

Project:

Exam_16.01

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Hochschule Flensburg, University of Applied Sciences
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Calculated:

1/16/2025 5:45 PM/4.0.547

PARK - Main Result

Calculation: AEP_Vestas_Noice_Plus_Bats_01

Setup

AEP scaled to a full year based on number of samples
Scaling factor from 31.0 years to 1 year: 0.032

Calculation performed in UTM (north)-WGS84 Zone: 32

At the site centre the difference between grid north and true north is: 0.6°

Wake

Wake Model: N.O. Jensen (RISO/EMD) Park 2 2018

Wake decay constant

Wake decay constant: 0.085 Mixed farmland Hub height dependent

Reference WTG: 01_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (1)

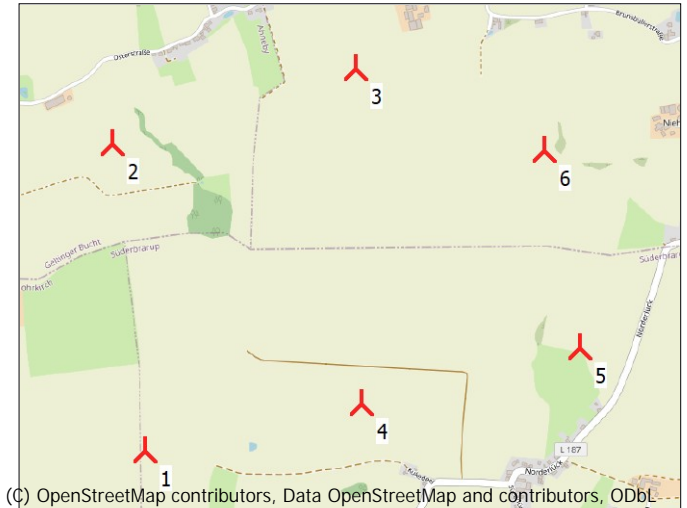
Scaler/wind data

Name EMD Default Measurement Mast Scaler
 Terrain scaling Measured Data Scaling (WASP Stability / A-Parameter)
 Micro terrain flow model WASP IBZ from Site Data
 Used period 1/1/1994 1:00:00 AM - 1/1/2025
 Meteo object(s) MCP LT - MCP session (1) - [Neural Network] (3), 125.00m - MCP LT - MCP session (1) - [Neural Network]
 Displacement height Omnidirectional from objects
 WASP version WASP 11 Version 11.04.0026

Power correction

Power curve correction (adjusted IEC method, improved to match turbine control)

	Min	Max	Avg	Corr.	Neg. corr.	Pos. corr.
				[%]	[%]	[%]
Air density						
From air density settings	[°C]	7.6	7.6	7.6		
From air density settings	[hPa]	990.7	990.7	990.7		
Resulting air density	[kg/m³]	1.229	1.229	1.229		
Relative to 15°C at sea level	[%]	100.4	100.4	100.4	0.2	0.0



Calculated Annual Energy for Wind Farm

WTG combination	Result PARK	Result-10.0%	GROSS (no loss) Free WTGs	Curtailment loss	Wake loss	Specific results ^{a)}		Full load hours	Wind speed	
						Capacity factor	Mean WTG result		free	wake reduced
	[MWh/y]	[MWh/y]	[MWh/y]	[%]	[%]	[%]	[MWh/y]	[Hours/year]	[m/s]	[m/s]
Wind farm	75,119.4	67,607.4	103,387.3	23.6	3.7	28.6	11,267.9	2,504	7.0	6.9

^{a)} Based on Result-10.0%

Calculated Annual Energy for each of 6 new WTGs with total 27.0 MW rated power

WTG type		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve		Annual Energy		Curtailment loss [%]	Wake loss [%]	Wind speed		
								Creator	Name	Result	Result-10.0%			free	reduced	
1	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	[MWh/y]	[MWh/y]						
2	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	16,921.4	15,229	0.4	1.6	7.01	6.96		
3	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	10,720.4	9,648	35.4	2.6	7.02	6.93		
4	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	10,344.5	9,310	35.3	4.4	6.99	6.84		
5	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	10,455.9	9,410	34.8	4.3	6.99	6.84		
6	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	16,445.0	14,801	0.5	3.6	6.98	6.86		
6	Yes	VESTAS	V150-4.5-4,500	4,500	150.0	125.0	USER	Level 0 - Calculated - PO4-OS & PO4 - 12-2021	10,232.1	9,209	35.3	5.8	7.04	6.84		

More power curves may be used due to curtailment. Please view Curtailment assumptions report.

WTG siting

	UTM (north)-ETRS89 Zone: 32				Z	Row data/Description	Calculation period	
	Easting	Northing					Start	End
					[m]			
1 New	547,816	6,060,703	60.0	01_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (1)			1/1/1994	1/1/2025
2 New	547,696	6,061,714	60.0	02_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (7)			1/1/1994	1/1/2025
3 New	548,500	6,061,972	60.0	03_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (8)			1/1/1994	1/1/2025
4 New	548,532	6,060,864	60.0	04_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (9)			1/1/1994	1/1/2025
5 New	549,254	6,061,058	60.0	05_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (10)			1/1/1994	1/1/2025
6 New	549,128	6,061,708	60.0	06_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (11)			1/1/1994	1/1/2025

PARK - Production Analysis

Calculation: AEP_Vestas_Noise_Plus_Bats_01 WTG: All new WTGs, Air density 1.229 kg/m³

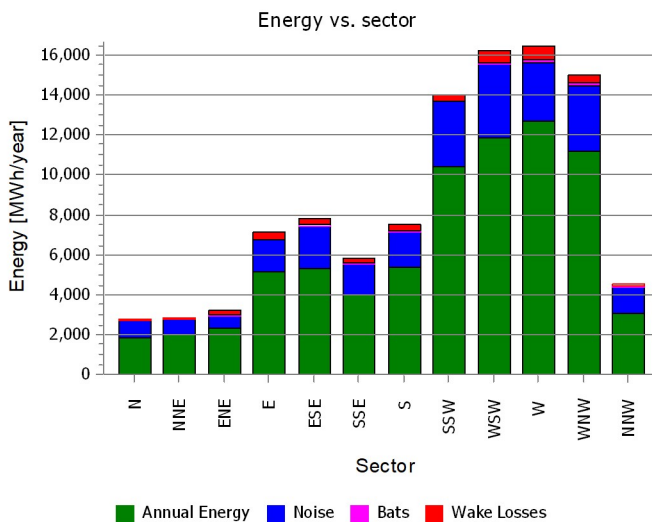
Directional Analysis

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
Gross	[MWh]	2,790.7	2,830.7	3,186.8	7,143.1	7,831.3	5,797.2	7,538.9	14,040.7	16,209.6	16,464.9	15,035.0	4,518.4	103,387.3
-Decrease due to curtailments	[MWh]	810.7	731.1	652.2	1,647.5	2,254.0	1,611.3	1,839.0	3,343.8	3,750.0	3,071.8	3,401.4	1,326.5	24,439.3
Noise	[MWh]	789.0	707.2	606.9	1,577.9	2,184.9	1,573.8	1,806.2	3,294.8	3,671.3	2,922.0	3,267.7	1,275.9	23,677.8
Bats	[MWh]	21.7	23.8	45.2	69.6	69.1	37.5	32.8	49.0	78.6	149.8	133.8	50.6	761.5
-Decrease due to wake losses	[MWh]	113.6	72.3	205.2	365.7	306.4	220.0	371.5	298.7	605.1	718.9	444.8	106.6	3,828.7
Resulting energy	[MWh]	1,866.3	2,027.4	2,329.5	5,129.8	5,270.9	3,966.0	5,328.4	10,398.2	11,854.6	12,674.2	11,188.7	3,085.3	75,119.4
Specific energy	[kWh/m ²]													708
Specific energy	[kWh/kW]													2,782
-Decrease due to curtailments	[%]	29.1	25.8	20.5	23.1	28.8	27.8	24.4	23.8	23.1	18.7	22.6	29.4	23.6
Noise	[%]	28.3	25.0	19.0	22.1	27.9	27.1	24.0	23.5	22.6	17.7	21.7	28.2	22.9
Bats	[%]	0.8	0.8	1.4	1.0	0.9	0.6	0.4	0.3	0.5	0.9	0.9	1.1	0.7
Decrease due to wake losses	[%]	4.1	2.6	6.4	5.1	3.9	3.8	4.9	2.1	3.7	4.4	3.0	2.4	3.70
Full Load Equivalent	[Hours/year]	69	75	86	190	195	147	197	385	439	469	414	114	2,782

Note:

- A turbines' curtailment losses are calculated based on the wake-reduced wind speed.

- The wake reduced wind speed includes curtailment of up-wind WTGs.



PARK - Power Curve Analysis

Calculation: AEP_Vestas_Noice_Plus_Bats_01 WTG: 1 - VESTAS V150-4.5 4500 150.0 !O!, Hub height: 125.0 m

Name: Level 0 - Calculated - PO4-OS & PO4 - 12-2021

Source: Manufacturer

Source/Date	Created by	Created	Edited	Stop wind speed [m/s]	Power control	CT curve type	Generator type	Specific power kW/m ²
12/3/2021	USER	8/30/2022	8/30/2022	24.5	Pitch	User defined	Variable	0.25

Based on Document no.: 0067-7057.V04.

HP curve comparison - Note: For standard air density

Vmean

HP value Pitch, variable speed (2013)

VESTAS V150-4.5 4500 150.0 !O! Level 0 - Calculated - PO4-OS & PO4 - 12-2021

Check value

[m/s]	5	6	7	8	9	10
[MWh]	8,677	12,863	16,760	20,128	22,908	25,089
[MWh]	8,804	12,992	16,852	20,105	22,641	24,450
[%]	-1	-1	-1	0	1	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/m²) 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 the windPRO manual.

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

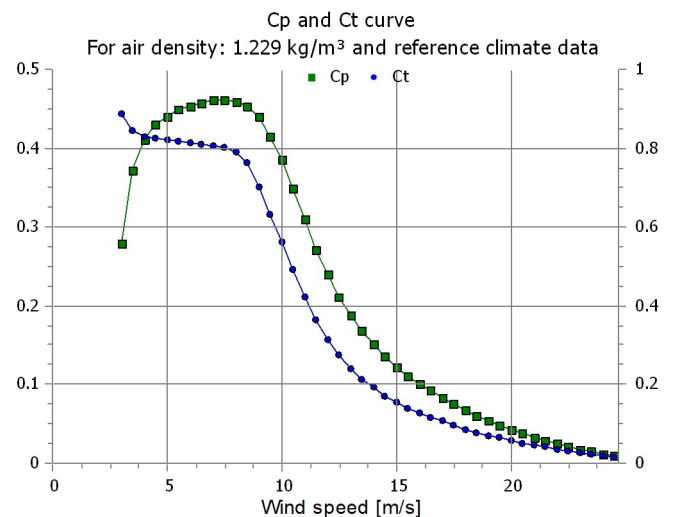
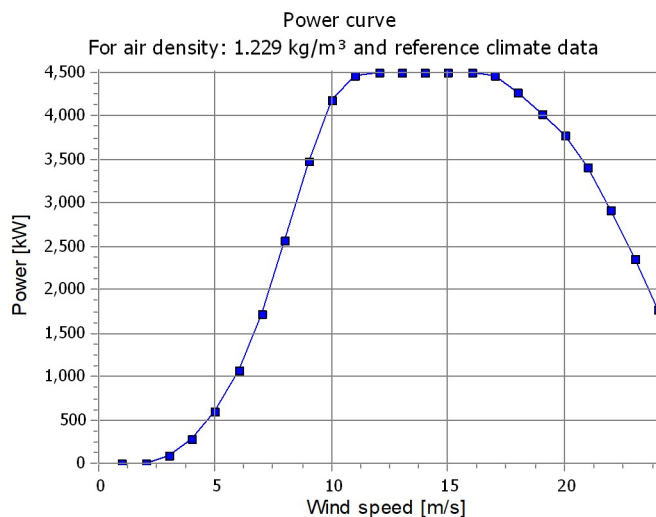
Original data, Air density: 1.225 kg/m³

Wind speed [m/s]	Power [kW]	Cp	Wind speed [m/s]	Ct curve
3.0	81.0	0.28	3.0	0.89
3.5	172.0	0.37	3.5	0.85
4.0	285.0	0.41	4.0	0.83
4.5	424.0	0.43	4.5	0.83
5.0	596.0	0.44	5.0	0.82
5.5	808.0	0.45	5.5	0.82
6.0	1,061.0	0.45	6.0	0.81
6.5	1,360.0	0.46	6.5	0.81
7.0	1,710.0	0.46	7.0	0.81
7.5	2,106.0	0.46	7.5	0.80
8.0	2,549.0	0.46	8.0	0.79
8.5	3,021.0	0.45	8.5	0.76
9.0	3,471.0	0.44	9.0	0.70
9.5	3,861.0	0.42	9.5	0.63
10.0	4,180.0	0.39	10.0	0.56
10.5	4,372.0	0.35	10.5	0.49
11.0	4,470.0	0.31	11.0	0.42
11.5	4,494.0	0.27	11.5	0.36
12.0	4,500.0	0.24	12.0	0.31
12.5	4,500.0	0.21	12.5	0.27
13.0	4,500.0	0.19	13.0	0.24
13.5	4,500.0	0.17	13.5	0.22
14.0	4,500.0	0.15	14.0	0.19
14.5	4,500.0	0.14	14.5	0.17
15.0	4,500.0	0.12	15.0	0.16
15.5	4,500.0	0.11	15.5	0.14
16.0	4,500.0	0.10	16.0	0.13
16.5	4,498.0	0.09	16.5	0.12
17.0	4,473.0	0.08	17.0	0.11
17.5	4,394.0	0.08	17.5	0.10
18.0	4,268.0	0.07	18.0	0.09
18.5	4,139.0	0.06	18.5	0.08
19.0	4,031.0	0.05	19.0	0.07
19.5	3,909.0	0.05	19.5	0.06
20.0	3,771.0	0.04	20.0	0.06
20.5	3,607.0	0.04	20.5	0.05
21.0	3,408.0	0.03	21.0	0.05
21.5	3,180.0	0.03	21.5	0.04
22.0	2,917.0	0.03	22.0	0.04
22.5	2,645.0	0.02	22.5	0.03
23.0	2,363.0	0.02	23.0	0.03
23.5	2,070.0	0.01	23.5	0.02
24.0	1,782.0	0.01	24.0	0.02
24.5	1,561.0	0.01	24.5	0.02

Power and efficiency vs. wind speed

Data used in calculation, Mean air density: 1.229 kg/m³

Wind speed [m/s]	Power [kW]	Cp
1.0	0.0	0.00
2.0	0.0	0.00
3.0	81.6	0.28
4.0	286.3	0.41
5.0	598.5	0.44
6.0	1,065.2	0.45
7.0	1,716.5	0.46
8.0	2,557.8	0.46
9.0	3,479.6	0.44
10.0	4,185.1	0.39
11.0	4,470.6	0.31
12.0	4,500.0	0.24
13.0	4,500.0	0.19
14.0	4,500.0	0.15
15.0	4,500.0	0.12
16.0	4,499.9	0.10
17.0	4,473.0	0.08
18.0	4,268.0	0.07
19.0	4,031.0	0.05
20.0	3,771.0	0.04
21.0	3,408.0	0.03
22.0	2,917.0	0.03
23.0	2,363.0	0.02
24.0	1,782.0	0.01

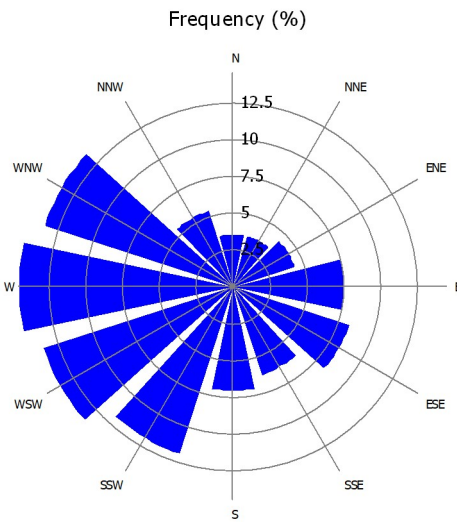
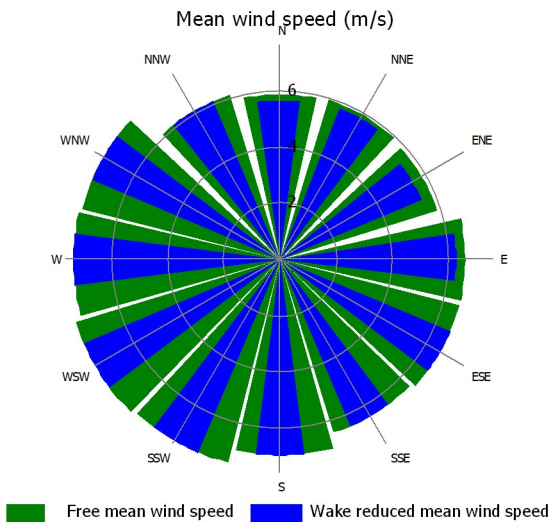
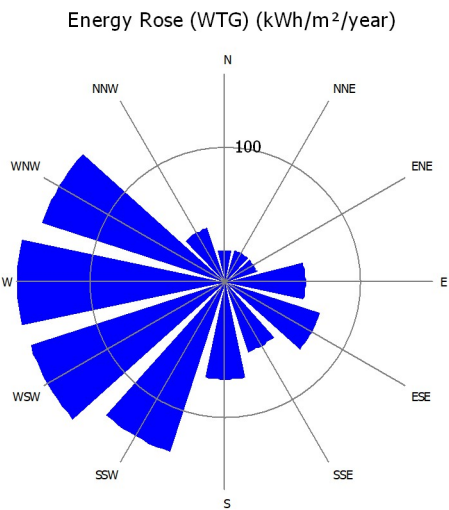
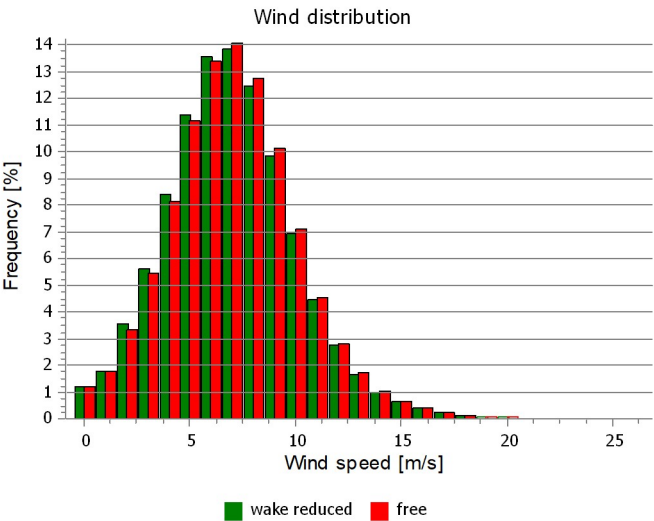


PARK - Wind Data Analysis

Calculation: AEP_Vestas_Noice_Plus_Bats_01 Wind data: 1 - 01_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (1); Hub height: 125.0
Site coordinates
UTM (north)-ETRS89 Zone: 32
East: 547,816 North: 6,060,703
01_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (1)
Masts used
Take nearest

Winddata for site

Sector	Free mean wind speed [m/s]	Wake reduced mean wind speed [m/s]	Frequency [%]	
0 N	5.9	5.7	3.6	
1 NNE	6.0	5.8	3.6	
2 ENE	5.9	5.5	4.4	
3 E	6.7	6.3	7.5	
4 ESE	6.6	6.6	8.3	
5 SSE	6.5	6.5	6.3	
6 S	7.0	7.0	7.1	
7 SSW	7.5	7.5	12.0	
8 WSW	7.7	7.7	13.6	
9 W	7.4	7.4	14.6	
10 WNW	7.3	7.3	13.5	
11 NNW	6.2	6.2	5.5	
All	7.0	7.0	100.0	

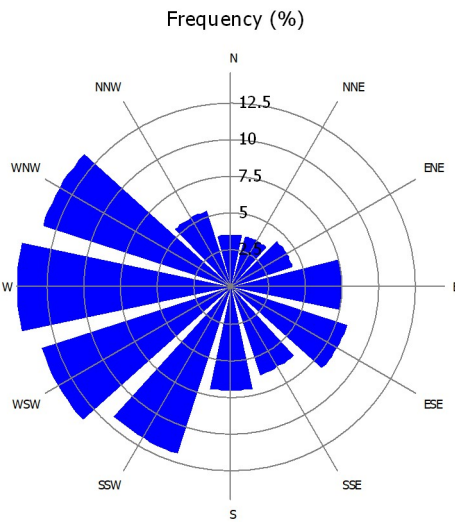
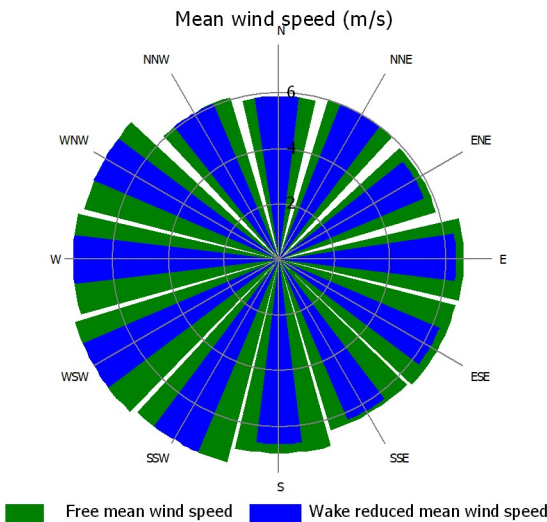
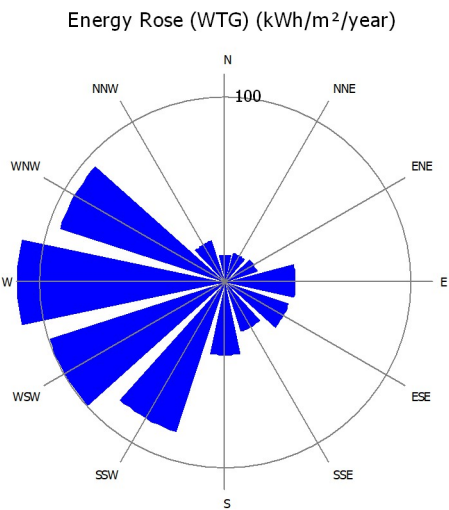
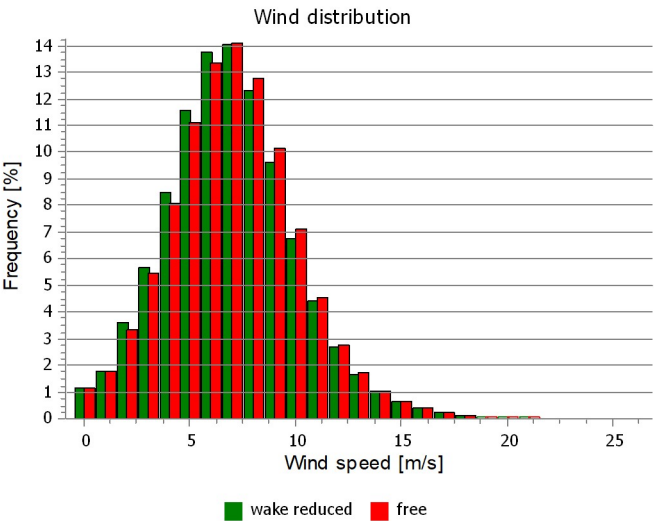


PARK - Wind Data Analysis

Calculation: AEP_Vestas_Noice_Plus_Bats_01 Wind data: 2 - 02_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (7); Hub height: 125.0
Site coordinates
UTM (north)-ETRS89 Zone: 32
East: 547,696 North: 6,061,714
02_VESTAS V150-4.5 4500 150.0 !O! hub: 125.0 m (TOT: 200.0 m) (7)
Masts used
Take nearest

Winddata for site

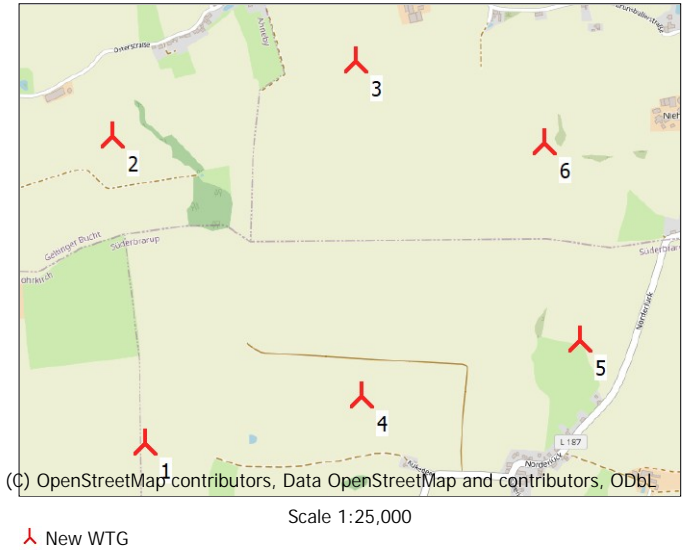
Sector	Free mean wind speed [m/s]	Wake reduced mean wind speed [m/s]	Frequency [%]
0 N	5.9	5.9	3.6
1 NNE	6.0	6.0	3.6
2 ENE	6.0	5.7	4.4
3 E	6.7	6.4	7.5
4 ESE	6.6	6.3	8.3
5 SSE	6.5	6.3	6.3
6 S	7.0	6.7	7.1
7 SSW	7.6	7.6	12.0
8 WSW	7.7	7.7	13.6
9 W	7.5	7.5	14.6
10 WNW	7.3	7.3	13.5
11 NNW	6.1	6.1	5.5
All	7.0	6.9	100.0



PARK - WTG distances

Calculation: AEP_Vestas_Noice_Plus_Bats_01
WTG distances

	Z	Nearest WTG	Z	Horizontal distance	Distance in rotor diameters
	[m]		[m]	[m]	
1	60.0	4	60.0	734	4.9
2	60.0	3	60.0	844	5.6
3	60.0	6	60.0	681	4.5
4	60.0	1	60.0	734	4.9
5	60.0	6	60.0	662	4.4
6	60.0	5	60.0	662	4.4
Min	60.0		60.0	662	4.4
Max	60.0		60.0	844	5.6



PARK - Time varying AEP

Calculation: AEP_Vestas_Noice_Plus_Bats_01

Windfarm: 27.0 MW based on 6 turbines of type VESTAS V150-4.5 4500 150.0 !O!.

Selection: All new WTGs

Calculated mean yield per month and hour [MWh]. The result includes wake losses and any curtailment losses.

Values are scaled to a full year, see correction factors at main result page.

Hour/Month [MWh]	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
0	162	145	143	119	115	106	102	102	117	143	144	154	1,552
1	160	144	143	118	111	102	97	103	113	136	145	152	1,525
2	159	143	142	118	109	101	99	101	113	136	144	156	1,522
3	158	143	138	114	111	98	99	100	111	137	144	151	1,506
4	162	144	140	116	110	99	98	99	113	136	142	152	1,511
5	159	145	173	314	308	278	272	266	314	353	137	153	2,872
6	458	409	393	308	291	260	255	269	309	396	390	437	4,176
7	447	403	389	294	261	252	241	238	291	383	385	428	4,013
8	444	397	360	253	251	238	234	223	278	369	370	416	3,833
9	427	383	348	252	232	238	237	218	256	345	355	408	3,698
10	427	368	347	255	236	242	239	231	281	341	355	399	3,722
11	415	359	348	258	241	239	233	227	267	335	329	388	3,638
12	406	372	354	273	262	262	255	248	291	350	354	392	3,822
13	418	384	374	294	277	280	267	263	311	368	353	395	3,984
14	419	383	389	305	291	296	283	278	301	371	366	395	4,078
15	425	394	393	306	296	296	281	268	314	373	354	397	4,097
16	421	379	378	304	289	282	267	267	302	362	363	397	4,011
17	424	372	369	294	284	275	260	258	283	353	367	407	3,946
18	424	378	375	273	271	258	252	235	252	360	372	412	3,860
19	445	390	385	268	260	253	239	212	270	385	383	409	3,899
20	447	400	402	300	270	213	213	218	298	389	388	423	3,959
21	454	412	386	114	102	86	82	92	113	176	403	422	2,842
22	157	144	146	119	112	98	95	98	113	146	143	151	1,522
23	157	142	143	119	112	101	98	102	121	145	141	150	1,531
Grand Total	8,174	7,335	7,160	5,487	5,202	4,951	4,797	4,715	5,533	6,991	7,027	7,746	75,119

Hour/Month [MW]	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
0	5.2	5.2	4.6	4.0	3.7	3.5	3.3	3.3	3.9	4.6	4.8	5.0	4.3
1	5.1	5.2	4.6	3.9	3.6	3.4	3.1	3.3	3.8	4.4	4.8	4.9	4.2
2	5.1	5.1	4.6	3.9	3.5	3.4	3.2	3.3	3.8	4.4	4.8	5.0	4.2
3	5.1	5.1	4.5	3.8	3.6	3.3	3.2	3.2	3.7	4.4	4.8	4.9	4.1
4	5.2	5.1	4.5	3.9	3.5	3.3	3.2	3.2	3.8	4.4	4.7	4.9	4.1
5	5.1	5.2	5.6	10.5	9.9	9.3	8.8	8.6	10.5	11.4	4.6	4.9	7.9
6	14.8	14.6	12.7	10.3	9.4	8.7	8.2	8.7	10.3	12.8	13.0	14.1	11.4
7	14.4	14.4	12.6	9.8	8.4	8.4	7.8	7.7	9.7	12.3	12.8	13.8	11.0
8	14.3	14.2	11.6	8.4	8.1	7.9	7.5	7.2	9.3	11.9	12.3	13.4	10.5
9	13.8	13.7	11.2	8.4	7.5	7.9	7.6	7.0	8.5	11.1	11.8	13.2	10.1
10	13.8	13.1	11.2	8.5	7.6	8.1	7.7	7.5	9.4	11.0	11.8	12.9	10.2
11	13.4	12.8	11.2	8.6	7.8	8.0	7.5	7.3	8.9	10.8	11.0	12.5	10.0
12	13.1	13.3	11.4	9.1	8.5	8.7	8.2	8.0	9.7	11.3	11.8	12.7	10.5
13	13.5	13.7	12.1	9.8	8.9	9.3	8.6	8.5	10.4	11.9	11.8	12.7	10.9
14	13.5	13.7	12.5	10.2	9.4	9.9	9.1	9.0	10.0	12.0	12.2	12.7	11.2
15	13.7	14.1	12.7	10.2	9.6	9.9	9.1	8.6	10.5	12.0	11.8	12.8	11.2
16	13.6	13.5	12.2	10.1	9.3	9.4	8.6	8.6	10.1	11.7	12.1	12.8	11.0
17	13.7	13.3	11.9	9.8	9.2	9.2	8.4	8.3	9.4	11.4	12.2	13.1	10.8
18	13.7	13.5	12.1	9.1	8.7	8.6	8.1	7.6	8.4	11.6	12.4	13.3	10.6
19	14.4	13.9	12.4	8.9	8.4	8.4	7.7	6.8	9.0	12.4	12.8	13.2	10.7
20	14.4	14.3	13.0	10.0	8.7	7.1	6.9	7.0	9.9	12.6	12.9	13.7	10.8
21	14.6	14.7	12.4	3.8	3.3	2.9	2.7	3.0	3.8	5.7	13.4	13.6	7.8
22	5.1	5.1	4.7	4.0	3.6	3.3	3.1	3.2	3.8	4.7	4.8	4.9	4.2
23	5.1	5.1	4.6	4.0	3.6	3.4	3.2	3.3	4.0	4.7	4.7	4.8	4.2
Grand Total	11.0	10.9	9.6	7.6	7.0	6.9	6.4	6.3	7.7	9.4	9.8	10.4	8.6

PARK - Time varying AEP

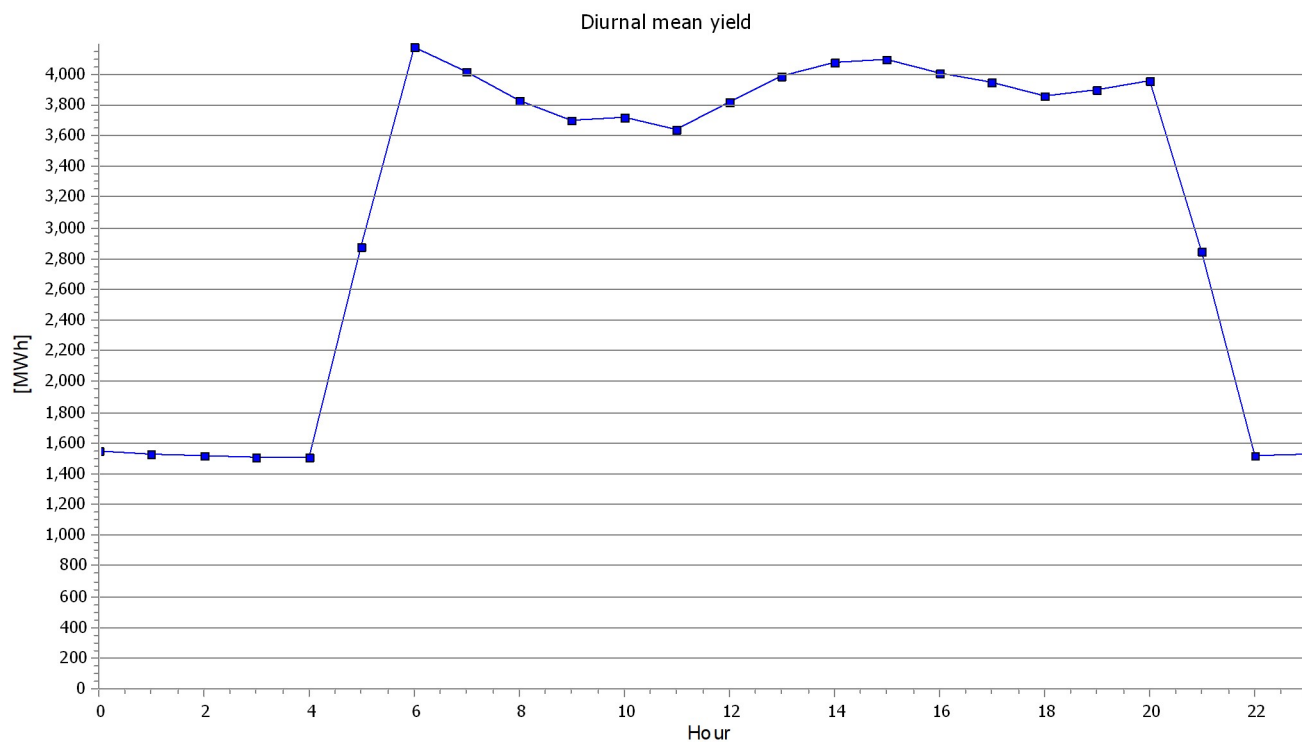
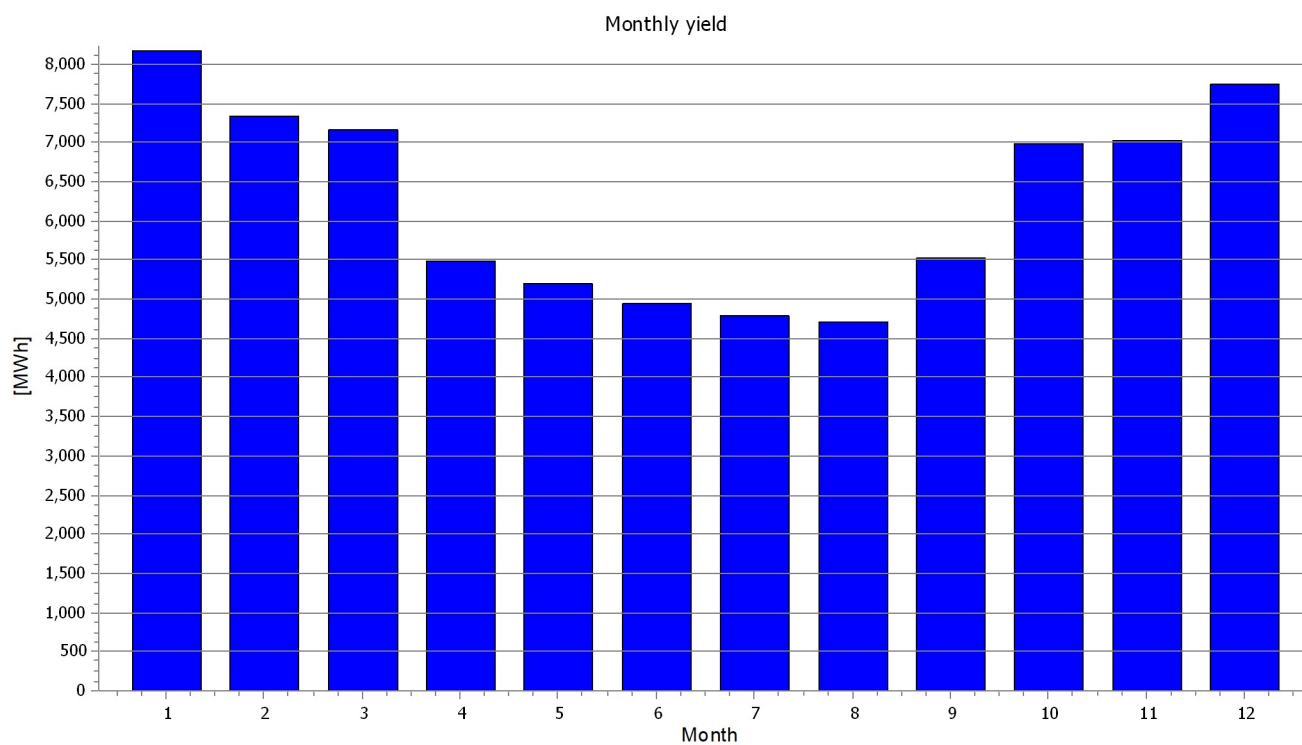
Calculation: AEP_Vestas_Noice_Plus_Bats_01

Windfarm: 27.0 MW based on 6 turbines of type VESTAS V150-4.5 4500 150.0 !O!.

Selection: All new WTGs

Calculated mean yield per month and hour [MWh]. The result includes wake losses and any curtailment losses.

Values are scaled to a full year, see correction factors at main result page.



PARK - Time varying AEP

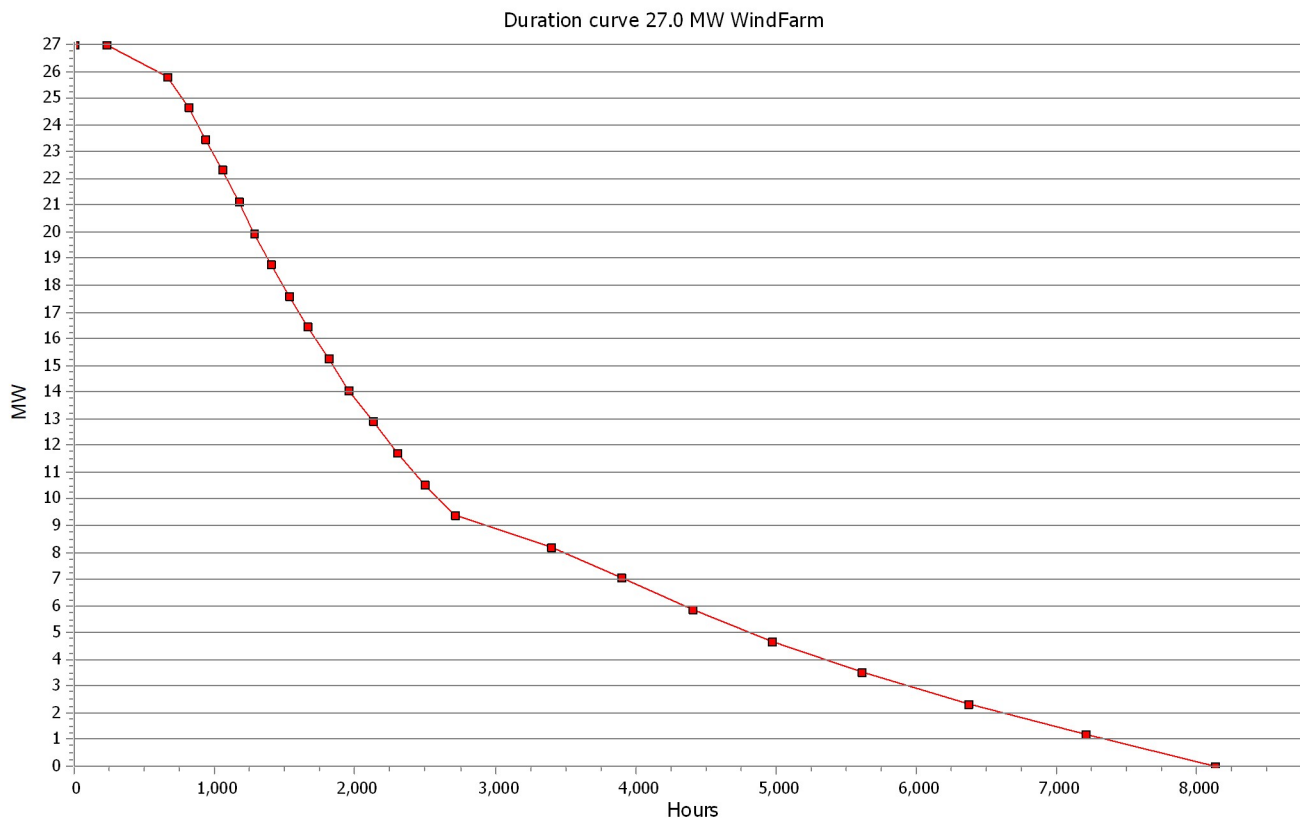
Calculation: AEP_Vestas_Noice_Plus_Bats_01

Windfarm: 27.0 MW based on 6 turbines of type VESTAS V150-4.5 4500 150.0 !O!.

Selection: All new WTGs

Calculated mean yield per month and hour [MWh]. The result includes wake losses and any curtailment losses.

Hours	Hours [%]	Hours accumulated	Power [MW]	Power (MW/WTG)
228	2.6	228	27.0	4.5
434	5.0	663	25.8 - 27.0	4.3 - 4.5
152	1.7	815	24.7 - 25.8	4.1 - 4.3
120	1.4	935	23.5 - 24.7	3.9 - 4.1
120	1.4	1055	22.3 - 23.5	3.7 - 3.9
117	1.3	1171	21.1 - 22.3	3.5 - 3.7
113	1.3	1285	20.0 - 21.1	3.3 - 3.5
119	1.4	1404	18.8 - 20.0	3.1 - 3.3
125	1.4	1529	17.6 - 18.8	2.9 - 3.1
136	1.5	1665	16.4 - 17.6	2.7 - 2.9
142	1.6	1807	15.3 - 16.4	2.5 - 2.7
149	1.7	1956	14.1 - 15.3	2.3 - 2.5
166	1.9	2122	12.9 - 14.1	2.2 - 2.3
180	2.1	2302	11.7 - 12.9	2.0 - 2.2
195	2.2	2498	10.6 - 11.7	1.8 - 2.0
213	2.4	2711	9.4 - 10.6	1.6 - 1.8
684	7.8	3395	8.2 - 9.4	1.4 - 1.6
498	5.7	3893	7.0 - 8.2	1.2 - 1.4
511	5.8	4404	5.9 - 7.0	1.0 - 1.2
562	6.4	4966	4.7 - 5.9	0.8 - 1.0
648	7.4	5614	3.5 - 4.7	0.6 - 0.8
752	8.6	6366	2.3 - 3.5	0.4 - 0.6
839	9.6	7205	1.2 - 2.3	0.2 - 0.4
923	10.5	8128	0.0 - 1.2	0.0 - 0.2
638	7.3	8766	0.0	0.0



Project:

Exam_16.01

Licensed user:

Hochschule Flensburg, University of Applied Sciences
Darf nur für Zwecke der Lehre verwendet werden

--

student / weti-lab-vt10@hs-flensburg.de

Calculated:

1/16/2025 5:45 PM/4.0.547

PARK - Scaling info

Calculation: AEP_Vestas_Noice_Plus_Bats_01

Scaler settings

Name	EMD Default Measurement Mast Scaler
Terrain scaling	Measured Data Scaling (WASP Stability / A-Parameter)
RIX correction	No RIX correction
Displacement height	from objects
Micro terrain flow model	Site data: RESGEN (5)

Site Data: Site data: RESGEN (5)

Obstacles:

All obstacles used

Roughness:

Terrain data files used in calculation:

C:\Users\student\Desktop\Exam_16_01_2025\Windpro_exam_16.01\ROUGHNESSLINE_ONLINEDATA_0.wpo

Min X: 518,359, Max X: 578,403, Min Y: 6,030,681, Max Y: 6,091,978, Width: 60,044 m, Height: 61,297 m

Orography:

Terrain data files used in calculation:

C:\Users\student\Desktop\Exam_16_01_2025\Windpro_exam_16.01\CONTOURLINE_ONLINEDATA_0.wpo

Min X: 538,612, Max X: 558,177, Min Y: 6,051,218, Max Y: 6,071,644, Width: 19,565 m, Height: 20,426 m

Post calibration

Overall factor	1.0000
Overall offset	0.0000
By sector	No
By month	No
By hour	No
By wind speed	No

PARK - Curtailment assumptions

Calculation: AEP_Vestas_Noise_Plus_Bats_01

Curtailment signals

Signal Signal source

Mean wind speed Scaler

WTG Curtailments

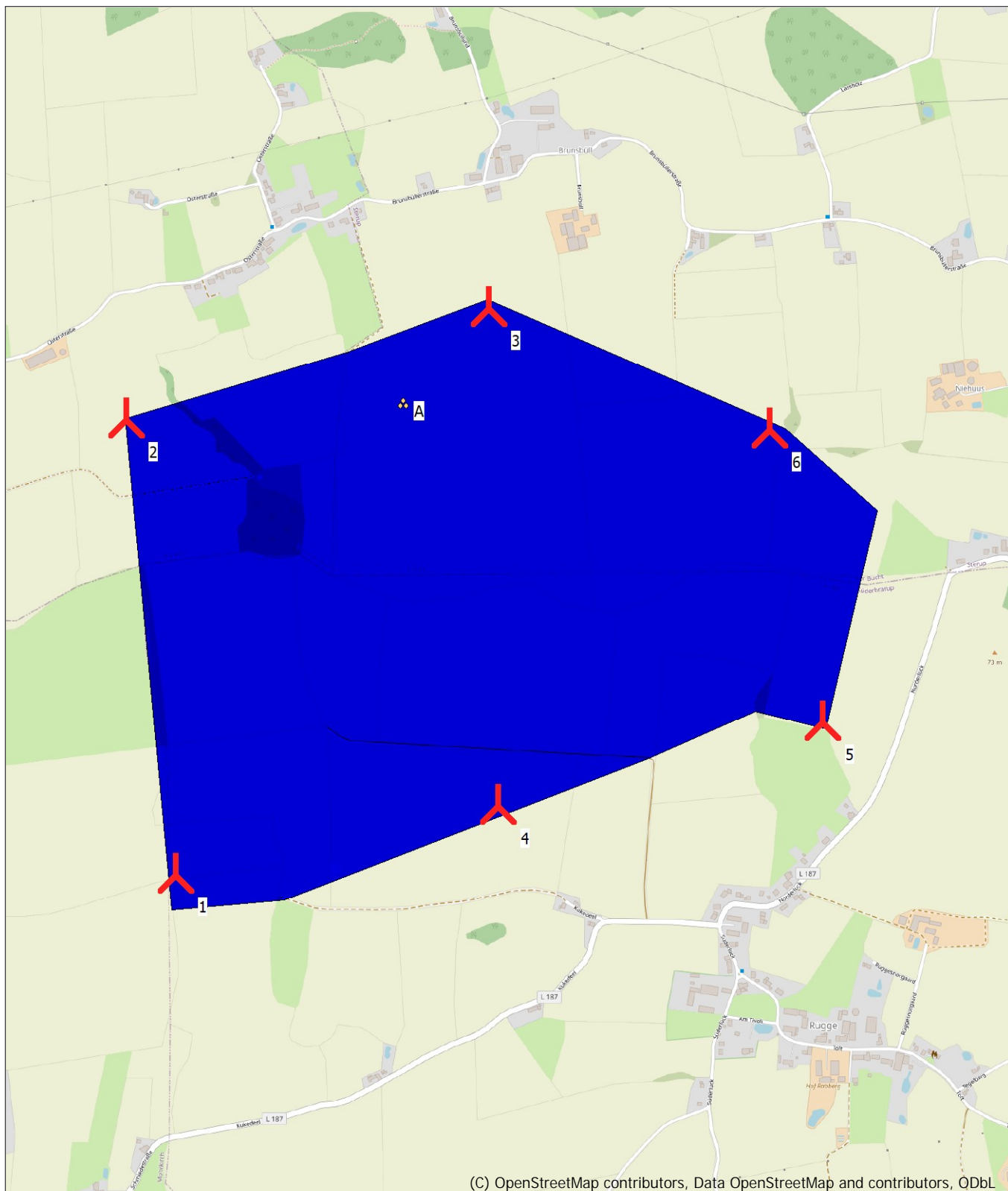
WTG Name	Index	Priority	Type	Action	Conditions	Times fully applied	Time partially applied	Times skipped
1 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunset], WS [0;6]	6521	0	0
2 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunset], WS [0;6]	6667	0	0
2 Noise	2	2	Noise	Shut down	Date [1/1;12/31], Time [10:00 PM;6:00 AM]	86750	0	0
3 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunset], WS [0;6]	6847	0	0
3 Noise	2	2	Noise	Shut down	Date [1/1;12/31], Time [10:00 PM;6:00 AM]	86712	0	0
4 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunset], WS [0;6]	6955	0	0
4 Noise	2	2	Noise	Shut down	Date [1/1;12/31], Time [10:00 PM;6:00 AM]	86498	0	0
5 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunset], WS [0;6]	6714	0	0
6 Bats	1	1	Bats	Shut down	Date [4/1;9/30], SunRiseSet [1:00h before sunset;1:00h after sunrise], WS [0;6]	25934	0	0
6 Noise	2	2	Noise	Shut down	Date [1/1;12/31], Time [10:00 PM;6:00 AM]	71280	0	0

WTG curtailments using wind speeds interacts with the wake losses.

Multiple curtailment rules may have been sequentially applied in each time step

PARK - Map

Calculation: AEP_Vestas_Noice_Plus_Bats_01



0 250 500 750 1000m

Map: EMD OpenStreetMap , Print scale 1:12,500, Map center UTM (north)-ETRS89 Zone: 32 East: 548,534 North: 6,061,313
 New WTG WTG area