

Project:
110506_BBI_Tricarico_XX

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Calculated:
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PARK - Main Result

Calculation: 111003 20 x S97 @ 100m HH

Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings

Air density calculation mode Individual per WTG
Result for WTG at hub altitude 1.137 kg/m³ to 1.163 kg/m³
Air density relative to standard 93.6 %
Hub altitude above sea level (asl) 470.0 m to 700.0 m
Annual mean temperature at hub alt. 12.7 °C to 14.2 °C
Pressure at WTGs 933.0 hPa to 959.0 hPa

Wake Model Parameters

From angle To angle Terrain type Wake Decay Constant
[°] [°]
-180.0 180.0 Open farmland 0.075

Wake calculation settings

Angle [°] Wind speed [m/s]
start end step start end step
0.5 360.0 1.0 0.5 30.5 2.0

Wind statistics

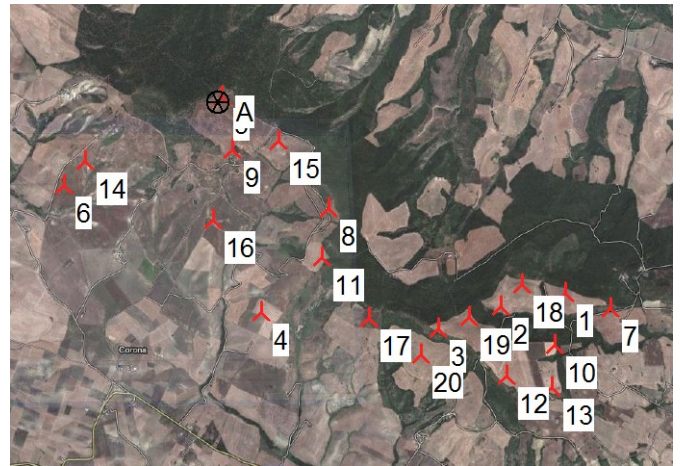
IT ST 01a - WA - 1year @ 30m.wvs

WASP version

WASP 6-9 for Windows RVEA0011 1, 0, 0, 13

WASP parameters

Non-default WASP parameters - detailed information at the end of "Main results"



🚩 New WTG

⊗ Site Data

Scale 1:75,000

Key results for height 30.0 m above ground level

Terrain GB2

East	North	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A 2,621,300	4,505,939	PARK - ST 01a - WA - 1year @ 30m	WASP (WASP 6-9 for Windows RVEA0011 1, 0, 0, 13)	3,214	6.9	0.1

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK [MWh/y]	GROSS (no loss) Free WTGs [MWh/y]	Park efficiency [%]	Specific results ^{a)}			
				Capacity factor [%]	Mean WTG result [MWh/y]	Full load hours [Hours/year]	Mean wind speed @hub height [m/s]
Wind farm	165,795.0	174,121.8	95.2	45.0	8,289.8	3,948	8.1

^{a)} Based on wake reduced results, but no other losses included

Calculated Annual Energy for each of 20 new WTGs with total 42.0 MW rated power

WTG type	Terrain	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve		Annual Energy Result [MWh]	Park Efficiency [%]	Capacity factor [%]	Mean wind speed [m/s]
								Creator	Name				
1 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,640.9	93.9	46.9	8.36	
2 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,371.4	93.3	45.5	8.21	
3 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,902.1	95.1	48.4	8.45	
4 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,822.1	97.7	42.5	7.61	
5 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	9,734.1	97.7	52.9	9.03	
6 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,576.3	99.2	41.2	7.37	
7 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,454.5	94.5	45.9	8.18	
8 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,989.2	95.0	43.4	7.98	
9 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,174.8	96.5	44.4	7.91	
10 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,314.5	92.1	45.2	8.27	
11 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,349.3	95.3	45.4	8.11	
12 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,931.5	94.2	48.5	8.61	
13 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,648.4	93.3	47.0	8.43	
14 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,945.4	98.5	43.2	7.65	
15 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,171.9	93.8	39.0	7.43	
16 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,743.7	97.0	42.1	7.62	
17 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,248.2	95.7	44.8	7.97	
18 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,489.2	94.2	46.1	8.24	
19 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	8,595.6	93.6	46.7	8.34	
20 A	Yes	Suzlon	S97-2,100	2,100	97.0	100.0	USER	Suzlon S97DFIG 2.1MW	7,691.9	94.8	41.8	7.65	

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

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**PARK - Main Result****Calculation:** 111003 20 x S97 @ 100m HH**WTG siting**

		GB2		Z [m]	Row data/Description
	East GB2	North			
1	New	2,624,776	4,504,102	580.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1124)
2	New	2,624,132	4,503,961	573.7	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1125)
3	New	2,623,519	4,503,734	600.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1126)
4	New	2,621,760	4,503,874	420.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1127)
5	New	2,621,343	4,506,001	596.8	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1128)
6	New	2,619,789	4,505,104	370.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1129)
7	New	2,625,225	4,503,959	553.4	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1130)
8	New	2,622,410	4,504,906	540.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1131)
9	New	2,621,448	4,505,472	540.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1132)
10	New	2,624,672	4,503,588	580.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1133)
11	New	2,622,351	4,504,426	540.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1134)
12	New	2,624,201	4,503,282	600.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1135)
13	New	2,624,653	4,503,173	590.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1136)
14	New	2,619,990	4,505,342	410.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1137)
15	New	2,621,908	4,505,569	520.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1138)
16	New	2,621,265	4,504,780	460.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1139)
17	New	2,622,830	4,503,832	540.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1140)
18	New	2,624,346	4,504,187	570.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1141)
19	New	2,623,817	4,503,857	590.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1142)
20	New	2,623,352	4,503,478	510.0	Suzlon S97 2100 97.0 !O! hub: 100.0 m (1143)

Non-default WAsP parameters:

WAsP parameter	Minimum	Maximum	Default	Current value
No. of standard roughnesses for atlas file	2.0000	5.0000	4.0000	5.0000
Std. roughness #5	0.0000	2.0000	1.0000	2.0000
Offset heatflux over land	-200.0000	200.0000	-40.0000	0.0000

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Loss&Uncertainty - Main result

Calculation: PARK - 20 x S97 @ 100m HH

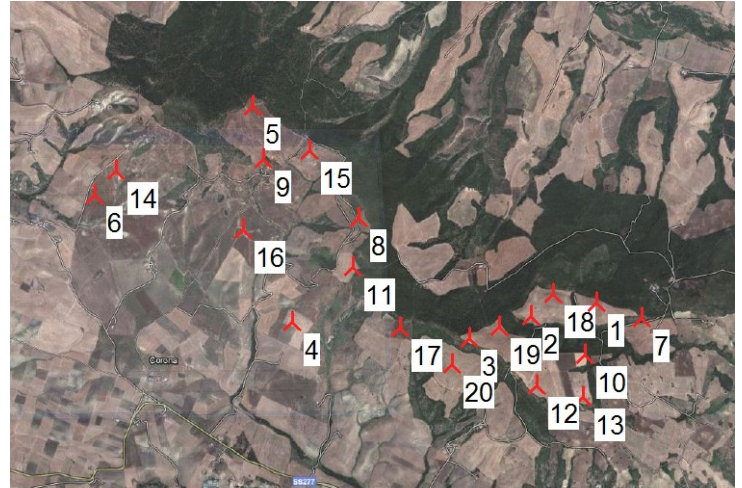
Main data for PARK

PARK calculation 2.7.486: 111003 20 x S97 @ 100m HH

Count 20
 Rated power 42.0 MW
 Mean wind speed 8.1 m/s at hub height
 Sensitivity 1.4 %AEP / %Mean Wind Speed
 Expected lifetime 20 Years

RESULTS

	P50	P84	P90
NET AEP [GWh/y]	165.8	122.4	109.9
Capacity factor [%]	45.1	33.3	29.9
Full load hours [h/y]	3,948	2,915	2,616

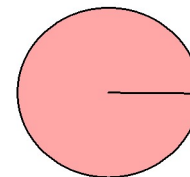


Scale: 75,000

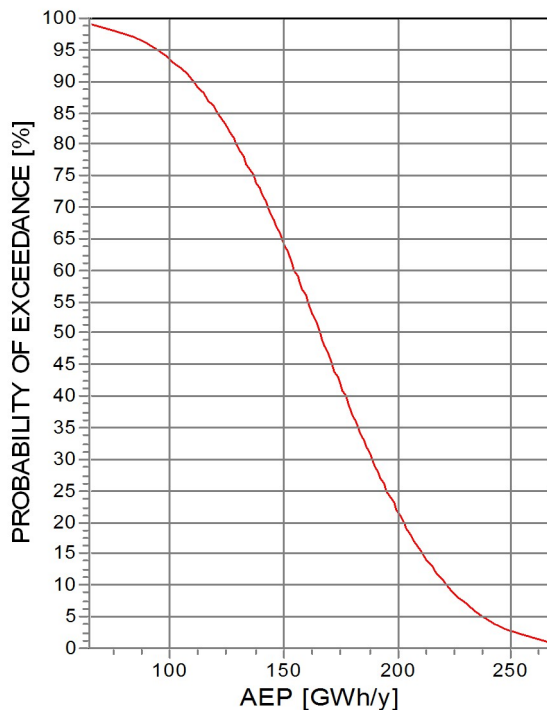
Result details

	P50	Uncertainty
GROSS AEP *)	174.1 GWh/y	26.3 %
Bias correction	0.0 GWh/y 0.0 %	0.0 %
Loss correction	-8.3 GWh/y -4.8 %	0.0 %
Wake loss		-4.8 %
Other losses		0.0 %
NET AEP	165.8 GWh/y	26.3 %

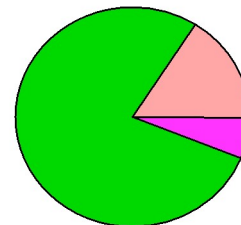
Loss: 4.8 %



1. Wake effects	4.8 %
2. Availability	0.0 %
3. Turbine performance	0.0 %
4. Electrical	0.0 %
5. Environmental	0.0 %
6. Curtailment	0.0 %
7. Other	0.0 %



Uncertainty: 26.3 %



A. Wind data	5.4 %
B. Wind model	25.7 %
C. Power conversion	2.0 %
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