

Project:

5969 Letter WF Shadow Flicker

Description:

4 Turbine Wind Farm, Letter, Drumkeeran, Co. Leitrim

Licensed user:

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Calculated:

11/07/2023 16:59/3.6.361

SHADOW - Main Result

Calculation: Scenario 1- Worst Case

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) [CLONES]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.45	1.93	2.72	4.31	5.45	4.41	4.74	3.96	3.48	2.54	1.71	1.01

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
92	147	184	348	228	220	1,047	1,157	643	563	808	864

W	WNW	NW	NNW	Sum
457	746	855	401	8,760

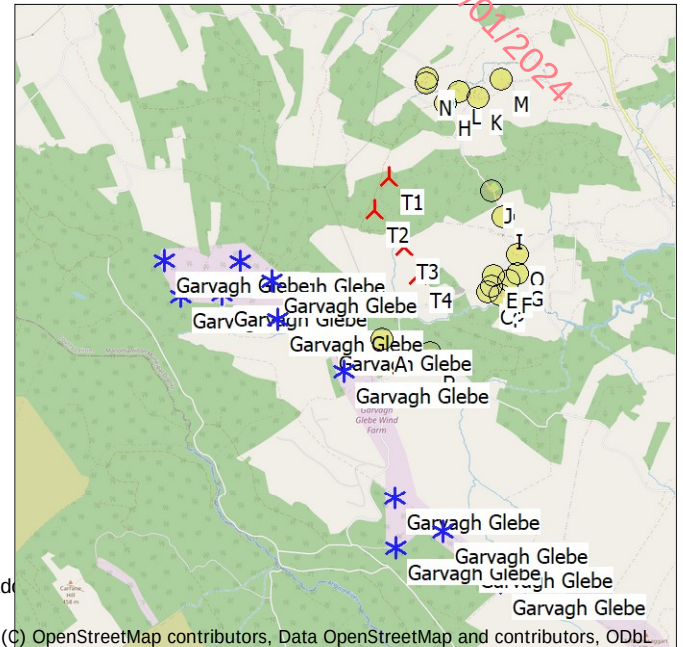
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_5969 Letter WF Shadow

Receptor grid resolution: 1.0 m

All coordinates are in

Irish ITM-IARNET95 (IE), geocentric, GRS80



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:75,000

New WTG

Existing WTG

Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type			Power, rated	Rotor diameter	Hub height	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance	RPM
			[m]				[kW]	[m]		[m]	[m]	[RPM]
1	587,560	824,664	251.7	T1	Yes	VESTAS	V117-4.2-4,200	4,200	117.0	91.5	1,735	13.6
2	587,417	824,333	258.0	T2	Yes	VESTAS	V117-4.2-4,200	4,200	117.0	91.5	1,735	13.6
3	587,716	823,981	245.2	T3	Yes	VESTAS	V117-4.2-4,200	4,200	117.0	91.5	1,735	13.6
4	587,857	823,693	239.5	T4	Yes	VESTAS	V117-4.2-4,200	4,200	117.0	91.5	1,735	13.6
5	587,105	822,747	304.5	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
6	586,940	823,079	299.6	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
7	586,448	823,267	330.8	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
8	585,899	823,514	329.9	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
9	585,481	823,489	315.6	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
10	585,320	823,853	313.7	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
11	586,392	823,646	321.9	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
12	586,079	823,839	316.4	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
13	587,612	821,481	314.1	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
14	588,097	821,147	339.2	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
15	588,343	820,917	353.5	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
16	588,668	820,641	378.3	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5
17	587,615	820,995	315.6	Garvagh Glebe	No	VESTAS	V80-1.8MW -1,800	1,800	80.0	60.0	1,583	15.5

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	H1	587,495	823,063	232.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	587,972	822,926	199.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	588,550	823,532	185.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	588,584	823,583	187.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	588,599	823,681	192.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	588,756	823,642	162.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	588,841	823,710	155.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	588,125	825,399	165.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	588,700	824,266	178.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	588,587	824,530	177.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5

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SHADOW - Main Result

Calculation: Scenario 1- Worst Case

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No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
K H11		588,452	825,457	144.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L H12		588,261	825,511	150.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M H13		588,687	825,627	135.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N H14		587,934	825,595	169.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O H15		587,946	825,648	170.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P H16		588,675	823,501	170.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q H17		588,841	823,893	169.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case		Shadow, expected values	
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A H1		61:51	155	0:50	10:28
B H2		16:36	56	0:30	2:59
C H3		69:18	121	0:44	13:51
D H4		78:31	138	0:47	15:31
E H5		47:38	110	0:37	9:42
F H6		33:21	92	0:30	6:48
G H7		25:45	78	0:28	5:05
H H8		41:04	102	0:33	3:59
I H9		46:01	142	0:27	7:42
J H10		52:51	160	0:27	7:24
K H11		20:42	76	0:25	2:17
L H12		31:18	98	0:30	3:05
M H13		7:18	30	0:19	0:50
N H14		24:36	58	0:30	2:14
O H15		19:12	50	0:27	1:41
P H16		62:54	120	0:44	12:28
Q H17		46:52	155	0:27	8:42

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	107:52	15:12
2	T2	79:52	11:05
3	T3	116:29	21:50
4	T4	119:26	20:46
5	Garvagh Glebe	30:32	4:08
6	Garvagh Glebe	27:19	5:18
7	Garvagh Glebe	7:58	1:33
8	Garvagh Glebe	0:00	0:00
9	Garvagh Glebe	0:00	0:00
10	Garvagh Glebe	0:00	0:00
11	Garvagh Glebe	11:17	2:17
12	Garvagh Glebe	0:00	0:00
13	Garvagh Glebe	0:00	0:00
14	Garvagh Glebe	0:00	0:00
15	Garvagh Glebe	0:00	0:00
16	Garvagh Glebe	0:00	0:00
17	Garvagh Glebe	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.