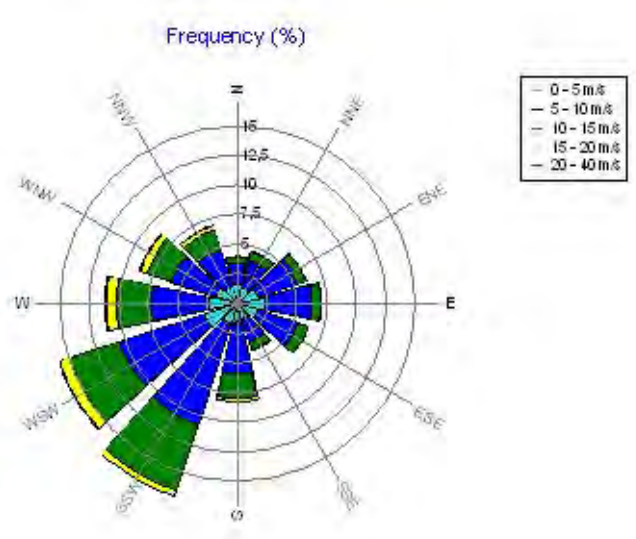
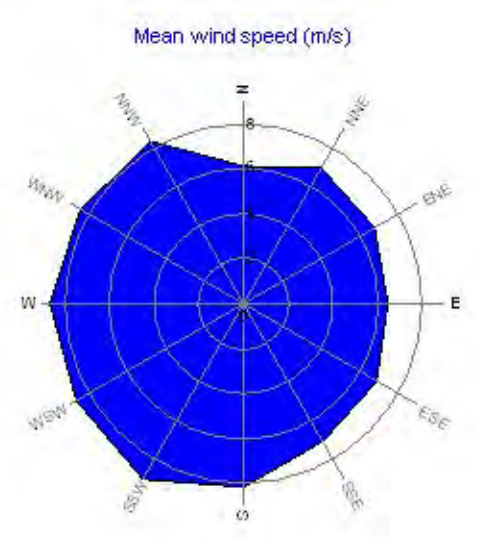
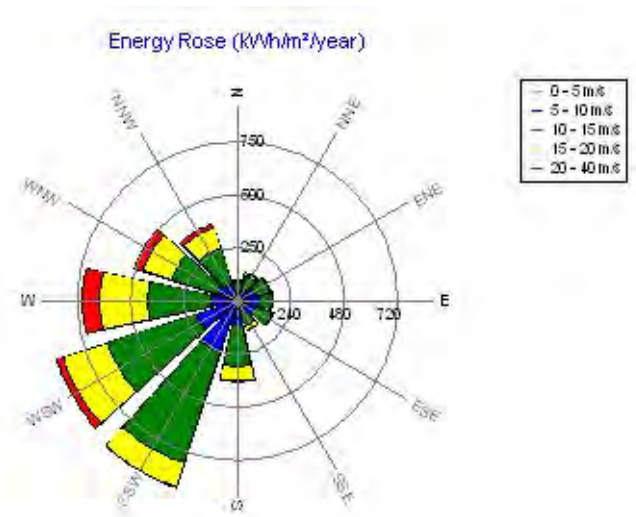
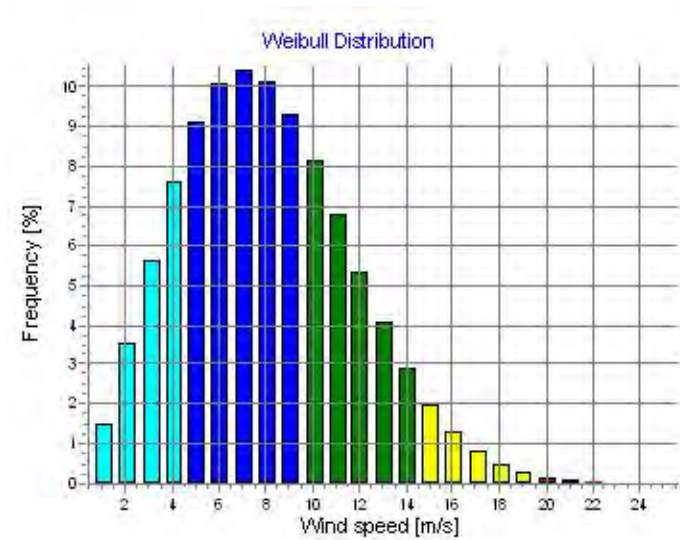
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 2bWind data: A - Oostpolder site data; Hub height: 100,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 6,90               | 6,13             | 1,854        | 4,0           |
| 1 NNE  | 7,85               | 6,95             | 2,322        | 4,5           |
| 2 ENE  | 7,60               | 6,75             | 2,545        | 6,1           |
| 3 E    | 7,30               | 6,48             | 2,553        | 7,1           |
| 4 ESE  | 7,79               | 6,91             | 2,498        | 6,3           |
| 5 SSE  | 7,97               | 7,06             | 2,115        | 4,2           |
| 6 S    | 9,18               | 8,14             | 2,486        | 8,2           |
| 7 SSW  | 10,06              | 9,00             | 3,146        | 17,0          |
| 8 WSW  | 9,71               | 8,61             | 2,393        | 15,8          |
| 9 W    | 9,77               | 8,65             | 2,068        | 11,2          |
| 10 WNW | 9,48               | 8,40             | 2,119        | 8,7           |
| 11 NNW | 9,43               | 8,35             | 2,209        | 6,9           |
| All    | 9,03               | 8,00             | 2,287        | 100,0         |



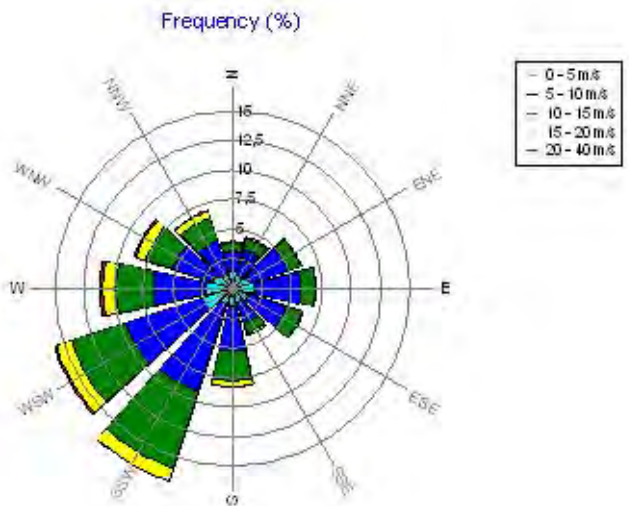
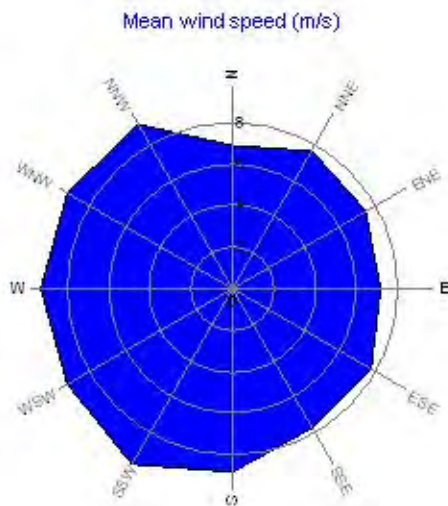
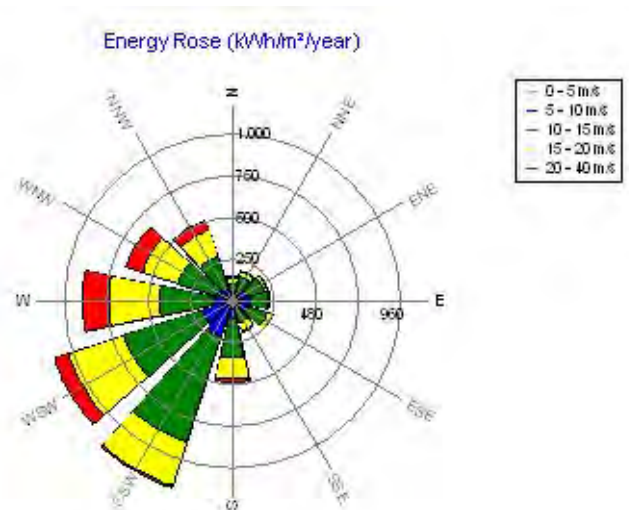
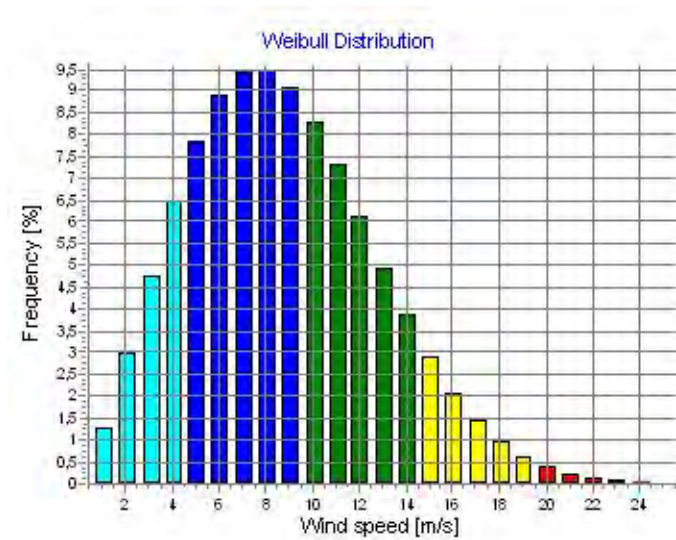
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 2bWind data: A - Oostpolder site data; Hub height: 135,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 7,73               | 6,87             | 1,814        | 4,0           |
| 1 NNE  | 8,64               | 7,66             | 2,275        | 4,5           |
| 2 ENE  | 8,40               | 7,45             | 2,494        | 6,1           |
| 3 E    | 8,07               | 7,16             | 2,498        | 7,1           |
| 4 ESE  | 8,71               | 7,72             | 2,451        | 6,3           |
| 5 SSE  | 8,77               | 7,77             | 2,072        | 4,2           |
| 6 S    | 9,95               | 8,83             | 2,443        | 8,2           |
| 7 SSW  | 10,88              | 9,73             | 3,096        | 17,1          |
| 8 WSW  | 10,44              | 9,25             | 2,357        | 15,8          |
| 9 W    | 10,45              | 9,26             | 2,045        | 11,1          |
| 10 WNW | 10,36              | 9,17             | 2,084        | 8,7           |
| 11 NNW | 10,32              | 9,14             | 2,166        | 6,9           |
| All    | 9,82               | 8,70             | 2,268        | 100,0         |



## PARK - Park power curve

Calculation: 716033 WP Oostpolder alternatief 2b

| Wind speed [m/s] | Power          |                |         |          |          |         |          |          |         |          |          |         |          |          |
|------------------|----------------|----------------|---------|----------|----------|---------|----------|----------|---------|----------|----------|---------|----------|----------|
|                  | Free WTGs [kW] | Park WTGs [kW] | N [kW]  | NNE [kW] | ENE [kW] | E [kW]  | ESE [kW] | SSE [kW] | S [kW]  | SSW [kW] | WSW [kW] | W [kW]  | WNW [kW] | NNW [kW] |
| 0,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 1,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 2,5              | 1.446          | 773            | 650     | 652      | 647      | 604     | 570      | 749      | 918     | 942      | 961      | 832     | 532      | 601      |
| 3,5              | 7.240          | 4.323          | 4.309   | 4.398    | 4.387    | 3.940   | 3.439    | 4.316    | 4.752   | 4.872    | 4.833    | 4.139   | 3.299    | 3.988    |
| 4,5              | 19.622         | 12.977         | 13.215  | 13.450   | 13.528   | 12.236  | 10.601   | 12.810   | 13.736  | 14.095   | 14.129   | 12.487  | 10.554   | 12.627   |
| 5,5              | 38.514         | 26.708         | 27.058  | 27.452   | 27.494   | 25.213  | 22.364   | 26.573   | 28.177  | 28.722   | 28.828   | 25.927  | 22.370   | 26.075   |
| 6,5              | 65.756         | 46.475         | 47.218  | 47.743   | 47.643   | 44.039  | 39.384   | 46.219   | 48.878  | 49.679   | 49.829   | 45.252  | 39.545   | 45.599   |
| 7,5              | 102.472        | 73.375         | 74.760  | 75.576   | 75.405   | 69.821  | 62.659   | 72.965   | 76.986  | 78.147   | 78.294   | 71.338  | 62.880   | 72.236   |
| 8,5              | 148.535        | 108.486        | 111.101 | 112.322  | 112.124  | 103.948 | 93.303   | 107.950  | 113.403 | 114.963  | 115.147  | 105.178 | 93.383   | 107.437  |
| 9,5              | 201.087        | 151.883        | 156.530 | 158.027  | 157.953  | 146.776 | 131.878  | 151.347  | 158.039 | 159.735  | 160.128  | 146.926 | 131.658  | 151.657  |
| 10,5             | 253.143        | 200.715        | 208.520 | 209.236  | 209.465  | 195.617 | 176.365  | 200.368  | 208.019 | 208.803  | 209.665  | 194.186 | 176.431  | 202.769  |
| 11,5             | 297.042        | 249.498        | 259.954 | 259.204  | 260.036  | 244.547 | 222.543  | 249.720  | 257.669 | 257.070  | 258.566  | 242.200 | 222.969  | 253.696  |
| 12,5             | 331.139        | 293.334        | 304.979 | 303.041  | 304.119  | 288.742 | 266.549  | 294.402  | 301.424 | 299.861  | 301.739  | 286.192 | 267.251  | 299.048  |
| 13,5             | 356.098        | 329.898        | 341.097 | 339.003  | 340.273  | 326.678 | 306.825  | 331.610  | 336.437 | 334.874  | 336.704  | 323.596 | 306.658  | 335.844  |
| 14,5             | 370.634        | 356.865        | 364.491 | 363.155  | 364.381  | 354.581 | 339.539  | 359.388  | 362.094 | 360.729  | 362.033  | 352.888 | 338.342  | 360.821  |
| 15,5             | 378.069        | 371.623        | 375.698 | 375.250  | 375.710  | 370.451 | 360.826  | 373.486  | 374.783 | 374.197  | 374.604  | 369.631 | 360.457  | 373.724  |
| 16,5             | 381.157        | 379.007        | 380.606 | 380.428  | 380.565  | 378.505 | 374.274  | 380.027  | 380.390 | 380.173  | 380.265  | 378.268 | 374.183  | 379.936  |
| 17,5             | 381.652        | 381.330        | 381.616 | 381.589  | 381.608  | 381.218 | 380.404  | 381.531  | 381.605 | 381.571  | 381.588  | 381.243 | 380.326  | 381.490  |
| 18,5             | 381.642        | 381.623        | 381.647 | 381.649  | 381.644  | 381.615 | 381.540  | 381.641  | 381.642 | 381.643  | 381.643  | 381.624 | 381.537  | 381.643  |
| 19,5             | 381.625        | 381.629        | 381.630 | 381.632  | 381.629  | 381.629 | 381.629  | 381.630  | 381.627 | 381.629  | 381.628  | 381.630 | 381.631  | 381.632  |
| 20,5             | 375.607        | 375.609        | 375.611 | 375.611  | 375.609  | 375.608 | 375.608  | 375.609  | 375.608 | 375.609  | 375.608  | 375.610 | 375.611  | 375.612  |
| 21,5             | 375.591        | 375.595        | 375.596 | 375.597  | 375.594  | 375.593 | 375.593  | 375.595  | 375.593 | 375.594  | 375.594  | 375.595 | 375.597  | 375.598  |
| 22,5             | 375.579        | 375.580        | 375.582 | 375.582  | 375.580  | 375.579 | 375.580  | 375.580  | 375.579 | 375.580  | 375.580  | 375.580 | 375.582  | 375.582  |
| 23,5             | 375.569        | 375.570        | 375.572 | 375.572  | 375.570  | 375.569 | 375.569  | 375.570  | 375.569 | 375.570  | 375.569  | 375.570 | 375.572  | 375.573  |
| 24,5             | 375.590        | 375.580        | 375.565 | 375.568  | 375.578  | 375.584 | 375.582  | 375.579  | 375.590 | 375.585  | 375.586  | 375.582 | 375.569  | 375.565  |
| 25,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 26,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 27,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 28,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 29,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |

### Description:

The park power curve is similar to a WTG power curve, meaning that when a given wind speed appears in front of the park with same speed in the entire wind farm area (before influence from the park), the output from the park can be found in the park power curve. Another way to say this: The park power curve includes array losses, but do NOT include terrain given variations in the wind speed over the park area.

Measuring a park power curve is not as simple as measuring a WTG power curve due to the fact that the park power curve depends on the wind direction and that the same wind speed normally will not appear for the entire park area at the same time (only in very flat non-complex terrain). The idea with this version of the park power curve is not to use it for validation based on measurements. This would require at least 2 measurement masts at two sides of the park, unless only a few direction sectors should be tested, AND non complex terrain (normally only useable off shore). Another park power curve version for complex terrain is available in windPRO.

The park power curve can be used for:

- Forecast systems, based on more rough (approximated) wind data, the park power curve would be an efficient way to make the connection from wind speed (and direction) to power.
- Construction of duration curves, telling how often a given power output will appear, the park power curve can be used together with the average wind distribution for the Wind farm area in hub height. The average wind distribution can eventually be obtained based on the Weibull parameters for each WTG position. These are found at print menu: >Result to file< in the >Park result< which can be saved to file or copied to clipboard and pasted in Excel.
- Calculation of wind energy index based on the PARK production (see below).
- Estimation of the expected PARK production for an existing wind farm based on wind measurements at minimum 2 measurement masts at two sides of wind farm. The masts must be used for obtaining the free wind speed. The free wind speed is used in the simulation of expected energy production with the PARK power curve. This procedure will only work suitable in non complex terrains. For complex terrain another park power curve calculation is available in windPRO (PPV-model).

### Note:

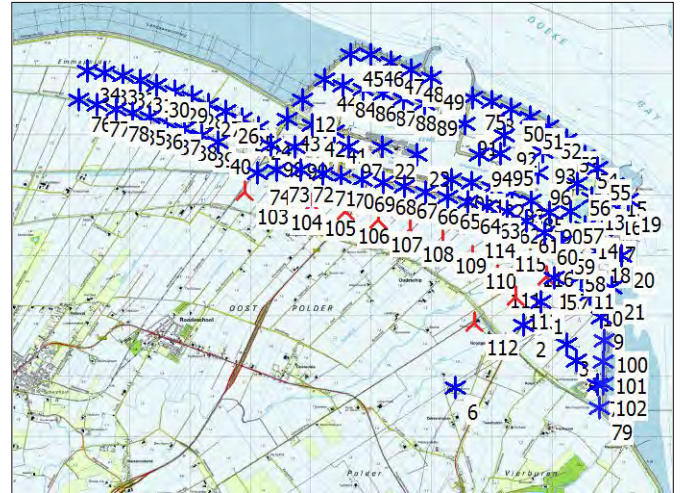
From the >Result to file< the >Wind Speeds Inside Wind farm< is also available. These can (e.g. via Excel) be used for extracting the wake induced reductions in measured wind speed.

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 2b

### WTG distances

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |     |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|-----|
| [m] |             | [m] | [m]                 |                                   |                                   |     |
| 1   | -0,3        | 117 | 0,3                 | 425                               | 3,3                               | 3,1 |
| 2   | 0,0         | 1   | -0,3                | 473                               | 3,5                               | 3,5 |
| 3   | 0,0         | 4   | 0,2                 | 315                               | 2,3                               | 2,3 |
| 4   | 0,2         | 3   | 0,0                 | 315                               | 2,3                               | 2,3 |
| 5   | 0,3         | 117 | 0,3                 | 129                               | 1,0                               | 0,9 |
| 6   | -0,1        | 112 | -0,4                | 1.105                             | 23,5                              | 8,7 |
| 7   | 1,8         | 102 | 0,2                 | 87                                | 1,7                               | 0,9 |
| 8   | 1,6         | 75  | 1,0                 | 323                               | 3,9                               | 2,8 |
| 9   | 0,1         | 100 | 0,0                 | 384                               | 4,7                               | 3,8 |
| 10  | -0,4        | 11  | 1,0                 | 321                               | 3,9                               | 3,9 |
| 11  | 1,0         | 58  | 1,0                 | 319                               | 3,9                               | 3,9 |
| 12  | 2,5         | 43  | 1,9                 | 417                               | 5,1                               | 3,0 |
| 13  | -1,0        | 16  | 2,0                 | 300                               | 3,7                               | 3,7 |
| 14  | 1,0         | 17  | 2,7                 | 301                               | 3,7                               | 3,7 |
| 15  | 1,0         | 16  | 2,0                 | 306                               | 3,7                               | 3,7 |
| 16  | 2,0         | 13  | -1,0                | 300                               | 3,7                               | 3,7 |
| 17  | 2,7         | 14  | 1,0                 | 301                               | 3,7                               | 3,7 |
| 18  | -0,7        | 17  | 2,7                 | 360                               | 4,4                               | 4,4 |
| 19  | 0,1         | 16  | 2,0                 | 320                               | 3,9                               | 3,9 |
| 20  | 2,0         | 18  | -0,7                | 401                               | 4,9                               | 4,9 |
| 21  | 0,0         | 10  | -0,4                | 379                               | 4,6                               | 4,6 |
| 22  | 4,3         | 97  | 2,8                 | 563                               | 6,3                               | 4,5 |
| 23  | 3,1         | 67  | 1,3                 | 561                               | 6,8                               | 4,5 |
| 24  | -1,2        | 25  | -0,4                | 315                               | 3,8                               | 3,8 |
| 25  | -0,4        | 26  | -1,0                | 301                               | 3,7                               | 3,7 |
| 26  | -1,0        | 25  | -0,4                | 301                               | 3,7                               | 3,7 |
| 27  | -1,3        | 28  | 0,2                 | 303                               | 3,7                               | 3,7 |
| 28  | 0,2         | 29  | 1,8                 | 300                               | 3,7                               | 3,7 |
| 29  | 1,8         | 28  | 0,2                 | 300                               | 3,7                               | 3,7 |
| 30  | -2,0        | 31  | -0,7                | 288                               | 3,5                               | 3,5 |
| 31  | -0,7        | 30  | -2,0                | 288                               | 3,5                               | 3,5 |
| 32  | 0,3         | 33  | 0,1                 | 299                               | 3,6                               | 3,6 |
| 33  | 0,1         | 34  | -1,1                | 297                               | 3,6                               | 3,6 |
| 34  | -1,1        | 33  | 0,1                 | 297                               | 3,6                               | 3,6 |
| 35  | 1,8         | 78  | -1,5                | 279                               | 3,4                               | 2,5 |
| 36  | 0,5         | 35  | 1,8                 | 300                               | 3,7                               | 3,7 |
| 37  | 1,5         | 36  | 0,5                 | 300                               | 3,7                               | 3,7 |
| 38  | -0,2        | 37  | 1,5                 | 302                               | 3,7                               | 3,7 |
| 39  | 0,6         | 38  | -0,2                | 302                               | 3,7                               | 3,7 |
| 40  | 0,9         | 39  | 0,6                 | 303                               | 3,7                               | 3,7 |
| 41  | 2,7         | 97  | 2,8                 | 356                               | 4,3                               | 4,0 |
| 42  | 0,2         | 41  | 2,7                 | 382                               | 4,7                               | 4,7 |
| 43  | 1,9         | 12  | 2,5                 | 417                               | 5,1                               | 3,0 |
| 44  | -0,5        | 84  | 0,1                 | 311                               | 3,8                               | 3,5 |
| 45  | 0,2         | 46  | 2,8                 | 333                               | 4,1                               | 4,1 |
| 46  | 2,8         | 45  | 0,2                 | 333                               | 4,1                               | 4,1 |
| 47  | 4,8         | 48  | 1,4                 | 355                               | 4,3                               | 4,3 |
| 48  | 1,4         | 49  | 3,2                 | 355                               | 4,3                               | 4,3 |
| 49  | 3,2         | 48  | 1,4                 | 355                               | 4,3                               | 4,3 |
| 50  | 1,1         | 8   | 1,6                 | 340                               | 4,2                               | 2,9 |
| 51  | 1,4         | 50  | 1,1                 | 342                               | 4,2                               | 4,2 |
| 52  | 2,1         | 51  | 1,4                 | 349                               | 4,3                               | 4,3 |
| 53  | 0,8         | 52  | 2,1                 | 370                               | 4,5                               | 4,5 |
| 54  | 0,6         | 55  | 1,8                 | 289                               | 3,5                               | 3,5 |
| 55  | 1,8         | 54  | 0,6                 | 289                               | 3,5                               | 3,5 |
| 56  | -0,4        | 13  | -1,0                | 345                               | 4,2                               | 4,2 |
| 57  | -0,7        | 14  | 1,0                 | 345                               | 4,2                               | 4,2 |
| 58  | 1,0         | 11  | 1,0                 | 319                               | 3,9                               | 3,9 |
| 59  | 4,7         | 58  | 1,0                 | 333                               | 4,1                               | 4,1 |
| 60  | -0,3        | 59  | 4,7                 | 335                               | 4,1                               | 4,1 |
| 61  | 1,7         | 85  | 1,3                 | 338                               | 4,1                               | 3,8 |
| 62  | -1,0        | 83  | 3,1                 | 332                               | 4,1                               | 3,7 |
| 63  | -2,9        | 82  | 1,0                 | 327                               | 4,0                               | 3,6 |



New WTG

Scale 1:125.000

Existing WTG

To be continued on next page...

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 2b

...continued from previous page

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |     |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|-----|
| [m] |             | [m] | [m]                 |                                   |                                   |     |
| 64  | 0,3         | 81  | 1,8                 | 324                               | 4,0                               | 3,6 |
| 65  | -1,9        | 80  | 2,3                 | 306                               | 3,7                               | 3,4 |
| 66  | 1,5         | 65  | -1,9                | 367                               | 4,5                               | 4,5 |
| 67  | 1,3         | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 68  | -1,2        | 67  | 1,3                 | 353                               | 4,3                               | 4,3 |
| 69  | -0,5        | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 70  | 0,5         | 71  | 0,0                 | 308                               | 3,8                               | 3,8 |
| 71  | 0,0         | 70  | 0,5                 | 308                               | 3,8                               | 3,8 |
| 72  | -0,1        | 71  | 0,0                 | 370                               | 4,5                               | 4,5 |
| 73  | 0,6         | 74  | -1,3                | 321                               | 3,9                               | 3,9 |
| 74  | -1,3        | 73  | 0,6                 | 321                               | 3,9                               | 3,9 |
| 75  | 1,0         | 8   | 1,6                 | 323                               | 3,9                               | 2,8 |
| 76  | 0,7         | 77  | 0,4                 | 309                               | 2,8                               | 2,8 |
| 77  | 0,4         | 76  | 0,7                 | 309                               | 2,8                               | 2,8 |
| 78  | -1,5        | 35  | 1,8                 | 279                               | 3,4                               | 2,5 |
| 79  | 1,0         | 7   | 1,8                 | 382                               | 7,3                               | 3,3 |
| 80  | 2,3         | 65  | -1,9                | 306                               | 3,7                               | 3,4 |
| 81  | 1,8         | 64  | 0,3                 | 324                               | 4,0                               | 3,6 |
| 82  | 1,0         | 63  | -2,9                | 327                               | 4,0                               | 3,6 |
| 83  | 3,1         | 62  | -1,0                | 332                               | 4,1                               | 3,7 |
| 84  | 0,1         | 44  | -0,5                | 311                               | 3,8                               | 3,5 |
| 85  | 1,3         | 61  | 1,7                 | 338                               | 4,1                               | 3,8 |
| 86  | 0,4         | 84  | 0,1                 | 332                               | 3,7                               | 3,7 |
| 87  | 1,0         | 88  | 0,9                 | 351                               | 3,9                               | 3,9 |
| 88  | 0,9         | 87  | 1,0                 | 351                               | 3,9                               | 3,9 |
| 89  | 2,3         | 88  | 0,9                 | 352                               | 3,9                               | 3,9 |
| 90  | 1,5         | 60  | -0,3                | 335                               | 4,1                               | 3,7 |
| 91  | 4,2         | 75  | 1,0                 | 455                               | 5,6                               | 5,1 |
| 92  | -0,8        | 95  | 2,7                 | 320                               | 3,6                               | 3,6 |
| 93  | 1,9         | 96  | 1,6                 | 371                               | 4,1                               | 4,1 |
| 94  | 1,6         | 95  | 2,7                 | 351                               | 3,9                               | 3,9 |
| 95  | 2,7         | 92  | -0,8                | 320                               | 3,6                               | 3,6 |
| 96  | 1,6         | 93  | 1,9                 | 371                               | 4,1                               | 4,1 |
| 97  | 2,8         | 41  | 2,7                 | 356                               | 4,3                               | 4,0 |
| 98  | -1,2        | 24  | -1,2                | 347                               | 4,2                               | 3,9 |
| 99  | -1,1        | 98  | -1,2                | 398                               | 4,4                               | 4,4 |
| 100 | 0,0         | 101 | 0,0                 | 360                               | 3,6                               | 3,6 |
| 101 | 0,0         | 102 | 0,2                 | 359                               | 3,6                               | 3,6 |
| 102 | 0,2         | 7   | 1,8                 | 87                                | 1,7                               | 0,9 |
| 103 | 0,0         | 74  | -1,3                | 389                               | 4,7                               | 3,1 |
| 104 | -1,0        | 73  | 0,6                 | 450                               | 5,5                               | 3,5 |
| 105 | 0,9         | 71  | 0,0                 | 529                               | 6,5                               | 4,2 |
| 106 | -1,8        | 107 | -0,9                | 560                               | 4,4                               | 4,4 |
| 107 | -0,9        | 108 | -1,6                | 560                               | 4,4                               | 4,4 |
| 108 | -1,6        | 109 | -1,0                | 560                               | 4,4                               | 4,4 |
| 109 | -1,0        | 114 | -1,3                | 550                               | 4,3                               | 4,3 |
| 110 | -0,2        | 114 | -1,3                | 508                               | 4,0                               | 4,0 |
| 111 | 0,0         | 113 | -0,2                | 457                               | 3,6                               | 3,6 |
| 112 | -0,4        | 113 | -0,2                | 811                               | 6,4                               | 6,4 |
| 113 | -0,2        | 1   | -0,3                | 426                               | 3,4                               | 3,1 |
| 114 | -1,3        | 63  | -2,9                | 406                               | 4,9                               | 3,2 |
| 115 | 0,9         | 62  | -1,0                | 458                               | 5,6                               | 3,6 |
| 116 | 1,0         | 60  | -0,3                | 436                               | 5,3                               | 3,4 |
| 117 | 0,3         | 5   | 0,3                 | 129                               | 1,0                               | 0,9 |
| Min | -2,9        |     | -2,9                | 87                                | 1,0                               | 0,9 |
| Max | 4,8         |     | 4,7                 | 1.105                             | 23,5                              | 8,7 |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 14:49/3.1.597

## PARK - Wind statistics info

Calculation: 716033 WP Oostpolder alternatief 2b

### Main data for wind statistic

File \\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\200117\24012017\RWE\_Oostpolder 100m-Corr099.wws  
Name RWE\_Oostpolder 100m-Corr099  
Country Netherlands  
Source User  
Mast coordinates Dutch Stereo-RD/NAP 2000 East: 248.822 North: 608.196  
Created 24-1-2017  
Edited 1-2-2017  
Sectors 12  
WAsP version WAsP 11 Version 11.05.0028  
Displacement height None

### Additional info for wind statistic

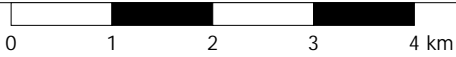
Source data Default Meteo data RWE  
Data from 25-4-2007  
Data to 31-1-2009  
Measurement length 21,3 Months

### Note

To get the most correct calculation results, wind statistics shall be calculated with the SAME model and model parameters, as currently chosen in calculation. For WAsP versions before 10.0, the model is unchanged, but thereafter more model changes affecting the wind statistic is seen. Likewise WAsP CFD should always use WAsP CFD calculated wind statistics.

### PARK - Map

Calculation: 716033 WP Oostpolder alternatief 2b



Map: Uithuizen , Print scale 1:75.000, Map center Dutch Stereo-RD/NAP 2000 East: 249.717 North: 606.402

- New WTG
- Existing WTG
- Obstacle

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 3b  
Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings  
Air density calculation mode Individual per WTG  
Result for WTG at hub altitude 1,236 kg/m<sup>3</sup> to 1,248 kg/m<sup>3</sup>  
Air density relative to standard 100,9 % to 101,8 %  
Hub altitude above sea level (asl) 39,9 m to 132,3 m  
Annual mean temperature at hub alt. 8,2 °C to 8,8 °C  
Pressure at WTGs 998,4 hPa to 1.009,6 hPa

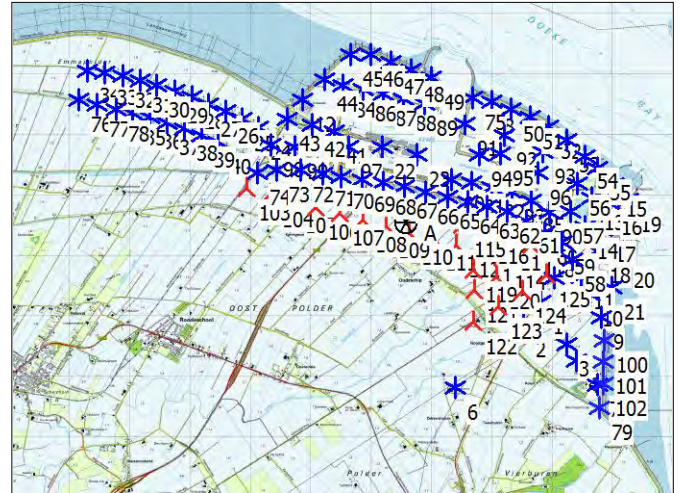
Wake Model Parameters  
Terrain type Wake decay constant  
HH:100m Open farmland 0,062

Displacement heights from objects

Wake calculation settings  
Angle [°] Wind speed [m/s]  
start end step start end step  
0,5 360,0 1,0 0,5 30,5 1,0

Wind statistics RWE\_Oostpolder 100m-Corr099.wws

WASP version WASP 11 Version 11.05.0028



▲ New WTG  
● Site Data

Scale 1:125.000

\* Existing WTG

### Key results for height 120,0 m above ground level

Terrain Dutch Stereo-RD/NAP 2000

X (east) Y (north) Name of wind distribution Type

A 250.596 606.527 Oostpolder site data

WASP (WASP 11 Version 11.05.0028)

Wind energy [kWh/m<sup>2</sup>] Mean wind speed [m/s] Equivalent roughness

5.493

8,4

1,1

### Calculated Annual Energy for Wind Farm

| WTG combination                                | Result PARK [MWh/y] | GROSS (no loss) Free WTGs [MWh/y] | Park efficiency [%] | Specific results <sup>a)</sup> |                         |                              |                                   |
|--|---------------------|-----------------------------------|---------------------|--------------------------------|-------------------------|------------------------------|-----------------------------------|
|  |                     |                                   |                     | Capacity factor [%]            | Mean WTG result [MWh/y] | Full load hours [Hours/year] | Mean wind speed @hub height [m/s] |
| Wind farm                                      | 1.089.643,9         | 1.315.323,6                       | 82,8                | 33,5                           | 8.717,2                 | 2.935                        | 8,2                               |
| New WTGs only                                  | 212.178,1           | 247.061,1                         | 85,9                | 44,8                           | 9.225,1                 | 3.926                        | 8,4                               |
| Existing park WTGs only                        | 877.465,8           | 1.068.262,5                       | 82,1                | 31,6                           | 8.602,6                 | 2.766                        | 8,2                               |
| Existing park WTGs without new WTGs            | 904.288,4           | 1.068.262,5                       | 84,7                |                                | 8.865,6                 |                              |                                   |
| Reduction for existing park WTGs caused by new | 26.822,7            |                                   |                     |                                |                         |                              |                                   |

<sup>a)</sup> Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 23 new WTGs with total 54,0 MW rated power

| Links | WTG type Valid | Manufact. | Type-generator  | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Power curve Creator | Name  | Annual Energy Park |                |                     |                            |
|-------|----------------|-----------|-----------------|-------------------|--------------------|----------------|---------------------|---|--------------------|----------------|---------------------|----------------------------|
|       |                |           |                 |                   |                    |                |                     |   | Result [MWh]       | Efficiency [%] | Capacity factor [%] | Free mean wind speed [m/s] |
| 103 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.884,5            | 92,38          | 48,0                | 8,41                       |
| 104 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.655,1            | 90,51          | 46,9                | 8,39                       |
| 105 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.610,3            | 90,04          | 46,7                | 8,39                       |
| 106 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.602,5            | 89,86          | 46,6                | 8,39                       |
| 107 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.621,5            | 90,03          | 46,7                | 8,39                       |
| 108 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.598,4            | 89,72          | 46,6                | 8,39                       |
| 109 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.580,1            | 89,55          | 46,5                | 8,39                       |
| 110 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.550,5            | 89,04          | 46,4                | 8,40                       |
| 111 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.463,5            | 88,13          | 45,9                | 8,41                       |
| 112 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.298,9            | 86,66          | 45,1                | 8,40                       |
| 113 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.833,3            | 81,93          | 42,9                | 8,43                       |
| 114 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.573,6            | 79,29          | 41,6                | 8,45                       |
| 115 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.855,3            | 81,85          | 43,0                | 8,46                       |
| 116 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.594,8            | 79,16          | 41,7                | 8,48                       |
| 117 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.360,6            | 77,14          | 40,6                | 8,47                       |
| 118 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.690,9            | 79,93          | 42,2                | 8,49                       |
| 119 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.307,1            | 86,81          | 45,2                | 8,39                       |
| 120 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 8.896,7            | 82,89          | 43,2                | 8,40                       |
| 121 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.596,9            | 89,62          | 46,6                | 8,39                       |
| 122 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.951,5            | 93,40          | 48,3                | 8,35                       |
| 123 A | Yes            | ENERCON   | E-103 EP2-2.350 | 2.350             | 103,0              | 120,0          | EMD                 | Level 0 - official - OM 0s - 2350kW - 08/2016 | 9.398,6            | 88,00          | 45,6                | 8,37                       |

To be continued on next page...



## PARK - Main Result

### Calculation: 716033 WP Oostpolder alternatief 3b

...continued from previous page

| WTG type |            | Links   | Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Power curve Creator                           | Name | Annual Energy |                      | Park Efficiency | Capacity factor | Free mean wind speed |
|----------|------------|---------|-------|-----------|----------------|--------------|----------------|------------|---|------|---------------|----------------------|-----------------|-----------------|----------------------|
| Result   | Efficiency |         |       |           |                |              |                |            |   |      | Capacity      | Free mean wind speed |                 |                 |                      |
| [kW]     | [m]        | [m]     | [MWh] | [%]       | [%]            | [m/s]        |                |            |   |      |               |                      |                 |                 |                      |
| 124 A    | Yes        | ENERCON | E-103 | EP2-2.350 | 2.350          | 103,0        | 120,0          | EMD        | Level 0 - official - OM 0s - 2350kW - 08/2016 |      | 8.997,9       | 83,71                | 43,7            | 8,41            |                      |
| 125 A    | Yes        | ENERCON | E-103 | EP2-2.350 | 2.350          | 103,0        | 120,0          | EMD        | Level 0 - official - OM 0s - 2350kW - 08/2016 |      | 8.255,8       | 76,26                | 40,1            | 8,46            |                      |

Annual Energy results do not include any losses apart from wake losses. For expected NET AEP (expected sold production), see report Loss & Uncertainty.

### Calculated Annual Energy for each of 102 existing park WTGs with total 317,3 MW rated power

| WTG type                          |                | Links      | Valid            | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height                                      | Power curve Creator | Name     | Annual Energy            |            |       | Park Efficiency |  |
|-----------------------------------|----------------|------------|------------------|-----------|----------------|--------------|----------------|---|---------------------|----------|--------------------------|------------|-------|-----------------|--|
| Calculated prod. without new WTGs | After New WTGs |            |                  |           |                |              |                |   |                     |          | Decrease due to new WTGs | Efficiency |       |                 |  |
| [kW]                              | [m]            | [m]        | [MWh]            | [MWh]     | [MWh %]        | [%]          |                |   |                     |          |                          |            |       |                 |  |
| 1 A                               | Yes            | LAGERWEY   | L136-4.5MW-4.500 | 4.500     | 136,0          | 132,0        | USER           | Lagerwey L136-4.5MW PV curve                    | 18.622,7            | 17.716,0 | 906,7                    | 4,9        | 86,41 |                 |  |
| 2 A                               | Yes            | LAGERWEY   | L136-4.5MW-4.500 | 4.500     | 136,0          | 132,0        | USER           | Lagerwey L136-4.5MW PV curve                    | 19.349,2            | 18.734,3 | 614,9                    | 3,2        | 91,87 |                 |  |
| 3 A                               | Yes            | LAGERWEY   | L136-4.5MW-4.500 | 4.500     | 136,0          | 132,0        | USER           | Lagerwey L136-4.5MW PV curve                    | 19.142,7            | 18.942,0 | 200,7                    | 1,0        | 92,38 |                 |  |
| 4 A                               | Yes            | LAGERWEY   | L136-4.5MW-4.500 | 4.500     | 136,0          | 132,0        | USER           | Lagerwey L136-4.5MW PV curve                    | 19.174,0            | 19.020,8 | 153,2                    | 0,8        | 92,77 |                 |  |
| 5 A                               | Yes            | LAGERWEY   | L136-4.5MW-4.500 | 4.500     | 136,0          | 132,0        | USER           | Lagerwey L136-4.5MW PV curve                    | 18.071,8            | 16.308,3 | 1.763,5                  | 9,8        | 79,06 |                 |  |
| 6 A                               | No             | VESTAS     | V47-660          | 660       | 47,0           | 40,0         | EMD            | Level 0 - calculated - - 07-2001                | 1.477,2             | 1.466,2  | 11,0                     | 0,7        | 96,31 |                 |  |
| 7 A                               | Yes            | VESTAS     | V52-850          | 850       | 52,0           | 40,0         | EMD            | Level 0 - calculated - 104.2 dB(A) - 07-2006    | 1.989,3             | 1.974,5  | 14,8                     | 0,7        | 92,40 |                 |  |
| 8 A                               | Yes            | VESTAS     | V117-3.45-3.450  | 3.450     | 117,0          | 93,5         | EMD            | Level 0 - Calculated - Modes 0 & 0-0S - 01-2016 | 12.967,1            | 12.839,0 | 128,1                    | 1,0        | 84,95 |                 |  |
| 9 A                               | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.706,0             | 7.592,6  | 113,4                    | 1,5        | 84,72 |                 |  |
| 10 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.552,7             | 7.326,5  | 226,3                    | 3,0        | 81,93 |                 |  |
| 11 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.445,1             | 7.144,6  | 300,5                    | 4,0        | 79,95 |                 |  |
| 12 A                              | No             | 2-B Energy | OTC 6 MW-6.000   | 6.000     | 140,0          | 105,0        | USER           | Turbulent power curve with TI of 8.7%           | 18.447,6            | 18.285,1 | 162,4                    | 0,9        | 83,67 |                 |  |
| 13 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 6.913,2             | 6.764,0  | 149,2                    | 2,2        | 73,32 |                 |  |
| 14 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 6.891,4             | 6.631,4  | 260,0                    | 3,8        | 72,75 |                 |  |
| 15 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.205,1             | 7.131,5  | 73,6                     | 1,0        | 75,59 |                 |  |
| 16 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.086,1             | 6.973,3  | 112,7                    | 1,6        | 74,95 |                 |  |
| 17 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.140,3             | 6.978,4  | 161,8                    | 2,3        | 75,86 |                 |  |
| 18 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.071,5             | 6.858,8  | 212,6                    | 3,0        | 76,09 |                 |  |
| 19 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.452,9             | 7.384,9  | 67,9                     | 0,9        | 80,37 |                 |  |
| 20 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.655,9             | 7.560,9  | 95,0                     | 1,2        | 81,69 |                 |  |
| 21 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.541,7             | 7.415,3  | 126,5                    | 1,7        | 81,93 |                 |  |
| 22 A                              | No             | Senvion    | 6.2M126-6.150    | 6.150     | 126,0          | 114,0        | USER           | Calculated power curve Senvion 6.2M126          | 18.923,9            | 18.425,9 | 498,1                    | 2,6        | 82,80 |                 |  |
| 23 A                              | No             | Senvion    | 6.2M126-6.150    | 6.150     | 126,0          | 114,0        | USER           | Calculated power curve Senvion 6.2M126          | 18.926,8            | 18.438,5 | 488,3                    | 2,6        | 82,55 |                 |  |
| 24 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.673,1             | 7.556,8  | 116,3                    | 1,5        | 84,29 |                 |  |
| 25 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.541,6             | 7.484,3  | 57,3                     | 0,8        | 82,97 |                 |  |
| 26 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.392,8             | 7.351,8  | 41,0                     | 0,6        | 81,64 |                 |  |
| 27 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.420,1             | 7.402,5  | 17,6                     | 0,2        | 81,89 |                 |  |
| 28 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.484,6             | 7.473,6  | 11,0                     | 0,1        | 82,07 |                 |  |
| 29 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.535,0             | 7.524,7  | 10,3                     | 0,1        | 82,43 |                 |  |
| 30 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.476,5             | 7.468,1  | 8,4                      | 0,1        | 82,49 |                 |  |
| 31 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.555,8             | 7.549,7  | 6,1                      | 0,1        | 83,04 |                 |  |
| 32 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.750,1             | 7.745,2  | 4,9                      | 0,1        | 84,32 |                 |  |
| 33 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.943,6             | 7.938,2  | 5,4                      | 0,1        | 86,40 |                 |  |
| 34 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 8.428,3             | 8.423,7  | 4,6                      | 0,1        | 91,91 |                 |  |
| 35 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.909,3             | 7.898,8  | 10,6                     | 0,1        | 87,36 |                 |  |
| 36 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.889,4             | 7.877,8  | 11,6                     | 0,1        | 87,46 |                 |  |
| 37 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.893,4             | 7.877,7  | 15,6                     | 0,2        | 87,54 |                 |  |
| 38 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.866,4             | 7.844,5  | 21,9                     | 0,3        | 87,55 |                 |  |
| 39 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.861,8             | 7.829,2  | 32,6                     | 0,4        | 87,45 |                 |  |
| 40 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.904,6             | 7.852,7  | 52,0                     | 0,7        | 87,87 |                 |  |
| 41 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.518,0             | 7.345,6  | 172,4                    | 2,3        | 80,37 |                 |  |
| 42 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.268,4             | 7.150,5  | 117,8                    | 1,6        | 78,68 |                 |  |
| 43 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.412,0             | 7.301,8  | 110,2                    | 1,5        | 80,45 |                 |  |
| 44 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.803,4             | 7.750,1  | 53,3                     | 0,7        | 81,89 |                 |  |
| 45 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 8.274,8             | 8.239,4  | 35,4                     | 0,4        | 85,12 |                 |  |
| 46 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 8.204,3             | 8.173,2  | 31,2                     | 0,4        | 83,83 |                 |  |
| 47 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 8.225,9             | 8.189,2  | 36,7                     | 0,4        | 83,83 |                 |  |
| 48 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.993,8             | 7.947,5  | 46,3                     | 0,6        | 82,85 |                 |  |
| 49 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.950,5             | 7.889,0  | 61,5                     | 0,8        | 82,75 |                 |  |
| 50 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.822,5             | 7.735,1  | 87,3                     | 1,1        | 80,53 |                 |  |
| 51 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.887,4             | 7.787,8  | 99,6                     | 1,3        | 81,23 |                 |  |
| 52 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.861,1             | 7.763,8  | 97,3                     | 1,2        | 80,76 |                 |  |
| 53 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.855,6             | 7.739,6  | 116,0                    | 1,5        | 80,96 |                 |  |
| 54 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.716,6             | 7.585,5  | 131,1                    | 1,7        | 79,60 |                 |  |
| 55 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.505,1             | 7.399,5  | 105,6                    | 1,4        | 77,74 |                 |  |
| 56 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.270,2             | 7.091,2  | 179,0                    | 2,5        | 76,03 |                 |  |
| 57 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.105,1             | 6.751,7  | 353,4                    | 5,0        | 73,73 |                 |  |
| 58 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.258,3             | 6.711,8  | 546,5                    | 7,5        | 74,70 |                 |  |
| 59 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.501,0             | 6.794,9  | 706,1                    | 9,4        | 74,56 |                 |  |
| 60 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.562,7             | 6.515,8  | 1.046,9                  | 13,8       | 72,55 |                 |  |
| 61 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.660,4             | 6.561,7  | 1.098,7                  | 14,3       | 72,85 |                 |  |
| 62 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.561,1             | 6.594,8  | 966,3                    | 12,8       | 73,31 |                 |  |
| 63 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.602,4             | 6.636,6  | 965,7                    | 12,7       | 74,01 |                 |  |
| 64 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.691,8             | 6.756,3  | 935,5                    | 12,2       | 75,11 |                 |  |
| 65 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.715,1             | 7.086,5  | 628,6                    | 8,1        | 79,36 |                 |  |
| 66 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.859,2             | 7.267,3  | 591,9                    | 7,5        | 81,00 |                 |  |
| 67 A                              | Yes            | ENERCON    | E-82 E3-3.000    | 3.000     | 82,0           | 98,4         | EMD            | Level 0 - official - Mode 0 - 08/2014           | 7.845,8             | 7.287,4  | 558,4                    | 7,1        | 81,10 |                 |  |

To be continued on next page...





## PARK - Main Result

### Calculation: 716033 WP Oostpolder alternatief 3b

...continued from previous page

| Links | WTG type |           | Type-generator             | Power, rated | Rotor diameter | Hub height | Power curve |   | Creator | Name     | Calculated prod. without new WTGs | Annual Energy  |                          | Park Efficiency |
|-------|----------|-----------|----------------------------|--------------|----------------|------------|-------------|---|---------|----------|-----------------------------------|----------------|--------------------------|-----------------|
|       | Valid    | Manufact. |                            |              |                |            | Created     | Name  |         |          |                                   | After New WTGs | Decrease due to new WTGs |                 |
|       |          |           |                            | [kW]         | [m]            | [m]        |             |   |         |          | [MWh]                             | [MWh]          | [MWh %]                  | [%]             |
| 68 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.779,6  | 7.232,3                           | 547,3 7,0      | 81,40                    |                 |
| 69 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.761,8  | 7.213,7                           | 548,0 7,1      | 81,33                    |                 |
| 70 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.711,7  | 7.174,5                           | 537,2 7,0      | 81,03                    |                 |
| 71 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.742,1  | 7.185,6                           | 556,5 7,2      | 81,41                    |                 |
| 72 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.697,6  | 7.130,8                           | 566,8 7,4      | 81,15                    |                 |
| 73 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 7.781,2  | 7.173,7                           | 607,5 7,8      | 81,14                    |                 |
| 74 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 8.055,1  | 7.418,5                           | 636,6 7,9      | 84,62                    |                 |
| 75 A  | Yes      | ENERCON   | E-82 E3-3.000              | 3.000        | 82,0           | 100,0      | EMD         | Level 0 - official - Mode 0 - 08/2014               |         | 8.075,2  | 8.002,5                           | 72,7 0,9       | 83,50                    |                 |
| 76 A  | Yes      | VESTAS    | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              |         | 12.800,1 | 12.796,0                          | 4,2 0,0        | 94,34                    |                 |
| 77 A  | Yes      | VESTAS    | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              |         | 12.289,5 | 12.284,5                          | 5,0 0,0        | 90,81                    |                 |
| 78 A  | Yes      | VESTAS    | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              |         | 11.992,1 | 11.984,1                          | 8,0 0,1        | 89,36                    |                 |
| 79 A  | Yes      | VESTAS    | V117-3.6-3.600             | 3.600        | 117,0          | 117,0      | EMD         | Level 0 - Calculated - Modes PO1 & PO1-OS - 01-2016 |         | 15.257,1 | 15.204,5                          | 52,6 0,3       | 96,80                    |                 |
| 80 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.313,7  | 7.912,5                           | 401,2 4,8      | 76,18                    |                 |
| 81 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.222,2  | 7.734,8                           | 487,4 5,9      | 74,26                    |                 |
| 82 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.181,9  | 7.654,5                           | 527,4 6,4      | 73,29                    |                 |
| 83 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.255,6  | 7.733,8                           | 521,8 6,3      | 73,36                    |                 |
| 84 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 7.733,7  | 8.672,7                           | 61,0 0,7       | 81,31                    |                 |
| 85 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.121,8  | 7.521,7                           | 600,1 7,4      | 72,30                    |                 |
| 86 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.781,2  | 8.718,1                           | 63,1 0,7       | 81,64                    |                 |
| 87 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.822,1  | 8.744,7                           | 77,4 0,9       | 82,12                    |                 |
| 88 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.752,0  | 8.665,6                           | 86,4 1,0       | 81,11                    |                 |
| 89 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.895,2  | 8.792,3                           | 102,9 1,2      | 82,58                    |                 |
| 90 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.130,7  | 7.525,3                           | 605,3 7,4      | 72,09                    |                 |
| 91 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 9.087,9  | 8.959,6                           | 128,3 1,4      | 83,22                    |                 |
| 92 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.377,8  | 8.235,6                           | 142,2 1,7      | 77,50                    |                 |
| 93 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.474,5  | 8.313,8                           | 160,7 1,9      | 77,93                    |                 |
| 94 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.516,5  | 8.290,7                           | 225,9 2,7      | 78,26                    |                 |
| 95 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.425,9  | 8.199,6                           | 226,2 2,7      | 77,49                    |                 |
| 96 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.377,8  | 8.101,7                           | 276,0 3,3      | 76,43                    |                 |
| 97 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.445,4  | 8.202,4                           | 243,0 2,9      | 79,37                    |                 |
| 98 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.474,3  | 8.269,3                           | 205,0 2,4      | 81,70                    |                 |
| 99 A  | Yes      | VESTAS    | V90-3.000                  | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         |         | 8.271,9  | 8.054,8                           | 217,1 2,6      | 79,60                    |                 |
| 100 A | Yes      | VESTAS    | V100-2.0-2.000             | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                        |         | 8.344,3  | 8.263,1                           | 81,2 1,0       | 87,94                    |                 |
| 101 A | Yes      | VESTAS    | V100-2.0-2.000             | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                        |         | 8.514,6  | 8.465,7                           | 48,9 0,6       | 90,24                    |                 |
| 102 A | Yes      | VESTAS    | V100-2.0-2.000             | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                        |         | 8.611,5  | 8.567,1                           | 44,3 0,5       | 91,60                    |                 |

## WTG siting

### Dutch Stereo-RD/NAP 2000

X (east) Y (north) Z Row data/Description

|          | X (east) | Y (north) | Z [m] | Row data/Description   |
|----------|----------|-----------|-------|--|
| 1 Exist  | 252.819  | 605.227   | -0,3  | LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (244) |
| 2 Exist  | 252.538  | 604.846   | 0,0   | LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (245) |
| 3 Exist  | 253.250  | 604.530   | 0,0   | LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (246) |
| 4 Exist  | 253.410  | 604.258   | 0,2   | LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (247) |
| 5 Exist  | 253.038  | 605.625   | 0,3   | LAGERWEY L136-4.5MW 4500 136.0 !O! hub: 132,0 m (TOT: 200,0 m) (248) |
| 6 Exist  | 251.401  | 603.815   | -0,1  | VESTAS V47 660 47.0 !O! hub: 40,0 m (TOT: 63,5 m) (264)              |
| 7 Exist  | 253.765  | 603.860   | 1,8   | VESTAS V52 850 52.0 !O! hub: 40,0 m (TOT: 66,0 m) (265)              |
| 8 Exist  | 252.007  | 608.545   | 1,6   | VESTAS V117-3.45 3450 117.0 !O! hub: 93,5 m (TOT: 152,0 m) (266)     |
| 9 Exist  | 253.830  | 604.979   | 0,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (267)       |
| 10 Exist | 253.634  | 605.359   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (268)       |
| 11 Exist | 253.487  | 605.644   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (269)       |
| 12 Exist | 248.875  | 608.572   | 2,5   | 2-B Energy OTC 6 MW 6000 140.0 !#! hub: 105,0 m (TOT: 175,0 m) (270) |
| 13 Exist | 253.662  | 606.943   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (271)       |
| 14 Exist | 253.548  | 606.476   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (272)       |
| 15 Exist | 254.026  | 607.172   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (273)       |
| 16 Exist | 253.954  | 606.875   | 2,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (274)       |
| 17 Exist | 253.843  | 606.417   | 2,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (275)       |
| 18 Exist | 253.758  | 606.067   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (276)       |
| 19 Exist | 254.272  | 606.915   | 0,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (277)       |
| 20 Exist | 254.151  | 605.985   | 2,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (278)       |
| 21 Exist | 253.996  | 605.473   | 0,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (279)       |
| 22 Exist | 250.194  | 607.795   | 4,3   | Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (280)     |
| 23 Exist | 250.760  | 607.657   | 3,1   | Senvion 6.2M126 6150 126.0 !O! hub: 114,0 m (TOT: 177,0 m) (281)     |
| 24 Exist | 248.142  | 608.104   | -1,2  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (282)       |
| 25 Exist | 247.865  | 608.255   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (283)       |
| 26 Exist | 247.590  | 608.377   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (284)       |
| 27 Exist | 247.311  | 608.501   | -1,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (285)       |
| 28 Exist | 247.034  | 608.625   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (286)       |
| 29 Exist | 246.747  | 608.713   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (371)       |
| 30 Exist | 246.447  | 608.805   | -2,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (288)       |

To be continued on next page...

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 3b

...continued from previous page

Dutch Stereo-RD/NAP 2000

|          | X (east) | Y (north) | Z [m] | Row data/Description   |
|----------|----------|-----------|-------|--|
| 31 Exist | 246.172  | 608.890   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (289)   |
| 32 Exist | 245.885  | 608.978   | 0,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (290)   |
| 33 Exist | 245.590  | 609.026   | 0,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (291)   |
| 34 Exist | 245.294  | 609.056   | -1,1  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (292)   |
| 35 Exist | 246.045  | 608.352   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (293)   |
| 36 Exist | 246.336  | 608.279   | 0,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (294)   |
| 37 Exist | 246.622  | 608.188   | 1,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (295)   |
| 38 Exist | 246.907  | 608.088   | -0,2  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (296)   |
| 39 Exist | 247.190  | 607.981   | 0,9   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (297)   |
| 40 Exist | 247.472  | 607.870   | 0,9   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (298)   |
| 41 Exist | 249.390  | 608.049   | 2,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (299)   |
| 42 Exist | 249.023  | 608.155   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (300)   |
| 43 Exist | 248.609  | 608.251   | 1,9   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (301)   |
| 44 Exist | 249.242  | 608.904   | -0,5  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (302)   |
| 45 Exist | 249.672  | 609.314   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (303)   |
| 46 Exist | 250.005  | 609.324   | 2,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (304)   |
| 47 Exist | 250.336  | 609.195   | 4,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (305)   |
| 48 Exist | 250.665  | 609.061   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (306)   |
| 49 Exist | 250.997  | 608.936   | 3,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (307)   |
| 50 Exist | 252.323  | 608.418   | 1,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (308)   |
| 51 Exist | 252.641  | 608.293   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (309)   |
| 52 Exist | 252.949  | 608.128   | 2,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (310)   |
| 53 Exist | 253.248  | 607.910   | 0,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (311)   |
| 54 Exist | 253.547  | 607.637   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (312)   |
| 55 Exist | 253.756  | 607.438   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (313)   |
| 56 Exist | 253.425  | 607.194   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (314)   |
| 57 Exist | 253.312  | 606.728   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (315)   |
| 58 Exist | 253.341  | 605.928   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (316)   |
| 59 Exist | 253.172  | 606.215   | 4,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (317)   |
| 60 Exist | 252.880  | 606.379   | -0,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (318)   |
| 61 Exist | 252.576  | 606.567   | 1,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (319)   |
| 62 Exist | 252.262  | 606.720   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (320)   |
| 63 Exist | 251.932  | 606.799   | -2,9  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (321)   |
| 64 Exist | 251.602  | 606.881   | 0,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (322)   |
| 65 Exist | 251.272  | 606.961   | -1,9  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (323)   |
| 66 Exist | 250.915  | 607.046   | 1,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (324)   |
| 67 Exist | 250.558  | 607.133   | 1,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (325)   |
| 68 Exist | 250.211  | 607.197   | -1,2  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (326)   |
| 69 Exist | 249.862  | 607.249   | -0,5  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (327)   |
| 70 Exist | 249.511  | 607.301   | 0,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (328)   |
| 71 Exist | 249.207  | 607.349   | 0,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (329)   |
| 72 Exist | 248.841  | 607.404   | -0,1  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (330)   |
| 73 Exist | 248.444  | 607.403   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (331)   |
| 74 Exist | 248.125  | 607.370   | -1,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (332)   |
| 75 Exist | 251.691  | 608.611   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 100,0 m (TOT: 141,0 m) (333)  |
| 76 Exist | 245.161  | 608.566   | 0,7   | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (354)       |
| 77 Exist | 245.463  | 608.501   | 0,4   | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (355)       |
| 78 Exist | 245.775  | 608.421   | -1,5  | VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (356)       |
| 79 Exist | 253.792  | 603.479   | 1,0   | VESTAS V117-3.6 3600 117.0 !O! hub: 117,0 m (TOT: 175,5 m) (664) |
| 80 Exist | 251.345  | 607.258   | 2,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (599)       |
| 81 Exist | 251.679  | 607.196   | 1,8   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (600)       |
| 82 Exist | 252.008  | 607.117   | 1,0   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (601)       |
| 83 Exist | 252.340  | 607.043   | 3,1   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (602)       |
| 84 Exist | 249.539  | 608.811   | 0,1   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (603)       |
| 85 Exist | 252.654  | 606.896   | 1,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (604)       |
| 86 Exist | 249.866  | 608.752   | 0,4   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (605)       |
| 87 Exist | 250.208  | 608.666   | 1,0   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (606)       |
| 88 Exist | 250.550  | 608.586   | 0,9   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (607)       |
| 89 Exist | 250.892  | 608.503   | 2,3   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (608)       |
| 90 Exist | 252.958  | 606.705   | 1,5   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (609)       |
| 91 Exist | 251.566  | 608.173   | 4,2   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (610)       |
| 92 Exist | 252.219  | 607.986   | -0,8  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (611)       |
| 93 Exist | 252.852  | 607.716   | 1,9   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (612)       |
| 94 Exist | 251.793  | 607.668   | 1,6   | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (613)       |

To be continued on next page...

## PARK - Main Result

Calculation: 716033 WP Oostpolder alternatief 3b

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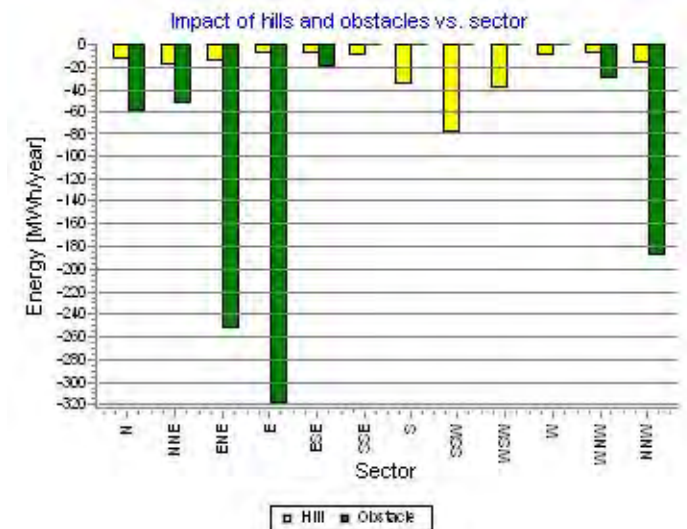
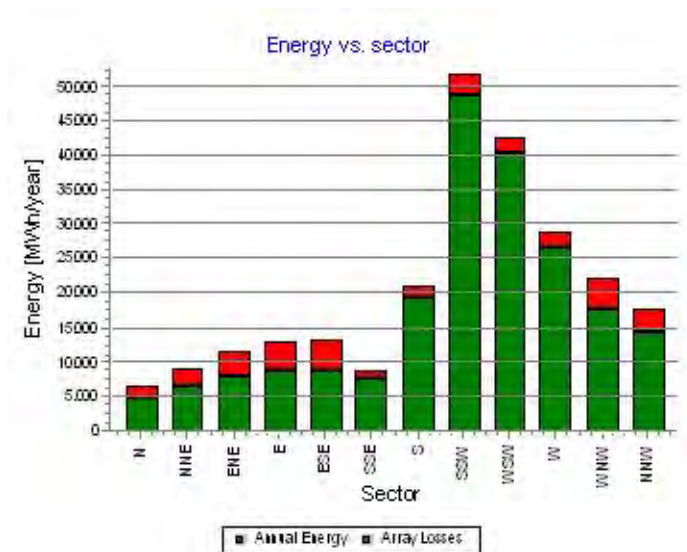
Dutch Stereo-RD/NAP 2000

|           | X (east) | Y (north) | Z    | Row data/Description   |
|-----------|----------|-----------|------|--|
|           | [m]      |           |      |  |
| 95 Exist  | 252.144  | 607.675   | 2,7  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (614)         |
| 96 Exist  | 252.765  | 607.355   | 1,6  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (615)         |
| 97 Exist  | 249.631  | 607.787   | 2,8  | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (616)         |
| 98 Exist  | 248.339  | 607.818   | -1,2 | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (617)         |
| 99 Exist  | 248.736  | 607.792   | -1,1 | VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (618)         |
| 100 Exist | 253.864  | 604.596   | 0,0  | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (712)   |
| 101 Exist | 253.855  | 604.236   | 0,0  | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (713)   |
| 102 Exist | 253.850  | 603.877   | 0,2  | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (714)   |
| 103 New   | 247.940  | 607.100   | 0,0  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (382) |
| 104 New   | 248.327  | 606.996   | -0,7 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (383) |
| 105 New   | 248.713  | 606.893   | -1,6 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (384) |
| 106 New   | 249.099  | 606.789   | -0,5 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (385) |
| 107 New   | 249.486  | 606.686   | -1,1 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (386) |
| 108 New   | 249.872  | 606.582   | -1,0 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (387) |
| 109 New   | 250.258  | 606.479   | -0,3 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (388) |
| 110 New   | 250.645  | 606.375   | -1,0 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (389) |
| 111 New   | 251.031  | 606.271   | -0,4 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (390) |
| 112 New   | 251.417  | 606.168   | -1,6 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (391) |
| 113 New   | 251.804  | 606.064   | -0,8 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (392) |
| 114 New   | 252.190  | 605.961   | 0,9  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (393) |
| 115 New   | 251.506  | 606.506   | 0,0  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (394) |
| 116 New   | 251.889  | 606.391   | 1,1  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (395) |
| 117 New   | 252.274  | 606.283   | 0,0  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (396) |
| 118 New   | 252.657  | 606.168   | 0,2  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (397) |
| 119 New   | 251.710  | 605.754   | -2,0 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (398) |
| 120 New   | 252.090  | 605.637   | 0,0  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (399) |
| 121 New   | 251.726  | 605.411   | 0,2  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (400) |
| 122 New   | 251.703  | 604.894   | -0,2 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (401) |
| 123 New   | 252.113  | 605.145   | -0,2 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (402) |
| 124 New   | 252.518  | 605.402   | -0,6 | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (403) |
| 125 New   | 252.918  | 605.667   | 0,2  | ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (404) |

## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 3bWTG: All new WTGs, Air density varies with WTG position 1,236 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N     | 1 NNE   | 2 ENE    | 3 E      | 4 ESE    | 5 SSE   | 6 S      | 7 SSW    | 8 WSW    | 9 W      | 10 WNW   | 11 NNW   | Total     |
|---------------------------------------|---------|---------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|-----------|
| Roughness based energy [MWh]          | 6.797,4 | 9.094,2 | 11.900,0 | 13.222,0 | 13.239,8 | 8.928,2 | 21.178,3 | 51.910,1 | 42.832,3 | 28.918,6 | 22.440,9 | 17.784,8 | 248.246,7 |
| -Decrease due to obstacles [MWh]      | 58,7    | 53,1    | 252,8    | 319,3    | 20,5     | 0,4     | 0,0      | 0,0      | 0,0      | 0,0      | 30,0     | 187,6    | 922,5     |
| +Increase due to hills [MWh]          | -13,5   | -18,0   | -16,1    | -7,7     | -7,7     | -10,8   | -35,6    | -78,1    | -38,9    | -10,4    | -9,0     | -17,2    | -263,1    |
| -Decrease due to array losses [MWh]   | 1.725,0 | 2.380,3 | 3.689,1  | 3.961,6  | 4.352,0  | 1.077,3 | 1.884,0  | 2.976,8  | 2.597,6  | 2.290,9  | 4.620,7  | 3.327,7  | 34.883,0  |
| Resulting energy [MWh]                | 5.000,2 | 6.642,7 | 7.942,1  | 8.933,3  | 8.859,6  | 7.839,8 | 19.258,7 | 48.855,2 | 40.195,7 | 26.617,2 | 17.781,2 | 14.252,3 | 212.178,1 |
| Specific energy [kWh/m <sup>2</sup> ] |         |         |          |          |          |         |          |          |          |          |          |          | 1.107     |
| Specific energy [kWh/kW]              |         |         |          |          |          |         |          |          |          |          |          |          | 3.926     |
| Decrease due to obstacles [%]         | 0,9     | 0,6     | 2,1      | 2,4      | 0,2      | 0,0     | 0,0      | 0,0      | 0,0      | 0,0      | 0,1      | 1,1      | 0,37      |
| Increase due to hills [%]             | -0,2    | -0,2    | -0,1     | -0,1     | -0,1     | -0,1    | -0,2     | -0,2     | -0,1     | 0,0      | 0,0      | -0,1     | -0,11     |
| Decrease due to array losses [%]      | 25,6    | 26,4    | 31,7     | 30,7     | 32,9     | 12,1    | 8,9      | 5,7      | 6,1      | 7,9      | 20,6     | 18,9     | 14,12     |
| Utilization [%]                       | 19,7    | 21,5    | 22,3     | 23,2     | 20,2     | 21,8    | 22,5     | 23,8     | 20,4     | 17,2     | 15,6     | 17,3     | 20,2      |
| Operational [Hours/year]              | 342     | 387     | 527      | 611      | 548      | 361     | 712      | 1.473    | 1.361    | 959      | 751      | 597      | 8.629     |
| Full Load Equivalent [Hours/year]     | 93      | 123     | 147      | 165      | 164      | 145     | 356      | 904      | 744      | 492      | 329      | 264      | 3.926     |



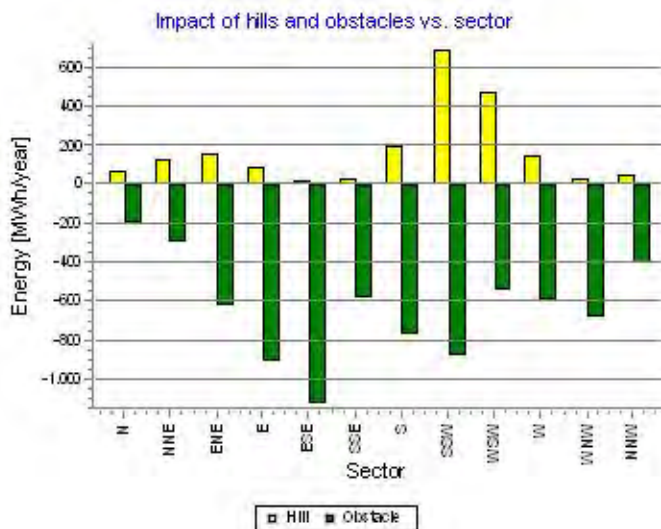
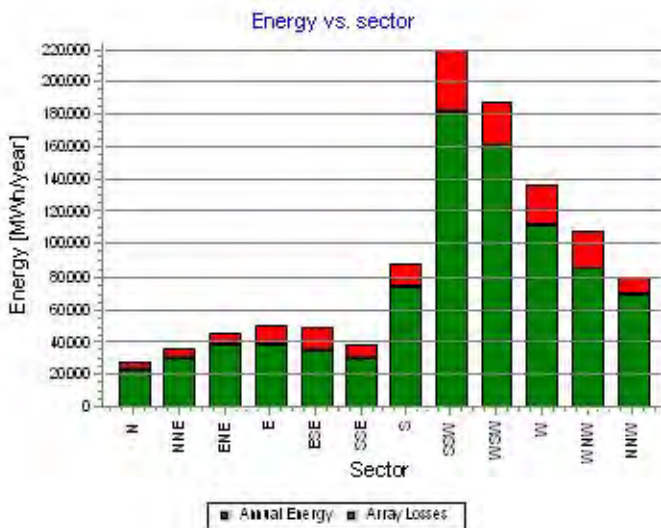




## PARK - Production Analysis

Calculation: 716033 WP Oostpolder alternatief 3bWTG: All existing WTGs, Air density varies with WTG position 1,236 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW     | 8 WSW     | 9 W       | 10 WNW    | 11 NNW   | Total       |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|-------------|
| Roughness based energy [MWh]          | 27.773,1 | 36.183,5 | 46.549,9 | 50.905,6 | 50.704,9 | 38.783,0 | 89.039,8 | 219.772,1 | 187.819,5 | 136.783,6 | 109.534,6 | 79.965,9 | 1.073.816,0 |
| -Decrease due to obstacles [MWh]      | 191,0    | 291,8    | 628,3    | 914,8    | 1.125,6  | 585,8    | 774,4    | 882,1     | 550,6     | 594,5     | 680,3     | 401,0    | 7.620,2     |
| +Increase due to hills [MWh]          | 65,3     | 127,8    | 154,3    | 89,5     | 24,1     | 27,0     | 193,1    | 687,6     | 469,8     | 146,2     | 31,1      | 51,4     | 2.067,3     |
| -Decrease due to array losses [MWh]   | 4.280,5  | 5.778,3  | 7.502,9  | 11.566,9 | 14.704,9 | 7.480,9  | 15.034,9 | 37.544,2  | 27.851,8  | 23.849,1  | 23.957,9  | 11.244,5 | 190.796,7   |
| Resulting energy [MWh]                | 23.366,9 | 30.241,2 | 38.573,0 | 38.513,5 | 34.898,5 | 30.743,3 | 73.423,6 | 182.033,4 | 159.886,9 | 112.486,1 | 84.927,4  | 68.371,8 | 877.465,6   |
| Specific energy [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |           |           |           |           |          | 1.336       |
| Specific energy [kWh/kW]              |          |          |          |          |          |          |          |           |           |           |           |          | 2.766       |
| Decrease due to obstacles [%]         | 0,7      | 0,8      | 1,3      | 1,8      | 2,2      | 1,5      | 0,9      | 0,4       | 0,3       | 0,4       | 0,6       | 0,5      | 0,71        |
| Increase due to hills [%]             | 0,2      | 0,4      | 0,3      | 0,2      | 0,0      | 0,1      | 0,2      | 0,3       | 0,3       | 0,1       | 0,0       | 0,1      | 0,19        |
| Decrease due to array losses [%]      | 15,5     | 16,0     | 16,3     | 23,1     | 29,6     | 19,6     | 17,0     | 17,1      | 14,8      | 17,5      | 22,0      | 14,1     | 17,86       |
| Utilization [%]                       | 28,8     | 31,1     | 33,2     | 30,8     | 26,8     | 25,8     | 27,7     | 28,6      | 25,8      | 21,2      | 20,0      | 25,1     | 25,7        |
| Operational [Hours/year]              | 333      | 375      | 509      | 592      | 531      | 354      | 688      | 1.426     | 1.324     | 945       | 738       | 584      | 8.399       |
| Full Load Equivalent [Hours/year]     | 74       | 95       | 122      | 121      | 110      | 97       | 231      | 574       | 504       | 355       | 268       | 216      | 2.766       |





## PARK - Power Curve Analysis

Calculation: 716033 WP Oostpolder alternatief 3bWTG: 108 - ENERCON E-103 EP2 2350 103.0 I-I Level 0 - official - OM 0s - 2350kW - 08/2016, Hub height: 120,0 m  
Name: Level 0 - official - OM 0s - 2350kW - 08/2016  
Source: Enercon

| Source/Date | Created by | Created    | Edited    | Stop wind speed [m/s] | Power control | CT curve type | Generator type | Specific power kW/m <sup>2</sup> |
|-------------|------------|------------|-----------|-----------------------|---------------|---------------|----------------|----------------------------------|
| 5-8-2016    | EMD        | 25-11-2009 | 2-11-2016 | 25,0                  | Pitch         | User defined  | Variable       | 0,28                             |

According to Enercon specification document D0434367-2\_#\_de\_#\_Betriebsmodi\_E-103\_EP2\_\_\_2350\_kW\_mit\_TES

HP curve comparison - Note: For standard air density and weibull k parameter = 2

| Vmean  | [m/s] | 5     | 6     | 7     | 8      | 9      | 10     |
|--|-------|-------|-------|-------|--------|--------|--------|
| HP value Pitch, variable speed (2013)  | [MWh] | 4.175 | 6.286 | 8.295 | 10.062 | 11.539 | 12.711 |
| ENERCON E-103 EP2 2350 103.0 I-I Level 0 - official - OM 0s - 2350kW - 08/2016 | [MWh] | 4.022 | 6.044 | 8.004 | 9.751  | 11.222 | 12.390 |
| Check value  | [%]   | 4     | 4     | 4     | 3      | 3      | 3      |

The table shows comparison between annual energy production calculated on basis of simplified "HP-curves" which assume that all WTGs performs quite similar - only specific power loading (kW/m<sup>2</sup>) and single/dual speed or stall/pitch decides the calculated values. Productions are without wake losses.

For further details, ask at the Danish Energy Agency for project report J.nr. 51171/00-0016 or see windPRO manual chapter 3.5.2.

The method is refined in EMD report "20 Detailed Case Studies comparing Project Design Calculations and actual Energy Productions for Wind Energy Projects worldwide", jan 2003.

Use the table to evaluate if the given power curve is reasonable - if the check value are lower than -5%, the power curve probably is too optimistic due to uncertainty in power curve measurement.

### Power curve

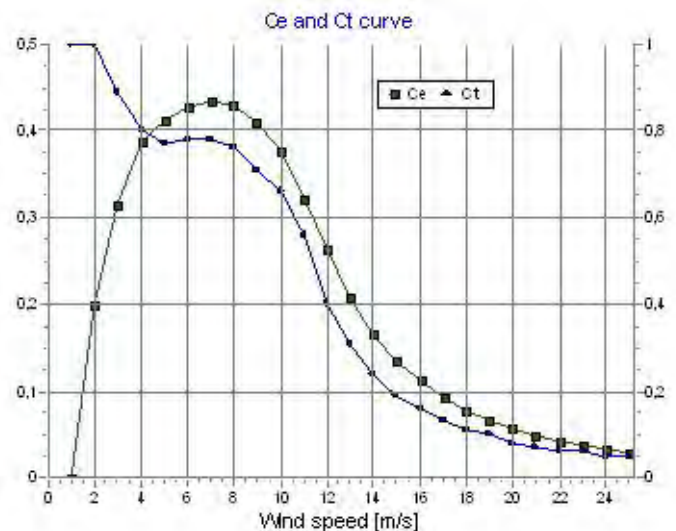
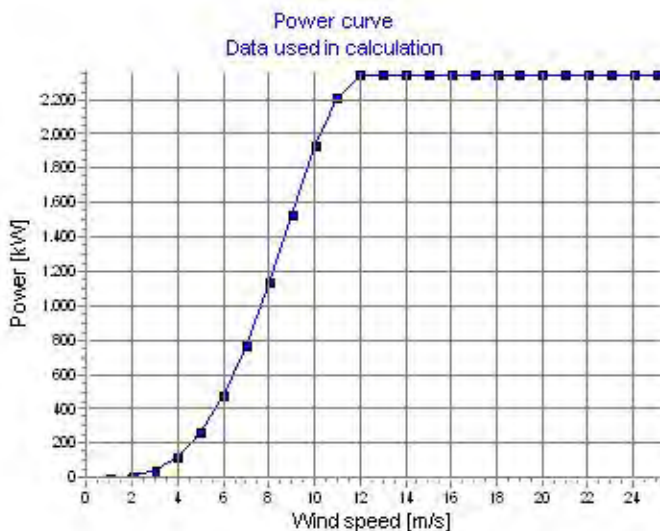
Original data, Air density: 1,225 kg/m<sup>3</sup>

| Wind speed [m/s] | Power [kW] | Ce   | Wind speed [m/s] | Ct curve |
|------------------|------------|------|------------------|----------|
| 0,0              | 0,0        | 0,00 | 2,0              | 1,07     |
| 1,0              | 0,0        | 0,00 | 2,5              | 0,98     |
| 1,5              | 0,0        | 0,00 | 3,0              | 0,89     |
| 2,0              | 8,0        | 0,20 | 3,5              | 0,84     |
| 2,5              | 22,0       | 0,28 | 4,0              | 0,80     |
| 3,0              | 43,0       | 0,31 | 4,5              | 0,78     |
| 3,5              | 79,0       | 0,36 | 5,0              | 0,77     |
| 4,0              | 126,0      | 0,39 | 5,5              | 0,78     |
| 4,5              | 188,0      | 0,40 | 6,0              | 0,78     |
| 5,0              | 263,0      | 0,41 | 6,5              | 0,78     |
| 5,5              | 357,0      | 0,42 | 7,0              | 0,78     |
| 6,0              | 470,0      | 0,43 | 7,5              | 0,78     |
| 6,5              | 605,0      | 0,43 | 8,0              | 0,76     |
| 7,0              | 758,0      | 0,43 | 8,5              | 0,73     |
| 7,5              | 927,0      | 0,44 | 9,0              | 0,71     |
| 8,0              | 1.122,0    | 0,43 | 9,5              | 0,68     |
| 8,5              | 1.326,0    | 0,42 | 10,0             | 0,66     |
| 9,0              | 1.525,0    | 0,41 | 10,5             | 0,64     |
| 9,5              | 1.733,0    | 0,40 | 11,0             | 0,58     |
| 10,0             | 1.925,0    | 0,38 | 11,5             | 0,47     |
| 10,5             | 2.073,0    | 0,35 | 12,0             | 0,40     |
| 11,0             | 2.205,0    | 0,32 | 12,5             | 0,35     |
| 11,5             | 2.294,0    | 0,30 | 13,0             | 0,31     |
| 12,0             | 2.350,0    | 0,27 | 13,5             | 0,27     |
| 12,5             | 2.350,0    | 0,24 | 14,0             | 0,24     |
| 13,0             | 2.350,0    | 0,21 | 14,5             | 0,22     |
| 13,5             | 2.350,0    | 0,19 | 15,0             | 0,19     |
| 14,0             | 2.350,0    | 0,17 | 15,5             | 0,18     |
| 14,5             | 2.350,0    | 0,15 | 16,0             | 0,16     |
| 15,0             | 2.350,0    | 0,14 | 16,5             | 0,15     |
| 15,5             | 2.350,0    | 0,12 | 17,0             | 0,13     |
| 16,0             | 2.350,0    | 0,11 | 17,5             | 0,12     |
| 16,5             | 2.350,0    | 0,10 | 18,0             | 0,11     |
| 17,0             | 2.350,0    | 0,09 | 18,5             | 0,10     |
| 17,5             | 2.350,0    | 0,09 | 19,0             | 0,10     |
| 18,0             | 2.350,0    | 0,08 | 19,5             | 0,09     |
| 18,5             | 2.350,0    | 0,07 | 20,0             | 0,08     |
| 19,0             | 2.350,0    | 0,07 | 20,5             | 0,08     |
| 19,5             | 2.350,0    | 0,06 | 21,0             | 0,07     |
| 20,0             | 2.350,0    | 0,06 | 21,5             | 0,07     |
| 20,5             | 2.350,0    | 0,05 | 22,0             | 0,06     |
| 21,0             | 2.350,0    | 0,05 | 22,5             | 0,06     |
| 21,5             | 2.350,0    | 0,05 | 23,0             | 0,06     |
| 22,0             | 2.350,0    | 0,04 | 23,5             | 0,05     |
| 22,5             | 2.350,0    | 0,04 | 24,0             | 0,05     |
| 23,0             | 2.350,0    | 0,04 | 24,5             | 0,05     |
| 23,5             | 2.350,0    | 0,04 | 25,0             | 0,05     |
| 24,0             | 2.350,0    | 0,03 |                  |          |
| 24,5             | 2.350,0    | 0,03 |                  |          |

### Power, Efficiency and energy vs. wind speed

Data used in calculation, Air density: 1,238 kg/m<sup>3</sup> New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>

| Wind speed [m/s] | Power [kW] | Ce   | Interval [m/s] | Energy [MWh] | Acc. Energy [MWh] | Relative [%] |
|------------------|------------|------|----------------|--------------|-------------------|--------------|
| 1,0              | 0,0        | 0,00 | 0,50- 1,50     | 0,0          | 0,0               | 0,0          |
| 2,0              | 8,2        | 0,20 | 1,50- 2,50     | 3,6          | 3,6               | 0,0          |
| 3,0              | 43,7       | 0,31 | 2,50- 3,50     | 22,3         | 25,9              | 0,3          |
| 4,0              | 127,7      | 0,39 | 3,50- 4,50     | 76,1         | 102,0             | 1,1          |
| 5,0              | 266,2      | 0,41 | 4,50- 5,50     | 185,1        | 287,1             | 3,0          |
| 6,0              | 475,5      | 0,43 | 5,50- 6,50     | 364,1        | 651,2             | 6,8          |
| 7,0              | 766,5      | 0,43 | 6,50- 7,50     | 611,2        | 1.262,4           | 13,2         |
| 8,0              | 1.133,2    | 0,43 | 7,50- 8,50     | 888,5        | 2.151,0           | 22,4         |
| 9,0              | 1.538,7    | 0,41 | 8,50- 9,50     | 1.130,1      | 3.281,1           | 34,2         |
| 10,0             | 1.937,3    | 0,38 | 9,50-10,50     | 1.259,4      | 4.540,5           | 47,3         |
| 11,0             | 2.214,3    | 0,32 | 10,50-11,50    | 1.233,0      | 5.773,5           | 60,2         |
| 12,0             | 2.350,0    | 0,26 | 11,50-12,50    | 1.068,0      | 6.841,5           | 71,3         |
| 13,0             | 2.350,0    | 0,21 | 12,50-13,50    | 839,8        | 7.681,4           | 80,0         |
| 14,0             | 2.350,0    | 0,17 | 13,50-14,50    | 624,0        | 8.305,4           | 86,5         |
| 15,0             | 2.350,0    | 0,14 | 14,50-15,50    | 444,5        | 8.749,9           | 91,2         |
| 16,0             | 2.350,0    | 0,11 | 15,50-16,50    | 305,0        | 9.054,9           | 94,3         |
| 17,0             | 2.350,0    | 0,09 | 16,50-17,50    | 202,7        | 9.257,6           | 96,4         |
| 18,0             | 2.350,0    | 0,08 | 17,50-18,50    | 131,3        | 9.388,9           | 97,8         |
| 19,0             | 2.350,0    | 0,07 | 18,50-19,50    | 83,5         | 9.472,4           | 98,7         |
| 20,0             | 2.350,0    | 0,06 | 19,50-20,50    | 52,3         | 9.524,7           | 99,2         |
| 21,0             | 2.350,0    | 0,05 | 20,50-21,50    | 32,4         | 9.557,1           | 99,6         |
| 22,0             | 2.350,0    | 0,04 | 21,50-22,50    | 19,8         | 9.576,8           | 99,8         |
| 23,0             | 2.350,0    | 0,04 | 22,50-23,50    | 11,9         | 9.588,7           | 99,9         |
| 24,0             | 2.350,0    | 0,03 | 23,50-24,50    | 7,1          | 9.595,8           | 100,0        |
| 25,0             | 2.350,0    | 0,03 | 24,50-25,50    | 2,6          | 9.598,4           | 100,0        |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 14:51/3.1.597

## PARK - Terrain

Calculation: 716033 WP Oostpolder alternatief 3bSite Data: A - Oostpolder site data

Obstacles:  
23 Obstacles used

Roughness:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2015\715068 WTG Intocon Eemshaven\TO\WP\ROUGHNESSLINE\_713066 715068\_1.wpo  
Min X: 219.227, Max X: 278.331, Min Y: 577.425, Max Y: 638.717, Width: 59.104 m, Height: 61.292 m

Orography:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\ObjectImports\713066 715068\_EMDGrid\_0(1).wpg  
Min X: 198.208, Max X: 300.556, Min Y: 557.205, Max Y: 659.267, Width: 102.348 m, Height: 102.062 m

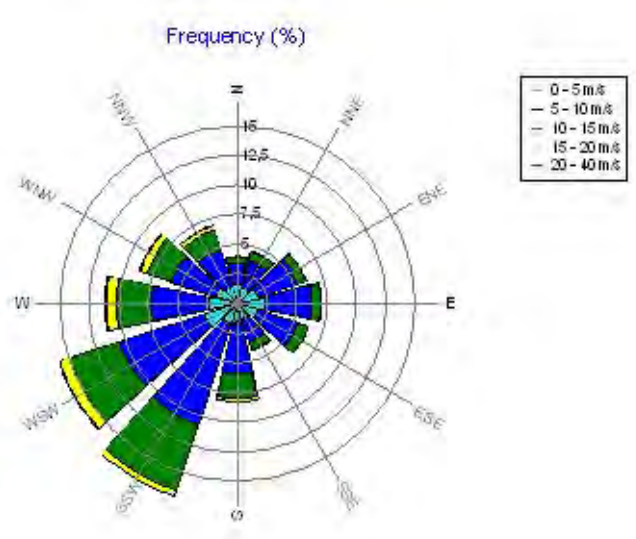
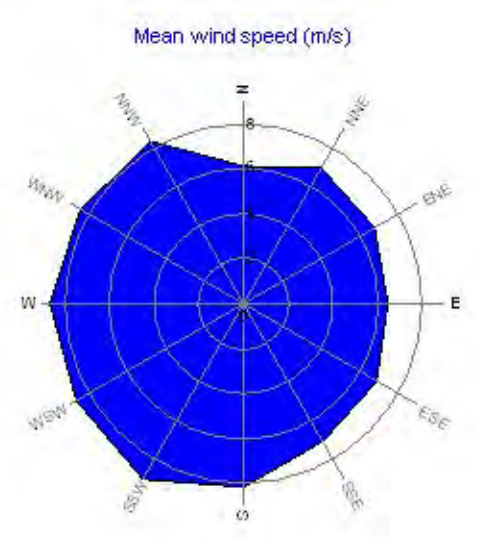
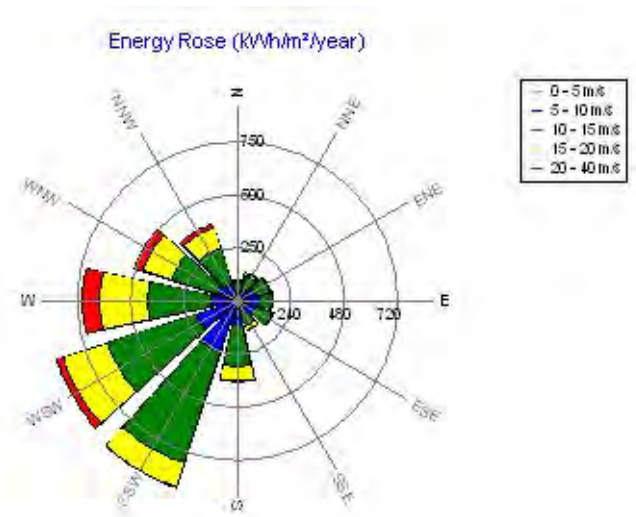
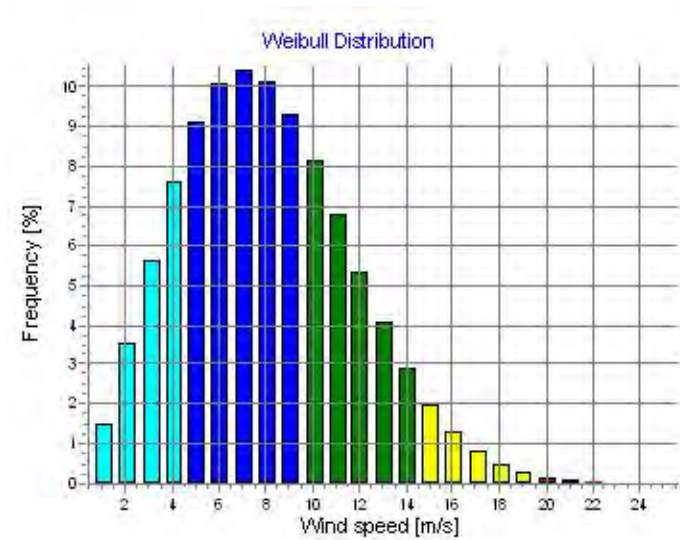
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 3bWind data: A - Oostpolder site data; Hub height: 100,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 6,90               | 6,13             | 1,854        | 4,0           |
| 1 NNE  | 7,85               | 6,95             | 2,322        | 4,5           |
| 2 ENE  | 7,60               | 6,75             | 2,545        | 6,1           |
| 3 E    | 7,30               | 6,48             | 2,553        | 7,1           |
| 4 ESE  | 7,79               | 6,91             | 2,498        | 6,3           |
| 5 SSE  | 7,97               | 7,06             | 2,115        | 4,2           |
| 6 S    | 9,18               | 8,14             | 2,486        | 8,2           |
| 7 SSW  | 10,06              | 9,00             | 3,146        | 17,0          |
| 8 WSW  | 9,71               | 8,61             | 2,393        | 15,8          |
| 9 W    | 9,77               | 8,65             | 2,068        | 11,2          |
| 10 WNW | 9,48               | 8,40             | 2,119        | 8,7           |
| 11 NNW | 9,43               | 8,35             | 2,209        | 6,9           |
| All    | 9,03               | 8,00             | 2,287        | 100,0         |



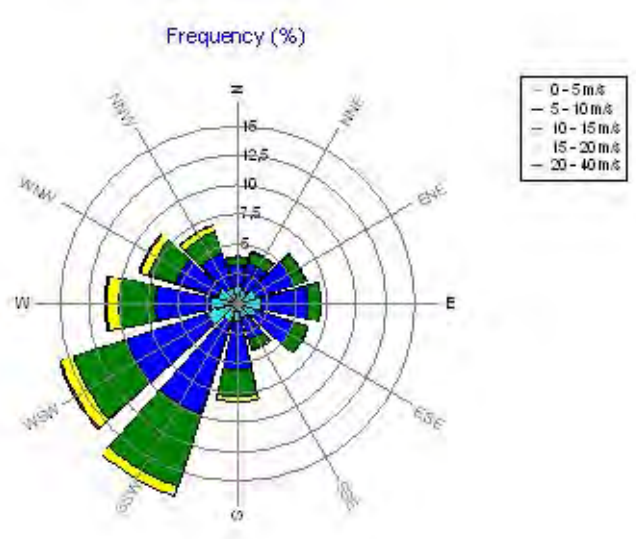
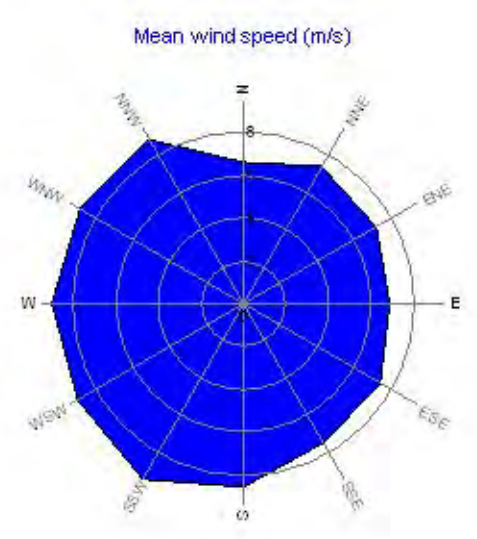
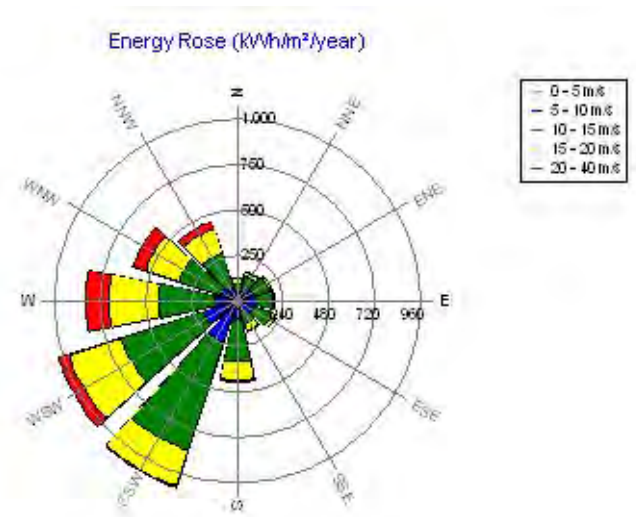
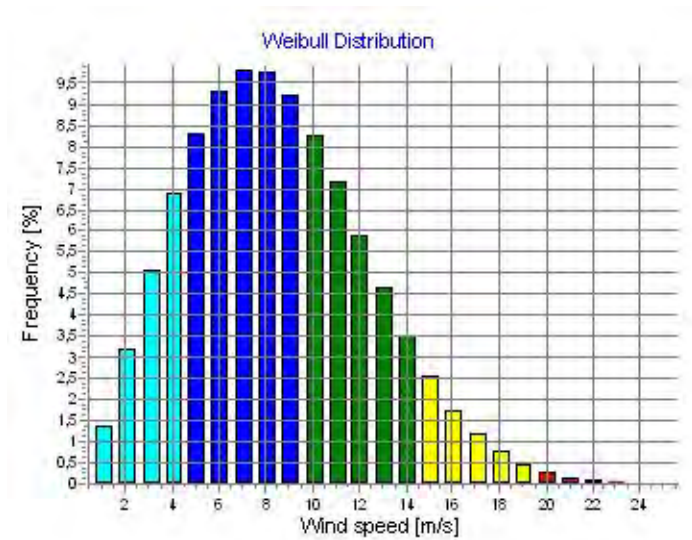
## PARK - Wind Data Analysis

Calculation: 716033 WP Oostpolder alternatief 3bWind data: A - Oostpolder site data; Hub height: 120,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 7,41               | 6,58             | 1,830        | 4,0           |
| 1 NNE  | 8,33               | 7,38             | 2,295        | 4,5           |
| 2 ENE  | 8,09               | 7,18             | 2,514        | 6,1           |
| 3 E    | 7,78               | 6,90             | 2,518        | 7,1           |
| 4 ESE  | 8,35               | 7,41             | 2,467        | 6,3           |
| 5 SSE  | 8,46               | 7,49             | 2,088        | 4,2           |
| 6 S    | 9,65               | 8,56             | 2,459        | 8,2           |
| 7 SSW  | 10,56              | 9,44             | 3,115        | 17,0          |
| 8 WSW  | 10,15              | 9,00             | 2,369        | 15,8          |
| 9 W    | 10,18              | 9,02             | 2,053        | 11,1          |
| 10 WNW | 10,01              | 8,87             | 2,096        | 8,7           |
| 11 NNW | 9,97               | 8,83             | 2,182        | 6,9           |
| All    | 9,51               | 8,43             | 2,275        | 100,0         |



## PARK - Park power curve

Calculation: 716033 WP Oostpolder alternatief 3b

| Wind speed [m/s] | Power          |                |         |          |          |         |          |          |         |          |          |         |          |          |
|------------------|----------------|----------------|---------|----------|----------|---------|----------|----------|---------|----------|----------|---------|----------|----------|
|                  | Free WTGs [kW] | Park WTGs [kW] | N [kW]  | NNE [kW] | ENE [kW] | E [kW]  | ESE [kW] | SSE [kW] | S [kW]  | SSW [kW] | WSW [kW] | W [kW]  | WNW [kW] | NNW [kW] |
| 0,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 1,5              | 2              | 1              | 0       | 0        | 0        | 0       | 0        | 1        | 1       | 1        | 1        | 1       | 0        | 0        |
| 2,5              | 1.519          | 706            | 708     | 733      | 723      | 651     | 470      | 666      | 836     | 849      | 802      | 673     | 432      | 636      |
| 3,5              | 7.241          | 4.184          | 4.238   | 4.358    | 4.346    | 3.939   | 3.197    | 4.200    | 4.574   | 4.701    | 4.651    | 4.047   | 3.033    | 3.903    |
| 4,5              | 19.569         | 12.696         | 13.026  | 13.260   | 13.383   | 12.187  | 10.239   | 12.590   | 13.348  | 13.678   | 13.777   | 12.334  | 10.140   | 12.506   |
| 5,5              | 38.152         | 26.020         | 26.594  | 26.983   | 27.135   | 25.029  | 21.664   | 25.979   | 27.262  | 27.699   | 27.927   | 25.408  | 21.550   | 25.744   |
| 6,5              | 65.109         | 45.150         | 46.156  | 46.692   | 46.780   | 43.457  | 38.074   | 45.072   | 47.225  | 47.890   | 48.231   | 44.209  | 37.956   | 44.693   |
| 7,5              | 101.621        | 71.331         | 73.039  | 73.871   | 73.950   | 68.838  | 60.600   | 71.186   | 74.468  | 75.468   | 75.898   | 69.792  | 60.379   | 70.744   |
| 8,5              | 147.250        | 105.808        | 108.612 | 109.864  | 110.045  | 102.512 | 90.334   | 105.654  | 110.154 | 111.588  | 112.263  | 103.354 | 89.852   | 105.315  |
| 9,5              | 199.177        | 148.520        | 153.240 | 154.660  | 155.180  | 144.802 | 127.962  | 148.506  | 154.042 | 155.548  | 156.688  | 144.827 | 127.096  | 148.947  |
| 10,5             | 249.930        | 196.433        | 204.368 | 204.896  | 205.946  | 192.997 | 171.473  | 196.682  | 202.995 | 203.400  | 205.231  | 191.389 | 170.842  | 199.525  |
| 11,5             | 292.253        | 244.959        | 254.781 | 253.839  | 255.597  | 240.988 | 216.868  | 246.008  | 252.839 | 252.090  | 254.555  | 239.148 | 216.535  | 249.750  |
| 12,5             | 323.939        | 287.381        | 298.901 | 296.742  | 298.728  | 283.910 | 259.850  | 289.039  | 295.246 | 293.128  | 295.909  | 280.959 | 260.320  | 294.089  |
| 13,5             | 347.478        | 322.080        | 333.342 | 331.275  | 333.247  | 319.608 | 298.680  | 324.071  | 328.454 | 326.513  | 328.764  | 315.997 | 298.283  | 328.766  |
| 14,5             | 361.684        | 348.107        | 355.662 | 354.351  | 355.735  | 345.915 | 330.907  | 350.745  | 353.240 | 351.850  | 353.263  | 344.339 | 329.382  | 352.108  |
| 15,5             | 369.119        | 362.723        | 366.749 | 366.307  | 366.760  | 361.515 | 352.075  | 364.607  | 365.839 | 365.290  | 365.687  | 360.859 | 351.520  | 364.778  |
| 16,5             | 372.207        | 370.077        | 371.655 | 371.478  | 371.615  | 369.555 | 365.391  | 371.093  | 371.455 | 371.250  | 371.326  | 369.366 | 365.246  | 370.986  |
| 17,5             | 372.702        | 372.382        | 372.666 | 372.638  | 372.658  | 372.268 | 371.465  | 372.582  | 372.655 | 372.623  | 372.641  | 372.296 | 371.379  | 372.539  |
| 18,5             | 372.692        | 372.673        | 372.696 | 372.698  | 372.694  | 372.665 | 372.591  | 372.691  | 372.692 | 372.693  | 372.693  | 372.672 | 372.587  | 372.693  |
| 19,5             | 372.675        | 372.679        | 372.680 | 372.681  | 372.679  | 372.679 | 372.679  | 372.680  | 372.677 | 372.679  | 372.678  | 372.678 | 372.681  | 372.682  |
| 20,5             | 366.657        | 366.659        | 366.660 | 366.661  | 366.659  | 366.658 | 366.658  | 366.659  | 366.658 | 366.659  | 366.658  | 366.658 | 366.661  | 366.662  |
| 21,5             | 366.641        | 366.645        | 366.646 | 366.647  | 366.644  | 366.643 | 366.643  | 366.645  | 366.643 | 366.644  | 366.643  | 366.644 | 366.647  | 366.648  |
| 22,5             | 366.629        | 366.630        | 366.631 | 366.632  | 366.630  | 366.629 | 366.630  | 366.630  | 366.629 | 366.630  | 366.629  | 366.630 | 366.632  | 366.632  |
| 23,5             | 366.619        | 366.620        | 366.622 | 366.622  | 366.620  | 366.619 | 366.619  | 366.620  | 366.619 | 366.620  | 366.619  | 366.620 | 366.622  | 366.623  |
| 24,5             | 366.640        | 366.630        | 366.614 | 366.618  | 366.628  | 366.634 | 366.632  | 366.629  | 366.640 | 366.635  | 366.638  | 366.632 | 366.619  | 366.615  |
| 25,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 26,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 27,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 28,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 29,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |

### Description:

The park power curve is similar to a WTG power curve, meaning that when a given wind speed appears in front of the park with same speed in the entire wind farm area (before influence from the park), the output from the park can be found in the park power curve. Another way to say this: The park power curve includes array losses, but do NOT include terrain given variations in the wind speed over the park area.

Measuring a park power curve is not as simple as measuring a WTG power curve due to the fact that the park power curve depends on the wind direction and that the same wind speed normally will not appear for the entire park area at the same time (only in very flat non-complex terrain). The idea with this version of the park power curve is not to use it for validation based on measurements. This would require at least 2 measurement masts at two sides of the park, unless only a few direction sectors should be tested, AND non complex terrain (normally only useable off shore). Another park power curve version for complex terrain is available in windPRO.

The park power curve can be used for:

- Forecast systems, based on more rough (approximated) wind data, the park power curve would be an efficient way to make the connection from wind speed (and direction) to power.
- Construction of duration curves, telling how often a given power output will appear, the park power curve can be used together with the average wind distribution for the Wind farm area in hub height. The average wind distribution can eventually be obtained based on the Weibull parameters for each WTG position. These are found at print menu: >Result to file< in the >Park result< which can be saved to file or copied to clipboard and pasted in Excel.
- Calculation of wind energy index based on the PARK production (see below).
- Estimation of the expected PARK production for an existing wind farm based on wind measurements at minimum 2 measurement masts at two sides of wind farm. The masts must be used for obtaining the free wind speed. The free wind speed is used in the simulation of expected energy production with the PARK power curve. This procedure will only work suitable in non complex terrains. For complex terrain another park power curve calculation is available in windPRO (PPV-model).

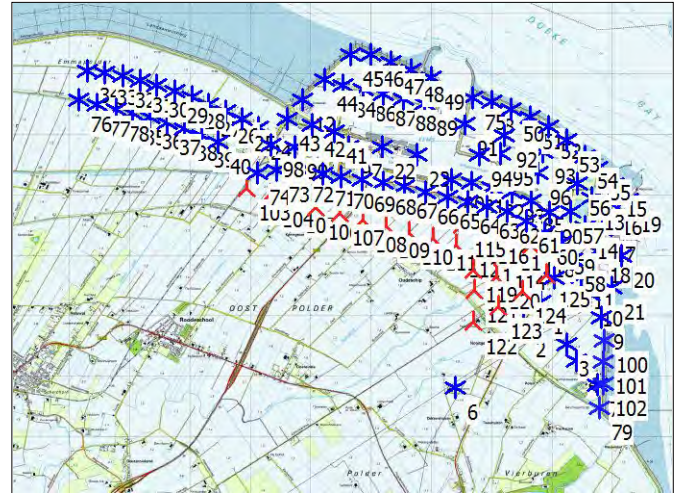
### Note:

From the >Result to file< the >Wind Speeds Inside Wind farm< is also available. These can (e.g. via Excel) be used for extracting the wake induced reductions in measured wind speed.

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 3b  
WTG distances

|    | Z    | Nearest WTG | Z    | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |
|----|------|-------------|------|---------------------|-----------------------------------|-----------------------------------|
|    | [m]  |             | [m]  | [m]                 |                                   |                                   |
| 1  | -0,3 | 124         | -0,6 | 348                 | 3,4                               | 2,6                               |
| 2  | 0,0  | 1           | -0,3 | 473                 | 3,5                               | 3,5                               |
| 3  | 0,0  | 4           | 0,2  | 315                 | 2,3                               | 2,3                               |
| 4  | 0,2  | 3           | 0,0  | 315                 | 2,3                               | 2,3                               |
| 5  | 0,3  | 125         | 0,2  | 127                 | 1,2                               | 0,9                               |
| 6  | -0,1 | 122         | -0,2 | 1.121               | 23,8                              | 10,9                              |
| 7  | 1,8  | 102         | 0,2  | 87                  | 1,7                               | 0,9                               |
| 8  | 1,6  | 75          | 1,0  | 323                 | 3,9                               | 2,8                               |
| 9  | 0,1  | 100         | 0,0  | 384                 | 4,7                               | 3,8                               |
| 10 | -0,4 | 11          | 1,0  | 321                 | 3,9                               | 3,9                               |
| 11 | 1,0  | 58          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 12 | 2,5  | 43          | 1,9  | 417                 | 5,1                               | 3,0                               |
| 13 | -1,0 | 16          | 2,0  | 300                 | 3,7                               | 3,7                               |
| 14 | 1,0  | 17          | 2,7  | 301                 | 3,7                               | 3,7                               |
| 15 | 1,0  | 16          | 2,0  | 306                 | 3,7                               | 3,7                               |
| 16 | 2,0  | 13          | -1,0 | 300                 | 3,7                               | 3,7                               |
| 17 | 2,7  | 14          | 1,0  | 301                 | 3,7                               | 3,7                               |
| 18 | -0,7 | 17          | 2,7  | 360                 | 4,4                               | 4,4                               |
| 19 | 0,1  | 16          | 2,0  | 320                 | 3,9                               | 3,9                               |
| 20 | 2,0  | 18          | -0,7 | 401                 | 4,9                               | 4,9                               |
| 21 | 0,0  | 10          | -0,4 | 379                 | 4,6                               | 4,6                               |
| 22 | 4,3  | 97          | 2,8  | 563                 | 6,3                               | 4,5                               |
| 23 | 3,1  | 67          | 1,3  | 561                 | 6,8                               | 4,5                               |
| 24 | -1,2 | 25          | -0,4 | 315                 | 3,8                               | 3,8                               |
| 25 | -0,4 | 26          | -1,0 | 301                 | 3,7                               | 3,7                               |
| 26 | -1,0 | 25          | -0,4 | 301                 | 3,7                               | 3,7                               |
| 27 | -1,3 | 28          | 0,2  | 303                 | 3,7                               | 3,7                               |
| 28 | 0,2  | 29          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 29 | 1,8  | 28          | 0,2  | 300                 | 3,7                               | 3,7                               |
| 30 | -2,0 | 31          | -0,7 | 288                 | 3,5                               | 3,5                               |
| 31 | -0,7 | 30          | -2,0 | 288                 | 3,5                               | 3,5                               |
| 32 | 0,3  | 33          | 0,1  | 299                 | 3,6                               | 3,6                               |
| 33 | 0,1  | 34          | -1,1 | 297                 | 3,6                               | 3,6                               |
| 34 | -1,1 | 33          | 0,1  | 297                 | 3,6                               | 3,6                               |
| 35 | 1,8  | 78          | -1,5 | 279                 | 3,4                               | 2,5                               |
| 36 | 0,5  | 35          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 37 | 1,5  | 36          | 0,5  | 300                 | 3,7                               | 3,7                               |
| 38 | -0,2 | 37          | 1,5  | 302                 | 3,7                               | 3,7                               |
| 39 | 0,6  | 38          | -0,2 | 302                 | 3,7                               | 3,7                               |
| 40 | 0,9  | 39          | 0,6  | 303                 | 3,7                               | 3,7                               |
| 41 | 2,7  | 97          | 2,8  | 356                 | 4,3                               | 4,0                               |
| 42 | 0,2  | 41          | 2,7  | 382                 | 4,7                               | 4,7                               |
| 43 | 1,9  | 12          | 2,5  | 417                 | 5,1                               | 3,0                               |
| 44 | -0,5 | 84          | 0,1  | 311                 | 3,8                               | 3,5                               |
| 45 | 0,2  | 46          | 2,8  | 333                 | 4,1                               | 4,1                               |
| 46 | 2,8  | 45          | 0,2  | 333                 | 4,1                               | 4,1                               |
| 47 | 4,8  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 48 | 1,4  | 49          | 3,2  | 355                 | 4,3                               | 4,3                               |
| 49 | 3,2  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 50 | 1,1  | 8           | 1,6  | 340                 | 4,2                               | 2,9                               |
| 51 | 1,4  | 50          | 1,1  | 342                 | 4,2                               | 4,2                               |
| 52 | 2,1  | 51          | 1,4  | 349                 | 4,3                               | 4,3                               |
| 53 | 0,8  | 52          | 2,1  | 370                 | 4,5                               | 4,5                               |
| 54 | 0,6  | 55          | 1,8  | 289                 | 3,5                               | 3,5                               |
| 55 | 1,8  | 54          | 0,6  | 289                 | 3,5                               | 3,5                               |
| 56 | -0,4 | 13          | -1,0 | 345                 | 4,2                               | 4,2                               |
| 57 | -0,7 | 14          | 1,0  | 345                 | 4,2                               | 4,2                               |
| 58 | 1,0  | 11          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 59 | 4,7  | 58          | 1,0  | 333                 | 4,1                               | 4,1                               |
| 60 | -0,3 | 118         | 0,2  | 307                 | 3,7                               | 3,0                               |
| 61 | 1,7  | 85          | 1,3  | 338                 | 4,1                               | 3,8                               |
| 62 | -1,0 | 83          | 3,1  | 332                 | 4,1                               | 3,7                               |
| 63 | -2,9 | 82          | 1,0  | 327                 | 4,0                               | 3,6                               |



▲ New WTG

Scale 1:125.000

\* Existing WTG

To be continued on next page...

## PARK - WTG distances

Calculation: 716033 WP Oostpolder alternatief 3b

...continued from previous page

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |      |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|------|
| [m] |             | [m] | [m]                 |                                   |                                   |      |
| 64  | 0,3         | 81  | 1,8                 | 324                               | 4,0                               | 3,6  |
| 65  | -1,9        | 80  | 2,3                 | 306                               | 3,7                               | 3,4  |
| 66  | 1,5         | 65  | -1,9                | 367                               | 4,5                               | 4,5  |
| 67  | 1,3         | 68  | -1,2                | 353                               | 4,3                               | 4,3  |
| 68  | -1,2        | 67  | 1,3                 | 353                               | 4,3                               | 4,3  |
| 69  | -0,5        | 68  | -1,2                | 353                               | 4,3                               | 4,3  |
| 70  | 0,5         | 71  | 0,0                 | 308                               | 3,8                               | 3,8  |
| 71  | 0,0         | 70  | 0,5                 | 308                               | 3,8                               | 3,8  |
| 72  | -0,1        | 71  | 0,0                 | 370                               | 4,5                               | 4,5  |
| 73  | 0,6         | 74  | -1,3                | 321                               | 3,9                               | 3,9  |
| 74  | -1,3        | 73  | 0,6                 | 321                               | 3,9                               | 3,9  |
| 75  | 1,0         | 8   | 1,6                 | 323                               | 3,9                               | 2,8  |
| 76  | 0,7         | 77  | 0,4                 | 309                               | 2,8                               | 2,8  |
| 77  | 0,4         | 76  | 0,7                 | 309                               | 2,8                               | 2,8  |
| 78  | -1,5        | 35  | 1,8                 | 279                               | 3,4                               | 2,5  |
| 79  | 1,0         | 7   | 1,8                 | 382                               | 7,3                               | 3,3  |
| 80  | 2,3         | 65  | -1,9                | 306                               | 3,7                               | 3,4  |
| 81  | 1,8         | 64  | 0,3                 | 324                               | 4,0                               | 3,6  |
| 82  | 1,0         | 63  | -2,9                | 327                               | 4,0                               | 3,6  |
| 83  | 3,1         | 62  | -1,0                | 332                               | 4,1                               | 3,7  |
| 84  | 0,1         | 44  | -0,5                | 311                               | 3,8                               | 3,5  |
| 85  | 1,3         | 61  | 1,7                 | 338                               | 4,1                               | 3,8  |
| 86  | 0,4         | 84  | 0,1                 | 332                               | 3,7                               | 3,7  |
| 87  | 1,0         | 88  | 0,9                 | 351                               | 3,9                               | 3,9  |
| 88  | 0,9         | 87  | 1,0                 | 351                               | 3,9                               | 3,9  |
| 89  | 2,3         | 88  | 0,9                 | 352                               | 3,9                               | 3,9  |
| 90  | 1,5         | 60  | -0,3                | 335                               | 4,1                               | 3,7  |
| 91  | 4,2         | 75  | 1,0                 | 455                               | 5,6                               | 5,1  |
| 92  | -0,8        | 95  | 2,7                 | 320                               | 3,6                               | 3,6  |
| 93  | 1,9         | 96  | 1,6                 | 371                               | 4,1                               | 4,1  |
| 94  | 1,6         | 95  | 2,7                 | 351                               | 3,9                               | 3,9  |
| 95  | 2,7         | 92  | -0,8                | 320                               | 3,6                               | 3,6  |
| 96  | 1,6         | 93  | 1,9                 | 371                               | 4,1                               | 4,1  |
| 97  | 2,8         | 41  | 2,7                 | 356                               | 4,3                               | 4,0  |
| 98  | -1,2        | 24  | -1,2                | 347                               | 4,2                               | 3,9  |
| 99  | -1,1        | 98  | -1,2                | 398                               | 4,4                               | 4,4  |
| 100 | 0,0         | 101 | 0,0                 | 360                               | 3,6                               | 3,6  |
| 101 | 0,0         | 102 | 0,2                 | 359                               | 3,6                               | 3,6  |
| 102 | 0,2         | 7   | 1,8                 | 87                                | 1,7                               | 0,9  |
| 103 | 0,0         | 74  | -1,3                | 327                               | 4,0                               | 3,2  |
| 104 | -0,7        | 105 | -1,6                | 400                               | 3,9                               | 3,9  |
| 105 | -1,6        | 106 | -0,5                | 400                               | 3,9                               | 3,9  |
| 106 | -0,5        | 107 | -1,1                | 400                               | 3,9                               | 3,9  |
| 107 | -1,1        | 108 | -1,0                | 400                               | 3,9                               | 3,9  |
| 108 | -1,0        | 109 | -0,3                | 400                               | 3,9                               | 3,9  |
| 109 | -0,3        | 110 | -1,0                | 400                               | 3,9                               | 3,9  |
| 110 | -1,0        | 111 | -0,4                | 400                               | 3,9                               | 3,9  |
| 111 | -0,4        | 112 | -1,6                | 400                               | 3,9                               | 3,9  |
| 112 | -1,6        | 115 | 0,0                 | 349                               | 3,4                               | 3,4  |
| 113 | -0,8        | 119 | -2,0                | 324                               | 3,1                               | 3,1  |
| 114 | 0,9         | 117 | 0,0                 | 332                               | 3,2                               | 3,2  |
| 115 | 0,0         | 112 | -1,6                | 349                               | 3,4                               | 3,4  |
| 116 | 1,1         | 113 | -0,8                | 337                               | 3,3                               | 3,3  |
| 117 | 0,0         | 114 | 0,9                 | 332                               | 3,2                               | 3,2  |
| 118 | 0,2         | 60  | -0,3                | 307                               | 3,7                               | 3,0  |
| 119 | -2,0        | 113 | -0,8                | 324                               | 3,1                               | 3,1  |
| 120 | 0,0         | 114 | 0,9                 | 339                               | 3,3                               | 3,3  |
| 121 | 0,2         | 119 | -2,0                | 343                               | 3,3                               | 3,3  |
| 122 | -0,2        | 123 | -0,2                | 480                               | 4,7                               | 4,7  |
| 123 | -0,2        | 121 | 0,2                 | 470                               | 4,6                               | 4,6  |
| 124 | -0,6        | 1   | -0,3                | 348                               | 3,4                               | 2,6  |
| 125 | 0,2         | 5   | 0,3                 | 127                               | 1,2                               | 0,9  |
| Min | -2,9        |     | -2,9                | 87                                | 1,2                               | 0,9  |
| Max | 4,8         |     | 3,2                 | 1.121                             | 23,8                              | 10,9 |



Project:  
24\_01\_2017

Licensed user:  
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Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 14:51/3.1.597

## PARK - Wind statistics info

Calculation: 716033 WP Oostpolder alternatief 3b

### Main data for wind statistic

File \\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\200117\24012017\RWE\_Oostpolder 100m-Corr099.wws  
Name RWE\_Oostpolder 100m-Corr099  
Country Netherlands  
Source User  
Mast coordinates Dutch Stereo-RD/NAP 2000 East: 248.822 North: 608.196  
Created 24-1-2017  
Edited 1-2-2017  
Sectors 12  
WAsP version WAsP 11 Version 11.05.0028  
Displacement height None

### Additional info for wind statistic

Source data Default Meteo data RWE  
Data from 25-4-2007  
Data to 31-1-2009  
Measurement length 21,3 Months

### Note

To get the most correct calculation results, wind statistics shall be calculated with the SAME model and model parameters, as currently chosen in calculation. For WAsP versions before 10.0, the model is unchanged, but thereafter more model changes affecting the wind statistic is seen. Likewise WAsP CFD should always use WAsP CFD calculated wind statistics.

### PARK - Map

Calculation: 716033 WP Oostpolder alternatief 3b



0 1 2 3 4 km

Map: Uithuizen , Print scale 1:75.000, Map center Dutch Stereo-RD/NAP 2000 East: 249.717 North: 606.402

- New WTG
- Existing WTG
- Obstacle

## PARK - Main Result

Calculation: WP Oostpolder VKA1

Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings  
 Air density calculation mode Individual per WTG  
 Result for WTG at hub altitude 1,232 kg/m<sup>3</sup> to 1,248 kg/m<sup>3</sup>  
 Air density relative to standard 100,6 % to 101,8 %  
 Hub altitude above sea level (asl) 39,9 m to 166,0 m  
 Annual mean temperature at hub alt. 8,0 °C to 8,8 °C  
 Pressure at WTGs 994,3 hPa to 1.009,6 hPa

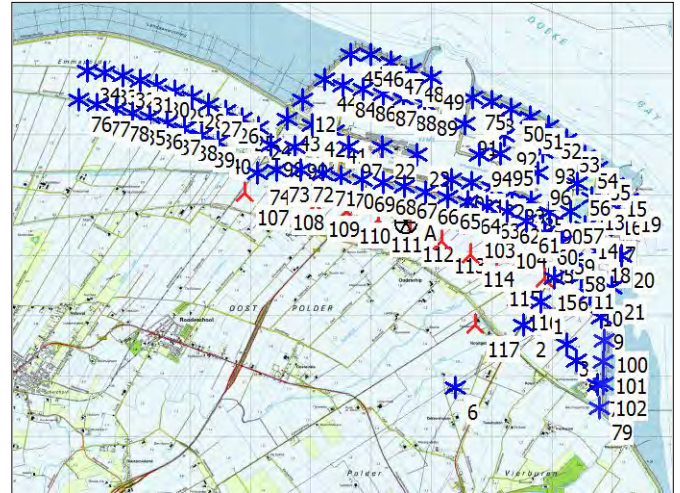
Wake Model Parameters  
 Terrain type Wake decay constant  
 HH:100m Open farmland 0,062

Displacement heights from objects

Wake calculation settings  
 Angle [°] Wind speed [m/s]  
 start end step start end step  
 0,5 360,0 1,0 0,5 30,5 1,0

Wind statistics RWE\_Oostpolder 100m-Corr099.wws

WASP version WASP 11 Version 11.05.0028



Scale 1:125.000

\* Existing WTG

▲ New WTG  
 ● Site Data

### Key results for height 165,0 m above ground level

Terrain Dutch Stereo-RD/NAP 2000

X (east) Y (north) Name of wind distribution Type

|  | Wind energy [kWh/m <sup>2</sup> ] | Mean wind speed [m/s] | Equivalent roughness |
|--|-----------------------------------|-----------------------|----------------------|
| A 250.596 606.527 Oostpolder site data | 7.041                             | 9,2                   | 1,1                  |

### Calculated Annual Energy for Wind Farm

| WTG combination                                | Result PARK [MWh/y] | GROSS (no loss) Free WTGs [MWh/y] | Park efficiency [%] | Specific results <sup>a)</sup> |                         |                              |                                   |
|--|---------------------|-----------------------------------|---------------------|--------------------------------|-------------------------|------------------------------|-----------------------------------|
|  |                     |                                   |                     | Capacity factor [%]            | Mean WTG result [MWh/y] | Full load hours [Hours/year] | Mean wind speed @hub height [m/s] |
| Wind farm                                      | 1.171.467,0         | 1.392.130,4                       | 84,1                | 35,1                           | 10.012,5                | 3.081                        | 8,3                               |
| New WTGs only                                  | 293.461,2           | 323.867,9                         | 90,6                | 53,1                           | 19.564,1                | 4.658                        | 9,2                               |
| Existing park WTGs only                        | 878.005,7           | 1.068.262,5                       | 82,2                | 31,6                           | 8.607,9                 | 2.767                        | 8,2                               |
| Existing park WTGs without new WTGs            | 904.288,4           | 1.068.262,5                       | 84,7                |                                | 8.865,6                 |                              |                                   |
| Reduction for existing park WTGs caused by new | 26.282,7            |                                   |                     |                                |                         |                              |                                   |

<sup>a)</sup> Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 15 new WTGs with total 63,0 MW rated power

| Links | Valid | WTG type Manufact. | Type-generator  | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Power curve Creator | Name                      | Annual Energy Park |                |                     |                            |      |
|-------|-------|--------------------|-----------------|-------------------|--------------------|----------------|---------------------|---------------------------|--------------------|----------------|---------------------|----------------------------|------|
|       |       |                    |                 |                   |                    |                |                     |                           | Result [MWh]       | Efficiency [%] | Capacity factor [%] | Free mean wind speed [m/s] |      |
| 103 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.112,7       | 88,01               | 51,9                       | 9,20 |
| 104 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 18.929,4       | 87,02               | 51,4                       | 9,21 |
| 105 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 18.979,9       | 87,24               | 51,6                       | 9,21 |
| 106 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 18.015,5       | 83,05               | 48,9                       | 9,18 |
| 107 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 20.421,1       | 95,08               | 55,5                       | 9,13 |
| 108 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 20.098,8       | 93,49               | 54,6                       | 9,13 |
| 109 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.975,6       | 92,70               | 54,3                       | 9,14 |
| 110 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.889,6       | 92,38               | 54,0                       | 9,13 |
| 111 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.892,7       | 92,26               | 54,0                       | 9,14 |
| 112 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.822,7       | 91,88               | 53,8                       | 9,14 |
| 113 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.662,1       | 91,06               | 53,4                       | 9,15 |
| 114 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.581,2       | 90,64               | 53,2                       | 9,15 |
| 115 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.426,3       | 89,98               | 52,8                       | 9,14 |
| 116 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 19.352,3       | 89,78               | 52,6                       | 9,12 |
| 117 A | Yes   | ENERCON            | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- | 4200kW - 04/2016   | 20.301,3       | 94,78               | 55,1                       | 9,07 |

Annual Energy results do not include any losses apart from wake losses. For expected NET AEP (expected sold production), see report Loss & Uncertainty.



## PARK - Main Result

Calculation: WP Oostpolder VKA1

Calculated Annual Energy for each of 102 existing park WTGs with total 317,3 MW rated power

| Links | WTG type |            |                            | Power, rated | Rotor diameter | Hub height | Power curve |   | Annual Energy                     |                |                          | Park Efficiency |       |
|-------|----------|------------|----------------------------|--------------|----------------|------------|-------------|---|-----------------------------------|----------------|--------------------------|-----------------|-------|
|       | Valid    | Manufact.  | Type-generator             |              |                |            | Creator     | Name  | Calculated prod. without new WTGs | After New WTGs | Decrease due to new WTGs |                 |       |
|       |          |            |                            | [kW]         | [m]            | [m]        |             |   | [MWh]                             | [MWh]          | [MWh %]                  | [%]             |       |
| 1 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                    | 18.622,7                          | 17.609,1       | 1.013,6                  | 5,4             | 85,89 |
| 2 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                    | 19.349,2                          | 18.741,8       | 607,4                    | 3,1             | 91,90 |
| 3 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                    | 19.142,7                          | 18.861,9       | 280,8                    | 1,5             | 91,99 |
| 4 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                    | 19.174,0                          | 18.999,6       | 174,4                    | 0,9             | 92,67 |
| 5 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500           | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                    | 18.071,8                          | 15.890,4       | 2.181,5                  | 12,1            | 77,03 |
| 6 A   | No       | VESTAS     | V47-660                    | 660          | 47,0           | 40,0       | EMD         | Level 0 - calculated - - 07-2001                | 1.477,2                           | 1.464,4        | 12,8                     | 0,9             | 96,19 |
| 7 A   | Yes      | VESTAS     | V52-850                    | 850          | 52,0           | 40,0       | EMD         | Level 0 - calculated - 104.2 dB(A) - 07-2006    | 1.989,3                           | 1.973,1        | 16,2                     | 0,8             | 92,33 |
| 8 A   | Yes      | VESTAS     | V117-3.45-3.450            | 3.450        | 117,0          | 93,5       | EMD         | Level 0 - Calculated - Modes 0 & 0-0S - 01-2016 | 12.967,1                          | 12.841,3       | 125,7                    | 1,0             | 84,97 |
| 9 A   | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.706,0                           | 7.566,4        | 139,6                    | 1,8             | 84,43 |
| 10 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.552,7                           | 7.350,7        | 202,1                    | 2,7             | 82,20 |
| 11 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.445,1                           | 7.097,7        | 347,4                    | 4,7             | 79,42 |
| 12 A  | No       | 2-B Energy | OTC 6 MW-6.000             | 6.000        | 140,0          | 105,0      | USER        | Turbulent power curve with TI of 8.7%           | 18.447,6                          | 18.281,4       | 166,2                    | 0,9             | 83,65 |
| 13 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 6.913,2                           | 6.756,1        | 157,0                    | 2,3             | 73,24 |
| 14 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 6.891,4                           | 6.641,3        | 250,1                    | 3,6             | 72,86 |
| 15 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.205,1                           | 7.123,4        | 81,7                     | 1,1             | 75,50 |
| 16 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.086,1                           | 6.968,7        | 117,3                    | 1,7             | 74,90 |
| 17 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.140,3                           | 6.964,7        | 175,6                    | 2,5             | 75,71 |
| 18 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.071,5                           | 6.808,3        | 263,2                    | 3,7             | 75,53 |
| 19 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.452,9                           | 7.381,1        | 71,8                     | 1,0             | 80,33 |
| 20 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.655,9                           | 7.540,7        | 115,2                    | 1,5             | 81,47 |
| 21 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.541,7                           | 7.400,9        | 140,9                    | 1,9             | 81,77 |
| 22 A  | No       | Senvion    | 6.2M126-6.150              | 6.150        | 126,0          | 114,0      | USER        | Calcdated power curve Senvion 6.2M126           | 18.923,9                          | 18.471,2       | 452,8                    | 2,4             | 83,00 |
| 23 A  | No       | Senvion    | 6.2M126-6.150              | 6.150        | 126,0          | 114,0      | USER        | Calcdated power curve Senvion 6.2M126           | 18.926,8                          | 18.397,6       | 529,2                    | 2,8             | 82,37 |
| 24 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.673,1                           | 7.543,2        | 129,9                    | 1,7             | 84,14 |
| 25 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.541,6                           | 7.473,7        | 67,9                     | 0,9             | 82,85 |
| 26 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.392,8                           | 7.339,2        | 53,7                     | 0,7             | 81,50 |
| 27 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.420,1                           | 7.398,5        | 21,5                     | 0,3             | 81,85 |
| 28 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.484,6                           | 7.469,1        | 15,5                     | 0,2             | 82,02 |
| 29 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.535,0                           | 7.520,2        | 14,8                     | 0,2             | 82,38 |
| 30 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.476,5                           | 7.464,7        | 11,7                     | 0,2             | 82,45 |
| 31 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.555,8                           | 7.546,9        | 8,9                      | 0,1             | 83,01 |
| 32 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.750,1                           | 7.742,8        | 7,3                      | 0,1             | 84,29 |
| 33 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.943,6                           | 7.934,8        | 8,8                      | 0,1             | 86,36 |
| 34 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.428,3                           | 8.420,4        | 7,9                      | 0,1             | 91,87 |
| 35 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.909,3                           | 7.891,6        | 17,7                     | 0,2             | 87,28 |
| 36 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.889,4                           | 7.870,5        | 18,9                     | 0,2             | 87,38 |
| 37 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.893,4                           | 7.870,2        | 23,1                     | 0,3             | 87,46 |
| 38 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.866,4                           | 7.837,2        | 29,2                     | 0,4             | 87,47 |
| 39 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.861,8                           | 7.821,1        | 40,7                     | 0,5             | 87,36 |
| 40 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.904,6                           | 7.845,0        | 59,6                     | 0,8             | 87,79 |
| 41 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.518,0                           | 7.349,3        | 168,6                    | 2,2             | 80,41 |
| 42 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.268,4                           | 7.127,6        | 140,8                    | 1,9             | 78,43 |
| 43 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.412,0                           | 7.316,0        | 96,0                     | 1,3             | 80,61 |
| 44 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.803,4                           | 7.746,5        | 56,9                     | 0,7             | 81,85 |
| 45 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.274,8                           | 8.235,3        | 39,5                     | 0,5             | 85,08 |
| 46 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.204,3                           | 8.167,5        | 36,8                     | 0,4             | 83,77 |
| 47 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.225,9                           | 8.170,6        | 55,4                     | 0,7             | 83,64 |
| 48 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.993,8                           | 7.937,0        | 56,8                     | 0,7             | 82,74 |
| 49 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.950,5                           | 7.887,9        | 62,6                     | 0,8             | 82,74 |
| 50 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.822,5                           | 7.739,2        | 83,2                     | 1,1             | 80,57 |
| 51 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.887,4                           | 7.772,0        | 115,4                    | 1,5             | 81,07 |
| 52 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.861,1                           | 7.763,3        | 97,8                     | 1,2             | 80,76 |
| 53 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.855,6                           | 7.725,2        | 130,5                    | 1,7             | 80,81 |
| 54 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.716,6                           | 7.589,3        | 127,3                    | 1,6             | 79,64 |
| 55 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.505,1                           | 7.371,8        | 133,3                    | 1,8             | 77,45 |
| 56 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.270,2                           | 7.048,4        | 221,8                    | 3,1             | 75,57 |
| 57 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.105,1                           | 6.757,4        | 347,7                    | 4,9             | 73,79 |
| 58 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.258,3                           | 6.758,4        | 499,9                    | 6,9             | 75,22 |
| 59 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.501,0                           | 6.818,6        | 682,4                    | 9,1             | 74,82 |
| 60 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.562,7                           | 6.696,0        | 866,7                    | 11,5            | 74,56 |
| 61 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.660,4                           | 6.786,4        | 874,0                    | 11,4            | 75,34 |
| 62 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.561,1                           | 6.704,1        | 857,0                    | 11,3            | 74,52 |
| 63 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.602,4                           | 6.729,1        | 873,3                    | 11,5            | 75,04 |
| 64 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.691,8                           | 7.035,8        | 656,1                    | 8,5             | 78,21 |
| 65 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.715,1                           | 7.180,2        | 535,0                    | 6,9             | 80,41 |
| 66 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.859,2                           | 7.255,6        | 603,7                    | 7,7             | 80,87 |
| 67 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.845,8                           | 7.291,8        | 554,0                    | 7,1             | 81,15 |
| 68 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.779,6                           | 7.282,3        | 497,3                    | 6,4             | 81,96 |
| 69 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.761,8                           | 7.175,9        | 585,9                    | 7,5             | 80,91 |
| 70 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.711,7                           | 7.180,1        | 531,5                    | 6,9             | 81,09 |
| 71 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.742,1                           | 7.213,3        | 528,8                    | 6,8             | 81,73 |
| 72 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.697,6                           | 7.191,7        | 506,0                    | 6,6             | 81,85 |
| 73 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 7.781,2                           | 7.359,2        | 422,0                    | 5,4             | 83,23 |
| 74 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.055,1                           | 7.564,6        | 490,5                    | 6,1             | 86,29 |
| 75 A  | Yes      | ENERCON    | E-82 E3-3.000              | 3.000        | 82,0           | 100,0      | EMD         | Level 0 - official - Mode 0 - 08/2014           | 8.075,2                           | 7.978,1        | 97,1                     | 1,2             | 83,24 |
| 76 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013          | 12.800,1                          | 12.792,4       | 7,7                      | 0,1             | 94,32 |
| 77 A  | Yes      | VESTAS     | V112-3.3 Gridstreame-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013          | 12.289,5                          | 12.279,9</     |                          |                 |       |



## PARK - Main Result

### Calculation: WP Oostpolder VKA1

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| Links | WTG type |           | Type-generator | Power, rated | Rotor diameter | Hub height | Power curve |   | Annual Energy without new WTGs | Annual Energy After New WTGs | Decrease due to new WTGs | Park Efficiency |
|-------|----------|-----------|----------------|--------------|----------------|------------|-------------|---|--------------------------------|------------------------------|--------------------------|-----------------|
|       | Valid    | Manufact. |                |              |                |            | Creator     | Name  |                                |                              |                          |                 |
| 84 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.733,7                        | 8.661,5                      | 72,2 0,8                 | 81,20           |
| 85 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.121,8                        | 7.559,3                      | 562,5 6,9                | 72,66           |
| 86 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.822,1                        | 8.696,8                      | 84,4 1,0                 | 81,44           |
| 87 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.822,1                        | 8.715,9                      | 106,1 1,2                | 81,85           |
| 88 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.752,0                        | 8.645,9                      | 106,1 1,2                | 80,93           |
| 89 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.895,2                        | 8.775,5                      | 119,6 1,3                | 82,42           |
| 90 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.130,7                        | 7.603,1                      | 527,6 6,5                | 72,84           |
| 91 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 9.087,9                        | 8.930,0                      | 157,9 1,7                | 82,95           |
| 92 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.377,8                        | 8.242,2                      | 135,6 1,6                | 77,56           |
| 93 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.474,5                        | 8.326,9                      | 147,5 1,7                | 78,05           |
| 94 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.516,5                        | 8.308,8                      | 207,7 2,4                | 78,43           |
| 95 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.425,9                        | 8.199,4                      | 226,5 2,7                | 77,49           |
| 96 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.377,8                        | 8.120,8                      | 257,0 3,1                | 76,60           |
| 97 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.445,4                        | 8.164,6                      | 280,8 3,3                | 79,01           |
| 98 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.474,3                        | 8.288,2                      | 186,1 2,2                | 81,89           |
| 99 A  | Yes      | VESTAS    | V90-3.000      | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009 | 8.271,9                        | 8.004,9                      | 267,0 3,2                | 79,11           |
| 100 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                | 8.344,3                        | 8.247,1                      | 97,2 1,2                 | 87,77           |
| 101 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                | 8.514,6                        | 8.454,0                      | 60,6 0,7                 | 90,11           |
| 102 A | Yes      | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013                | 8.611,5                        | 8.554,1                      | 57,4 0,7                 | 91,46           |

### WTG siting

Dutch Stereo-RD/NAP 2000

X (east) Y (north) Z Row data/Description

| 1  | Exist | 252.819 | 605.227 | -0,3 | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) | (244) |  |
|----|-------|---------|---------|------|------------------------------------|-----------------------------|-------|--|
| 2  | Exist | 252.538 | 604.846 | 0,0  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) | (245) |  |
| 3  | Exist | 253.250 | 604.530 | 0,0  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) | (246) |  |
| 4  | Exist | 253.410 | 604.258 | 0,2  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) | (247) |  |
| 5  | Exist | 253.038 | 605.625 | 0,3  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) | (248) |  |
| 6  | Exist | 251.401 | 603.815 | -0,1 | VESTAS V47 660 47.0 !O!            | hub: 40,0 m (TOT: 63,5 m)   | (264) |  |
| 7  | Exist | 253.765 | 603.860 | 1,8  | VESTAS V52 850 52.0 !O!            | hub: 40,0 m (TOT: 66,0 m)   | (265) |  |
| 8  | Exist | 252.007 | 608.545 | 1,6  | VESTAS V117-3.45 3450 117.0 !O!    | hub: 93,5 m (TOT: 152,0 m)  | (266) |  |
| 9  | Exist | 253.830 | 604.979 | 0,1  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (267) |  |
| 10 | Exist | 253.634 | 605.359 | -0,4 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (268) |  |
| 11 | Exist | 253.487 | 605.644 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (269) |  |
| 12 | Exist | 248.875 | 608.572 | 2,5  | 2-B Energy OTC 6 MW 6000 140.0 !#! | hub: 105,0 m (TOT: 175,0 m) | (270) |  |
| 13 | Exist | 253.662 | 606.943 | -1,0 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (271) |  |
| 14 | Exist | 253.548 | 606.476 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (272) |  |
| 15 | Exist | 254.026 | 607.172 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (273) |  |
| 16 | Exist | 253.954 | 606.875 | 2,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (274) |  |
| 17 | Exist | 253.843 | 606.417 | 2,7  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (275) |  |
| 18 | Exist | 253.758 | 606.067 | -0,7 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (276) |  |
| 19 | Exist | 254.272 | 606.915 | 0,1  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (277) |  |
| 20 | Exist | 254.151 | 605.985 | 2,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (278) |  |
| 21 | Exist | 253.996 | 605.473 | 0,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (279) |  |
| 22 | Exist | 250.194 | 607.795 | 4,3  | Senvion 6.2M126 6150 126.0 !O!     | hub: 114,0 m (TOT: 177,0 m) | (280) |  |
| 23 | Exist | 250.760 | 607.657 | 3,1  | Senvion 6.2M126 6150 126.0 !O!     | hub: 114,0 m (TOT: 177,0 m) | (281) |  |
| 24 | Exist | 248.142 | 608.104 | -1,2 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (282) |  |
| 25 | Exist | 247.865 | 608.255 | -0,4 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (283) |  |
| 26 | Exist | 247.590 | 608.377 | -1,0 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (284) |  |
| 27 | Exist | 247.311 | 608.501 | -1,3 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (285) |  |
| 28 | Exist | 247.034 | 608.625 | 0,2  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (286) |  |
| 29 | Exist | 246.747 | 608.713 | 1,8  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (371) |  |
| 30 | Exist | 246.447 | 608.805 | -2,0 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (288) |  |
| 31 | Exist | 246.172 | 608.890 | -0,7 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (289) |  |
| 32 | Exist | 245.885 | 608.978 | 0,3  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (290) |  |
| 33 | Exist | 245.590 | 609.026 | 0,1  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (291) |  |
| 34 | Exist | 245.294 | 609.056 | -1,1 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (292) |  |
| 35 | Exist | 246.045 | 608.352 | 1,8  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (293) |  |
| 36 | Exist | 246.336 | 608.279 | 0,5  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (294) |  |
| 37 | Exist | 246.622 | 608.188 | 1,5  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (295) |  |
| 38 | Exist | 246.907 | 608.088 | -0,2 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (296) |  |
| 39 | Exist | 247.190 | 607.981 | 0,6  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (297) |  |
| 40 | Exist | 247.472 | 607.870 | 0,9  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (298) |  |
| 41 | Exist | 249.390 | 608.049 | 2,7  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (299) |  |
| 42 | Exist | 249.023 | 608.155 | 0,2  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (300) |  |
| 43 | Exist | 248.609 | 608.251 | 1,9  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m)  | (301) |  |

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## PARK - Main Result

Calculation: WP Oostpolder VKA1

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| Dutch Stereo-RD/NAP 2000 |          |           |         |   |
|--------------------------|----------|-----------|---------|---|
|                          | X (east) | Y (north) | Z       | Row data/Description  |
|                          | [m]      |           |         |   |
| 44                       | Exist    | 249.242   | 608.904 | -0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (302)     |
| 45                       | Exist    | 249.672   | 609.314 | 0,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (303)      |
| 46                       | Exist    | 250.005   | 609.324 | 2,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (304)      |
| 47                       | Exist    | 250.336   | 609.195 | 4,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (305)      |
| 48                       | Exist    | 250.665   | 609.061 | 1,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (306)      |
| 49                       | Exist    | 250.997   | 608.936 | 3,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (307)      |
| 50                       | Exist    | 252.323   | 608.418 | 1,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (308)      |
| 51                       | Exist    | 252.641   | 608.293 | 1,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (309)      |
| 52                       | Exist    | 252.949   | 608.128 | 2,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (310)      |
| 53                       | Exist    | 253.248   | 607.910 | 0,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (311)      |
| 54                       | Exist    | 253.547   | 607.637 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (312)      |
| 55                       | Exist    | 253.756   | 607.438 | 1,8 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (313)      |
| 56                       | Exist    | 253.425   | 607.194 | -0,4 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (314)     |
| 57                       | Exist    | 253.312   | 606.728 | -0,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (315)     |
| 58                       | Exist    | 253.341   | 605.928 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (316)      |
| 59                       | Exist    | 253.172   | 606.215 | 4,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (317)      |
| 60                       | Exist    | 252.880   | 606.379 | -0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (318)     |
| 61                       | Exist    | 252.576   | 606.567 | 1,7 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (319)      |
| 62                       | Exist    | 252.262   | 606.720 | -1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (320)     |
| 63                       | Exist    | 251.932   | 606.799 | -2,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (321)     |
| 64                       | Exist    | 251.602   | 606.881 | 0,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (322)      |
| 65                       | Exist    | 251.272   | 606.961 | -1,9 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (323)     |
| 66                       | Exist    | 250.915   | 607.046 | 1,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (324)      |
| 67                       | Exist    | 250.558   | 607.133 | 1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (325)      |
| 68                       | Exist    | 250.211   | 607.197 | -1,2 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (326)     |
| 69                       | Exist    | 249.862   | 607.249 | -0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (327)     |
| 70                       | Exist    | 249.511   | 607.301 | 0,5 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (328)      |
| 71                       | Exist    | 249.207   | 607.349 | 0,0 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (329)      |
| 72                       | Exist    | 248.841   | 607.404 | -0,1 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (330)     |
| 73                       | Exist    | 248.444   | 607.403 | 0,6 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (331)      |
| 74                       | Exist    | 248.125   | 607.370 | -1,3 ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (332)     |
| 75                       | Exist    | 251.691   | 608.611 | 1,0 ENERCON E-82 E3 3000 82.0 !O! hub: 100,0 m (TOT: 141,0 m) (333)     |
| 76                       | Exist    | 245.161   | 608.566 | 0,7 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (354)          |
| 77                       | Exist    | 245.463   | 608.501 | 0,4 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (355)          |
| 78                       | Exist    | 245.775   | 608.421 | -1,5 VESTAS V90 3000 90.0 !O! hub: 100,0 m (TOT: 156,0 m) (356)         |
| 79                       | Exist    | 253.792   | 603.479 | 1,0 VESTAS V117-3.6 3600 117.0 !O! hub: 117,0 m (TOT: 175,5 m) (664)    |
| 80                       | Exist    | 251.345   | 607.258 | 2,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (599)          |
| 81                       | Exist    | 251.679   | 607.196 | 1,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (600)          |
| 82                       | Exist    | 252.008   | 607.117 | 1,0 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (601)          |
| 83                       | Exist    | 252.340   | 607.043 | 3,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (602)          |
| 84                       | Exist    | 249.539   | 608.811 | 0,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (603)          |
| 85                       | Exist    | 252.654   | 606.896 | 1,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (604)          |
| 86                       | Exist    | 249.866   | 608.752 | 0,4 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (605)          |
| 87                       | Exist    | 250.208   | 608.666 | 1,0 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (606)          |
| 88                       | Exist    | 250.550   | 608.586 | 0,9 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (607)          |
| 89                       | Exist    | 250.892   | 608.503 | 2,3 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (608)          |
| 90                       | Exist    | 252.958   | 606.705 | 1,5 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (609)          |
| 91                       | Exist    | 251.566   | 608.173 | 4,2 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (610)          |
| 92                       | Exist    | 252.219   | 607.986 | -0,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (611)         |
| 93                       | Exist    | 252.852   | 607.716 | 1,9 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (612)          |
| 94                       | Exist    | 251.793   | 607.668 | 1,6 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (613)          |
| 95                       | Exist    | 252.144   | 607.675 | 2,7 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (614)          |
| 96                       | Exist    | 252.765   | 607.355 | 1,6 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (615)          |
| 97                       | Exist    | 249.631   | 607.787 | 2,8 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (616)          |
| 98                       | Exist    | 248.339   | 607.818 | -1,2 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (617)         |
| 99                       | Exist    | 248.736   | 607.792 | -1,1 VESTAS V90 3000 90.0 !O! hub: 105,0 m (TOT: 150,0 m) (618)         |
| 100                      | Exist    | 253.864   | 604.596 | 0,0 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (712)    |
| 101                      | Exist    | 253.855   | 604.236 | 0,0 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (713)    |
| 102                      | Exist    | 253.850   | 603.877 | 0,2 VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (714)    |
| 103                      | New      | 251.679   | 606.481 | -1,3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (748) |
| 104                      | New      | 252.191   | 606.316 | 0,6 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (749)  |
| 105                      | New      | 252.640   | 606.079 | 0,0 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (750)  |
| 106                      | New      | 252.891   | 605.613 | 0,0 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (751)  |
| 107                      | New      | 247.910   | 607.020 | -0,3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (752) |

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## PARK - Main Result

Calculation: WP Oostpolder VKA1

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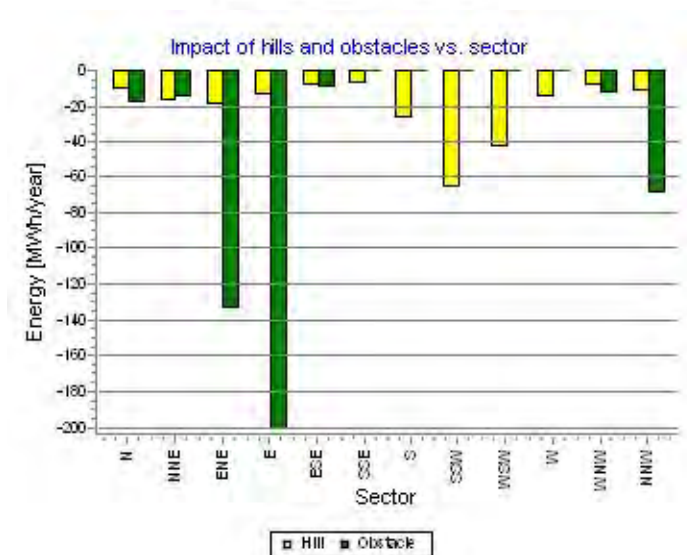
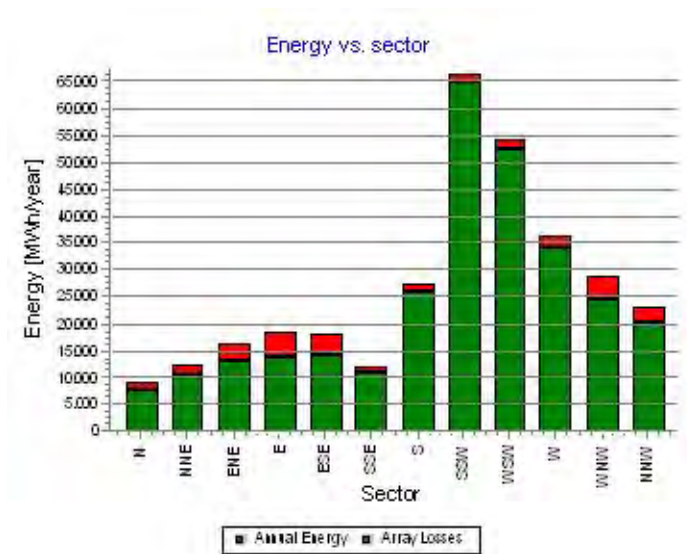
Dutch Stereo-RD/NAP 2000

|         | X (east) | Y (north) | Z    | Row data/Description   |
|---------|----------|-----------|------|--|
|         |          |           | [m]  |  |
| 108 New | 248.500  | 606.952   | -1,0 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (753) |
| 109 New | 249.086  | 606.838   | 1,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (754) |
| 110 New | 249.597  | 606.724   | -1,7 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (755) |
| 111 New | 250.131  | 606.584   | -0,9 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (756) |
| 112 New | 250.661  | 606.425   | -1,6 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (757) |
| 113 New | 251.175  | 606.238   | -1,0 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (758) |
| 114 New | 251.655  | 606.010   | -0,3 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (759) |
| 115 New | 252.082  | 605.684   | -0,8 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (760) |
| 116 New | 252.404  | 605.290   | -0,1 | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (761) |
| 117 New | 251.732  | 604.852   | 0,1  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (762) |

## PARK - Production Analysis

Calculation: WP Oostpolder VKA1WTG: All new WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                        |                       | 0 N     | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW    | 8 WSW    | 9 W      | 10 WNW   | 11 NNW   | Total     |
|-------------------------------|-----------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Roughness based energy        | [MWh]                 | 9.348,6 | 12.525,0 | 16.585,3 | 18.479,1 | 18.226,8 | 12.000,8 | 27.628,0 | 66.625,2 | 54.633,8 | 36.588,4 | 28.923,9 | 23.009,9 | 324.574,8 |
| -Decrease due to obstacles    | [MWh]                 | 17,8    | 14,7     | 134,4    | 201,5    | 9,7      | 0,1      | 0,0      | 0,0      | 0,0      | 0,0      | 12,9     | 68,1     | 459,1     |
| +Increase due to hills        | [MWh]                 | -10,9   | -16,8    | -19,7    | -13,4    | -8,4     | -7,9     | -26,5    | -65,0    | -43,1    | -15,4    | -8,8     | -11,8    | -247,8    |
| -Decrease due to array losses | [MWh]                 | 1.389,2 | 1.770,9  | 3.384,0  | 4.368,6  | 4.017,3  | 1.070,2  | 1.411,7  | 1.581,8  | 2.099,4  | 2.246,5  | 4.357,8  | 2.709,3  | 30.406,7  |
| Resulting energy              | [MWh]                 | 7.930,7 | 10.722,7 | 13.047,2 | 13.895,6 | 14.191,4 | 10.922,6 | 26.189,8 | 64.978,4 | 52.491,4 | 34.326,5 | 24.544,3 | 20.220,7 | 293.461,3 |
| Specific energy               | [kWh/m <sup>2</sup> ] |         |          |          |          |          |          |          |          |          |          |          |          | 1.253     |
| Specific energy               | [kWh/kW]              |         |          |          |          |          |          |          |          |          |          |          |          | 4.658     |
| Decrease due to obstacles     | [%]                   | 0,2     | 0,1      | 0,8      | 1,1      | 0,1      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,3      | 0,14      |
| Increase due to hills         | [%]                   | -0,1    | -0,1     | -0,1     | -0,1     | 0,0      | -0,1     | -0,1     | -0,1     | -0,1     | 0,0      | 0,0      | -0,1     | -0,08     |
| Decrease due to array losses  | [%]                   | 14,9    | 14,2     | 20,6     | 23,9     | 22,1     | 8,9      | 5,1      | 2,4      | 3,8      | 6,1      | 15,1     | 11,8     | 9,39      |
| Utilization                   | [%]                   | 18,7    | 20,9     | 22,2     | 22,1     | 19,9     | 18,5     | 19,4     | 20,4     | 17,4     | 14,6     | 13,4     | 15,0     | 17,7      |
| Operational                   | [Hours/year]          | 342     | 388      | 528      | 612      | 549      | 361      | 713      | 1.475    | 1.363    | 960      | 752      | 598      | 8.642     |
| Full Load Equivalent          | [Hours/year]          | 126     | 170      | 207      | 221      | 225      | 173      | 416      | 1.031    | 833      | 545      | 390      | 321      | 4.658     |



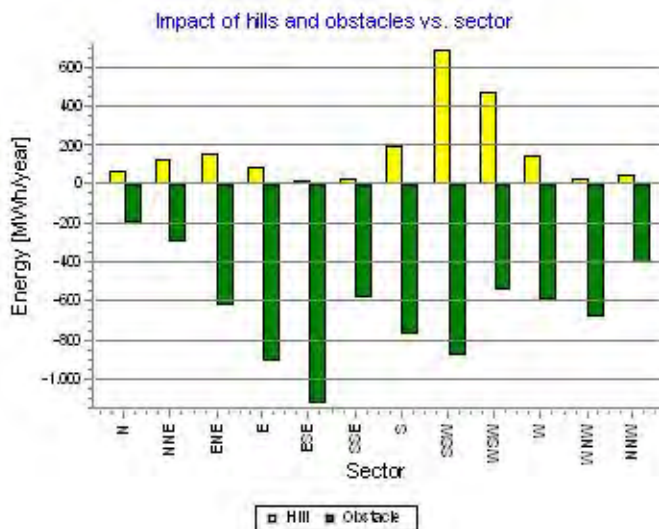
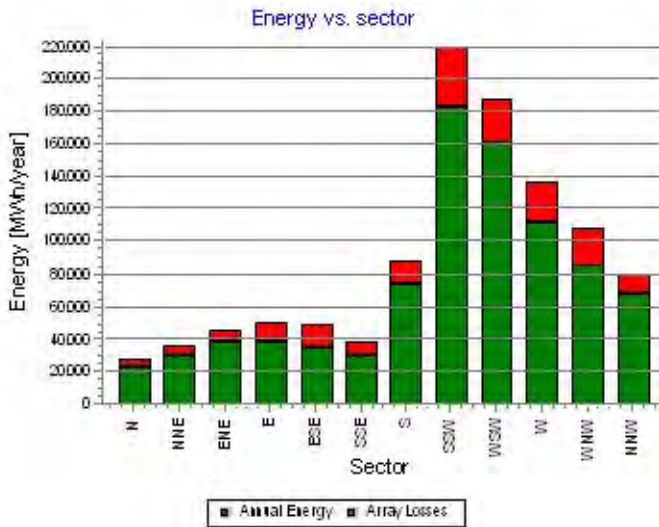




## PARK - Production Analysis

Calculation: WP Oostpolder VKA1WTG: All existing WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW     | 8 WSW     | 9 W       | 10 WNW    | 11 NNW   | Total       |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|-------------|
| Roughness based energy [MWh]          | 27.773,1 | 36.183,5 | 46.549,9 | 50.905,6 | 50.704,9 | 38.783,0 | 89.039,8 | 219.772,1 | 187.819,5 | 136.783,6 | 109.534,6 | 79.965,9 | 1.073.816,0 |
| -Decrease due to obstacles [MWh]      | 191,0    | 291,8    | 628,3    | 914,8    | 1.125,6  | 585,8    | 774,4    | 882,1     | 550,6     | 594,5     | 680,3     | 401,0    | 7.620,2     |
| +Increase due to hills [MWh]          | 65,3     | 127,8    | 154,3    | 89,5     | 24,1     | 27,0     | 193,1    | 687,6     | 469,8     | 146,2     | 31,1      | 51,4     | 2.067,3     |
| -Decrease due to array losses [MWh]   | 4.353,6  | 5.806,4  | 7.502,9  | 11.567,3 | 14.952,1 | 7.480,5  | 14.870,9 | 36.571,4  | 27.755,8  | 24.488,8  | 23.541,6  | 11.365,6 | 190.256,6   |
| Resulting energy [MWh]                | 23.293,9 | 30.213,2 | 38.573,0 | 38.513,1 | 34.651,3 | 30.743,7 | 73.587,6 | 183.006,2 | 159.982,9 | 111.846,5 | 85.343,7  | 68.250,6 | 878.006,1   |
| Specific energy [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |           |           |           |           |          | 1.337       |
| Specific energy [kWh/kW]              |          |          |          |          |          |          |          |           |           |           |           |          | 2.767       |
| Decrease due to obstacles [%]         | 0,7      | 0,8      | 1,3      | 1,8      | 2,2      | 1,5      | 0,9      | 0,4       | 0,3       | 0,4       | 0,6       | 0,5      | 0,71        |
| Increase due to hills [%]             | 0,2      | 0,4      | 0,3      | 0,2      | 0,0      | 0,1      | 0,2      | 0,3       | 0,3       | 0,1       | 0,0       | 0,1      | 0,19        |
| Decrease due to array losses [%]      | 15,7     | 16,1     | 16,3     | 23,1     | 30,1     | 19,6     | 16,8     | 16,7      | 14,8      | 18,0      | 21,6      | 14,3     | 17,81       |
| Utilization [%]                       | 28,7     | 31,1     | 33,1     | 30,8     | 26,6     | 25,8     | 27,8     | 28,8      | 25,8      | 21,1      | 20,1      | 25,0     | 25,7        |
| Operational [Hours/year]              | 333      | 375      | 509      | 592      | 531      | 354      | 688      | 1.426     | 1.324     | 945       | 738       | 584      | 8.399       |
| Full Load Equivalent [Hours/year]     | 73       | 95       | 122      | 121      | 109      | 97       | 232      | 577       | 504       | 353       | 269       | 215      | 2.767       |



## PARK - Power Curve Analysis

Calculation: WP Oostpolder VKA1WTG: 103 - ENERCON E-141 EP4 4200 141.0 !-! Level 0 - official - 0 s- 4200kW - 04/2016, Hub height: 165,0 m  
Name: Level 0 - official - 0 s- 4200kW - 04/2016  
Source: Manufacturer

| Source/Date | Created by | Created   | Edited   | Stop wind speed [m/s] | Power control | CT curve type | Generator type | Specific power kW/m <sup>2</sup> |
|-------------|------------|-----------|----------|-----------------------|---------------|---------------|----------------|----------------------------------|
| 13-4-2016   | EMD        | 29-4-2016 | 9-5-2016 | 25,0                  | Pitch         | User defined  | Variable       | 0,27                             |

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HP curve comparison - Note: For standard air density and weibull k parameter = 2

| Vmean   | [m/s] | 5     | 6      | 7      | 8      | 9      | 10     |
|---|-------|-------|--------|--------|--------|--------|--------|
| HP value Pitch, variable speed (2013)                                       | [MWh] | 7.749 | 11.582 | 15.194 | 18.346 | 20.965 | 23.032 |
| ENERCON E-141 EP4 4200 141.0 !-! Level 0 - official - 0 s- 4200kW - 04/2016 | [MWh] | 7.644 | 11.288 | 14.772 | 17.854 | 20.437 | 22.479 |
| Check value   | [%]   | 1     | 3      | 3      | 3      | 3      | 2      |

The table shows comparison between annual energy production calculated on basis of simplified "HP-curves" which assume that all WTGs performs quite similar - only specific power loading (kW/m<sup>2</sup>) and single/dual speed or stall/pitch decides the calculated values. Productions are without wake losses.

For further details, ask at the Danish Energy Agency for project report J.nr. 51171/00-0016 or see windPRO manual chapter 3.5.2.

The method is refined in EMD report "20 Detailed Case Studies comparing Project Design Calculations and actual Energy Productions for Wind Energy Projects worldwide", jan 2003.

Use the table to evaluate if the given power curve is reasonable - if the check value are lower than -5%, the power curve probably is too optimistic due to uncertainty in power curve measurement.

### Power curve

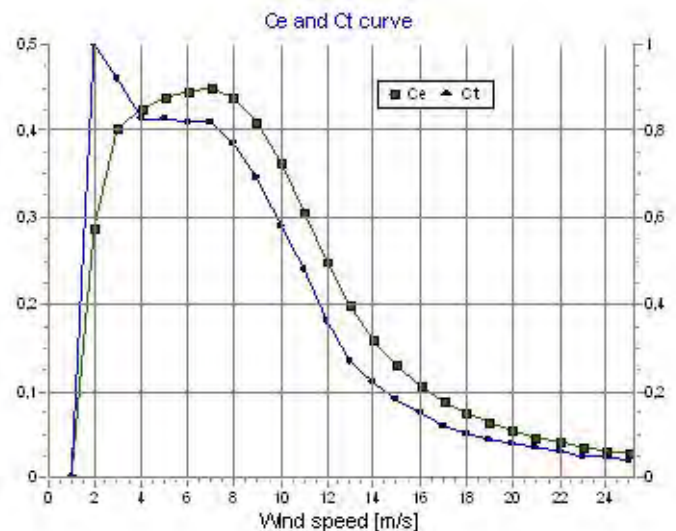
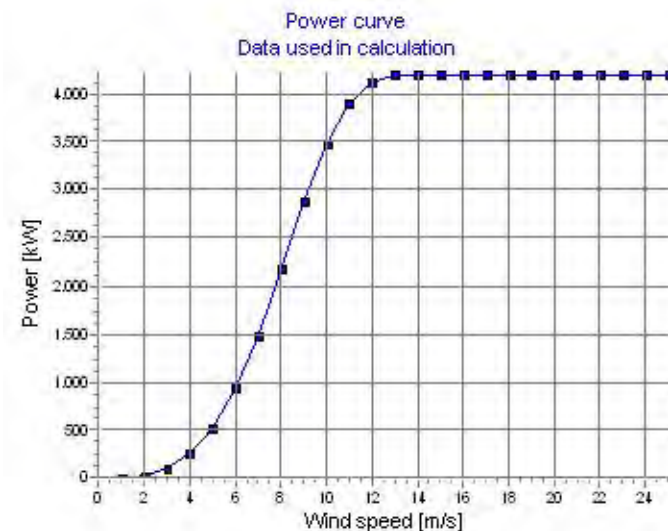
Original data, Air density: 1,225 kg/m<sup>3</sup>

| Wind speed [m/s] | Power [kW] | Ce   | Wind speed [m/s] | Ct curve |
|------------------|------------|------|------------------|----------|
| 0,0              | 0,0        | 0,00 | 0,0              | 0,00     |
| 0,5              | 0,0        | 0,00 | 0,5              | 0,00     |
| 1,0              | 0,0        | 0,00 | 1,0              | 0,00     |
| 1,5              | 0,0        | 0,00 | 1,5              | 0,00     |
| 2,0              | 22,0       | 0,29 | 2,0              | 1,16     |
| 2,5              | 54,0       | 0,36 | 2,5              | 1,01     |
| 3,0              | 104,0      | 0,40 | 3,0              | 0,92     |
| 3,5              | 171,0      | 0,42 | 3,5              | 0,87     |
| 4,0              | 260,0      | 0,42 | 4,0              | 0,83     |
| 4,5              | 376,0      | 0,43 | 4,5              | 0,83     |
| 5,0              | 523,0      | 0,44 | 5,0              | 0,83     |
| 5,5              | 703,0      | 0,44 | 5,5              | 0,82     |
| 6,0              | 920,0      | 0,45 | 6,0              | 0,82     |
| 6,5              | 1.176,0    | 0,45 | 6,5              | 0,82     |
| 7,0              | 1.471,0    | 0,45 | 7,0              | 0,82     |
| 7,5              | 1.799,0    | 0,45 | 7,5              | 0,80     |
| 8,0              | 2.151,0    | 0,44 | 8,0              | 0,77     |
| 8,5              | 2.514,0    | 0,43 | 8,5              | 0,74     |
| 9,0              | 2.867,0    | 0,41 | 9,0              | 0,69     |
| 9,5              | 3.194,0    | 0,39 | 9,5              | 0,63     |
| 10,0             | 3.481,0    | 0,36 | 10,0             | 0,58     |
| 10,5             | 3.719,0    | 0,34 | 10,5             | 0,53     |
| 11,0             | 3.903,0    | 0,31 | 11,0             | 0,48     |
| 11,5             | 4.033,0    | 0,28 | 11,5             | 0,41     |
| 12,0             | 4.119,0    | 0,25 | 12,0             | 0,36     |
| 12,5             | 4.171,0    | 0,22 | 12,5             | 0,31     |
| 13,0             | 4.196,0    | 0,20 | 13,0             | 0,27     |
| 13,5             | 4.200,0    | 0,18 | 13,5             | 0,24     |
| 14,0             | 4.200,0    | 0,16 | 14,0             | 0,22     |
| 14,5             | 4.200,0    | 0,14 | 14,5             | 0,19     |
| 15,0             | 4.200,0    | 0,13 | 15,0             | 0,18     |
| 15,5             | 4.200,0    | 0,12 | 15,5             | 0,16     |
| 16,0             | 4.200,0    | 0,11 | 16,0             | 0,15     |
| 16,5             | 4.200,0    | 0,10 | 16,5             | 0,13     |
| 17,0             | 4.200,0    | 0,09 | 17,0             | 0,12     |
| 17,5             | 4.200,0    | 0,08 | 17,5             | 0,11     |
| 18,0             | 4.200,0    | 0,08 | 18,0             | 0,10     |
| 18,5             | 4.200,0    | 0,07 | 18,5             | 0,10     |
| 19,0             | 4.200,0    | 0,06 | 19,0             | 0,09     |
| 19,5             | 4.200,0    | 0,06 | 19,5             | 0,08     |
| 20,0             | 4.200,0    | 0,05 | 20,0             | 0,08     |
| 20,5             | 4.200,0    | 0,05 | 20,5             | 0,07     |
| 21,0             | 4.200,0    | 0,05 | 21,0             | 0,07     |
| 21,5             | 4.200,0    | 0,04 | 21,5             | 0,06     |
| 22,0             | 4.200,0    | 0,04 | 22,0             | 0,06     |
| 22,5             | 4.200,0    | 0,04 | 22,5             | 0,06     |
| 23,0             | 4.200,0    | 0,04 | 23,0             | 0,05     |
| 23,5             | 4.200,0    | 0,03 | 23,5             | 0,05     |
| 24,0             | 4.200,0    | 0,03 | 24,0             | 0,05     |
| 24,5             | 4.200,0    | 0,03 | 24,5             | 0,04     |

### Power, Efficiency and energy vs. wind speed

Data used in calculation, Air density: 1,232 kg/m<sup>3</sup> New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>

| Wind speed [m/s] | Power [kW] | Ce   | Interval [m/s] | Energy [MWh] | Acc.Energy [MWh] | Relative [%] |
|------------------|------------|------|----------------|--------------|------------------|--------------|
| 1,0              | 0,0        | 0,00 | 0,50- 1,50     | 0,0          | 0,0              | 0,0          |
| 2,0              | 22,3       | 0,29 | 1,50- 2,50     | 7,1          | 7,2              | 0,0          |
| 3,0              | 104,8      | 0,40 | 2,50- 3,50     | 40,1         | 47,2             | 0,2          |
| 4,0              | 261,8      | 0,43 | 3,50- 4,50     | 126,7        | 173,9            | 0,9          |
| 5,0              | 526,5      | 0,44 | 4,50- 5,50     | 302,4        | 476,3            | 2,5          |
| 6,0              | 926,0      | 0,45 | 5,50- 6,50     | 598,2        | 1.074,5          | 5,6          |
| 7,0              | 1.480,0    | 0,45 | 6,50- 7,50     | 1.019,2      | 2.093,7          | 11,0         |
| 8,0              | 2.162,5    | 0,44 | 7,50- 8,50     | 1.515,1      | 3.608,8          | 18,9         |
| 9,0              | 2.879,5    | 0,41 | 8,50- 9,50     | 1.967,4      | 5.576,2          | 29,2         |
| 10,0             | 3.492,4    | 0,36 | 9,50-10,50     | 2.242,5      | 7.818,7          | 40,9         |
| 11,0             | 3.910,9    | 0,31 | 10,50-11,50    | 2.272,6      | 10.091,3         | 52,8         |
| 12,0             | 4.122,8    | 0,25 | 11,50-12,50    | 2.087,8      | 12.179,1         | 63,7         |
| 13,0             | 4.196,3    | 0,20 | 12,50-13,50    | 1.777,2      | 13.956,4         | 73,0         |
| 14,0             | 4.200,0    | 0,16 | 13,50-14,50    | 1.430,4      | 15.386,8         | 80,5         |
| 15,0             | 4.200,0    | 0,13 | 14,50-15,50    | 1.104,6      | 16.491,4         | 86,3         |
| 16,0             | 4.200,0    | 0,11 | 15,50-16,50    | 823,1        | 17.314,5         | 90,6         |
| 17,0             | 4.200,0    | 0,09 | 16,50-17,50    | 593,6        | 17.908,1         | 93,7         |
| 18,0             | 4.200,0    | 0,07 | 17,50-18,50    | 416,1        | 18.324,2         | 95,9         |
| 19,0             | 4.200,0    | 0,06 | 18,50-19,50    | 284,8        | 18.609,1         | 97,4         |
| 20,0             | 4.200,0    | 0,05 | 19,50-20,50    | 191,4        | 18.800,5         | 98,4         |
| 21,0             | 4.200,0    | 0,05 | 20,50-21,50    | 126,9        | 18.927,4         | 99,0         |
| 22,0             | 4.200,0    | 0,04 | 21,50-22,50    | 83,2         | 19.010,5         | 99,5         |
| 23,0             | 4.200,0    | 0,04 | 22,50-23,50    | 54,0         | 19.064,5         | 99,7         |
| 24,0             | 4.200,0    | 0,03 | 23,50-24,50    | 34,7         | 19.099,2         | 99,9         |
| 25,0             | 4.200,0    | 0,03 | 24,50-25,50    | 13,5         | 19.112,7         | 100,0        |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 9:08/3.1.597

## PARK - Terrain

Calculation: WP Oostpolder VKA1Site Data: A - Oostpolder site data

Obstacles:  
23 Obstacles used

Roughness:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2015\715068 WTG Intocon Eemshaven\TO\WP\ROUGHNESSLINE\_713066 715068\_1.wpo  
Min X: 219.227, Max X: 278.331, Min Y: 577.425, Max Y: 638.717, Width: 59.104 m, Height: 61.292 m

Orography:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\ObjectImports\713066 715068\_EMDGrid\_0(1).wpg  
Min X: 198.208, Max X: 300.556, Min Y: 557.205, Max Y: 659.267, Width: 102.348 m, Height: 102.062 m

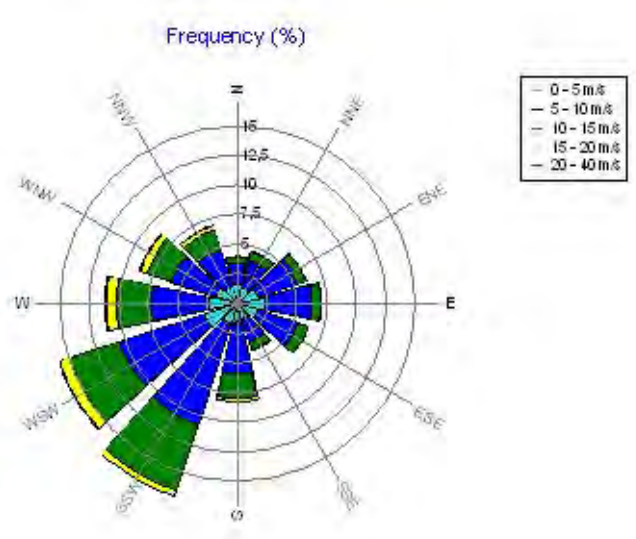
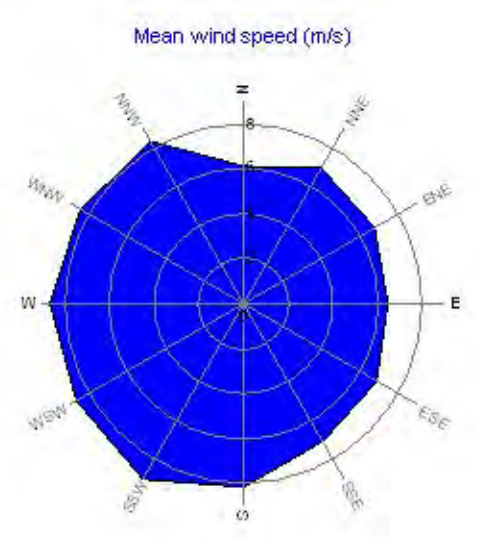
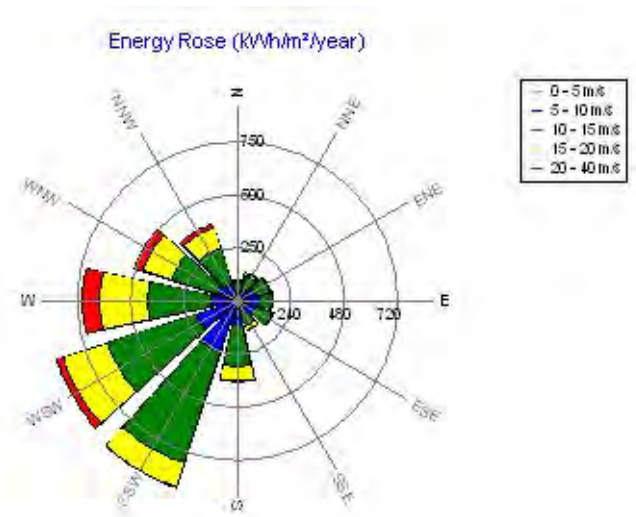
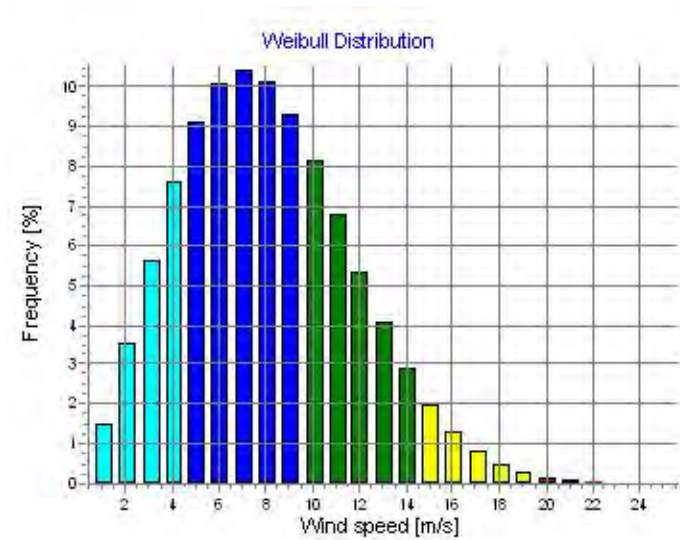
## PARK - Wind Data Analysis

Calculation: WP Oostpolder VKA1Wind data: A - Oostpolder site data; Hub height: 100,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 6,90               | 6,13             | 1,854        | 4,0           |
| 1 NNE  | 7,85               | 6,95             | 2,322        | 4,5           |
| 2 ENE  | 7,60               | 6,75             | 2,545        | 6,1           |
| 3 E    | 7,30               | 6,48             | 2,553        | 7,1           |
| 4 ESE  | 7,79               | 6,91             | 2,498        | 6,3           |
| 5 SSE  | 7,97               | 7,06             | 2,115        | 4,2           |
| 6 S    | 9,18               | 8,14             | 2,486        | 8,2           |
| 7 SSW  | 10,06              | 9,00             | 3,146        | 17,0          |
| 8 WSW  | 9,71               | 8,61             | 2,393        | 15,8          |
| 9 W    | 9,77               | 8,65             | 2,068        | 11,2          |
| 10 WNW | 9,48               | 8,40             | 2,119        | 8,7           |
| 11 NNW | 9,43               | 8,35             | 2,209        | 6,9           |
| All    | 9,03               | 8,00             | 2,287        | 100,0         |



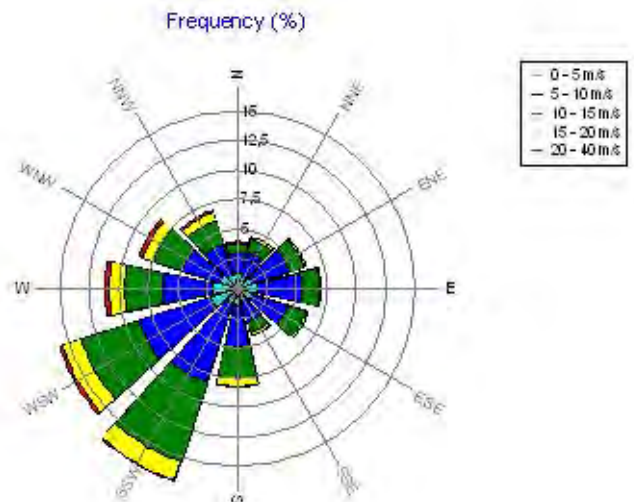
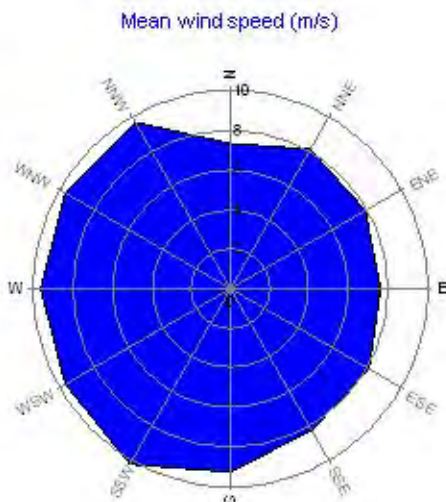
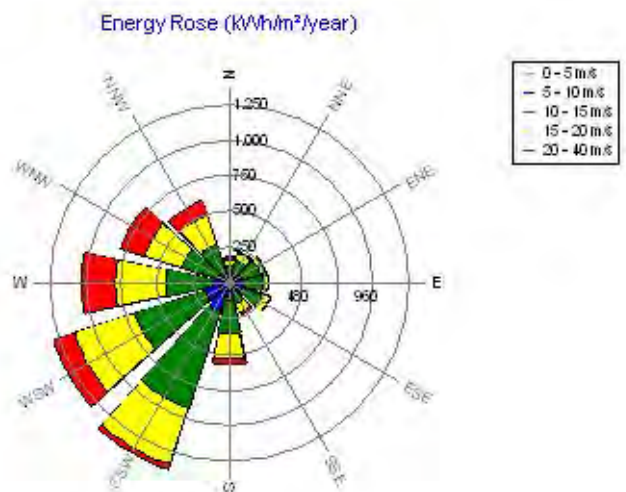
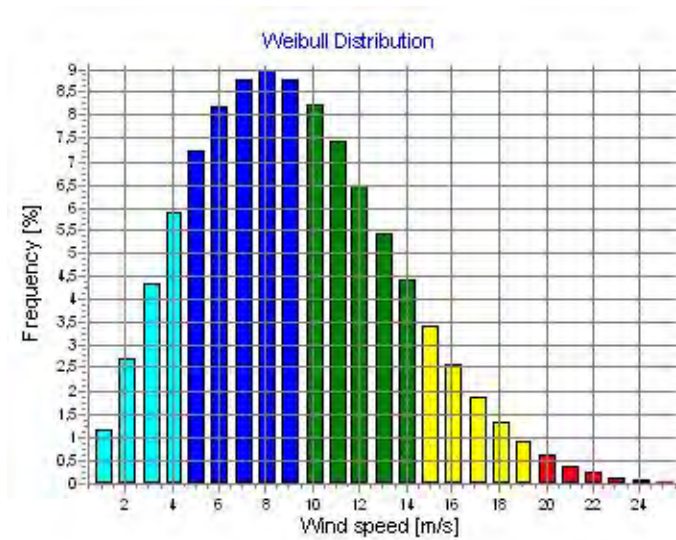
## PARK - Wind Data Analysis

Calculation: WP Oostpolder VKA1Wind data: A - Oostpolder site data; Hub height: 165,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 8,26               | 7,34             | 1,795        | 4,0           |
| 1 NNE  | 9,17               | 8,13             | 2,252        | 4,5           |
| 2 ENE  | 8,91               | 7,90             | 2,467        | 6,1           |
| 3 E    | 8,54               | 7,57             | 2,471        | 7,1           |
| 4 ESE  | 9,21               | 8,16             | 2,424        | 6,3           |
| 5 SSE  | 9,31               | 8,25             | 2,049        | 4,2           |
| 6 S    | 10,47              | 9,28             | 2,420        | 8,2           |
| 7 SSW  | 11,44              | 10,22            | 3,064        | 17,1          |
| 8 WSW  | 10,93              | 9,68             | 2,334        | 15,8          |
| 9 W    | 10,92              | 9,68             | 2,029        | 11,1          |
| 10 WNW | 10,94              | 9,69             | 2,064        | 8,7           |
| 11 NNW | 10,90              | 9,65             | 2,143        | 6,9           |
| All    | 10,35              | 9,16             | 2,252        | 100,0         |



## PARK - Park power curve

Calculation: WP Oostpolder VKA1

| Wind speed [m/s] | Power          |                |         |          |          |         |          |          |         |          |          |         |          |          |
|------------------|----------------|----------------|---------|----------|----------|---------|----------|----------|---------|----------|----------|---------|----------|----------|
|                  | Free WTGs [kW] | Park WTGs [kW] | N [kW]  | NNE [kW] | ENE [kW] | E [kW]  | ESE [kW] | SSE [kW] | S [kW]  | SSW [kW] | WSW [kW] | W [kW]  | WNW [kW] | NNW [kW] |
| 0,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 1,5              | 2              | 1              | 0       | 0        | 0        | 0       | 0        | 1        | 1       | 2        | 2        | 2       | 0        | 0        |
| 2,5              | 1.822          | 959            | 977     | 1.009    | 955      | 836     | 684      | 915      | 1.124   | 1.158    | 1.074    | 890     | 637      | 882      |
| 3,5              | 7.982          | 4.855          | 4.989   | 5.176    | 5.038    | 4.483   | 3.769    | 4.850    | 5.339   | 5.505    | 5.333    | 4.523   | 3.627    | 4.590    |
| 4,5              | 20.871         | 13.822         | 14.426  | 14.787   | 14.684   | 13.168  | 11.281   | 13.612   | 14.562  | 14.976   | 14.822   | 13.042  | 11.210   | 13.730   |
| 5,5              | 40.459         | 27.972         | 28.970  | 29.591   | 29.335   | 26.638  | 23.429   | 27.739   | 29.388  | 30.046   | 29.793   | 26.680  | 23.323   | 27.769   |
| 6,5              | 68.792         | 48.282         | 50.028  | 50.928   | 50.356   | 46.047  | 40.824   | 47.878   | 50.642  | 51.636   | 51.191   | 46.244  | 40.799   | 48.033   |
| 7,5              | 106.993        | 76.119         | 78.903  | 80.289   | 79.363   | 72.728  | 64.697   | 75.471   | 79.724  | 81.242   | 80.502   | 72.955  | 64.652   | 75.809   |
| 8,5              | 154.371        | 112.579        | 116.904 | 118.919  | 117.681  | 108.085 | 96.245   | 111.699  | 117.525 | 119.636  | 118.710  | 107.887 | 96.067   | 112.556  |
| 9,5              | 207.085        | 157.510        | 163.875 | 166.252  | 165.027  | 152.243 | 136.029  | 156.545  | 163.673 | 166.068  | 165.456  | 151.165 | 135.623  | 158.350  |
| 10,5             | 257.901        | 207.228        | 216.396 | 217.756  | 217.154  | 201.835 | 181.708  | 206.548  | 214.473 | 215.815  | 216.061  | 199.505 | 181.717  | 210.314  |
| 11,5             | 299.923        | 255.541        | 266.657 | 266.151  | 266.749  | 250.304 | 228.523  | 255.733  | 263.560 | 263.074  | 264.439  | 247.520 | 228.922  | 260.527  |
| 12,5             | 332.482        | 297.368        | 309.273 | 307.311  | 308.564  | 292.936 | 271.662  | 298.317  | 305.090 | 303.359  | 305.313  | 289.720 | 272.413  | 303.578  |
| 13,5             | 356.428        | 331.775        | 342.808 | 340.776  | 342.190  | 328.661 | 309.580  | 333.392  | 338.153 | 336.563  | 338.369  | 325.187 | 309.294  | 337.661  |
| 14,5             | 370.634        | 357.393        | 364.725 | 363.423  | 364.688  | 354.914 | 340.248  | 359.953  | 362.728 | 361.480  | 362.654  | 353.319 | 338.955  | 361.067  |
| 15,5             | 378.069        | 371.750        | 375.699 | 375.257  | 375.710  | 370.465 | 360.936  | 373.637  | 374.973 | 374.443  | 374.807  | 369.775 | 360.538  | 373.729  |
| 16,5             | 381.157        | 379.044        | 380.605 | 380.428  | 380.565  | 378.505 | 374.304  | 380.066  | 380.448 | 380.242  | 380.327  | 378.312 | 374.206  | 379.936  |
| 17,5             | 381.652        | 381.333        | 381.616 | 381.589  | 381.608  | 381.218 | 380.408  | 381.533  | 381.611 | 381.577  | 381.594  | 381.245 | 380.328  | 381.489  |
| 18,5             | 381.642        | 381.623        | 381.647 | 381.648  | 381.644  | 381.615 | 381.540  | 381.641  | 381.642 | 381.643  | 381.643  | 381.623 | 381.535  | 381.643  |
| 19,5             | 381.625        | 381.629        | 381.630 | 381.631  | 381.629  | 381.629 | 381.629  | 381.630  | 381.627 | 381.629  | 381.628  | 381.629 | 381.629  | 381.632  |
| 20,5             | 375.607        | 375.609        | 375.610 | 375.611  | 375.609  | 375.608 | 375.608  | 375.609  | 375.608 | 375.609  | 375.608  | 375.609 | 375.610  | 375.612  |
| 21,5             | 375.591        | 375.595        | 375.596 | 375.597  | 375.594  | 375.593 | 375.593  | 375.595  | 375.593 | 375.594  | 375.594  | 375.595 | 375.596  | 375.598  |
| 22,5             | 375.579        | 375.580        | 375.581 | 375.582  | 375.580  | 375.579 | 375.580  | 375.580  | 375.579 | 375.580  | 375.580  | 375.580 | 375.581  | 375.582  |
| 23,5             | 375.569        | 375.570        | 375.572 | 375.572  | 375.570  | 375.569 | 375.569  | 375.570  | 375.569 | 375.570  | 375.570  | 375.570 | 375.572  | 375.573  |
| 24,5             | 375.590        | 375.580        | 375.565 | 375.568  | 375.578  | 375.584 | 375.582  | 375.579  | 375.590 | 375.585  | 375.586  | 375.581 | 375.569  | 375.565  |
| 25,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 26,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 27,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 28,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 29,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |

### Description:

The park power curve is similar to a WTG power curve, meaning that when a given wind speed appears in front of the park with same speed in the entire wind farm area (before influence from the park), the output from the park can be found in the park power curve. Another way to say this: The park power curve includes array losses, but do NOT include terrain given variations in the wind speed over the park area.

Measuring a park power curve is not as simple as measuring a WTG power curve due to the fact that the park power curve depends on the wind direction and that the same wind speed normally will not appear for the entire park area at the same time (only in very flat non-complex terrain). The idea with this version of the park power curve is not to use it for validation based on measurements. This would require at least 2 measurement masts at two sides of the park, unless only a few direction sectors should be tested, AND non complex terrain (normally only useable off shore). Another park power curve version for complex terrain is available in windPRO.

The park power curve can be used for:

- Forecast systems, based on more rough (approximated) wind data, the park power curve would be an efficient way to make the connection from wind speed (and direction) to power.
- Construction of duration curves, telling how often a given power output will appear, the park power curve can be used together with the average wind distribution for the Wind farm area in hub height. The average wind distribution can eventually be obtained based on the Weibull parameters for each WTG position. These are found at print menu: >Result to file< in the >Park result< which can be saved to file or copied to clipboard and pasted in Excel.
- Calculation of wind energy index based on the PARK production (see below).
- Estimation of the expected PARK production for an existing wind farm based on wind measurements at minimum 2 measurement masts at two sides of wind farm. The masts must be used for obtaining the free wind speed. The free wind speed is used in the simulation of expected energy production with the PARK power curve. This procedure will only work suitable in non complex terrains. For complex terrain another park power curve calculation is available in windPRO (PPV-model).

### Note:

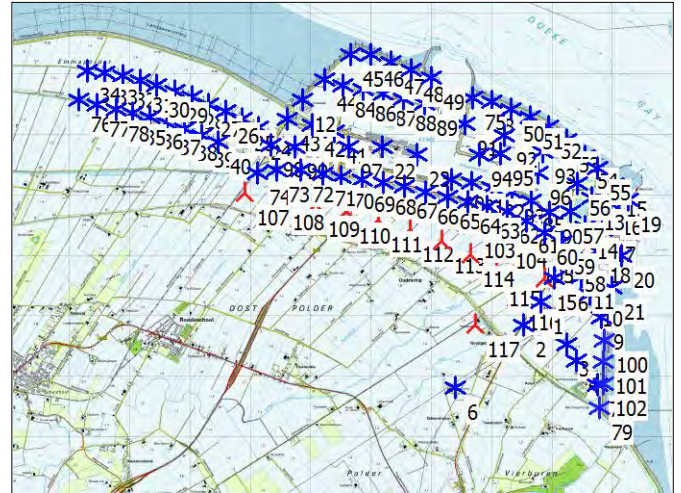
From the >Result to file< the >Wind Speeds Inside Wind farm< is also available. These can (e.g. via Excel) be used for extracting the wake induced reductions in measured wind speed.

## PARK - WTG distances

Calculation: WP Oostpolder VKA1

### WTG distances

|    | Z    | Nearest WTG | Z    | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |
|----|------|-------------|------|---------------------|-----------------------------------|-----------------------------------|
|    | [m]  |             | [m]  | [m]                 |                                   |                                   |
| 1  | -0,3 | 106         | 0,0  | 392                 | 2,9                               | 2,8                               |
| 2  | 0,0  | 116         | -0,1 | 464                 | 3,4                               | 3,3                               |
| 3  | 0,0  | 4           | 0,2  | 315                 | 2,3                               | 2,3                               |
| 4  | 0,2  | 3           | 0,0  | 315                 | 2,3                               | 2,3                               |
| 5  | 0,3  | 106         | 0,0  | 148                 | 1,1                               | 1,0                               |
| 6  | -0,1 | 117         | 0,1  | 1.089               | 23,2                              | 7,7                               |
| 7  | 1,8  | 102         | 0,2  | 87                  | 1,7                               | 0,9                               |
| 8  | 1,6  | 75          | 1,0  | 323                 | 3,9                               | 2,8                               |
| 9  | 0,1  | 100         | 0,0  | 384                 | 4,7                               | 3,8                               |
| 10 | -0,4 | 11          | 1,0  | 321                 | 3,9                               | 3,9                               |
| 11 | 1,0  | 58          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 12 | 2,5  | 43          | 1,9  | 417                 | 5,1                               | 3,0                               |
| 13 | -1,0 | 16          | 2,0  | 300                 | 3,7                               | 3,7                               |
| 14 | 1,0  | 17          | 2,7  | 301                 | 3,7                               | 3,7                               |
| 15 | 1,0  | 16          | 2,0  | 306                 | 3,7                               | 3,7                               |
| 16 | 2,0  | 13          | -1,0 | 300                 | 3,7                               | 3,7                               |
| 17 | 2,7  | 14          | 1,0  | 301                 | 3,7                               | 3,7                               |
| 18 | -0,7 | 17          | 2,7  | 360                 | 4,4                               | 4,4                               |
| 19 | 0,1  | 16          | 2,0  | 320                 | 3,9                               | 3,9                               |
| 20 | 2,0  | 18          | -0,7 | 401                 | 4,9                               | 4,9                               |
| 21 | 0,0  | 10          | -0,4 | 379                 | 4,6                               | 4,6                               |
| 22 | 4,3  | 97          | 2,8  | 563                 | 6,3                               | 4,5                               |
| 23 | 3,1  | 67          | 1,3  | 561                 | 6,8                               | 4,5                               |
| 24 | -1,2 | 25          | -0,4 | 315                 | 3,8                               | 3,8                               |
| 25 | -0,4 | 26          | -1,0 | 301                 | 3,7                               | 3,7                               |
| 26 | -1,0 | 25          | -0,4 | 301                 | 3,7                               | 3,7                               |
| 27 | -1,3 | 28          | 0,2  | 303                 | 3,7                               | 3,7                               |
| 28 | 0,2  | 29          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 29 | 1,8  | 28          | 0,2  | 300                 | 3,7                               | 3,7                               |
| 30 | -2,0 | 31          | -0,7 | 288                 | 3,5                               | 3,5                               |
| 31 | -0,7 | 30          | -2,0 | 288                 | 3,5                               | 3,5                               |
| 32 | 0,3  | 33          | 0,1  | 299                 | 3,6                               | 3,6                               |
| 33 | 0,1  | 34          | -1,1 | 297                 | 3,6                               | 3,6                               |
| 34 | -1,1 | 33          | 0,1  | 297                 | 3,6                               | 3,6                               |
| 35 | 1,8  | 78          | -1,5 | 279                 | 3,4                               | 2,5                               |
| 36 | 0,5  | 35          | 1,8  | 300                 | 3,7                               | 3,7                               |
| 37 | 1,5  | 36          | 0,5  | 300                 | 3,7                               | 3,7                               |
| 38 | -0,2 | 37          | 1,5  | 302                 | 3,7                               | 3,7                               |
| 39 | 0,6  | 38          | -0,2 | 302                 | 3,7                               | 3,7                               |
| 40 | 0,9  | 39          | 0,6  | 303                 | 3,7                               | 3,7                               |
| 41 | 2,7  | 97          | 2,8  | 356                 | 4,3                               | 4,0                               |
| 42 | 0,2  | 41          | 2,7  | 382                 | 4,7                               | 4,7                               |
| 43 | 1,9  | 12          | 2,5  | 417                 | 5,1                               | 3,0                               |
| 44 | -0,5 | 84          | 0,1  | 311                 | 3,8                               | 3,5                               |
| 45 | 0,2  | 46          | 2,8  | 333                 | 4,1                               | 4,1                               |
| 46 | 2,8  | 45          | 0,2  | 333                 | 4,1                               | 4,1                               |
| 47 | 4,8  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 48 | 1,4  | 49          | 3,2  | 355                 | 4,3                               | 4,3                               |
| 49 | 3,2  | 48          | 1,4  | 355                 | 4,3                               | 4,3                               |
| 50 | 1,1  | 8           | 1,6  | 340                 | 4,2                               | 2,9                               |
| 51 | 1,4  | 50          | 1,1  | 342                 | 4,2                               | 4,2                               |
| 52 | 2,1  | 51          | 1,4  | 349                 | 4,3                               | 4,3                               |
| 53 | 0,8  | 52          | 2,1  | 370                 | 4,5                               | 4,5                               |
| 54 | 0,6  | 55          | 1,8  | 289                 | 3,5                               | 3,5                               |
| 55 | 1,8  | 54          | 0,6  | 289                 | 3,5                               | 3,5                               |
| 56 | -0,4 | 13          | -1,0 | 345                 | 4,2                               | 4,2                               |
| 57 | -0,7 | 14          | 1,0  | 345                 | 4,2                               | 4,2                               |
| 58 | 1,0  | 11          | 1,0  | 319                 | 3,9                               | 3,9                               |
| 59 | 4,7  | 58          | 1,0  | 333                 | 4,1                               | 4,1                               |
| 60 | -0,3 | 59          | 4,7  | 335                 | 4,1                               | 4,1                               |
| 61 | 1,7  | 85          | 1,3  | 338                 | 4,1                               | 3,8                               |
| 62 | -1,0 | 83          | 3,1  | 332                 | 4,1                               | 3,7                               |
| 63 | -2,9 | 82          | 1,0  | 327                 | 4,0                               | 3,6                               |



▲ New WTG

Scale 1:125.000

\* Existing WTG

To be continued on next page...

## PARK - WTG distances

Calculation: WP Oostpolder VKA1

...continued from previous page

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |     |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|-----|
| [m] |             | [m] | [m]                 |                                   |                                   |     |
| 64  | 0,3         | 81  | 1,8                 | 324                               | 4,0                               | 3,6 |
| 65  | -1,9        | 80  | 2,3                 | 306                               | 3,7                               | 3,4 |
| 66  | 1,5         | 65  | -1,9                | 367                               | 4,5                               | 4,5 |
| 67  | 1,3         | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 68  | -1,2        | 67  | 1,3                 | 353                               | 4,3                               | 4,3 |
| 69  | -0,5        | 68  | -1,2                | 353                               | 4,3                               | 4,3 |
| 70  | 0,5         | 71  | 0,0                 | 308                               | 3,8                               | 3,8 |
| 71  | 0,0         | 70  | 0,5                 | 308                               | 3,8                               | 3,8 |
| 72  | -0,1        | 71  | 0,0                 | 370                               | 4,5                               | 4,5 |
| 73  | 0,6         | 74  | -1,3                | 321                               | 3,9                               | 3,9 |
| 74  | -1,3        | 73  | 0,6                 | 321                               | 3,9                               | 3,9 |
| 75  | 1,0         | 8   | 1,6                 | 323                               | 3,9                               | 2,8 |
| 76  | 0,7         | 77  | 0,4                 | 309                               | 2,8                               | 2,8 |
| 77  | 0,4         | 76  | 0,7                 | 309                               | 2,8                               | 2,8 |
| 78  | -1,5        | 35  | 1,8                 | 279                               | 3,4                               | 2,5 |
| 79  | 1,0         | 7   | 1,8                 | 382                               | 7,3                               | 3,3 |
| 80  | 2,3         | 65  | -1,9                | 306                               | 3,7                               | 3,4 |
| 81  | 1,8         | 64  | 0,3                 | 324                               | 4,0                               | 3,6 |
| 82  | 1,0         | 63  | -2,9                | 327                               | 4,0                               | 3,6 |
| 83  | 3,1         | 62  | -1,0                | 332                               | 4,1                               | 3,7 |
| 84  | 0,1         | 44  | -0,5                | 311                               | 3,8                               | 3,5 |
| 85  | 1,3         | 61  | 1,7                 | 338                               | 4,1                               | 3,8 |
| 86  | 0,4         | 84  | 0,1                 | 332                               | 3,7                               | 3,7 |
| 87  | 1,0         | 88  | 0,9                 | 351                               | 3,9                               | 3,9 |
| 88  | 0,9         | 87  | 1,0                 | 351                               | 3,9                               | 3,9 |
| 89  | 2,3         | 88  | 0,9                 | 352                               | 3,9                               | 3,9 |
| 90  | 1,5         | 60  | -0,3                | 335                               | 4,1                               | 3,7 |
| 91  | 4,2         | 75  | 1,0                 | 455                               | 5,6                               | 5,1 |
| 92  | -0,8        | 95  | 2,7                 | 320                               | 3,6                               | 3,6 |
| 93  | 1,9         | 96  | 1,6                 | 371                               | 4,1                               | 4,1 |
| 94  | 1,6         | 95  | 2,7                 | 351                               | 3,9                               | 3,9 |
| 95  | 2,7         | 92  | -0,8                | 320                               | 3,6                               | 3,6 |
| 96  | 1,6         | 93  | 1,9                 | 371                               | 4,1                               | 4,1 |
| 97  | 2,8         | 41  | 2,7                 | 356                               | 4,3                               | 4,0 |
| 98  | -1,2        | 24  | -1,2                | 347                               | 4,2                               | 3,9 |
| 99  | -1,1        | 98  | -1,2                | 398                               | 4,4                               | 4,4 |
| 100 | 0,0         | 101 | 0,0                 | 360                               | 3,6                               | 3,6 |
| 101 | 0,0         | 102 | 0,2                 | 359                               | 3,6                               | 3,6 |
| 102 | 0,2         | 7   | 1,8                 | 87                                | 1,7                               | 0,9 |
| 103 | -1,3        | 63  | -2,9                | 406                               | 4,9                               | 2,9 |
| 104 | 0,6         | 62  | -1,0                | 410                               | 5,0                               | 2,9 |
| 105 | 0,0         | 60  | -0,3                | 384                               | 4,7                               | 2,7 |
| 106 | 0,0         | 5   | 0,3                 | 148                               | 1,1                               | 1,0 |
| 107 | -0,3        | 74  | -1,3                | 411                               | 5,0                               | 2,9 |
| 108 | -1,0        | 73  | 0,6                 | 454                               | 5,5                               | 3,2 |
| 109 | 1,0         | 110 | -1,7                | 523                               | 3,7                               | 3,7 |
| 110 | -1,7        | 109 | 1,0                 | 523                               | 3,7                               | 3,7 |
| 111 | -0,9        | 110 | -1,7                | 552                               | 3,9                               | 3,9 |
| 112 | -1,6        | 113 | -1,0                | 546                               | 3,9                               | 3,9 |
| 113 | -1,0        | 114 | -0,3                | 531                               | 3,8                               | 3,8 |
| 114 | -0,3        | 103 | -1,3                | 472                               | 3,3                               | 3,3 |
| 115 | -0,8        | 116 | -0,1                | 509                               | 3,6                               | 3,6 |
| 116 | -0,1        | 1   | -0,3                | 420                               | 3,1                               | 3,0 |
| 117 | 0,1         | 116 | -0,1                | 801                               | 5,7                               | 5,7 |
| Min | -2,9        |     | -2,9                | 87                                | 1,1                               | 0,9 |
| Max | 4,8         |     | 4,7                 | 1.089                             | 23,2                              | 7,7 |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 9:08/3.1.597

## PARK - Wind statistics info

Calculation: WP Oostpolder VKA1

### Main data for wind statistic

|                     |  |
|---------------------|--|
| File                | \\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\200117\24012017\RWE_Oostpolder 100m-Corr099.wws |
| Name                | RWE_Oostpolder 100m-Corr099  |
| Country             | Netherlands  |
| Source              | User   |
| Mast coordinates    | Dutch Stereo-RD/NAP 2000 East: 248.822 North: 608.196  |
| Created             | 24-1-2017  |
| Edited              | 1-2-2017   |
| Sectors             | 12   |
| WAsP version        | WAsP 11 Version 11.05.0028   |
| Displacement height | None   |

### Additional info for wind statistic

|                    |                        |
|--------------------|------------------------|
| Source data        | Default Meteo data RWE |
| Data from          | 25-4-2007              |
| Data to            | 31-1-2009              |
| Measurement length | 21,3 Months            |

### Note

To get the most correct calculation results, wind statistics shall be calculated with the SAME model and model parameters, as currently chosen in calculation. For WAsP versions before 10.0, the model is unchanged, but thereafter more model changes affecting the wind statistic is seen. Likewise WAsP CFD should always use WAsP CFD calculated wind statistics.

### PARK - Map

Calculation: WP Oostpolder VKA1



0 1 2 3 4 km

Map: Uithuizen , Print scale 1:75.000, Map center Dutch Stereo-RD/NAP 2000 East: 249.717 North: 606.402

New WTG      Existing WTG      Obstacle

## PARK - Main Result

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings  
 Air density calculation mode Individual per WTG  
 Result for WTG at hub altitude 1,232 kg/m<sup>3</sup> to 1,248 kg/m<sup>3</sup>  
 Air density relative to standard 100,6 % to 101,8 %  
 Hub altitude above sea level (asl) 39,9 m to 166,1 m  
 Annual mean temperature at hub alt. 8,0 °C to 8,8 °C  
 Pressure at WTGs 994,3 hPa to 1.009,6 hPa

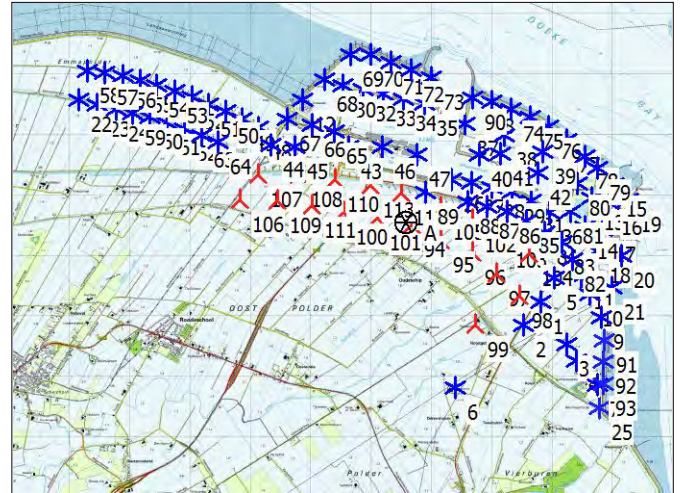
Wake Model Parameters  
 Terrain type Wake decay constant  
 HH:100m Open farmland 0,062

Displacement heights from objects

Wake calculation settings  
 Angle [°] Wind speed [m/s]  
 start end step start end step  
 0,5 360,0 1,0 0,5 30,5 1,0

Wind statistics RWE\_Oostpolder 100m-Corr099.wws

WASP version WASP 11 Version 11.05.0028



▲ New WTG  
 \* Site Data

Scale 1:125.000  
 \* Existing WTG

### Key results for height 165,0 m above ground level

Terrain Dutch Stereo-RD/NAP 2000

X (east) Y (north) Name of wind distribution Type

|  | Wind energy [kWh/m <sup>2</sup> ] | Mean wind speed [m/s] | Equivalent roughness |
|--|-----------------------------------|-----------------------|----------------------|
| A 250.596 606.527 Oostpolder site data | 7.041                             | 9,2                   | 1,1                  |

### Calculated Annual Energy for Wind Farm

| WTG combination                                | Result PARK [MWh/y] | GROSS (no loss) Free WTGs [MWh/y] | Park efficiency [%] | Specific results <sup>a)</sup> |                         |                              |                                   |
|--|---------------------|-----------------------------------|---------------------|--------------------------------|-------------------------|------------------------------|-----------------------------------|
|  |                     |                                   |                     | Capacity factor [%]            | Mean WTG result [MWh/y] | Full load hours [Hours/year] | Mean wind speed @hub height [m/s] |
| Wind farm                                      | 1.205.913,3         | 1.420.879,2                       | 84,9                | 36,8                           | 10.671,8                | 3.222                        | 8,4                               |
| New WTGs only                                  | 389.352,5           | 432.361,5                         | 90,1                | 52,9                           | 19.467,6                | 4.635                        | 9,2                               |
| Existing park WTGs only                        | 816.560,8           | 988.517,7                         | 82,6                | 32,1                           | 8.780,2                 | 2.813                        | 8,2                               |
| Existing park WTGs without new WTGs            | 846.652,8           | 988.517,7                         | 85,6                |                                | 9.103,8                 |                              |                                   |
| Reduction for existing park WTGs caused by new | 30.092,1            |                                   |                     |                                |                         |                              |                                   |

<sup>a)</sup> Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 20 new WTGs with total 84,0 MW rated power

| Links | WTG type Valid | Manufact. | Type-generator  | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Power curve Creator | Name                                       | Annual Energy Park |                |                     |                            |
|-------|----------------|-----------|-----------------|-------------------|--------------------|----------------|---------------------|--|--------------------|----------------|---------------------|----------------------------|
|       |                |           |                 |                   |                    |                |                     |  | Result [MWh]       | Efficiency [%] | Capacity factor [%] | Free mean wind speed [m/s] |
| 94 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.482,5           | 90,15          | 52,9                | 9,16                       |
| 95 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.672,6           | 91,10          | 53,4                | 9,15                       |
| 96 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.589,2           | 90,56          | 53,2                | 9,16                       |
| 97 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.502,6           | 90,33          | 53,0                | 9,14                       |
| 98 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.362,5           | 89,78          | 52,6                | 9,13                       |
| 99 A  | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 20.340,4           | 94,96          | 55,2                | 9,07                       |
| 100 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.675,8           | 91,36          | 53,4                | 9,13                       |
| 101 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.608,2           | 90,89          | 53,3                | 9,15                       |
| 102 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.002,6           | 87,36          | 51,6                | 9,21                       |
| 103 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 18.868,2           | 86,70          | 51,2                | 9,22                       |
| 104 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.037,6           | 87,53          | 51,7                | 9,21                       |
| 105 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.055,3           | 87,65          | 51,8                | 9,21                       |
| 106 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 20.321,6           | 94,74          | 55,2                | 9,12                       |
| 107 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.679,1           | 91,28          | 53,5                | 9,16                       |
| 108 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.276,7           | 89,05          | 52,4                | 9,19                       |
| 109 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.820,6           | 92,30          | 53,8                | 9,12                       |
| 110 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.156,8           | 88,30          | 52,0                | 9,20                       |
| 111 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.717,2           | 91,57          | 53,6                | 9,14                       |
| 112 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.059,6           | 87,62          | 51,8                | 9,22                       |
| 113 A | Yes            | ENERCON   | E-141 EP4-4.200 | 4.200             | 141,0              | 165,0          | EMD                 | Level 0 - official - 0 s- 4200kW - 04/2016 | 19.123,3           | 88,02          | 51,9                | 9,21                       |

Annual Energy results do not include any losses apart from wake losses. For expected NET AEP (expected sold production), see report Loss & Uncertainty.

## PARK - Main Result

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

Calculated Annual Energy for each of 93 existing park WTGs with total 290,3 MW rated power

| Links | WTG type |            |                           | Power, rated | Rotor diameter | Hub height | Power curve |   | Annual Energy | Park Efficiency |                                   |                |
|-------|----------|------------|---------------------------|--------------|----------------|------------|-------------|---|---------------|-----------------|-----------------------------------|----------------|
|       | Valid    | Manufact.  | Type-generator            |              |                |            | Creator     | Name  |               |                 | Calculated prod. without new WTGs | After New WTGs |
|       |          |            |                           | [kW]         | [m]            | [m]        |             |   | [MWh]         | [MWh]           | [MWh %]                           | [%]            |
| 1 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500          | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                        | 18.646,7      | 17.716,3        | 930,4 5,0                         | 86,41          |
| 2 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500          | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                        | 19.372,9      | 18.791,9        | 581,0 3,0                         | 92,15          |
| 3 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500          | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                        | 19.156,2      | 18.883,4        | 272,8 1,4                         | 92,09          |
| 4 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500          | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                        | 19.181,8      | 19.011,1        | 170,7 0,9                         | 92,72          |
| 5 A   | Yes      | LAGERWEY   | L136-4.5MW-4.500          | 4.500        | 136,0          | 132,0      | USER        | Lagerwey L136-4.5MW PV curve                        | 18.095,9      | 17.003,3        | 1.092,7 6,0                       | 82,43          |
| 6 A   | No       | VESTAS     | V47-660                   | 660          | 47,0           | 40,0       | EMD         | Level 0 - calculated - - 07-2001                    | 1.479,8       | 1.463,3         | 16,5 1,1                          | 96,11          |
| 7 A   | Yes      | VESTAS     | V52-850                   | 850          | 52,0           | 40,0       | EMD         | Level 0 - calculated - 104.2 dB(A) - 07-2006        | 1.990,3       | 1.973,7         | 16,6 0,8                          | 92,36          |
| 8 A   | Yes      | VESTAS     | V117-3.45-3.450           | 3.450        | 117,0          | 93,5       | EMD         | Level 0 - Calculated - Modes 0 & 0-OS - 01-2016     | 13.073,7      | 12.807,7        | 266,0 2,0                         | 84,74          |
| 9 A   | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.713,8       | 7.578,2         | 135,6 1,8                         | 84,56          |
| 10 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.559,6       | 7.393,3         | 166,3 2,2                         | 82,68          |
| 11 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.457,4       | 7.208,0         | 249,4 3,3                         | 80,66          |
| 12 A  | No       | 2-B Energy | OTC 6 MW-6.000            | 6.000        | 140,0          | 105,0      | USER        | Turbulent power curve with TI of 8.7%               | 18.772,6      | 18.370,9        | 401,7 2,1                         | 84,06          |
| 13 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 6.926,2       | 6.776,3         | 149,9 2,2                         | 73,45          |
| 14 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 6.907,2       | 6.677,0         | 230,2 3,3                         | 73,26          |
| 15 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.214,6       | 7.132,0         | 82,5 1,1                          | 75,60          |
| 16 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.095,3       | 6.980,8         | 114,5 1,6                         | 75,03          |
| 17 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.152,4       | 7.009,7         | 142,7 2,0                         | 76,20          |
| 18 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.080,1       | 6.866,5         | 213,7 3,0                         | 76,18          |
| 19 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.460,4       | 7.396,3         | 64,1 0,9                          | 80,49          |
| 20 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.662,4       | 7.575,1         | 87,3 1,1                          | 81,84          |
| 21 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.546,5       | 7.444,2         | 102,3 1,4                         | 82,25          |
| 22 A  | Yes      | VESTAS     | V112-3.3 Gridstream-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              | 12.801,1      | 12.789,0        | 12,1 0,1                          | 94,29          |
| 23 A  | Yes      | VESTAS     | V112-3.3 Gridstream-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              | 12.290,7      | 12.275,4        | 15,3 0,1                          | 90,75          |
| 24 A  | Yes      | VESTAS     | V112-3.3 Gridstream-3.300 | 3.300        | 112,0          | 100,0      | EMD         | Level 0 - Mode 0 - Estimated - 12-2013              | 11.993,9      | 11.969,8        | 24,1 0,2                          | 89,26          |
| 25 A  | Yes      | VESTAS     | V117-3.6-3.600            | 3.600        | 117,0          | 117,0      | EMD         | Level 0 - Calculated - Modes PO1 & PO1-OS - 01-2016 | 9.263,9       | 15.184,5        | 79,4 0,5                          | 96,67          |
| 26 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.126,5       | 8.124,3         | 902,2 10,0                        | 78,22          |
| 27 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.602,3       | 7.873,6         | 728,7 8,5                         | 75,59          |
| 28 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.300,5       | 7.614,0         | 686,5 8,3                         | 72,90          |
| 29 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.300,1       | 7.738,9         | 561,1 6,8                         | 73,41          |
| 30 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.913,4       | 8.676,1         | 237,4 2,7                         | 81,34          |
| 31 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.166,9       | 8.076,1         | 565,8 6,9                         | 73,06          |
| 32 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.981,0       | 8.699,7         | 281,4 3,1                         | 81,46          |
| 33 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.052,4       | 8.738,5         | 313,9 3,5                         | 82,06          |
| 34 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.981,3       | 8.661,1         | 320,2 3,6                         | 81,07          |
| 35 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.104,3       | 8.763,7         | 340,5 3,7                         | 82,31          |
| 36 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.162,2       | 7.651,4         | 510,7 6,3                         | 73,30          |
| 37 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.289,0       | 8.912,3         | 376,6 4,1                         | 82,78          |
| 38 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.458,9       | 8.233,7         | 225,2 2,7                         | 77,48          |
| 39 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.513,0       | 8.318,0         | 195,0 2,3                         | 77,97          |
| 40 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.769,3       | 8.308,2         | 461,1 5,3                         | 78,42          |
| 41 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.509,3       | 8.170,1         | 339,2 4,0                         | 77,21          |
| 42 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 8.419,6       | 8.100,5         | 319,1 3,8                         | 76,41          |
| 43 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.303,9       | 8.418,8         | 885,1 9,5                         | 81,47          |
| 44 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.127,9       | 8.431,0         | 696,8 7,6                         | 83,30          |
| 45 A  | Yes      | VESTAS     | V90-3.000                 | 3.000        | 90,0           | 105,0      | EMD         | Level 0 - Estimated - 107.0 dB(A) - 06-2009         | 9.090,5       | 8.330,0         | 760,6 8,4                         | 82,32          |
| 46 A  | No       | Senvion    | 6.2M126-6.150             | 6.150        | 126,0          | 114,0      | USER        | Calcdted power curve Senvion 6.2M126                | 20.356,1      | 18.667,4        | 1.688,8 8,3                       | 83,89          |
| 47 A  | No       | Senvion    | 6.2M126-6.150             | 6.150        | 126,0          | 114,0      | USER        | Calcdted power curve Senvion 6.2M126                | 20.342,4      | 18.621,4        | 1.721,0 8,5                       | 83,37          |
| 48 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.813,7       | 7.536,9         | 276,8 3,5                         | 84,07          |
| 49 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.623,2       | 7.483,1         | 140,2 1,8                         | 82,95          |
| 50 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.434,2       | 7.336,9         | 97,3 1,3                          | 81,48          |
| 51 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.447,7       | 7.392,6         | 55,1 0,7                          | 81,78          |
| 52 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.500,4       | 7.466,8         | 33,6 0,4                          | 81,99          |
| 53 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.547,7       | 7.516,0         | 31,7 0,4                          | 82,33          |
| 54 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.484,3       | 7.462,1         | 22,2 0,3                          | 82,42          |
| 55 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.560,5       | 7.545,2         | 15,3 0,2                          | 82,92          |
| 56 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.753,3       | 7.741,1         | 12,1 0,2                          | 84,27          |
| 57 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.948,0       | 7.932,4         | 15,6 0,2                          | 86,34          |
| 58 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.432,2       | 8.417,7         | 14,5 0,2                          | 91,85          |
| 59 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.911,0       | 7.887,7         | 23,3 0,3                          | 87,24          |
| 60 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.891,5       | 7.866,8         | 24,7 0,3                          | 87,34          |
| 61 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.897,1       | 7.866,6         | 30,5 0,4                          | 87,42          |
| 62 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.874,5       | 7.831,3         | 43,2 0,5                          | 87,40          |
| 63 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.884,6       | 7.814,4         | 70,1 0,9                          | 87,29          |
| 64 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.984,9       | 7.831,2         | 153,7 1,9                         | 87,63          |
| 65 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.046,1       | 7.471,2         | 574,8 7,1                         | 81,74          |
| 66 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.684,2       | 7.257,0         | 427,2 5,6                         | 79,85          |
| 67 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.694,7       | 7.403,0         | 291,6 3,8                         | 81,57          |
| 68 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.926,0       | 7.760,7         | 165,3 2,1                         | 82,00          |
| 69 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.338,2       | 8.239,2         | 99,0 1,2                          | 85,12          |
| 70 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.281,2       | 8.174,5         | 106,7 1,3                         | 83,85          |
| 71 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.316,2       | 8.170,4         | 145,7 1,8                         | 83,64          |
| 72 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.086,8       | 7.931,9         | 154,9 1,9                         | 82,68          |
| 73 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 8.047,6       | 7.895,0         | 152,5 1,9                         | 82,81          |
| 74 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.898,3       | 7.733,0         | 165,3 2,1                         | 80,51          |
| 75 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.918,0       | 7.767,1         | 150,8 1,9                         | 81,01          |
| 76 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.892,3       | 7.758,3         | 134,0 1,7                         | 80,71          |
| 77 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.877,6       | 7.728,7         | 148,9 1,9                         | 80,85          |
| 78 A  | Yes      | ENERCON    | E-82 E3-3.000             | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014               | 7.734,5       | 7.592,0         | 142,5 1,8                         | 79,67          |
| 79 A  | Yes      | ENERCON    | E-8                       |              |                |            |             |   |               |                 |                                   |                |

## PARK - Main Result

### Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

...continued from previous page

| Links | Valid | WTG type  |                | Power, rated | Rotor diameter | Hub height | Power curve |                                       | Calculated prod. without new WTGs | Annual Energy  |                          | Park Efficiency |
|-------|-------|-----------|----------------|--------------|----------------|------------|-------------|---------------------------------------|-----------------------------------|----------------|--------------------------|-----------------|
|       |       | Manufact. | Type-generator |              |                |            | Creator     | Name                                  |                                   | After New WTGs | Decrease due to new WTGs |                 |
|       |       |           |                | [kW]         | [m]            | [m]        |             |                                       | [MWh]                             | [MWh %]        | [%]                      |                 |
| 82 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.273,3                           | 6.895,3        | 378,0 5,2                | 76,74           |
| 83 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.516,2                           | 6.936,0        | 580,2 7,7                | 76,11           |
| 84 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.588,6                           | 6.745,6        | 843,0 11,1               | 75,11           |
| 85 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.695,6                           | 6.798,6        | 897,0 11,7               | 75,48           |
| 86 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.621,8                           | 6.771,3        | 850,5 11,2               | 75,27           |
| 87 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.715,7                           | 6.727,4        | 988,3 12,8               | 75,02           |
| 88 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 7.973,5                           | 7.097,4        | 876,0 11,0               | 78,90           |
| 89 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 98,4       | EMD         | Level 0 - official - Mode 0 - 08/2014 | 8.266,4                           | 7.311,4        | 955,0 11,6               | 81,49           |
| 90 A  | Yes   | ENERCON   | E-82 E3-3.000  | 3.000        | 82,0           | 100,0      | EMD         | Level 0 - official - Mode 0 - 08/2014 | 8.195,1                           | 7.978,3        | 216,7 2,6                | 83,25           |
| 91 A  | Yes   | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013          | 8.349,0                           | 8.261,7        | 87,3 1,0                 | 87,93           |
| 92 A  | Yes   | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013          | 8.518,0                           | 8.459,4        | 58,7 0,7                 | 90,17           |
| 93 A  | Yes   | VESTAS    | V100-2.0-2.000 | 2.000        | 100,0          | 100,0      | EMD         | Level 0 - Mode 0 - - 07-2013          | 8.614,2                           | 8.559,1        | 55,1 0,6                 | 91,51           |

### WTG siting

Dutch Stereo-RD/NAP 2000

X (east) Y (north) Z Row data/Description  
[m]

|          |         |         |      |                                    |                                   |
|----------|---------|---------|------|------------------------------------|-----------------------------------|
| 1 Exist  | 252.819 | 605.227 | -0,3 | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) (244) |
| 2 Exist  | 252.538 | 604.846 | 0,0  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) (245) |
| 3 Exist  | 253.250 | 604.530 | 0,0  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) (246) |
| 4 Exist  | 253.410 | 604.258 | 0,2  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) (247) |
| 5 Exist  | 253.038 | 605.625 | 0,3  | LAGERWEY L136-4.5MW 4500 136.0 !O! | hub: 132,0 m (TOT: 200,0 m) (248) |
| 6 Exist  | 251.401 | 603.815 | -0,1 | VESTAS V47 660 47.0 !O!            | hub: 40,0 m (TOT: 63,5 m) (264)   |
| 7 Exist  | 253.765 | 603.860 | 1,8  | VESTAS V52 850 52.0 !O!            | hub: 40,0 m (TOT: 66,0 m) (265)   |
| 8 Exist  | 252.007 | 608.545 | 1,6  | VESTAS V117-3.45 3450 117.0 !O!    | hub: 93,5 m (TOT: 152,0 m) (266)  |
| 9 Exist  | 253.830 | 604.979 | 0,1  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (267)  |
| 10 Exist | 253.634 | 605.359 | -0,4 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (268)  |
| 11 Exist | 253.487 | 605.644 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (269)  |
| 12 Exist | 248.875 | 608.572 | 2,5  | 2-B Energy OTC 6 MW 6000 140.0 !#! | hub: 105,0 m (TOT: 175,0 m) (270) |
| 13 Exist | 253.662 | 606.943 | -1,0 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (271)  |
| 14 Exist | 253.548 | 606.476 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (272)  |
| 15 Exist | 254.026 | 607.172 | 1,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (273)  |
| 16 Exist | 253.954 | 606.875 | 2,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (274)  |
| 17 Exist | 253.843 | 606.417 | 2,7  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (275)  |
| 18 Exist | 253.758 | 606.067 | -0,7 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (276)  |
| 19 Exist | 254.272 | 606.915 | 0,1  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (277)  |
| 20 Exist | 254.151 | 605.985 | 2,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (278)  |
| 21 Exist | 253.996 | 605.473 | 0,0  | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (279)  |
| 22 Exist | 245.161 | 608.566 | 0,7  | VESTAS V90 3000 90.0 !O!           | hub: 100,0 m (TOT: 156,0 m) (354) |
| 23 Exist | 245.463 | 608.501 | 0,4  | VESTAS V90 3000 90.0 !O!           | hub: 100,0 m (TOT: 156,0 m) (355) |
| 24 Exist | 245.775 | 608.421 | -1,5 | VESTAS V90 3000 90.0 !O!           | hub: 100,0 m (TOT: 156,0 m) (356) |
| 25 Exist | 253.792 | 603.479 | 1,0  | VESTAS V117-3.6 3600 117.0 !O!     | hub: 117,0 m (TOT: 175,5 m) (664) |
| 26 Exist | 251.345 | 607.258 | 2,3  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (599) |
| 27 Exist | 251.679 | 607.196 | 1,8  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (600) |
| 28 Exist | 252.008 | 607.117 | 1,0  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (601) |
| 29 Exist | 252.340 | 607.043 | 3,1  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (602) |
| 30 Exist | 249.539 | 608.811 | 0,1  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (603) |
| 31 Exist | 252.654 | 606.896 | 1,3  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (604) |
| 32 Exist | 249.866 | 608.752 | 0,4  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (605) |
| 33 Exist | 250.208 | 608.666 | 1,0  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (606) |
| 34 Exist | 250.550 | 608.586 | 0,9  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (607) |
| 35 Exist | 250.892 | 608.503 | 2,3  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (608) |
| 36 Exist | 252.958 | 606.705 | 1,5  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (609) |
| 37 Exist | 251.566 | 608.173 | 4,2  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (610) |
| 38 Exist | 252.219 | 607.986 | -0,8 | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (611) |
| 39 Exist | 252.852 | 607.716 | 1,9  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (612) |
| 40 Exist | 251.793 | 607.668 | 1,6  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (613) |
| 41 Exist | 252.144 | 607.675 | 2,7  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (614) |
| 42 Exist | 252.765 | 607.355 | 1,6  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (615) |
| 43 Exist | 249.631 | 607.787 | 2,8  | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (616) |
| 44 Exist | 248.339 | 607.818 | -1,2 | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (617) |
| 45 Exist | 248.736 | 607.792 | -1,1 | VESTAS V90 3000 90.0 !O!           | hub: 105,0 m (TOT: 150,0 m) (618) |
| 46 Exist | 250.194 | 607.795 | 4,3  | Senvion 6.2M126 6150 126.0 !O!     | hub: 114,0 m (TOT: 177,0 m) (658) |
| 47 Exist | 250.760 | 607.657 | 3,1  | Senvion 6.2M126 6150 126.0 !O!     | hub: 114,0 m (TOT: 177,0 m) (659) |
| 48 Exist | 248.142 | 608.104 | -1,2 | ENERCON E-82 E3 3000 82.0 !O!      | hub: 98,4 m (TOT: 139,4 m) (660)  |

To be continued on next page...

## PARK - Main Result

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

...continued from previous page

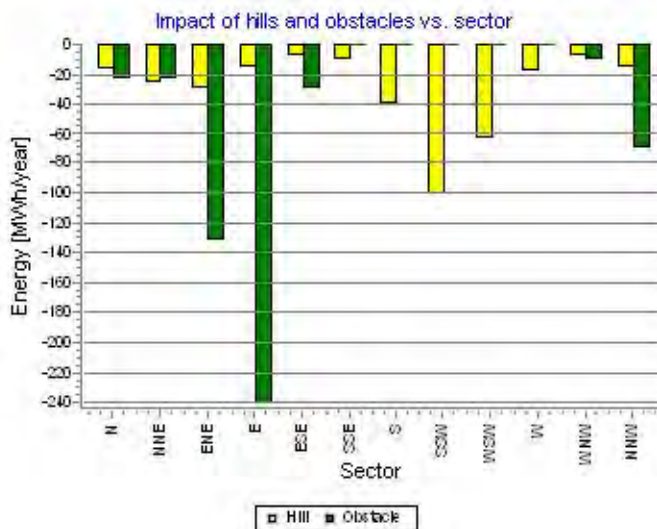
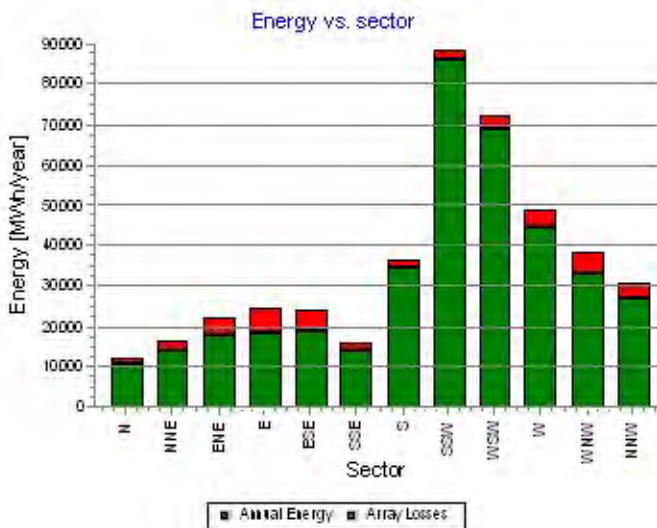
Dutch Stereo-RD/NAP 2000

|          | X (east) | Y (north) | Z [m] | Row data/Description   |
|----------|----------|-----------|-------|--|
| 49 Exist | 247.865  | 608.255   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (661)     |
| 50 Exist | 247.590  | 608.377   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (662)     |
| 51 Exist | 247.311  | 608.501   | -1,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (663)     |
| 52 Exist | 247.034  | 608.625   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (664)     |
| 53 Exist | 246.747  | 608.713   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (371)     |
| 54 Exist | 246.447  | 608.805   | -2,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (666)     |
| 55 Exist | 246.172  | 608.890   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (667)     |
| 56 Exist | 245.885  | 608.978   | 0,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (668)     |
| 57 Exist | 245.590  | 609.026   | 0,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (669)     |
| 58 Exist | 245.294  | 609.056   | -1,1  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (670)     |
| 59 Exist | 246.045  | 608.352   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (671)     |
| 60 Exist | 246.336  | 608.279   | 0,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (672)     |
| 61 Exist | 246.622  | 608.188   | 1,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (673)     |
| 62 Exist | 246.907  | 608.088   | -0,2  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (674)     |
| 63 Exist | 247.190  | 607.981   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (675)     |
| 64 Exist | 247.472  | 607.870   | 0,9   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (676)     |
| 65 Exist | 249.390  | 608.049   | 2,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (677)     |
| 66 Exist | 249.023  | 608.155   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (678)     |
| 67 Exist | 248.609  | 608.251   | 1,9   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (679)     |
| 68 Exist | 249.242  | 608.904   | -0,5  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (680)     |
| 69 Exist | 249.672  | 609.314   | 0,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (681)     |
| 70 Exist | 250.005  | 609.324   | 2,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (682)     |
| 71 Exist | 250.336  | 609.195   | 4,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (683)     |
| 72 Exist | 250.665  | 609.061   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (684)     |
| 73 Exist | 250.997  | 608.936   | 3,2   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (685)     |
| 74 Exist | 252.323  | 608.418   | 1,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (686)     |
| 75 Exist | 252.641  | 608.293   | 1,4   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (687)     |
| 76 Exist | 252.949  | 608.128   | 2,1   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (688)     |
| 77 Exist | 253.248  | 607.910   | 0,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (689)     |
| 78 Exist | 253.547  | 607.637   | 0,6   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (690)     |
| 79 Exist | 253.756  | 607.438   | 1,8   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (691)     |
| 80 Exist | 253.425  | 607.194   | -0,4  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (692)     |
| 81 Exist | 253.312  | 606.728   | -0,7  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (693)     |
| 82 Exist | 253.341  | 605.928   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (694)     |
| 83 Exist | 253.172  | 606.215   | 4,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (695)     |
| 84 Exist | 252.880  | 606.379   | -0,3  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (696)     |
| 85 Exist | 252.576  | 606.567   | 1,7   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (697)     |
| 86 Exist | 252.262  | 606.720   | -1,0  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (698)     |
| 87 Exist | 251.932  | 606.799   | -2,9  | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (699)     |
| 88 Exist | 251.602  | 606.881   | 0,3   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (700)     |
| 89 Exist | 250.915  | 607.046   | 1,5   | ENERCON E-82 E3 3000 82.0 !O! hub: 98,4 m (TOT: 139,4 m) (702)     |
| 90 Exist | 251.691  | 608.611   | 1,0   | ENERCON E-82 E3 3000 82.0 !O! hub: 100,0 m (TOT: 141,0 m) (711)    |
| 91 Exist | 253.864  | 604.596   | 0,0   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (712)   |
| 92 Exist | 253.855  | 604.236   | 0,0   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (713)   |
| 93 Exist | 253.850  | 603.877   | 0,2   | VESTAS V100-2.0 2000 100.0 !O! hub: 100,0 m (TOT: 150,0 m) (714)   |
| 94 New   | 250.684  | 606.500   | -1,1  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (644) |
| 95 New   | 251.170  | 606.252   | -1,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (645) |
| 96 New   | 251.688  | 606.042   | 0,5   | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (646) |
| 97 New   | 252.082  | 605.684   | -0,8  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (647) |
| 98 New   | 252.469  | 605.331   | -2,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (648) |
| 99 New   | 251.732  | 604.852   | 0,1   | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (649) |
| 100 New  | 249.560  | 606.703   | -1,2  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (650) |
| 101 New  | 250.117  | 606.616   | -0,7  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (651) |
| 102 New  | 251.693  | 606.576   | -0,9  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (652) |
| 103 New  | 252.197  | 606.333   | 0,2   | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (653) |
| 104 New  | 252.625  | 606.025   | 1,1   | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (654) |
| 105 New  | 251.157  | 606.782   | 0,0   | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (655) |
| 106 New  | 247.827  | 606.909   | -0,6  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (656) |
| 107 New  | 248.133  | 607.325   | -1,0  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (657) |
| 108 New  | 248.805  | 607.337   | -0,3  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (658) |
| 109 New  | 248.451  | 606.902   | -1,3  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (659) |
| 110 New  | 249.405  | 607.243   | -0,6  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (660) |
| 111 New  | 249.027  | 606.820   | -0,6  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (661) |
| 112 New  | 250.512  | 607.025   | -1,6  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (662) |
| 113 New  | 249.999  | 607.151   | -2,3  | ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (663) |

## PARK - Production Analysis

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)WTG: All new WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                        |                       | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW    | 8 WSW    | 9 W      | 10 WNW   | 11 NNW   | Total     |
|-------------------------------|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Roughness based energy        | [MWh]                 | 12.511,8 | 16.734,6 | 22.245,4 | 24.664,8 | 24.038,6 | 15.824,7 | 36.834,8 | 88.767,9 | 72.749,5 | 49.110,9 | 38.912,3 | 30.841,2 | 433.236,5 |
| -Decrease due to obstacles    | [MWh]                 | 23,2     | 22,6     | 131,1    | 241,0    | 29,1     | 0,1      | 0,0      | 0,0      | 0,0      | 0,0      | 9,9      | 69,5     | 526,4     |
| +Increase due to hills        | [MWh]                 | -16,5    | -26,1    | -29,0    | -16,0    | -7,7     | -10,0    | -39,5    | -100,0   | -62,7    | -18,0    | -8,1     | -15,1    | -348,5    |
| -Decrease due to array losses | [MWh]                 | 1.824,8  | 2.453,6  | 4.227,6  | 5.860,7  | 5.321,7  | 1.561,0  | 2.084,3  | 2.510,1  | 3.675,9  | 4.082,0  | 5.740,0  | 3.667,3  | 43.009,0  |
| Resulting energy              | [MWh]                 | 10.647,3 | 14.232,3 | 17.857,7 | 18.547,1 | 18.680,1 | 14.253,7 | 34.710,9 | 86.157,8 | 69.011,0 | 45.010,9 | 33.154,3 | 27.089,3 | 389.352,8 |
| Specific energy               | [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |          |          |          |          |          | 1.247     |
| Specific energy               | [kWh/kW]              |          |          |          |          |          |          |          |          |          |          |          |          | 4.635     |
| Decrease due to obstacles     | [%]                   | 0,2      | 0,1      | 0,6      | 1,0      | 0,1      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,0      | 0,2      | 0,12      |
| Increase due to hills         | [%]                   | -0,1     | -0,2     | -0,1     | -0,1     | 0,0      | -0,1     | -0,1     | -0,1     | -0,1     | 0,0      | 0,0      | 0,0      | -0,08     |
| Decrease due to array losses  | [%]                   | 14,6     | 14,7     | 19,1     | 24,0     | 22,2     | 9,9      | 5,7      | 2,8      | 5,1      | 8,3      | 14,8     | 11,9     | 9,95      |
| Utilization                   | [%]                   | 18,6     | 20,7     | 22,3     | 22,1     | 20,1     | 18,7     | 19,3     | 20,3     | 17,2     | 14,1     | 13,2     | 14,9     | 17,6      |
| Operational                   | [Hours/year]          | 342      | 387      | 527      | 612      | 548      | 361      | 713      | 1.475    | 1.362    | 963      | 753      | 599      | 8.641     |
| Full Load Equivalent          | [Hours/year]          | 127      | 169      | 213      | 221      | 222      | 170      | 413      | 1.026    | 822      | 536      | 395      | 322      | 4.635     |

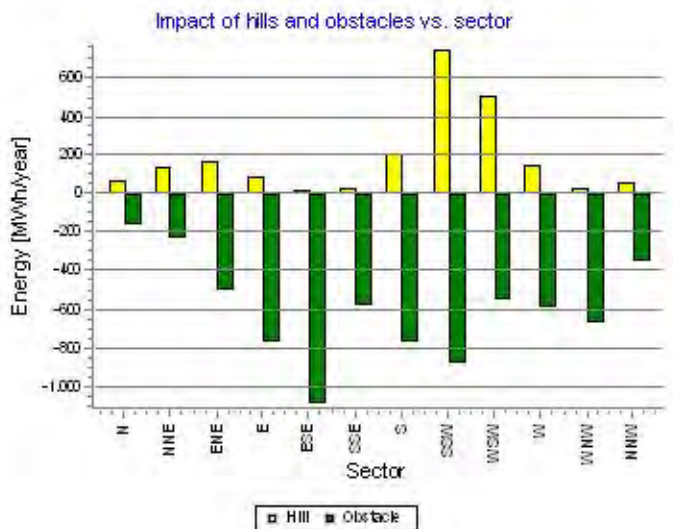
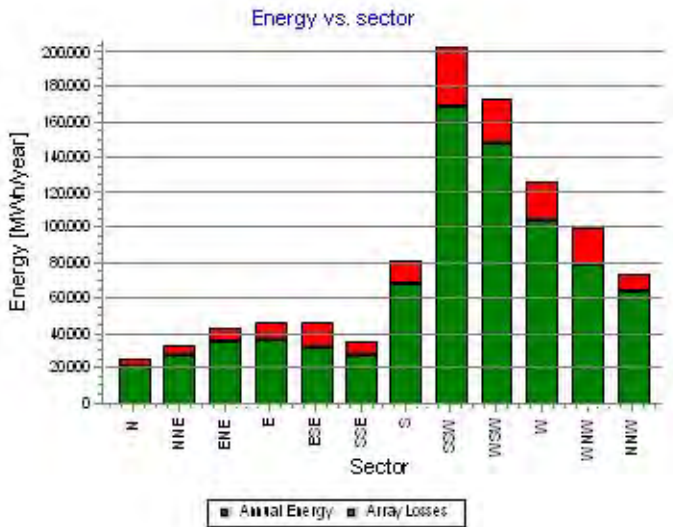




## PARK - Production Analysis

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling) WTG: All existing WTGs, Air density varies with WTG position 1,232 kg/m<sup>3</sup> - 1,248 kg/m<sup>3</sup>  
Directional Analysis

| Sector                                | 0 N      | 1 NNE    | 2 ENE    | 3 E      | 4 ESE    | 5 SSE    | 6 S      | 7 SSW     | 8 WSW     | 9 W       | 10 WNW    | 11 NNW   | Total     |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|-----------|
| Roughness based energy [MWh]          | 25.698,4 | 33.506,9 | 43.131,9 | 47.260,4 | 47.276,9 | 36.187,3 | 82.256,8 | 203.063,9 | 173.479,5 | 126.363,6 | 101.418,8 | 73.831,8 | 993.475,8 |
| -Decrease due to obstacles [MWh]      | 163,3    | 231,7    | 505,3    | 768,9    | 1.089,3  | 585,7    | 774,4    | 882,1     | 550,6     | 594,5     | 670,6     | 343,9    | 7.160,5   |
| +Increase due to hills [MWh]          | 70,6     | 137,7    | 163,9    | 92,3     | 22,9     | 28,4     | 208,6    | 741,8     | 501,1     | 151,1     | 28,8      | 54,8     | 2.202,1   |
| -Decrease due to array losses [MWh]   | 3.839,8  | 5.000,7  | 6.677,2  | 9.872,3  | 13.634,7 | 7.028,2  | 13.684,8 | 33.906,3  | 25.468,1  | 21.233,6  | 21.345,9  | 10.265,4 | 171.956,9 |
| Resulting energy [MWh]                | 21.765,9 | 28.412,2 | 36.113,4 | 36.711,6 | 32.575,7 | 28.601,7 | 68.006,2 | 169.017,3 | 147.961,8 | 104.686,5 | 79.431,1  | 63.277,4 | 816.560,7 |
| Specific energy [kWh/m <sup>2</sup> ] |          |          |          |          |          |          |          |           |           |           |           |          | 1.341     |
| Specific energy [kWh/kW]              |          |          |          |          |          |          |          |           |           |           |           |          | 2.813     |
| Decrease due to obstacles [%]         | 0,6      | 0,7      | 1,2      | 1,6      | 2,3      | 1,6      | 0,9      | 0,4       | 0,3       | 0,5       | 0,7       | 0,5      | 0,72      |
| Increase due to hills [%]             | 0,3      | 0,4      | 0,4      | 0,2      | 0,0      | 0,1      | 0,3      | 0,4       | 0,3       | 0,1       | 0,0       | 0,1      | 0,22      |
| Decrease due to array losses [%]      | 15,0     | 15,0     | 15,6     | 21,2     | 29,5     | 19,7     | 16,8     | 16,7      | 14,7      | 16,9      | 21,2      | 14,0     | 17,40     |
| Utilization [%]                       | 28,7     | 31,3     | 33,2     | 31,4     | 26,6     | 25,4     | 27,6     | 28,5      | 25,6      | 21,2      | 19,9      | 24,9     | 25,6      |
| Operational [Hours/year]              | 333      | 374      | 509      | 591      | 531      | 354      | 687      | 1.425     | 1.323     | 944       | 737       | 583      | 8.391     |
| Full Load Equivalent [Hours/year]     | 75       | 98       | 124      | 126      | 112      | 99       | 234      | 582       | 510       | 361       | 274       | 218      | 2.813     |







## PARK - Power Curve Analysis

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling) WTG: 94 - ENERCON E-141 EP4 4200 141.0 I-I Level 0 - official - 0 s- 4200kW - 04/2016, Hub height: 165,0 m  
Name: Level 0 - official - 0 s- 4200kW - 04/2016  
Source: Manufacturer

| Source/Date | Created by | Created   | Edited   | Stop wind speed [m/s] | Power control | CT curve type | Generator type | Specific power kW/m <sup>2</sup> |
|-------------|------------|-----------|----------|-----------------------|---------------|---------------|----------------|----------------------------------|
| 13-4-2016   | EMD        | 29-4-2016 | 9-5-2016 | 25,0                  | Pitch         | User defined  | Variable       | 0,27                             |

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HP curve comparison - Note: For standard air density and weibull k parameter = 2

| Vmean   | [m/s] | 5     | 6      | 7      | 8      | 9      | 10     |
|---|-------|-------|--------|--------|--------|--------|--------|
| HP value Pitch, variable speed (2013)                                       | [MWh] | 7.749 | 11.582 | 15.194 | 18.346 | 20.965 | 23.032 |
| ENERCON E-141 EP4 4200 141.0 I-I Level 0 - official - 0 s- 4200kW - 04/2016 | [MWh] | 7.644 | 11.288 | 14.772 | 17.854 | 20.437 | 22.479 |
| Check value   | [%]   | 1     | 3      | 3      | 3      | 3      | 2      |

The table shows comparison between annual energy production calculated on basis of simplified "HP-curves" which assume that all WTGs performs quite similar - only specific power loading (kW/m<sup>2</sup>) and single/dual speed or stall/pitch decides the calculated values. Productions are without wake losses.

For further details, ask at the Danish Energy Agency for project report J.nr. 51171/00-0016 or see windPRO manual chapter 3.5.2.

The method is refined in EMD report "20 Detailed Case Studies comparing Project Design Calculations and actual Energy Productions for Wind Energy Projects worldwide", jan 2003.

Use the table to evaluate if the given power curve is reasonable - if the check value are lower than -5%, the power curve probably is too optimistic due to uncertainty in power curve measurement.

### Power curve

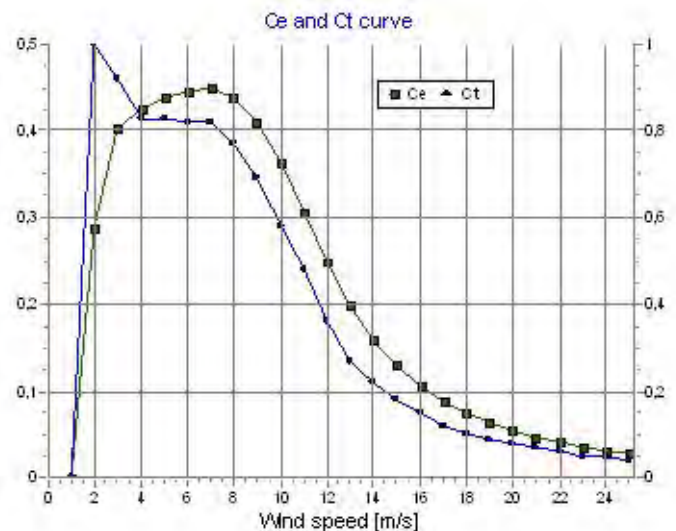
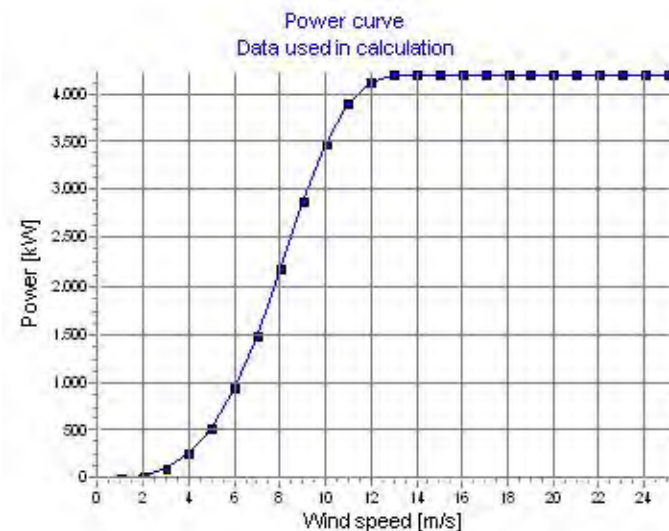
Original data, Air density: 1,225 kg/m<sup>3</sup>

| Wind speed [m/s] | Power [kW] | Ce   | Wind speed [m/s] | Ct curve |
|------------------|------------|------|------------------|----------|
| 0,0              | 0,0        | 0,00 | 0,0              | 0,00     |
| 0,5              | 0,0        | 0,00 | 0,5              | 0,00     |
| 1,0              | 0,0        | 0,00 | 1,0              | 0,00     |
| 1,5              | 0,0        | 0,00 | 1,5              | 0,00     |
| 2,0              | 22,0       | 0,29 | 2,0              | 1,16     |
| 2,5              | 54,0       | 0,36 | 2,5              | 1,01     |
| 3,0              | 104,0      | 0,40 | 3,0              | 0,92     |
| 3,5              | 171,0      | 0,42 | 3,5              | 0,87     |
| 4,0              | 260,0      | 0,42 | 4,0              | 0,83     |
| 4,5              | 376,0      | 0,43 | 4,5              | 0,83     |
| 5,0              | 523,0      | 0,44 | 5,0              | 0,83     |
| 5,5              | 703,0      | 0,44 | 5,5              | 0,82     |
| 6,0              | 920,0      | 0,45 | 6,0              | 0,82     |
| 6,5              | 1.176,0    | 0,45 | 6,5              | 0,82     |
| 7,0              | 1.471,0    | 0,45 | 7,0              | 0,82     |
| 7,5              | 1.799,0    | 0,45 | 7,5              | 0,80     |
| 8,0              | 2.151,0    | 0,44 | 8,0              | 0,77     |
| 8,5              | 2.514,0    | 0,43 | 8,5              | 0,74     |
| 9,0              | 2.867,0    | 0,41 | 9,0              | 0,69     |
| 9,5              | 3.194,0    | 0,39 | 9,5              | 0,63     |
| 10,0             | 3.481,0    | 0,36 | 10,0             | 0,58     |
| 10,5             | 3.719,0    | 0,34 | 10,5             | 0,53     |
| 11,0             | 3.903,0    | 0,31 | 11,0             | 0,48     |
| 11,5             | 4.033,0    | 0,28 | 11,5             | 0,41     |
| 12,0             | 4.119,0    | 0,25 | 12,0             | 0,36     |
| 12,5             | 4.171,0    | 0,22 | 12,5             | 0,31     |
| 13,0             | 4.196,0    | 0,20 | 13,0             | 0,27     |
| 13,5             | 4.200,0    | 0,18 | 13,5             | 0,24     |
| 14,0             | 4.200,0    | 0,16 | 14,0             | 0,22     |
| 14,5             | 4.200,0    | 0,14 | 14,5             | 0,19     |
| 15,0             | 4.200,0    | 0,13 | 15,0             | 0,18     |
| 15,5             | 4.200,0    | 0,12 | 15,5             | 0,16     |
| 16,0             | 4.200,0    | 0,11 | 16,0             | 0,15     |
| 16,5             | 4.200,0    | 0,10 | 16,5             | 0,13     |
| 17,0             | 4.200,0    | 0,09 | 17,0             | 0,12     |
| 17,5             | 4.200,0    | 0,08 | 17,5             | 0,11     |
| 18,0             | 4.200,0    | 0,08 | 18,0             | 0,10     |
| 18,5             | 4.200,0    | 0,07 | 18,5             | 0,10     |
| 19,0             | 4.200,0    | 0,06 | 19,0             | 0,09     |
| 19,5             | 4.200,0    | 0,06 | 19,5             | 0,08     |
| 20,0             | 4.200,0    | 0,05 | 20,0             | 0,08     |
| 20,5             | 4.200,0    | 0,05 | 20,5             | 0,07     |
| 21,0             | 4.200,0    | 0,05 | 21,0             | 0,07     |
| 21,5             | 4.200,0    | 0,04 | 21,5             | 0,06     |
| 22,0             | 4.200,0    | 0,04 | 22,0             | 0,06     |
| 22,5             | 4.200,0    | 0,04 | 22,5             | 0,06     |
| 23,0             | 4.200,0    | 0,04 | 23,0             | 0,05     |
| 23,5             | 4.200,0    | 0,03 | 23,5             | 0,05     |
| 24,0             | 4.200,0    | 0,03 | 24,0             | 0,05     |
| 24,5             | 4.200,0    | 0,03 | 24,5             | 0,04     |

### Power, Efficiency and energy vs. wind speed

Data used in calculation, Air density: 1,232 kg/m<sup>3</sup> New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>

| Wind speed [m/s] | Power [kW] | Ce   | Interval [m/s] | Energy [MWh] | Acc.Energy [MWh] | Relative [%] |
|------------------|------------|------|----------------|--------------|------------------|--------------|
| 1,0              | 0,0        | 0,00 | 0,50- 1,50     | 0,0          | 0,0              | 0,0          |
| 2,0              | 22,3       | 0,29 | 1,50- 2,50     | 7,4          | 7,4              | 0,0          |
| 3,0              | 104,8      | 0,40 | 2,50- 3,50     | 41,5         | 48,9             | 0,3          |
| 4,0              | 261,8      | 0,43 | 3,50- 4,50     | 131,0        | 180,0            | 0,9          |
| 5,0              | 526,5      | 0,44 | 4,50- 5,50     | 312,4        | 492,4            | 2,5          |
| 6,0              | 926,0      | 0,45 | 5,50- 6,50     | 617,2        | 1.109,6          | 5,7          |
| 7,0              | 1.480,0    | 0,45 | 6,50- 7,50     | 1.049,8      | 2.159,3          | 11,1         |
| 8,0              | 2.162,5    | 0,44 | 7,50- 8,50     | 1.557,5      | 3.716,9          | 19,1         |
| 9,0              | 2.879,5    | 0,41 | 8,50- 9,50     | 2.018,3      | 5.735,1          | 29,4         |
| 10,0             | 3.492,4    | 0,36 | 9,50-10,50     | 2.295,4      | 8.030,6          | 41,2         |
| 11,0             | 3.910,8    | 0,31 | 10,50-11,50    | 2.320,8      | 10.351,4         | 53,1         |
| 12,0             | 4.122,7    | 0,25 | 11,50-12,50    | 2.127,2      | 12.478,6         | 64,1         |
| 13,0             | 4.196,3    | 0,20 | 12,50-13,50    | 1.806,5      | 14.285,1         | 73,3         |
| 14,0             | 4.200,0    | 0,16 | 13,50-14,50    | 1.450,6      | 15.735,7         | 80,8         |
| 15,0             | 4.200,0    | 0,13 | 14,50-15,50    | 1.117,5      | 16.853,2         | 86,5         |
| 16,0             | 4.200,0    | 0,11 | 15,50-16,50    | 830,6        | 17.683,8         | 90,8         |
| 17,0             | 4.200,0    | 0,09 | 16,50-17,50    | 597,4        | 18.281,2         | 93,8         |
| 18,0             | 4.200,0    | 0,07 | 17,50-18,50    | 417,5        | 18.698,7         | 96,0         |
| 19,0             | 4.200,0    | 0,06 | 18,50-19,50    | 284,9        | 18.983,6         | 97,4         |
| 20,0             | 4.200,0    | 0,05 | 19,50-20,50    | 190,7        | 19.174,3         | 98,4         |
| 21,0             | 4.200,0    | 0,05 | 20,50-21,50    | 125,9        | 19.300,2         | 99,1         |
| 22,0             | 4.200,0    | 0,04 | 21,50-22,50    | 82,1         | 19.382,3         | 99,5         |
| 23,0             | 4.200,0    | 0,04 | 22,50-23,50    | 53,1         | 19.435,4         | 99,8         |
| 24,0             | 4.200,0    | 0,03 | 23,50-24,50    | 33,9         | 19.469,3         | 99,9         |
| 25,0             | 4.200,0    | 0,03 | 24,50-25,50    | 13,2         | 19.482,5         | 100,0        |



Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 9:31/3.1.597

## PARK - Terrain

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling) Site Data: A - Oostpolder site data

Obstacles:  
23 Obstacles used

Roughness:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2015\715068 WTG Intocon Eemshaven\TO\WP\ROUGHNESSLINE\_713066 715068\_1.wpo  
Min X: 219.227, Max X: 278.331, Min Y: 577.425, Max Y: 638.717, Width: 59.104 m, Height: 61.292 m

Orography:  
Terrain data files used in calculation:  
\\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\ObjectImports\713066 715068\_EMDGrid\_0(1).wpg  
Min X: 198.208, Max X: 300.556, Min Y: 557.205, Max Y: 659.267, Width: 102.348 m, Height: 102.062 m

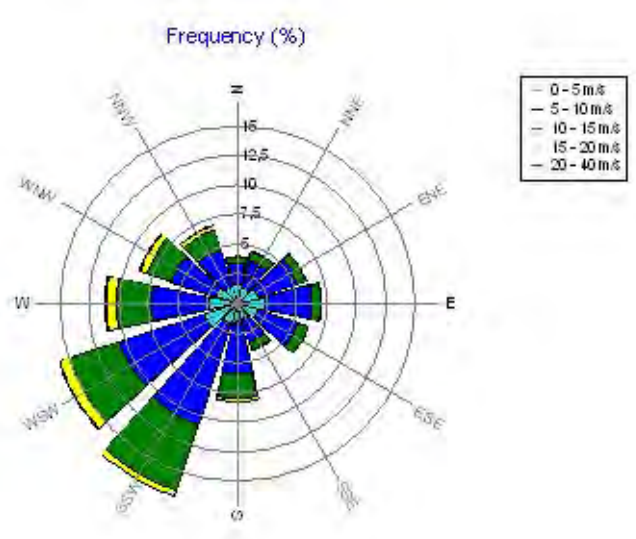
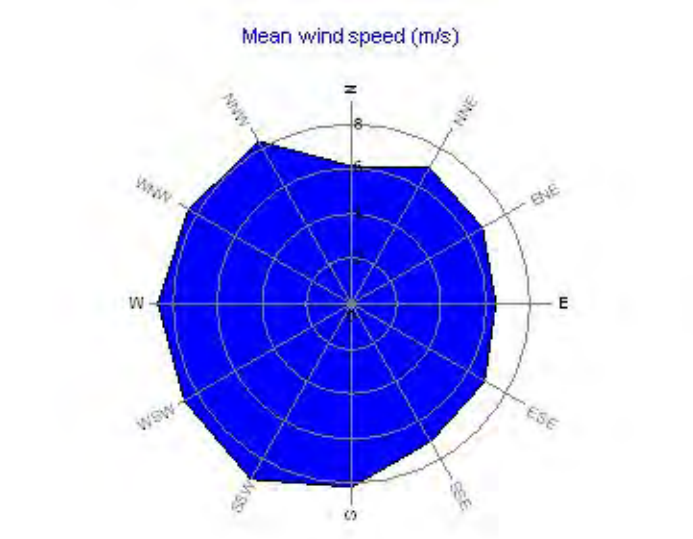
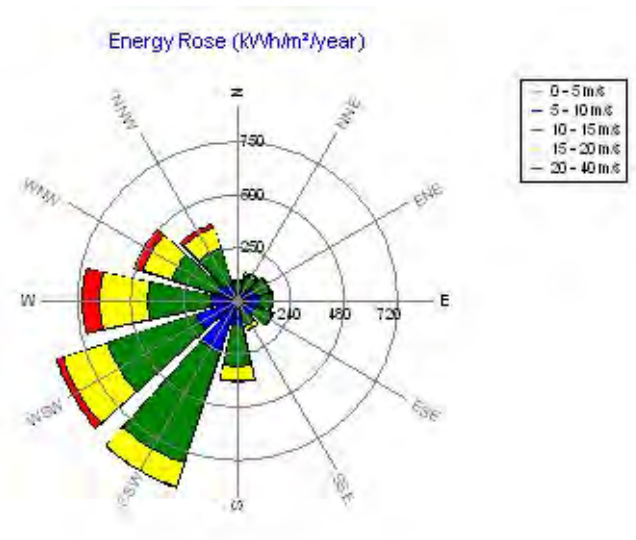
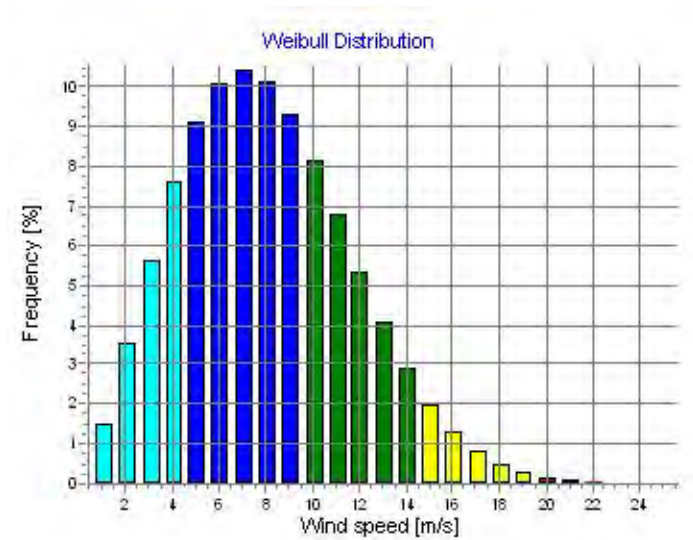
## PARK - Wind Data Analysis

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling) Wind data: A - Oostpolder site data; Hub height: 100,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 6,90               | 6,13             | 1,854        | 4,0           |
| 1 NNE  | 7,85               | 6,95             | 2,322        | 4,5           |
| 2 ENE  | 7,60               | 6,75             | 2,545        | 6,1           |
| 3 E    | 7,30               | 6,48             | 2,553        | 7,1           |
| 4 ESE  | 7,79               | 6,91             | 2,498        | 6,3           |
| 5 SSE  | 7,97               | 7,06             | 2,115        | 4,2           |
| 6 S    | 9,18               | 8,14             | 2,486        | 8,2           |
| 7 SSW  | 10,06              | 9,00             | 3,146        | 17,0          |
| 8 WSW  | 9,71               | 8,61             | 2,393        | 15,8          |
| 9 W    | 9,77               | 8,65             | 2,068        | 11,2          |
| 10 WNW | 9,48               | 8,40             | 2,119        | 8,7           |
| 11 NNW | 9,43               | 8,35             | 2,209        | 6,9           |
| All    | 9,03               | 8,00             | 2,287        | 100,0         |



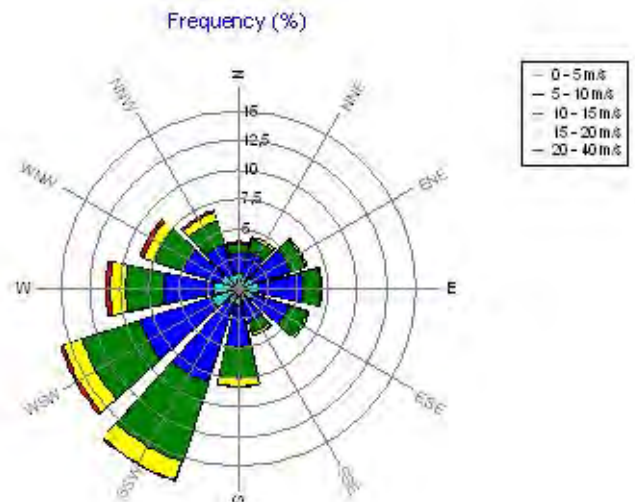
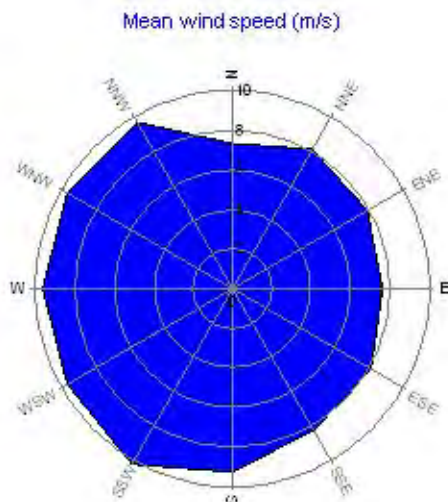
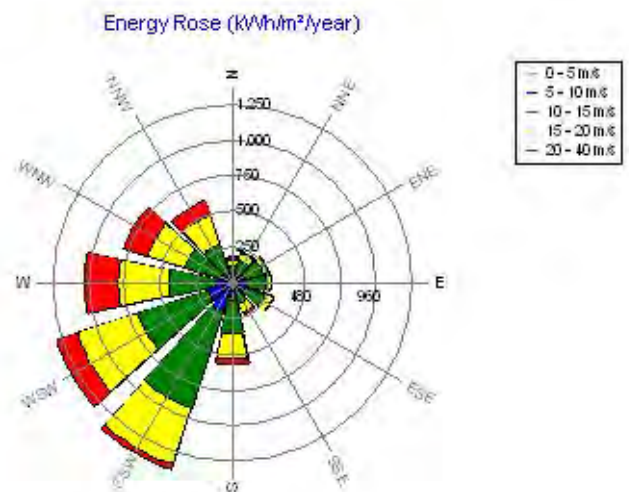
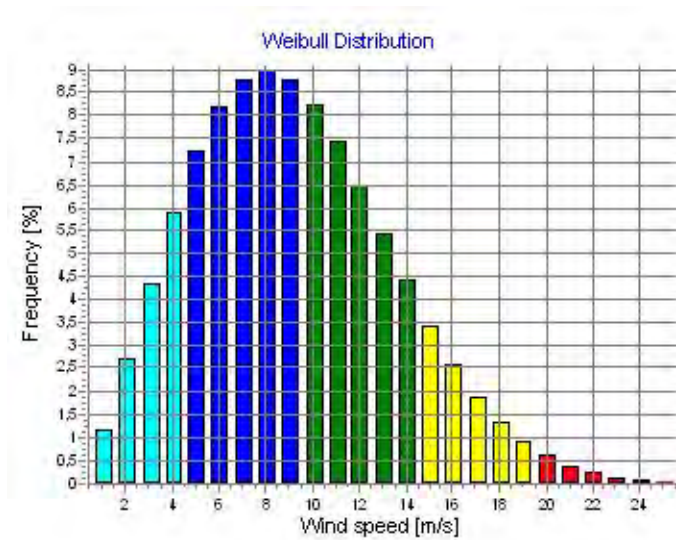
## PARK - Wind Data Analysis

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling) Wind data: A - Oostpolder site data; Hub height: 165,0

Site coordinates  
Dutch Stereo-RD/NAP 2000  
East: 250.596 North: 606.527  
Wind statistics  
RWE\_Oostpolder 100m-Corr099.wvs

### Weibull Data

| Sector | Current site       |                  |              |               |
|--------|--------------------|------------------|--------------|---------------|
|        | A- parameter [m/s] | Wind speed [m/s] | k- parameter | Frequency [%] |
| 0 N    | 8,26               | 7,34             | 1,795        | 4,0           |
| 1 NNE  | 9,17               | 8,13             | 2,252        | 4,5           |
| 2 ENE  | 8,91               | 7,90             | 2,467        | 6,1           |
| 3 E    | 8,54               | 7,57             | 2,471        | 7,1           |
| 4 ESE  | 9,21               | 8,16             | 2,424        | 6,3           |
| 5 SSE  | 9,31               | 8,25             | 2,049        | 4,2           |
| 6 S    | 10,47              | 9,28             | 2,420        | 8,2           |
| 7 SSW  | 11,44              | 10,22            | 3,064        | 17,1          |
| 8 WSW  | 10,93              | 9,68             | 2,334        | 15,8          |
| 9 W    | 10,92              | 9,68             | 2,029        | 11,1          |
| 10 WNW | 10,94              | 9,69             | 2,064        | 8,7           |
| 11 NNW | 10,90              | 9,65             | 2,143        | 6,9           |
| All    | 10,35              | 9,16             | 2,252        | 100,0         |



## PARK - Park power curve

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

| Wind speed [m/s] | Power          |                |         |          |          |         |          |          |         |          |          |         |          |          |
|------------------|----------------|----------------|---------|----------|----------|---------|----------|----------|---------|----------|----------|---------|----------|----------|
|                  | Free WTGs [kW] | Park WTGs [kW] | N [kW]  | NNE [kW] | ENE [kW] | E [kW]  | ESE [kW] | SSE [kW] | S [kW]  | SSW [kW] | WSW [kW] | W [kW]  | WNW [kW] | NNW [kW] |
| 0,5              | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 1,5              | 3              | 1              | 0       | 0        | 0        | 0       | 0        | 2        | 2       | 3        | 2        | 2       | 0        | 0        |
| 2,5              | 1.980          | 1.053          | 1.082   | 1.102    | 1.030    | 926     | 788      | 1.002    | 1.216   | 1.284    | 1.152    | 986     | 727      | 958      |
| 3,5              | 8.354          | 5.154          | 5.330   | 5.492    | 5.313    | 4.768   | 3.995    | 5.116    | 5.629   | 5.872    | 5.640    | 4.838   | 3.863    | 4.851    |
| 4,5              | 21.597         | 14.382         | 15.059  | 15.391   | 15.213   | 13.780  | 11.741   | 14.075   | 15.195  | 15.628   | 15.335   | 13.604  | 11.703   | 14.227   |
| 5,5              | 41.741         | 28.991         | 30.055  | 30.655   | 30.239   | 27.752  | 24.284   | 28.560   | 30.515  | 31.280   | 30.697   | 27.760  | 24.220   | 28.651   |
| 6,5              | 70.854         | 49.924         | 51.775  | 52.657   | 51.826   | 47.843  | 42.190   | 49.200   | 52.468  | 53.642   | 52.660   | 47.944  | 42.236   | 49.437   |
| 7,5              | 110.002        | 78.593         | 81.541  | 82.887   | 81.567   | 75.429  | 66.753   | 77.486   | 82.469  | 84.236   | 82.759   | 75.515  | 66.818   | 77.925   |
| 8,5              | 158.186        | 116.082        | 120.643 | 122.549  | 120.861  | 111.946 | 99.220   | 114.590  | 121.357 | 123.725  | 122.027  | 111.533 | 99.144   | 115.518  |
| 9,5              | 211.063        | 162.035        | 168.593 | 170.842  | 169.196  | 157.388 | 139.956  | 160.281  | 168.536 | 171.117  | 169.890  | 156.007 | 139.636  | 162.077  |
| 10,5             | 261.104        | 212.254        | 221.368 | 222.780  | 221.826  | 208.112 | 186.575  | 210.377  | 219.572 | 221.006  | 220.854  | 205.365 | 186.562  | 214.200  |
| 11,5             | 301.559        | 260.234        | 270.737 | 270.527  | 270.643  | 256.951 | 233.870  | 258.768  | 267.910 | 267.637  | 268.501  | 253.825 | 234.256  | 263.659  |
| 12,5             | 331.985        | 300.670        | 311.423 | 309.898  | 310.579  | 298.862 | 276.346  | 299.863  | 307.576 | 306.223  | 307.566  | 295.478 | 277.022  | 305.100  |
| 13,5             | 353.507        | 332.341        | 342.206 | 340.644  | 341.436  | 332.570 | 311.994  | 332.422  | 337.494 | 336.130  | 337.394  | 328.599 | 311.783  | 336.745  |
| 14,5             | 365.960        | 354.902        | 361.260 | 360.302  | 361.044  | 355.791 | 339.518  | 355.978  | 358.874 | 357.757  | 358.617  | 353.456 | 338.734  | 357.456  |
| 15,5             | 372.395        | 367.365        | 370.558 | 370.255  | 370.500  | 368.393 | 357.961  | 368.250  | 369.584 | 369.105  | 369.409  | 367.206 | 357.925  | 368.535  |
| 16,5             | 375.048        | 373.484        | 374.640 | 374.510  | 374.560  | 374.019 | 369.552  | 374.005  | 374.401 | 374.222  | 374.291  | 373.672 | 369.484  | 373.946  |
| 17,5             | 375.472        | 375.240        | 375.446 | 375.424  | 375.430  | 375.347 | 374.420  | 375.352  | 375.434 | 375.404  | 375.420  | 375.331 | 374.373  | 375.314  |
| 18,5             | 375.462        | 375.449        | 375.467 | 375.468  | 375.464  | 375.459 | 375.375  | 375.461  | 375.462 | 375.463  | 375.463  | 375.460 | 375.371  | 375.463  |
| 19,5             | 375.445        | 375.449        | 375.450 | 375.451  | 375.449  | 375.449 | 375.449  | 375.450  | 375.447 | 375.448  | 375.448  | 375.448 | 375.449  | 375.451  |
| 20,5             | 369.427        | 369.429        | 369.430 | 369.431  | 369.429  | 369.428 | 369.428  | 369.429  | 369.428 | 369.429  | 369.428  | 369.428 | 369.430  | 369.432  |
| 21,5             | 369.411        | 369.414        | 369.416 | 369.417  | 369.414  | 369.413 | 369.413  | 369.415  | 369.413 | 369.414  | 369.413  | 369.413 | 369.415  | 369.418  |
| 22,5             | 369.399        | 369.400        | 369.401 | 369.402  | 369.400  | 369.399 | 369.400  | 369.400  | 369.399 | 369.400  | 369.399  | 369.399 | 369.401  | 369.402  |
| 23,5             | 369.389        | 369.390        | 369.392 | 369.392  | 369.390  | 369.389 | 369.389  | 369.390  | 369.389 | 369.390  | 369.389  | 369.389 | 369.392  | 369.393  |
| 24,5             | 369.410        | 369.400        | 369.385 | 369.388  | 369.398  | 369.404 | 369.402  | 369.399  | 369.410 | 369.405  | 369.407  | 369.404 | 369.389  | 369.385  |
| 25,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 26,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 27,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 28,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |
| 29,5             | 0              | 0              | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        | 0       | 0        | 0        |

### Description:

The park power curve is similar to a WTG power curve, meaning that when a given wind speed appears in front of the park with same speed in the entire wind farm area (before influence from the park), the output from the park can be found in the park power curve. Another way to say this: The park power curve includes array losses, but do NOT include terrain given variations in the wind speed over the park area.

Measuring a park power curve is not as simple as measuring a WTG power curve due to the fact that the park power curve depends on the wind direction and that the same wind speed normally will not appear for the entire park area at the same time (only in very flat non-complex terrain). The idea with this version of the park power curve is not to use it for validation based on measurements. This would require at least 2 measurement masts at two sides of the park, unless only a few direction sectors should be tested, AND non complex terrain (normally only useable off shore). Another park power curve version for complex terrain is available in windPRO.

The park power curve can be used for:

- Forecast systems, based on more rough (approximated) wind data, the park power curve would be an efficient way to make the connection from wind speed (and direction) to power.
- Construction of duration curves, telling how often a given power output will appear, the park power curve can be used together with the average wind distribution for the Wind farm area in hub height. The average wind distribution can eventually be obtained based on the Weibull parameters for each WTG position. These are found at print menu: >Result to file< in the >Park result< which can be saved to file or copied to clipboard and pasted in Excel.
- Calculation of wind energy index based on the PARK production (see below).
- Estimation of the expected PARK production for an existing wind farm based on wind measurements at minimum 2 measurement masts at two sides of wind farm. The masts must be used for obtaining the free wind speed. The free wind speed is used in the simulation of expected energy production with the PARK power curve. This procedure will only work suitable in non complex terrains. For complex terrain another park power curve calculation is available in windPRO (PPV-model).

### Note:

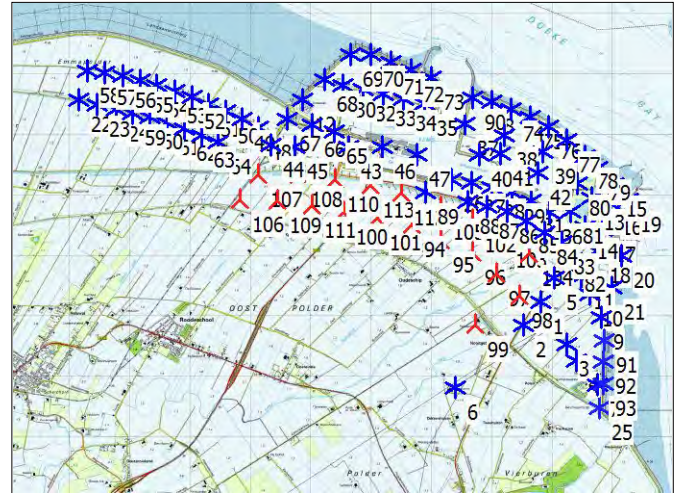
From the >Result to file< the >Wind Speeds Inside Wind farm< is also available. These can (e.g. via Excel) be used for extracting the wake induced reductions in measured wind speed.

## PARK - WTG distances

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

### WTG distances

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |     |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|-----|
| [m] |             | [m] | [m]                 |                                   |                                   |     |
| 1   | -0,3        | 98  | -2,0                | 365                               | 2,7                               | 2,6 |
| 2   | 0,0         | 1   | -0,3                | 473                               | 3,5                               | 3,5 |
| 3   | 0,0         | 4   | 0,2                 | 315                               | 2,3                               | 2,3 |
| 4   | 0,2         | 3   | 0,0                 | 315                               | 2,3                               | 2,3 |
| 5   | 0,3         | 82  | 1,0                 | 428                               | 5,2                               | 3,1 |
| 6   | -0,1        | 99  | 0,1                 | 1.089                             | 23,2                              | 7,7 |
| 7   | 1,8         | 93  | 0,2                 | 87                                | 1,7                               | 0,9 |
| 8   | 1,6         | 90  | 1,0                 | 323                               | 3,9                               | 2,8 |
| 9   | 0,1         | 91  | 0,0                 | 384                               | 4,7                               | 3,8 |
| 10  | -0,4        | 11  | 1,0                 | 321                               | 3,9                               | 3,9 |
| 11  | 1,0         | 82  | 1,0                 | 319                               | 3,9                               | 3,9 |
| 12  | 2,5         | 67  | 1,9                 | 417                               | 5,1                               | 3,0 |
| 13  | -1,0        | 16  | 2,0                 | 300                               | 3,7                               | 3,7 |
| 14  | 1,0         | 17  | 2,7                 | 301                               | 3,7                               | 3,7 |
| 15  | 1,0         | 16  | 2,0                 | 306                               | 3,7                               | 3,7 |
| 16  | 2,0         | 13  | -1,0                | 300                               | 3,7                               | 3,7 |
| 17  | 2,7         | 14  | 1,0                 | 301                               | 3,7                               | 3,7 |
| 18  | -0,7        | 17  | 2,7                 | 360                               | 4,4                               | 4,4 |
| 19  | 0,1         | 16  | 2,0                 | 320                               | 3,9                               | 3,9 |
| 20  | 2,0         | 18  | -0,7                | 401                               | 4,9                               | 4,9 |
| 21  | 0,0         | 10  | -0,4                | 379                               | 4,6                               | 4,6 |
| 22  | 0,7         | 23  | 0,4                 | 309                               | 2,8                               | 2,8 |
| 23  | 0,4         | 22  | 0,7                 | 309                               | 2,8                               | 2,8 |
| 24  | -1,5        | 59  | 1,8                 | 279                               | 3,4                               | 2,5 |
| 25  | 1,0         | 7   | 1,8                 | 382                               | 7,3                               | 3,3 |
| 26  | 2,3         | 27  | 1,8                 | 340                               | 3,8                               | 3,8 |
| 27  | 1,8         | 88  | 0,3                 | 324                               | 4,0                               | 3,6 |
| 28  | 1,0         | 87  | -2,9                | 327                               | 4,0                               | 3,6 |
| 29  | 3,1         | 86  | -1,0                | 332                               | 4,1                               | 3,7 |
| 30  | 0,1         | 68  | -0,5                | 311                               | 3,8                               | 3,5 |
| 31  | 1,3         | 85  | 1,7                 | 338                               | 4,1                               | 3,8 |
| 32  | 0,4         | 30  | 0,1                 | 332                               | 3,7                               | 3,7 |
| 33  | 1,0         | 34  | 0,9                 | 351                               | 3,9                               | 3,9 |
| 34  | 0,9         | 33  | 1,0                 | 351                               | 3,9                               | 3,9 |
| 35  | 2,3         | 34  | 0,9                 | 352                               | 3,9                               | 3,9 |
| 36  | 1,5         | 84  | -0,3                | 335                               | 4,1                               | 3,7 |
| 37  | 4,2         | 90  | 1,0                 | 455                               | 5,6                               | 5,1 |
| 38  | -0,8        | 41  | 2,7                 | 320                               | 3,6                               | 3,6 |
| 39  | 1,9         | 42  | 1,6                 | 371                               | 4,1                               | 4,1 |
| 40  | 1,6         | 41  | 2,7                 | 351                               | 3,9                               | 3,9 |
| 41  | 2,7         | 38  | -0,8                | 320                               | 3,6                               | 3,6 |
| 42  | 1,6         | 39  | 1,9                 | 371                               | 4,1                               | 4,1 |
| 43  | 2,8         | 65  | 2,7                 | 356                               | 4,3                               | 4,0 |
| 44  | -1,2        | 48  | -1,2                | 347                               | 4,2                               | 3,9 |
| 45  | -1,1        | 44  | -1,2                | 398                               | 4,4                               | 4,4 |
| 46  | 4,3         | 43  | 2,8                 | 563                               | 6,3                               | 4,5 |
| 47  | 3,1         | 46  | 4,3                 | 582                               | 4,6                               | 4,6 |
| 48  | -1,2        | 49  | -0,4                | 315                               | 3,8                               | 3,8 |
| 49  | -0,4        | 50  | -1,0                | 301                               | 3,7                               | 3,7 |
| 50  | -1,0        | 49  | -0,4                | 301                               | 3,7                               | 3,7 |
| 51  | -1,3        | 52  | 0,2                 | 303                               | 3,7                               | 3,7 |
| 52  | 0,2         | 53  | 1,8                 | 300                               | 3,7                               | 3,7 |
| 53  | 1,8         | 52  | 0,2                 | 300                               | 3,7                               | 3,7 |
| 54  | -2,0        | 55  | -0,7                | 288                               | 3,5                               | 3,5 |
| 55  | -0,7        | 54  | -2,0                | 288                               | 3,5                               | 3,5 |
| 56  | 0,3         | 57  | 0,1                 | 299                               | 3,6                               | 3,6 |
| 57  | 0,1         | 58  | -1,1                | 297                               | 3,6                               | 3,6 |
| 58  | -1,1        | 57  | 0,1                 | 297                               | 3,6                               | 3,6 |
| 59  | 1,8         | 24  | -1,5                | 279                               | 3,4                               | 2,5 |
| 60  | 0,5         | 59  | 1,8                 | 300                               | 3,7                               | 3,7 |
| 61  | 1,5         | 60  | 0,5                 | 300                               | 3,7                               | 3,7 |
| 62  | -0,2        | 61  | 1,5                 | 302                               | 3,7                               | 3,7 |
| 63  | 0,6         | 62  | -0,2                | 302                               | 3,7                               | 3,7 |



▲ New WTG

Scale 1:125.000

\* Existing WTG

To be continued on next page...

## PARK - WTG distances

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

...continued from previous page

| Z   | Nearest WTG | Z   | Horizontal distance | Distance in rotor diameters (max) | Distance in rotor diameters (min) |
|-----|-------------|-----|---------------------|-----------------------------------|-----------------------------------|
| [m] |             | [m] | [m]                 |                                   |                                   |
| 64  | 0,9         | 63  | 0,6                 | 303                               | 3,7                               |
| 65  | 2,7         | 43  | 2,8                 | 356                               | 4,3                               |
| 66  | 0,2         | 65  | 2,7                 | 382                               | 4,7                               |
| 67  | 1,9         | 12  | 2,5                 | 417                               | 5,1                               |
| 68  | -0,5        | 30  | 0,1                 | 311                               | 3,8                               |
| 69  | 0,2         | 70  | 2,8                 | 333                               | 4,1                               |
| 70  | 2,8         | 69  | 0,2                 | 333                               | 4,1                               |
| 71  | 4,8         | 72  | 1,4                 | 355                               | 4,3                               |
| 72  | 1,4         | 73  | 3,2                 | 355                               | 4,3                               |
| 73  | 3,2         | 72  | 1,4                 | 355                               | 4,3                               |
| 74  | 1,1         | 8   | 1,6                 | 340                               | 4,2                               |
| 75  | 1,4         | 74  | 1,1                 | 342                               | 4,2                               |
| 76  | 2,1         | 75  | 1,4                 | 349                               | 4,3                               |
| 77  | 0,8         | 76  | 2,1                 | 370                               | 4,5                               |
| 78  | 0,6         | 79  | 1,8                 | 289                               | 3,5                               |
| 79  | 1,8         | 78  | 0,6                 | 289                               | 3,5                               |
| 80  | -0,4        | 13  | -1,0                | 345                               | 4,2                               |
| 81  | -0,7        | 14  | 1,0                 | 345                               | 4,2                               |
| 82  | 1,0         | 11  | 1,0                 | 319                               | 3,9                               |
| 83  | 4,7         | 82  | 1,0                 | 333                               | 4,1                               |
| 84  | -0,3        | 83  | 4,7                 | 335                               | 4,1                               |
| 85  | 1,7         | 31  | 1,3                 | 338                               | 4,1                               |
| 86  | -1,0        | 29  | 3,1                 | 332                               | 4,1                               |
| 87  | -2,9        | 102 | -0,9                | 327                               | 4,0                               |
| 88  | 0,3         | 102 | -0,9                | 318                               | 3,9                               |
| 89  | 1,5         | 105 | 0,0                 | 358                               | 4,4                               |
| 90  | 1,0         | 8   | 1,6                 | 323                               | 3,9                               |
| 91  | 0,0         | 92  | 0,0                 | 360                               | 3,6                               |
| 92  | 0,0         | 93  | 0,2                 | 359                               | 3,6                               |
| 93  | 0,2         | 7   | 1,8                 | 87                                | 1,7                               |
| 94  | -1,1        | 95  | -1,0                | 545                               | 3,9                               |
| 95  | -1,0        | 105 | 0,0                 | 530                               | 3,8                               |
| 96  | 0,5         | 97  | -0,8                | 532                               | 3,8                               |
| 97  | -0,8        | 98  | -2,0                | 524                               | 3,7                               |
| 98  | -2,0        | 1   | -0,3                | 365                               | 2,7                               |
| 99  | 0,1         | 2   | 0,0                 | 805                               | 5,9                               |
| 100 | -1,2        | 111 | -0,6                | 545                               | 3,9                               |
| 101 | -0,7        | 113 | -2,3                | 548                               | 3,9                               |
| 102 | -0,9        | 88  | 0,3                 | 318                               | 3,9                               |
| 103 | 0,2         | 86  | -1,0                | 392                               | 4,8                               |
| 104 | 1,1         | 84  | -0,3                | 436                               | 5,3                               |
| 105 | 0,0         | 89  | 1,5                 | 358                               | 4,4                               |
| 106 | -0,6        | 107 | -1,0                | 517                               | 3,7                               |
| 107 | -1,0        | 106 | -0,6                | 517                               | 3,7                               |
| 108 | -0,3        | 45  | -1,1                | 461                               | 5,1                               |
| 109 | -1,3        | 107 | -1,0                | 528                               | 3,7                               |
| 110 | -0,6        | 100 | -1,2                | 562                               | 4,0                               |
| 111 | -0,6        | 100 | -1,2                | 545                               | 3,9                               |
| 112 | -1,6        | 89  | 1,5                 | 403                               | 4,9                               |
| 113 | -2,3        | 112 | -1,6                | 529                               | 3,7                               |
| Min | -2,9        |     | -2,9                | 87                                | 1,7                               |
| Max | 4,8         |     | 4,7                 | 1.089                             | 23,2                              |

Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 9:31/3.1.597

## PARK - Wind statistics info

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)

### Main data for wind statistic

|                     |  |
|---------------------|--|
| File                | \\sbs2011\projecten\Extern\2016\716033 WP Oostpolder\TO\WP\200117\24012017\RWE_Oostpolder 100m-Corr099.wws |
| Name                | RWE_Oostpolder 100m-Corr099  |
| Country             | Netherlands  |
| Source              | User   |
| Mast coordinates    | Dutch Stereo-RD/NAP 2000 East: 248.822 North: 608.196  |
| Created             | 24-1-2017  |
| Edited              | 1-2-2017   |
| Sectors             | 12   |
| WASP version        | WASP 11 Version 11.05.0028   |
| Displacement height | None   |

### Additional info for wind statistic

|                    |                        |
|--------------------|------------------------|
| Source data        | Default Meteo data RWE |
| Data from          | 25-4-2007              |
| Data to            | 31-1-2009              |
| Measurement length | 21,3 Months            |

### Note

To get the most correct calculation results, wind statistics shall be calculated with the SAME model and model parameters, as currently chosen in calculation. For WASP versions before 10.0, the model is unchanged, but thereafter more model changes affecting the wind statistic is seen. Likewise WASP CFD should always use WASP CFD calculated wind statistics.



## PARK - Map

Calculation: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)



0 1 2 3 4 km

Map: Uithuizen, Print scale 1:75.000, Map center Dutch Stereo-RD/NAP 2000 East: 249.717 North: 606.402

New WTG    Existing WTG    Obstacle

**BIJLAGE 2**  
**INVOER EN RESULTATEN**  
**MODEL VERLIEZEN**



## Loss&Uncertainty - Main result

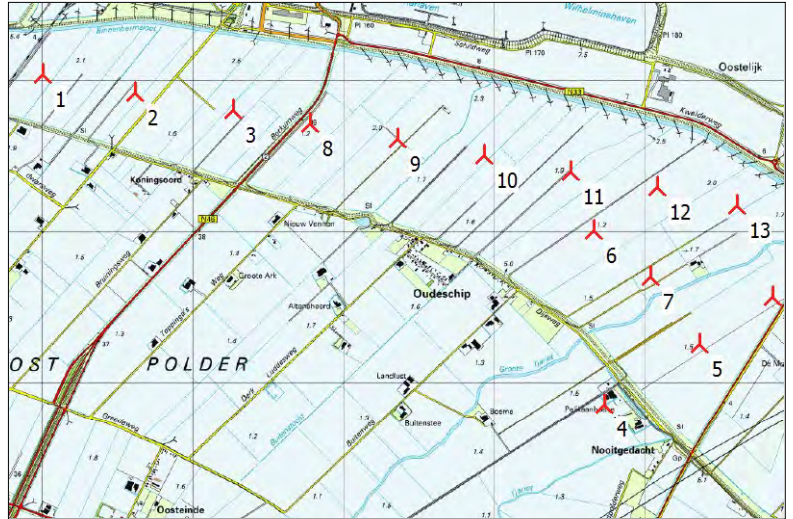
Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 1b  
 Count 14  
 Rated power 58,8 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years

### RESULTS

|                 |         |       |
|-----------------|---------|-------|
|                 |         | P50   |
| NET AEP         | [GWh/y] | 250,2 |
| Capacity factor | [%]     | 48,6  |
| Full load hours | [h/y]   | 4.256 |



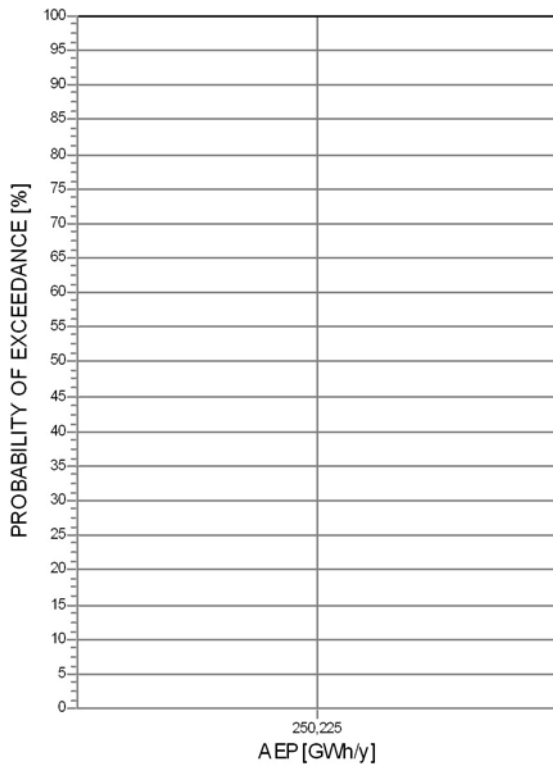
Scale: 50.000

### Result details

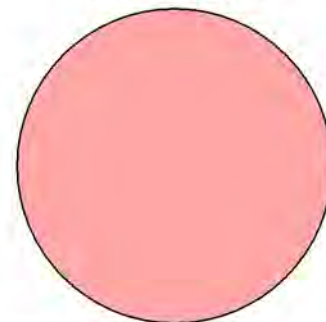
|                 | P50         |         | Uncertainty |
|-----------------|-------------|---------|-------------|
| GROSS AEP *)    | 302,4 GWh/y |         | 0,0 %       |
| Bias correction | 0,0 GWh/y   | 0,0 %   | 0,0 %       |
| Loss correction | -52,2 GWh/y | -17,3 % | 0,0 %       |
| Wake loss       |             | -9,1 %  |             |
| Other losses    |             | -9,0 %  |             |
| NET AEP         | 250,2 GWh/y |         | 0,0 %       |



|                        |       |                 |       |
|------------------------|-------|-----------------|-------|
| 1. Wake effects        | 9,1 % | 2. Availability | 3,0 % |
| 3. Turbine performance | 0,5 % | 4. Electrical   | 2,0 % |
| 5. Environmental       | 1,0 % | 6. Curtailment  | 2,8 % |
| 7. Other               | 0,0 % |                 |       |



Uncertainty: 0,0 %



|                     |       |               |       |
|---------------------|-------|---------------|-------|
| A. Wind data        | 0,0 % | B. Wind model | 0,0 % |
| C. Power conversion | 0,0 % | D. BIAS       | 0,0 % |
| E. LOSS             | 0,0 % |               |       |

\*) Calculated Annual Energy Production before any bias or loss corrections  
 Assumptions: Uncertainty and percentiles (PXX values) are calculated for the expected lifetime

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

### ASSUMPTIONS

| LOSS                                     | Method *)   | Loss [%] | Loss [GWh/y] | Std dev**) [%] | Comment                   |
|--|-------------|----------|--------------|----------------|---------------------------|
| 1. Wake effects                          |             |          |              |                |                           |
| Wake effects, all WTGs                   | Calculation | 9,1      | 27,5         | 0,0            |                           |
| 2. Availability                          |             |          |              |                |                           |
| Turbine availability                     | Estimate    | 3,0      | 9,1          | 0,0            |                           |
| 3. Turbine performance                   |             |          |              |                |                           |
| High wind hysteresis                     | Estimate    | 0,5      | 1,5          | 0,0            |                           |
| 4. Electrical                            |             |          |              |                |                           |
| Electrical losses                        | Estimate    | 2,0      | 6,0          | 0,0            |                           |
| 5. Environmental                         |             |          |              |                |                           |
| Performance degradation not due to icing | Estimate    | 0,5      | 1,5          | 0,0            |                           |
| Performance degradation due to icing     | Estimate    | 0,5      | 1,5          | 0,0            |                           |
| 6. Curtailment                           |             |          |              |                |                           |
| Noise                                    | Calculation | 2,4      | 7,4          | 0,0            |                           |
| Flicker                                  | Calculation | 0,3      | 1,1          | 0,0            |                           |
| Birds                                    | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| Bats                                     | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| 7. Other                                 |             |          |              |                | No input                  |
| LOSS, total                              |             | 17,3     | 52,2         | 0,0            |                           |

### UNCERTAINTY

|                                  | Method *) | Std dev, wind speed [%] | Std dev, AEP [%] | Comment |
|----------------------------------|-----------|-------------------------|------------------|---------|
| A. Wind data                     |           |                         |                  |         |
| Wind measurement/Wind data       |           |                         |                  |         |
| Long term correction             |           |                         |                  |         |
| Year-to-year variability         |           |                         |                  |         |
| Future climate                   |           |                         |                  |         |
| Other wind related               |           |                         |                  |         |
| B. Wind model                    |           |                         |                  |         |
| Vertical extrapolation           |           |                         |                  |         |
| Horizontal extrapolation         |           |                         |                  |         |
| Other wind model related         |           |                         |                  |         |
| C. Power conversion              |           |                         |                  |         |
| Power curve uncertainty          |           |                         |                  |         |
| Metering uncertainty             |           |                         |                  |         |
| Other AEP related uncertainties  |           |                         |                  |         |
| D. BIAS, total uncertainty       |           |                         | 0,0              |         |
| E. LOSS, total uncertainty       |           |                         | 0,0              |         |
| UNCERTAINTY, total (1y average)  |           |                         | 0,0              |         |
| UNCERTAINTY, total (20y average) |           |                         | 0,0              |         |

### VARIABILITY

| Years | Variability (std dev) [%] | Total std dev [%] |
|-------|---------------------------|-------------------|
| 1     | 0,00                      | 0,0               |
| 5     | 0,00                      | 0,0               |
| 10    | 0,00                      | 0,0               |
| 20    | 0,00                      | 0,0               |

### RESULTS

AEP versus exceedance level / time horizon

| PXX [%] | 1 y [MWh/y] | 5 y [MWh/y] | 10 y [MWh/y] | 20 y [MWh/y] |
|---------|-------------|-------------|--------------|--------------|
| 50      | 250.225     | 250.225     | 250.225      | 250.225      |
| 75      | 250.225     | 250.225     | 250.225      | 250.225      |
| 84      | 250.225     | 250.225     | 250.225      | 250.225      |
| 90      | 250.225     | 250.225     | 250.225      | 250.225      |
| 95      | 250.225     | 250.225     | 250.225      | 250.225      |

Project:

24\_01\_2017

Licensed user:

Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:

14-3-2017 11:00/3.1.597

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

\*) Calculation means that a calculation method available in the windPRO software is used. This still typically involve a user judgement and user data where the quality of those decides the accuracy. If calculation method is used, the values will often be different from turbine to turbine, here the average is shown, but at page "WTG results" the individual turbine results are shown.

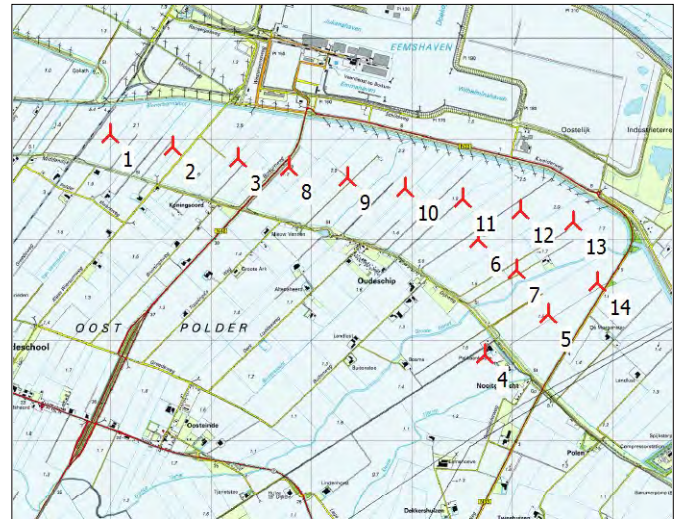
\*\*) For totals the std dev refers to the full AEP, otherwise std dev refers to the bias or loss component which is a fraction of the total AEP.

## Loss&Uncertainty - WTG results

Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

### Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 1b  
 Count 14  
 Rated power 58,8 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years



Scale: 75.000

### Expected AEP per WTG including bias, loss and uncertainty evaluation

| Description   | User label | Calculated GROSS*)<br>[MWh/y] | Bias<br>[%] | Loss<br>[%] | 20 years averaging |                  |
|---|------------|-------------------------------|-------------|-------------|--------------------|------------------|
|   |            |                               |             |             | Unc.<br>[%]        | P50<br>[MWh/y]   |
| 1 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (294)  | 1          | 21.506,7                      | 0,0         | 11,7        | 0,0                | 18.996,6         |
| 2 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (295)  | 2          | 21.474,8                      | 0,0         | 12,6        | 0,0                | 18.779,5         |
| 3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (296)  | 3          | 21.508,2                      | 0,0         | 13,3        | 0,0                | 18.643,5         |
| 4 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (297)  | 4          | 21.420,3                      | 0,0         | 11,7        | 0,0                | 18.918,1         |
| 5 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (298)  | 5          | 21.552,9                      | 0,0         | 15,8        | 0,0                | 18.146,6         |
| 6 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (299)  | 6          | 21.604,8                      | 0,0         | 15,2        | 0,0                | 18.328,4         |
| 7 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (300)  | 7          | 21.589,4                      | 0,0         | 15,6        | 0,0                | 18.232,1         |
| 8 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (301)  | 8          | 21.596,7                      | 0,0         | 14,0        | 0,0                | 18.576,6         |
| 9 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (302)  | 9          | 21.603,7                      | 0,0         | 28,9        | 0,0                | 15.354,0         |
| 10 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (303) | 10         | 21.669,1                      | 0,0         | 29,4        | 0,0                | 15.295,1         |
| 11 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (304) | 11         | 21.691,9                      | 0,0         | 15,7        | 0,0                | 18.283,8         |
| 12 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (305) | 12         | 21.745,7                      | 0,0         | 18,8        | 0,0                | 17.665,2         |
| 13 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (306) | 13         | 21.771,5                      | 0,0         | 18,3        | 0,0                | 17.781,1         |
| 14 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (307) | 14         | 21.674,0                      | 0,0         | 20,8        | 0,0                | 17.165,8         |
| <b>PARK</b>   |            | <b>302.409,7</b>              | <b>0,0</b>  | <b>17,3</b> | <b>0,0</b>         | <b>250.225,1</b> |

## Loss&Uncertainty - Noise

Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

Noise reduced mode is achieved by less aggressive pitching or reduction of maximum power. In both cases this results in less power production. There might also be situations where the turbine is fully stopped for fulfilling special noise requirements

### Assumptions:

| WTG(s)   | Time  |       | Calculated power curve                     | Curtailed power curve                 |
|--|-------|-------|--|---------------------------------------|
|  | From  | To    |  |                                       |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (302) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 8 - official - 1000kW - 04/2016 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (303) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 8 - official - 1000kW - 04/2016 |

### Time series used in calculation

Name: Lauwersoog\_KNMI\_1991\_2016.10,00m -  
From: 18-3-1991 1:00:00  
To: 2-1-2017 23:00:00  
Period: 310 months  
Time step: 60 minutes  
The period used is calibrated to calculate annual loss

### Result

Calculated AEP before loss: 302.409,7 MWh/y  
Calculated loss: 7.397,5 MWh/y  
Calculated AEP after loss: 295.012,3 MWh/y  
Percent loss: 2,45 %

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (294) | 21.506,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (295) | 21.474,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (296) | 21.508,2                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (297) | 21.420,3                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (298) | 21.552,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (299) | 21.604,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (300) | 21.589,4                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (301) | 21.596,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (302) | 21.603,7                      | 3.690,6       | 17,08                 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (303) | 21.669,1                      | 3.706,9       | 17,11                 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (304) | 21.691,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (305) | 21.745,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (306) | 21.771,5                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (307) | 21.674,0                      | 0,0           | 0,00                  |
| TOTAL  | 302.409,7                     | 7.397,5       | 2,45                  |

## Loss&Uncertainty - Flicker

Calculation: 716033 Losses alternatief 1b (Schaduw\_en\_geluid)

Calculated losses due to shadow (flicker) loss.

Used SHADOW calculation: 3.1.597: 1b schaduw

Assumptions:

Advanced stop (light sensors etc. included). Reduced to: 30 % AEP reduction relative to worst case.

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (294) | 21.506,7                      | 156,7         | 0,73                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (295) | 21.474,8                      | 70,9          | 0,33                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (296) | 21.508,2                      | 67,1          | 0,31                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (297) | 21.420,3                      | 124,0         | 0,58                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (298) | 21.552,9                      | 27,0          | 0,13                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (299) | 21.604,8                      | 111,7         | 0,52                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (300) | 21.589,4                      | 63,4          | 0,29                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (301) | 21.596,7                      | 82,7          | 0,38                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (302) | 21.603,7                      | 111,8         | 0,52                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (303) | 21.669,1                      | 106,5         | 0,49                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (304) | 21.691,9                      | 63,8          | 0,29                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (305) | 21.745,7                      | 47,1          | 0,22                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (306) | 21.771,5                      | 14,8          | 0,07                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (307) | 21.674,0                      | 3,9           | 0,02                  |
| TOTAL  | 302.409,7                     | 1.051,3       | 0,35                  |



## Loss&Uncertainty - Main result

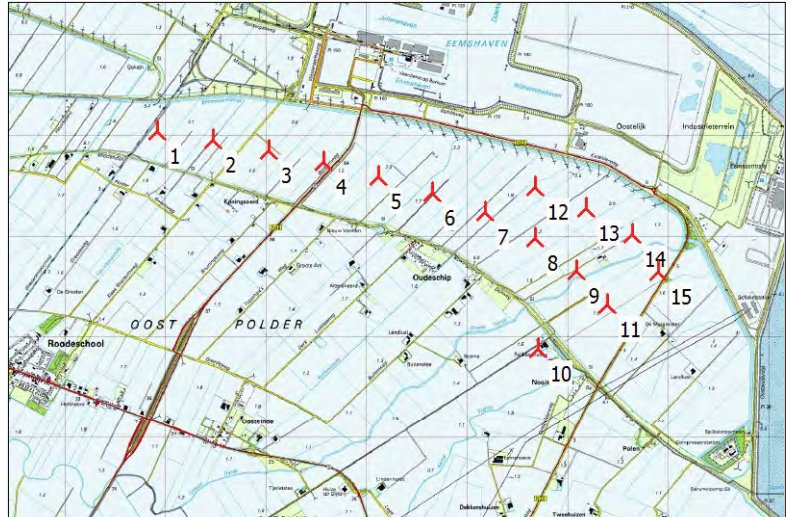
Calculation: 716033 Losses alternatief 2b (Schaduw)

Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 2b  
 Count 15  
 Rated power 63,0 MW  
 Mean wind speed 8,7 m/s at hub height  
 Sensitivity 1,3 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years

### RESULTS

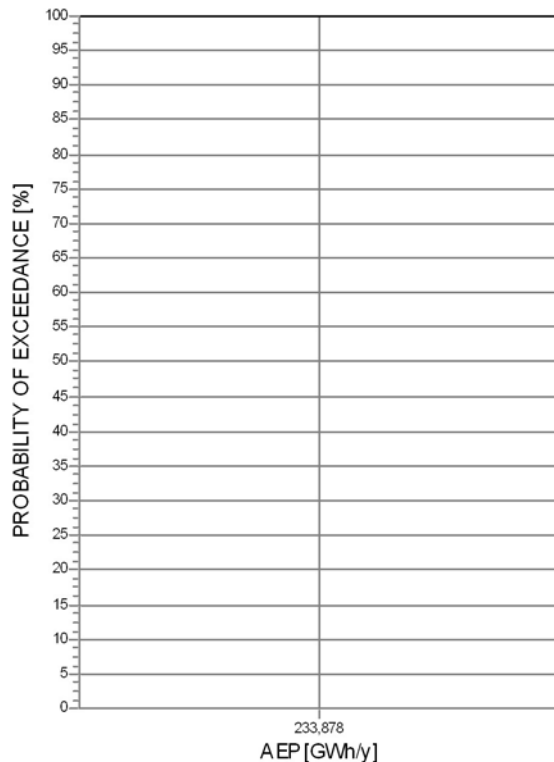
|                 |         |       |
|-----------------|---------|-------|
|                 |         | P50   |
| NET AEP         | [GWh/y] | 233,9 |
| Capacity factor | [%]     | 42,4  |
| Full load hours | [h/y]   | 3.712 |



Scale: 75.000

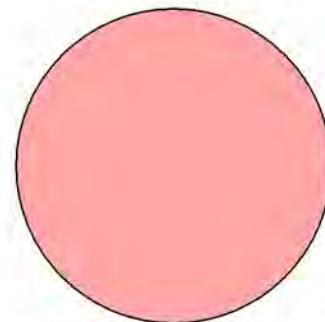
### Result details

|                 | P50         |         | Uncertainty |
|-----------------|-------------|---------|-------------|
| GROSS AEP *)    | 281,3 GWh/y |         | 0,0 %       |
| Bias correction | 0,0 GWh/y   | 0,0 %   | 0,0 %       |
| Loss correction | -47,4 GWh/y | -16,9 % | 0,0 %       |
| Wake loss       |             | -11,0 % |             |
| Other losses    |             | -6,6 %  |             |
| NET AEP         | 233,9 GWh/y |         | 0,0 %       |



|                        |        |                 |       |
|------------------------|--------|-----------------|-------|
| 1. Wake effects        | 11,0 % | 2. Availability | 3,0 % |
| 3. Turbine performance | 0,5 %  | 4. Electrical   | 2,0 % |
| 5. Environmental       | 1,0 %  | 6. Curtailment  | 0,3 % |
| 7. Other               | 0,0 %  |                 |       |

Uncertainty: 0,0 %



|                     |       |               |       |
|---------------------|-------|---------------|-------|
| A. Wind data        | 0,0 % | B. Wind model | 0,0 % |
| C. Power conversion | 0,0 % | D. BIAS       | 0,0 % |
| E. LOSS             | 0,0 % |               |       |

\*) Calculated Annual Energy Production before any bias or loss corrections  
 Assumptions: Uncertainty and percentiles (PXX values) are calculated for the expected lifetime

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 2b (Schaduw)

### ASSUMPTIONS

| LOSS                                     | Method *)   | Loss [%] | Loss [GWh/y] | Std dev**) [%] | Comment                   |
|--|-------------|----------|--------------|----------------|---------------------------|
| 1. Wake effects                          |             |          |              |                |                           |
| Wake effects, all WTGs                   | Calculation | 11,0     | 30,8         | 0,0            |                           |
| 2. Availability                          |             |          |              |                |                           |
| Turbine availability                     | Estimate    | 3,0      | 8,4          | 0,0            |                           |
| 3. Turbine performance                   |             |          |              |                |                           |
| High wind hysteresis                     | Estimate    | 0,5      | 1,4          | 0,0            |                           |
| 4. Electrical                            |             |          |              |                |                           |
| Electrical losses                        | Estimate    | 2,0      | 5,6          | 0,0            |                           |
| 5. Environmental                         |             |          |              |                |                           |
| Performance degradation not due to icing | Estimate    | 0,5      | 1,4          | 0,0            |                           |
| Performance degradation due to icing     | Estimate    | 0,5      | 1,4          | 0,0            |                           |
| 6. Curtailment                           |             |          |              |                |                           |
| Noise                                    | Estimate    | 0,0      | 0,0          | 0,0            | Niet van toepassing       |
| Flicker                                  | Calculation | 0,3      | 0,8          | 0,0            |                           |
| Birds                                    | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| Bats                                     | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| 7. Other                                 |             |          |              |                | No input                  |
| LOSS, total                              |             | 16,9     | 47,4         | 0,0            |                           |

### UNCERTAINTY

|                                  | Method *) | Std dev, wind speed [%] | Std dev, AEP [%] | Comment |
|----------------------------------|-----------|-------------------------|------------------|---------|
| A. Wind data                     |           |                         |                  |         |
| Wind measurement/Wind data       |           |                         |                  |         |
| Long term correction             |           |                         |                  |         |
| Year-to-year variability         |           |                         |                  |         |
| Future climate                   |           |                         |                  |         |
| Other wind related               |           |                         |                  |         |
| B. Wind model                    |           |                         |                  |         |
| Vertical extrapolation           |           |                         |                  |         |
| Horizontal extrapolation         |           |                         |                  |         |
| Other wind model related         |           |                         |                  |         |
| C. Power conversion              |           |                         |                  |         |
| Power curve uncertainty          |           |                         |                  |         |
| Metering uncertainty             |           |                         |                  |         |
| Other AEP related uncertainties  |           |                         |                  |         |
| D. BIAS, total uncertainty       |           |                         | 0,0              |         |
| E. LOSS, total uncertainty       |           |                         | 0,0              |         |
| UNCERTAINTY, total (1y average)  |           |                         | 0,0              |         |
| UNCERTAINTY, total (20y average) |           |                         | 0,0              |         |

### VARIABILITY

| Years | Variability (std dev) [%] | Total std dev [%] |
|-------|---------------------------|-------------------|
| 1     | 0,00                      | 0,0               |
| 5     | 0,00                      | 0,0               |
| 10    | 0,00                      | 0,0               |
| 20    | 0,00                      | 0,0               |

### RESULTS

AEP versus exceedance level / time horizon

| PXX [%] | 1 y [MWh/y] | 5 y [MWh/y] | 10 y [MWh/y] | 20 y [MWh/y] |
|---------|-------------|-------------|--------------|--------------|
| 50      | 233.878     | 233.878     | 233.878      | 233.878      |
| 75      | 233.878     | 233.878     | 233.878      | 233.878      |
| 84      | 233.878     | 233.878     | 233.878      | 233.878      |
| 90      | 233.878     | 233.878     | 233.878      | 233.878      |
| 95      | 233.878     | 233.878     | 233.878      | 233.878      |

Project:

24\_01\_2017

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Calculated:

14-3-2017 12:01/3.1.597

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 2b (Schaduw)

\*) Calculation means that a calculation method available in the windPRO software is used. This still typically involve a user judgement and user data where the quality of those decides the accuracy. If calculation method is used, the values will often be different from turbine to turbine, here the average is shown, but at page "WTG results" the individual turbine results are shown.

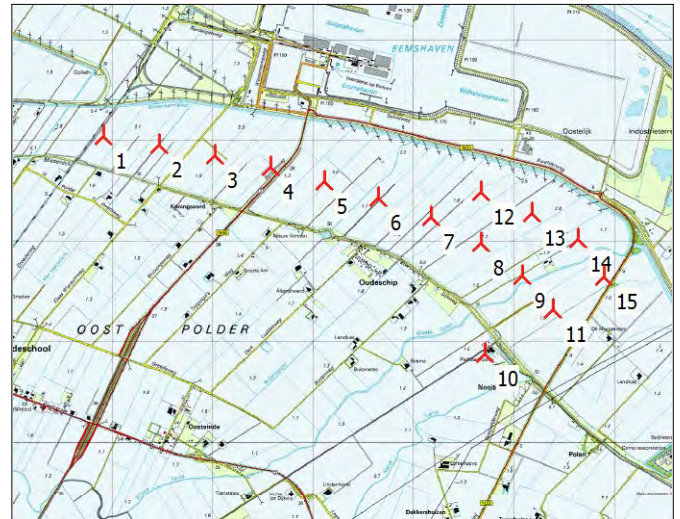
\*\*) For totals the std dev refers to the full AEP, otherwise std dev refers to the bias or loss component which is a fraction of the total AEP.

## Loss&Uncertainty - WTG results

Calculation: 716033 Losses alternatief 2b (Schaduw)

### Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 2b  
 Count 15  
 Rated power 63,0 MW  
 Mean wind speed 8,7 m/s at hub height  
 Sensitivity 1,3 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years



Scale: 75.000

### Expected AEP per WTG including bias, loss and uncertainty evaluation

| Description   | User label | Calculated GROSS*)<br>[MWh/y] | Bias [%]   | Loss [%]    | 20 years averaging |                  |
|---|------------|-------------------------------|------------|-------------|--------------------|------------------|
|   |            |                               |            |             | Unc. [%]           | P50 [MWh/y]      |
| 1 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (308)  | 1          | 18.661,3                      | 0,0        | 12,6        | 0,0                | 16.301,7         |
| 2 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (309)  | 2          | 18.627,3                      | 0,0        | 14,0        | 0,0                | 16.020,5         |
| 3 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (310)  | 3          | 18.699,3                      | 0,0        | 14,6        | 0,0                | 15.973,1         |
| 4 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (311)  | 4          | 18.662,8                      | 0,0        | 14,7        | 0,0                | 15.927,7         |
| 5 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (312)  | 5          | 18.709,5                      | 0,0        | 14,7        | 0,0                | 15.965,9         |
| 6 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (313)  | 6          | 18.732,3                      | 0,0        | 15,4        | 0,0                | 15.847,6         |
| 7 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (314)  | 7          | 18.741,0                      | 0,0        | 15,8        | 0,0                | 15.775,3         |
| 8 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (315)  | 8          | 18.766,3                      | 0,0        | 16,1        | 0,0                | 15.747,2         |
| 9 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (316)  | 9          | 18.733,6                      | 0,0        | 17,0        | 0,0                | 15.549,1         |
| 10 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (317) | 10         | 18.571,2                      | 0,0        | 12,0        | 0,0                | 16.341,9         |
| 11 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (318) | 11         | 18.700,2                      | 0,0        | 17,4        | 0,0                | 15.449,9         |
| 12 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (319) | 12         | 18.892,0                      | 0,0        | 19,6        | 0,0                | 15.196,9         |
| 13 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (320) | 13         | 18.940,3                      | 0,0        | 20,9        | 0,0                | 14.975,4         |
| 14 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (321) | 14         | 18.942,2                      | 0,0        | 21,4        | 0,0                | 14.891,3         |
| 15 ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (322) | 15         | 18.894,9                      | 0,0        | 26,4        | 0,0                | 13.899,2         |
| <b>PARK</b>   |            | <b>281.274,2</b>              | <b>0,0</b> | <b>16,9</b> | <b>0,0</b>         | <b>233.878,4</b> |

## Loss&Uncertainty - Flicker

Calculation: 716033 Losses alternatief 2b (Schaduw)

Calculated losses due to shadow (flicker) loss.

Used SHADOW calculation: 3.1.597: 2b receptoren binnen 6 uur

Assumptions:

Advanced stop (light sensors etc. included). Reduced to: 30 % AEP reduction relative to worst case.

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (308) | 18.661,3                      | 112,4         | 0,60                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (309) | 18.627,3                      | 62,0          | 0,33                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (310) | 18.699,3                      | 26,7          | 0,14                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (311) | 18.662,8                      | 45,1          | 0,24                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (312) | 18.709,5                      | 37,4          | 0,20                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (313) | 18.732,3                      | 141,5         | 0,76                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (314) | 18.741,0                      | 93,1          | 0,50                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (315) | 18.766,3                      | 84,8          | 0,45                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (316) | 18.733,6                      | 28,5          | 0,15                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (317) | 18.571,2                      | 83,1          | 0,45                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (318) | 18.700,2                      | 10,6          | 0,06                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (319) | 18.892,0                      | 30,4          | 0,16                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (320) | 18.940,3                      | 25,3          | 0,13                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (321) | 18.942,2                      | 3,1           | 0,02                  |
| ENERCON E-126 EP4 TES 4200 127.0 !O! hub: 135,0 m (TOT: 198,5 m) (322) | 18.894,9                      | 0,0           | 0,00                  |
| TOTAL  | 281.274,2                     | 783,9         | 0,28                  |

## Loss&Uncertainty - Main result

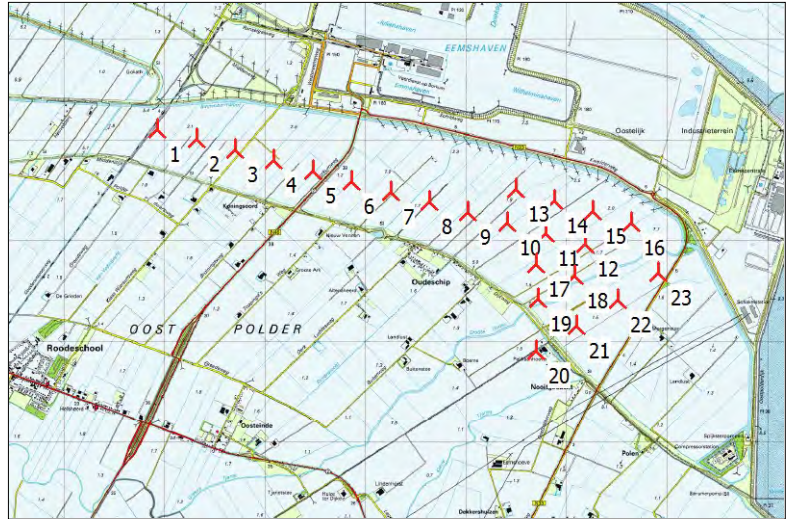
Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)

### Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 3b  
 Count 23  
 Rated power 54,1 MW  
 Mean wind speed 8,4 m/s at hub height  
 Sensitivity 1,3 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years

### RESULTS

|                 |         |       |
|-----------------|---------|-------|
|                 |         | P50   |
| NET AEP         | [GWh/y] | 180,2 |
| Capacity factor | [%]     | 38,1  |
| Full load hours | [h/y]   | 3.334 |



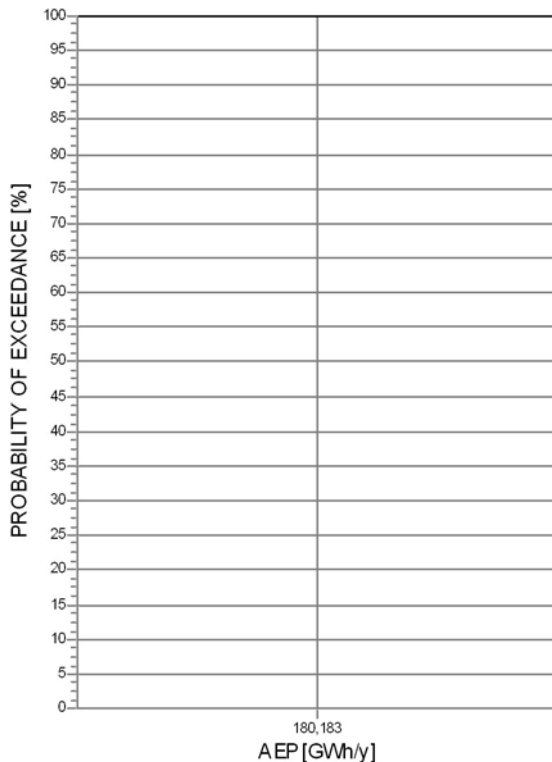
Scale: 75.000

### Result details

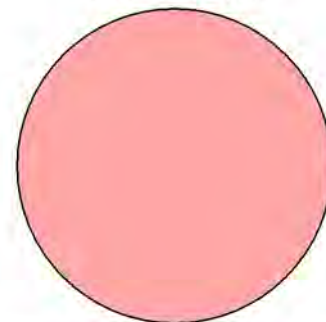
|                 | P50         |         | Uncertainty |
|-----------------|-------------|---------|-------------|
| GROSS AEP *)    | 247,1 GWh/y |         | 0,0 %       |
| Bias correction | 0,0 GWh/y   | 0,0 %   | 0,0 %       |
| Loss correction | -66,9 GWh/y | -27,1 % | 0,0 %       |
| Wake loss       |             | -14,1 % |             |
| Other losses    |             | -15,1 % |             |
| NET AEP         | 180,2 GWh/y |         | 0,0 %       |



|                        |        |                 |       |
|------------------------|--------|-----------------|-------|
| 1. Wake effects        | 14,1 % | 2. Availability | 3,0 % |
| 3. Turbine performance | 0,5 %  | 4. Electrical   | 2,0 % |
| 5. Environmental       | 1,0 %  | 6. Curtailment  | 9,3 % |
| 7. Other               | 0,0 %  |                 |       |



Uncertainty: 0,0 %



|                     |       |               |       |
|---------------------|-------|---------------|-------|
| A. Wind data        | 0,0 % | B. Wind model | 0,0 % |
| C. Power conversion | 0,0 % | D. BIAS       | 0,0 % |
| E. LOSS             | 0,0 % |               |       |

\*) Calculated Annual Energy Production before any bias or loss corrections  
 Assumptions: Uncertainty and percentiles (PXX values) are calculated for the expected lifetime

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)  
ASSUMPTIONS

| LOSS                                     | Method *)   | Loss [%] | Loss [GWh/y] | Std dev**) [%] | Comment                   |
|--|-------------|----------|--------------|----------------|---------------------------|
| 1. Wake effects                          |             |          |              |                |                           |
| Wake effects, all WTGs                   | Calculation | 14,1     | 34,9         | 0,0            |                           |
| 2. Availability                          |             |          |              |                |                           |
| Turbine availability                     | Estimate    | 3,0      | 7,4          | 0,0            |                           |
| 3. Turbine performance                   |             |          |              |                |                           |
| High wind hysteresis                     | Estimate    | 0,5      | 1,2          | 0,0            |                           |
| 4. Electrical                            |             |          |              |                |                           |
| Electrical losses                        | Estimate    | 2,0      | 4,9          | 0,0            |                           |
| 5. Environmental                         |             |          |              |                |                           |
| Performance degradation not due to icing | Estimate    | 0,5      | 1,2          | 0,0            |                           |
| Performance degradation due to icing     | Estimate    | 0,5      | 1,2          | 0,0            |                           |
| 6. Curtailment                           |             |          |              |                |                           |
| Noise                                    | Calculation | 9,1      | 22,6         | 0,0            |                           |
| Flicker                                  | Calculation | 0,2      | 0,5          | 0,0            |                           |
| Birds                                    | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| Bats                                     | Estimate    | 0,0      | 0,0          | 0,0            | Nog geen info beschikbaar |
| 7. Other                                 |             |          |              |                | No input                  |
| LOSS, total                              |             | 27,1     | 66,9         | 0,0            |                           |

| UNCERTAINTY                      | Method *) | Std dev, wind speed [%] | Std dev, AEP [%] | Comment |
|----------------------------------|-----------|-------------------------|------------------|---------|
| A. Wind data                     |           |                         |                  |         |
| Wind measurement/Wind data       |           |                         |                  |         |
| Long term correction             |           |                         |                  |         |
| Year-to-year variability         |           |                         |                  |         |
| Future climate                   |           |                         |                  |         |
| Other wind related               |           |                         |                  |         |
| B. Wind model                    |           |                         |                  |         |
| Vertical extrapolation           |           |                         |                  |         |
| Horizontal extrapolation         |           |                         |                  |         |
| Other wind model related         |           |                         |                  |         |
| C. Power conversion              |           |                         |                  |         |
| Power curve uncertainty          |           |                         |                  |         |
| Metering uncertainty             |           |                         |                  |         |
| Other AEP related uncertainties  |           |                         |                  |         |
| D. BIAS, total uncertainty       |           |                         | 0,0              |         |
| E. LOSS, total uncertainty       |           |                         | 0,0              |         |
| UNCERTAINTY, total (1y average)  |           |                         | 0,0              |         |
| UNCERTAINTY, total (20y average) |           |                         | 0,0              |         |

| VARIABILITY | Years | Variability (std dev) [%] | Total std dev [%] |
|-------------|-------|---------------------------|-------------------|
|             | 1     | 0,00                      | 0,0               |
|             | 5     | 0,00                      | 0,0               |
|             | 10    | 0,00                      | 0,0               |
|             | 20    | 0,00                      | 0,0               |

## RESULTS

| AEP versus exceedance level / time horizon |             |             |              |              |
|--|-------------|-------------|--------------|--------------|
| PXX [%]                                    | 1 y [MWh/y] | 5 y [MWh/y] | 10 y [MWh/y] | 20 y [MWh/y] |
| 50   | 180.183     | 180.183     | 180.183      | 180.183      |
| 75   | 180.183     | 180.183     | 180.183      | 180.183      |
| 84   | 180.183     | 180.183     | 180.183      | 180.183      |
| 90   | 180.183     | 180.183     | 180.183      | 180.183      |
| 95   | 180.183     | 180.183     | 180.183      | 180.183      |

Project:

24\_01\_2017

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0031742489940



Calculated:

14-3-2017 13:47/3.1.597

## Loss&Uncertainty - Assumptions and results

Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)

\*) Calculation means that a calculation method available in the windPRO software is used. This still typically involve a user judgement and user data where the quality of those decides the accuracy. If calculation method is used, the values will often be different from turbine to turbine, here the average is shown, but at page "WTG results" the individual turbine results are shown.

\*\*) For totals the std dev refers to the full AEP, otherwise std dev refers to the bias or loss component which is a fraction of the total AEP.

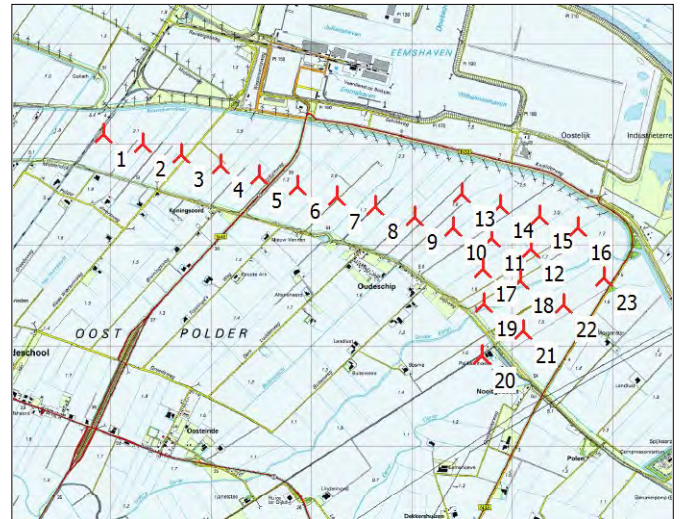


## Loss&Uncertainty - WTG results

Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)

### Main data for PARK

PARK calculation 3.1.597: 716033 WP Oostpolder alternatief 3b  
 Count 23  
 Rated power 54,1 MW  
 Mean wind speed 8,4 m/s at hub height  
 Sensitivity 1,3 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years



Scale: 75.000

### Expected AEP per WTG including bias, loss and uncertainty evaluation

| Description   | User label | Calculated GROSS*)<br>[MWh/y] | Bias<br>[%] | Loss<br>[%] | 20 years averaging |                  |
|---|------------|-------------------------------|-------------|-------------|--------------------|------------------|
|   |            |                               |             |             | Unc.<br>[%]        | P50<br>[MWh/y]   |
| 1 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (382)  | 1          | 10.700,2                      | 0,0         | 14,9        | 0,0                | 9.102,4          |
| 2 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (383)  | 2          | 10.667,9                      | 0,0         | 16,6        | 0,0                | 8.898,7          |
| 3 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (384)  | 3          | 10.673,9                      | 0,0         | 21,5        | 0,0                | 8.374,6          |
| 4 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (385)  | 4          | 10.685,7                      | 0,0         | 21,7        | 0,0                | 8.364,6          |
| 5 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (386)  | 5          | 10.687,4                      | 0,0         | 21,6        | 0,0                | 8.380,3          |
| 6 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (387)  | 6          | 10.698,6                      | 0,0         | 20,6        | 0,0                | 8.496,4          |
| 7 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (388)  | 7          | 10.698,1                      | 0,0         | 23,8        | 0,0                | 8.147,3          |
| 8 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (389)  | 8          | 10.725,5                      | 0,0         | 24,4        | 0,0                | 8.107,9          |
| 9 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (390)  | 9          | 10.737,8                      | 0,0         | 25,2        | 0,0                | 8.033,6          |
| 10 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (391) | 10         | 10.730,6                      | 0,0         | 39,6        | 0,0                | 6.482,1          |
| 11 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (392) | 11         | 10.781,1                      | 0,0         | 42,9        | 0,0                | 6.157,7          |
| 12 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (393) | 12         | 10.813,4                      | 0,0         | 32,5        | 0,0                | 7.299,5          |
| 13 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (394) | 13         | 10.818,3                      | 0,0         | 30,3        | 0,0                | 7.535,6          |
| 14 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (395) | 14         | 10.858,1                      | 0,0         | 32,6        | 0,0                | 7.315,4          |
| 15 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (396) | 15         | 10.838,8                      | 0,0         | 27,8        | 0,0                | 7.828,9          |
| 16 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (397) | 16         | 10.872,8                      | 0,0         | 25,2        | 0,0                | 8.138,3          |
| 17 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (398) | 17         | 10.721,3                      | 0,0         | 39,6        | 0,0                | 6.478,4          |
| 18 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (399) | 18         | 10.732,7                      | 0,0         | 29,4        | 0,0                | 7.579,0          |
| 19 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (400) | 19         | 10.708,9                      | 0,0         | 37,5        | 0,0                | 6.692,1          |
| 20 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (401) | 20         | 10.655,0                      | 0,0         | 20,6        | 0,0                | 8.465,4          |
| 21 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (402) | 21         | 10.680,5                      | 0,0         | 25,0        | 0,0                | 8.013,3          |
| 22 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (403) | 22         | 10.749,3                      | 0,0         | 21,6        | 0,0                | 8.425,7          |
| 23 ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (404) | 23         | 10.825,2                      | 0,0         | 28,6        | 0,0                | 7.730,8          |
| <b>PARK</b>   |            | <b>247.061,1</b>              | <b>0,0</b>  | <b>27,1</b> | <b>0,0</b>         | <b>180.183,0</b> |



## Loss&Uncertainty - Noise

Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (382) | 10.700,2                      | 143,6         | 1,34                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (383) | 10.667,9                      | 142,7         | 1,34                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (384) | 10.673,9                      | 726,8         | 6,81                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (385) | 10.685,7                      | 728,1         | 6,81                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (386) | 10.687,4                      | 728,1         | 6,81                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (387) | 10.698,6                      | 571,1         | 5,34                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (388) | 10.698,1                      | 954,3         | 8,92                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (389) | 10.725,5                      | 958,8         | 8,94                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (390) | 10.737,8                      | 960,7         | 8,95                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (391) | 10.730,6                      | 2.718,8       | 25,34                 |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (392) | 10.781,1                      | 2.737,8       | 25,39                 |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (393) | 10.813,4                      | 973,0         | 9,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (394) | 10.818,3                      | 974,4         | 9,01                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (395) | 10.858,1                      | 981,0         | 9,03                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (396) | 10.838,8                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (397) | 10.872,8                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (398) | 10.721,3                      | 2.714,4       | 25,32                 |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (399) | 10.732,7                      | 958,9         | 8,93                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (400) | 10.708,9                      | 2.709,5       | 25,30                 |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (401) | 10.655,0                      | 944,4         | 8,86                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (402) | 10.680,5                      | 949,0         | 8,89                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (403) | 10.749,3                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (404) | 10.825,2                      | 0,0           | 0,00                  |
| TOTAL  | 247.061,1                     | 22.575,3      | 9,14                  |

## Loss&Uncertainty - Flicker

Calculation: 716033 Losses alternatief 3b (Schaduw\_en\_geluid)

Calculated losses due to shadow (flicker) loss.

Used SHADOW calculation: 3.1.597: 3b receptoren binnen 6 uur

Assumptions:

Advanced stop (light sensors etc. included). Reduced to: 30 % AEP reduction relative to worst case.

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (382) | 10.700,2                      | 34,4          | 0,32                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (383) | 10.667,9                      | 25,7          | 0,24                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (384) | 10.673,9                      | 15,1          | 0,14                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (385) | 10.685,7                      | 18,7          | 0,17                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (386) | 10.687,4                      | 19,8          | 0,18                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (387) | 10.698,6                      | 14,9          | 0,14                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (388) | 10.698,1                      | 30,7          | 0,29                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (389) | 10.725,5                      | 47,1          | 0,44                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (390) | 10.737,8                      | 47,0          | 0,44                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (391) | 10.730,6                      | 31,7          | 0,30                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (392) | 10.781,1                      | 23,4          | 0,22                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (393) | 10.813,4                      | 9,7           | 0,09                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (394) | 10.818,3                      | 13,9          | 0,13                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (395) | 10.858,1                      | 8,5           | 0,08                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (396) | 10.838,8                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (397) | 10.872,8                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (398) | 10.721,3                      | 50,0          | 0,47                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (399) | 10.732,7                      | 10,8          | 0,10                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (400) | 10.708,9                      | 33,2          | 0,31                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (401) | 10.655,0                      | 34,3          | 0,32                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (402) | 10.680,5                      | 7,5           | 0,07                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (403) | 10.749,3                      | 0,0           | 0,00                  |
| ENERCON E-103 EP2 2350 103.0 !-! hub: 120,0 m (TOT: 171,5 m) (404) | 10.825,2                      | 0,0           | 0,00                  |
| TOTAL  | 247.061,1                     | 476,5         | 0,19                  |

## Loss&Uncertainty - Main result

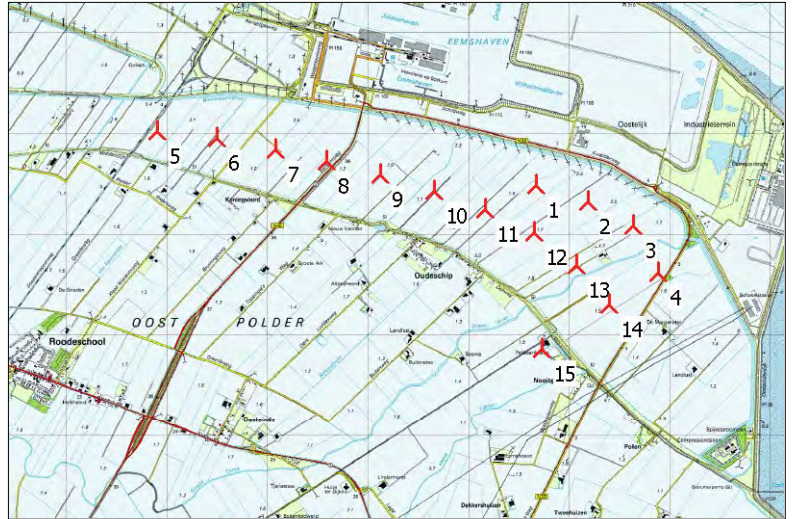
Calculation: VKA1 (Schaduw\_en\_geluid)

Main data for PARK

PARK calculation 3.1.597: WP Oostpolder VKA1  
 Count 15  
 Rated power 63,0 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years

### RESULTS

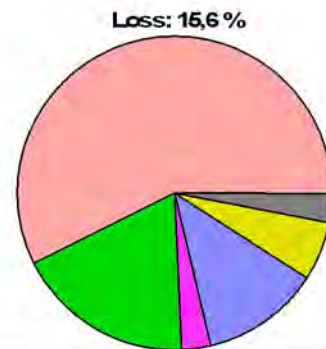
P50  
 NET AEP [GWh/y] 273,4  
 Capacity factor [%] 49,5  
 Full load hours [h/y] 4.340



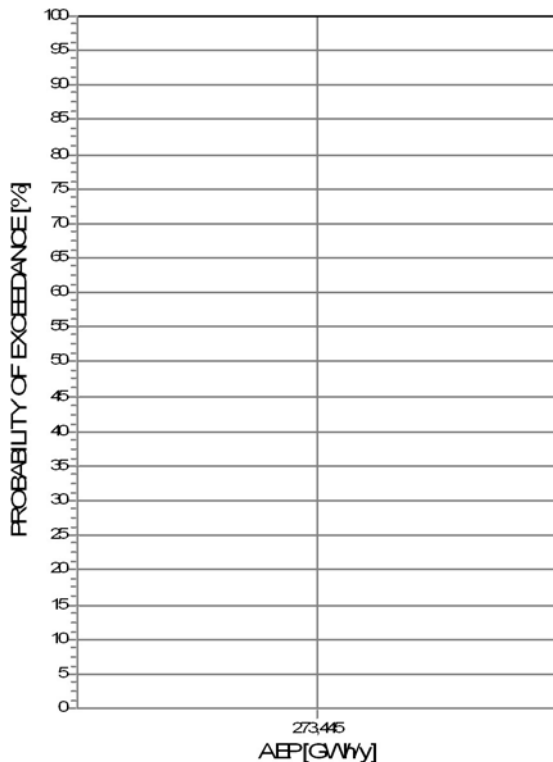
Scale: 75.000

### Result details

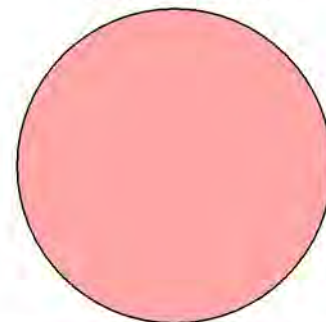
|                 | P50         |         | Uncertainty |
|-----------------|-------------|---------|-------------|
| GROSS AEP *)    | 323,9 GWh/y |         | 0,0 %       |
| Bias correction | 0,0 GWh/y   | 0,0 %   | 0,0 %       |
| Loss correction | -50,4 GWh/y | -15,6 % | 0,0 %       |
| Wake loss       |             | -9,4 %  |             |
| Other losses    |             | -6,8 %  |             |
| NET AEP         | 273,4 GWh/y |         | 0,0 %       |



|                        |      |                 |     |
|------------------------|------|-----------------|-----|
| 1. Wake effects        | 94%  | 2. Availability | 30% |
| 3. Turbine performance | 05%  | 4. Electrical   | 20% |
| 5. Environmental       | 1,0% | 6. Curtailment  | 05% |
| 7. Other               | 00%  |                 |     |



Uncertainty: 0,0 %



|                     |     |               |     |
|---------------------|-----|---------------|-----|
| A. Wind data        | 00% | B. Wind model | 00% |
| C. Power conversion | 00% | D. BIAS       | 00% |
| E. LOSS             | 00% |               |     |

\*) Calculated Annual Energy Production before any bias or loss corrections  
 Assumptions: Uncertainty and percentiles (PXX values) are calculated for the expected lifetime

## Loss&Uncertainty - Assumptions and results

Calculation: VKA1 (Schaduw\_en\_geluid)

### ASSUMPTIONS

| LOSS                                     | Method *)   | Loss [%] | Loss [GWh/y] | Std dev**) [%] | Comment   |
|--|-------------|----------|--------------|----------------|-----------|
| 1. Wake effects                          |             |          |              |                |           |
| Wake effects, all WTGs                   | Calculation | 9,4      | 30,4         | 0,0            | Berekend  |
| 2. Availability                          |             |          |              |                |           |
| Turbine availability                     | Estimate    | 3,0      | 9,7          | 0,0            | Schatting |
| 3. Turbine performance                   |             |          |              |                |           |
| High wind hysteresis                     | Estimate    | 0,5      | 1,6          | 0,0            | Schatting |
| 4. Electrical                            |             |          |              |                |           |
| Electrical losses                        | Estimate    | 2,0      | 6,5          | 0,0            | Schatting |
| 5. Environmental                         |             |          |              |                |           |
| Performance degradation not due to icing | Estimate    | 0,5      | 1,6          | 0,0            | Schatting |
| Performance degradation due to icing     | Estimate    | 0,5      | 1,6          | 0,0            | Schatting |
| 6. Curtailment                           |             |          |              |                |           |
| Noise                                    | Calculation | 0,2      | 0,7          | 0,0            | Berekend  |
| Flicker                                  | Calculation | 0,3      | 0,9          | 0,0            | Berekend  |
| 7. Other                                 |             |          |              |                | No input  |
| LOSS, total                              |             | 15,6     | 50,4         | 0,0            |           |

| UNCERTAINTY                      | Method *) | Std dev, wind speed [%] | Std dev, AEP [%] | Comment |
|----------------------------------|-----------|-------------------------|------------------|---------|
| A. Wind data                     |           |                         |                  |         |
| Wind measurement/Wind data       |           |                         |                  |         |
| Long term correction             |           |                         |                  |         |
| Year-to-year variability         |           |                         |                  |         |
| Future climate                   |           |                         |                  |         |
| Other wind related               |           |                         |                  |         |
| B. Wind model                    |           |                         |                  |         |
| Vertical extrapolation           |           |                         |                  |         |
| Horizontal extrapolation         |           |                         |                  |         |
| Other wind model related         |           |                         |                  |         |
| C. Power conversion              |           |                         |                  |         |
| Power curve uncertainty          |           |                         |                  |         |
| Metering uncertainty             |           |                         |                  |         |
| Other AEP related uncertainties  |           |                         |                  |         |
| D. BIAS, total uncertainty       |           |                         | 0,0              |         |
| E. LOSS, total uncertainty       |           |                         | 0,0              |         |
| UNCERTAINTY, total (1y average)  |           |                         | 0,0              |         |
| UNCERTAINTY, total (20y average) |           |                         | 0,0              |         |

| VARIABILITY |                           |                   |
|-------------|---------------------------|-------------------|
| Years       | Variability (std dev) [%] | Total std dev [%] |
| 1           | 0,00                      | 0,0               |
| 5           | 0,00                      | 0,0               |
| 10          | 0,00                      | 0,0               |
| 20          | 0,00                      | 0,0               |

### RESULTS

| AEP versus exceedance level / time horizon |             |             |              |              |  |
|--|-------------|-------------|--------------|--------------|--|
| PXX [%]                                    | 1 y [MWh/y] | 5 y [MWh/y] | 10 y [MWh/y] | 20 y [MWh/y] |  |
| 50   | 273.445     | 273.445     | 273.445      | 273.445      |  |
| 75   | 273.445     | 273.445     | 273.445      | 273.445      |  |
| 84   | 273.445     | 273.445     | 273.445      | 273.445      |  |
| 90   | 273.445     | 273.445     | 273.445      | 273.445      |  |
| 95   | 273.445     | 273.445     | 273.445      | 273.445      |  |

\*) Calculation means that a calculation method available in the windPRO software is used. This still typically involve a user judgement and user data where the quality of those decides the accuracy. If calculation method is used, the values will often be different from turbine to turbine, here the average is shown, but at page "WTG results" the individual turbine results are shown.

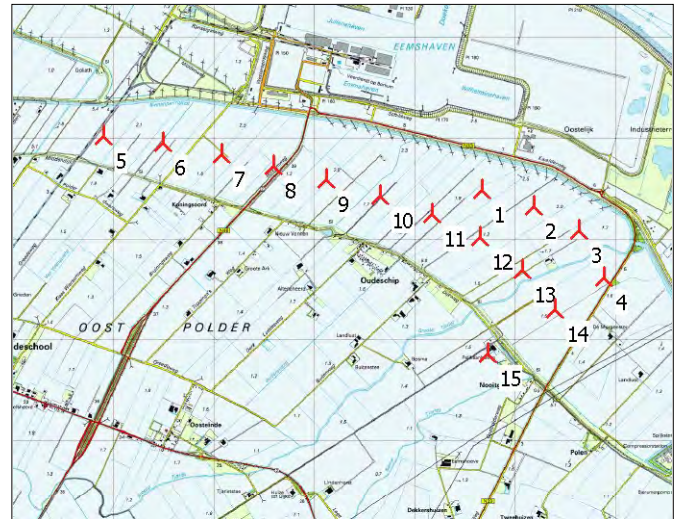
\*\*) For totals the std dev refers to the full AEP, otherwise std dev refers to the bias or loss component which is a fraction of the total AEP.

## Loss&Uncertainty - WTG results

Calculation: VKA1 (Schaduw\_en\_geluid)

Main data for PARK

PARK calculation 3.1.597: WP Oostpolder VKA1  
 Count 15  
 Rated power 63,0 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years



Scale: 75.000

### Expected AEP per WTG including bias, loss and uncertainty evaluation

| Description   | Calculated GROSS*)<br>[MWh/y] | Bias<br>[%] | Loss<br>[%] | 20 years averaging |                  |
|---|-------------------------------|-------------|-------------|--------------------|------------------|
|   |                               |             |             | Unc.<br>[%]        | P50<br>[MWh/y]   |
| 1 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (748)  | 21.715,7                      | 0,0         | 17,7        | 0,0                | 17.868,8         |
| 2 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (749)  | 21.753,8                      | 0,0         | 18,6        | 0,0                | 17.696,7         |
| 3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (750)  | 21.756,2                      | 0,0         | 18,4        | 0,0                | 17.761,8         |
| 4 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (751)  | 21.692,8                      | 0,0         | 22,2        | 0,0                | 16.867,2         |
| 5 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (752)  | 21.478,8                      | 0,0         | 11,7        | 0,0                | 18.973,0         |
| 6 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (753)  | 21.497,2                      | 0,0         | 13,7        | 0,0                | 18.552,2         |
| 7 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (754)  | 21.547,7                      | 0,0         | 13,4        | 0,0                | 18.664,2         |
| 8 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (755)  | 21.530,9                      | 0,0         | 13,7        | 0,0                | 18.577,7         |
| 9 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (756)  | 21.560,9                      | 0,0         | 13,7        | 0,0                | 18.608,5         |
| 10 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (757) | 21.574,7                      | 0,0         | 14,2        | 0,0                | 18.512,4         |
| 11 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (758) | 21.591,9                      | 0,0         | 16,9        | 0,0                | 17.948,1         |
| 12 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (759) | 21.602,2                      | 0,0         | 15,5        | 0,0                | 18.251,3         |
| 13 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (760) | 21.589,3                      | 0,0         | 16,0        | 0,0                | 18.143,6         |
| 14 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (761) | 21.556,3                      | 0,0         | 16,0        | 0,0                | 18.099,7         |
| 15 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (762) | 21.419,6                      | 0,0         | 11,8        | 0,0                | 18.898,5         |
| <b>PARK</b>   | <b>323.867,9</b>              | <b>0,0</b>  | <b>15,6</b> | <b>0,0</b>         | <b>273.445,3</b> |

Project:  
24\_01\_2017

Licensed user:  
Pondera Consult B.V.  
Welbergweg 49  
NL-7556 PE Hengelo  
0031742489940



Calculated:  
16-3-2017 13:19/3.1.597

## Loss&Uncertainty - Noise

Calculation: VKA1 (Schaduw\_en\_geluid)

Noise reduced mode is achieved by less aggressive pitching or reduction of maximum power. In both cases this results in less power production. There might also be situations where the turbine is fully stopped for fulfilling special noise requirements

### Assumptions:

| WTG(s)   | Time  |       | Calculated power curve                     | Curtailed power curve                       |
|--|-------|-------|--|---|
|  | From  | To    |  |   |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (753) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 1 - official - I s- 4000kW - 04/2016  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (758) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 2 - official - II s- 3800kW - 04/2016 |

### Time series used in calculation

Name: Lauwersoog\_KNMI\_1991\_2016.10,00m -

From: 18-3-1991 1:00:00

To: 2-1-2017 23:00:00

Period: 310 months

Time step: 60 minutes

The period used is calibrated to calculate annual loss

### Result

Calculated AEP before loss: 323.867,9 MWh/y  
Calculated loss: 673,4 MWh/y  
Calculated AEP after loss: 323.194,5 MWh/y  
Percent loss: 0,21 %

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (748) | 21.715,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (749) | 21.753,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (750) | 21.756,2                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (751) | 21.692,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (752) | 21.478,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (753) | 21.497,2                      | 213,5         | 0,99                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (754) | 21.547,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (755) | 21.530,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (756) | 21.560,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (757) | 21.574,7                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (758) | 21.591,9                      | 459,9         | 2,13                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (759) | 21.602,2                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (760) | 21.589,3                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (761) | 21.556,3                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (762) | 21.419,6                      | 0,0           | 0,00                  |
| TOTAL  | 323.867,9                     | 673,4         | 0,21                  |



## Loss&Uncertainty - Flicker

Calculation: VKA1 (Schaduw\_en\_geluid)

Calculated losses due to shadow (flicker) loss.

Used SHADOW calculation: 3.1.597: VKA 1 schaduw

Assumptions:

Advanced stop (light sensors etc. included). Reduced to: 30 % AEP reduction relative to worst case.

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (748) | 21.715,7                      | 34,8          | 0,16                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (749) | 21.753,8                      | 35,6          | 0,16                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (750) | 21.756,2                      | 13,7          | 0,06                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (751) | 21.692,8                      | 3,5           | 0,02                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (752) | 21.478,8                      | 167,9         | 0,78                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (753) | 21.497,2                      | 94,2          | 0,44                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (754) | 21.547,7                      | 47,4          | 0,22                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (755) | 21.530,9                      | 54,5          | 0,25                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (756) | 21.560,9                      | 22,3          | 0,10                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (757) | 21.574,7                      | 57,9          | 0,27                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (758) | 21.591,9                      | 85,7          | 0,40                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (759) | 21.602,2                      | 99,9          | 0,46                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (760) | 21.589,3                      | 56,3          | 0,26                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (761) | 21.556,3                      | 26,2          | 0,12                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (762) | 21.419,6                      | 126,0         | 0,59                  |
| TOTAL  | 323.867,9                     | 925,9         | 0,29                  |

## Loss&Uncertainty - Main result

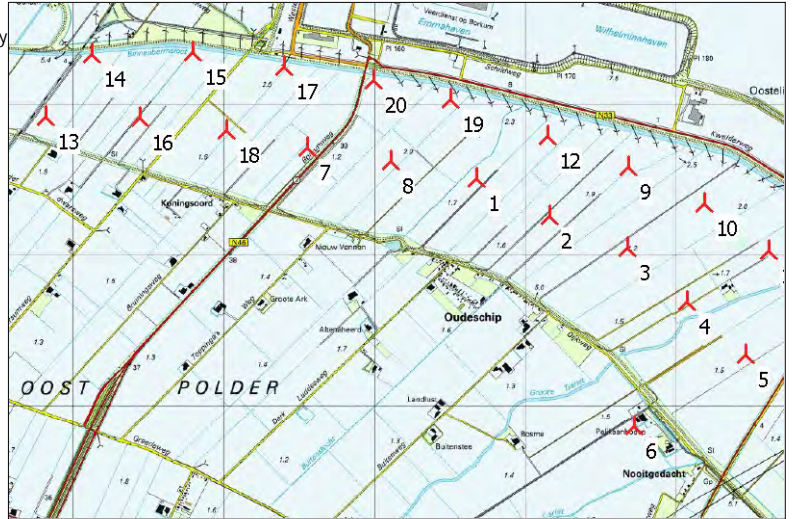
Calculation: VKA 2 (Schaduw\_en\_geluid)

Main data for PARK

PARK calculation 3.1.597: WP Oostpolder VKA 2 (met aangepaste innogy)  
 Count 20  
 Rated power 84,0 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years

### RESULTS

|                 |         |       |
|-----------------|---------|-------|
|                 |         | P50   |
| NET AEP         | [GWh/y] | 355,6 |
| Capacity factor | [%]     | 48,3  |
| Full load hours | [h/y]   | 4.234 |



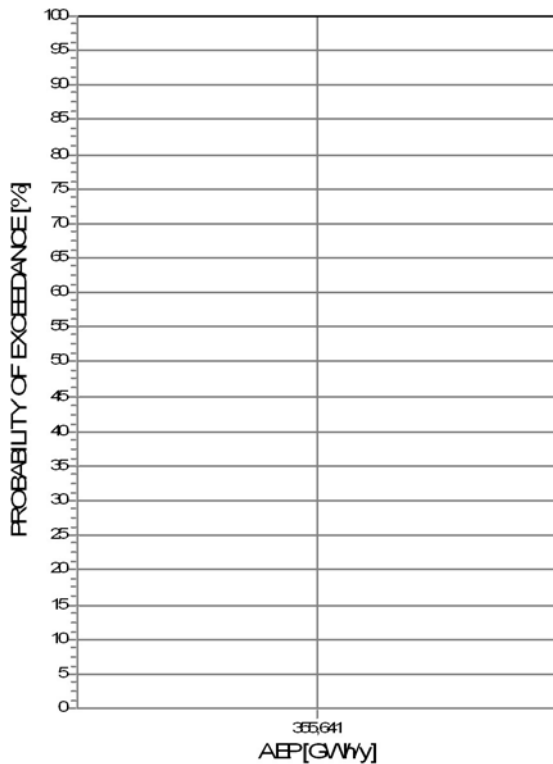
Scale: 50.000

### Result details

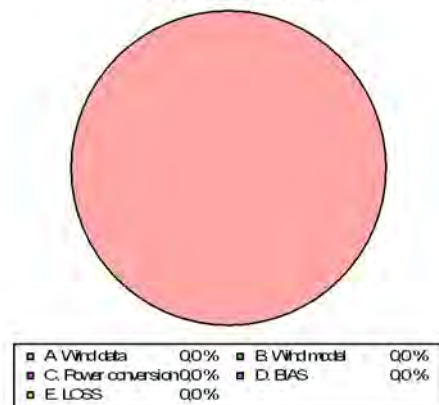
|                 | P50         |         | Uncertainty |
|-----------------|-------------|---------|-------------|
| GROSS AEP *)    | 432,4 GWh/y |         | 0,0 %       |
| Bias correction | 0,0 GWh/y   | 0,0 %   | 0,0 %       |
| Loss correction | -76,7 GWh/y | -17,7 % | 0,0 %       |
| Wake loss       |             | -9,9 %  |             |
| Other losses    |             | -8,7 %  |             |
| NET AEP         | 355,6 GWh/y |         | 0,0 %       |



|                        |      |                 |     |
|------------------------|------|-----------------|-----|
| 1. Wake effects        | 99%  | 2. Availability | 30% |
| 3. Turbine performance | Q5%  | 4. Electrical   | 20% |
| 5. Environmental       | 1,0% | 6. Curtailment  | 25% |
| 7. Other               | Q0%  |                 |     |



Uncertainty: 0,0 %



\*) Calculated Annual Energy Production before any bias or loss corrections  
 Assumptions: Uncertainty and percentiles (PXX values) are calculated for the expected lifetime

## Loss&Uncertainty - Assumptions and results

Calculation: VKA 2 (Schaduw\_en\_geluid)

### ASSUMPTIONS

| LOSS                                     | Method *)   | Loss [%] | Loss [GWh/y] | Std dev**) [%] | Comment   |
|--|-------------|----------|--------------|----------------|-----------|
| 1. Wake effects                          |             |          |              |                |           |
| Wake effects, all WTGs                   | Calculation | 9,9      | 43,0         | 0,0            | Berekend  |
| 2. Availability                          |             |          |              |                |           |
| Turbine availability                     | Estimate    | 3,0      | 13,0         | 0,0            | Schatting |
| 3. Turbine performance                   |             |          |              |                |           |
| High wind hysteresis                     | Estimate    | 0,5      | 2,2          | 0,0            | Schatting |
| 4. Electrical                            |             |          |              |                |           |
| Electrical losses                        | Estimate    | 2,0      | 8,6          | 0,0            | Schatting |
| 5. Environmental                         |             |          |              |                |           |
| Performance degradation not due to icing | Estimate    | 0,5      | 2,2          | 0,0            | Schatting |
| Performance degradation due to icing     | Estimate    | 0,5      | 2,2          | 0,0            | Schatting |
| 6. Curtailment                           |             |          |              |                |           |
| Noise                                    | Calculation | 2,2      | 9,4          | 0,0            | Berekend  |
| Flicker                                  | Calculation | 0,3      | 1,2          | 0,0            | Berekend  |
| 7. Other                                 |             |          |              |                | No input  |
| LOSS, total                              |             | 17,7     | 76,7         | 0,0            |           |

| UNCERTAINTY                      | Method *) | Std dev, wind speed [%] | Std dev, AEP [%] | Comment |
|----------------------------------|-----------|-------------------------|------------------|---------|
| A. Wind data                     |           |                         |                  |         |
| Wind measurement/Wind data       |           |                         |                  |         |
| Long term correction             |           |                         |                  |         |
| Year-to-year variability         |           |                         |                  |         |
| Future climate                   |           |                         |                  |         |
| Other wind related               |           |                         |                  |         |
| B. Wind model                    |           |                         |                  |         |
| Vertical extrapolation           |           |                         |                  |         |
| Horizontal extrapolation         |           |                         |                  |         |
| Other wind model related         |           |                         |                  |         |
| C. Power conversion              |           |                         |                  |         |
| Power curve uncertainty          |           |                         |                  |         |
| Metering uncertainty             |           |                         |                  |         |
| Other AEP related uncertainties  |           |                         |                  |         |
| D. BIAS, total uncertainty       |           |                         | 0,0              |         |
| E. LOSS, total uncertainty       |           |                         | 0,0              |         |
| UNCERTAINTY, total (1y average)  |           |                         | 0,0              |         |
| UNCERTAINTY, total (20y average) |           |                         | 0,0              |         |

| VARIABILITY |                           |                   |
|-------------|---------------------------|-------------------|
| Years       | Variability (std dev) [%] | Total std dev [%] |
| 1           | 0,00                      | 0,0               |
| 5           | 0,00                      | 0,0               |
| 10          | 0,00                      | 0,0               |
| 20          | 0,00                      | 0,0               |

### RESULTS

| AEP versus exceedance level / time horizon |             |             |              |              |
|--|-------------|-------------|--------------|--------------|
| PXX [%]                                    | 1 y [MWh/y] | 5 y [MWh/y] | 10 y [MWh/y] | 20 y [MWh/y] |
| 50   | 355.641     | 355.641     | 355.641      | 355.641      |
| 75   | 355.641     | 355.641     | 355.641      | 355.641      |
| 84   | 355.641     | 355.641     | 355.641      | 355.641      |
| 90   | 355.641     | 355.641     | 355.641      | 355.641      |
| 95   | 355.641     | 355.641     | 355.641      | 355.641      |

\*) Calculation means that a calculation method available in the windPRO software is used. This still typically involve a user judgement and user data where the quality of those decides the accuracy. If calculation method is used, the values will often be different from turbine to turbine, here the average is shown, but at page "WTG results" the individual turbine results are shown.

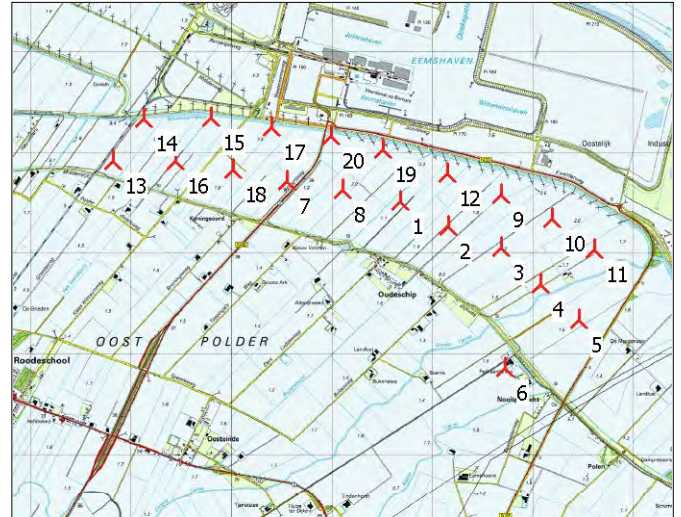
\*\*) For totals the std dev refers to the full AEP, otherwise std dev refers to the bias or loss component which is a fraction of the total AEP.

## Loss&Uncertainty - WTG results

Calculation: VKA 2 (Schaduw\_en\_geluid)

Main data for PARK

PARK calculation 3.1.597: WP Oostpolder VKA 2 (met aangepaste innogy opstelling)  
 Count 20  
 Rated power 84,0 MW  
 Mean wind speed 9,2 m/s at hub height  
 Sensitivity 1,1 %AEP / %Mean Wind Speed  
 Expected lifetime 20 Years



Scale: 75.000

### Expected AEP per WTG including bias, loss and uncertainty evaluation

| Description   | Calculated GROSS*)<br>[MWh/y] | Bias<br>[%] | Loss<br>[%] | 20 years averaging |                  |
|---|-------------------------------|-------------|-------------|--------------------|------------------|
|   |                               |             |             | Unc.<br>[%]        | P50<br>[MWh/y]   |
| 1 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (644)  | 21.610,0                      | 0,0         | 16,6        | 0,0                | 18.018,6         |
| 2 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (645)  | 21.594,5                      | 0,0         | 16,8        | 0,0                | 17.958,9         |
| 3 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (646)  | 21.630,9                      | 0,0         | 15,6        | 0,0                | 18.264,9         |
| 4 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (647)  | 21.589,3                      | 0,0         | 15,6        | 0,0                | 18.214,9         |
| 5 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (648)  | 21.566,5                      | 0,0         | 16,0        | 0,0                | 18.112,2         |
| 6 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (649)  | 21.419,6                      | 0,0         | 11,6        | 0,0                | 18.934,9         |
| 7 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (650)  | 21.535,7                      | 0,0         | 15,5        | 0,0                | 18.192,5         |
| 8 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (651)  | 21.573,3                      | 0,0         | 15,8        | 0,0                | 18.156,5         |
| 9 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (652)  | 21.752,1                      | 0,0         | 18,3        | 0,0                | 17.770,5         |
| 10 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (653) | 21.763,1                      | 0,0         | 18,9        | 0,0                | 17.640,5         |
| 11 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (654) | 21.750,9                      | 0,0         | 18,1        | 0,0                | 17.815,4         |
| 12 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (655) | 21.739,8                      | 0,0         | 18,0        | 0,0                | 17.831,6         |
| 13 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (656) | 21.450,3                      | 0,0         | 12,2        | 0,0                | 18.833,9         |
| 14 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (657) | 21.558,0                      | 0,0         | 15,1        | 0,0                | 18.307,1         |
| 15 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (658) | 21.646,4                      | 0,0         | 16,8        | 0,0                | 18.016,2         |
| 16 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (659) | 21.473,2                      | 0,0         | 32,6        | 0,0                | 14.475,0         |
| 17 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (660) | 21.695,8                      | 0,0         | 17,4        | 0,0                | 17.927,8         |
| 18 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (661) | 21.533,2                      | 0,0         | 29,1        | 0,0                | 15.269,7         |
| 19 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (662) | 21.752,2                      | 0,0         | 18,0        | 0,0                | 17.840,4         |
| 20 ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (663) | 21.726,6                      | 0,0         | 17,6        | 0,0                | 17.893,4         |
| <b>PARK</b>   | <b>432.361,5</b>              | <b>0,0</b>  | <b>17,7</b> | <b>0,0</b>         | <b>355.641,4</b> |

## Loss&Uncertainty - Noise

Calculation: VKA 2 (Schaduw\_en\_geluid)

Noise reduced mode is achieved by less aggressive pitching or reduction of maximum power. In both cases this results in less power production. There might also be situations where the turbine is fully stopped for fulfilling special noise requirements

### Assumptions:

| WTG(s)   | Time  |       | Calculated power curve                     | Curtailed power curve                       |
|--|-------|-------|--|---|
|  | From  | To    |  |   |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (644) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 1 - official - I s- 4000kW - 04/2016  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (645) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 2 - official - II s- 3800kW - 04/2016 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (650) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 1 - official - I s- 4000kW - 04/2016  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (651) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 1 - official - I s- 4000kW - 04/2016  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (659) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 9 - official - 500kW - 04/2016        |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (661) | 23:00 | 07:00 | Level 0 - official - 0 s- 4200kW - 04/2016 | Level 8 - official - 1000kW - 04/2016       |

### Time series used in calculation

Name: Lauwersoog\_KNMI\_1991\_2016.10,00m -  
From: 18-3-1991 1:00:00  
To: 2-1-2017 23:00:00  
Period: 310 months  
Time step: 60 minutes  
The period used is calibrated to calculate annual loss

### Result

Calculated AEP before loss: 432.361,5 MWh/y  
Calculated loss: 9.409,0 MWh/y  
Calculated AEP after loss: 422.952,5 MWh/y  
Percent loss: 2,18 %

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (644) | 21.610,0                      | 215,0         | 1,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (645) | 21.594,5                      | 460,0         | 2,13                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (646) | 21.630,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (647) | 21.589,3                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (648) | 21.566,5                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (649) | 21.419,6                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (650) | 21.535,7                      | 213,9         | 0,99                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (651) | 21.573,3                      | 214,5         | 0,99                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (652) | 21.752,1                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (653) | 21.763,1                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (654) | 21.750,9                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (655) | 21.739,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (656) | 21.450,3                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (657) | 21.558,0                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (658) | 21.646,4                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (659) | 21.473,2                      | 4.631,4       | 21,57                 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (660) | 21.695,8                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (661) | 21.533,2                      | 3.674,1       | 17,06                 |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (662) | 21.752,2                      | 0,0           | 0,00                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (663) | 21.726,6                      | 0,0           | 0,00                  |
| TOTAL  | 432.361,5                     | 9.409,0       | 2,18                  |

## Loss&Uncertainty - Flicker

Calculation: VKA 2 (Schaduw\_en\_geluid)

Calculated losses due to shadow (flicker) loss.

Used SHADOW calculation: 3.1.597: VKA 2 schaduw

Assumptions:

Advanced stop (light sensors etc. included). Reduced to: 30 % AEP reduction relative to worst case.

### Result

| WTG  | Calculated AEP GROSS<br>[MWh] | Loss<br>[MWh] | Percent of AEP<br>[%] |
|--|-------------------------------|---------------|-----------------------|
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (644) | 21.610,0                      | 52,0          | 0,24                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (645) | 21.594,5                      | 84,3          | 0,39                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (646) | 21.630,9                      | 92,7          | 0,43                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (647) | 21.589,3                      | 56,2          | 0,26                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (648) | 21.566,5                      | 22,8          | 0,11                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (649) | 21.419,6                      | 126,0         | 0,59                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (650) | 21.535,7                      | 58,0          | 0,27                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (651) | 21.573,3                      | 26,5          | 0,12                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (652) | 21.752,1                      | 29,0          | 0,13                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (653) | 21.763,1                      | 34,4          | 0,16                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (654) | 21.750,9                      | 14,3          | 0,07                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (655) | 21.739,8                      | 14,6          | 0,07                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (656) | 21.450,3                      | 220,3         | 1,03                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (657) | 21.558,0                      | 141,2         | 0,65                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (658) | 21.646,4                      | 41,7          | 0,19                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (659) | 21.473,2                      | 121,1         | 0,56                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (660) | 21.695,8                      | 13,1          | 0,06                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (661) | 21.533,2                      | 60,9          | 0,28                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (662) | 21.752,2                      | 8,9           | 0,04                  |
| ENERCON E-141 EP4 4200 141.0 !-! hub: 165,0 m (TOT: 235,5 m) (663) | 21.726,6                      | 16,9          | 0,08                  |
| TOTAL  | 432.361,5                     | 1.235,0       | 0,29                  |