

Anlage 3
Berechnungsergebnisse Zusatzbelastung

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kisdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Hauptergebnis

Berechnung: Zusatzbelastung

Voraussetzungen für Berechnung des Schattenwurfs

Beschattungsbereich der WEA

Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt

Siehe WEA-Tabelle

Minimale relevante Sonnenhöhe über Horizont 3 °
 Tage zwischen Berechnungen 1 Tag(e)
 Berechnungszeitsprung 1 Minuten
 Die dargestellten Zeiten sind die astronomisch maximal mögliche
 Beschattungsdauer, berechnet unter folgenden Annahmen:
 Die Sonne scheint täglich von Sonnenauf- bis -untergang
 Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
 Die Windenergieanlage/n ist/sind immer in Betrieb

Eine WEA wird nicht berücksichtigt, wenn sie von keinem Teil der
 Rezeptorfläche aus sichtbar ist. Die Sichtbarkeitsberechnung basiert auf
 den folgenden Annahmen:

Verwendete Höhenlinien: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Hindernisse in Berechnung verwendet

Berechnungshöhe ü.Gr. für Karte: 1,5 m

Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:

UTM (north)-ETRS89 Zone: 32

WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ		Typ	Nenn- leistung	Rotor- durch- messer	Naben- höhe	Schattendaten	
					Aktu- ell	Hersteller					Beschatt.- Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
1	606.556	5.991.795	52,4	WEA 1	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
2	607.097	5.991.895	50,0	WEA 2	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
3	606.825	5.991.392	50,0	WEA 3	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
4	607.330	5.991.494	50,0	WEA 4	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
5	606.955	5.990.935	50,0	WEA 5	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
6	607.614	5.991.141	50,0	WEA 6	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
7	607.418	5.990.784	45,2	WEA 7	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
8	608.025	5.990.923	40,7	WEA 8	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
9	607.098	5.990.474	44,3	WEA 9	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
10	607.729	5.990.474	39,9	WEA 10	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
11	607.625	5.989.978	36,8	WEA 11	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
12	607.367	5.989.560	40,0	WEA 12	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
A IO 1	606.679	5.989.510	48,2	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
B IO 2	606.671	5.989.527	47,4	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
C IO 3	606.572	5.989.470	46,8	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
D IO 4	606.279	5.989.776	48,5	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
E IO 5	606.282	5.989.825	49,7	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
F IO 6	606.253	5.989.867	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
G IO 7	606.228	5.990.275	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
H IO 8	606.195	5.990.322	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
I IO 9	606.228	5.990.409	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
J IO 10	606.644	5.992.832	53,8	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
K IO 11	607.772	5.991.929	45,9	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
L IO 12	608.687	5.990.429	26,6	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
M IO 13	608.548	5.990.038	26,7	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
N IO 14	608.243	5.989.995	30,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
O IO 15	608.331	5.989.736	30,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
P IO 16	608.657	5.989.846	23,4	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
Q IO 17	608.349	5.992.356	20,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
R IO 18	608.766	5.992.585	28,5	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0
S IO 19	609.010	5.991.942	20,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"		3,0

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SHADOW - Hauptergebnis

Berechnung: Zusatzbelastung

Berechnungsergebnisse

Schattenrezeptor

astron. max. mögl. Beschattungsdauer

Nr.	Name	Stunden/Jahr	Schattentage/Jahr	Max.Schattendauer/Tag
		[h/a]	[d/a]	[h/d]
A IO 1		89:08	174	0:53
B IO 2		82:19	153	0:52
C IO 3		63:19	144	0:46
D IO 4		38:34	139	0:33
E IO 5		46:23	156	0:33
F IO 6		58:39	170	0:37
G IO 7		95:16	233	0:56
H IO 8		88:58	235	0:48
I IO 9		106:42	249	0:43
J IO 10		15:12	39	0:29
K IO 11		199:16	231	1:30
L IO 12		86:30	213	0:41
M IO 13		109:54	205	1:00
N IO 14		117:15	227	0:59
O IO 15		129:30	160	1:14
P IO 16		63:09	169	0:36
Q IO 17		56:29	143	0:43
R IO 18		13:35	57	0:21
S IO 19		34:41	118	0:28

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal
		[h/a]
1	WEA 1	13:42
2	WEA 2	80:02
3	WEA 3	21:35
4	WEA 4	88:34
5	WEA 5	72:20
6	WEA 6	107:03
7	WEA 7	75:11
8	WEA 8	18:58
9	WEA 9	158:52
10	WEA 10	114:41
11	WEA 11	258:50
12	WEA 12	172:32

Summen in Rezeptortabelle und WEA-Tabelle können sich unterscheiden, da eine WEA gleichzeitig an zwei oder mehr Rezeptoren Beschattung verursachen kann und/oder ein Rezeptor gleichzeitig von zwei oder mehr WEA beschattet werden kann.

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SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni				
1	08:35	08:06	07:08				06:53	07:18 (12)	05:43	07:15 (12)	04:52	05:51 (11)			
	16:02	16:53	17:50				19:49	33	07:51 (12)	20:45	22	07:37 (12)	21:36	28	06:19 (11)
2	08:35	08:04	07:06				06:50		07:16 (12)	05:41		06:09 (11)	04:51		05:52 (11)
	16:04	16:55	17:52				19:51	37	07:53 (12)	20:47	17	07:33 (12)	21:37	26	06:18 (11)
3	08:35	08:02	07:04				06:48		07:14 (12)	05:39		06:07 (11)	04:50		05:52 (11)
	16:05	16:57	17:54				19:53	40	07:54 (12)	20:48	7	06:14 (11)	21:38	26	06:18 (11)
4	08:35	08:01	07:01				06:46		07:11 (12)	05:37		06:05 (11)	04:49		05:53 (11)
	16:06	16:59	17:56				19:54	44	07:55 (12)	20:50	10	06:15 (11)	21:39	25	06:18 (11)
5	08:35	07:59	06:59				06:43		07:10 (12)	05:35		06:03 (11)	04:48		05:54 (11)
	16:07	17:01	17:58				19:56	46	07:56 (12)	20:52	14	06:17 (11)	21:41	23	06:17 (11)
6	08:34	07:57	06:57				06:41		07:08 (12)	05:33		06:01 (11)	04:48		05:54 (11)
	16:08	17:04	18:00				19:58	48	07:56 (12)	20:54	17	06:18 (11)	21:42	22	06:16 (11)
7	08:34	07:55	06:54				06:38		07:08 (12)	05:31		05:59 (11)	04:47		05:56 (11)
	16:10	17:06	18:01				20:00	48	07:56 (12)	20:56	19	06:18 (11)	21:43	21	06:17 (11)
8	08:33	07:53	06:52				06:36		07:06 (12)	05:29		05:57 (11)	04:46		05:56 (11)
	16:11	17:08	18:03				20:02	50	07:56 (12)	20:58	22	06:19 (11)	21:44	20	06:16 (11)
9	08:33	07:51	06:49				06:33		07:06 (12)	05:27		05:56 (11)	04:46		05:57 (11)
	16:13	17:10	18:05				20:04	51	07:57 (12)	20:59	24	06:20 (11)	21:45	19	06:16 (11)
10	08:32	07:49	06:47				06:31		07:05 (12)	05:25		05:54 (11)	04:45		05:57 (11)
	16:14	17:12	18:07				20:06	52	07:57 (12)	21:01	27	06:21 (11)	21:46	18	06:15 (11)
11	08:31	07:47	06:45				06:28		07:04 (12)	05:23		05:52 (11)	04:45		05:59 (11)
	16:15	17:14	18:09				20:08	52	07:56 (12)	21:03	29	06:21 (11)	21:46	15	06:14 (11)
12	08:31	07:46	06:42				06:26		07:04 (12)	05:21		05:51 (11)	04:44		06:00 (11)
	16:17	17:16	18:11				20:09	53	07:57 (12)	21:05	31	06:22 (11)	21:47	14	06:14 (11)
13	08:30	07:43	06:40				06:24		07:04 (12)	05:19		05:49 (11)	04:44		06:00 (11)
	16:19	17:18	18:13				20:11	53	07:57 (12)	21:06	33	06:22 (11)	21:48	13	06:13 (11)
14	08:29	07:41	06:37				06:21		07:03 (12)	05:18		05:47 (11)	04:43		06:01 (11)
	16:20	17:20	18:15				20:13	53	07:56 (12)	21:08	34	06:21 (11)	21:49	12	06:13 (11)
15	08:28	07:39	06:35				06:19		07:03 (12)	05:16		05:46 (11)	04:43		06:02 (11)
	16:22	17:22	18:17				20:15	53	07:56 (12)	21:10	36	06:22 (11)	21:49	11	06:13 (11)
16	08:27	07:37	06:32				06:17		07:03 (12)	05:14		05:45 (11)	04:43		06:03 (11)
	16:24	17:24	18:19				20:17	53	07:56 (12)	21:12	37	06:22 (11)	21:50	9	06:12 (11)
17	08:26	07:35	06:30				06:14		07:03 (12)	05:12		05:46 (11)	04:43		06:04 (11)
	16:25	17:26	18:21				20:19	51	07:54 (12)	21:13	36	06:22 (11)	21:50	8	06:12 (11)
18	08:25	07:33	06:27				06:12		07:03 (12)	05:11		05:45 (11)	04:43		06:05 (11)
	16:27	17:28	18:23				20:21	51	07:54 (12)	21:15	37	06:22 (11)	21:51	6	06:11 (11)
19	08:24	07:31	06:25				06:10		07:03 (12)	05:09		05:46 (11)	04:43		06:06 (11)
	16:29	17:30	18:24				20:22	51	07:54 (12)	21:17	36	06:22 (11)	21:51	5	06:11 (11)
20	08:23	07:29	06:23				06:07		07:04 (12)	05:08		05:45 (11)	04:43		06:07 (11)
	16:31	17:32	18:26				20:24	49	07:53 (12)	21:18	37	06:22 (11)	21:52	3	06:10 (11)
21	08:22	07:27	06:20				06:05		07:04 (12)	05:06		05:46 (11)	04:43		06:07 (11)
	16:32	17:34	18:28				20:26	48	07:52 (12)	21:20	36	06:22 (11)	21:52	3	06:10 (11)
22	08:21	07:24	06:18				06:03		07:04 (12)	05:05		05:47 (11)	04:43		06:07 (11)
	16:34	17:36	18:30				20:28	47	07:51 (12)	21:21	35	06:22 (11)	21:52	3	06:10 (11)
23	08:19	07:22	06:15				06:00		07:05 (12)	05:03		05:46 (11)	04:43		06:08 (11)
	16:36	17:38	18:32				20:30	45	07:50 (12)	21:23	35	06:21 (11)	21:52	3	06:11 (11)
24	08:18	07:20	06:13				05:58		07:05 (12)	05:02		05:47 (11)	04:43		06:08 (11)
	16:38	17:40	18:34				20:32	44	07:49 (12)	21:25	34	06:21 (11)	21:53	3	06:11 (11)
25	08:17	07:18	06:10				05:56		07:06 (12)	05:00		05:47 (11)	04:44		06:07 (11)
	16:40	17:42	18:36				20:34	42	07:48 (12)	21:26	34	06:21 (11)	21:53	5	06:12 (11)
26	08:15	07:15	06:08				05:54		07:07 (12)	04:59		05:48 (11)	04:44		06:07 (11)
	16:42	17:44	18:38				20:36	39	07:46 (12)	21:27	33	06:21 (11)	21:53	6	06:13 (11)
27	08:14	07:13	06:05				05:51		07:08 (12)	04:58		05:48 (11)	04:44		06:06 (11)
	16:44	17:46	18:39				20:37	37	07:45 (12)	21:29	33	06:21 (11)	21:53	8	06:14 (11)
28	08:12	07:11	06:03				05:49		07:10 (12)	04:57		05:49 (11)	04:45		06:06 (11)
	16:46	17:48	18:41	14	06:42 (12)		20:39	33	07:43 (12)	21:30	32	06:21 (11)	21:53	9	06:15 (11)
29	08:11		06:00		06:26 (12)		05:47		07:11 (12)	04:55		05:50 (11)	04:45		06:05 (11)
	16:48		18:43	20	06:46 (12)		20:41	30	07:41 (12)	21:32	30	06:20 (11)	21:52	11	06:16 (11)
30	08:09		05:58		06:23 (12)		05:45		07:13 (12)	04:54		05:50 (11)	04:46		06:05 (11)
	16:49		18:45	25	06:48 (12)		20:43	26	07:39 (12)	21:33	30	06:20 (11)	21:52	12	06:17 (11)
31	08:08		06:55		07:21 (12)					04:53		05:51 (11)			
	16:51		19:47	29	07:50 (12)					21:34	28	06:19 (11)			
Sonnenscheinstunden	248	271	365				419			494				511	
astr.max.mögl.Beschattung				88			1359				885			387	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Zusatzbelastung**Schattenrezeptor:** A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
 Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
 Die Sonne scheint täglich von Sonnenauf- bis -untergang
 Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
 Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November		Dezember	
1	04:47		06:04 (11)	05:26		05:59 (11)	06:21		07:03 (12)	07:15		07:13		08:09		
	21:52	13	06:17 (11)	21:17	33	06:32 (11)	20:11	53	07:56 (12)	18:56		16:45		15:59		
2	04:47		06:04 (11)	05:28		06:01 (11)	06:23		07:03 (12)	07:17		07:15		08:11		
	21:52	14	06:18 (11)	21:15	31	06:32 (11)	20:08	52	07:55 (12)	18:54		16:43		15:58		
3	04:48		06:04 (11)	05:30		06:02 (11)	06:25		07:03 (12)	07:18		07:17		08:12		
	21:51	15	06:19 (11)	21:14	29	06:31 (11)	20:06	52	07:55 (12)	18:51		16:41		15:58		
4	04:49		06:03 (11)	05:31		06:04 (11)	06:26		07:03 (12)	07:20		07:19		08:14		
	21:51	18	06:21 (11)	21:12	27	06:31 (11)	20:03	52	07:55 (12)	18:49		16:39		15:57		
5	04:50		06:02 (11)	05:33		06:05 (11)	06:28		07:03 (12)	07:22		07:21		08:15		
	21:50	19	06:21 (11)	21:10	25	06:30 (11)	20:01	50	07:53 (12)	18:47		16:37		15:56		
6	04:51		06:02 (11)	05:35		06:07 (11)	06:30		07:03 (12)	07:24		07:23		08:17		
	21:50	20	06:22 (11)	21:08	22	06:29 (11)	19:58	50	07:53 (12)	18:44		16:35		15:56		
7	04:52		06:01 (11)	05:36		06:09 (11)	06:32		07:04 (12)	07:26		07:25		08:18		
	21:49	22	06:23 (11)	21:06	20	06:29 (11)	19:56	48	07:52 (12)	18:42		16:33		15:55		
8	04:53		06:01 (11)	05:38		06:10 (11)	06:33		07:04 (12)	07:28		07:27		08:19		
	21:48	22	06:23 (11)	21:04	17	06:27 (11)	19:54	46	07:50 (12)	18:39		16:31		15:55		
9	04:54		06:01 (11)	05:40		06:12 (11)	06:35		07:04 (12)	07:29		07:29		08:21		
	21:48	23	06:24 (11)	21:02	14	06:26 (11)	19:51	45	07:49 (12)	18:37		16:29		15:54		
10	04:55		06:00 (11)	05:42		06:14 (11)	06:37		07:06 (12)	07:31		07:31		08:22		
	21:47	25	06:25 (11)	21:00	11	06:25 (11)	19:49	42	07:48 (12)	18:34		16:28		15:54		
11	04:56		06:00 (11)	05:43		06:15 (11)	06:39		07:08 (12)	07:33		07:33		08:23		
	21:46	26	06:26 (11)	20:58	7	06:22 (11)	19:46	39	07:47 (12)	18:32		16:26		15:54		
12	04:57		05:59 (11)	05:45		06:17 (11)	06:41		07:09 (12)	07:35		07:35		08:24		
	21:45	27	06:26 (11)	20:56	17	07:41 (12)	19:44	36	07:45 (12)	18:30		16:24		15:53		
13	04:58		05:59 (11)	05:47		07:23 (12)	06:42		07:11 (12)	07:37		07:37		08:25		
	21:44	28	06:27 (11)	20:54	20	07:43 (12)	19:41	32	07:43 (12)	18:27		16:23		15:53		
14	04:59		05:58 (11)	05:49		07:21 (12)	06:44		07:13 (12)	07:39		07:39		08:26		
	21:43	29	06:27 (11)	20:52	25	07:46 (12)	19:39	28	07:41 (12)	18:25		16:21		15:53		
15	05:01		05:59 (11)	05:51		07:19 (12)	06:46		07:14 (12)	07:41		07:41		08:27		
	21:42	30	06:29 (11)	20:50	29	07:48 (12)	19:36	23	07:37 (12)	18:23		16:19		15:53		
16	05:02		05:58 (11)	05:52		07:16 (12)	06:48		07:16 (12)	07:42		07:43		08:28		
	21:41	31	06:29 (11)	20:47	33	07:49 (12)	19:34	18	07:34 (12)	18:20		16:18		15:53		
17	05:03		05:58 (11)	05:54		07:15 (12)	06:49		07:19 (12)	07:44		07:44		08:29		
	21:40	31	06:29 (11)	20:45	36	07:51 (12)	19:31	10	07:29 (12)	18:18		16:16		15:53		
18	05:05		05:57 (11)	05:56		07:14 (12)	06:51			07:46		07:46		08:30		
	21:39	33	06:30 (11)	20:43	38	07:52 (12)	19:29			18:16		16:15		15:53		
19	05:06		05:57 (11)	05:58		07:12 (12)	06:53			07:48		07:48		08:31		
	21:37	33	06:30 (11)	20:41	41	07:53 (12)	19:26			18:13		16:13		15:54		
20	05:07		05:57 (11)	05:59		07:11 (12)	06:55			07:50		07:50		08:31		
	21:36	34	06:31 (11)	20:39	43	07:54 (12)	19:24			18:11		16:12		15:54		
21	05:09		05:57 (11)	06:01		07:10 (12)	06:57			07:52		07:52		08:32		
	21:35	34	06:31 (11)	20:36	45	07:55 (12)	19:21			18:09		16:10		15:54		
22	05:10		05:56 (11)	06:03		07:10 (12)	06:58			07:54		07:54		08:33		
	21:33	35	06:31 (11)	20:34	46	07:56 (12)	19:19			18:06		16:09		15:55		
23	05:12		05:57 (11)	06:05		07:08 (12)	07:00			07:56		07:55		08:33		
	21:32	35	06:32 (11)	20:32	48	07:56 (12)	19:16			18:04		16:08		15:55		
24	05:13		05:56 (11)	06:07		07:08 (12)	07:02			07:58		07:57		08:34		
	21:30	36	06:32 (11)	20:29	48	07:56 (12)	19:14			18:02		16:06		15:56		
25	05:15		05:57 (11)	06:08		07:07 (12)	07:04			08:00		07:59		08:34		
	21:29	36	06:33 (11)	20:27	50	07:57 (12)	19:11			18:00		16:05		15:56		
26	05:16		05:56 (11)	06:10		07:06 (12)	07:06			08:02		08:01		08:35		
	21:27	36	06:32 (11)	20:25	51	07:57 (12)	19:09			17:58		16:04		15:57		
27	05:18		05:56 (11)	06:12		07:05 (12)	07:07			07:04		08:02		08:35		
	21:26	37	06:33 (11)	20:22	52	07:57 (12)	19:06			16:55		16:03		15:58		
28	05:20		05:56 (11)	06:14		07:05 (12)	07:09			07:06		08:04		08:35		
	21:24	36	06:32 (11)	20:20	52	07:57 (12)	19:04			16:53		16:02		15:58		
29	05:21		05:57 (11)	06:16		07:04 (12)	07:11			07:07		08:06		08:35		
	21:22	36	06:33 (11)	20:18	52	07:56 (12)	19:01			16:51		16:01		15:59		
30	05:23		05:56 (11)	06:17		07:04 (12)	07:13			07:09		08:07		08:35		
	21:21	36	06:32 (11)	20:15	53	07:57 (12)	18:59			16:49		16:00		16:00		
31	05:25		05:58 (11)	06:19		07:04 (12)				07:11				08:35		
	21:19	35	06:33 (11)	20:13	53	07:57 (12)				16:47				16:01		
Sonnenscheinstunden	514			462			384			330		259		232		
astr.max.mögl.Beschattung	885			1068			676									

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	07:18 (12) 07:59 (12)	05:43 20:45
2	08:35 16:04	08:04 16:55	07:06 17:52	06:50 19:51	07:16 (12) 08:00 (12)	05:41 20:47
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:53	07:15 (12) 08:01 (12)	05:39 20:48
4	08:35 16:06	08:01 16:59	07:01 17:56	06:46 19:54	07:14 (12) 08:01 (12)	05:37 20:50
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:56	07:13 (12) 08:02 (12)	05:35 20:52
6	08:34 16:08	07:57 17:04	06:57 18:00	06:41 19:58	07:12 (12) 08:01 (12)	05:33 20:54
7	08:34 16:10	07:55 17:06	06:54 18:01	06:38 20:00	07:11 (12) 08:02 (12)	05:31 20:56
8	08:33 16:11	07:53 17:08	06:52 18:03	06:36 20:02	07:10 (12) 08:01 (12)	05:29 20:58
9	08:33 16:13	07:51 17:10	06:49 18:05	06:33 20:04	07:10 (12) 08:02 (12)	05:27 20:59
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 20:06	07:10 (12) 08:02 (12)	05:25 21:01
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 20:08	07:09 (12) 08:01 (12)	05:23 21:03
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 20:09	07:09 (12) 08:01 (12)	05:21 21:05
13	08:30 16:19	07:43 17:18	06:40 18:13	06:24 20:11	07:09 (12) 08:01 (12)	05:19 21:06
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 20:13	07:08 (12) 08:00 (12)	05:18 21:08
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	07:08 (12) 07:59 (12)	05:16 21:10
16	08:27 16:24	07:37 17:24	06:32 18:19	06:17 20:17	07:09 (12) 07:59 (12)	05:14 21:12
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	07:08 (12) 07:57 (12)	05:12 21:13
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 20:21	07:09 (12) 07:57 (12)	05:11 21:15
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 20:22	07:09 (12) 07:56 (12)	05:09 21:17
20	08:23 16:31	07:29 17:32	06:23 18:26	06:07 20:24	07:10 (12) 07:55 (12)	05:08 21:18
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 20:26	07:11 (12) 07:54 (12)	05:06 21:20
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 20:28	07:11 (12) 07:52 (12)	05:05 21:21
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 20:30	07:12 (12) 07:51 (12)	05:03 21:23
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 20:32	07:13 (12) 07:50 (12)	05:02 21:25
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 20:34	07:14 (12) 07:48 (12)	05:00 21:26
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 20:36	07:16 (12) 07:46 (12)	04:59 21:27
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 20:37	07:18 (12) 07:44 (12)	04:58 21:29
28	08:12 16:46	07:11 17:48	06:03 18:41	05:49 20:39	07:20 (12) 07:42 (12)	04:57 21:30
29	08:11 16:48		06:00 18:43	05:47 20:41	07:23 (12) 07:38 (12)	04:55 21:32
30	08:09 16:49		05:58 18:45	05:45 20:43	06:13 (11) 06:14 (11)	04:54 21:33
31	08:08 16:51		06:55 19:47	07:21 (12) 07:58 (12)		04:53 21:34
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung			160	1268	884	141

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

SHADOW - Kalender

Berechnung: Zusatzbelastung**Schattenrezeptor:** B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs												
Referenzjahr für Kalender					2019							
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:												
Die Sonne scheint täglich von Sonnenauf- bis -untergang												
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung												
Die Windenergieanlage/n ist/sind immer in Betrieb												
	Jul		August		September		Oktober	November	Dezember			
1	04:47		05:26		06:00 (11)	06:21	07:08 (12)	07:15	07:13	08:09		
	21:52		21:17	36	06:36 (11)	20:11	52	08:00 (12)	18:56	16:45	15:59	
2	04:47		05:28		06:01 (11)	06:23		07:08 (12)	07:17	07:15	08:11	
	21:52		21:15	35	06:36 (11)	20:08	52	08:00 (12)	18:54	16:43	15:58	
3	04:48		05:30		06:02 (11)	06:25		07:08 (12)	07:18	07:17	08:12	
	21:51		21:14	33	06:35 (11)	20:06	52	08:00 (12)	18:51	16:41	15:58	
4	04:49		05:31		06:04 (11)	06:26		07:08 (12)	07:20	07:19	08:14	
	21:51		21:12	31	06:35 (11)	20:03	52	08:00 (12)	18:49	16:39	15:57	
5	04:50		05:33		06:05 (11)	06:28		07:07 (12)	07:22	07:21	08:15	
	21:50	6	06:18 (11)	21:10	29	06:34 (11)	20:01	51	07:58 (12)	18:47	16:37	15:56
6	04:51		05:35		06:07 (11)	06:30		07:07 (12)	07:24	07:23	08:17	
	21:50	10	06:20 (11)	21:08	27	06:34 (11)	19:58	51	07:58 (12)	18:44	16:35	15:56
7	04:52		05:36		06:09 (11)	06:32		07:07 (12)	07:26	07:25	08:18	
	21:49	13	06:22 (11)	21:06	25	06:34 (11)	19:56	51	07:58 (12)	18:42	16:33	15:55
8	04:53		05:38		06:10 (11)	06:33		07:07 (12)	07:28	07:27	08:19	
	21:48	15	06:23 (11)	21:04	22	06:32 (11)	19:54	49	07:56 (12)	18:39	16:31	15:55
9	04:54		05:40		06:12 (11)	06:35		07:07 (12)	07:29	07:29	08:21	
	21:48	16	06:24 (11)	21:02	20	06:32 (11)	19:51	48	07:55 (12)	18:37	16:29	15:54
10	04:55		05:42		06:14 (11)	06:37		07:08 (12)	07:31	07:31	08:22	
	21:47	18	06:25 (11)	21:00	17	06:31 (11)	19:49	47	07:55 (12)	18:34	16:28	15:54
11	04:56		05:43		06:15 (11)	06:39		07:09 (12)	07:33	07:33	08:23	
	21:46	20	06:26 (11)	20:58	14	06:29 (11)	19:46	45	07:54 (12)	18:32	16:26	15:54
12	04:57		05:45		06:17 (11)	06:41		07:09 (12)	07:35	07:35	08:24	
	21:45	22	06:27 (11)	20:56	11	06:28 (11)	19:44	43	07:52 (12)	18:30	16:24	15:53
13	04:58		05:47		06:18 (11)	06:42		07:11 (12)	07:37	07:37	08:25	
	21:44	23	06:28 (11)	20:54	7	06:25 (11)	19:41	39	07:50 (12)	18:27	16:23	15:53
14	04:59		05:49		06:20 (11)	06:44		07:13 (12)	07:39	07:39	08:26	
	21:43	25	06:29 (11)	20:52	2	06:22 (11)	19:39	36	07:49 (12)	18:25	16:21	15:53
15	05:01		05:51		07:31 (12)	06:46		07:14 (12)	07:41	07:41	08:27	
	21:42	26	06:30 (11)	20:50	14	07:45 (12)	19:36	32	07:46 (12)	18:23	16:19	15:53
16	05:02		05:52		07:27 (12)	06:48		07:16 (12)	07:42	07:43	08:28	
	21:41	27	06:31 (11)	20:47	20	07:47 (12)	19:34	28	07:44 (12)	18:20	16:18	15:53
17	05:03		05:54		07:25 (12)	06:49		07:18 (12)	07:44	07:44	08:29	
	21:40	28	06:31 (11)	20:45	25	07:50 (12)	19:31	24	07:42 (12)	18:18	16:16	15:53
18	05:05		05:56		07:23 (12)	06:51		07:20 (12)	07:46	07:46	08:30	
	21:39	30	06:32 (11)	20:43	29	07:52 (12)	19:29	19	07:39 (12)	18:16	16:15	15:53
19	05:06		05:58		07:20 (12)	06:53		07:22 (12)	07:48	07:48	08:31	
	21:37	30	06:32 (11)	20:41	33	07:53 (12)	19:26	10	07:32 (12)	18:13	16:13	15:54
20	05:07		05:59		07:19 (12)	06:55			07:50	07:50	08:31	
	21:36	31	06:33 (11)	20:39	36	07:55 (12)	19:24		18:11	16:12	15:54	
21	05:09		06:01		07:18 (12)	06:57			07:52	07:52	08:32	
	21:35	33	06:34 (11)	20:36	38	07:56 (12)	19:21		18:09	16:10	15:54	
22	05:10		06:03		07:17 (12)	06:58			07:54	07:54	08:33	
	21:33	33	06:34 (11)	20:34	41	07:58 (12)	19:19		18:06	16:09	15:55	
23	05:12		06:05		07:15 (12)	07:00			07:56	07:55	08:33	
	21:32	34	06:35 (11)	20:32	43	07:58 (12)	19:16		18:04	16:08	15:55	
24	05:13		06:07		07:14 (12)	07:02			07:58	07:57	08:34	
	21:30	35	06:35 (11)	20:29	45	07:59 (12)	19:14		18:02	16:06	15:56	
25	05:15		06:08		07:13 (12)	07:04			08:00	07:59	08:34	
	21:29	35	06:36 (11)	20:27	47	08:00 (12)	19:11		18:00	16:05	15:56	
26	05:16		06:10		07:12 (12)	07:06			08:02	08:01	08:35	
	21:27	35	06:35 (11)	20:25	47	07:59 (12)	19:09		17:58	16:04	15:57	
27	05:18		06:12		07:11 (12)	07:07			07:04	08:02	08:35	
	21:26	36	06:36 (11)	20:22	49	08:00 (12)	19:06		16:55	16:03	15:58	
28	05:20		06:14		07:11 (12)	07:09			07:06	08:04	08:35	
	21:24	36	06:36 (11)	20:20	50	08:01 (12)	19:04		16:53	16:02	15:58	
29	05:21		06:16		07:09 (12)	07:11			07:07	08:06	08:35	
	21:22	36	06:36 (11)	20:18	51	08:00 (12)	19:01		16:51	16:01	15:59	
30	05:23		06:17		07:09 (12)	07:13			07:09	08:07	08:35	
	21:21	36	06:36 (11)	20:15	51	08:00 (12)	18:59		16:49	16:00	16:00	
31	05:25		06:19		07:09 (12)				07:11		08:35	
	21:19	36	06:36 (11)	20:13	52	08:01 (12)			16:47		16:01	
Sonnenscheinstunden	514		462		384		330	259	232			
astr.max.mögl.Beschattung		725		980		781						
Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):												
Tag im Monat	Sonnenaufgang (SS:MM)				Zeitpunkt (SS:MM) Schattenanfang					(WEA mit erstem Schatten)		
	Sonnenuntergang (SS:MM)		Minuten mit Schatten		Zeitpunkt (SS:MM) Schattenende					(WEA mit letztem Schatten)		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende
			(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: ZusatzbelastungSchattenrezeptor: C - IO 3

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	07:18 (12) 20:45	06:11 (11) 21:36	05:59 (11) 06:13 (11)
2	08:35 16:04	08:04 16:55	07:06 17:52	06:50 19:51	07:16 (12) 20:47	06:09 (11) 21:37	06:00 (11) 06:11 (11)
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:53	07:14 (12) 20:48	06:07 (11) 21:38	06:02 (11) 06:09 (11)
4	08:35 16:06	08:01 16:59	07:01 17:56	06:46 19:54	07:11 (12) 20:50	06:05 (11) 21:39	
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:56	07:09 (12) 20:52	06:03 (11) 21:41	
6	08:34 16:08	07:57 17:04	06:57 18:00	06:41 19:58	07:06 (12) 20:54	06:01 (11) 21:42	
7	08:34 16:10	07:55 17:06	06:54 18:01	06:38 20:00	07:04 (12) 20:56	05:59 (11) 21:43	
8	08:33 16:11	07:53 17:08	06:52 18:03	06:36 20:02	07:01 (12) 20:58	05:57 (11) 21:44	
9	08:33 16:13	07:51 17:10	06:49 18:05	06:33 20:04	07:00 (12) 20:59	05:56 (11) 21:45	
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 20:06	06:59 (12) 21:01	05:54 (11) 21:46	
11	08:31 16:15	07:48 17:14	06:45 18:09	06:29 20:08	06:58 (12) 21:03	05:52 (11) 21:46	
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 20:09	06:58 (12) 21:05	05:51 (11) 21:47	
13	08:30 16:19	07:43 17:18	06:40 18:13	06:24 20:11	06:57 (12) 21:06	05:49 (11) 21:48	
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 20:13	06:56 (12) 21:08	05:48 (11) 21:49	
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	06:56 (12) 21:10	05:48 (11) 21:49	05:18 (10) 05:19 (10)
16	08:27 16:24	07:37 17:24	06:32 18:19	06:17 20:17	06:56 (12) 21:12	05:48 (11) 21:50	05:18 (10) 05:19 (10)
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	06:56 (12) 21:13	05:49 (11) 21:50	05:18 (10) 05:20 (10)
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 20:21	06:56 (12) 21:15	05:48 (11) 21:51	05:18 (10) 05:20 (10)
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 20:22	06:56 (12) 21:17	05:49 (11) 21:51	05:18 (10) 05:20 (10)
20	08:23 16:31	07:29 17:32	06:23 18:26	06:07 20:24	06:57 (12) 21:18	05:49 (11) 21:52	05:18 (10) 05:20 (10)
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 20:26	06:57 (12) 21:20	05:50 (11) 21:52	05:18 (10) 05:21 (10)
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 20:28	06:57 (12) 21:21	05:50 (11) 21:52	05:18 (10) 05:21 (10)
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 20:30	06:57 (12) 21:23	05:50 (11) 21:52	05:19 (10) 05:22 (10)
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 20:32	06:58 (12) 21:25	05:51 (11) 21:53	05:19 (10) 05:21 (10)
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 20:34	06:59 (12) 21:26	05:52 (11) 21:53	05:19 (10) 05:21 (10)
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 20:36	07:00 (12) 21:28	05:53 (11) 21:53	05:20 (10) 05:22 (10)
27	08:14 16:44	07:13 17:46	06:05 18:39	05:52 20:37	07:01 (12) 21:29	05:54 (11) 21:53	05:20 (10) 05:21 (10)
28	08:12 16:46	07:11 17:48	06:03 18:41	05:49 20:39	07:03 (12) 21:30	05:54 (11) 21:53	05:21 (10) 05:22 (10)
29	08:11 16:48		06:00 18:43	05:47 20:41	07:04 (12) 21:32	05:55 (11) 21:52	
30	08:09 16:50		05:58 18:45	05:45 20:43	07:07 (12) 21:33	05:56 (11) 21:52	
31	08:08 16:51		06:55 19:47	07:21 (12) 07:27 (12)	07:25 (12) 21:34	05:57 (11) 06:14 (11)	
	Sonnenscheinstunden astr.max.mögl.Beschattung	248 271	365 365	419 1089	494 744	511 60	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat
Sonnenaufgang (SS:MM)
Sonnenuntergang (SS:MM)

Minuten mit Schatten
Zeitpunkt (SS:MM) Schattenanfang
Zeitpunkt (SS:MM) Schattenende

(WEA mit erstem Schatten)
(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: Zusatzbelastung**Schattenrezeptor:** C - IO 3

Voraussetzungen für Berechnung des Schattenwurfs

- Referenzjahr für Kalender 2019
- Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
 - Die Sonne scheint täglich von Sonnenauf- bis -untergang
 - Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
 - Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47	05:26	05:59 (11)	06:21	06:56 (12)	07:15
	21:52	21:17	20:11	18:56	16:45	15:59
2	04:47	05:28	06:01 (11)	06:23	06:57 (12)	07:17
	21:52	21:15	20:08	18:54	16:43	15:58
3	04:48	05:30	06:02 (11)	06:25	06:57 (12)	07:18
	21:51	21:14	20:06	18:51	16:41	15:58
4	04:49	05:31	06:04 (11)	06:26	06:57 (12)	07:20
	21:51	21:12	20:03	18:49	16:39	15:57
5	04:50	05:33	06:05 (11)	06:28	06:57 (12)	07:22
	21:50	21:10	20:01	18:47	16:37	15:56
6	04:51	05:35	06:07 (11)	06:30	06:59 (12)	07:24
	21:50	21:08	19:58	18:44	16:35	15:56
7	04:52	05:36	06:09 (11)	06:32	07:01 (12)	07:26
	21:49	21:06	19:56	18:42	16:33	15:55
8	04:53	05:38	06:10 (11)	06:33	07:02 (12)	07:28
	21:48	21:04	19:54	18:39	16:31	15:55
9	04:54	05:40	06:12 (11)	06:35	07:04 (12)	07:29
	21:48	21:02	19:51	18:37	16:29	15:54
10	04:55	05:42	06:14 (11)	06:37	07:06 (12)	07:31
	21:47	21:00	19:49	18:34	16:28	15:54
11	04:56	06:09 (11)	05:43	06:39	07:08 (12)	07:33
	21:46	20:58	19:46	18:32	16:26	15:54
12	04:57	06:08 (11)	05:45	06:41	07:09 (12)	07:35
	21:45	20:56	19:44	18:30	16:24	15:53
13	04:58	06:06 (11)	05:47	06:42	07:11 (12)	07:37
	21:44	20:54	19:41	18:27	16:23	15:53
14	04:59	06:05 (11)	05:49	06:44	07:39	07:39
	21:43	20:52	19:39	18:25	16:21	15:53
15	05:01	06:05 (11)	05:51	06:46	07:41	07:41
	21:42	20:50	19:36	18:23	16:19	15:53
16	05:02	06:04 (11)	05:52	06:48	07:42	07:43
	21:41	20:47	19:34	18:20	16:18	15:53
17	05:03	06:03 (11)	05:54	06:50	07:44	07:44
	21:40	20:45	19:31	18:18	16:16	15:53
18	05:05	06:02 (11)	05:56	06:51	07:46	07:46
	21:39	20:43	19:29	18:16	16:15	15:53
19	05:06	06:02 (11)	05:58	06:53	07:48	07:48
	21:37	20:41	19:26	18:13	16:13	15:54
20	05:07	06:02 (11)	05:59	06:55	07:50	07:50
	21:36	20:39	19:24	18:11	16:12	15:54
21	05:09	06:01 (11)	06:01	06:57	07:52	07:52
	21:35	20:36	19:21	18:09	16:10	15:54
22	05:10	06:01 (11)	06:03	06:58	07:54	07:54
	21:33	20:34	19:19	18:06	16:09	15:55
23	05:12	06:00 (11)	06:05	07:00	07:56	07:55
	21:32	20:32	19:16	18:04	16:08	15:55
24	05:13	06:00 (11)	06:07	07:02	07:58	07:57
	21:30	20:29	19:14	18:02	16:06	15:56
25	05:15	06:00 (11)	06:08	07:04	08:00	07:59
	21:29	20:27	19:11	18:00	16:05	15:56
26	05:16	05:59 (11)	06:10	07:06	08:02	08:01
	21:27	20:25	19:09	17:58	16:04	15:57
27	05:18	05:59 (11)	06:12	07:07	07:04	08:02
	21:26	20:22	19:06	16:55	16:03	15:58
28	05:20	05:59 (11)	06:14	07:09	07:06	08:04
	21:24	20:20	19:04	16:53	16:02	15:58
29	05:21	05:59 (11)	06:16	07:11	07:07	08:06
	21:22	20:18	19:01	16:51	16:01	15:59
30	05:23	05:59 (11)	06:17	07:13	07:09	08:07
	21:21	20:15	18:59	16:49	16:00	16:00
31	05:25	05:59 (11)	06:19	06:57 (12)	07:11	08:35
	21:19	20:13	18:46	16:47		16:01
Sonnenscheinstunden	514	462	384	330	259	232
astr. max. mögl. Beschattung	526	941	433			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35	08:06	07:08	06:53	05:43	04:52
	16:02	16:53	17:50	19:49	20:45	21:36
2	08:35	08:04	07:06	06:50	05:41	04:51
	16:04	16:55	17:52	19:51	20:47	21:37
3	08:35	08:02	07:04	06:48	05:39	04:50
	16:05	16:57	17:54	19:53	20:48	21:38
4	08:35	08:01	07:01	06:46	05:37	04:49
	16:06	16:59	17:56	19:54	20:50	21:39
5	08:35	07:59	06:59	07:25 (12)	05:35	04:48
	16:07	17:02	17:58	19:56	20:52	21:41
6	08:34	07:57	06:57	07:23 (12)	05:33	04:48
	16:08	17:04	18:00	19:58	20:54	21:42
7	08:34	07:55	06:54	07:21 (12)	05:31	04:47
	16:10	17:06	18:01	19:59	20:56	21:43
8	08:33	07:53	06:52	07:18 (12)	05:29	04:46
	16:11	17:08	18:03	19:59	20:58	21:44
9	08:33	07:51	06:49	07:16 (12)	05:27	04:46
	16:13	17:10	18:05	19:59	20:59	21:45
10	08:32	07:49	06:47	07:13 (12)	05:25	04:45
	16:14	17:12	18:07	19:59	21:01	21:46
11	08:32	07:48	06:45	07:11 (12)	05:23	04:45
	16:15	17:14	18:09	19:59	21:03	21:46
12	08:31	07:46	06:42	07:08 (12)	05:21	04:44
	16:17	17:16	18:11	19:59	21:05	21:47
13	08:30	07:44	06:40	07:06 (12)	05:19	04:44
	16:19	17:18	18:13	19:59	21:06	21:48
14	08:29	07:41	06:37	07:04 (12)	05:18	04:43
	16:20	17:20	18:15	19:59	21:08	21:49
15	08:28	07:39	06:35	07:05 (12)	05:16	04:43
	16:22	17:22	18:17	19:59	21:10	21:49
16	08:27	07:37	06:32	07:04 (12)	05:14	04:43
	16:24	17:24	18:19	19:59	21:12	21:50
17	08:26	07:35	06:30	07:05 (12)	05:12	04:43
	16:25	17:26	18:21	19:59	21:13	21:50
18	08:25	07:33	06:27	07:04 (12)	05:11	04:43
	16:27	17:28	18:23	19:59	21:15	21:51
19	08:24	07:31	06:25	07:05 (12)	05:09	04:43
	16:29	17:30	18:24	19:59	21:17	21:51
20	08:23	07:29	06:23	07:05 (12)	05:08	04:43
	16:31	17:32	18:26	19:59	21:18	21:52
21	08:22	07:27	06:20	07:07 (12)	05:06	04:43
	16:32	17:34	18:28	19:59	21:20	21:52
22	08:21	07:24	06:18	07:07 (12)	05:05	04:43
	16:34	17:36	18:30	19:59	21:21	21:52
23	08:19	07:22	06:15	07:10 (12)	05:03	04:43
	16:36	17:38	18:32	19:59	21:23	21:52
24	08:18	07:20	06:13	07:12 (12)	05:02	04:43
	16:38	17:40	18:34	19:59	21:25	21:53
25	08:17	07:18	06:10	07:23 (12)	05:00	04:44
	16:40	17:42	18:36	19:59	21:26	21:53
26	08:15	07:15	06:08	05:54	04:59	04:44
	16:42	17:44	18:38	20:36	21:28	21:53
27	08:14	07:13	06:05	05:52	04:58	04:44
	16:44	17:46	18:40	20:37	21:29	21:53
28	08:12	07:11	06:03	05:49	04:57	04:45
	16:46	17:48	18:41	20:39	21:30	21:53
29	08:11		06:00	05:47	04:55	04:45
	16:48		18:43	20:41	21:32	21:52
30	08:09		05:58	05:45	04:54	04:46
	16:50		18:45	20:43	21:33	21:52
31	08:08		06:55		04:53	
	16:51		19:47		21:34	
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung			468	297	293	168

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

		Juli				August				September				Oktober				November		Dezember	
1	04:47		05:22 (9)	05:26		06:01 (10)	06:21	06:51 (11)	07:15		07:44 (12)	07:13		08:09							
	21:52	6	05:28 (9)	21:17	22	06:23 (10)	20:11	26	07:17 (11)	18:56	33	08:17 (12)	16:45	15:59							
2	04:47		05:23 (9)	05:28		06:01 (10)	06:23	06:52 (11)	07:17		07:45 (12)	07:15		08:11							
	21:52	5	05:28 (9)	21:15	23	06:24 (10)	20:08	26	07:18 (11)	18:54	32	08:17 (12)	16:43	15:58							
3	04:48		05:24 (9)	05:30		06:02 (10)	06:25	06:54 (11)	07:18		07:47 (12)	07:17		08:12							
	21:51	3	05:27 (9)	21:14	21	06:23 (10)	20:06	24	07:18 (11)	18:51	29	08:16 (12)	16:41	15:58							
4	04:49		05:25 (9)	05:31		06:04 (10)	06:26	06:56 (11)	07:20		07:49 (12)	07:19		08:14							
	21:51	2	05:27 (9)	21:12	20	06:24 (10)	20:03	21	07:17 (11)	18:49	26	08:15 (12)	16:39	15:57							
5	04:50			05:33		06:06 (10)	06:28	06:57 (11)	07:22		07:51 (12)	07:21		08:15							
	21:50			21:10	18	06:24 (10)	20:01	19	07:16 (11)	18:47	24	08:15 (12)	16:37	15:56							
6	04:51			05:35		06:07 (10)	06:30	06:59 (11)	07:24		07:52 (12)	07:23		08:17							
	21:50			21:08	16	06:23 (10)	19:58	17	07:16 (11)	18:44	21	08:13 (12)	16:35	15:56							
7	04:52			05:36		06:09 (10)	06:32	07:01 (11)	07:26		07:54 (12)	07:25		08:18							
	21:49			21:06	14	06:23 (10)	19:56	14	07:15 (11)	18:42	17	08:11 (12)	16:33	15:55							
8	04:53			05:38		06:10 (10)	06:33	07:02 (11)	07:28		07:56 (12)	07:27		08:19							
	21:48			21:04	12	06:22 (10)	19:54	11	07:13 (11)	18:39	14	08:10 (12)	16:31	15:55							
9	04:54			05:40		06:12 (10)	06:35	07:04 (11)	07:29		07:58 (12)	07:29		08:21							
	21:48			21:02	10	06:22 (10)	19:51	8	07:12 (11)	18:37	10	08:08 (12)	16:30	15:54							
10	04:55			05:42		06:14 (10)	06:37	07:06 (11)	07:31		08:00 (12)	07:31		08:22							
	21:47			21:00	8	06:22 (10)	19:49	4	07:10 (11)	18:34	5	08:05 (12)	16:28	15:54							
11	04:56			05:43		06:15 (10)	06:39		07:33			07:33		08:23							
	21:46			20:58	5	06:20 (10)	19:46		18:32			16:26		15:54							
12	04:57			05:45		06:17 (10)	06:41		07:35			07:35		08:24							
	21:45			20:56	2	06:19 (10)	19:44		18:30			16:24		15:53							
13	04:58			05:47			06:42		07:37			07:37		08:25							
	21:44			20:54			19:41		18:27			16:23		15:53							
14	04:59			05:49			06:44		07:39			07:39		08:26							
	21:43			20:52			19:39		18:25			16:21		15:53							
15	05:01			05:51			06:46		07:41			07:41		08:27							
	21:42			20:50			19:36		18:23			16:19		15:53							
16	05:02			05:52			06:48		07:42			07:43		08:28							
	21:41			20:47			19:34		18:20			16:18		15:53							
17	05:03			05:54			06:50		07:44			07:44		08:29							
	21:40			20:45			19:31		18:18			16:16		15:53							
18	05:05			05:56			06:51		07:46			07:46		08:30							
	21:39			20:43			19:29		18:16			16:15		15:53							
19	05:06			05:58			06:53		07:48			07:48		08:31							
	21:37			20:41			19:26		18:13			16:13		15:54							
20	05:07			05:59			06:55		07:50			07:50		08:32							
	21:36			20:39			19:24		18:11			16:12		15:54							
21	05:09			06:01			06:57		07:52			07:52		08:32							
	21:35			20:36			19:21	13	08:10 (12)	18:09		16:10		15:54							
22	05:10			06:03			06:58		07:54 (12)	07:54		07:54		08:33							
	21:33			20:34			19:19	19	08:13 (12)	18:06		16:09		15:55							
23	05:12			06:05			07:00		07:52 (12)	07:56		07:56		08:33							
	21:32			20:32			19:16	23	08:15 (12)	18:04		16:08		15:55							
24	05:13		06:09 (10)	06:07			07:02		07:50 (12)	07:58		07:57		08:34							
	21:30	5	06:14 (10)	20:29			19:14	25	08:15 (12)	18:02		16:06		15:56							
25	05:15		06:07 (10)	06:08		07:03 (11)	07:04		07:49 (12)	08:00		07:59		08:34							
	21:29	10	06:17 (10)	20:27	8	07:11 (11)	19:11	27	08:16 (12)	18:00		16:05		15:56							
26	05:16		06:05 (10)	06:10		06:59 (11)	07:06		07:48 (12)	08:02		08:01		08:35							
	21:27	13	06:18 (10)	20:25	14	07:13 (11)	19:09	29	08:17 (12)	17:58		16:04		15:57							
27	05:18		06:04 (10)	06:12		06:57 (11)	07:07		07:47 (12)	07:04		08:03		08:35							
	21:26	16	06:20 (10)	20:23	18	07:15 (11)	19:06	30	08:17 (12)	16:55		16:03		15:58							
28	05:20		06:03 (10)	06:14		06:56 (11)	07:09		07:46 (12)	07:06		08:04		08:35							
	21:24	18	06:21 (10)	20:20	21	07:17 (11)	19:04	32	08:18 (12)	16:53		16:02		15:58							
29	05:21		06:03 (10)	06:16		06:54 (11)	07:11		07:45 (12)	07:08		08:06		08:35							
	21:22	19	06:22 (10)	20:18	23	07:17 (11)	19:01	32	08:17 (12)	16:51		16:01		15:59							
30	05:23		06:02 (10)	06:17		06:53 (11)	07:13		07:44 (12)	07:09		08:08		08:35							
	21:21	20	06:22 (10)	20:15	24	07:17 (11)	18:59	33	08:17 (12)	16:49		16:00		16:00							
31	05:25		06:01 (10)	06:19		06:52 (11)			07:11			08:35									
	21:19	22	06:23 (10)	20:13	26	07:18 (11)			16:47			16:01									
Sonnenscheinstunden		514		462			384		330		259		232								
astr.max.mögl.Beschattung		139		305			433		211												

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdaorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April		Mai		Juni	
1	08:35	08:06	07:08		07:35 (12)	06:53		07:18 (11)	05:43	
	16:02	16:53	17:50	3	07:38 (12)	19:49	6	07:24 (11)	20:45	7
2	08:35	08:04	07:06		07:33 (12)	06:50		07:16 (11)	05:41	
	16:04	16:55	17:52	8	07:41 (12)	19:51	9	07:25 (11)	20:47	10
3	08:35	08:02	07:04		07:30 (12)	06:48		07:14 (11)	05:39	
	16:05	16:57	17:54	12	07:42 (12)	19:53	13	07:27 (11)	20:48	12
4	08:35	08:01	07:01		07:28 (12)	06:46		07:11 (11)	05:37	
	16:06	16:59	17:56	16	07:44 (12)	19:54	16	07:27 (11)	20:50	14
5	08:35	07:59	06:59		07:25 (12)	06:43		07:09 (11)	05:35	
	16:07	17:01	17:58	19	07:44 (12)	19:56	18	07:27 (11)	20:52	16
6	08:34	07:57	06:57		07:23 (12)	06:41		07:06 (11)	05:33	
	16:08	17:04	18:00	22	07:45 (12)	19:58	21	07:27 (11)	20:54	18
7	08:34	07:55	06:54		07:21 (12)	06:38		07:04 (11)	05:31	
	16:10	17:06	18:01	25	07:46 (12)	20:00	23	07:27 (11)	20:56	20
8	08:33	07:53	06:52		07:18 (12)	06:36		07:01 (11)	05:29	
	16:11	17:08	18:03	28	07:46 (12)	20:02	25	07:26 (11)	20:58	21
9	08:33	07:51	06:49		07:16 (12)	06:33		06:59 (11)	05:27	
	16:13	17:10	18:05	31	07:47 (12)	20:04	27	07:26 (11)	20:59	23
10	08:32	07:49	06:47		07:13 (12)	06:31		07:00 (11)	05:25	
	16:14	17:12	18:07	33	07:46 (12)	20:06	25	07:25 (11)	21:01	22
11	08:32	07:48	06:45		07:14 (12)	06:29		06:59 (11)	05:23	
	16:15	17:14	18:09	32	07:46 (12)	20:08	25	07:24 (11)	21:03	21
12	08:31	07:46	06:42		07:13 (12)	06:26		07:00 (11)	05:21	
	16:17	17:16	18:11	32	07:45 (12)	20:09	23	07:23 (11)	21:05	20
13	08:30	07:44	06:40		07:13 (12)	06:24		07:01 (11)	05:19	
	16:19	17:18	18:13	32	07:45 (12)	20:11	21	07:22 (11)	21:06	19
14	08:29	07:41	06:37		07:13 (12)	06:21		07:02 (11)	05:18	
	16:20	17:20	18:15	31	07:44 (12)	20:13	18	07:20 (11)	21:08	17
15	08:28	07:39	06:35		07:14 (12)	06:19		07:03 (11)	05:16	
	16:22	17:22	18:17	29	07:43 (12)	20:15	15	07:18 (11)	21:10	14
16	08:27	07:37	06:32		07:14 (12)	06:17		07:06 (11)	05:14	
	16:24	17:24	18:19	28	07:42 (12)	20:17	9	07:15 (11)	21:12	11
17	08:26	07:35	06:30		07:15 (12)	06:14			05:12	
	16:25	17:26	18:21	26	07:41 (12)	20:19			21:13	8
18	08:25	07:33	06:27		07:16 (12)	06:12			05:11	
	16:27	17:28	18:23	22	07:38 (12)	20:21			21:15	
19	08:24	07:31	06:25		07:18 (12)	06:10			05:09	
	16:29	17:30	18:24	19	07:37 (12)	20:23			21:17	
20	08:23	07:29	06:23		07:20 (12)	06:07			05:08	
	16:31	17:32	18:26	13	07:33 (12)	20:24			21:18	
21	08:22	07:27	06:20			06:05			05:06	
	16:32	17:34	18:28			20:26			21:20	
22	08:21	07:24	06:18			06:03			05:05	
	16:34	17:36	18:30			20:28			21:21	
23	08:19	07:22	06:15			06:00			05:03	
	16:36	17:38	18:32			20:30			21:23	
24	08:18	07:20	06:13			05:58			05:02	
	16:38	17:40	18:34			20:32			21:25	
25	08:17	07:18	06:10			05:56			05:00	
	16:40	17:42	18:36			20:34			21:26	
26	08:15	07:15	06:08			05:54			04:59	
	16:42	17:44	18:38			20:36			21:28	
27	08:14	07:13	06:05			05:52			04:58	
	16:44	17:46	18:40			20:37			21:29	
28	08:12	07:11	06:03			05:49			04:57	
	16:46	17:48	18:41			20:39			21:30	
29	08:11		06:00			05:47		06:15 (10)	04:55	
	16:48		18:43			20:41	1	06:16 (10)	21:32	
30	08:09		05:58			05:45		06:13 (10)	04:54	
	16:50		18:45			20:43	4	06:17 (10)	21:33	
31	08:08		06:55		07:21 (11)				04:53	
	16:51		19:47	2	07:23 (11)				21:34	
Sonnenscheinstunden	248	271	365		419			494		511
astr.max.mögl.Beschattung				463		299		273		535

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember
1	04:47		05:22 (7)	05:26	06:08 (10)	06:21	06:59 (11)	07:15	07:53 (12)	07:13	08:09
	21:52	20	05:42 (9)	21:17	18	06:26 (10)	20:11	23	07:22 (11)	18:56	31
2	04:47		05:23 (7)	05:28		06:07 (10)	06:23		06:58 (11)	07:17	
	21:52	19	05:42 (9)	21:15	21	06:28 (10)	20:08	25	07:23 (11)	18:54	32
3	04:48		05:24 (7)	05:30		06:06 (10)	06:25		06:58 (11)	07:18	
	21:51	18	05:42 (9)	21:14	21	06:27 (10)	20:06	25	07:23 (11)	18:51	32
4	04:49		05:25 (7)	05:31		06:06 (10)	06:26		06:57 (11)	07:20	
	21:51	17	05:42 (9)	21:12	22	06:28 (10)	20:03	27	07:24 (11)	18:49	33
5	04:50		05:25 (9)	05:33		06:06 (10)	06:28		06:57 (11)	07:22	
	21:50	16	05:41 (9)	21:10	23	06:29 (10)	20:01	26	07:23 (11)	18:47	33
6	04:51		05:26 (9)	05:35		06:07 (10)	06:30		06:59 (11)	07:24	
	21:50	15	05:41 (9)	21:08	22	06:29 (10)	19:58	24	07:23 (11)	18:44	30
7	04:52		05:27 (9)	05:36		06:09 (10)	06:32		07:01 (11)	07:26	
	21:49	14	05:41 (9)	21:06	20	06:29 (10)	19:56	22	07:23 (11)	18:42	28
8	04:53		05:28 (9)	05:38		06:10 (10)	06:33		07:02 (11)	07:28	
	21:48	12	05:40 (9)	21:04	18	06:28 (10)	19:54	19	07:21 (11)	18:39	25
9	04:54		05:29 (9)	05:40		06:12 (10)	06:35		07:04 (11)	07:29	
	21:48	11	05:40 (9)	21:02	16	06:28 (10)	19:51	17	07:21 (11)	18:37	22
10	04:55		05:30 (9)	05:42		06:14 (10)	06:37		07:06 (11)	07:31	
	21:47	9	05:39 (9)	21:00	14	06:28 (10)	19:49	14	07:20 (11)	18:34	19
11	04:56		05:31 (9)	05:43		06:15 (10)	06:39		07:08 (11)	07:33	
	21:46	7	05:38 (9)	20:58	12	06:27 (10)	19:46	11	07:19 (11)	18:32	16
12	04:57		05:32 (9)	05:45		06:17 (10)	06:41		07:09 (11)	07:35	
	21:45	5	05:37 (9)	20:56	10	06:27 (10)	19:44	8	07:17 (11)	18:30	13
13	04:58		05:33 (9)	05:47		06:19 (10)	06:42		07:11 (11)	07:37	
	21:44	2	05:35 (9)	20:54	8	06:27 (10)	19:41	4	07:15 (11)	18:27	9
14	04:59			05:49		06:20 (10)	06:44			07:39	
	21:43			20:52	5	06:25 (10)	19:39			18:25	4
15	05:01			05:51		06:22 (10)	06:46			07:41	
	21:42			20:50	2	06:24 (10)	19:36			18:23	
16	05:02			05:52			06:48			07:42	
	21:41			20:47			19:34			18:20	
17	05:03			05:54			06:50			07:44	
	21:40			20:45			19:31			18:18	
18	05:05			05:56			06:51			07:46	
	21:39			20:43			19:29			18:16	
19	05:06			05:58			06:53			07:48	
	21:37			20:41			19:26			18:13	
20	05:07			05:59			06:55			07:50	
	21:36			20:39			19:24			18:11	
21	05:09			06:01			06:57			07:52	
	21:35			20:36			19:21			18:09	
22	05:10			06:03			06:58			07:54	
	21:33			20:34			19:19			18:06	
23	05:12			06:05			07:00			07:56	
	21:32			20:32			19:16			18:04	
24	05:13			06:07			07:02		08:09 (12)	07:58	
	21:30			20:29			19:14	2	08:11 (12)	18:02	
25	05:15			06:08			07:04		08:03 (12)	08:00	
	21:29			20:27			19:11	14	08:17 (12)	18:00	
26	05:16			06:10			07:06		08:00 (12)	08:02	
	21:27			20:25			19:09	20	08:20 (12)	17:58	
27	05:18			06:12			07:07		07:58 (12)	07:04	
	21:26			20:23			19:06	23	08:21 (12)	16:55	
28	05:20			06:14			07:09		07:57 (12)	07:06	
	21:24	8	06:21 (10)	20:20	3	07:14 (11)	19:04	26	08:23 (12)	16:53	
29	05:21			06:16			07:05 (11)		07:55 (12)	07:08	
	21:22	11	06:23 (10)	20:18	13	07:18 (11)	19:01	27	08:22 (12)	16:51	
30	05:23			06:17			07:03 (11)		07:54 (12)	07:09	
	21:21	14	06:24 (10)	20:15	17	07:20 (11)	18:59	29	08:23 (12)	16:49	
31	05:25			06:19			07:02 (11)			07:11	
	21:19	17	06:26 (10)	20:13	20	07:22 (11)				16:47	
Sonnenscheinstunden	514			462		384			330		
astr.max.mögl.Beschattung	215			285		386			327		
										259	232

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Keskorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	May	Juni	
1	08:35 16:02	08:06 16:53	07:08 17:50	07:35 (12) 19:49	06:53 20:45	07:18 (11) 21:36	05:25 (7)
2	08:35 16:04	08:04 16:55	07:06 17:52	07:33 (12) 19:51	06:50 20:47	07:16 (11) 21:37	05:47 (9)
3	08:35 16:05	08:02 16:57	07:04 17:54	07:30 (12) 19:53	06:48 20:49	07:14 (11) 21:39	05:24 (7)
4	08:35 16:06	08:01 16:59	07:01 17:56	07:28 (12) 19:54	06:46 20:50	07:11 (11) 21:40	05:48 (9)
5	08:35 16:07	07:59 17:01	06:59 17:58	07:25 (12) 19:56	06:43 20:52	07:09 (11) 21:41	05:23 (7)
6	08:34 16:08	07:57 17:04	06:57 18:00	07:23 (12) 19:58	06:41 20:54	07:06 (11) 21:42	05:49 (9)
7	08:34 16:10	07:55 17:06	06:54 18:01	07:21 (12) 20:00	06:38 20:56	07:04 (11) 21:43	05:22 (7)
8	08:33 16:11	07:53 17:08	06:52 18:03	07:20 (12) 20:02	06:36 20:57	07:03 (11) 21:44	05:50 (9)
9	08:33 16:13	07:51 17:10	06:49 18:05	07:20 (12) 20:04	06:33 20:59	07:02 (11) 21:45	05:21 (7)
10	08:32 16:14	07:50 17:12	06:47 18:07	07:20 (12) 20:06	06:31 21:01	07:01 (11) 21:46	05:51 (9)
11	08:32 16:15	07:48 17:14	06:45 18:09	07:20 (12) 20:08	06:29 21:03	07:00 (11) 21:47	05:19 (7)
12	08:31 16:17	07:46 17:16	06:42 18:11	07:20 (12) 20:09	06:26 21:05	06:58 (11) 21:48	05:52 (9)
13	08:30 16:19	07:44 17:18	06:40 18:13	07:21 (12) 20:11	06:24 21:06	06:57 (11) 21:49	05:18 (7)
14	08:29 16:20	07:41 17:20	06:37 18:15	07:22 (12) 20:13	06:21 21:08	06:56 (11) 21:50	05:53 (9)
15	08:28 16:22	07:39 17:22	06:35 18:17	07:23 (12) 20:15	06:19 21:10	06:55 (11) 21:51	05:18 (7)
16	08:27 16:24	07:37 17:24	06:32 18:19	07:24 (12) 20:17	06:17 21:12	06:54 (11) 21:52	05:54 (9)
17	08:26 16:25	07:35 17:26	06:30 18:21	07:28 (12) 20:19	06:14 21:13	06:53 (11) 21:53	05:19 (7)
18	08:25 16:27	07:33 17:28	06:27 18:23	07:39 (12) 20:21	06:12 21:15	06:52 (11) 21:54	05:55 (9)
19	08:24 16:29	07:31 17:30	06:25 18:24	07:42 (12) 20:23	06:10 21:17	06:51 (11) 21:55	05:18 (7)
20	08:23 16:31	07:29 17:32	06:23 18:26	07:44 (12) 20:25	06:07 21:18	06:50 (11) 21:56	05:56 (9)
21	08:22 16:32	07:27 17:34	06:20 18:28	07:46 (12) 20:27	06:05 21:20	06:49 (11) 21:57	05:19 (7)
22	08:21 16:34	07:24 17:36	06:18 18:30	07:48 (12) 20:29	06:03 21:21	06:48 (11) 21:58	05:57 (9)
23	08:19 16:36	07:22 17:38	06:15 18:32	07:50 (12) 20:31	06:00 21:23	06:47 (11) 21:59	05:18 (7)
24	08:18 16:38	07:20 17:40	06:13 18:34	07:52 (12) 20:33	05:58 21:25	06:46 (11) 22:00	05:58 (9)
25	08:17 16:40	07:18 17:42	06:10 18:36	07:54 (12) 20:35	05:56 21:27	06:45 (11) 22:01	05:19 (7)
26	08:15 16:42	07:15 17:44	06:08 18:38	07:56 (12) 20:37	05:54 21:29	06:44 (11) 22:02	05:59 (9)
27	08:14 16:44	07:13 17:46	06:05 18:40	07:58 (12) 20:39	05:52 21:31	06:43 (11) 22:03	05:20 (7)
28	08:12 16:46	07:11 17:48	06:03 18:41	07:59 (12) 20:41	05:50 21:33	06:42 (11) 22:04	05:21 (7)
29	08:11 16:48		06:00 18:43	08:01 (12) 20:43	05:48 21:35	06:41 (11) 22:05	05:56 (9)
30	08:09 16:50		05:58 18:45	08:03 (12) 20:45	05:46 21:37	06:40 (11) 22:06	05:22 (7)
31	08:08 16:51		05:55 19:47	08:05 (12) 20:47	05:44 21:39	06:39 (11) 22:07	05:57 (9)
	Sonnenscheinstunden astr.max.mögl.Beschattung	248 271	365 17	438	419 284	494 334	511 988

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: ZusatzbelastungSchattenrezeptor: F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47	05:22 (7)	05:26	06:22 (10)	06:21	07:12 (11)
2	21:52	34 05:56 (9)	21:17	2 06:24 (10)	20:11	9 07:21 (11)
3	04:47	05:23 (7)	05:28	06:19 (10)	06:23	9 07:09 (11)
4	21:52	33 05:56 (9)	21:15	9 06:28 (10)	20:08	15 07:24 (11)
5	04:48	05:24 (7)	05:30	06:16 (10)	06:25	15 07:07 (11)
6	21:51	33 05:57 (9)	21:14	14 06:30 (10)	20:06	19 07:26 (11)
7	04:49	05:25 (7)	05:31	06:15 (10)	06:26	19 07:06 (11)
8	21:51	32 05:57 (9)	21:12	16 06:31 (10)	20:03	21 07:27 (11)
9	04:50	05:25 (7)	05:33	06:14 (10)	06:28	21 07:04 (11)
10	21:50	31 05:56 (9)	21:10	19 06:33 (10)	20:01	23 07:27 (11)
11	04:51	05:26 (7)	05:35	06:13 (10)	06:30	23 07:03 (11)
12	21:50	30 05:56 (9)	21:08	20 06:33 (10)	19:58	25 07:28 (11)
13	04:52	05:27 (7)	05:36	06:13 (10)	06:32	25 07:02 (11)
14	21:49	30 05:57 (9)	21:06	21 06:34 (10)	19:56	26 07:28 (11)
15	04:53	05:28 (7)	05:38	06:11 (10)	06:33	26 07:02 (11)
16	21:48	29 05:57 (9)	21:04	23 06:34 (10)	19:54	25 07:27 (11)
17	04:54	05:29 (7)	05:40	06:12 (10)	06:35	25 07:04 (11)
18	21:48	27 05:56 (9)	21:02	22 06:34 (10)	19:51	23 07:27 (11)
19	04:55	05:30 (7)	05:42	06:14 (10)	06:37	23 07:06 (11)
20	21:47	26 05:56 (9)	21:00	21 06:35 (10)	19:49	21 07:27 (11)
21	04:56	05:31 (7)	05:43	06:15 (10)	06:39	21 07:08 (11)
22	21:46	25 05:56 (9)	20:58	19 06:34 (10)	19:46	19 07:27 (11)
23	04:57	05:32 (7)	05:45	06:17 (10)	06:41	19 07:09 (11)
24	21:45	24 05:56 (9)	20:56	17 06:34 (10)	19:44	16 07:25 (11)
25	04:58	05:33 (7)	05:47	06:19 (10)	06:42	16 07:11 (11)
26	21:44	22 05:55 (9)	20:54	15 06:34 (10)	19:41	14 07:25 (11)
27	04:59	05:34 (9)	05:49	06:20 (10)	06:44	14 07:13 (11)
28	21:43	21 05:55 (9)	20:52	13 06:33 (10)	19:39	11 07:24 (11)
29	05:01	05:36 (9)	05:51	11 06:22 (10)	06:46	11 07:15 (11)
30	21:42	19 05:55 (9)	20:50	11 06:33 (10)	19:36	8 07:23 (11)
31	05:02	05:37 (9)	05:52	8 06:23 (10)	06:48	8 07:16 (11)
32	21:41	17 05:54 (9)	20:47	8 06:31 (10)	19:34	4 07:20 (11)
33	05:03	05:38 (9)	05:54	6 06:25 (10)	06:50	
34	21:40	15 05:53 (9)	20:45	6 06:31 (10)	19:31	
35	05:05	05:39 (9)	05:56	6 06:27 (10)	06:51	
36	21:39	13 05:52 (9)	20:43	3 06:30 (10)	19:29	
37	05:06	05:40 (9)	05:58		06:53	
38	21:37	11 05:51 (9)	20:41		19:26	
39	05:07	05:42 (9)	05:59		06:55	
40	21:36	9 05:51 (9)	20:39		19:24	
41	05:09	05:43 (9)	06:01		06:57	
42	21:35	6 05:49 (9)	20:36		19:21	
43	05:10	05:45 (9)	06:03		06:58	
44	21:33	2 05:47 (9)	20:34		19:19	
45	05:12		06:05		07:00	
46	21:32		20:32		19:16	
47	05:13		06:07		07:02	
48	21:30		20:29		19:14	
49	05:15		06:08		07:04	
50	21:29		20:27		19:11	
51	05:16		06:10		07:06	
52	21:27		20:25		19:09	
53	05:18		06:12		07:07	
54	21:26		20:23		19:06	
55	05:20		06:14		07:09	08:09 (12)
56	21:24		20:20		19:04	12 08:21 (12)
57	05:21		06:16		07:11	12 08:05 (12)
58	21:22		20:18		19:01	18 08:23 (12)
59	05:23		06:17		07:13	18 08:03 (12)
60	21:21		20:15		18:59	21 08:24 (12)
61	05:25		06:19			07:11
62	21:19		20:13			16:47
63	Sonnenscheinstunden	514	462	384	330	380
64	astr.max.mögl.Beschattung	489	259	330	380	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattende	(WEA mit letztem Schatten)
	Minuten mit Schatten		

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** G - IO 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni						
1	08:35		08:06	08:36 (12)	07:08		06:53		05:43	06:11 (7)	04:52	05:30 (6)					
	16:02		16:53	6	08:42 (12)	17:50		19:49		07:12 (9)	21:36	22	05:52 (6)				
2	08:35		08:04		08:35 (12)	07:06		06:50	07:16 (10)	05:41	06:09 (7)	04:51	05:30 (6)				
	16:04		16:55	9	08:44 (12)	17:52		19:51	2	07:18 (10)	20:47	54	21:37	22	05:52 (6)		
3	08:35		08:02		08:33 (12)	07:04		06:48		07:14 (10)	05:39	06:07 (7)	04:50	05:30 (6)			
	16:05		16:57	12	08:45 (12)	17:54		19:53	6	07:20 (10)	20:49	54	07:10 (9)	21:38	22	05:52 (6)	
4	08:35		08:01		08:31 (12)	07:01	07:28 (11)	06:46		07:11 (10)	05:37	06:05 (7)	04:49	05:32 (6)			
	16:06		16:59	15	08:46 (12)	17:56	3	07:31 (11)	19:54	9	07:20 (10)	20:50	55	07:09 (9)	21:39	20	05:52 (6)
5	08:35		07:59		08:29 (12)	06:59		07:25 (11)	06:43		07:09 (10)	05:35	06:03 (7)	04:48	05:32 (6)		
	16:07		17:01	17	08:46 (12)	17:58	7	07:32 (11)	19:56	12	07:21 (10)	20:52	56	07:08 (9)	21:41	20	05:52 (6)
6	08:34		07:57		08:27 (12)	06:57		07:23 (11)	06:41		07:06 (10)	05:33	06:01 (7)	04:48	05:32 (6)		
	16:08		17:04	20	08:47 (12)	18:00	10	07:33 (11)	19:58	15	07:21 (10)	20:54	55	07:06 (9)	21:42	19	05:51 (6)
7	08:34		07:55		08:25 (12)	06:54		07:21 (11)	06:38		07:04 (10)	05:31	05:59 (7)	04:47	05:33 (6)		
	16:10		17:06	22	08:47 (12)	18:01	13	07:34 (11)	20:00	17	07:21 (10)	20:56	54	07:05 (9)	21:43	19	05:52 (6)
8	08:33		07:53		08:23 (12)	06:52		07:18 (11)	06:36		07:01 (10)	05:29	05:58 (7)	04:46	05:33 (6)		
	16:11		17:08	25	08:48 (12)	18:03	16	07:34 (11)	20:02	19	07:20 (10)	20:58	51	07:03 (9)	21:44	18	05:51 (6)
9	08:33		07:51		08:21 (12)	06:49		07:16 (11)	06:33		06:59 (10)	05:27	05:59 (7)	04:46	05:34 (6)		
	16:12		17:10	27	08:48 (12)	18:05	18	07:34 (11)	20:04	21	07:20 (10)	20:59	47	07:01 (9)	21:45	17	05:51 (6)
10	08:32		07:50		08:19 (12)	06:47		07:13 (11)	06:31		06:57 (10)	05:25	05:59 (7)	04:45	05:34 (6)		
	16:14		17:12	28	08:47 (12)	18:07	21	07:34 (11)	20:06	23	07:20 (10)	21:01	40	06:58 (9)	21:46	16	05:50 (6)
11	08:32		07:48		08:19 (12)	06:45		07:11 (11)	06:29		06:54 (9)	05:23	05:58 (7)	04:45	05:35 (6)		
	16:15		17:14	28	08:47 (12)	18:09	23	07:34 (11)	20:08	25	07:19 (10)	21:03	29	06:27 (7)	21:46	16	05:51 (6)
12	08:31		07:46		08:20 (12)	06:42		07:08 (11)	06:26		06:52 (9)	05:21	05:59 (7)	04:44	05:36 (6)		
	16:17		17:16	27	08:47 (12)	18:11	25	07:33 (11)	20:09	26	07:18 (10)	21:05	28	06:27 (7)	21:47	15	05:51 (6)
13	08:30		07:44		08:21 (12)	06:40		07:09 (11)	06:24		06:50 (9)	05:19	05:59 (7)	04:44	05:36 (6)		
	16:19		17:18	25	08:46 (12)	18:13	24	07:33 (11)	20:11	27	07:17 (10)	21:06	27	06:26 (7)	21:48	14	05:50 (6)
14	08:29		07:41		08:22 (12)	06:37		07:08 (11)	06:21		06:47 (9)	05:18	06:00 (7)	04:43	05:36 (6)		
	16:20		17:20	24	08:46 (12)	18:15	23	07:31 (11)	20:13	28	07:15 (10)	21:08	25	06:25 (7)	21:49	14	05:50 (6)
15	08:28		07:39		08:23 (12)	06:35		07:10 (11)	06:19		06:45 (9)	05:16	05:46 (6)	04:43	05:37 (6)		
	16:22		17:22	22	08:45 (12)	18:17	20	07:30 (11)	20:15	28	07:13 (10)	21:10	25	06:25 (7)	21:49	13	05:50 (6)
16	08:27		07:37		08:23 (12)	06:32		07:10 (11)	06:17		06:43 (9)	05:14	05:44 (6)	04:43	05:38 (6)		
	16:24		17:24	20	08:43 (12)	18:19	18	07:28 (11)	20:17	31	07:14 (9)	21:12	27	06:24 (7)	21:50	12	05:50 (6)
17	08:26		07:35		08:25 (12)	06:30		07:12 (11)	06:14		06:40 (9)	05:12	05:43 (6)	04:43	05:38 (6)		
	16:25		17:26	17	08:42 (12)	18:21	14	07:26 (11)	20:19	34	07:14 (9)	21:13	28	06:24 (7)	21:50	12	05:50 (6)
18	08:25		07:33		08:27 (12)	06:27		07:15 (11)	06:12		06:38 (9)	05:11	05:41 (6)	04:43	05:39 (6)		
	16:27		17:28	13	08:40 (12)	18:23	7	07:22 (11)	20:21	36	07:14 (9)	21:15	27	06:22 (7)	21:51	11	05:50 (6)
19	08:24		07:31		08:33 (12)	06:25		06:10			06:36 (9)	05:09	05:40 (6)	04:43	05:39 (6)		
	16:29		17:30	2	08:35 (12)	18:24		20:23	39	07:15 (9)	21:17	28	06:22 (7)	21:51	11	05:50 (6)	
20	08:23		07:29			06:23		06:07			06:36 (9)	05:08	05:38 (6)	04:43	05:39 (6)		
	16:31		17:32			18:26		20:24	40	07:16 (9)	21:18	27	06:20 (7)	21:52	11	05:50 (6)	
21	08:22		07:27			06:20		06:05			06:35 (9)	05:06	05:37 (6)	04:43	05:39 (6)		
	16:32		17:34			18:28		20:26	41	07:16 (9)	21:20	25	06:18 (7)	21:52	11	05:50 (6)	
22	08:21		07:24			06:18		06:03			06:34 (9)	05:05	05:36 (6)	04:43	05:39 (6)		
	16:34		17:36			18:30		20:28	41	07:15 (9)	21:21	20	06:15 (7)	21:52	11	05:50 (6)	
23	08:19		07:22			06:15		06:00			06:34 (9)	05:03	05:34 (6)	04:43	05:40 (6)		
	16:36		17:38			18:32		20:30	41	07:15 (9)	21:23	17	05:51 (6)	21:53	11	05:51 (6)	
24	08:18		07:20			06:13		05:58			06:34 (9)	05:02	05:33 (6)	04:43	05:40 (6)		
	16:38		17:40			18:34		20:32	41	07:15 (9)	21:25	19	05:52 (6)	21:53	11	05:51 (6)	
25	08:17		07:18			06:10		05:56			07:15 (9)	05:00	05:32 (6)	04:44	05:40 (6)		
	16:40		17:42			18:36		20:34	41	07:15 (9)	21:26	20	05:52 (6)	21:53	11	05:51 (6)	
26	08:15		07:15			06:08		05:54			06:34 (9)	04:59	05:31 (6)	04:44	05:41 (6)		
	16:42		17:44			18:38		20:36	41	07:15 (9)	21:28	21	05:52 (6)	21:53	11	05:52 (6)	
27	08:14		07:13			06:05		05:52			06:19 (7)	04:58	05:30 (6)	04:44	05:40 (6)		
	16:44		17:46			18:40		20:37	42	07:14 (9)	21:29	23	05:53 (6)	21:53	12	05:52 (6)	
28	08:12		07:11			06:03		05:49			06:17 (7)	04:56	05:29 (6)	04:45	05:41 (6)		
	16:46		17:48			18:41		20:39	46	07:14 (9)	21:30	24	05:53 (6)	21:53	12	05:53 (6)	
29	08:11					06:00		05:47			06:15 (7)	04:55	05:29 (6)	04:45	05:40 (6)		
	16:48					18:43		20:41	49	07:14 (9)	21:32	24	05:53 (6)	21:52	13	05:53 (6)	
30	08:09					05:58		05:45			06:13 (7)	04:54	05:29 (6)	04:46	05:40 (6)		
	16:49					18:45		20:43	51	07:13 (9)	21:33	24	05:53 (6)	21:52	14	05:54 (6)	
31	08:08	08:38 (12)				06:55					04:53		05:30 (6)				
	16:51	08:41 (12)				19:47					21:35		05:52 (6)				
Sonnenscheinstunden	248		271		359		365		419		494		1028		511	441	
astr.max.mögl.Beschattung	3						242		872								

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)		Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** G - IO 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	04:47		05:39 (6)	05:26	06:10 (7)	06:21	06:50 (9)	07:15	07:48 (11)	07:13	07:49 (12)	08:09
	21:52	15	05:54 (6)	21:17	06:36 (7)	20:11	07:17 (10)	18:56	08:11 (11)	16:45	08:16 (12)	15:59
2	04:47		05:40 (6)	05:28	06:10 (7)	06:23	06:52 (9)	07:17	07:47 (11)	07:15	07:49 (12)	08:11
	21:52	15	05:55 (6)	21:16	06:37 (7)	20:08	07:17 (10)	18:54	08:11 (11)	16:43	08:17 (12)	15:58
3	04:48		05:40 (6)	05:30	06:09 (7)	06:25	06:54 (9)	07:18	07:47 (11)	07:17	07:49 (12)	08:12
	21:51	16	05:56 (6)	21:14	06:37 (7)	20:06	07:18 (10)	18:51	08:12 (11)	16:41	08:17 (12)	15:58
4	04:49		05:40 (6)	05:31	06:09 (7)	06:26	06:56 (10)	07:20	07:49 (11)	07:19	07:52 (12)	08:14
	21:51	16	05:56 (6)	21:12	07:08 (9)	20:03	07:18 (10)	18:49	08:12 (11)	16:39	08:17 (12)	15:57
5	04:50		05:39 (6)	05:33	06:08 (7)	06:28	06:57 (10)	07:22	07:51 (11)	07:21	07:54 (12)	08:15
	21:50	17	05:56 (6)	21:10	07:10 (9)	20:01	07:17 (10)	18:47	08:12 (11)	16:37	08:17 (12)	15:56
6	04:51		05:39 (6)	05:35	06:08 (7)	06:30	06:59 (10)	07:24	07:52 (11)	07:23	07:56 (12)	08:17
	21:50	18	05:57 (6)	21:08	07:13 (9)	19:59	07:17 (10)	18:44	08:10 (11)	16:35	08:17 (12)	15:56
7	04:52		05:39 (6)	05:36	06:09 (7)	06:32	07:01 (10)	07:26	07:54 (11)	07:25	07:58 (12)	08:18
	21:49	19	05:58 (6)	21:06	07:15 (9)	19:56	07:17 (10)	18:42	08:10 (11)	16:33	08:16 (12)	15:55
8	04:53		05:39 (6)	05:38	06:10 (7)	06:33	07:02 (10)	07:28	07:56 (11)	07:27	08:00 (12)	08:19
	21:48	19	05:58 (6)	21:04	07:15 (9)	19:54	07:15 (10)	18:39	08:09 (11)	16:31	08:16 (12)	15:55
9	04:54		05:39 (6)	05:40	06:12 (7)	06:35	07:04 (10)	07:29	07:58 (11)	07:29	08:02 (12)	08:21
	21:48	20	05:59 (6)	21:02	07:17 (9)	19:51	07:15 (10)	18:37	08:08 (11)	16:29	08:15 (12)	15:54
10	04:55		05:38 (6)	05:42	06:14 (7)	06:37	07:06 (10)	07:31	08:00 (11)	07:31	08:04 (12)	08:22
	21:47	21	05:59 (6)	21:00	07:18 (9)	19:49	07:14 (10)	18:34	08:07 (11)	16:28	08:14 (12)	15:54
11	04:56		05:38 (6)	05:43	06:15 (7)	06:39	07:08 (10)	07:33	08:02 (11)	07:33	08:07 (12)	08:23
	21:46	22	06:00 (6)	20:58	07:18 (9)	19:46	07:12 (10)	18:32	08:05 (11)	16:26	08:14 (12)	15:54
12	04:57		05:38 (6)	05:45	06:17 (7)	06:41		07:35		07:35	08:09 (12)	08:24
	21:45	22	06:00 (6)	20:56	07:19 (9)	19:44		18:30		16:24	08:13 (12)	15:53
13	04:58		05:38 (6)	05:47	06:19 (7)	06:42		07:37		07:37	08:11 (12)	08:25
	21:44	22	06:00 (6)	20:54	07:20 (9)	19:41		18:27		16:23	08:12 (12)	15:53
14	04:59		05:38 (6)	05:49	06:20 (7)	06:44		07:39		07:39		08:26
	21:43	22	06:00 (6)	20:52	07:20 (9)	19:39		18:25		16:21		15:53
15	05:01		05:37 (6)	05:51	06:22 (7)	06:46		07:41		07:41		08:27
	21:42	24	06:01 (6)	20:50	07:21 (9)	19:36		18:23		16:19		15:53
16	05:02		05:38 (6)	05:52	06:23 (7)	06:48		07:43		07:43		08:28
	21:41	24	06:02 (6)	20:47	07:20 (9)	19:34		18:20		16:18		15:53
17	05:03		05:38 (6)	05:54	06:25 (7)	06:50		07:44		07:44		08:29
	21:40	24	06:02 (6)	20:45	07:21 (9)	19:31		18:18		16:16		15:53
18	05:05		05:39 (6)	05:56	06:40 (9)	06:51		07:46		07:46		08:30
	21:39	22	06:01 (6)	20:43	07:21 (9)	19:29		18:16		16:15		15:53
19	05:06		05:40 (6)	05:58	06:39 (9)	06:53		07:48		07:48		08:31
	21:37	21	06:01 (6)	20:41	07:21 (9)	19:26		18:13		16:13		15:54
20	05:07		05:42 (6)	05:59	06:39 (9)	06:55		07:50		07:50		08:32
	21:36	20	06:02 (6)	20:39	07:21 (9)	19:24		18:11		16:12		15:54
21	05:09		05:43 (6)	06:01	06:39 (9)	06:57		07:52		07:52		08:32
	21:35	19	06:02 (6)	20:36	07:21 (9)	19:21		18:09		16:10		15:54
22	05:10		05:44 (6)	06:03	06:39 (9)	06:58		07:54		07:54		08:33
	21:33	17	06:01 (6)	20:34	07:21 (9)	19:19		18:06		16:09		15:55
23	05:12		05:46 (6)	06:05	06:39 (9)	07:00		07:56		07:56		08:33
	21:32	20	06:25 (7)	20:32	07:20 (9)	19:16		18:04		16:08		15:55
24	05:13		05:47 (6)	06:07	06:39 (9)	07:02		07:58		07:57		08:34
	21:30	25	06:28 (7)	20:29	07:19 (9)	19:14		18:02		16:06		15:56
25	05:15		05:49 (6)	06:08	06:40 (9)	07:04		08:00		08:57 (12)	07:59	08:34
	21:29	27	06:31 (7)	20:27	07:19 (9)	19:11		18:00	11	09:08 (12)	16:05	15:56
26	05:16		05:50 (6)	06:10	06:40 (9)	07:06		08:02		08:55 (12)	08:01	08:35
	21:27	28	06:32 (7)	20:25	07:17 (9)	19:09		17:58	16	09:11 (12)	16:04	15:57
27	05:18		05:52 (6)	06:12	06:42 (9)	07:07		07:57 (11)		07:53 (12)	08:03	08:35
	21:26	27	06:33 (7)	20:23	07:17 (9)	19:06	8	08:05 (11)	16:55	08:12 (12)	16:03	15:58
28	05:20		05:53 (6)	06:14	06:44 (9)	07:09		07:54 (11)		07:52 (12)	08:04	08:35
	21:24	28	06:34 (7)	20:20	07:16 (9)	19:04	14	08:08 (11)	16:53	08:14 (12)	16:02	15:58
29	05:21		05:55 (6)	06:16	06:45 (9)	07:11		07:51 (11)		07:51 (12)	08:06	08:35
	21:22	27	06:35 (7)	20:18	07:14 (9)	19:01	18	08:09 (11)	16:51	08:15 (12)	16:01	15:59
30	05:23		05:56 (6)	06:17	06:47 (9)	07:13		07:49 (11)		07:50 (12)	08:08	08:35
	21:21	25	06:35 (7)	20:15	07:15 (10)	18:59	21	08:10 (11)	16:49	08:16 (12)	16:00	16:00
31	05:25		06:11 (7)	06:19	06:49 (9)			07:11		07:50 (12)		08:35
	21:19	25	06:36 (7)	20:13	07:17 (10)			16:47	26	08:16 (12)		16:01
Sonneneinstrahlung	514		462		384		330		259		232	
astr.max.mögl.Beschattung		667		1307		249		327		221		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:35 16:02	08:06 16:53	08:36 (12) 17:50	06:53 19:49	07:18 (10) 20:45	06:11 (7) 21:36	05:41 (6)
2	08:35 16:04	08:04 16:55	08:35 (12) 17:52	07:33 (11) 19:51	07:16 (10) 20:47	06:09 (7) 21:37	05:41 (6)
3	08:35 16:05	08:02 16:57	08:33 (12) 17:54	07:30 (11) 19:53	07:14 (10) 20:49	06:08 (7) 21:38	05:42 (6)
4	08:35 16:06	08:01 16:59	08:31 (12) 17:56	07:28 (11) 19:54	07:11 (10) 20:50	06:07 (7) 21:39	05:23 (5)
5	08:35 16:07	07:59 17:01	08:29 (12) 17:58	07:25 (11) 19:56	07:09 (10) 20:52	06:06 (7) 21:41	05:22 (5)
6	08:34 16:08	07:57 17:04	08:27 (12) 18:00	07:23 (11) 19:58	07:06 (10) 20:54	06:05 (7) 21:42	05:21 (5)
7	08:34 16:10	07:55 17:06	08:25 (12) 18:01	07:21 (11) 20:00	07:04 (10) 20:56	06:04 (7) 21:43	05:21 (5)
8	08:33 16:11	07:53 17:08	08:23 (12) 18:02	07:19 (11) 20:02	07:01 (9) 20:58	06:03 (7) 21:44	05:20 (5)
9	08:33 16:12	07:51 17:10	08:21 (12) 18:03	07:18 (11) 20:04	06:59 (9) 20:59	06:02 (7) 21:45	05:20 (5)
10	08:32 16:14	07:50 17:12	08:20 (12) 18:04	07:17 (11) 20:06	06:57 (9) 21:01	06:01 (7) 21:46	05:19 (5)
11	08:32 16:15	07:48 17:14	08:19 (12) 18:05	07:16 (11) 20:08	06:55 (9) 21:03	05:59 (6) 21:47	05:19 (5)
12	08:31 16:17	07:46 17:16	08:18 (12) 18:06	07:15 (11) 20:09	06:54 (9) 21:05	05:58 (6) 21:48	05:18 (5)
13	08:30 16:19	07:44 17:18	08:17 (12) 18:07	07:14 (11) 20:11	06:52 (9) 21:06	05:57 (6) 21:49	05:18 (5)
14	08:29 16:20	07:41 17:20	08:16 (12) 18:08	07:13 (11) 20:13	06:50 (9) 21:08	05:56 (6) 21:50	05:18 (5)
15	08:28 16:22	07:39 17:22	08:15 (12) 18:09	07:12 (11) 20:15	06:48 (9) 21:10	05:55 (6) 21:51	05:18 (5)
16	08:27 16:24	07:37 17:24	08:14 (12) 18:10	07:11 (11) 20:17	06:47 (9) 21:12	05:54 (6) 21:52	05:18 (5)
17	08:26 16:25	07:35 17:26	08:13 (12) 18:11	07:10 (11) 20:19	06:46 (9) 21:13	05:53 (6) 21:53	05:18 (5)
18	08:25 16:27	07:33 17:28	08:12 (12) 18:12	07:09 (11) 20:21	06:45 (9) 21:15	05:52 (6) 21:54	05:18 (5)
19	08:24 16:29	07:31 17:30	08:11 (12) 18:13	07:08 (11) 20:23	06:44 (9) 21:17	05:51 (6) 21:55	05:18 (5)
20	08:23 16:31	07:29 17:32	08:10 (12) 18:14	07:07 (11) 20:25	06:43 (9) 21:19	05:50 (6) 21:56	05:18 (5)
21	08:22 16:33	07:27 17:34	08:09 (12) 18:15	07:06 (11) 20:27	06:42 (9) 21:21	05:49 (6) 21:57	05:18 (5)
22	08:21 16:34	07:24 17:36	08:08 (12) 18:16	07:05 (11) 20:29	06:41 (9) 21:23	05:48 (6) 21:58	05:18 (5)
23	08:19 16:36	07:22 17:38	08:07 (12) 18:17	07:04 (11) 20:31	06:40 (9) 21:25	05:47 (6) 21:59	05:18 (5)
24	08:18 16:38	07:20 17:40	08:06 (12) 18:18	07:03 (11) 20:33	06:39 (9) 21:27	05:46 (6) 22:00	05:18 (5)
25	08:17 16:40	07:18 17:42	08:05 (12) 18:19	07:02 (11) 20:35	06:38 (9) 21:29	05:45 (6) 22:01	05:18 (5)
26	08:15 16:42	07:15 17:44	08:04 (12) 18:20	07:01 (11) 20:37	06:37 (9) 21:31	05:44 (6) 22:02	05:18 (5)
27	08:14 16:44	07:13 17:46	08:03 (12) 18:21	07:00 (11) 20:39	06:36 (9) 21:33	05:43 (6) 22:03	05:18 (5)
28	08:12 16:46	07:11 17:48	08:02 (12) 18:22	06:59 (11) 20:41	06:35 (9) 21:35	05:42 (6) 22:04	05:18 (5)
29	08:11 16:48	07:09 17:50	08:01 (12) 18:23	06:58 (11) 20:43	06:34 (9) 21:37	05:41 (6) 22:05	05:18 (5)
30	08:09 16:49	07:07 17:52	08:00 (12) 18:24	06:57 (11) 20:45	06:33 (9) 21:39	05:40 (6) 22:06	05:18 (5)
31	08:08 16:51	07:05 17:54	07:59 (12) 18:25	06:56 (11) 20:47	06:32 (9) 21:41	05:39 (6) 22:07	05:18 (5)
	Sonnenscheinstunden astr.max.mögl.Beschattung	248 14	271 321	365 228	419 1012	494 725	511 529

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Keskorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember					
1	04:47	05:22 (5)	05:26	05:59 (6)	06:21	06:50 (9)	07:15	07:57 (11)	07:13	07:54 (12)	08:09					
	21:52	18	05:40 (5)	21:17	24	06:39 (7)	20:11	35	07:25 (9)	18:56	15	08:12 (11)	16:45	24	08:18 (12)	15:59
2	04:47	05:23 (5)	05:28	06:01 (6)	06:23	06:52 (9)	07:17	07:55 (11)	07:15	07:53 (12)	08:11					
	21:52	17	05:40 (5)	21:16	24	06:41 (7)	20:08	33	07:25 (9)	18:54	18	08:13 (11)	16:43	25	08:18 (12)	15:58
3	04:48	05:24 (5)	05:30	06:02 (6)	06:25	06:54 (9)	07:18	07:53 (11)	07:17	07:52 (12)	08:12					
	21:51	16	05:40 (5)	21:14	22	06:41 (7)	20:06	30	07:24 (9)	18:51	21	08:14 (11)	16:41	27	08:19 (12)	15:58
4	04:49	05:25 (5)	05:31	06:20 (7)	06:26	06:56 (9)	07:20	07:52 (11)	07:19	07:53 (12)	08:14					
	21:51	15	05:40 (5)	21:12	23	06:43 (7)	20:03	27	07:23 (9)	18:49	23	08:15 (11)	16:39	27	08:20 (12)	15:57
5	04:50	05:25 (5)	05:33	06:19 (7)	06:28	06:57 (9)	07:22	07:52 (11)	07:21	07:54 (12)	08:15					
	21:50	13	05:38 (5)	21:10	24	06:43 (7)	20:01	25	07:22 (10)	18:47	23	08:15 (11)	16:37	26	08:20 (12)	15:56
6	04:51	05:26 (5)	05:35	06:18 (7)	06:30	06:59 (9)	07:24	07:52 (11)	07:23	07:56 (12)	08:17					
	21:50	12	05:38 (5)	21:08	26	06:44 (7)	19:59	23	07:22 (10)	18:44	23	08:15 (11)	16:35	24	08:20 (12)	15:56
7	04:52	05:27 (5)	05:36	06:18 (7)	06:32	07:01 (10)	07:26	07:54 (11)	07:25	07:58 (12)	08:18					
	21:49	10	05:37 (5)	21:06	27	06:45 (7)	19:56	22	07:23 (10)	18:42	21	08:15 (11)	16:33	21	08:19 (12)	15:55
8	04:53	05:28 (5)	05:38	06:17 (7)	06:33	07:02 (10)	07:28	07:56 (11)	07:27	08:00 (12)	08:19					
	21:48	13	05:58 (6)	21:04	27	06:44 (7)	19:54	20	07:22 (10)	18:39	18	08:14 (11)	16:31	19	08:19 (12)	15:55
9	04:54	05:29 (5)	05:40	06:17 (7)	06:35	07:04 (10)	07:29	07:58 (11)	07:29	08:02 (12)	08:21					
	21:48	14	06:00 (6)	21:02	28	06:45 (7)	19:51	18	07:22 (10)	18:37	16	08:14 (11)	16:29	17	08:19 (12)	15:54
10	04:55	05:30 (5)	05:42	06:17 (7)	06:37	07:06 (10)	07:31	08:00 (11)	07:31	08:04 (12)	08:22					
	21:47	13	06:01 (6)	21:00	28	06:45 (7)	19:49	15	07:21 (10)	18:34	13	08:13 (11)	16:28	14	08:18 (12)	15:54
11	04:56	05:50 (6)	05:43	06:16 (7)	06:39	07:08 (10)	07:33	08:02 (11)	07:33	08:07 (12)	08:23					
	21:46	12	06:02 (6)	20:58	29	06:45 (7)	19:46	13	07:21 (10)	18:32	10	08:12 (11)	16:26	12	08:19 (12)	15:54
12	04:57	05:49 (6)	05:45	06:17 (7)	06:41	07:09 (10)	07:35	08:04 (11)	07:35	08:09 (12)	08:24					
	21:45	14	06:03 (6)	20:56	40	07:18 (9)	19:44	10	07:19 (10)	18:30	7	08:11 (11)	16:24	9	08:18 (12)	15:53
13	04:58	05:48 (6)	05:47	06:19 (7)	06:42	07:11 (10)	07:37	08:06 (11)	07:37	08:11 (12)	08:25					
	21:44	16	06:04 (6)	20:54	44	07:21 (9)	19:41	7	07:18 (10)	18:27	4	08:10 (11)	16:23	6	08:17 (12)	15:53
14	04:59	05:48 (6)	05:49	06:20 (7)	06:44	07:13 (10)	07:39	07:17 (10)	18:25	07:39	08:13 (12)	08:26				
	21:43	17	06:05 (6)	20:52	46	07:22 (9)	19:39	4	07:17 (10)	18:25	3	08:16 (12)	16:21	5	08:16 (12)	15:53
15	05:01	05:47 (6)	05:51	06:22 (7)	06:46	07:41	07:41	07:41	07:41	08:17 (12)	08:27					
	21:42	18	06:05 (6)	20:50	47	07:24 (9)	19:36	18:23	16:19	15:53						
16	05:02	05:48 (6)	05:52	06:23 (7)	06:48	07:43	07:43	07:43	07:43	08:28						
	21:41	19	06:07 (6)	20:47	48	07:25 (9)	19:34	18:20	16:18	15:53						
17	05:03	05:47 (6)	05:54	06:25 (7)	06:50	07:44	07:44	07:44	07:44	08:29						
	21:40	20	06:07 (6)	20:45	47	07:26 (9)	19:31	18:18	16:16	15:53						
18	05:05	05:46 (6)	05:56	06:27 (7)	06:51	07:46	07:46	07:46	07:46	08:30						
	21:39	21	06:07 (6)	20:43	47	07:28 (9)	19:29	18:16	16:15	15:53						
19	05:06	05:46 (6)	05:58	06:28 (7)	06:53	07:48	07:48	07:48	07:48	08:31						
	21:37	21	06:07 (6)	20:41	46	07:28 (9)	19:26	18:13	16:13	15:54						
20	05:07	05:46 (6)	05:59	06:30 (7)	06:55	07:50	07:50	07:50	07:50	08:32						
	21:36	22	06:08 (6)	20:39	44	07:28 (9)	19:24	18:11	16:12	15:54						
21	05:09	05:46 (6)	06:01	06:32 (7)	06:57	07:52	07:52	07:52	07:52	08:32						
	21:35	22	06:08 (6)	20:36	41	07:29 (9)	19:21	18:09	16:10	15:54						
22	05:10	05:45 (6)	06:03	06:52 (9)	06:58	07:54	07:54	07:54	07:54	08:33						
	21:33	23	06:08 (6)	20:34	38	07:30 (9)	19:19	18:06	16:09	15:55						
23	05:12	05:46 (6)	06:05	06:50 (9)	07:00	07:56	07:56	07:56	07:56	08:33						
	21:32	23	06:09 (6)	20:32	39	07:29 (9)	19:16	18:04	16:08	15:55						
24	05:13	05:47 (6)	06:07	06:50 (9)	07:02	07:58	07:58	07:58	07:58	08:34						
	21:30	22	06:09 (6)	20:30	40	07:30 (9)	19:14	18:02	16:06	15:56						
25	05:15	05:49 (6)	06:08	06:50 (9)	07:04	08:00	08:00	08:00	08:00	08:34						
	21:29	21	06:10 (6)	20:27	40	07:30 (9)	19:11	18:00	16:05	15:56						
26	05:16	05:50 (6)	06:10	06:49 (9)	07:06	08:02	08:02	08:02	08:02	08:35						
	21:27	19	06:09 (6)	20:25	40	07:29 (9)	19:09	17:58	16:04	15:57						
27	05:18	05:52 (6)	06:12	06:49 (9)	07:07	07:04	07:04	08:01 (12)	08:03	08:35						
	21:26	17	06:09 (6)	20:23	40	07:29 (9)	19:06	16:55	9	08:10 (12)	16:03					
28	05:20	05:53 (6)	06:14	06:49 (9)	07:09	07:06	07:06	07:59 (12)	08:04	08:35						
	21:24	16	06:09 (6)	20:20	40	07:29 (9)	19:04	16:53	15	08:14 (12)	16:02					
29	05:21	05:55 (6)	06:16	06:48 (9)	07:11	07:08	07:08	07:57 (12)	08:06	08:35						
	21:22	14	06:09 (6)	20:18	40	07:28 (9)	19:01	16:51	18	08:15 (12)	16:01					
30	05:23	05:56 (6)	06:17	06:48 (9)	07:13	07:09	07:09	07:56 (12)	08:08	08:35						
	21:21	18	06:34 (7)	20:15	39	07:27 (9)	18:59	11	08:10 (11)	16:49	21	08:17 (12)	16:00			
31	05:25	05:58 (6)	06:19	06:49 (9)	07:11	07:11	07:11	07:54 (12)	08:08	08:35						
	21:19	22	06:38 (7)	20:13	38	07:27 (9)	16:47	23	08:17 (12)	16:01	232					
Sonnenscheinstunden	514		462		384		330		298		259		254		232	
astr.max.mögl.Beschattung		538		1126		293										

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744**SHADOW - Kalender****Berechnung: Zusatzbelastung Schattenrezeptor: I - IO 9****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni						
1	08:35		08:06		08:36 (12)	07:08	07:35 (11)	06:53	07:18 (10)	05:43	06:19 (7)	04:52	05:25 (5)				
	16:02		16:53	25	09:01 (12)	17:50	17	07:52 (11)	19:49	26	07:44 (9)	20:45	29	06:48 (7)	21:36	24	05:49 (5)
2	08:35		08:04		08:36 (12)	07:06	07:33 (11)	06:50	07:16 (10)	05:41	06:20 (7)	04:51	05:24 (5)				
	16:04		16:55	26	09:02 (12)	17:52	19	07:52 (11)	19:51	30	07:46 (9)	20:47	27	06:47 (7)	21:37	25	05:49 (5)
3	08:35		08:02		08:36 (12)	07:04	07:30 (11)	06:48	07:14 (9)	05:39	06:20 (7)	04:50	05:23 (5)				
	16:05		16:57	26	09:02 (12)	17:54	22	07:52 (11)	19:53	33	07:47 (9)	20:49	26	06:46 (7)	21:38	27	05:50 (5)
4	08:35		08:01		08:36 (12)	07:01	07:28 (11)	06:46	07:11 (9)	05:37	06:21 (7)	04:49	05:23 (5)				
	16:06		16:59	26	09:02 (12)	17:56	24	07:52 (11)	19:54	36	07:47 (9)	20:50	24	06:45 (7)	21:39	28	05:51 (5)
5	08:35		07:59		08:37 (12)	06:59	23	07:27 (11)	06:43	39	07:09 (9)	05:35	23	06:21 (7)	04:48	30	05:22 (5)
	16:07		17:01	25	09:02 (12)	17:58	23	07:50 (11)	19:56	40	07:47 (9)	20:54	22	06:44 (7)	21:41	31	05:52 (5)
6	08:34		07:57		08:38 (12)	06:57	20	07:27 (11)	06:41	41	07:07 (9)	05:33	22	06:01 (6)	04:48	31	05:52 (5)
	16:08		17:04	23	09:01 (12)	18:00	23	07:50 (11)	19:58	40	07:47 (9)	20:54	22	06:43 (7)	21:42	31	05:52 (5)
7	08:34		07:55		08:39 (12)	06:54	20	07:29 (11)	06:38	41	07:07 (9)	05:31	22	05:59 (6)	04:47	32	05:21 (5)
	16:10		17:06	21	09:00 (12)	18:01	20	07:49 (11)	20:00	41	07:48 (9)	20:56	22	06:41 (7)	21:43	32	05:53 (5)
8	08:33		07:53		08:40 (12)	06:52	18	07:29 (11)	06:36	41	07:06 (9)	05:29	21	05:57 (6)	04:46	33	05:20 (5)
	16:11		17:08	19	08:59 (12)	18:03	18	07:47 (11)	20:02	41	07:47 (9)	20:58	21	06:39 (7)	21:44	33	05:53 (5)
9	08:33		07:51		08:41 (12)	06:49	15	07:31 (11)	06:33	41	07:06 (9)	05:27	17	05:56 (6)	04:46	34	05:20 (5)
	16:12		17:10	17	08:58 (12)	18:05	15	07:46 (11)	20:04	41	07:47 (9)	20:59	17	06:37 (7)	21:45	34	05:54 (5)
10	08:32		07:50		08:42 (12)	06:47	9	07:33 (11)	06:31	41	07:06 (9)	05:25	12	05:54 (6)	04:45	35	05:19 (5)
	16:14		17:12	13	08:55 (12)	18:07	9	07:42 (11)	20:06	41	07:47 (9)	21:01	12	06:06 (6)	21:46	35	05:54 (5)
11	08:32		07:48		08:46 (12)	06:45		06:29	20:08	41	07:05 (9)	05:23	14	05:52 (6)	04:45	36	05:19 (5)
	16:15		17:14	6	08:52 (12)	18:09		06:26	20:08	41	07:46 (9)	21:03	14	06:06 (6)	21:46	36	05:55 (5)
12	08:31		07:46			06:42		06:22	20:09	41	07:05 (9)	05:21	16	05:51 (6)	04:44	37	05:19 (5)
	16:17		17:16			18:11		20:09	20:09	41	07:46 (9)	21:05	16	06:07 (6)	21:47	37	05:56 (5)
13	08:30		07:44			06:40		06:24	20:10	41	07:05 (9)	05:19	18	05:49 (6)	04:44	37	05:18 (5)
	16:19		17:18			18:13		20:11	20:11	41	07:46 (9)	21:06	18	06:07 (6)	21:48	37	05:55 (5)
14	08:29		07:41			06:37		06:21	20:12	41	07:05 (9)	05:18	20	05:47 (6)	04:43	38	05:18 (5)
	16:20		17:20			18:15		20:13	20:13	40	07:45 (9)	21:08	20	06:07 (6)	21:49	38	05:56 (5)
15	08:28		07:39			06:35		06:19	20:14	39	07:05 (9)	05:16	22	05:46 (6)	04:43	38	05:18 (5)
	16:22		17:22			18:17		20:15	20:15	39	07:44 (9)	21:10	22	06:08 (6)	21:49	38	05:56 (5)
16	08:27		07:37			06:32		06:17	20:16	38	07:06 (9)	05:14	23	05:44 (6)	04:43	38	05:19 (5)
	16:24		17:24			18:19		20:17	20:17	38	07:44 (9)	21:12	23	06:07 (6)	21:50	38	05:57 (5)
17	08:26		07:35			06:30		06:14	20:18	36	07:06 (9)	05:12	25	05:43 (6)	04:43	38	05:19 (5)
	16:25		17:26			18:21		20:19	20:19	36	07:42 (9)	21:13	25	06:08 (6)	21:50	38	05:57 (5)
18	08:25		07:33			06:27		06:12	20:20	40	06:38 (7)	05:11	24	05:43 (6)	04:43	38	05:19 (5)
	16:27		17:28			18:23		20:21	20:21	40	07:41 (9)	21:15	24	06:07 (6)	21:51	38	05:57 (5)
19	08:24		07:31			06:25		06:10	20:22	42	07:40 (9)	21:17	24	05:43 (6)	04:43	39	05:19 (5)
	16:29		17:30			18:24		20:23	20:23	42	07:40 (9)	21:17	24	06:07 (6)	21:51	39	05:58 (5)
20	08:23		07:29			06:23		06:07	20:24	43	07:39 (9)	21:18	23	05:43 (6)	04:43	39	05:19 (5)
	16:31		17:32			18:26		20:24	20:24	43	07:39 (9)	21:18	23	06:06 (6)	21:52	39	05:58 (5)
21	08:22		07:27			06:20		06:05	20:25	43	07:37 (9)	21:20	22	05:44 (6)	04:43	39	05:19 (5)
	16:32		17:34			18:28		20:26	20:26	43	07:37 (9)	21:20	22	06:06 (6)	21:52	39	05:58 (5)
22	08:21	08:53 (12)	07:24			06:18		06:03	20:27	42	06:29 (7)	05:05	21	05:45 (6)	04:43	39	05:19 (5)
	16:34	2	08:55 (12)	17:36		18:30		20:28	20:28	42	07:34 (9)	21:21	21	06:06 (6)	21:52	39	05:58 (5)
23	08:19	08:52 (12)	07:22			06:15		06:00	20:29	40	06:27 (7)	05:03	20	05:45 (6)	04:43	39	05:20 (5)
	16:36	4	08:56 (12)	17:38		18:32		20:30	20:30	40	07:32 (9)	21:23	20	06:05 (6)	21:53	39	05:59 (5)
24	08:18	08:50 (12)	07:20		07:47 (11)	06:13		05:58	20:31	36	06:25 (7)	05:02	20	05:45 (6)	04:43	39	05:20 (5)
	16:38	7	08:57 (12)	17:40	1	07:48 (11)	18:34	20:32	20:32	36	07:28 (9)	21:25	20	06:05 (6)	21:53	39	05:59 (5)
25	08:17	08:49 (12)	07:18			06:10		05:56	20:33	36	06:23 (7)	05:00	18	05:46 (6)	04:44	39	05:20 (5)
	16:40	10	08:59 (12)	17:42	5	07:50 (11)	18:36	20:34	20:34	26	06:49 (7)	21:26	18	06:04 (6)	21:53	39	05:59 (5)
26	08:15	08:47 (12)	07:15		07:42 (11)	06:08		05:54	20:35	26	06:49 (7)	21:26	18	05:31 (5)	04:44	39	05:21 (5)
	16:42	12	08:59 (12)	17:44	8	07:50 (11)	18:38	5	06:38 (10)	28	06:49 (7)	21:28	26	06:04 (6)	21:53	38	05:59 (5)
27	08:14	08:45 (12)	07:13		07:40 (11)	06:05		05:51	20:36	28	06:19 (7)	04:58	26	05:30 (5)	04:44	38	05:21 (5)
	16:44	15	09:00 (12)	17:46	11	07:51 (11)	18:40	8	06:39 (10)	30	06:49 (7)	21:29	26	06:03 (6)	21:53	38	05:59 (5)
28	08:12	08:44 (12)	07:11		07:38 (11)	06:03		05:49	20:37	30	06:19 (7)	04:56	26	05:29 (5)	04:45	38	05:22 (5)
	16:46	17	09:01 (12)	17:48	14	07:52 (11)	18:41	11	06:28 (10)	30	06:49 (7)	21:30	27	06:02 (6)	21:53	38	06:00 (5)
29	08:11	08:42 (12)				06:00		05:47	20:39	30	06:19 (7)	04:55	27	05:28 (5)	04:45	38	05:21 (5)
	16:48	19	09:01 (12)			18:43	14	06:40 (10)	20:41	30	06:49 (7)	21:32	28	06:01 (6)	21:52	38	05:59 (5)
30	08:09	08:40 (12)				05:58		06:23 (10)	20:43	29	06:19 (7)	04:54	28	05:27 (5)	04:46	38	05:22 (5)
	16:49	21	09:01 (12)			18:45	18	06:41 (9)	20:43	29	06:48 (7)	21:33	24	05:58 (6)	21:52	38	06:00 (5)
31	08:08	08:38 (12)				06:55		07:21 (10)			04:53		22	05:26 (5)			
	16:51	23	09:01 (12)			19:47	23	07:44 (9)			21:35		22	05:48 (5)			
Sonneneinstrahlung		248		271		365		419		1103		494		686		511	1062
astr. max. mögl. Beschattung		130		266		269											

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: I - IO 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	04:47		05:22 (5)	05:26	05:59 (6)	06:21	07:04 (9)	07:15		07:13		08:09
	21:52	37	05:59 (5)	21:17	06:17 (6)	20:11	07:45 (9)	18:56		16:45		15:59
2	04:47		05:23 (5)	05:28	06:01 (6)	06:23	07:04 (9)	07:17		07:15	08:13 (12)	08:11
	21:52	37	06:00 (5)	21:16	06:17 (6)	20:08	07:45 (9)	18:54		16:43	11	15:58
3	04:48		05:24 (5)	05:30	06:02 (6)	06:25	07:04 (9)	07:18		07:17		08:12
	21:51	36	06:00 (5)	21:14	06:16 (6)	20:06	07:45 (9)	18:51		16:41	15	15:58
4	04:49		05:25 (5)	05:31	06:04 (6)	06:26	07:04 (9)	07:20		07:19		08:14
	21:51	35	06:00 (5)	21:12	06:16 (6)	20:03	07:45 (9)	18:49		16:39	19	15:57
5	04:50		05:25 (5)	05:33	06:05 (6)	06:28	07:03 (9)	07:22	08:11 (11)	07:21		08:15
	21:50	34	05:59 (5)	21:10	06:46 (7)	20:01	07:44 (9)	18:47	9	08:20 (11)	21	15:56
6	04:51		05:26 (5)	05:35	06:07 (6)	06:30	07:03 (9)	07:24		08:07 (11)		08:17
	21:50	33	05:59 (5)	21:08	06:49 (7)	19:59	07:44 (9)	18:44	15	08:22 (11)	23	15:56
7	04:52		05:27 (5)	05:36	06:09 (6)	06:32	07:03 (9)	07:26		08:05 (11)		08:18
	21:49	32	05:59 (5)	21:06	06:51 (7)	19:56	07:44 (9)	18:42	18	08:23 (11)	24	15:55
8	04:53		05:28 (5)	05:38	06:10 (6)	06:33	07:03 (9)	07:28		08:04 (11)		08:19
	21:48	31	05:59 (5)	21:04	06:52 (7)	19:54	07:42 (9)	18:39	20	08:24 (11)	26	15:55
9	04:54		05:29 (5)	05:40	06:31 (7)	06:35	07:04 (9)	07:29		08:02 (11)		08:21
	21:48	30	05:59 (5)	21:02	06:53 (7)	19:51	07:41 (9)	18:37	23	08:25 (11)	26	15:54
10	04:55		05:30 (5)	05:42	06:30 (7)	06:37	07:06 (9)	07:31		08:02 (11)		08:22
	21:47	28	05:58 (5)	21:00	06:55 (7)	19:49	07:40 (9)	18:34	23	08:25 (11)	26	15:54
11	04:56		05:31 (5)	05:43	06:29 (7)	06:39	07:08 (10)	07:33		08:02 (11)		08:23
	21:46	27	05:58 (5)	20:58	06:55 (7)	19:46	07:39 (9)	18:32	24	08:26 (11)	26	15:54
12	04:57		05:32 (5)	05:45	06:28 (7)	06:41	07:09 (10)	07:35		08:04 (11)		08:24
	21:45	25	05:57 (5)	20:56	06:55 (7)	19:44	07:37 (9)	18:30	22	08:26 (11)	24	15:53
13	04:58		05:33 (5)	05:47	06:28 (7)	06:42	07:11 (10)	07:37		08:06 (11)		08:25
	21:44	24	05:57 (5)	20:54	06:56 (7)	19:41	07:36 (9)	18:27	19	08:25 (11)	22	15:53
14	04:59		05:34 (5)	05:49	06:27 (7)	06:44	07:13 (10)	07:39		08:08 (11)		08:26
	21:43	22	05:56 (5)	20:52	06:56 (7)	19:39	07:34 (9)	18:25	17	08:25 (11)	20	15:53
15	05:01		05:35 (5)	05:51	06:27 (7)	06:46	07:15 (10)	07:41		08:10 (11)		08:27
	21:42	26	06:07 (6)	20:50	06:56 (7)	19:36	07:32 (9)	18:23	15	08:25 (11)	18	15:53
16	05:02		05:37 (5)	05:52	06:26 (7)	06:48	07:16 (10)	07:43		08:12 (11)		08:28
	21:41	28	06:10 (6)	20:47	06:55 (7)	19:34	07:29 (10)	18:20	12	08:24 (11)	16	15:53
17	05:03		05:38 (5)	05:54	06:26 (7)	06:50	07:18 (10)	07:44		08:14 (11)		08:29
	21:40	27	06:11 (6)	20:45	06:56 (7)	19:31	07:28 (10)	18:18	9	08:23 (11)	13	15:53
18	05:05		05:39 (5)	05:56	06:27 (7)	06:51	07:20 (10)	07:46		08:16 (11)		08:30
	21:39	26	06:12 (6)	20:43	06:56 (7)	19:29	07:27 (10)	18:16	5	08:21 (11)	11	15:53
19	05:06		05:40 (5)	05:58	06:28 (7)	06:53	07:22 (10)	07:48		08:18 (11)		08:31
	21:37	26	06:13 (6)	20:41	06:55 (7)	19:26	07:25 (10)	18:13	2	08:20 (11)	8	15:54
20	05:07		05:56 (6)	05:59	06:30 (7)	06:55		07:50				08:32
	21:36	18	06:14 (6)	20:39	07:32 (9)	19:24		18:11			6	15:54
21	05:09		05:55 (6)	06:01	06:32 (7)	06:57		07:52				08:32
	21:35	20	06:15 (6)	20:36	07:37 (9)	19:21		18:09			3	15:54
22	05:10		05:55 (6)	06:03	06:34 (7)	06:58		07:54				08:33
	21:33	20	06:15 (6)	20:34	07:39 (9)	19:19		18:06				15:55
23	05:12		05:55 (6)	06:05	06:35 (7)	07:00		07:56				08:33
	21:32	21	06:16 (6)	20:32	07:40 (9)	19:16		18:04				15:55
24	05:13		05:54 (6)	06:07	06:37 (7)	07:02		07:58				08:34
	21:30	22	06:16 (6)	20:30	07:42 (9)	19:14		18:02				15:56
25	05:15		05:54 (6)	06:08	06:39 (7)	07:04		08:00				08:34
	21:29	23	06:17 (6)	20:27	07:43 (9)	19:11		18:00				15:56
26	05:16		05:53 (6)	06:10	06:40 (7)	07:06		08:02				08:35
	21:27	24	06:17 (6)	20:25	07:43 (9)	19:09		17:58				15:57
27	05:18		05:54 (6)	06:12	06:42 (7)	07:07		07:04				08:35
	21:26	24	06:18 (6)	20:23	07:44 (9)	19:06		16:55				15:58
28	05:20		05:53 (6)	06:14	07:08 (9)	07:09		07:06				08:35
	21:24	25	06:18 (6)	20:20	07:45 (9)	19:04		16:53				15:58
29	05:21		05:55 (6)	06:16	07:06 (9)	07:11		07:08				08:35
	21:23	23	06:18 (6)	20:18	07:45 (9)	19:01		16:51				15:59
30	05:23		05:56 (6)	06:17	07:06 (9)	07:13		07:09				08:35
	21:21	22	06:18 (6)	20:15	07:45 (9)	18:59		16:49				16:00
31	05:25		05:58 (6)	06:19	07:05 (9)			07:11				08:35
	21:19	20	06:18 (6)	20:13	07:46 (9)			16:47				16:01
Sonnenscheinstunden	514			462		384		330		259		232
astr.max.mögl.Beschattung		826		917		552		233		358		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** J - IO 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:36 16:02	10:18 (2) 16:53	08:06 17:50	06:53 19:49	05:43 20:45	04:52 21:36	04:47 21:52	05:26 21:17	06:21 20:11	07:15 18:56	07:13 16:45	08:09 15:59
2	08:35 16:03	10:18 (2) 16:55	08:04 17:52	06:50 19:51	05:41 20:47	04:51 21:37	04:47 21:52	05:28 21:16	06:23 20:08	07:17 18:54	07:15 16:43	08:11 15:58
3	08:35 16:04	10:19 (2) 16:57	08:03 17:54	06:48 19:53	05:39 20:49	04:50 21:38	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:51	07:17 16:41	08:12 15:57
4	08:35 16:06	10:21 (2) 16:59	08:01 17:56	06:45 19:54	05:37 20:50	04:49 21:40	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	07:19 16:39	08:14 15:57
5	08:35 16:07	10:21 (2) 17:01	07:59 17:58	06:43 19:56	05:35 20:52	04:48 21:41	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:47	07:21 16:37	08:15 15:56
6	08:34 16:08	10:23 (2) 17:03	07:57 17:59	06:41 19:58	05:32 20:54	04:47 21:42	04:50 21:50	05:35 21:08	06:30 19:59	07:24 18:44	07:23 16:35	08:17 15:55
7	08:34 16:10	10:24 (2) 17:05	07:55 18:01	06:38 20:00	05:31 20:56	04:47 21:43	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 15:55
8	08:33 16:11	10:25 (2) 17:07	07:53 18:03	06:36 20:02	05:29 20:58	04:46 21:44	04:52 21:48	05:38 21:04	06:33 19:54	07:28 18:39	07:27 16:31	08:19 15:54
9	08:33 16:12	10:27 (2) 17:09	07:52 18:05	06:49 20:04	05:27 20:59	04:45 21:45	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:37	07:29 16:29	08:21 15:54
10	08:32 16:14	10:30 (2) 17:12	07:50 18:07	06:47 20:06	05:25 21:01	04:45 21:46	04:55 21:47	05:42 21:00	06:37 19:49	07:31 18:34	07:31 16:28	08:22 15:54
11	08:32 16:15	10:39 (2) 17:14	07:48 18:09	06:45 20:08	05:23 21:03	04:44 21:47	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 16:26	08:23 15:53
12	08:31 16:17	10:41 (2) 17:16	07:46 18:11	06:42 20:09	05:21 21:05	04:44 21:47	04:57 21:45	05:45 20:56	06:41 19:44	07:35 18:30	07:35 16:24	08:24 15:53
13	08:30 16:18	10:42 (2) 17:18	07:44 18:13	06:40 20:11	05:19 21:07	04:44 21:48	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	07:37 16:22	08:25 15:53
14	08:29 16:20	10:43 (2) 17:20	07:42 18:15	06:37 20:13	05:17 21:08	04:43 21:49	04:59 21:43	05:49 20:52	06:44 19:39	07:39 18:25	07:39 16:21	08:27 15:53
15	08:28 16:22	10:44 (2) 17:22	07:40 18:17	06:35 20:15	05:16 21:10	04:43 21:49	05:00 21:42	05:50 20:50	06:46 19:36	07:41 18:22	07:41 16:19	08:27 15:53
16	08:27 16:23	10:45 (2) 17:24	07:37 18:19	06:32 20:17	05:14 21:12	04:43 21:50	05:02 21:41	05:52 20:47	06:48 19:34	07:43 18:20	07:43 16:18	08:28 15:53
17	08:26 16:25	10:46 (2) 17:26	07:35 18:21	06:30 20:19	05:12 21:13	04:43 21:51	05:03 21:40	05:54 20:45	06:49 19:31	07:44 18:18	07:45 16:16	08:29 15:53
18	08:25 16:27	10:47 (2) 17:28	07:33 18:23	06:27 20:21	05:11 21:15	04:42 21:51	05:04 21:39	05:56 20:43	06:51 19:29	07:46 18:15	07:46 16:14	08:30 15:53
19	08:24 16:29	10:48 (2) 17:30	07:31 18:24	06:25 20:23	05:09 21:17	04:42 21:52	05:06 21:37	05:58 20:41	06:53 19:26	07:48 18:13	07:48 16:13	08:31 15:53
20	08:23 16:30	10:49 (2) 17:32	07:29 18:26	06:23 20:24	05:07 21:18	04:42 21:52	05:07 21:36	05:59 20:39	06:55 19:24	07:50 18:11	07:50 16:12	08:32 15:54
21	08:22 16:32	10:50 (2) 17:34	07:27 18:28	06:20 20:26	05:06 21:20	04:43 21:52	05:09 21:35	06:01 20:36	06:57 19:21	07:52 18:09	07:52 16:10	08:32 15:54
22	08:21 16:34	10:51 (2) 17:36	07:24 18:30	06:18 20:28	05:04 21:22	04:43 21:52	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	07:54 16:09	08:33 15:54
23	08:19 16:36	10:52 (2) 17:38	07:22 18:32	06:15 20:30	05:03 21:23	04:43 21:53	05:12 21:32	06:05 20:32	07:00 19:16	07:56 18:04	07:56 16:08	08:33 15:55
24	08:18 16:38	10:53 (2) 17:40	07:20 18:34	06:13 20:32	05:02 21:25	04:43 21:53	05:13 21:31	06:07 20:30	07:02 19:14	07:58 18:02	07:57 16:06	08:34 15:55
25	08:17 16:40	10:54 (2) 17:42	07:18 18:36	06:10 20:34	05:00 21:26	04:43 21:53	05:15 21:29	06:08 20:27	07:04 19:11	07:59 18:00	07:59 16:05	08:34 15:56
26	08:15 16:42	10:55 (2) 17:44	07:15 18:38	06:08 20:36	04:59 21:28	04:44 21:53	05:16 21:27	06:10 20:25	07:06 19:09	08:02 17:58	08:01 16:04	08:35 15:57
27	08:14 16:44	10:56 (2) 17:46	07:13 18:39	06:05 20:37	04:58 21:29	04:44 21:53	05:18 21:26	06:12 20:23	07:07 19:06	08:03 17:56	08:03 16:03	08:35 15:57
28	08:12 16:45	10:57 (2) 17:48	07:11 18:41	06:03 20:39	04:56 21:31	04:45 21:53	05:19 21:24	06:14 20:20	07:09 19:04	08:04 17:54	08:04 16:02	08:35 15:58
29	08:11 16:47	10:58 (2) 17:50	07:09 18:43	06:01 20:41	04:55 21:32	04:45 21:53	05:21 21:23	06:16 20:18	07:11 19:01	08:06 17:51	08:06 16:01	08:35 15:59
30	08:09 16:49	10:59 (2) 17:52	07:07 18:45	05:59 20:43	04:54 21:33	04:46 21:52	05:23 21:21	06:17 20:15	07:13 18:59	08:08 17:49	08:08 16:00	08:35 16:00
31	08:08 16:51	11:00 (2) 17:54	07:05 18:47	05:57 20:45	04:53 21:35	04:45 21:53	05:24 21:19	06:19 20:13	07:14 18:59	08:09 17:49	08:09 16:01	08:35 16:01
	Sonnenscheinstunden astr. max. mögl. Beschattung	248 196	271 365	419 494	511 594	515 594	462 515	384 462	330 462	259 330	232 330	716 716

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni			
1	08:35	12:57 (6)	08:06	15:13 (4)	07:08	15:25 (4)	06:53	18:28 (2)	05:43	04:52				
	16:02	62	15:27 (5)	16:53	52	16:05 (4)	17:50	55	16:54 (3)	19:49	47	19:15 (2)	20:45	21:36
2	08:35	12:57 (6)	08:04	15:13 (4)	07:06	15:28 (4)	06:50	18:28 (2)	05:41	04:51				
	16:03	64	15:28 (5)	16:55	53	16:06 (4)	17:52	48	16:53 (3)	19:51	48	19:16 (2)	20:47	21:37
3	08:35	12:58 (6)	08:02	15:13 (4)	07:04	15:31 (4)	06:48	18:26 (2)	05:39	04:50				
	16:04	63	15:29 (5)	16:57	55	16:08 (4)	17:54	36	16:50 (3)	19:53	50	19:16 (2)	20:48	21:38
4	08:35	12:58 (6)	08:01	15:13 (4)	07:01	16:37 (3)	06:45	18:26 (2)	05:36	04:49				
	16:06	64	15:30 (5)	16:59	55	16:08 (4)	17:56	10	16:47 (3)	19:54	51	19:17 (2)	20:50	21:39
5	08:35	12:59 (6)	07:59	15:12 (4)	06:59		06:43	18:25 (2)	05:34	04:48				
	16:07	65	15:32 (5)	17:01	57	16:09 (4)	17:57		19:56	52	19:17 (2)	20:52	21:41	
6	08:34	13:00 (6)	07:57	15:12 (4)	06:57		06:41	18:24 (2)	05:32	04:47				
	16:08	65	15:33 (5)	17:03	57	16:09 (4)	17:59		19:58	53	19:17 (2)	20:54	21:42	
7	08:34	13:01 (6)	07:55	15:12 (4)	06:54		06:38	18:24 (2)	05:30	04:47				
	16:10	64	15:34 (5)	17:05	58	16:10 (4)	18:01		20:00	53	19:17 (2)	20:56	21:43	
8	08:33	13:02 (6)	07:53	15:12 (4)	06:52		06:36	18:23 (2)	05:29	04:46				
	16:11	64	15:35 (5)	17:07	58	16:10 (4)	18:03		20:02	53	19:16 (2)	20:58	21:44	
9	08:33	13:03 (6)	07:51	15:12 (4)	06:49		06:33	18:23 (2)	05:27	04:45				
	16:12	62	15:35 (5)	17:09	58	16:10 (4)	18:05		20:04	53	19:16 (2)	20:59	21:45	
10	08:32	13:04 (6)	07:49	15:11 (4)	06:47		06:31	18:23 (2)	05:25	04:45				
	16:14	61	15:35 (5)	17:11	65	16:43 (3)	18:07		20:06	53	19:16 (2)	21:01	21:46	
11	08:32	13:06 (6)	07:47	15:11 (4)	06:45		06:28	18:22 (2)	05:23	04:44				
	16:15	59	15:37 (5)	17:14	70	16:45 (3)	18:09		20:08	53	19:15 (2)	21:03	21:46	
12	08:31	13:08 (6)	07:45	15:11 (4)	06:42		06:26	18:23 (2)	05:21	04:44				
	16:17	56	15:37 (5)	17:16	75	16:48 (3)	18:11		20:09	52	19:15 (2)	21:05	21:47	
13	08:30	13:09 (6)	07:43	15:11 (4)	06:40		06:24	18:23 (2)	05:19	04:44				
	16:18	55	15:37 (5)	17:18	79	16:50 (3)	18:13		20:11	52	19:15 (2)	21:06	21:48	
14	08:29	13:11 (6)	07:41	15:11 (4)	06:37		06:21	18:23 (2)	05:17	04:43				
	16:20	52	15:38 (5)	17:20	82	16:52 (3)	18:15		20:13	51	19:14 (2)	21:08	21:49	
15	08:28	13:13 (6)	07:39	15:12 (4)	06:35		06:19	18:23 (2)	05:16	04:43				
	16:22	47	15:37 (5)	17:22	85	16:55 (3)	18:17		20:15	51	19:14 (2)	21:10	21:49	
16	08:27	13:16 (6)	07:37	15:11 (4)	06:32		06:16	18:24 (2)	05:14	04:43				
	16:23	42	15:38 (5)	17:24	87	16:56 (3)	18:19		20:17	49	19:13 (2)	21:12	21:50	
17	08:26	15:08 (5)	07:35	15:12 (4)	06:30		17:51 (1)	06:14	18:23 (2)	05:12	04:43			
	16:25	31	15:39 (4)	17:26	89	16:58 (3)	18:21	5	17:56 (1)	20:19	48	19:11 (2)	21:13	21:50
18	08:25	15:09 (5)	07:33	15:12 (4)	06:27		17:48 (1)	06:12	18:24 (2)	05:11	04:42			
	16:27	35	15:44 (4)	17:28	89	16:59 (3)	18:22	10	17:58 (1)	20:21	47	19:11 (2)	21:15	21:51
19	08:24	15:09 (5)	07:31	15:13 (4)	06:25		17:46 (1)	06:09	18:25 (2)	05:09	04:42			
	16:29	37	15:46 (4)	17:30	89	17:00 (3)	18:24	14	18:00 (1)	20:22	45	19:10 (2)	21:17	21:51
20	08:23	15:10 (5)	07:29	15:13 (4)	06:22		17:44 (1)	06:07	18:26 (2)	05:07	04:42			
	16:30	39	15:49 (4)	17:32	88	16:59 (3)	18:26	17	18:01 (1)	20:24	43	19:09 (2)	21:18	21:52
21	08:22	15:11 (5)	07:26	15:14 (4)	06:20		17:43 (1)	06:05	18:26 (2)	05:06	04:43			
	16:32	41	15:52 (4)	17:34	88	17:00 (3)	18:28	21	18:04 (1)	20:26	41	19:07 (2)	21:20	21:52
22	08:21	15:11 (5)	07:24	15:15 (4)	06:18		17:41 (1)	06:03	18:28 (2)	05:04	04:43			
	16:34	42	15:53 (4)	17:36	86	17:00 (3)	18:30	24	18:05 (1)	20:28	38	19:06 (2)	21:21	21:52
23	08:19	15:13 (5)	07:22	15:15 (4)	06:15		17:41 (1)	06:00	18:29 (2)	05:03	04:43			
	16:36	42	15:55 (4)	17:38	83	16:59 (3)	18:32	27	18:08 (1)	20:30	35	19:04 (2)	21:23	21:53
24	08:18	15:13 (5)	07:20	15:17 (4)	06:13		17:39 (1)	05:58	18:31 (2)	05:02	04:43			
	16:38	43	15:56 (4)	17:40	81	16:59 (3)	18:34	30	18:09 (1)	20:32	32	19:03 (2)	21:25	21:53
25	08:17	15:15 (5)	07:18	15:18 (4)	06:10		17:39 (1)	05:56	18:33 (2)	05:00	04:43			
	16:40	43	15:58 (4)	17:42	78	16:59 (3)	18:36	30	18:09 (1)	20:34	28	19:01 (2)	21:26	21:53
26	08:15	15:16 (5)	07:15	15:19 (4)	06:08		17:39 (2)	05:54	18:35 (2)	04:59	04:44			
	16:42	43	15:59 (4)	17:44	74	16:58 (3)	18:38	30	18:09 (2)	20:36	23	18:58 (2)	21:28	21:53
27	08:14	15:16 (4)	07:13	15:21 (4)	06:05		17:37 (2)	05:51	18:39 (2)	04:58	04:44			
	16:43	44	16:00 (4)	17:46	69	16:57 (3)	18:39	34	18:11 (2)	20:37	16	18:55 (2)	21:29	21:53
28	08:12	15:16 (4)	07:11	15:22 (4)	06:03		17:34 (2)	05:49	18:46 (2)	04:56	04:45			
	16:45	46	16:02 (4)	17:48	63	16:55 (3)	18:41	38	18:12 (2)	20:39	2	18:48 (2)	21:30	21:53
29	08:11	15:15 (4)			06:00		17:33 (2)	05:47		04:55	04:45			
	16:47	48	16:03 (4)		18:43	41	18:14 (2)	20:41		21:32	21:52			
30	08:09	15:15 (4)			05:58		17:31 (2)	05:45		04:54	04:46			
	16:49	49	16:04 (4)		18:45	43	18:14 (2)	20:43		21:33	21:52			
31	08:08	15:14 (4)			06:55		18:30 (2)			04:53				
	16:51	51	16:05 (4)		19:47	45	19:15 (2)			21:35				
Sonnenscheinstunden	248		271		365		419		494		511			
astr. max. mögl. Beschattung	1579		2023		558		1219							

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	04:46 21:52	05:26 21:17	06:21 20:11	18:22 (2) 19:14 (2)	07:15 16:45	14:40 (4) 16:15 (3)
2	04:47 21:52	05:28 21:15	06:23 20:08	18:21 (2) 19:14 (2)	07:16 16:43	14:40 (4) 16:13 (3)
3	04:48 21:51	05:29 21:14	06:24 20:06	18:21 (2) 19:14 (2)	07:18 16:41	14:40 (4) 16:11 (3)
4	04:49 21:51	05:31 21:12	06:26 20:03	18:20 (2) 19:13 (2)	07:20 16:39	14:40 (4) 15:39 (4)
5	04:50 21:50	05:33 21:10	06:28 20:01	18:20 (2) 19:13 (2)	07:22 16:37	14:42 (4) 15:40 (4)
6	04:50 21:50	05:35 21:08	06:30 19:58	18:20 (2) 19:13 (2)	07:24 16:35	14:42 (4) 15:39 (4)
7	04:51 21:49	05:36 21:06	06:32 19:56	18:20 (2) 19:13 (2)	07:26 16:33	14:42 (4) 15:39 (4)
8	04:52 21:48	05:38 21:04	06:33 19:54	18:19 (2) 19:11 (2)	07:27 16:31	14:42 (4) 15:38 (4)
9	04:53 21:48	05:40 21:02	06:35 19:51	18:20 (2) 19:11 (2)	07:29 16:29	14:43 (4) 15:38 (4)
10	04:54 21:47	05:42 21:00	06:37 19:49	18:20 (2) 19:10 (2)	07:31 16:28	14:43 (4) 15:37 (4)
11	04:56 21:46	05:43 20:58	06:39 19:46	18:19 (2) 19:09 (2)	07:33 16:26	14:45 (4) 15:37 (4)
12	04:57 21:45	05:45 20:56	06:40 19:44	18:20 (2) 19:08 (2)	07:35 16:24	14:45 (4) 15:37 (4)
13	04:58 21:44	05:47 20:54	06:42 19:41	18:21 (2) 19:07 (2)	07:37 16:22	14:46 (4) 15:36 (4)
14	04:59 21:43	05:49 20:52	06:44 19:39	18:22 (2) 19:06 (2)	07:39 16:21	14:47 (4) 15:35 (4)
15	05:00 21:42	05:50 20:50	06:46 19:36	18:22 (2) 19:04 (2)	07:41 16:19	14:48 (4) 15:35 (4)
16	05:02 21:41	05:52 20:47	06:48 19:34	18:23 (2) 19:02 (2)	07:42 16:17	14:49 (4) 15:34 (4)
17	05:03 21:40	05:54 20:45	06:49 19:31	18:24 (2) 19:01 (2)	07:44 16:16	14:49 (5) 15:33 (4)
18	05:04 21:39	05:56 20:43	06:51 19:29	18:26 (2) 18:59 (2)	07:46 16:14	14:48 (5) 15:32 (4)
19	05:06 21:37	05:58 20:41	06:53 19:26	18:26 (1) 18:56 (1)	07:48 16:13	14:48 (5) 15:31 (4)
20	05:07 21:36	05:59 20:39	06:55 19:24	18:26 (1) 18:55 (1)	07:50 16:12	14:48 (5) 15:31 (4)
21	05:09 21:35	06:01 20:36	06:57 19:21	18:26 (1) 18:55 (1)	07:52 16:10	14:48 (5) 15:30 (4)
22	05:10 21:33	06:03 20:34	06:58 19:19	18:26 (1) 18:52 (1)	07:54 16:09	14:47 (5) 15:28 (4)
23	05:12 21:32	06:05 20:32	07:00 19:16	18:27 (1) 18:50 (1)	07:56 16:08	14:47 (5) 15:27 (4)
24	05:13 21:30	06:07 20:29	07:02 19:14	18:26 (1) 18:47 (1)	07:58 16:06	14:47 (5) 15:25 (4)
25	05:15 21:29	06:08 20:27	07:04 19:11	18:27 (1) 18:45 (1)	08:00 16:05	14:46 (5) 15:23 (4)
26	05:16 21:27	06:10 20:25	07:06 19:09	18:27 (1) 18:42 (1)	08:02 16:04	14:46 (5) 15:22 (4)
27	05:18 21:26	06:12 20:22	07:07 19:06	18:31 (1) 18:40 (1)	08:03 16:03	12:57 (6) 15:17 (5)
28	05:19 21:24	06:14 20:20	07:09 19:04	18:34 (1) 18:38 (1)	08:04 16:02	12:54 (6) 15:17 (5)
29	05:21 21:22	06:15 20:18	07:11 19:01	18:24 (2) 19:14 (2)	08:06 16:01	12:52 (6) 15:18 (5)
30	05:23 21:21	06:17 20:15	07:13 19:15	18:24 (2) 19:15 (2)	08:08 16:00	12:51 (6) 15:18 (5)
31	05:24 21:19	06:19 20:13	07:15 19:15	18:23 (2) 19:15 (2)	08:11 16:01	12:55 (6) 15:25 (6)
Sonnenscheinstunden	515	462	384	330	259	232
astr.max.mögl.Beschattung			585	1064	1529	1482
						1917

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** L - IO 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar		März		April		Mai		Juni					
1	08:35	08:06		07:08		16:49 (11)	06:53	19:09 (10)	05:43	19:41 (7)	04:52	20:50 (6)			
	16:02	16:53		17:50	31	17:20 (11)	19:49	19:23 (9)	20:45	29	20:10 (5)	21:36	13	21:03 (6)	
2	08:35	08:04		07:06		16:49 (11)	06:50	19:06 (10)	05:41	19:41 (7)	04:51	20:49 (6)			
	16:03	16:55		17:52	31	17:20 (11)	19:51	19:26 (9)	20:47	29	20:10 (5)	21:37	15	21:04 (6)	
3	08:35	08:02		07:04		16:48 (11)	06:48	19:03 (10)	05:39		19:42 (7)	04:50		20:49 (6)	
	16:05	16:57		17:54	31	17:19 (11)	19:52	19:27 (10)	20:48	28	20:10 (5)	21:38	16	21:05 (6)	
4	08:35	08:01		07:01		16:48 (11)	06:45	19:01 (10)	05:36		19:42 (7)	04:49		20:49 (6)	
	16:06	16:59	3	16:30 (12)	17:55	32	17:20 (11)	19:54	19:29 (9)	20:50	27	20:09 (7)	21:39	18	21:07 (6)
5	08:34	07:59		16:25 (12)	06:59		16:48 (11)	06:43	19:00 (10)	05:34		19:42 (7)	04:48		20:48 (6)
	16:07	17:01	8	16:33 (12)	17:57	31	17:19 (11)	19:56	19:30 (10)	20:52	26	20:08 (7)	21:40	20	21:08 (6)
6	08:34	07:57		16:24 (12)	06:56		16:48 (11)	06:40	18:58 (10)	05:32		19:42 (7)	04:47		20:47 (6)
	16:08	17:03	11	16:35 (12)	17:59	30	17:18 (11)	19:58	19:30 (10)	20:54	26	20:08 (7)	21:42	21	21:08 (6)
7	08:34	07:55		16:23 (12)	06:54		16:48 (11)	06:38	18:57 (10)	05:30		19:43 (7)	04:47		20:48 (6)
	16:10	17:05	14	16:37 (12)	18:01	29	17:17 (11)	20:00	19:31 (10)	20:56	24	20:07 (7)	21:43	22	21:10 (6)
8	08:33	07:53		16:22 (12)	06:52		16:49 (11)	06:36	18:56 (10)	05:29		19:43 (7)	04:46		20:47 (6)
	16:11	17:07	16	16:38 (12)	18:03	27	17:16 (11)	20:02	19:31 (10)	20:57	23	20:06 (7)	21:44	23	21:10 (6)
9	08:33	07:51		16:22 (12)	06:49		16:50 (11)	06:33	18:55 (10)	05:27		19:44 (7)	04:45		20:47 (6)
	16:12	17:09	19	16:41 (12)	18:05	24	17:14 (11)	20:04	19:32 (10)	20:59	20	20:04 (7)	21:45	24	21:11 (6)
10	08:32	07:49		16:21 (12)	06:47		16:52 (11)	06:31	18:55 (10)	05:25		19:46 (7)	04:45		20:47 (6)
	16:14	17:11	22	16:43 (12)	18:07	21	17:13 (11)	20:06	19:32 (10)	21:01	18	20:04 (7)	21:45	25	21:12 (6)
11	08:31	07:47		16:21 (12)	06:44		16:54 (11)	06:28	18:54 (10)	05:23		19:48 (7)	04:44		20:47 (6)
	16:15	17:13	24	16:45 (12)	18:09	18	17:12 (11)	20:07	19:31 (10)	21:03	14	20:02 (7)	21:46	26	21:13 (6)
12	08:31	07:45		16:22 (12)	06:42		16:56 (11)	06:26	18:54 (10)	05:21		19:49 (7)	04:44		20:47 (6)
	16:17	17:16	23	16:45 (12)	18:11	12	17:08 (11)	20:09	19:32 (10)	21:05	10	19:59 (7)	21:47	26	21:13 (6)
13	08:30	07:43		16:22 (12)	06:40			06:24	18:54 (10)	05:19			04:44		20:47 (6)
	16:18	17:18	23	16:45 (12)	18:13			20:11	19:32 (10)	21:06			21:48	26	21:13 (6)
14	08:29	07:41		16:22 (12)	06:37			06:21	18:53 (10)	05:17			04:43		20:47 (6)
	16:20	17:20	23	16:45 (12)	18:15			20:13	19:31 (10)	21:08			21:49	27	21:14 (6)
15	08:28	07:39		16:22 (12)	06:35			06:19	18:53 (10)	05:16			04:43		20:47 (6)
	16:22	17:22	22	16:44 (12)	18:17			20:15	19:31 (10)	21:10			21:49	27	21:14 (6)
16	08:27	07:37		16:23 (12)	06:32			06:16	18:53 (10)	05:14			04:43		20:47 (6)
	16:23	17:24	20	16:43 (12)	18:19			20:17	19:30 (10)	21:11			21:50	28	21:15 (6)
17	08:26	07:35		16:24 (12)	06:30			06:14	18:53 (10)	05:12			04:43		20:48 (6)
	16:25	17:26	19	16:43 (12)	18:21			20:19	19:29 (10)	21:13			21:50	27	21:15 (6)
18	08:25	07:33		16:26 (12)	06:27			06:12	18:54 (10)	05:11			04:43		20:48 (6)
	16:27	17:28	15	16:41 (12)	18:22			20:21	19:28 (10)	21:15			21:51	27	21:15 (6)
19	08:24	07:31		16:28 (12)	06:25			06:09	18:54 (10)	05:09			04:42		20:48 (6)
	16:29	17:30	12	16:40 (12)	18:24			20:22	19:28 (10)	21:16			21:51	27	21:15 (6)
20	08:23	07:29			06:22			06:07	18:55 (10)	05:07			04:42		20:48 (6)
	16:30	17:32			18:26			20:24	19:27 (10)	21:18			21:52	28	21:16 (6)
21	08:22	07:26		16:59 (11)	06:20			06:05	18:55 (10)	05:06			04:43		20:48 (6)
	16:32	17:34	8	17:07 (11)	18:28			20:26	19:59 (5)	21:20			21:52	28	21:16 (6)
22	08:21	07:24		16:57 (11)	06:17			06:03	18:56 (10)	05:04			04:43		20:48 (6)
	16:34	17:36	13	17:10 (11)	18:30			20:28	20:01 (5)	21:21			21:52	28	21:16 (6)
23	08:19	07:22		16:54 (11)	06:15			06:00	18:58 (10)	05:03			04:43		20:48 (6)
	16:36	17:38	17	17:11 (11)	18:32			20:30	20:03 (5)	21:23			21:52	28	21:16 (6)
24	08:18	07:20		16:53 (11)	06:13			05:58	19:00 (10)	05:02			04:43		20:49 (6)
	16:38	17:40	21	17:14 (11)	18:34			20:32	20:05 (5)	21:24			21:53	28	21:17 (6)
25	08:17	07:17		16:52 (11)	06:10			05:56	19:02 (10)	05:00			04:43		20:49 (6)
	16:40	17:42	24	17:16 (11)	18:36			20:34	20:07 (5)	21:26			21:53	27	21:16 (6)
26	08:15	07:15		16:50 (11)	06:08			05:54	19:06 (10)	04:59			04:44		20:50 (6)
	16:42	17:44	28	17:18 (11)	18:37			20:35	20:08 (5)	21:27			21:53	27	21:17 (6)
27	08:14	07:13		16:50 (11)	06:05			05:51	19:43 (7)	04:58			04:44		20:50 (6)
	16:43	17:46	29	17:19 (11)	18:39			20:37	20:10 (5)	21:29			21:53	27	21:17 (6)
28	08:12	07:11		16:49 (11)	06:03			05:49	19:42 (7)	04:56			04:45		20:49 (6)
	16:45	17:48	30	17:19 (11)	18:41			20:39	20:11 (5)	21:30			21:52	27	21:16 (6)
29	08:11			06:00			18:16 (9)	05:47	19:41 (7)	04:55		20:56 (6)	04:45		20:50 (6)
	16:47			18:43	3	18:19 (9)	20:41	30	20:11 (5)	21:32	4	21:00 (6)	21:52	27	21:17 (6)
30	08:09			05:58		18:13 (9)	05:45		19:41 (7)	04:54		20:53 (6)	04:46		20:51 (6)
	16:49			18:45	7	18:20 (9)	20:43	30	20:11 (5)	21:33	8	21:01 (6)	21:52	27	21:18 (6)
31	08:07			06:55		19:11 (9)				04:53		20:52 (6)			
	16:51			19:47	11	19:22 (9)				21:34	10	21:02 (6)			
Sonnenscheinstunden	248	271		365			419		494			511			
astr.max.mögl.Beschattung			444		338			999		296			740		

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** L - IO 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47 21:52 26	20:51 (6) 21:17 (6) 21:17	06:21 20:10 (7) 20:08	18:53 (10) 18:53 (10) 18:54	07:15 18:56 16:45	15:51 (12) 16:15 (12) 15:59
2	04:47 21:51 26	20:51 (6) 21:17 (6) 21:15	06:23 20:10 (7) 20:08	18:53 (10) 18:53 (10) 18:54	07:16 18:56 16:43	15:51 (12) 16:13 (12) 15:58
3	04:48 21:51 26	20:52 (6) 21:18 (6) 21:14	06:24 20:12 (7) 20:06	18:53 (10) 18:53 (10) 18:51	07:18 17:34 (11) 17:47 (11)	15:51 (12) 16:11 (12) 15:57
4	04:49 21:51 25	20:52 (6) 21:17 (6) 21:12	06:26 20:14 (7) 20:03	18:52 (10) 18:52 (10) 18:49	07:20 17:31 (11) 17:50 (11)	15:51 (12) 16:09 (12) 15:57
5	04:50 21:50 24	20:52 (6) 21:16 (6) 21:10	06:28 20:14 (7) 20:01	18:52 (10) 18:52 (10) 18:46	07:22 17:28 (11) 17:50 (11)	15:53 (12) 16:08 (12) 15:56
6	04:51 21:50 23	20:53 (6) 21:16 (6) 21:08	06:30 20:16 (7) 19:58	18:53 (10) 18:53 (10) 18:44	07:24 17:27 (11) 17:51 (11)	15:54 (12) 16:05 (12) 15:55
7	04:51 21:49 22	20:54 (6) 21:16 (6) 21:06	06:32 20:17 (7) 19:56	18:54 (10) 18:54 (10) 18:42	07:26 17:25 (11) 17:52 (11)	15:55 (12) 16:03 (12) 15:55
8	04:52 21:48 21	20:54 (6) 21:15 (6) 21:04	06:33 20:17 (7) 19:53	18:54 (10) 18:54 (10) 18:39	07:27 17:24 (11) 17:53 (11)	15:56 (12) 16:01 (12) 15:54
9	04:53 21:47 19	20:55 (6) 21:14 (6) 21:02	06:35 20:18 (7) 19:51	18:55 (10) 18:55 (10) 18:37	07:29 17:23 (11) 17:53 (11)	15:58 (12) 15:59 (12) 15:54
10	04:55 21:47 18	20:56 (6) 21:14 (6) 21:00	06:37 20:17 (7) 19:49	18:56 (10) 18:56 (10) 18:34	07:31 17:23 (11) 17:54 (11)	15:54 15:54 15:54
11	04:56 21:46 16	20:57 (6) 21:13 (6) 20:58	06:39 20:18 (5) 19:46	18:57 (10) 18:57 (10) 18:32	07:33 17:22 (11) 17:54 (11)	15:53 15:53 15:53
12	04:57 21:45 15	20:57 (6) 21:12 (6) 20:56	06:40 20:19 (5) 19:44	18:59 (10) 18:59 (10) 18:29	07:35 17:22 (11) 17:54 (11)	15:53 15:53 15:53
13	04:58 21:44 13	20:58 (6) 21:11 (6) 20:54	06:42 20:19 (5) 19:41	19:02 (9) 19:15 (9) 18:27	07:37 17:22 (11) 17:53 (11)	15:53 15:53 15:53
14	04:59 21:43 10	21:00 (6) 21:10 (6) 20:52	06:44 20:19 (5) 19:39	19:03 (9) 19:13 (9) 18:25	07:39 17:22 (11) 17:53 (11)	15:53 15:53 15:53
15	05:00 21:42 8	21:01 (6) 21:09 (6) 20:49	06:46 20:20 (5) 19:36	19:04 (9) 19:09 (9) 18:22	07:40 17:22 (11) 17:52 (11)	15:53 15:53 15:53
16	05:02 21:41 2	21:06 (6) 21:08 (6) 20:47	06:48 20:19 (5) 19:34	19:09 (9) 18:20 17:42	07:42 17:22 (11) 17:52 (11)	15:53 15:53 15:53
17	05:03 21:40 0	21:07 (6) 20:45 19:16 (10)	06:49 20:17 (5) 19:31	19:10 (9) 18:18 17:44	07:44 17:22 (11) 17:54 (11)	15:53 15:53 15:53
18	05:04 21:38 0	21:08 (6) 20:43 19:15 (5)	06:51 20:15 (5) 19:29	19:11 (9) 18:15 17:48	07:46 17:23 (11) 17:54 (11)	15:53 15:53 15:53
19	05:06 21:37 0	21:09 (6) 20:41 19:12 (5)	06:53 20:13 (5) 19:26	19:12 (9) 18:13 17:50	07:48 17:25 (11) 17:55	15:53 15:53 15:53
20	05:07 21:36 0	21:10 (6) 20:38 19:09 (10)	06:55 20:11 (5) 19:24	19:13 (9) 18:11 17:52	07:50 17:27 (11) 17:52	15:53 15:53 15:53
21	05:09 21:35 0	21:11 (6) 20:36 19:04 (10)	06:57 20:09 (5) 19:21	19:14 (9) 18:09 17:54	07:52 17:29 (11) 17:54	15:53 15:53 15:53
22	05:10 21:33 0	21:12 (6) 20:34 19:02 (10)	06:58 20:06 (5) 19:19	19:15 (9) 18:06 17:56	07:54 17:38 (11) 17:55	15:53 15:53 15:53
23	05:12 21:32 0	21:13 (6) 20:32 19:00 (10)	07:00 20:04 (5) 19:16	19:16 (9) 18:04 17:58	07:56 17:36 (11) 16:08	15:53 15:53 15:53
24	05:13 21:30 0	21:14 (6) 20:29 18:59 (10)	07:02 20:02 (7) 19:14	19:17 (9) 18:02 17:59	07:58 17:08 (12) 16:06	15:53 15:53 15:53
25	05:15 21:29 0	21:15 (6) 20:27 18:57 (10)	07:04 19:30 (10) 19:11	19:18 (9) 18:00 18:00	08:00 16:56 (12) 16:09	15:53 15:53 15:53
26	05:16 21:27 0	21:16 (6) 20:25 18:57 (10)	07:05 19:31 (10) 19:09	19:19 (9) 17:57 17:57	08:02 16:54 (12) 16:04	15:53 15:53 15:53
27	05:18 21:26 0	21:17 (6) 20:22 18:56 (10)	07:07 19:31 (10) 19:06	19:20 (9) 17:55 17:55	08:04 16:13 (12) 16:03	15:53 15:53 15:53
28	05:19 21:24 0	21:18 (6) 20:20 18:55 (10)	07:09 19:32 (10) 19:04	19:21 (9) 17:53 17:53	08:06 16:13 (12) 16:02	15:53 15:53 15:53
29	05:21 21:22 0	21:19 (6) 20:18 18:54 (10)	07:11 19:31 (10) 19:01	19:22 (9) 17:51 17:51	08:08 16:15 (12) 16:01	15:53 15:53 15:53
30	05:23 21:21 0	21:20 (6) 20:17 18:54 (10)	07:13 19:32 (10) 18:59	19:23 (9) 17:49 17:49	08:10 16:15 (12) 16:00	15:53 15:53 15:53
31	05:24 21:19 0	21:21 (6) 20:13 18:54 (10)	07:15 19:32 (10) 18:57	19:24 (9) 17:47 17:47	08:12 16:15 (12) 16:01	15:53 15:53 15:53
Sonnenscheinstunden	514	462	384	330	259	232
astr.max.mögl.Beschattung	294	896	407	652	124	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: M - IO 13

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 17:22 (12)	05:43 18:35 (11)	04:52 19:48 (9)
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 17:23 (12)	05:41 18:34 (11)	04:51 19:49 (9)
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 17:22 (12)	05:39 18:35 (11)	04:50 19:49 (9)
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 17:22 (12)	05:37 18:35 (11)	04:49 19:50 (9)
5	08:34 16:07	07:59 17:01	06:59 17:57	06:43 17:21 (12)	05:34 18:34 (11)	04:48 19:50 (9)
6	08:34 16:08	07:57 17:03	06:56 17:59	06:40 17:21 (12)	05:32 18:34 (11)	04:47 19:51 (9)
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 17:20 (12)	05:30 18:35 (11)	04:47 19:51 (9)
8	08:33 16:11	07:53 17:07	06:52 18:03	06:36 17:19 (12)	05:29 18:36 (11)	04:46 19:52 (9)
9	08:33 16:12	07:51 17:09	06:49 18:05	06:33 17:17 (12)	05:27 18:37 (11)	04:45 19:53 (9)
10	08:32 16:14	07:49 17:11	06:47 18:07	06:31 17:16 (12)	05:25 18:37 (11)	04:45 19:54 (9)
11	08:31 16:15	07:47 17:14	06:44 18:09	06:28 17:14 (12)	05:23 18:37 (11)	04:44 19:55 (9)
12	08:31 16:17	07:45 17:16	06:42 18:11	06:26 17:13 (12)	05:21 18:38 (11)	04:44 19:56 (9)
13	08:30 16:18	07:43 17:18	06:40 18:13	06:24 17:11 (12)	05:19 18:39 (11)	04:44 19:57 (9)
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 17:10 (12)	05:17 18:40 (11)	04:43 19:58 (9)
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 17:09 (12)	05:16 18:41 (11)	04:43 19:59 (9)
16	08:27 16:23	07:37 17:24	06:32 18:19	06:16 17:08 (12)	05:14 18:42 (11)	04:43 20:00 (9)
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 17:07 (12)	05:12 18:43 (11)	04:43 20:01 (9)
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 17:06 (12)	05:11 18:44 (11)	04:43 20:02 (9)
19	08:24 16:29	07:31 17:30	06:25 18:25	06:10 17:05 (12)	05:09 18:45 (11)	04:43 20:03 (9)
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 17:04 (12)	05:07 18:46 (11)	04:43 20:04 (9)
21	08:22 16:32	07:26 17:34	06:20 18:28	06:05 17:03 (12)	05:06 18:47 (11)	04:43 20:05 (9)
22	08:21 16:34	07:24 17:36	06:17 17:05 (12)	06:03 17:52 (11)	05:04 19:58 (9)	04:43 20:17 (10)
23	08:19 16:36	07:22 17:38	06:15 17:01 (12)	06:00 17:49 (11)	05:03 19:59 (9)	04:43 20:18 (10)
24	08:18 16:38	07:20 17:40	06:13 17:00 (12)	05:58 17:46 (11)	05:02 19:59 (9)	04:43 20:19 (10)
25	08:17 16:40	07:17 17:42	06:10 16:58 (12)	05:56 17:44 (11)	05:00 19:59 (9)	04:44 20:20 (10)
26	08:15 16:42	07:15 17:44	06:08 16:57 (12)	05:54 17:42 (11)	04:59 19:59 (9)	04:44 20:21 (10)
27	08:14 16:43	07:13 17:46	06:05 16:56 (12)	05:51 17:41 (11)	04:58 19:59 (9)	04:44 20:22 (10)
28	08:12 16:45	07:11 17:48	06:03 16:55 (12)	05:49 17:39 (11)	04:56 19:59 (9)	04:45 20:23 (10)
29	08:11 16:47		06:00 18:43	05:47 17:38 (11)	04:55 19:59 (9)	04:45 20:24 (10)
30	08:09 16:49		05:58 18:45	05:45 17:37 (11)	04:54 19:59 (9)	04:46 20:25 (10)
31	08:07 16:51		05:55 18:47	05:43 17:36 (11)	04:53 19:59 (9)	04:46 20:26 (10)
Sonneneinstrahlung	248	271	365	419	494	511
astr.max.mögl.Beschattung		119	568	635	737	1738

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** M - IO 13

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	04:47 21:52 60	20:18 (10) 21:18 (7) 21:17	05:26 21:17 21:17	06:21 20:10 26	18:38 (11) 19:04 (11) 18:56	07:13 16:45 15:59
2	04:47 21:51 59	20:19 (10) 21:18 (7) 21:15	05:28 21:15 21:15	06:23 20:08 30	18:36 (11) 19:06 (11) 18:54	07:15 16:43 15:58
3	04:48 21:51 59	20:19 (10) 21:18 (7) 21:14	05:29 21:14 21:14	06:24 20:06 32	18:35 (11) 19:07 (11) 18:51	07:17 16:41 15:57
4	04:49 21:51 57	20:19 (10) 21:16 (7) 21:12	05:31 21:12 10	06:26 20:06 (9) 20:03	18:33 (11) 19:07 (11) 18:49	07:19 16:39 15:57
5	04:50 21:50 57	20:19 (10) 21:16 (7) 21:10	05:33 21:10 14	06:28 20:03 (9) 20:01	18:32 (11) 19:07 (11) 18:46	07:22 16:37 15:56
6	04:51 21:49 56	20:20 (10) 21:16 (7) 21:08	05:35 21:08 17	06:30 20:02 (9) 19:58	18:31 (11) 19:08 (11) 18:44	07:24 16:35 15:56
7	04:51 21:49 56	20:20 (10) 21:16 (7) 21:06	06:32 20:01 (9) 19:56	18:31 (11) 19:08 (11) 18:42	07:26 17:31 (12) 16:33	15:56 15:55 15:55
8	04:52 21:48 55	20:20 (10) 21:15 (7) 21:04	06:33 20:00 (9) 19:53	18:29 (11) 19:08 (11) 18:39	07:27 17:30 (12) 16:31	15:55 15:55 15:55
9	04:53 21:47 53	20:21 (10) 21:14 (7) 21:02	06:35 20:21 (9) 19:51	18:29 (11) 19:08 (11) 18:37	07:29 17:29 (12) 16:29	15:54 15:54 15:54
10	04:55 21:47 53	20:21 (10) 21:14 (7) 21:00	06:37 19:58 (9) 19:49	18:29 (11) 19:08 (11) 18:34	07:31 17:28 (12) 16:28	15:54 15:54 15:54
11	04:56 21:46 52	20:21 (10) 21:13 (7) 20:58	06:39 19:58 (9) 19:46	18:27 (11) 19:07 (11) 18:32	07:33 17:28 (12) 16:26	15:53 15:53 15:53
12	04:57 21:45 51	20:21 (10) 21:12 (7) 20:56	06:40 19:58 (9) 19:44	18:27 (11) 19:06 (11) 18:30	07:35 17:28 (12) 16:24	15:53 15:53 15:53
13	04:58 21:44 49	20:22 (10) 21:11 (7) 20:54	06:42 19:57 (9) 19:41	18:28 (11) 19:06 (11) 18:27	07:37 17:28 (12) 16:22	15:53 15:53 15:53
14	04:59 21:43 48	20:22 (10) 21:10 (7) 20:52	06:44 19:57 (9) 19:39	18:28 (11) 19:06 (11) 18:25	07:39 17:28 (12) 16:21	15:53 15:53 15:53
15	05:00 21:42 47	20:22 (10) 21:09 (7) 20:49	06:46 19:57 (9) 19:36	18:27 (11) 19:04 (11) 18:22	07:40 17:28 (12) 16:19	15:53 15:53 15:53
16	05:02 21:41 46	20:23 (10) 21:09 (7) 20:47	06:48 19:56 (9) 19:34	18:28 (11) 19:03 (11) 18:20	07:42 17:29 (12) 16:18	15:53 15:53 15:53
17	05:03 21:40 43	20:23 (10) 21:08 (7) 20:45	06:49 19:57 (9) 19:31	18:28 (11) 19:02 (11) 18:18	07:44 17:30 (12) 16:16	15:53 15:53 15:53
18	05:04 21:38 37	20:24 (10) 21:01 (10) 20:43	06:51 19:58 (9) 19:29	18:29 (11) 19:01 (11) 18:15	07:46 17:31 (12) 16:14	15:53 15:53 15:53
19	05:06 21:37 36	20:24 (10) 21:00 (10) 20:41	06:53 19:58 (9) 19:26	18:29 (11) 18:59 (11) 18:13	07:48 17:45 (12) 16:13	15:53 15:53 15:53
20	05:07 21:36 35	20:25 (10) 20:59 (10) 20:38	06:55 19:59 (9) 19:24	18:31 (11) 18:57 (11) 18:11	07:50 17:43 (12) 16:12	15:54 15:54 15:54
21	05:09 21:35 34	20:25 (10) 20:59 (10) 20:36	06:57 20:00 (9) 19:21	18:33 (11) 18:55 (11) 18:09	07:52 17:35 (12) 16:10	15:54 15:54 15:54
22	05:10 21:33 32	20:26 (10) 20:58 (10) 20:34	06:58 20:01 (9) 19:19	18:35 (11) 18:52 (11) 18:06	07:54 16:09 15:54	15:54 15:54 15:54
23	05:12 21:32 31	20:27 (10) 20:58 (10) 20:32	07:00 19:16 18:47 (11)	18:38 (11) 18:04 18:02	07:56 16:08 15:55	15:55 15:55 15:55
24	05:13 21:30 29	20:28 (10) 20:57 (10) 20:29	07:02 19:14 18:02	18:02 18:00 18:00	07:58 16:06 15:55	15:56 15:56 15:56
25	05:15 21:29 28	20:29 (10) 20:57 (10) 20:27	07:04 19:11 18:00	18:00 18:00 18:00	07:59 16:05 15:56	15:57 15:57 15:57
26	05:16 21:27 25	20:30 (10) 20:55 (10) 20:25	07:06 19:09 18:00	18:00 18:00 18:00	08:00 16:04 15:57	15:58 15:58 15:58
27	05:18 21:26 22	20:31 (10) 20:53 (10) 20:22	07:07 19:06 18:00	18:00 18:00 18:00	08:02 16:03 15:57	15:59 15:59 15:59
28	05:20 21:24 19	20:33 (10) 20:52 (10) 20:20	07:09 19:04 18:00	18:00 18:00 18:00	08:04 16:02 15:58	16:00 16:00 16:00
29	05:21 21:22 14	20:35 (10) 20:49 (10) 20:18	06:15 18:47 (11) 18:58 (11)	18:00 18:00 18:00	08:06 16:01 15:59	16:01 16:01 16:01
30	05:23 21:21 7	20:39 (10) 20:46 (10) 20:15	07:13 18:43 (11) 19:01 (11)	18:00 18:00 18:00	08:07 16:00 16:00	16:02 16:02 16:02
31	05:24 21:19	06:19 20:13	18:41 (11) 19:03 (11)	18:00 18:00	08:08 16:01	16:03 16:03
Sonnenscheinstunden	514	462	384	330	259	232
astr.max.mögl.Beschattung	1250	399	745	403		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** N - IO 14

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mal	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	16:32 (12) 17:09 (12)	06:53 19:49	18:31 (11) 19:04 (11)
2	08:35 16:03	08:04 16:55	07:06 17:52	16:32 (12) 17:09 (12)	06:50 19:51	18:30 (11) 19:03 (11)
3	08:35 16:05	08:02 16:57	07:04 17:54	16:32 (12) 17:08 (12)	06:48 19:52	18:28 (11) 19:01 (11)
4	08:35 16:06	08:01 16:59	07:01 17:56	16:32 (12) 17:08 (12)	06:45 19:54	18:27 (11) 19:00 (11)
5	08:34 16:07	07:59 17:01	06:59 17:57	16:32 (12) 17:06 (12)	06:43 19:56	18:27 (11) 19:00 (11)
6	08:34 16:08	07:57 17:03	06:57 17:59	16:33 (12) 17:06 (12)	06:41 19:58	18:25 (11) 19:00 (11)
7	08:34 16:10	07:55 17:05	06:54 18:01	16:33 (12) 17:04 (12)	06:38 20:00	18:24 (11) 19:00 (11)
8	08:33 16:11	07:53 17:07	06:52 18:03	16:35 (12) 17:03 (12)	06:36 20:02	18:23 (11) 19:00 (11)
9	08:33 16:12	07:51 17:09	06:49 18:05	16:36 (12) 17:01 (12)	06:33 20:04	18:23 (11) 19:00 (11)
10	08:32 16:14	07:49 17:12	06:47 18:07	16:38 (12) 16:59 (12)	06:31 20:06	18:22 (11) 19:00 (11)
11	08:31 16:15	07:47 17:14	06:44 18:09	16:41 (12) 16:57 (12)	06:28 20:07	18:21 (11) 19:00 (11)
12	08:31 16:17	07:45 17:16	06:42 18:11	16:45 (12) 16:51 (12)	06:26 20:09	18:21 (11) 19:00 (11)
13	08:30 16:18	07:43 17:18	06:40 18:13	06:24 20:11	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 20:13	18:20 (11) 19:00 (11)	18:20 (11) 19:00 (11)
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	18:20 (11) 19:00 (11)	18:20 (11) 19:00 (11)
16	08:27 16:23	07:37 17:24	06:32 16:46 (12) 18:19	06:16 20:17	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
17	08:26 16:25	07:35 17:26	06:30 16:43 (12) 18:21	06:14 20:19	18:20 (11) 19:00 (11)	18:20 (11) 19:00 (11)
18	08:25 16:27	07:33 17:28	06:27 16:41 (12) 18:22	06:12 20:21	18:20 (11) 19:00 (11)	18:20 (11) 19:00 (11)
19	08:24 16:29	07:31 17:30	06:25 16:39 (12) 18:24	06:09 20:22	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
20	08:23 16:30	07:29 17:32	06:22 16:37 (12) 18:26	06:07 20:24	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
21	08:22 16:32	07:26 17:34	06:20 16:36 (12) 18:28	06:05 20:26	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
22	08:21 16:34	07:24 17:36	06:17 16:35 (12) 18:30	06:03 20:28	18:21 (11) 19:00 (11)	18:21 (11) 19:00 (11)
23	08:19 16:36	07:22 17:38	06:15 16:34 (12) 18:32	06:00 20:30	18:22 (11) 19:00 (11)	18:22 (11) 19:00 (11)
24	08:18 16:38	07:20 17:40	06:13 16:34 (12) 18:34	05:58 20:32	18:23 (11) 19:00 (11)	18:23 (11) 19:00 (11)
25	08:17 16:40	07:17 17:42	06:10 16:33 (12) 18:36	05:56 20:34	18:24 (11) 19:00 (11)	18:24 (11) 19:00 (11)
26	08:15 16:42	07:15 17:44	06:08 16:32 (12) 18:38	05:54 17:52 (11) 20:35	18:25 (11) 19:00 (11)	18:25 (11) 19:00 (11)
27	08:14 16:44	07:13 17:46	06:05 16:32 (12) 18:39	05:51 17:45 (11) 20:37	18:26 (11) 19:00 (11)	18:26 (11) 19:00 (11)
28	08:12 16:45	07:11 17:48	06:03 16:31 (12) 18:41	05:49 17:41 (11) 20:39	18:27 (11) 19:00 (11)	18:27 (11) 19:00 (11)
29	08:11 16:47		06:00 18:43	05:47 17:38 (11) 20:41	18:27 (11) 19:00 (11)	18:27 (11) 19:00 (11)
30	08:09 16:49		05:58 18:45	05:45 17:35 (11) 20:43	18:28 (11) 19:00 (11)	18:28 (11) 19:00 (11)
31	08:07 16:51		05:55 19:47	05:43 18:34 (11) 19:14 (11)	19:05 (11) 20:43	19:05 (11) 20:43
Sonneneinstrahlung	248	271	379	503	419	511
astr.max.mögl.Beschattung					1559	843

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdaorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: N - IO 14

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	04:47 21:52 10	21:08 (5) 21:17 31	20:13 (9) 06:21 58	18:20 (11) 07:15 58	07:13 16:45 08:11	08:09 15:59 08:11
2	04:47 21:51 10	21:08 (5) 21:15 30	20:14 (9) 06:23 58	18:20 (11) 07:16 58	07:15 16:43 08:12	08:11 15:58 08:12
3	04:48 21:51 9	21:09 (5) 21:14 29	20:14 (9) 06:24 58	18:20 (11) 07:18 8	17:23 (12) 16:41 15:57	07:17 16:41 15:57
4	04:49 21:51 7	21:09 (5) 21:12 27	20:15 (9) 06:26 56	18:20 (11) 07:20 16	17:19 (12) 16:39 15:57	07:19 16:39 15:57
5	04:50 21:50 6	21:10 (5) 21:10 26	20:14 (9) 06:28 56	18:20 (11) 07:22 21	17:15 (12) 16:37 15:56	07:21 16:37 15:56
6	04:51 21:50 5	21:11 (5) 21:08 24	20:15 (9) 06:30 55	18:20 (11) 07:24 25	17:13 (12) 16:35 15:56	07:23 16:35 15:56
7	04:51 21:49 4	21:12 (5) 21:06 20	20:17 (9) 06:32 54	18:21 (11) 07:26 28	17:11 (12) 16:33 15:55	07:25 16:33 15:55
8	04:52 21:48 2	21:13 (5) 21:04 18	20:17 (9) 06:33 53	18:21 (11) 07:27 31	17:09 (12) 16:31 15:55	07:27 16:31 15:55
9	04:54 21:47 7	21:15 (5) 21:02 24	20:35 (9) 06:35 51	18:21 (11) 07:29 33	17:08 (12) 16:29 15:54	07:29 16:29 15:54
10	04:55 21:47 11	20:22 (9) 21:00 30	18:47 (11) 06:37 49	18:22 (11) 07:31 34	17:07 (12) 16:28 15:54	07:31 16:28 15:54
11	04:56 21:46 13	20:33 (9) 20:58 31	20:31 (9) 19:49 47	18:22 (11) 07:33 36	17:06 (12) 16:26 15:53	07:33 16:26 15:53
12	04:57 21:45 15	20:34 (9) 20:58 33	18:44 (11) 06:39 45	18:23 (11) 07:35 36	17:06 (12) 16:24 15:53	07:35 16:24 15:53
13	04:58 21:44 17	20:35 (9) 20:56 29	18:39 (11) 06:42 42	18:24 (11) 07:37 37	17:05 (12) 16:22 15:53	07:37 16:22 15:53
14	04:59 21:43 19	20:36 (9) 20:54 33	19:12 (11) 19:41 42	18:26 (11) 07:39 37	17:05 (12) 16:21 15:53	07:39 16:21 15:53
15	05:01 21:42 21	20:37 (9) 20:52 36	18:37 (11) 06:44 38	19:04 (11) 18:25 37	17:05 (12) 16:21 15:53	07:41 16:21 15:53
16	05:02 21:41 21	20:38 (9) 20:49 39	19:13 (11) 19:39 38	18:26 (11) 07:40 37	17:05 (12) 16:19 15:53	07:41 16:19 15:53
17	05:03 21:40 23	20:39 (9) 20:47 42	19:15 (11) 19:36 35	18:29 (11) 07:42 38	17:04 (12) 16:18 15:53	07:42 16:18 15:53
18	05:04 21:38 24	20:40 (9) 20:43 47	18:33 (11) 06:48 30	18:59 (11) 18:20 38	17:04 (12) 16:18 15:53	07:44 16:18 15:53
19	05:06 21:37 26	20:41 (9) 20:41 49	18:32 (11) 06:49 25	18:31 (11) 07:44 37	17:04 (12) 16:16 15:53	07:44 16:16 15:53
20	05:07 21:36 26	20:42 (9) 20:38 49	18:31 (11) 06:51 17	18:56 (11) 18:18 36	17:05 (12) 16:14 15:53	07:46 16:14 15:53
21	05:09 21:35 27	20:43 (9) 20:32 53	18:29 (11) 06:53 49	18:52 (11) 18:15 36	17:05 (12) 16:14 15:53	07:48 16:14 15:53
22	05:10 21:33 28	20:15 (9) 05:58 49	19:18 (11) 19:29 17	18:13 18:13 35	17:05 (12) 16:13 15:53	07:50 16:13 15:53
23	05:12 21:32 29	20:16 (9) 05:59 49	18:29 (11) 06:55 49	18:29 (11) 07:42 38	17:05 (12) 16:12 15:54	07:50 16:12 15:54
24	05:13 21:30 29	20:42 (9) 20:38 49	19:18 (11) 19:24 49	18:11 18:11 34	17:06 (12) 16:12 15:54	07:52 16:12 15:54
25	05:15 21:29 30	20:15 (9) 06:01 51	18:28 (11) 06:57 51	18:22 (11) 07:44 38	17:06 (12) 16:10 15:54	07:52 16:10 15:54
26	05:16 21:27 31	20:42 (9) 20:36 51	19:19 (11) 19:21 51	18:09 18:09 32	17:06 (12) 16:09 15:54	07:54 16:09 15:54
27	05:18 21:26 30	20:14 (9) 06:03 53	18:26 (11) 06:58 53	18:26 (11) 07:00 35	17:07 (12) 16:08 15:55	07:55 16:08 15:55
28	05:20 21:24 31	20:43 (9) 20:32 53	19:19 (11) 19:16 30	18:04 18:04 25	17:07 (12) 16:08 15:56	07:56 16:08 15:56
29	05:21 21:22 31	20:14 (9) 06:07 55	18:25 (11) 07:02 55	18:02 18:02 21	17:08 (12) 16:06 15:56	07:57 16:06 15:56
30	05:23 21:21 31	20:43 (9) 20:29 55	19:20 (11) 19:14 55	18:02 18:00 21	17:10 (12) 16:06 15:56	07:59 16:06 15:56
31	05:24 21:19 30	20:14 (9) 06:08 55	18:24 (11) 07:04 55	18:00 18:00 21	17:12 (12) 16:05 15:56	08:01 16:05 15:56
	Sonnenscheinstunden astr.max.mögl.Beschattung	514 603	462 1271	384 827	330 725	259 232

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: O - IO 15

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximale mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	18:23 (12) 20:45	19:41 (11) 21:36
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:51	18:25 (12) 20:47	19:41 (11) 21:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:52	18:27 (12) 20:48	19:39 (11) 21:38
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:54	18:41 (12) 20:50	19:38 (11) 21:39
5	08:34 16:07	07:59 17:01	06:59 17:57	06:43 19:56	18:41 (12) 20:52	19:37 (11) 21:40
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 19:58	18:41 (12) 20:54	19:36 (11) 21:42
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 20:00	18:41 (12) 20:56	19:35 (11) 21:43
8	08:33 16:11	07:53 17:07	06:52 18:03	06:36 20:02	18:41 (12) 20:57	19:34 (11) 21:44
9	08:33 16:12	07:51 17:09	06:49 18:05	06:33 20:04	18:41 (12) 20:59	19:34 (11) 21:45
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 20:06	18:41 (12) 21:01	19:33 (11) 21:45
11	08:31 16:15	07:47 17:14	06:44 18:09	06:28 20:07	18:41 (12) 21:03	19:33 (11) 21:46
12	08:31 16:17	07:45 17:16	06:42 18:11	06:26 20:09	18:41 (12) 21:05	19:32 (11) 21:47
13	08:30 16:18	07:43 17:18	06:40 18:13	06:24 20:11	18:41 (12) 21:07	19:32 (11) 21:48
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 20:13	18:41 (12) 21:08	19:32 (11) 21:49
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	18:41 (12) 21:10	19:32 (11) 21:49
16	08:27 16:23	07:37 17:24	06:32 18:19	06:16 20:17	18:41 (12) 21:11	19:32 (11) 21:50
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	18:41 (12) 21:12	19:32 (11) 21:50
18	08:25 16:27	07:33 17:28	06:27 18:22	06:12 20:21	18:41 (12) 21:13	19:32 (11) 21:51
19	08:24 16:29	07:31 17:30	06:25 18:24	06:09 20:22	18:41 (12) 21:14	19:32 (11) 21:51
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 20:24	18:41 (12) 21:15	19:32 (11) 21:52
21	08:22 16:32	07:26 17:34	06:20 18:28	06:05 20:26	18:41 (12) 21:16	19:32 (11) 21:52
22	08:21 16:34	07:24 17:36	06:17 18:30	06:03 20:28	18:41 (12) 21:17	19:32 (11) 21:52
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 20:30	18:41 (12) 21:18	19:32 (11) 21:52
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 20:32	18:41 (12) 21:19	19:32 (11) 21:52
25	08:17 16:40	07:17 17:42	06:10 18:36	05:56 20:34	18:41 (12) 21:20	19:32 (11) 21:52
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 20:35	18:41 (12) 21:21	19:32 (11) 21:52
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 20:37	18:41 (12) 21:22	19:32 (11) 21:52
28	08:12 16:45	07:11 17:48	06:03 18:41	05:49 20:39	18:41 (12) 21:23	19:32 (11) 21:52
29	08:11 16:47		06:00 18:43	05:47 20:41	18:41 (12) 21:24	19:32 (11) 21:52
30	08:09 16:49		05:58 18:45	05:45 20:43	18:41 (12) 21:25	19:32 (11) 21:52
31	08:07 16:51		05:55 18:47	05:42 20:45	18:41 (12) 21:26	19:32 (11) 21:52
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung			614	135	1642	2043

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** O - IO 15

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember		
1	04:47		19:44 (11)	05:26		19:42 (11)	06:21		07:15	18:09 (12)	07:13	08:09	
	21:52	68	21:10 (9)	21:17	50	20:32 (11)	20:10		18:56	20	18:29 (12)	16:45	15:59
2	04:47		19:45 (11)	05:28		19:43 (11)	06:23		07:16		18:11 (12)	07:15	08:11
	21:51	67	21:10 (9)	21:15	49	20:32 (11)	20:08		18:54	16	18:27 (12)	16:43	15:58
3	04:48		19:45 (11)	05:29		19:43 (11)	06:24		07:18		18:15 (12)	07:17	08:12
	21:51	68	21:11 (9)	21:14	48	20:31 (11)	20:06		18:51	9	18:24 (12)	16:41	15:58
4	04:49		19:44 (11)	05:31		19:43 (11)	06:26		07:20			07:19	08:14
	21:51	69	21:10 (9)	21:12	48	20:31 (11)	20:03		18:49			16:39	15:57
5	04:50		19:44 (11)	05:33		19:43 (11)	06:28		07:22			07:21	08:15
	21:50	70	21:11 (9)	21:10	47	20:30 (11)	20:01		18:46			16:37	15:56
6	04:51		19:44 (11)	05:35		19:44 (11)	06:30		07:24			07:23	08:16
	21:49	70	21:11 (9)	21:08	46	20:30 (11)	19:58		18:44			16:35	15:56
7	04:52		19:44 (11)	05:36		19:45 (11)	06:32		07:26			07:25	08:18
	21:49	70	21:11 (9)	21:06	44	20:29 (11)	19:56		18:42			16:33	15:55
8	04:52		19:44 (11)	05:38		19:45 (11)	06:33		07:27			07:27	08:19
	21:48	72	21:12 (9)	21:04	43	20:28 (11)	19:53		18:39			16:31	15:55
9	04:54		19:44 (11)	05:40		19:46 (11)	06:35		07:29			07:29	08:20
	21:47	71	21:12 (9)	21:02	42	20:28 (11)	19:51		18:37			16:29	15:54
10	04:55		19:44 (11)	05:42		19:46 (11)	06:37		07:31			07:31	08:22
	21:47	72	21:12 (9)	21:00	40	20:26 (11)	19:49	9	18:33 (12)			16:28	15:54
11	04:56		19:44 (11)	05:43		19:47 (11)	06:39		18:19 (12)			07:33	08:23
	21:46	72	21:12 (9)	20:58	38	20:25 (11)	19:46	17	18:36 (12)			16:26	15:53
12	04:57		19:43 (11)	05:45		19:49 (11)	06:40		18:16 (12)			07:35	08:24
	21:45	74	21:12 (9)	20:56	35	20:24 (11)	19:44	22	18:38 (12)			16:24	15:53
13	04:58		19:43 (11)	05:47		19:49 (11)	06:42		18:14 (12)			07:37	08:25
	21:44	73	21:11 (9)	20:54	33	20:22 (11)	19:41	25	18:39 (12)			16:22	15:53
14	04:59		19:43 (11)	05:49		19:51 (11)	06:44		18:13 (12)			07:39	08:26
	21:43	72	21:10 (9)	20:52	29	20:20 (11)	19:39	28	18:41 (12)			16:21	15:53
15	05:01		19:43 (11)	05:50		19:53 (11)	06:46		18:10 (12)			07:41	08:27
	21:42	70	21:09 (9)	20:49	25	20:18 (11)	19:36	31	18:41 (12)			16:19	15:53
16	05:02		19:43 (11)	05:52		19:55 (11)	06:48		18:09 (12)			07:42	08:28
	21:41	70	21:09 (9)	20:47	20	20:15 (11)	19:34	33	18:42 (12)			16:18	15:53
17	05:03		19:43 (11)	05:54		19:59 (11)	06:49		18:08 (12)			07:44	08:29
	21:40	70	21:08 (9)	20:45	12	20:11 (11)	19:31	34	18:42 (12)			16:16	15:53
18	05:05		19:42 (11)	05:56			06:51		18:07 (12)			07:46	08:30
	21:38	69	21:06 (9)	20:43		19:29	36		18:43 (12)			16:14	15:53
19	05:06		19:42 (11)	05:58			06:53		18:06 (12)			07:48	08:31
	21:37	67	21:05 (9)	20:41		19:26	36		18:42 (12)			16:13	15:53
20	05:07		19:43 (11)	05:59			06:55		18:05 (12)			07:50	08:31
	21:36	64	21:04 (9)	20:38		19:24	37		18:42 (12)			16:12	15:54
21	05:09		19:42 (11)	06:01			06:57		18:05 (12)			07:52	08:32
	21:35	64	21:03 (9)	20:36		19:21	37		18:42 (12)			16:10	15:54
22	05:10		19:42 (11)	06:03			06:58		18:05 (12)			07:54	08:33
	21:33	61	21:01 (9)	20:34		19:19	37		18:42 (12)			16:09	15:55
23	05:12		19:42 (11)	06:05			07:00		18:04 (12)			07:56	08:33
	21:32	61	21:01 (9)	20:32		19:16	37		18:41 (12)			16:08	15:55
24	05:13		19:42 (11)	06:07			07:02		18:04 (12)			07:58	08:34
	21:30	58	20:59 (9)	20:29		19:14	36		18:40 (12)			16:06	15:56
25	05:15		19:42 (11)	06:08			07:04		18:04 (12)			07:59	08:34
	21:29	54	20:58 (9)	20:27		19:11	36		18:40 (12)			16:05	15:56
26	05:16		19:42 (11)	06:10			07:06		18:05 (12)			08:01	08:34
	21:27	51	20:33 (11)	20:25		19:09	34		18:39 (12)			16:04	15:57
27	05:18		19:42 (11)	06:12			07:07		18:05 (12)			08:02	08:35
	21:26	51	20:33 (11)	20:22		19:06	33		18:38 (12)			16:03	15:58
28	05:20		19:42 (11)	06:14			07:09		18:05 (12)			08:04	08:35
	21:24	51	20:33 (11)	20:20		19:04	31		18:36 (12)			16:02	15:58
29	05:21		19:42 (11)	06:15			07:11		18:06 (12)			08:06	08:35
	21:22	50	20:32 (11)	20:18		19:01	28		18:34 (12)			16:01	15:59
30	05:23		19:42 (11)	06:17			07:13		18:07 (12)			08:07	08:35
	21:21	51	20:33 (11)	20:15		18:59	25		18:32 (12)			16:00	16:00
31	05:24		19:43 (11)	06:19									08:35
	21:19	50	20:33 (11)	20:13					16:47				16:01
Sonnenscheinstunden		514		462		384		330		259		232	
astr. max. mögl. Beschattung		2000		649		642		45					

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung Schattenrezeptor: P - IO 16

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	05:43 20:45	19:18 (11) 20:16 (9)
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:51	05:41 20:47	19:22 (11) 20:18 (9)
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:52	05:39 20:48	20:12 (9) 20:21 (9)
4	08:35 16:06	08:01 16:59	07:01 17:55	06:45 19:54	05:37 20:50	20:11 (9) 20:22 (9)
5	08:34 16:07	07:59 17:01	06:59 17:57	06:43 19:56	05:34 20:52	20:10 (9) 20:24 (9)
6	08:34 16:08	07:57 17:03	06:56 17:59	06:40 19:58	05:32 20:54	20:09 (9) 20:25 (9)
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:30 20:56	20:08 (9) 20:27 (9)
8	08:33 16:11	07:53 17:07	06:52 18:03	17:37 (12) 20:02	19:23 (11) 19:36 (11)	05:29 20:28 (9)
9	08:33 16:12	07:51 17:09	06:49 18:05	17:31 (12) 20:04	19:20 (11) 19:38 (11)	05:27 20:30 (9)
10	08:32 16:14	07:49 17:11	06:47 18:07	17:29 (12) 20:06	19:18 (11) 19:40 (11)	05:25 21:01
11	08:31 16:15	07:47 17:14	06:44 18:09	17:28 (12) 20:07	19:16 (11) 19:41 (11)	05:23 21:03
12	08:31 16:17	07:45 17:16	06:42 18:11	17:26 (12) 20:09	19:15 (11) 19:43 (11)	05:21 21:05
13	08:30 16:18	07:43 17:18	06:40 18:13	17:25 (12) 20:11	19:14 (11) 19:44 (11)	05:19 21:06
14	08:29 16:20	07:41 17:20	06:37 18:15	17:24 (12) 20:13	19:12 (11) 19:44 (11)	05:17 21:08
15	08:28 16:22	07:39 17:22	06:35 18:17	17:24 (12) 20:15	19:11 (11) 19:45 (11)	05:16 21:10
16	08:27 16:23	07:37 17:24	06:32 18:19	17:23 (12) 20:17	19:11 (11) 19:45 (11)	05:14 21:11
17	08:26 16:25	07:35 17:26	06:30 18:21	17:23 (12) 20:19	19:10 (11) 19:45 (11)	05:12 21:13
18	08:25 16:27	07:33 17:28	06:27 18:22	17:22 (12) 20:20	19:10 (11) 19:45 (11)	05:11 21:15
19	08:24 16:29	07:31 17:30	06:25 18:24	17:23 (12) 20:22	19:10 (11) 19:45 (11)	05:09 21:16
20	08:23 16:30	07:29 17:32	06:22 18:26	17:23 (12) 20:24	19:10 (11) 19:45 (11)	05:07 21:18
21	08:22 16:32	07:26 17:34	06:20 18:28	17:24 (12) 20:26	19:09 (11) 19:44 (11)	05:06 21:20
22	08:21 16:34	07:24 17:36	06:17 18:30	17:24 (12) 20:28	19:09 (11) 19:43 (11)	05:04 21:21
23	08:19 16:36	07:22 17:38	06:15 18:32	17:25 (12) 20:30	19:09 (11) 19:43 (11)	05:03 21:23
24	08:18 16:38	07:20 17:40	06:13 18:34	17:27 (12) 20:32	19:10 (11) 19:42 (11)	05:02 21:24
25	08:17 16:40	07:17 17:42	06:10 18:36	17:41 (12) 20:34	19:11 (11) 19:42 (11)	05:00 21:26
26	08:15 16:42	07:15 17:44	06:08 18:37	17:38 (12) 20:35	19:11 (11) 19:41 (11)	04:59 21:27
27	08:14 16:43	07:13 17:46	06:05 18:39	20:37	19:12 (11) 19:40 (11)	04:58 21:29
28	08:12 16:45	07:11 17:48	06:03 18:41	05:49 20:39	19:13 (11) 19:39 (11)	04:56 21:30
29	08:11 16:47		06:00 18:43	05:47 20:41	19:14 (11) 19:36 (11)	04:55 21:32
30	08:09 16:49		05:58 18:45	05:45 20:43	19:15 (11) 19:34 (11)	04:54 21:33
31	08:07 16:51		05:55 19:47		04:53 21:34	20:55 (10) 21:02 (10)
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung			354	667	348	760

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdaorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** P - IO 16

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47 21:52 27	20:51 (10) 21:18 (7) 22	05:26 21:17 22	20:18 (9) 20:10 30	19:13 (11) 07:15 25	18:04 (12) 07:13 08:09
2	04:47 21:51 27	20:51 (10) 21:18 (7) 23	05:28 21:15 23	20:18 (9) 20:08 27	19:14 (11) 07:16 23	18:04 (12) 07:15 15:58
3	04:48 21:51 26	20:52 (10) 21:18 (10) 22	05:29 21:14 22	20:18 (9) 20:06 24	19:15 (11) 07:18 20	18:05 (12) 07:17 15:57
4	04:49 21:51 24	20:52 (10) 21:16 (10) 23	05:31 21:12 23	20:18 (9) 20:03 20	19:16 (11) 07:20 16	18:06 (12) 07:19 15:57
5	04:50 21:50 23	20:53 (10) 21:16 (10) 23	05:33 21:10 23	20:17 (9) 20:01 16	19:18 (11) 07:22 13	18:06 (12) 07:21 15:56
6	04:51 21:49 23	20:53 (10) 21:16 (10) 21	05:35 21:08 21	20:18 (9) 19:58 11	19:21 (11) 07:24 9	18:08 (12) 07:23 15:56
7	04:51 21:49 21	20:54 (10) 21:15 (10) 19	05:36 21:06 19	20:18 (9) 19:56 11	19:32 (11) 07:26 9	18:17 (12) 07:25 15:56
8	04:52 21:48 20	20:55 (10) 21:15 (10) 17	05:38 21:04 17	20:18 (9) 19:53 17	18:42 07:27 16:33	18:17 (12) 07:26 15:55
9	04:53 21:47 18	20:56 (10) 21:14 (10) 14	05:40 21:02 14	20:19 (9) 19:51 16	18:39 07:29 16:31	18:19 (12) 07:29 15:55
10	04:55 21:47 17	20:57 (10) 21:14 (10) 12	05:42 21:00 12	20:19 (9) 19:49 16	18:37 07:31 16:28	18:22 (12) 07:31 15:54
11	04:56 21:46 15	20:58 (10) 21:13 (10) 9	05:43 20:58 9	20:20 (9) 19:46 16	18:34 07:33 16:26	18:23 (12) 07:33 15:53
12	04:57 21:45 13	20:59 (10) 21:12 (10) 8	05:45 20:56 8	19:33 (11) 19:44 16	18:32 07:35 16:24	18:24 (12) 07:35 15:53
13	04:58 21:44 10	21:01 (10) 21:11 (10) 14	05:47 20:54 14	19:27 (11) 19:41 16	18:30 07:37 16:22	18:25 (12) 07:37 15:53
14	04:59 21:43 7	21:03 (10) 21:10 (10) 18	05:49 20:52 18	19:24 (11) 19:39 16	18:27 07:39 16:21	18:26 (12) 07:39 15:53
15	05:00 21:42 16	05:50 20:49 22	05:50 20:49 22	19:22 (11) 19:36 16	18:25 07:40 16:19	18:27 (12) 07:40 15:53
16	05:02 21:41 17	05:52 20:47 25	05:52 20:47 25	19:20 (11) 19:34 16	18:22 07:42 16:18	18:28 (12) 07:42 15:53
17	05:03 21:40 18	05:54 20:45 27	05:54 20:45 27	19:19 (11) 19:31 16	18:20 07:44 16:16	18:29 (12) 07:44 15:53
18	05:04 21:38 19	05:56 20:43 29	05:56 20:43 29	19:18 (11) 19:29 16	18:18 07:46 16:14	18:30 (12) 07:46 15:53
19	05:06 21:37 20	05:58 20:41 31	05:58 20:41 31	19:16 (11) 19:26 16	18:15 07:48 16:13	18:31 (12) 07:48 15:53
20	05:07 21:36 21	05:59 20:38 32	05:59 20:38 32	19:16 (11) 19:24 16	18:13 07:50 16:12	18:32 (12) 07:50 15:54
21	05:09 21:35 22	06:01 20:36 33	06:01 20:36 33	19:15 (11) 19:21 15	18:11 07:52 16:10	18:33 (12) 07:52 15:54
22	05:10 21:33 23	06:03 20:34 34	06:03 20:34 34	19:14 (11) 19:19 19	18:09 07:54 16:09	18:34 (12) 07:54 15:54
23	05:12 21:32 24	06:05 20:32 35	06:05 20:32 35	19:13 (11) 19:16 22	18:08 07:56 16:08	18:35 (12) 07:56 15:55
24	05:13 21:30 25	06:07 20:30 (9) 35	06:07 20:29 35	19:13 (11) 19:14 24	18:07 (12) 18:02 16:06	18:36 (12) 18:02 15:55
25	05:15 21:29 9	06:08 20:25 (9) 36	06:08 20:27 36	19:12 (11) 19:11 26	18:06 (12) 18:00 16:05	18:37 (12) 18:00 15:56
26	05:16 21:27 12	06:10 20:23 (9) 36	06:10 20:25 36	19:12 (11) 19:09 27	18:05 (12) 17:57 16:04	18:38 (12) 17:57 15:57
27	05:18 21:26 15	06:12 20:21 (9) 35	06:12 20:22 35	19:12 (11) 19:06 27	18:04 (12) 16:55 16:03	18:39 (12) 16:55 15:57
28	05:20 21:24 17	06:14 20:20 (9) 34	06:14 20:20 34	19:13 (11) 19:04 28	18:03 (12) 16:53 16:02	18:40 (12) 16:53 15:58
29	05:21 21:22 18	06:15 20:18 (9) 34	06:15 20:18 34	19:12 (11) 19:01 28	18:03 (12) 16:51 16:01	18:41 (12) 16:51 15:59
30	05:23 21:21 20	06:17 20:19 (9) 33	06:17 20:15 33	19:12 (11) 18:59 27	18:03 (12) 16:49 16:00	18:42 (12) 16:49 16:00
31	05:24 21:19 21	06:19 20:19 (9) 32	06:19 20:13 32	19:13 (11) 19:45 (11)	17:11 16:47 330	18:43 (12) 16:47 259
Sonnenscheinstunden	514	462	384	381	106	232
astr.max.mögl.Beschattung	385	788	381	106	259	232

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** Q - IO 17

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni	
1	08:35	14:30 (6)	08:06	15:51 (4)	07:08	17:03 (2)	06:53	05:43	04:52			
	16:02	27	14:57 (6)	16:53	26	16:17 (4)	17:50	21	17:24 (2)	19:49	20:45	21:36
2	08:35	14:30 (6)	08:04	15:51 (4)	07:06	17:02 (2)	06:50	05:41	04:51			
	16:03	26	14:56 (6)	16:55	27	16:18 (4)	17:52	23	17:25 (2)	19:51	20:47	21:37
3	08:35	14:31 (6)	08:02	15:51 (4)	07:04	17:00 (2)	06:48	05:39	04:50			
	16:04	26	14:57 (6)	16:57	28	16:19 (4)	17:54	25	17:25 (2)	19:53	20:48	21:38
4	08:35	14:31 (6)	08:01	15:51 (4)	07:01	17:00 (2)	06:45	05:36	04:49			
	16:06	26	14:57 (6)	16:59	28	16:19 (4)	17:55	26	17:26 (2)	19:54	20:50	21:39
5	08:35	14:32 (6)	07:59	15:51 (4)	06:59	16:59 (2)	06:43	05:34	04:48			
	16:07	25	14:57 (6)	17:01	29	16:20 (4)	17:57	27	17:26 (2)	19:56	20:52	21:41
6	08:34	14:33 (6)	07:57	15:51 (4)	06:57	16:59 (2)	06:40	05:32	04:47			
	16:08	24	14:57 (6)	17:03	31	16:35 (3)	17:59	27	17:26 (2)	19:58	20:54	21:42
7	08:34	14:34 (6)	07:55	15:52 (4)	06:54	16:58 (2)	06:38	05:30	04:47			
	16:09	24	14:58 (6)	17:05	34	16:37 (3)	18:01	27	17:25 (2)	20:00	20:56	21:43
8	08:33	14:35 (6)	07:53	15:52 (4)	06:52	16:59 (2)	06:36	05:28	04:46			
	16:11	23	14:58 (6)	17:07	36	16:39 (3)	18:03	27	17:26 (2)	20:02	20:58	21:44
9	08:33	14:35 (6)	07:51	15:52 (4)	06:49	16:59 (2)	06:33	05:27	04:45			
	16:12	23	14:58 (6)	17:09	38	16:40 (3)	18:05	26	17:25 (2)	20:04	20:59	21:45
10	08:32	14:36 (6)	07:49	15:52 (4)	06:47	16:59 (2)	06:31	05:25	04:45			
	16:14	21	14:57 (6)	17:11	42	16:43 (3)	18:07	25	17:24 (2)	20:06	21:01	21:46
11	08:31	14:38 (6)	07:47	15:53 (4)	06:44	17:00 (2)	06:28	05:23	04:44			
	16:15	20	14:58 (6)	17:13	42	16:45 (3)	18:09	24	17:24 (2)	20:07	21:03	21:46
12	08:31	14:39 (6)	07:45	15:55 (4)	06:42	17:00 (2)	06:26	05:21	04:44			
	16:17	19	14:58 (6)	17:15	41	16:47 (3)	18:11	22	17:22 (2)	20:09	21:05	21:47
13	08:30	14:40 (6)	07:43	15:56 (4)	06:40	17:02 (2)	06:24	05:19	04:43			
	16:18	17	14:57 (6)	17:18	40	16:48 (3)	18:13	19	17:21 (2)	20:11	21:06	21:48
14	08:29	14:41 (6)	07:41	15:58 (4)	06:37	17:03 (2)	06:21	05:17	04:43			
	16:20	16	14:57 (6)	17:20	37	16:48 (3)	18:15	15	17:18 (2)	20:13	21:08	21:49
15	08:28	14:42 (6)	07:39	16:01 (4)	06:35	17:07 (2)	06:19	05:16	04:43			
	16:22	13	14:55 (6)	17:22	30	16:48 (3)	18:17	7	17:14 (2)	20:15	21:10	21:49
16	08:27	14:45 (6)	07:37	16:27 (3)	06:32		06:16	05:14	04:43			
	16:23	8	14:53 (6)	17:24	19	16:46 (3)	18:19		20:17	21:12	21:50	
17	08:26		07:35	16:28 (3)	06:30		06:14	05:12	04:43			
	16:25		17:26	16:46 (3)	18:21		20:19	21:13	21:50			
18	08:25		07:33	16:30 (3)	06:27		06:12	05:11	04:42			
	16:27		17:28	16:45 (3)	18:22		20:21	21:15	21:51			
19	08:24		07:31	16:31 (3)	06:25		06:09	05:09	04:42			
	16:29		17:30	16:44 (3)	18:24		20:22	21:17	21:51			
20	08:23		07:29	16:34 (3)	06:22		06:07	05:07	04:42			
	16:30		17:32	16:40 (3)	18:26		20:24	21:18	21:52			
21	08:22		07:26		06:20		06:05	05:06	04:42			
	16:32		17:34		18:28		20:26	21:20	21:52			
22	08:21		07:24		06:17		06:03	05:04	04:43			
	16:34		17:36		18:30		20:28	21:21	21:52			
23	08:19		07:22		06:15		06:00	05:03	04:43			
	16:36		17:38		18:32		20:30	21:23	21:52			
24	08:18	16:00 (4)	07:20		06:13		05:58	05:01	04:43			
	16:38	6	16:06 (4)	17:40	18:34		20:32	21:25	21:53			
25	08:17	15:57 (4)	07:18		06:10		05:56	05:00	04:43			
	16:40	12	16:09 (4)	17:42	18:36		20:34	21:26	21:53			
26	08:15	15:56 (4)	07:15	17:11 (2)	06:08		05:54	04:59	04:44			
	16:41	14	16:10 (4)	17:44	6	17:17 (2)	18:38	20:35	21:28	21:53		
27	08:14	15:54 (4)	07:13	17:07 (2)	06:05		05:51	04:57	04:44			
	16:43	18	16:12 (4)	17:46	13	17:20 (2)	18:39	20:37	21:29	21:53		
28	08:12	15:54 (4)	07:11	17:04 (2)	06:03		05:49	04:56	04:45			
	16:45	21	16:15 (4)	17:48	17	17:21 (2)	18:41	20:39	21:30	21:53		
29	08:11	15:53 (4)			06:00		05:47	04:55	04:45			
	16:47	22	16:15 (4)		18:43		20:41	21:32	21:52			
30	08:09	15:52 (4)			05:58		05:45	04:54	04:46			
	16:49	24	16:16 (4)		18:45		20:43	21:33	21:52			
31	08:07	15:51 (4)			06:55			04:53				
	16:51	26	16:17 (4)		19:47			21:34				
Sonnenscheinstunden		248		271		365		419		494		511
astr.max.mögl.Beschattung		481		616		341						

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** Q - IO 17

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember			
1	04:46 21:52	05:26 21:17	06:21 20:11	07:15 18:56	17:43 (2) 17:58 (2)	07:13 16:45	15:23 (4) 16:15 (3)	08:09 15:59	14:21 (6) 14:39 (6)
2	04:47 21:52	05:28 21:15	06:23 20:08	07:16 18:54	17:41 (2) 18:00 (2)	07:15 16:43	15:22 (4) 16:13 (3)	08:11 15:58	14:20 (6) 14:39 (6)
3	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:51	17:39 (2) 18:01 (2)	07:17 16:41	15:22 (4) 16:11 (3)	08:12 15:57	14:20 (6) 14:41 (6)
4	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	17:38 (2) 18:02 (2)	07:19 16:39	15:21 (4) 16:09 (3)	08:14 15:57	14:20 (6) 14:42 (6)
5	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:46	17:36 (2) 18:01 (2)	07:21 16:37	15:22 (4) 16:07 (3)	08:15 15:56	14:19 (6) 14:42 (6)
6	04:50 21:50	05:35 21:08	06:30 19:58	07:24 18:44	17:35 (2) 18:01 (2)	07:23 16:35	15:21 (4) 16:05 (3)	08:17 15:55	14:20 (6) 14:43 (6)
7	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:42	17:35 (2) 18:02 (2)	07:25 16:33	15:21 (4) 15:49 (4)	08:18 15:55	14:20 (6) 14:44 (6)
8	04:52 21:48	05:38 21:04	06:33 19:53	07:27 18:39	17:34 (2) 18:01 (2)	07:27 16:31	15:21 (4) 15:49 (4)	08:19 15:54	14:20 (6) 14:45 (6)
9	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:37	17:34 (2) 18:01 (2)	07:29 16:29	15:21 (4) 15:49 (4)	08:21 15:54	14:20 (6) 14:45 (6)
10	04:54 21:47	05:42 21:00	06:37 19:49	07:31 18:34	17:34 (2) 18:01 (2)	07:31 16:27	15:21 (4) 15:49 (4)	08:22 15:54	14:20 (6) 14:45 (6)
11	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	17:34 (2) 18:00 (2)	07:33 16:26	15:23 (4) 15:49 (4)	08:23 15:53	14:21 (6) 14:47 (6)
12	04:57 21:45	05:45 20:56	06:40 19:44	07:35 18:29	17:35 (2) 17:59 (2)	07:35 16:24	15:23 (4) 15:49 (4)	08:24 15:53	14:21 (6) 14:47 (6)
13	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	17:35 (2) 17:58 (2)	07:37 16:22	15:24 (4) 15:48 (4)	08:25 15:53	14:21 (6) 14:48 (6)
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 18:25	17:36 (2) 17:57 (2)	07:39 16:21	15:24 (4) 15:48 (4)	08:26 15:53	14:21 (6) 14:48 (6)
15	05:00 21:42	05:50 20:50	06:46 19:36	07:41 18:22	17:37 (2) 17:55 (2)	07:41 16:19	15:25 (4) 15:47 (4)	08:27 15:53	14:22 (6) 14:49 (6)
16	05:02 21:41	05:52 20:47	06:48 19:34	07:42 18:20	17:39 (2) 17:52 (2)	07:43 16:17	15:26 (4) 15:46 (4)	08:28 15:53	14:22 (6) 14:49 (6)
17	05:03 21:40	05:54 20:45	06:49 19:31	07:44 18:18	17:42 (2) 17:50 (2)	07:44 16:16	15:28 (4) 15:44 (4)	08:29 15:53	14:23 (6) 14:50 (6)
18	05:04 21:39	05:56 20:43	06:51 19:29	07:46 18:15	17:46 16:14	07:46 15:42 (4)	15:29 (4) 15:42 (4)	08:30 15:53	14:23 (6) 14:50 (6)
19	05:06 21:37	05:58 20:41	06:53 19:26	07:48 18:13	07:48 16:13	07:48 15:32 (4)	15:32 (4) 15:41 (4)	08:31 15:53	14:23 (6) 14:50 (6)
20	05:07 21:36	05:59 20:39	06:55 19:24	07:50 18:11	07:50 16:11	07:50 16:11	15:41 (4) 16:11	15:53 15:54	14:50 (6) 14:51 (6)
21	05:09 21:35	06:01 20:36	06:57 19:21	07:52 18:09	07:52 16:10	07:52 16:10	15:52 (4) 16:10	08:32 15:54	14:24 (6) 14:52 (6)
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	07:54 16:09	07:54 16:09	15:54 (4) 16:09	08:33 15:54	14:24 (6) 14:52 (6)
23	05:12 21:32	06:05 20:32	07:00 19:16	07:56 18:04	17:05 (3) 17:10 (3)	07:55 16:07	15:55 (3) 16:07	08:33 15:55	14:25 (6) 14:53 (6)
24	05:13 21:30	06:06 20:29	07:02 19:14	07:58 18:02	17:01 (3) 17:13 (3)	07:57 16:06	15:56 (3) 16:06	08:34 15:55	14:26 (6) 14:53 (6)
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 18:00	16:59 (3) 17:14 (3)	07:59 16:05	15:57 (3) 16:05	08:34 15:56	14:26 (6) 14:53 (6)
26	05:16 21:27	06:10 20:25	07:06 19:09	08:02 17:57	16:58 (3) 17:15 (3)	08:01 16:04	15:58 (3) 16:04	08:35 15:57	14:27 (6) 14:54 (6)
27	05:18 21:26	06:12 20:22	07:07 19:06	07:04 16:55	15:57 (3) 16:16 (3)	08:03 16:03	14:25 (6) 14:31 (6)	08:35 15:57	14:27 (6) 14:54 (6)
28	05:19 21:24	06:14 20:20	07:09 19:04	07:05 16:53	15:32 (4) 16:17 (3)	08:04 16:02	14:23 (6) 14:34 (6)	08:35 15:58	14:28 (6) 14:55 (6)
29	05:21 21:22	06:15 20:18	07:11 19:01	07:07 16:51	15:28 (4) 16:17 (3)	08:06 16:01	14:22 (6) 14:36 (6)	08:35 15:59	14:28 (6) 14:55 (6)
30	05:23 21:21	06:17 20:15	07:13 18:59	07:09 17:46 (2) 17:55 (2)	15:26 (4) 16:17 (3)	08:08 16:00	14:21 (6) 14:37 (6)	08:35 16:00	14:29 (6) 14:56 (6)
31	05:24 21:19	06:19 20:13		07:11 16:47	15:25 (4) 16:17 (3)			08:35 16:01	14:29 (6) 14:56 (6)
Sonnenscheinstunden	515	462	384	330	259	566	792		
astr.max.mögl.Beschattung			9	584	566	792			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Zusatzbelastung**Schattenrezeptor:** R - IO 18

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	16:09 (4) 17:50	07:08 17:20 (2)	06:53 19:49	05:43 20:45
2	08:35 16:03	08:04 16:55	16:09 (4) 17:52	07:06 17:20 (2)	06:50 19:51	05:41 20:47
3	08:35 16:04	08:02 16:57	16:10 (4) 17:53	07:04 17:18 (2)	06:48 19:52	05:38 20:48
4	08:35 16:06	08:01 16:59	16:10 (4) 17:55	07:01 17:17 (2)	06:45 19:54	05:36 20:50
5	08:35 16:07	07:59 17:01	16:10 (4) 17:57	06:59 17:14 (2)	06:43 19:56	05:34 20:52
6	08:34 16:08	07:57 17:03	16:10 (4) 17:59	06:57 19:58	06:40 20:54	05:32 21:42
7	08:34 16:09	07:55 17:05	16:10 (4) 18:01	06:54 20:00	06:38 20:56	05:30 21:43
8	08:33 16:11	07:53 17:07	16:11 (4) 18:03	06:52 20:02	06:36 20:58	05:28 21:44
9	08:33 16:12	07:51 17:09	16:11 (4) 18:05	06:49 20:04	06:33 20:59	05:26 21:45
10	08:32 16:14	07:49 17:11	16:12 (4) 18:07	06:47 20:06	06:31 21:01	05:25 21:46
11	08:31 16:15	07:47 17:13	16:14 (4) 18:09	06:44 20:07	06:28 21:03	05:23 21:46
12	08:31 16:17	07:45 17:15	16:16 (4) 18:11	06:42 20:09	06:26 21:05	05:21 21:47
13	08:30 16:18	07:43 17:17	16:24 (4) 18:13	18:11 20:11	20:09 21:06	21:05 21:48
14	08:29 16:20	07:41 17:20	06:40 18:15	06:37 20:13	06:24 21:08	05:19 21:49
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 17:24	06:32 18:19	06:16 20:17	05:14 21:12	04:43 21:50
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	05:12 21:13	04:42 21:50
18	08:25 16:27	07:33 17:28	06:27 18:22	06:12 20:21	05:10 21:15	04:42 21:51
19	08:24 16:28	07:31 17:30	06:25 18:24	06:09 20:22	05:09 21:17	04:42 21:51
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 20:24	05:07 21:18	04:42 21:52
21	08:22 16:32	07:26 17:34	06:20 18:28	06:05 20:26	05:06 21:20	04:42 21:52
22	08:21 16:34	07:24 17:36	17:05 (2) 18:30	06:17 20:28	05:04 21:21	04:43 21:52
23	08:19 16:36	07:22 17:38	17:10 (2) 18:32	18:30 20:30	21:21 21:23	21:52 21:52
24	08:18 16:38	07:20 17:40	17:11 (2) 18:34	18:32 20:32	21:23 21:25	21:52 21:53
25	08:17 16:40	07:17 17:42	17:12 (2) 18:36	18:34 20:34	21:25 21:26	21:53 21:53
26	08:15 16:41	07:15 17:44	17:16 (2) 18:37	18:36 20:35	21:26 21:28	21:53 21:53
27	08:14 16:43	07:13 17:46	17:01 (2) 18:39	18:37 20:37	21:28 21:29	21:53 21:53
28	08:12 16:45	07:11 17:48	17:20 (2) 18:41	18:39 20:39	21:29 21:30	21:53 21:53
29	08:11 16:47	16:13 (4) 16:17 (4)	17:00 (2) 18:43	18:41 20:41	21:30 21:32	21:53 21:52
30	08:09 16:49	16:12 (4) 16:19 (4)	17:02 (2) 18:45	18:43 20:43	21:32 21:33	21:52 21:52
31	08:07 16:51	16:11 (4) 16:21 (4)	17:02 (2) 19:47	18:45 19:47	21:33 21:34	21:52 21:52
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung	26	297	80			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

20.08.2019 10:57/3.2.744

SHADOW - Kalender**Berechnung: Zusatzbelastung Schattenrezeptor: R - IO 18****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober		November		Dezember
1	04:46	05:26	06:21	07:15		07:13	15:44 (4)	08:09
	21:52	21:17	20:11	18:56		16:45	11 15:55 (4)	15:59
2	04:47	05:28	06:23	07:16		07:15	15:42 (4)	08:11
	21:52	21:15	20:08	18:54		16:43	15 15:57 (4)	15:58
3	04:48	05:29	06:24	07:18		07:17	15:41 (4)	08:12
	21:51	21:14	20:06	18:51		16:41	17 15:58 (4)	15:57
4	04:49	05:31	06:26	07:20		07:19	15:40 (4)	08:14
	21:51	21:12	20:03	18:49		16:39	19 15:59 (4)	15:57
5	04:49	05:33	06:28	07:22		07:21	15:40 (4)	08:15
	21:50	21:10	20:01	18:46		16:37	20 16:00 (4)	15:56
6	04:50	05:35	06:30	07:24		07:23	15:40 (4)	08:17
	21:50	21:08	19:58	18:44		16:35	20 16:00 (4)	15:55
7	04:51	05:36	06:32	07:26		07:25	15:40 (4)	08:18
	21:49	21:06	19:56	18:42		16:33	20 16:00 (4)	15:55
8	04:52	05:38	06:33	07:27		07:27	15:39 (4)	08:19
	21:48	21:04	19:53	18:39		16:31	21 16:00 (4)	15:54
9	04:53	05:40	06:35	07:29		07:29	15:39 (4)	08:21
	21:48	21:02	19:51	18:37		16:29	20 15:59 (4)	15:54
10	04:54	05:41	06:37	07:31	17:39 (2)	07:31	15:40 (4)	08:22
	21:47	21:00	19:49	18:34	10 17:49 (2)	16:27	17 15:57 (4)	15:54
11	04:56	05:43	06:39	07:33	17:37 (2)	07:33	15:41 (4)	08:23
	21:46	20:58	19:46	18:32	14 17:51 (2)	16:26	15 15:56 (4)	15:53
12	04:57	05:45	06:40	07:35	17:35 (2)	07:35	15:41 (4)	08:24
	21:45	20:56	19:44	18:29	17 17:52 (2)	16:24	13 15:54 (4)	15:53
13	04:58	05:47	06:42	07:37	17:34 (2)	07:37	15:42 (4)	08:25
	21:44	20:54	19:41	18:27	19 17:53 (2)	16:22	10 15:52 (4)	15:53
14	04:59	05:49	06:44	07:39	17:34 (2)	07:39	15:43 (4)	08:26
	21:43	20:52	19:39	18:25	19 17:53 (2)	16:21	7 15:50 (4)	15:53
15	05:00	05:50	06:46	07:40	17:33 (2)	07:41	15:44 (4)	08:27
	21:42	20:50	19:36	18:22	20 17:53 (2)	16:19	4 15:48 (4)	15:53
16	05:02	05:52	06:48	07:42	17:33 (2)	07:42		08:28
	21:41	20:47	19:34	18:20	19 17:52 (2)	16:17		15:53
17	05:03	05:54	06:49	07:44	17:33 (2)	07:44		08:29
	21:40	20:45	19:31	18:18	17 17:50 (2)	16:16		15:53
18	05:04	05:56	06:51	07:46	17:33 (2)	07:46		08:30
	21:39	20:43	19:29	18:15	15 17:48 (2)	16:14		15:53
19	05:06	05:57	06:53	07:48	17:33 (2)	07:48		08:31
	21:37	20:41	19:26	18:13	12 17:45 (2)	16:13		15:53
20	05:07	05:59	06:55	07:50	17:34 (2)	07:50		08:32
	21:36	20:39	19:24	18:11	9 17:43 (2)	16:11		15:54
21	05:09	06:01	06:56	07:52	17:35 (2)	07:52		08:32
	21:35	20:36	19:21	18:08	5 17:40 (2)	16:10		15:54
22	05:10	06:03	06:58	07:54	17:37 (2)	07:54		08:33
	21:33	20:34	19:19	18:06	1 17:38 (2)	16:09		15:54
23	05:12	06:05	07:00	07:56		07:55		08:33
	21:32	20:32	19:16	18:04		16:07		15:55
24	05:13	06:06	07:02	07:58		07:57		08:34
	21:30	20:29	19:14	18:02		16:06		15:55
25	05:15	06:08	07:04	08:00		07:59		08:34
	21:29	20:27	19:11	18:00		16:05		15:56
26	05:16	06:10	07:05	08:02		08:01		08:35
	21:27	20:25	19:09	17:57		16:04		15:57
27	05:18	06:12	07:07	07:04		08:02		08:35
	21:26	20:22	19:06	16:55		16:03		15:57
28	05:19	06:14	07:09	07:05		08:04		08:35
	21:24	20:20	19:04	16:53		16:02		15:58
29	05:21	06:15	07:11	07:07		08:06		08:35
	21:22	20:18	19:01	16:51		16:01		15:59
30	05:23	06:17	07:13	07:09		08:07		08:35
	21:21	20:15	18:59	16:49		16:00		16:00
31	05:24	06:19		07:11	15:47 (4)			08:35
	21:19	20:13		16:47	6 15:53 (4)			16:01
Sonnenscheinstunden	515	462	384	330		259		232
astr.max.mögl.Beschattung				183		229		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** S - IO 19

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35	08:06	15:34 (8) 07:08	06:53	05:43	04:52
	16:02	16:53	21 15:55 (8) 17:50	19:49	20:45	21:36
2	08:35	08:04	15:35 (8) 07:06	06:50	05:41	04:51
	16:03	16:55	19 15:54 (8) 17:52	19:51	20:47	21:37
3	08:35	08:02	15:37 (8) 07:04	06:48	05:38	04:50
	16:04	16:57	15 15:52 (8) 17:53	19:52	20:48	21:38
4	08:35	08:01	15:40 (8) 07:01	06:45	05:36	04:49
	16:06	16:59	11 15:51 (8) 17:55	19:54	20:50	21:39
5	08:34	07:59	06:59	17:29 (4) 06:43	05:34	04:48
	16:07	17:01	17:57	3 17:32 (4) 19:56	20:52	21:41
6	08:34	07:57	06:56	17:27 (4) 06:40	05:32	04:47
	16:08	17:03	17:59	7 17:34 (4) 19:58	20:54	21:42
7	08:34	15:34 (8) 07:55	06:54	17:24 (4) 06:38	05:30	04:47
	16:09	1 15:35 (8) 17:05	18:01	12 17:36 (4) 20:00	20:56	21:43
8	08:33	15:33 (8) 07:53	06:52	17:24 (4) 06:36	05:28	04:46
	16:11	3 15:36 (8) 17:07	18:03	14 17:38 (4) 20:02	20:58	21:44
9	08:33	15:31 (8) 07:51	06:49	17:22 (4) 06:33	05:27	04:45
	16:12	6 15:37 (8) 17:09	18:05	18 17:40 (4) 20:04	20:59	21:45
10	08:32	15:31 (8) 07:49	16:42 (6) 06:47	17:22 (4) 06:31	05:25	04:45
	16:14	8 15:39 (8) 17:11	1 16:43 (6) 18:07	20 17:42 (4) 20:06	21:01	21:46
11	08:31	15:31 (8) 07:47	16:39 (6) 06:44	17:22 (4) 06:28	05:23	04:44
	16:15	10 15:41 (8) 17:13	6 16:45 (6) 18:09	21 17:43 (4) 20:07	21:03	21:46
12	08:31	15:30 (8) 07:45	16:37 (6) 06:42	17:21 (4) 06:26	05:21	04:44
	16:17	13 15:43 (8) 17:15	11 16:48 (6) 18:11	21 17:42 (4) 20:09	21:05	21:47
13	08:30	15:30 (8) 07:43	16:36 (6) 06:40	17:22 (4) 06:24	05:19	04:43
	16:18	15 15:45 (8) 17:17	14 16:50 (6) 18:13	20 17:42 (4) 20:11	21:06	21:48
14	08:29	15:30 (8) 07:41	16:35 (6) 06:37	17:22 (4) 06:21	05:17	04:43
	16:20	17 15:47 (8) 17:20	17 16:52 (6) 18:15	19 17:41 (4) 20:13	21:08	21:49
15	08:28	15:29 (8) 07:39	16:35 (6) 06:35	17:23 (4) 06:19	05:16	04:43
	16:22	19 15:48 (8) 17:22	20 16:55 (6) 18:17	17 17:40 (4) 20:15	21:10	21:49
16	08:27	15:29 (8) 07:37	16:33 (6) 06:32	17:23 (4) 06:16	05:14	04:43
	16:23	21 15:50 (8) 17:24	22 16:55 (6) 18:19	15 17:38 (4) 20:17	21:12	21:50
17	08:26	15:29 (8) 07:35	16:33 (6) 06:30	17:26 (4) 06:14	05:12	04:42
	16:25	23 15:52 (8) 17:26	23 16:56 (6) 18:21	10 17:36 (4) 20:19	21:13	21:50
18	08:25	15:29 (8) 07:33	16:33 (6) 06:27	06:12	05:11	04:42
	16:27	25 15:54 (8) 17:28	23 16:56 (6) 18:22	20:21	21:15	21:51
19	08:24	15:28 (8) 07:31	16:33 (6) 06:25	06:09	05:09	04:42
	16:28	26 15:54 (8) 17:30	23 16:56 (6) 18:24	20:22	21:17	21:51
20	08:23	15:29 (8) 07:29	16:33 (6) 06:22	06:07	05:07	04:42
	16:30	26 15:55 (8) 17:32	22 16:55 (6) 18:26	20:24	21:18	21:52
21	08:22	15:29 (8) 07:26	16:34 (6) 06:20	06:05	05:06	04:42
	16:32	27 15:56 (8) 17:34	21 16:55 (6) 18:28	20:26	21:20	21:52
22	08:21	15:29 (8) 07:24	16:35 (6) 06:17	06:02	05:04	04:43
	16:34	27 15:56 (8) 17:36	20 16:55 (6) 18:30	20:28	21:21	21:52
23	08:19	15:29 (8) 07:22	16:35 (6) 06:15	06:00	05:03	04:43
	16:36	28 15:57 (8) 17:38	18 16:53 (6) 18:32	20:30	21:23	21:52
24	08:18	15:29 (8) 07:20	16:36 (6) 06:12	05:58	05:01	04:43
	16:38	27 15:56 (8) 17:40	16 16:52 (6) 18:34	20:32	21:24	21:53
25	08:17	15:29 (8) 07:17	16:39 (6) 06:10	05:56	05:00	04:43
	16:40	27 15:56 (8) 17:42	11 16:50 (6) 18:36	20:34	21:26	21:53
26	08:15	15:30 (8) 07:15	16:43 (6) 06:08	05:53	04:59	04:44
	16:41	27 15:57 (8) 17:44	2 16:45 (6) 18:37	20:35	21:27	21:53
27	08:14	15:30 (8) 07:13	06:05	05:51	04:57	04:44
	16:43	27 15:57 (8) 17:46	18:39	20:37	21:29	21:53
28	08:12	15:30 (8) 07:11	06:03	05:49	04:56	04:45
	16:45	26 15:56 (8) 17:48	18:41	20:39	21:30	21:53
29	08:11	15:32 (8)	06:00	05:47	04:55	04:45
	16:47	25 15:57 (8)	18:43	20:41	21:32	21:52
30	08:09	15:32 (8)	05:58	05:45	04:54	04:46
	16:49	24 15:56 (8)	18:45	20:43	21:33	21:52
31	08:07	15:33 (8)	06:55		04:53	
	16:51	23 15:56 (8)	19:47		21:34	
Sonnenscheinstunden	248	271	365	419	494	511
astr. max. mögl. Beschattung	501	336	197			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender

Berechnung: Zusatzbelastung **Schattenrezeptor:** S - IO 19

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

		Jul	August	September		Oktober		November		Dezember				
	1	04:46	05:26	06:21		07:15	18:01 (4)	07:13	16:08 (6)	08:09	15:11 (8)			
		21:52	21:17	20:10		18:56	20	18:21 (4)	16:45	7	16:15 (6)	15:59	14	15:25 (8)
	2	04:47	05:28	06:23		07:16	18:01 (4)	07:15	16:10 (6)	08:11		15:12 (8)		15:12 (8)
		21:52	21:15	20:08		18:54	20	18:21 (4)	16:43	3	16:13 (6)	15:58	12	15:24 (8)
	3	04:48	05:29	06:24		07:18	18:00 (4)	07:17			08:12		15:14 (8)	
		21:51	21:14	20:06		18:51	21	18:21 (4)	16:41		15:57	9	15:23 (8)	
	4	04:49	05:31	06:26		07:20	18:00 (4)	07:19			08:14		15:14 (8)	
		21:51	21:12	20:03		18:49	21	18:21 (4)	16:39		15:57	8	15:22 (8)	
	5	04:50	05:33	06:28		07:22	17:59 (4)	07:21			08:15		15:16 (8)	
		21:50	21:10	20:01		18:46	20	18:19 (4)	16:37		15:56	5	15:21 (8)	
	6	04:50	05:35	06:30		07:24	17:59 (4)	07:23			08:17		15:19 (8)	
		21:50	21:08	19:58		18:44	18	18:17 (4)	16:35		15:55	2	15:21 (8)	
	7	04:51	05:36	06:31		07:26	18:00 (4)	07:25			08:18			
		21:49	21:06	19:56		18:42	14	18:14 (4)	16:33		15:55			
	8	04:52	05:38	06:33		07:27	18:00 (4)	07:27		15:11 (8)	08:19			
		21:48	21:04	19:53		18:39	12	18:12 (4)	16:31	9	15:20 (8)	15:54		
	9	04:53	05:40	06:35		07:29	18:02 (4)	07:29		15:08 (8)	08:21			
		21:48	21:02	19:51		18:37	7	18:09 (4)	16:29	14	15:22 (8)	15:54		
	10	04:54	05:41	06:37		07:31	18:04 (4)	07:31		15:07 (8)	08:22			
		21:47	21:00	19:49		18:34	3	18:07 (4)	16:27	17	15:24 (8)	15:54		
	11	04:56	05:43	06:39		07:33		07:33		15:05 (8)	08:23			
		21:46	20:58	19:46		18:32		16:26	20	15:25 (8)	15:53			
	12	04:57	05:45	06:40		07:35		07:35		15:05 (8)	08:24			
		21:45	20:56	19:44		18:29		16:24	22	15:27 (8)	15:53			
	13	04:58	05:47	06:42		07:37		07:37		15:05 (8)	08:25			
		21:44	20:54	19:41		18:27		16:22	23	15:28 (8)	15:53			
	14	04:59	05:49	06:44		07:39		07:39		15:04 (8)	08:26			
		21:43	20:52	19:39		18:25		16:21	24	15:28 (8)	15:53			
	15	05:00	05:50	06:46		07:40		07:41		15:04 (8)	08:27			
		21:42	20:49	19:36		18:22		16:19	25	15:29 (8)	15:53			
	16	05:02	05:52	06:48		07:42		07:42		15:03 (8)	08:28			
		21:41	20:47	19:34		18:20		16:17	26	15:29 (8)	15:53			
	17	05:03	05:54	06:49		07:44		07:44		15:03 (8)	08:29			
		21:40	20:45	19:31		18:18		16:16	27	15:30 (8)	15:53			
	18	05:04	05:56	06:51		07:46		17:10 (6)	07:46	15:03 (8)	08:30			
		21:38	20:43	19:29		18:15	11	17:21 (6)	16:14	27	15:30 (8)	15:53		
	19	05:06	05:57	06:53		07:48		17:08 (6)	07:48	15:03 (8)	08:31			
		21:37	20:41	19:26		18:13	15	17:23 (6)	16:13	27	15:30 (8)	15:53		
	20	05:07	05:59	06:55		07:50		17:06 (6)	07:50	15:03 (8)	08:31			
		21:36	20:38	19:24		18:11	18	17:24 (6)	16:11	27	15:30 (8)	15:54		
	21	05:09	06:01	06:56		07:52		17:05 (6)	07:52	15:04 (8)	08:32			
		21:35	20:36	19:21		18:08	20	17:25 (6)	16:10	27	15:31 (8)	15:54		
	22	05:10	06:03	06:58		07:54		17:04 (6)	07:54	15:04 (8)	08:33			
		21:33	20:34	19:19		18:06	22	17:26 (6)	16:09	27	15:31 (8)	15:54		
	23	05:12	06:05	07:00		07:56		17:03 (6)	07:55	15:04 (8)	08:33			
		21:32	20:32	19:16		18:04	23	17:26 (6)	16:07	27	15:31 (8)	15:55		
	24	05:13	06:06	07:02		07:58		17:03 (6)	07:57	15:05 (8)	08:34			
		21:30	20:29	19:14		18:02	23	17:26 (6)	16:06	26	15:31 (8)	15:55		
	25	05:15	06:08	07:04		08:00		17:03 (6)	07:59	15:06 (8)	08:34			
		21:29	20:27	19:11		18:00	23	17:26 (6)	16:05	25	15:31 (8)	15:56		
	26	05:16	06:10	07:05		08:02		17:03 (6)	08:01	15:06 (8)	08:34			
		21:27	20:25	19:09		17:57	22	17:25 (6)	16:04	25	15:31 (8)	15:57		
	27	05:18	06:12	07:07		07:03		16:03 (6)	08:02	15:07 (8)	08:35			
		21:26	20:22	19:06	1	18:13 (4)	16:55	22	16:25 (6)	16:03	22	15:29 (8)	15:57	
	28	05:19	06:14	07:09		18:06 (4)	07:05		16:03 (6)	08:04	15:08 (8)	08:35		
		21:24	20:20	19:04	11	18:17 (4)	16:53	21	16:24 (6)	16:02	20	15:28 (8)	15:58	
	29	05:21	06:15	07:11		18:04 (4)	07:07		16:04 (6)	08:06	15:09 (8)	08:35		
		21:22	20:18	19:01	15	18:19 (4)	16:51	18	16:22 (6)	16:01	18	15:27 (8)	15:59	
	30	05:23	06:17	07:13		18:02 (4)	07:09		16:05 (6)	08:07	15:10 (8)	08:35		
		21:21	20:15	18:59	18	18:20 (4)	16:49	15	16:20 (6)	16:00	16	15:26 (8)	16:00	
	31	05:24	06:19			07:11		16:06 (6)				08:35		
		21:19	20:13			16:47	12	16:18 (6)				16:01		
Sonnenscheinstunden		515	462	384		330		259			232			
astr.max.mögl.Beschattung				45		421		531			50			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

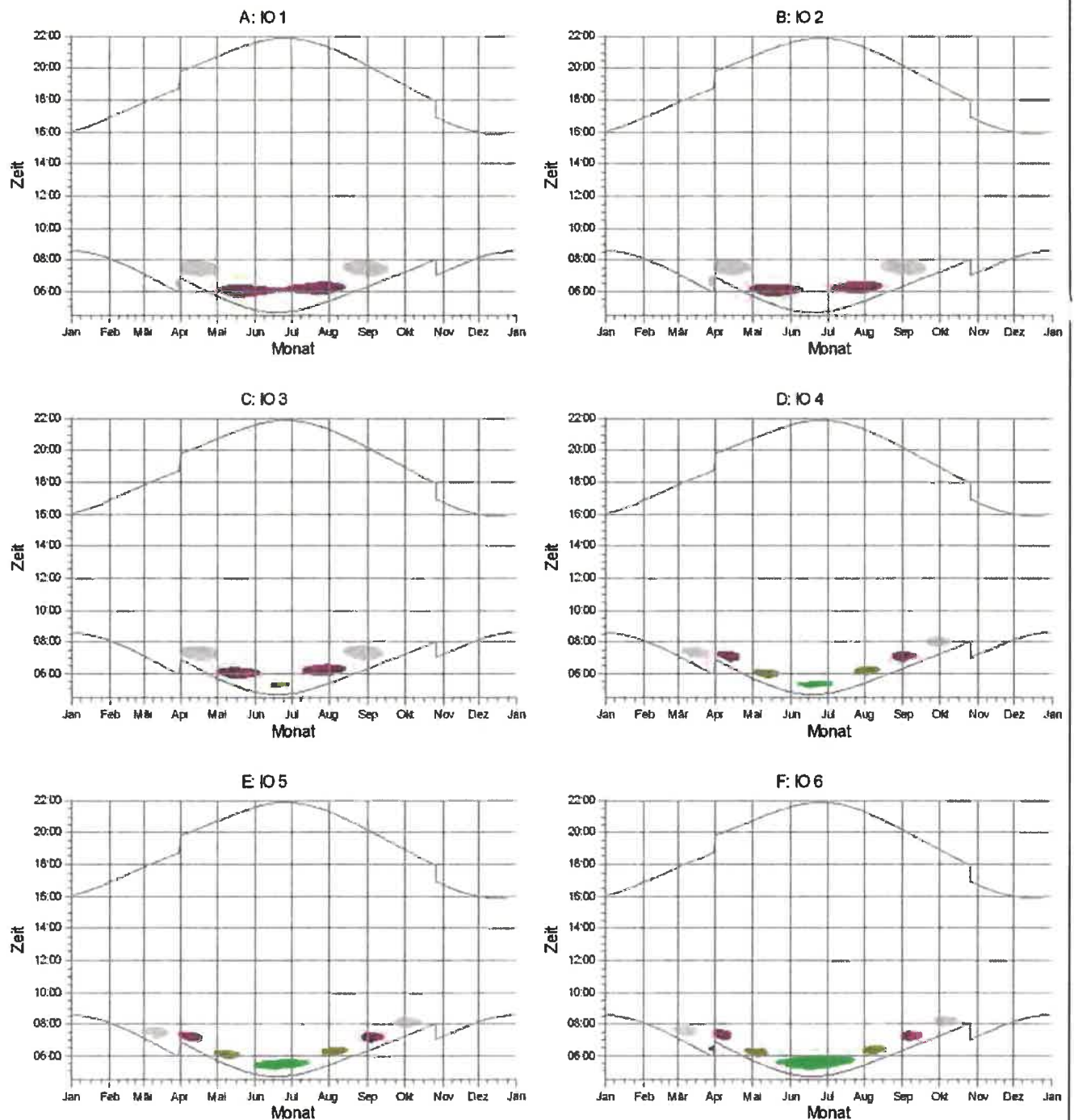
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

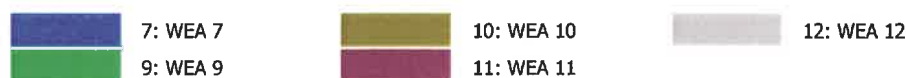
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Zusatzbelastung



WEA



Projekt:

19-095-GBK-02

Beschreibung:

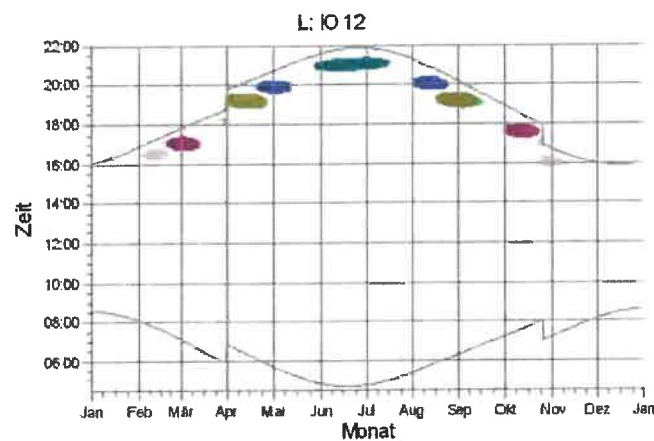
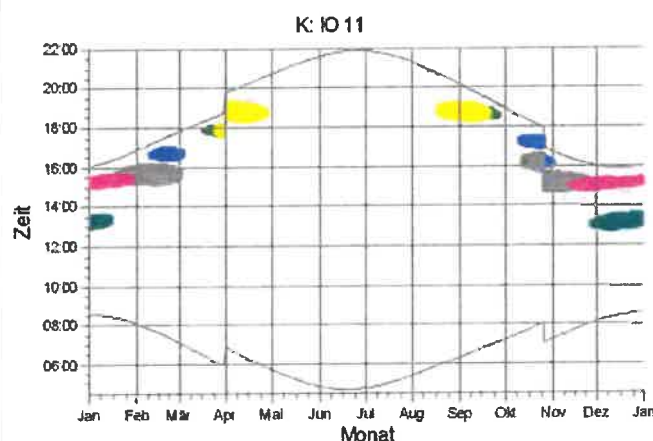
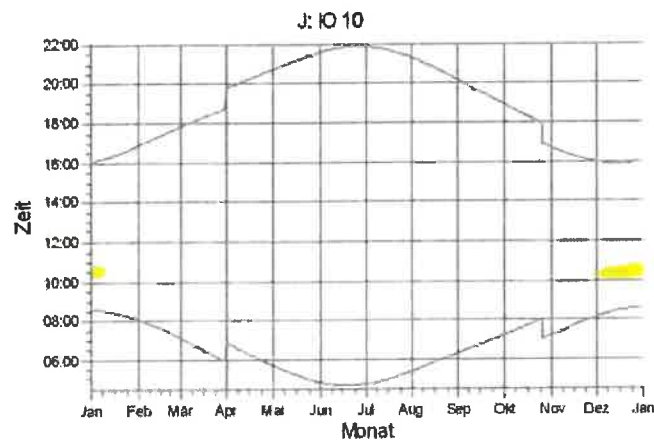
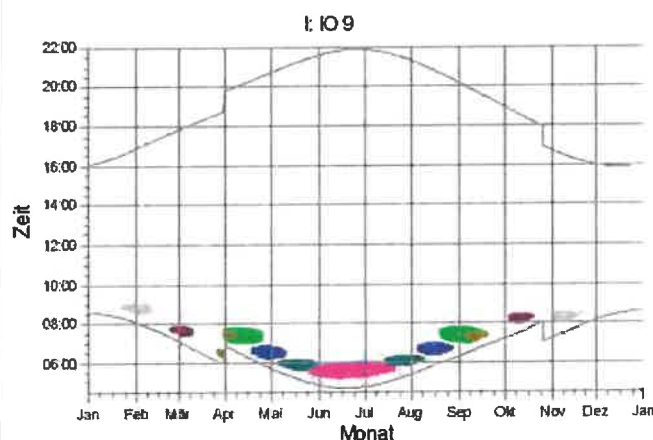
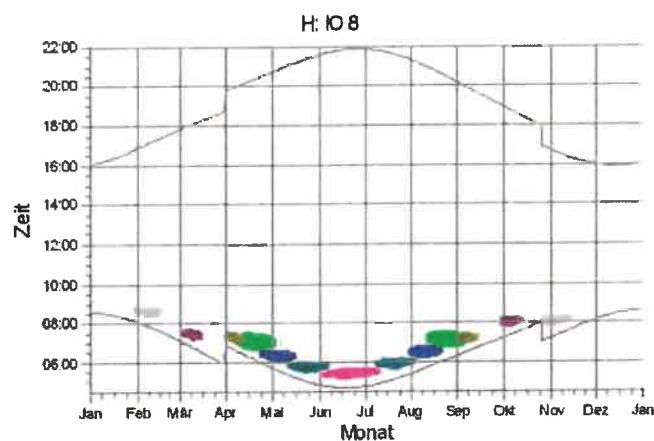
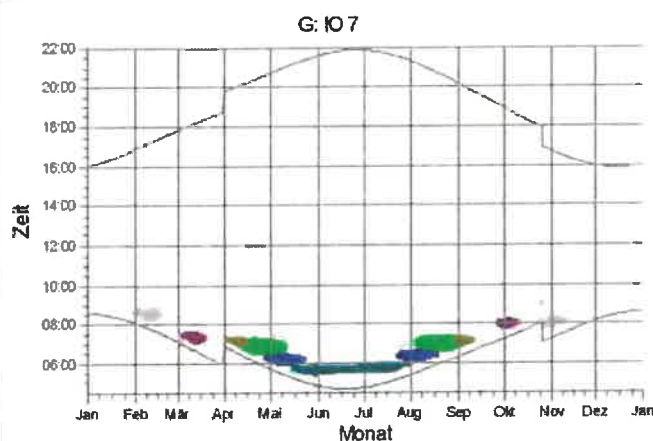
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdauf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Zusatzbelastung



WEA



1: WEA 1

2: WEA 2

3: WEA 3



4: WEA 4

5: WEA 5

6: WEA 6



7: WEA 7

9: WEA 9

10: WEA 10



11: WEA 11

12: WEA 12

Projekt:

19-095-GBK-02

Beschreibung:

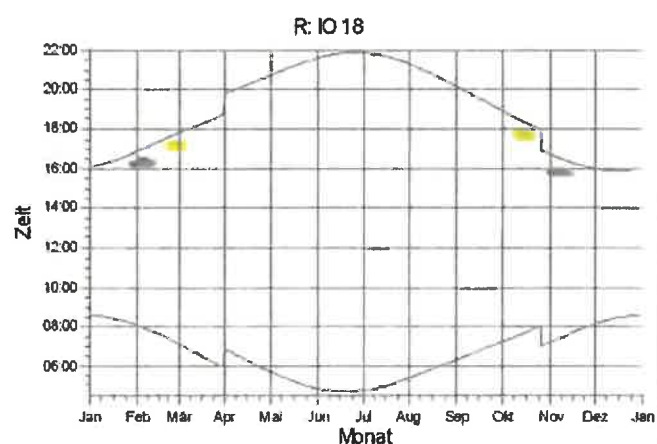
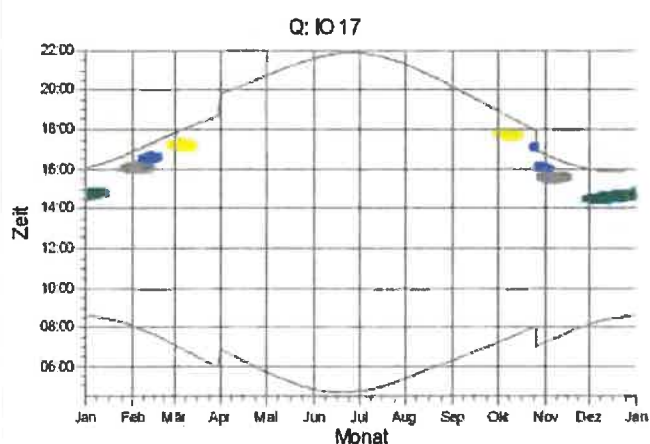
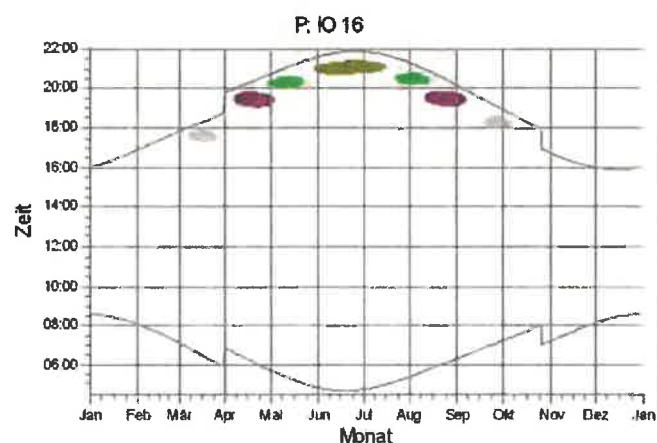
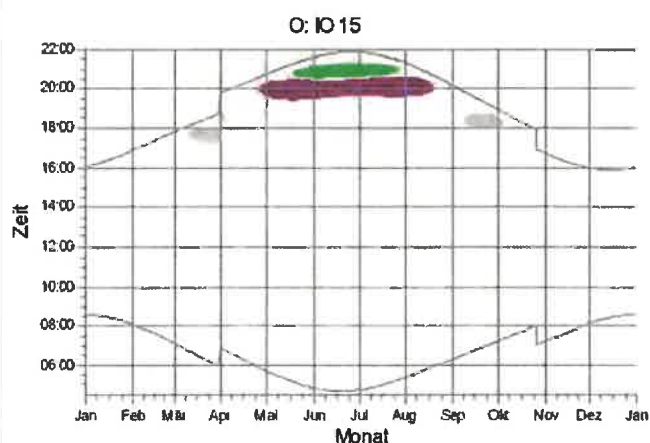
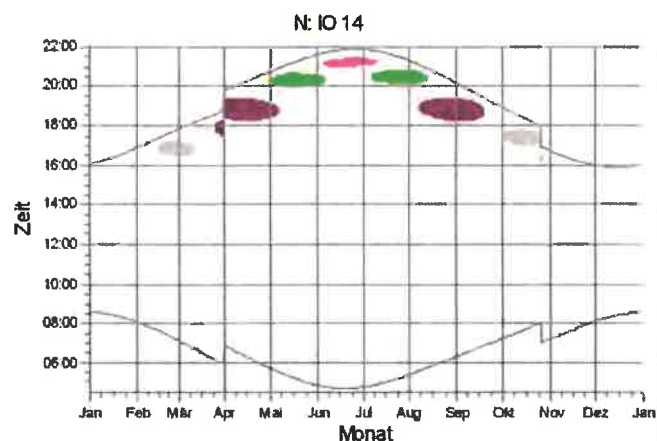
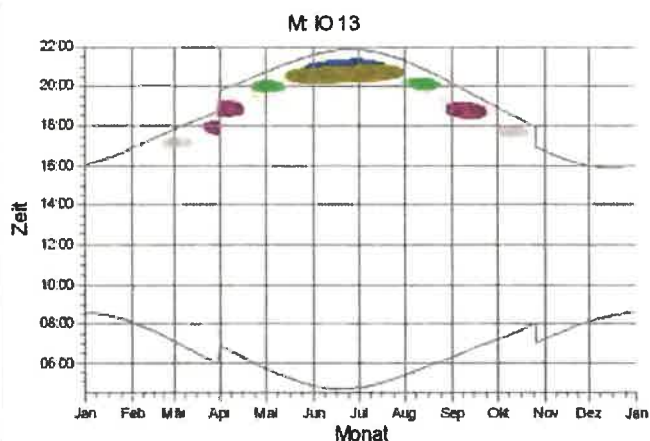
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Zusatzbelastung



WEA



Projekt:

19-095-GBK-02

Beschreibung:

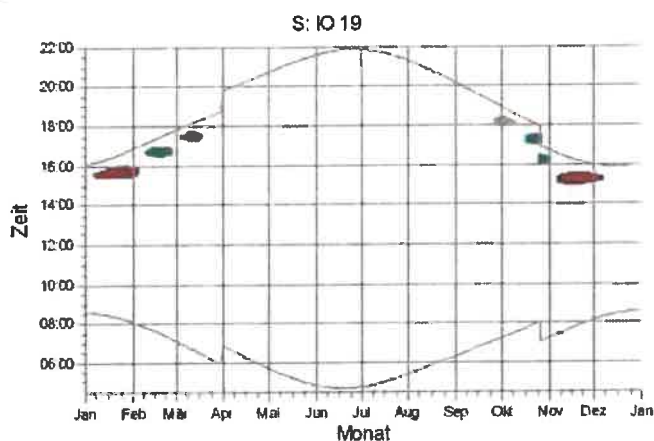
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Zusatzbelastung



WEA



4: WEA 4



6: WEA 6



8: WEA 8

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 1 - WEA 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember	
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	18:40-19:02/22 20:45	05:43 21:36	04:52 21:52	04:47 21:17	05:26 20:11	06:21 18:56	07:15 16:45	07:13 15:59	
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:51	18:42-19:01/19 20:47	05:41 21:37	04:51 21:52	04:47 21:16	05:28 20:08	06:23 18:54	07:17 16:43	07:15 15:58	
3	08:35 16:05	08:03 16:57	07:04 17:54	06:48 19:53	18:43-18:58/15 20:49	05:39 21:38	04:50 21:51	04:48 21:14	05:30 20:06	06:25 18:51	07:18 16:41	07:17 15:58	
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:54	18:47-18:54/7 20:50	05:37 21:40	04:49 21:51	04:49 21:12	05:31 20:03	06:26 18:49	07:20 16:39	07:19 15:57	
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:56	05:35 20:52	04:48 21:41	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:47	07:21 16:37	08:15 15:56	
6	08:34 16:08	07:57 17:03	06:57 18:00	06:41 19:58	05:33 20:54	04:48 21:42	04:51 21:50	05:35 21:08	06:30 19:59	07:24 18:44	07:23 16:35	08:17 15:56	
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:31 20:56	04:47 21:43	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 15:55	
8	08:33 16:11	07:53 17:07	06:52 18:03	06:36 20:02	05:29 20:58	04:46 21:44	04:52 21:48	05:38 21:04	06:33 19:54	07:28 18:39	07:27 16:31	08:19 15:55	
9	08:33 16:12	07:51 17:10	06:49 18:05	06:33 20:04	05:27 20:59	04:46 21:45	04:54 21:48	05:40 21:02	06:35 19:51	07:29 18:37	07:29 16:29	08:21 15:54	
10	08:32 16:14	07:50 17:12	06:47 18:07	06:31 20:06	05:25 21:01	04:45 21:46	04:55 21:47	05:42 21:00	06:37 19:49	18:39-18:51/12 18:34	07:31 16:28	07:31 15:54	
11	08:32 16:15	07:48 17:14	06:45 18:09	06:28 20:08	05:23 21:03	04:44 21:47	04:56 21:46	05:43 20:58	06:39 19:46	18:35-18:52/17 18:32	07:33 16:26	07:33 15:53	
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 20:09	05:21 21:05	04:44 21:47	04:57 21:45	05:45 20:56	06:41 19:44	18:33-18:54/21 18:30	07:35 16:24	07:35 15:53	
13	08:30 16:18	07:44 17:18	06:40 18:13	06:24 20:11	05:19 21:07	04:44 21:48	04:58 21:44	05:47 20:54	06:42 19:41	18:32-18:55/23 18:27	07:37 16:22	07:37 15:53	
14	08:29 16:20	07:42 17:20	06:37 18:15	06:21 20:13	05:17 21:08	04:43 21:49	04:59 21:43	05:49 20:52	06:44 19:39	18:31-18:56/25 18:25	07:39 16:21	07:39 15:53	
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	05:16 21:10	04:43 21:49	05:01 21:42	05:50 20:50	06:46 19:36	18:29-18:56/27 18:22	07:41 16:19	07:41 15:53	
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 20:17	05:14 21:12	04:43 21:50	05:02 21:41	05:52 20:47	06:48 19:34	18:28-18:56/28 18:20	07:43 16:18	07:43 15:53	
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	05:12 21:13	04:43 21:51	05:03 21:40	05:54 20:45	06:49 19:31	18:27-18:57/30 18:18	07:44 16:16	07:44 15:53	
18	08:25 16:27	07:33 17:28	06:27 18:23	17:48-17:58/10 20:21	05:11 21:15	04:43 21:51	05:05 21:39	05:56 20:43	06:51 19:29	18:27-18:57/30 18:16	07:46 16:15	07:46 15:53	
19	08:24 16:29	07:31 17:30	06:25 18:24	17:46-18:00/14 20:23	05:10 21:17	05:09 21:51	04:43 21:37	05:06 20:41	05:58 19:26	18:26-18:56/30 18:13	07:48 16:13	07:48 15:53	
20	08:23 16:30	07:29 17:32	06:23 18:26	17:44-18:01/17 20:24	05:07 21:18	05:07 21:52	04:43 21:36	05:07 20:39	05:59 19:24	18:26-18:55/29 18:11	07:50 16:12	07:50 15:54	
21	08:22 16:32	07:27 17:34	06:20 18:28	17:43-18:04/21 20:26	05:06 21:20	04:43 21:52	05:09 21:35	06:01 20:36	06:57 19:21	18:26-18:55/29 18:09	07:52 16:10	07:52 15:54	
22	08:21 16:34	07:24 17:36	06:18 18:30	17:41-18:05/24 20:28	05:04 21:22	04:43 21:52	05:10 21:33	06:03 20:34	06:58 19:19	18:26-18:52/26 18:06	07:54 16:09	07:54 15:54	
23	08:19 16:36	07:22 17:38	06:15 18:32	17:41-18:08/27 20:30	05:03 21:23	04:43 21:53	05:12 21:32	06:05 20:32	07:00 19:16	18:27-18:50/23 18:04	07:56 16:08	07:56 15:55	
24	08:18 16:38	07:20 17:40	06:13 18:34	17:39-18:09/30 20:32	05:02 21:25	04:43 21:53	05:13 21:30	06:07 20:30	07:02 19:14	18:26-18:47/21 18:02	07:58 16:06	07:57 15:56	
25	08:17 16:40	07:18 17:42	06:10 18:36	17:39-18:09/30 20:34	05:00 21:26	04:44 21:53	05:15 21:29	06:08 20:27	07:04 19:11	18:27-18:45/18 18:00	07:59 16:05	07:59 15:56	
26	08:15 16:42	07:15 17:44	06:08 18:38	17:39-18:08/29 20:36	05:04 21:28	04:44 21:53	05:16 21:27	06:10 20:25	07:06 19:09	18:29-18:42/13 17:58	08:01 16:04	08:01 15:57	
27	08:14 16:44	07:13 17:46	06:05 18:39	17:39-18:08/29 20:37	05:01 21:29	04:44 21:53	05:18 21:26	06:12 20:23	07:07 19:06	18:31-18:40/9 16:55	07:04 16:03	08:03 15:58	
28	08:12 16:45	07:11 17:48	06:03 18:41	17:38-18:07/29 20:39	05:00 21:30	04:45 21:53	05:20 21:24	06:14 20:20	07:09 19:04	18:34-18:38/4 16:53	07:06 16:02	08:04 15:58	
29	08:11 16:47		06:00 18:43	17:39-18:07/28 20:41	05:00 21:32	04:45 21:52	05:21 21:23	06:16 20:18	07:11 19:01		07:08 16:51	08:06 16:01	
30	08:09 16:49		05:58 18:45	17:39-18:05/26 20:43	05:00 21:33	04:46 21:52	05:23 21:21	06:17 20:15	07:13 18:59		07:09 16:49	08:08 16:00	
31	08:08 16:51		06:55 19:47	18:40-19:05/25	05:00 21:35	04:53	05:24	06:19	20:13		07:11 16:47	08:35 16:01	
Sonnenscheinstunden	248	271	365	419	494	511	515	462	384	415	330	259	232
Anzahl Minuten mit Schatten	0	0	344	63	0	0	0	0	0	415	0	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung WEA: 2 - WEA 2****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 10:18-10:44/26 16:02	08:06 16:53	07:08 17:00-17:24/24 17:50	06:53 18:28-19:15/47 19:49	05:43 20:45	04:52 21:36
2	08:35 10:18-10:43/25 16:03	08:04 16:55	07:06 17:01-17:25/24 17:52	06:50 18:28-19:16/48 19:51	05:41 20:47	04:51 21:37
3	08:35 10:19-10:43/24 16:05	08:02 16:57	07:04 17:00-17:25/25 17:54	06:48 18:26-19:16/50 19:53	05:39 20:49	04:50 21:38
4	08:35 10:21-10:44/23 16:06	08:01 16:59	07:01 17:00-17:26/26 17:56	06:45 18:26-19:17/51 19:54	05:37 20:50	04:49 21:39
5	08:35 10:21-10:43/22 16:07	07:59 17:01	06:59 16:59-17:26/27 17:58	06:43 18:25-19:17/52 19:56	05:35 20:52	04:48 21:41
6	08:34 10:23-10:43/20 16:08	07:57 17:03	06:57 16:59-17:26/27 17:59	06:41 18:24-19:17/53 19:58	05:32 20:54	04:47 21:42
7	08:34 10:24-10:42/18 16:10	07:55 17:05	06:54 16:58-17:25/27 18:01	06:38 18:24-19:17/53 20:00	05:31 20:56	04:47 21:43
8	08:33 10:25-10:41/16 16:11	07:53 17:07	06:52 16:59-17:26/27 18:03	06:36 18:23-19:16/53 20:02	05:29 20:58	04:46 21:44
9	08:33 10:27-10:40/13 16:12	07:51 17:09	06:49 16:59-17:25/26 18:05	06:33 18:23-19:16/53 20:04	05:27 20:59	04:45 21:45
10	08:32 10:30-10:39/9 16:14	07:50 17:12	06:47 16:59-17:24/25 18:07	06:31 18:23-19:16/53 20:06	05:25 21:01	04:45 21:46
11	08:32 16:15	07:48 17:14	06:45 17:00-17:24/24 18:09	06:28 18:22-19:15/53 20:08	05:23 21:03	04:44 21:46
12	08:31 16:17	07:46 17:16	06:42 17:00-17:22/22 18:11	06:26 18:23-19:15/52 20:09	05:21 21:05	04:44 21:47
13	08:30 16:18	07:44 17:18	06:40 17:02-17:21/19 18:13	06:24 18:23-19:15/52 20:11	05:19 21:06	04:44 21:48
14	08:29 16:20	07:41 17:20	06:37 17:03-17:18/15 18:15	06:21 18:23-19:14/51 20:13	05:17 21:08	04:43 21:49
15	08:28 16:22	07:39 17:22	06:35 17:07-17:14/7 18:17	06:19 18:23-19:14/51 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 18:24-19:13/49 20:17	05:14 21:12	04:43 21:50
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 18:23-19:11/48 20:19	05:12 21:13	04:43 21:51
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 18:24-19:11/47 20:21	05:11 21:15	04:43 21:51
19	08:24 16:29	07:31 17:30	06:25 18:24	06:09 18:25-19:10/45 20:22	05:09 21:17	04:42 21:51
20	08:23 16:30	07:29 17:32	06:23 18:26	06:07 18:26-19:09/43 20:24	05:07 21:18	04:43 21:52
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 18:26-19:07/41 20:26	05:06 21:20	04:43 21:52
22	08:21 16:34	07:24 17:05-17:10/5 17:36	06:18 18:30	06:03 18:28-19:06/38 20:28	05:04 21:21	04:43 21:52
23	08:19 16:36	07:22 17:03-17:11/8 17:38	06:15 18:32	06:00 18:29-19:04/35 20:30	05:03 21:23	04:43 21:53
24	08:18 16:38	07:20 17:02-17:14/12 17:40	06:13 17:46-18:03/17 18:34	05:58 18:31-19:03/32 20:32	05:02 21:25	04:43 21:53
25	08:17 16:40	07:18 17:02-17:16/14 17:42	06:10 17:42-18:07/25 18:36	05:56 18:33-19:01/28 20:34	05:00 21:26	04:43 21:53
26	08:15 16:42	07:15 17:01-17:18/17 17:44	06:08 17:39-18:09/30 18:38	05:54 18:35-18:58/23 20:36	04:59 21:28	04:44 21:53
27	08:14 16:44	07:13 17:01-17:20/19 17:46	06:05 17:37-18:11/34 18:39	05:51 18:39-18:55/16 20:37	04:58 21:29	04:44 21:53
28	08:12 16:45	07:11 17:00-17:21/21 17:48	06:03 17:34-18:12/38 18:41	05:49 18:46-18:48/2 20:39	04:56 21:30	04:45 21:53
29	08:11 16:47	-	06:00 17:33-18:14/41 18:43	05:47 20:41	04:55 21:32	04:45 21:52
30	08:09 16:49	-	05:58 17:31-18:14/43 18:45	05:45 20:43	04:54 21:33	04:46 21:52
31	08:08 16:51	-	06:55 18:30-19:15/45 19:47	-	04:53 21:35	-
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	196	96	618	1219	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kisdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
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 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 2 - WEA 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47 21:52	05:26 21:17	06:21 18:22-19:14/52 20:11	07:15 17:43-17:58/15 18:56	07:13 16:45	08:09 15:59
2	04:47 21:52	05:28 21:16	06:23 18:21-19:14/53 20:08	07:16 17:41-18:00/19 18:54	07:15 16:43	08:11 15:58
3	04:48 21:51	05:29 21:14	06:24 18:21-19:14/53 20:06	07:18 17:39-18:01/22 18:51	07:17 16:41	08:12 10:15-10:20/5 15:57
4	04:49 21:51	05:31 21:12	06:26 18:20-19:13/53 20:03	07:20 17:38-18:02/24 18:49	07:19 16:39	08:14 10:12-10:23/11 15:57
5	04:50 21:50	05:33 21:10	06:28 18:20-19:13/53 20:01	07:22 17:36-18:01/25 18:47	07:21 16:37	08:15 10:11-10:25/14 15:56
6	04:51 21:50	05:35 21:08	06:30 18:20-19:13/53 19:58	07:24 17:35-18:01/26 18:44	07:23 16:35	08:17 10:10-10:27/17 15:56
7	04:51 21:49	05:36 21:06	06:32 18:20-19:13/53 19:56	07:26 17:35-18:02/27 18:42	07:25 16:33	08:18 10:09-10:28/19 15:55
8	04:52 21:48	05:38 21:04	06:33 18:19-19:11/52 19:54	07:28 17:34-18:01/27 18:39	07:27 16:31	08:19 10:09-10:30/21 15:54
9	04:53 21:48	05:40 21:02	06:35 18:20-19:11/51 19:51	07:29 17:34-18:01/27 18:37	07:29 16:29	08:21 10:09-10:31/22 15:54
10	04:55 21:47	05:42 21:00	06:37 18:20-19:10/50 19:49	07:31 17:34-18:01/27 18:34	07:31 16:28	08:22 10:08-10:31/23 15:54
11	04:56 21:46	05:43 20:58	06:39 18:19-19:09/50 19:46	07:33 17:34-18:00/26 18:32	07:33 16:26	08:23 10:09-10:33/24 15:53
12	04:57 21:45	05:45 20:56	06:41 18:20-19:08/48 19:44	07:35 17:35-17:59/24 18:30	07:35 16:24	08:24 10:08-10:34/26 15:53
13	04:58 21:44	05:47 20:54	06:42 18:21-19:07/46 19:41	07:37 17:34-17:58/24 18:27	07:37 16:22	08:25 10:08-10:35/27 15:53
14	04:59 21:43	05:49 20:52	06:44 18:22-19:06/44 19:39	07:39 17:34-17:57/23 18:25	07:39 16:21	08:26 10:08-10:35/27 15:53
15	05:00 21:42	05:50 20:50	06:46 18:22-19:04/42 19:36	07:41 17:33-17:55/22 18:22	07:41 16:19	08:27 10:09-10:36/27 15:53
16	05:02 21:41	05:52 20:47	06:48 18:23-19:02/39 19:34	07:42 17:33-17:52/19 18:20	07:43 16:18	08:28 10:09-10:37/28 15:53
17	05:03 21:40	05:54 18:46-19:01/15 20:45	06:49 18:24-19:01/37 19:31	07:44 17:33-17:50/17 18:18	07:44 16:16	08:29 10:09-10:37/28 15:53
18	05:04 21:39	05:56 18:43-19:04/21 20:43	06:51 18:26-18:59/33 19:29	07:46 17:33-17:48/15 18:15	07:46 16:14	08:30 10:10-10:38/28 15:53
19	05:06 21:37	05:58 18:39-19:06/27 20:41	06:53 18:27-18:55/28 19:26	07:48 17:33-17:45/12 18:13	07:48 16:13	08:31 10:10-10:39/29 15:53
20	05:07 21:36	05:59 18:37-19:08/31 20:39	06:55 18:30-18:52/22 19:24	07:50 17:34-17:43/9 18:11	07:50 16:12	08:32 10:10-10:39/29 15:54
21	05:09 21:35	06:01 18:35-19:09/34 20:36	06:57 18:33-18:48/15 19:21	07:52 17:35-17:40/5 18:09	07:52 16:10	08:32 10:11-10:40/29 15:54
22	05:10 21:33	06:03 18:33-19:10/37 20:34	06:58 19:19	07:54 17:37-17:38/1 18:06	07:54 16:09	08:33 10:11-10:40/29 15:54
23	05:12 21:32	06:05 18:32-19:11/39 20:32	07:00 19:16	07:56 18:04	07:56 16:08	08:33 10:12-10:41/29 15:55
24	05:13 21:30	06:07 18:30-19:12/42 20:29	07:02 19:14	07:58 18:02	07:57 16:06	08:34 10:12-10:41/29 15:55
25	05:15 21:29	06:08 18:28-19:12/44 20:27	07:04 19:11	08:00 18:00	07:59 16:05	08:34 10:13-10:42/29 15:56
26	05:16 21:27	06:10 18:27-19:13/46 20:25	07:06 19:09	08:02 17:58	08:01 16:04	08:35 10:13-10:42/29 15:57
27	05:18 21:26	06:12 18:27-19:14/47 20:22	07:07 19:06	07:04 16:55	08:03 16:03	08:35 10:14-10:42/28 15:57
28	05:20 21:24	06:14 18:26-19:15/49 20:20	07:09 19:04	07:06 16:53	08:04 16:02	08:35 10:14-10:42/28 15:58
29	05:21 21:23	06:16 18:24-19:14/50 20:18	07:11 19:01	07:07 16:51	08:06 16:01	08:35 10:15-10:43/28 15:59
30	05:23 21:21	06:17 18:24-19:15/51 20:15	07:13 17:46-17:55/9 18:59	07:09 16:49	08:08 16:00	08:35 10:16-10:43/27 16:00
31	05:24 21:19	06:19 18:23-19:15/52 20:13		07:11 16:47		08:35 10:17-10:43/26 16:01
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	0	585	936	436	0	716

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 3 - WEA 3

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35 16:02	08:06 16:53	07:08 17:50	16:30-16:54/24	06:53 17:50	05:43 19:49	04:52 20:45	04:47 21:52	05:26 21:17	06:21 20:11	07:15 18:56	08:09 15:59
2	08:35 16:03	08:04 16:55	07:06 17:52	16:31-16:53/22	06:50 17:52	05:41 19:51	04:51 20:47	04:47 21:52	05:28 21:16	06:23 20:08	07:17 18:54	08:11 15:58
3	08:35 16:05	08:02 16:57	07:04 17:54	16:33-16:50/17	06:48 17:54	05:39 19:53	04:50 20:49	04:48 21:51	05:30 21:14	06:24 20:06	07:18 18:51	08:12 15:58
4	08:35 16:06	08:01 16:59	07:01 17:56	16:37-16:47/10	06:45 17:56	05:37 19:54	04:49 20:50	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	08:14 15:57
5	08:35 16:07	07:59 17:01	06:59 17:58		06:43 17:56	05:35 19:56	04:48 20:52	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:47	08:15 15:56
6	08:34 16:08	07:57 17:03	16:33-16:35/2		06:41 17:59	05:33 19:58	04:48 20:54	04:51 21:50	05:35 21:08	06:30 19:58	07:24 18:44	08:17 15:56
7	08:34 16:10	07:55 17:05	16:31-16:37/6		06:38 18:01	05:31 19:58	04:47 20:56	04:52 21:43	05:36 21:06	06:32 19:56	07:26 18:42	08:18 15:55
8	08:33 16:11	07:53 17:07	16:30-16:39/9		06:36 18:03	05:29 19:58	04:46 20:58	04:52 21:44	05:38 21:04	06:33 19:54	07:28 18:39	08:19 15:55
9	08:33 16:12	07:51 17:10	16:28-16:40/12		06:33 18:05	05:27 19:59	04:46 20:59	04:54 21:48	05:40 21:02	06:35 19:51	07:29 18:37	08:21 15:54
10	08:32 16:14	07:50 17:12	16:27-16:43/16		06:31 18:07	05:25 19:59	04:45 21:01	04:55 21:47	05:42 21:00	06:37 19:49	07:31 18:34	08:22 15:54
11	08:32 16:15	07:48 17:14	16:27-16:45/18		06:28 18:09	05:23 19:59	04:44 21:03	04:56 21:46	05:43 21:00	06:39 19:46	07:33 18:32	08:23 15:53
12	08:31 16:17	07:46 17:16	16:27-16:48/21		06:26 18:11	05:21 19:59	04:44 21:05	04:57 21:47	05:45 21:06	06:41 19:44	07:35 18:30	08:24 15:53
13	08:30 16:18	07:44 17:18	16:27-16:50/23		06:24 18:13	05:19 19:59	04:44 21:08	04:58 21:48	05:47 21:04	06:42 19:44	07:37 18:27	08:25 15:53
14	08:29 16:20	07:41 17:20	16:27-16:52/25		06:21 18:15	05:17 19:59	04:43 21:08	04:59 21:49	05:49 21:02	06:44 19:44	07:39 18:25	08:26 15:53
15	08:28 16:22	07:39 17:22	16:28-16:55/27		06:19 18:17	05:16 19:59	04:43 21:10	05:01 21:49	05:50 21:02	06:46 19:44	07:41 18:22	08:27 15:53
16	08:27 16:23	07:37 17:24	16:27-16:56/29		06:17 18:19	05:14 19:59	04:43 21:12	05:02 21:50	05:52 21:41	06:48 19:44	07:42 18:20	08:28 15:53
17	08:26 16:25	07:35 17:26	16:27-16:58/31		06:14 18:21	05:12 19:59	04:43 21:13	05:03 21:51	05:54 21:40	06:49 19:44	07:44 18:18	08:29 15:53
18	08:25 16:27	07:33 17:28	16:27-16:59/32		06:12 18:23	05:11 19:59	04:43 21:15	05:05 21:51	05:56 21:43	06:51 19:44	07:46 18:15	08:30 15:53
19	08:24 16:29	07:31 17:30	16:27-17:00/33		06:10 18:24	05:09 19:59	04:43 21:17	05:06 21:51	05:58 21:41	06:53 19:44	07:48 18:13	08:31 15:53
20	08:23 16:30	07:29 17:32	16:26-16:59/33		06:07 18:26	05:07 19:59	04:43 21:18	05:07 21:52	05:59 21:36	06:55 19:44	07:50 18:11	08:32 15:54
21	08:22 16:32	07:27 17:34	16:26-17:00/34		06:05 18:28	05:06 19:59	04:43 21:20	05:09 21:52	06:01 21:35	06:57 19:44	07:52 18:09	08:33 15:54
22	08:21 16:34	07:24 17:36	16:26-17:00/34		06:03 18:30	05:04 19:59	04:43 21:21	05:10 21:52	06:03 21:33	06:58 19:44	07:54 18:06	08:33 15:55
23	08:19 16:36	07:22 17:38	16:26-16:59/33		06:01 18:32	05:03 19:59	04:43 21:23	05:12 21:53	06:05 21:32	07:00 19:44	07:56 18:04	08:33 15:55
24	08:18 16:38	07:20 17:40	16:26-16:59/33		06:00 18:34	05:02 19:59	04:43 21:25	05:13 21:53	06:07 21:30	07:02 19:44	07:58 18:02	08:34 15:56
25	08:17 16:40	07:18 17:42	16:27-16:59/32		06:00 18:36	05:00 19:59	04:44 21:26	05:15 21:53	06:08 21:29	07:04 19:44	08:00 18:00	08:34 15:56
26	08:15 16:42	07:15 17:44	16:27-16:58/31		05:58 18:38	05:00 19:59	04:44 21:28	05:16 21:53	06:10 21:27	07:06 19:44	08:02 18:00	08:35 15:57
27	08:14 16:44	07:13 17:46	16:28-16:57/29		05:55 18:39	04:58 19:59	04:44 21:29	05:18 21:53	06:12 21:26	07:07 19:44	08:04 18:00	08:35 15:58
28	08:12 16:45	07:11 17:48	16:28-16:55/27		05:53 18:41	04:56 19:59	04:45 21:30	05:20 21:53	06:14 21:24	07:09 19:44	08:06 18:00	08:35 15:58
29	08:11 16:47				05:51 18:43	04:55 19:59	04:45 21:32	05:21 21:53	06:16 21:18	07:11 19:44	08:08 18:00	08:35 15:59
30	08:09 16:49				05:49 18:45	04:54 19:59	04:46 21:33	05:23 21:52	06:17 21:21	07:13 19:44	08:09 18:00	08:35 16:00
31	08:08 16:51				05:47 19:47	04:53 19:59	04:46 21:35	05:24 21:19	06:19 20:13	07:14 19:44	15:56-16:18/22	08:35 16:01
Sonnenscheinstunden	248	271	365	419	494	511	515	462	384	330	259	232
Anzahl Minuten mit Schatten	0	570	73	0	0	0	0	0	0	582	70	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	Minuten mit Schatten