

SHADOW - Kalender

Berechnung: Gesamtbelastung **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

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

	Juli		August		September		Oktober		November		Dezember
1	04:47		20:18 (10)	05:26		06:21	18:38 (11)	07:15		07:13	08:09
	21:52	60	21:18 (7)	21:17		20:10	26	19:04 (11)	18:56		16:45
2	04:47		20:19 (10)	05:28		06:23		18:36 (11)	07:16		07:15
	21:51	59	21:18 (7)	21:15		20:08	30	19:06 (11)	18:54		16:43
3	04:48		20:19 (10)	05:29		06:24		18:35 (11)	07:18	17:41 (12)	07:17
	21:51	59	21:18 (7)	21:14		20:06	32	19:07 (11)	18:51	8	17:49 (12)
4	04:49		20:19 (10)	05:31	20:06 (9)	06:26		18:33 (11)	07:20		17:37 (12)
	21:51	57	21:16 (7)	21:12	10	20:03 (9)	34	19:07 (11)	18:49	15	17:52 (12)
5	04:50		20:19 (10)	05:33	20:03 (9)	06:28		18:32 (11)	07:22		17:34 (12)
	21:50	57	21:16 (7)	21:10	14	20:17 (9)	35	19:07 (11)	18:46	19	17:53 (12)
6	04:51		20:20 (10)	05:35	20:02 (9)	06:30		18:31 (11)	07:24		17:32 (12)
	21:49	56	21:16 (7)	21:08	17	20:19 (9)	37	19:08 (11)	18:44	22	17:54 (12)
7	04:51		20:20 (10)	05:36	20:01 (9)	06:32		18:31 (11)	07:26		17:31 (12)
	21:49	56	21:16 (7)	21:06	19	20:20 (9)	37	19:08 (11)	18:42	24	17:55 (12)
8	04:52		20:20 (10)	05:38	20:00 (9)	06:33		18:29 (11)	07:27		17:30 (12)
	21:48	55	21:15 (7)	21:04	20	20:20 (9)	39	19:08 (11)	18:39	26	17:56 (12)
9	04:53		20:21 (10)	05:40	19:59 (9)	06:35		18:29 (11)	07:29		17:29 (12)
	21:47	53	21:14 (7)	21:02	22	20:21 (9)	39	19:08 (11)	18:37	27	17:56 (12)
10	04:55		20:21 (10)	05:42	19:58 (9)	06:37		18:29 (11)	07:31		17:28 (12)
	21:47	53	21:14 (7)	21:00	23	20:21 (9)	39	19:08 (11)	18:34	28	17:56 (12)
11	04:56		20:21 (10)	05:43	19:58 (9)	06:39		18:27 (11)	07:33		17:28 (12)
	21:46	52	21:13 (7)	20:58	24	20:22 (9)	40	19:07 (11)	18:32	28	17:56 (12)
12	04:57		20:21 (10)	05:45	19:58 (9)	06:40		18:27 (11)	07:35		17:28 (12)
	21:45	51	21:12 (7)	20:56	24	20:22 (9)	39	19:06 (11)	18:30	28	17:56 (12)
13	04:58		20:22 (10)	05:47	19:57 (9)	06:42		18:28 (11)	07:37		17:28 (12)
	21:44	49	21:11 (7)	20:54	24	20:21 (9)	38	19:06 (11)	18:27	28	17:56 (12)
14	04:59		20:22 (10)	05:49	19:57 (9)	06:44		18:28 (11)	07:39		17:28 (12)
	21:43	48	21:10 (7)	20:52	25	20:22 (9)	38	19:06 (11)	18:25	28	17:56 (12)
15	05:00		20:22 (10)	05:50	19:57 (9)	06:46		18:27 (11)	07:40		17:28 (12)
	21:42	47	21:09 (7)	20:49	25	20:22 (9)	37	19:04 (11)	18:22	27	17:55 (12)
16	05:02		20:23 (10)	05:52	19:56 (9)	06:48		18:28 (11)	07:42		17:28 (12)
	21:41	46	21:09 (7)	20:47	23	20:19 (9)	35	19:03 (11)	18:20	25	17:53 (12)
17	05:03		20:23 (10)	05:54	19:57 (9)	06:49		18:28 (11)	07:44		17:29 (12)
	21:40	43	21:08 (7)	20:45	20	20:17 (9)	34	19:02 (11)	18:18	21	17:50 (12)
18	05:04		20:24 (10)	05:56	19:58 (9)	06:51		18:29 (11)	07:46		17:30 (12)
	21:38	37	21:01 (10)	20:43	17	20:15 (9)	32	19:01 (11)	18:15	18	17:48 (12)
19	05:06		20:24 (10)	05:58	19:58 (9)	06:53		18:29 (11)	07:48		17:31 (12)
	21:37	36	21:00 (10)	20:41	15	20:13 (9)	30	18:59 (11)	18:13	14	17:45 (12)
20	05:07		20:25 (10)	05:59	19:59 (9)	06:55		18:31 (11)	07:50		17:32 (12)
	21:36	35	21:00 (10)	20:38	12	20:11 (9)	26	18:57 (11)	18:11	11	17:43 (12)
21	05:09		20:25 (10)	06:01	20:00 (9)	06:57		18:33 (11)	07:52		17:35 (12)
	21:35	34	20:59 (10)	20:36	9	20:09 (9)	22	18:55 (11)	18:09	6	17:41 (12)
22	05:10		20:26 (10)	06:03	20:01 (9)	06:58		18:35 (11)	07:54		17:34 (12)
	21:33	32	20:58 (10)	20:34	5	20:06 (9)	17	18:52 (11)	18:06		16:09
23	05:12		20:27 (10)	06:05		07:00		18:38 (11)	07:56		16:08
	21:32	31	20:58 (10)	20:32		19:16	9	18:47 (11)	18:04		16:08
24	05:13		20:28 (10)	06:07		07:02			07:58		16:06
	21:30	29	20:57 (10)	20:29		19:14			18:02		16:06
25	05:15		20:29 (10)	06:08		07:04			18:00		16:05
	21:29	28	20:57 (10)	20:27		19:11			18:00		16:05
26	05:16		20:30 (10)	06:10		07:06			18:02		16:04
	21:27	25	20:55 (10)	20:25		19:09			17:57		16:04
27	05:18		20:31 (10)	06:12		07:07			17:55		16:03
	21:26	22	20:53 (10)	20:22		19:06			17:53		16:03
28	05:20		20:33 (10)	06:14		07:09			17:50		16:02
	21:24	19	20:52 (10)	20:20		19:04			16:53		16:02
29	05:21		20:35 (10)	06:15	18:47 (11)	07:11			16:51		16:01
	21:22	14	20:49 (10)	20:18	11	18:58 (11)	19:01		16:51		16:01
30	05:23		20:39 (10)	06:17		18:43 (11)	07:13		16:49		16:00
	21:21	7	20:46 (10)	20:15	18	19:01 (11)	18:59		16:49		16:00
31	05:24			06:19		18:41 (11)			16:47		16:01
	21:19			20:13	22	19:03 (11)					16:01
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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung **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

	Januar	Februar	März	April	Mai	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) 20:45
2	08:35 16:03	08:04 16:55	07:06 17:52	16:32 (12) 17:09 (12)	44 19:51	18:30 (11) 20:47
3	08:35 16:05	08:02 16:57	07:04 17:54	16:32 (12) 17:08 (12)	46 19:52	18:28 (11) 20:48
4	08:35 16:06	08:01 16:59	07:01 17:56	16:32 (12) 17:08 (12)	48 19:54	18:27 (11) 20:50
5	08:34 16:07	07:59 17:01	06:59 17:57	16:32 (12) 17:06 (12)	50 19:56	18:27 (11) 20:52
6	08:34 16:08	07:57 17:03	06:57 17:59	16:33 (12) 17:06 (12)	51 19:58	18:25 (11) 20:54
7	08:34 16:10	07:55 17:05	06:54 18:01	16:33 (12) 17:04 (12)	53 20:00	18:24 (11) 20:56
8	08:33 16:11	07:53 17:07	06:52 18:03	16:35 (12) 17:03 (12)	55 20:02	18:23 (11) 20:57
9	08:33 16:12	07:51 17:09	06:49 18:05	16:36 (12) 17:01 (12)	56 20:04	18:23 (11) 20:59
10	08:32 16:14	07:49 17:12	06:47 18:07	16:38 (12) 16:59 (12)	58 20:06	18:22 (11) 21:01
11	08:31 16:15	07:47 17:14	06:44 18:09	16:41 (12) 16:57 (12)	58 20:07	18:21 (11) 21:03
12	08:31 16:17	07:45 17:16	06:42 18:11	16:45 (12) 16:51 (12)	58 20:09	18:21 (11) 21:05
13	08:30 16:18	07:43 17:18	06:40 18:13	16:46 (12) 16:54 (12)	59 20:11	18:21 (11) 21:07
14	08:29 16:20	07:41 17:20	06:37 18:15	16:56 (12) 16:59 (12)	59 20:13	18:20 (11) 21:08
15	08:28 16:22	07:39 17:22	06:35 18:17	16:59 (12) 17:01 (12)	59 20:15	18:20 (11) 21:10
16	08:27 16:23	07:37 17:24	06:32 18:19	16:59 (12) 17:01 (12)	59 20:17	18:21 (11) 21:11
17	08:26 16:25	07:35 17:26	06:30 18:21	16:59 (12) 17:01 (12)	57 20:19	18:20 (11) 21:13
18	08:25 16:27	07:33 17:28	06:27 18:22	16:59 (12) 17:01 (12)	57 20:21	18:20 (11) 21:15
19	08:24 16:29	07:31 17:30	06:25 18:24	16:59 (12) 17:03 (12)	56 20:22	18:21 (11) 21:17
20	08:23 16:30	07:29 17:32	06:22 18:26	16:59 (12) 17:05 (12)	55 20:24	18:21 (11) 21:18
21	08:22 16:32	07:26 17:34	06:20 18:28	16:59 (12) 17:07 (12)	54 20:26	18:21 (11) 21:20
22	08:21 16:34	07:24 17:36	06:17 18:30	16:59 (12) 17:08 (12)	53 20:28	18:21 (11) 21:21
23	08:19 16:36	07:22 17:38	06:15 18:32	16:59 (12) 17:08 (12)	52 20:30	18:22 (11) 21:23
24	08:18 16:38	07:20 17:40	06:13 18:34	16:59 (12) 17:09 (12)	50 20:32	18:23 (11) 21:24
25	08:17 16:40	07:17 17:42	06:10 18:36	16:59 (12) 17:09 (12)	48 20:34	18:24 (11) 21:26
26	08:15 16:42	07:15 17:44	06:08 18:38	16:59 (12) 17:09 (12)	46 20:35	18:25 (11) 21:27
27	08:14 16:44	07:13 17:46	06:05 18:39	16:59 (12) 17:09 (12)	44 20:37	18:26 (11) 21:29
28	08:12 16:45	07:11 17:48	06:03 18:41	16:59 (12) 17:09 (12)	42 20:39	18:27 (11) 21:30
29	08:11 16:47		06:00 18:43	16:59 (12) 17:09 (12)	40 20:41	18:27 (11) 21:32
30	08:09 16:49		05:58 18:45	16:59 (12) 17:09 (12)	37 20:43	18:28 (11) 21:33
31	08:07 16:51		05:55 18:47	16:59 (12) 17:09 (12)	37 20:45	18:29 (11) 21:34
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung		379	503	1559	843	325

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
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DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung 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

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

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:

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+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung 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

	Januar	Februar	März		April		Mai		Juni				
1	08:35	08:06	07:08		06:53	18:23 (12)	05:43	19:41 (11)	04:52	19:35 (11)			
	16:02	16:53	17:50		19:49	24	18:47 (12)	20:45	32	20:13 (11)	21:36	73	21:03 (9)
2	08:35	08:04	07:06		06:50		18:25 (12)	05:41		19:41 (11)	04:51		19:35 (11)
	16:03	16:55	17:52		19:51	20	18:45 (12)	20:47	34	20:15 (11)	21:37	74	21:04 (9)
3	08:35	08:02	07:04		06:48		18:27 (12)	05:39		19:39 (11)	04:50		19:36 (11)
	16:05	16:57	17:54		19:52	14	18:41 (12)	20:48	37	20:16 (11)	21:38	72	21:04 (9)
4	08:35	08:01	07:01		06:45			05:37		19:38 (11)	04:49		19:37 (11)
	16:06	16:59	17:56		19:54			20:50	39	20:17 (11)	21:39	72	21:05 (9)
5	08:34	07:59	06:59		06:43			05:35		19:37 (11)	04:48		19:37 (11)
	16:07	17:01	17:57		19:56			20:52	41	20:18 (11)	21:40	71	21:05 (9)
6	08:34	07:57	06:57		06:41			05:33		19:36 (11)	04:48		19:37 (11)
	16:08	17:03	17:59		19:58			20:54	43	20:19 (11)	21:42	72	21:05 (9)
7	08:34	07:55	06:54		06:38			05:31		19:35 (11)	04:47		19:38 (11)
	16:10	17:05	18:01		20:00			20:56	44	20:19 (11)	21:43	72	21:06 (9)
8	08:33	07:53	06:52		06:36			05:29		19:34 (11)	04:46		19:38 (11)
	16:11	17:07	18:03		20:02			20:57	46	20:20 (11)	21:44	70	21:05 (9)
9	08:33	07:51	06:49		06:33			05:27		19:34 (11)	04:46		19:39 (11)
	16:12	17:09	18:05		20:04			20:59	47	20:21 (11)	21:45	70	21:06 (9)
10	08:32	07:49	06:47		06:31			05:25		19:33 (11)	04:45		19:39 (11)
	16:14	17:12	18:07		20:06			21:01	48	20:21 (11)	21:45	69	21:05 (9)
11	08:31	07:47	06:44		06:28			05:23		19:33 (11)	04:44		19:40 (11)
	16:15	17:14	18:09		20:07			21:03	48	20:21 (11)	21:46	68	21:06 (9)
12	08:31	07:45	06:42	17:35 (12)	06:26			05:21		19:32 (11)	04:44		19:41 (11)
	16:17	17:16	18:11	11	17:46 (12)	20:09		21:05	49	20:21 (11)	21:47	68	21:07 (9)
13	08:30	07:43	06:40		17:32 (12)	06:24		05:19		19:32 (11)	04:44		19:40 (11)
	16:18	17:18	18:13	17	17:49 (12)	20:11		21:06	50	20:22 (11)	21:48	68	21:06 (9)
14	08:29	07:41	06:37		17:29 (12)	06:21		05:17		19:32 (11)	04:43		19:41 (11)
	16:20	17:20	18:15	21	17:50 (12)	20:13		21:08	50	20:22 (11)	21:49	67	21:06 (9)
15	08:28	07:39	06:35		17:27 (12)	06:19		05:16		19:32 (11)	04:43		19:41 (11)
	16:22	17:22	18:17	25	17:52 (12)	20:15		21:10	51	20:23 (11)	21:49	67	21:07 (9)
16	08:27	07:37	06:32		17:25 (12)	06:16		05:14		19:31 (11)	04:43		19:42 (11)
	16:23	17:24	18:19	29	17:54 (12)	20:17		21:11	51	20:22 (11)	21:50	66	21:07 (9)
17	08:26	07:35	06:30		17:24 (12)	06:14		05:12		19:32 (11)	04:43		19:42 (11)
	16:25	17:26	18:21	31	17:55 (12)	20:19		21:13	51	20:23 (11)	21:50	66	21:07 (9)
18	08:25	07:33	06:27		17:22 (12)	06:12		05:11		19:31 (11)	04:43		19:43 (11)
	16:27	17:28	18:22	33	17:55 (12)	20:21		21:15	51	20:22 (11)	21:51	65	21:07 (9)
19	08:24	07:31	06:25		17:22 (12)	06:09		05:09		19:32 (11)	04:43		19:43 (11)
	16:29	17:30	18:24	34	17:56 (12)	20:22		21:16	51	20:23 (11)	21:51	66	21:08 (9)
20	08:23	07:29	06:22		17:21 (12)	06:07		05:07		19:31 (11)	04:43		19:43 (11)
	16:30	17:32	18:26	35	17:56 (12)	20:24		21:18	54	20:47 (9)	21:52	66	21:08 (9)
21	08:22	07:26	06:20		17:20 (12)	06:05		05:06		19:32 (11)	04:43		19:43 (11)
	16:32	17:34	18:28	37	17:57 (12)	20:26		21:20	58	20:49 (9)	21:52	66	21:08 (9)
22	08:21	07:24	06:17		17:19 (12)	06:03		05:04		19:32 (11)	04:43		19:43 (11)
	16:34	17:36	18:30	37	17:56 (12)	20:28		21:21	61	20:51 (9)	21:52	66	21:08 (9)
23	08:19	07:22	06:15		17:19 (12)	06:00		05:03		19:32 (11)	04:43		19:44 (11)
	16:36	17:38	18:32	37	17:56 (12)	20:30		21:23	61	20:51 (9)	21:52	66	21:09 (9)
24	08:18	07:20	06:13		17:19 (12)	05:58		05:02		19:32 (11)	04:43		19:44 (11)
	16:38	17:40	18:34	37	17:56 (12)	20:32		21:24	64	20:53 (9)	21:52	66	21:09 (9)
25	08:17	07:17	06:10		17:19 (12)	05:56		05:00		19:33 (11)	04:44		19:44 (11)
	16:40	17:42	18:36	37	17:56 (12)	20:34		21:26	64	20:54 (9)	21:53	66	21:09 (9)
26	08:15	07:15	06:08		17:19 (12)	05:54		04:59		19:33 (11)	04:44		19:45 (11)
	16:42	17:44	18:38	35	17:54 (12)	20:35		21:27	67	20:56 (9)	21:53	65	21:09 (9)
27	08:14	07:13	06:05		17:19 (12)	05:51	19:55 (11)	04:58		19:33 (11)	04:44		19:44 (11)
	16:44	17:46	18:39	35	17:54 (12)	20:37	8	20:03 (11)	21:29	20:57 (9)	21:53	66	21:09 (9)
28	08:12	07:11	06:03		17:19 (12)	05:49		19:50 (11)	04:56	19:34 (11)	04:45		19:44 (11)
	16:45	17:48	18:41	34	17:53 (12)	20:39	18	20:08 (11)	21:30	20:59 (9)	21:52	66	21:09 (9)
29	08:11		06:00		17:20 (12)	05:47		19:46 (11)	04:55	19:34 (11)	04:45		19:44 (11)
	16:47		18:43	32	17:52 (12)	20:41	23	20:09 (11)	21:32	21:00 (9)	21:52	67	21:10 (9)
30	08:09		05:58		17:20 (12)	05:45		19:43 (11)	04:54	19:35 (11)	04:46		19:45 (11)
	16:49		18:45	30	17:50 (12)	20:43	28	20:11 (11)	21:33	21:01 (9)	21:52	67	21:10 (9)
31	08:07		06:55		18:22 (12)			04:53		19:35 (11)			
	16:51		19:47	27	18:49 (12)			21:34	71	21:02 (9)			
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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SHADOW - Kalender

Berechnung: Gesamtbelastung **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	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	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	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	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	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	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	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	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	20:28 (11)	19:51	18:37			16:29	15:54
10	04:55		19:44 (11)	05:42	19:46 (11)	06:37	18:24 (12)	07:31		07:31	08:22
	21:47	72	21:12 (9)	21:00	20:26 (11)	19:49	18:33 (12)	18:34		16:28	15:54
11	04:56		19:44 (11)	05:43	19:47 (11)	06:39	18:19 (12)	07:33		07:33	08:23
	21:46	72	21:12 (9)	20:58	20:25 (11)	19:46	18:36 (12)	18:32		16:26	15:53
12	04:57		19:43 (11)	05:45	19:49 (11)	06:40	18:16 (12)	07:35		07:35	08:24
	21:45	74	21:12 (9)	20:56	20:24 (11)	19:44	18:38 (12)	18:30		16:24	15:53
13	04:58		19:43 (11)	05:47	19:49 (11)	06:42	18:14 (12)	07:37		07:37	08:25
	21:44	73	21:11 (9)	20:54	20:22 (11)	19:41	18:39 (12)	18:27		16:22	15:53
14	04:59		19:43 (11)	05:49	19:51 (11)	06:44	18:13 (12)	07:39		07:39	08:26
	21:43	72	21:10 (9)	20:52	20:20 (11)	19:39	18:41 (12)	18:25		16:21	15:53
15	05:01		19:43 (11)	05:50	19:53 (11)	06:46	18:10 (12)	07:40		07:41	08:27
	21:42	70	21:09 (9)	20:49	20:18 (11)	19:36	18:41 (12)	18:22		16:19	15:53
16	05:02		19:43 (11)	05:52	19:55 (11)	06:48	18:09 (12)	07:42		07:42	08:28
	21:41	70	21:09 (9)	20:47	20:15 (11)	19:34	18:42 (12)	18:20		16:18	15:53
17	05:03		19:43 (11)	05:54	19:59 (11)	06:49	18:08 (12)	07:44		07:44	08:29
	21:40	70	21:08 (9)	20:45	20:11 (11)	19:31	18:42 (12)	18:18		16:16	15:53
18	05:05		19:42 (11)	05:56		06:51	18:07 (12)	07:46		07:46	08:30
	21:38	69	21:06 (9)	20:43		19:29	18:43 (12)	18:15		16:14	15:53
19	05:06		19:42 (11)	05:58		06:53	18:06 (12)	07:48		07:48	08:31
	21:37	67	21:05 (9)	20:41		19:26	18:42 (12)	18:13		16:13	15:53
20	05:07		19:43 (11)	05:59		06:55	18:05 (12)	07:50		07:50	08:31
	21:36	64	21:04 (9)	20:38		19:24	18:42 (12)	18:11		16:12	15:54
21	05:09		19:42 (11)	06:01		06:57	18:05 (12)	07:52		07:52	08:32
	21:35	64	21:03 (9)	20:36		19:21	18:42 (12)	18:09		16:10	15:54
22	05:10		19:42 (11)	06:03		06:58	18:05 (12)	07:54		07:54	08:33
	21:33	61	21:01 (9)	20:34		19:19	18:42 (12)	18:06		16:09	15:55
23	05:12		19:42 (11)	06:05		07:00	18:04 (12)	07:56		07:55	08:33
	21:32	61	21:01 (9)	20:32		19:16	18:41 (12)	18:04		16:08	15:55
24	05:13		19:42 (11)	06:07		07:02	18:04 (12)	07:58		07:57	08:34
	21:30	58	20:59 (9)	20:29		19:14	18:40 (12)	18:02		16:06	15:56
25	05:15		19:42 (11)	06:08		07:04	18:04 (12)	08:00		07:59	08:34
	21:29	54	20:58 (9)	20:27		19:11	18:40 (12)	18:00		16:05	15:56
26	05:16		19:42 (11)	06:10		07:06	18:05 (12)	08:02		08:01	08:34
	21:27	51	20:33 (11)	20:25		19:09	18:39 (12)	17:57		16:04	15:57
27	05:18		19:42 (11)	06:12		07:07	18:05 (12)	07:03		08:02	08:35
	21:26	51	20:33 (11)	20:22		19:06	18:38 (12)	16:55		16:03	15:58
28	05:20		19:42 (11)	06:14		07:09	18:05 (12)	07:05		08:04	08:35
	21:24	51	20:33 (11)	20:20		19:04	18:36 (12)	16:53		16:02	15:58
29	05:21		19:42 (11)	06:15		07:11	18:06 (12)	07:07		08:06	08:35
	21:22	50	20:32 (11)	20:18		19:01	18:34 (12)	16:51		16:01	15:59
30	05:23		19:42 (11)	06:17		07:13	18:07 (12)	07:09		08:07	08:35
	21:21	51	20:33 (11)	20:15		18:59	18:32 (12)	16:49		16:00	16:00
31	05:24		19:43 (11)	06:19				07:11			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	(WEA mit erstem Schatten)	Zeitpunkt (SS:MM) Schattenende	(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:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung 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 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	06:53 19:49	05:43 20:45	19:18 (11) 21:36
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:51	05:41 20:47	19:22 (11) 21:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:52	05:39 20:48	20:12 (9) 21:38
4	08:35 16:06	08:01 16:59	07:01 17:55	06:45 19:54	05:37 20:50	20:11 (9) 21:39
5	08:34 16:07	07:59 17:01	06:59 17:57	06:43 19:56	05:34 20:52	20:10 (9) 21:40
6	08:34 16:08	07:57 17:03	06:56 17:59	06:40 19:58	05:32 20:54	20:09 (9) 21:42
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:30 20:56	20:08 (9) 21:43
8	08:33 16:11	07:53 17:07	06:52 18:03	17:37 (12) 20:02	19:23 (11) 20:57	20:08 (9) 21:44
9	08:33 16:12	07:51 17:09	06:49 18:05	17:31 (12) 20:04	19:20 (11) 20:59	20:07 (9) 21:45
10	08:32 16:14	07:49 17:11	06:47 18:07	17:29 (12) 20:06	19:18 (11) 21:01	20:08 (9) 21:45
11	08:31 16:15	07:47 17:14	06:44 18:09	17:28 (12) 20:07	19:16 (11) 21:03	20:07 (9) 21:46
12	08:31 16:17	07:45 17:16	06:42 18:11	17:26 (12) 20:09	19:15 (11) 21:05	20:07 (9) 21:47
13	08:30 16:18	07:43 17:18	06:40 18:13	17:25 (12) 20:11	19:14 (11) 21:06	20:08 (9) 21:48
14	08:29 16:20	07:41 17:20	06:37 18:15	17:24 (12) 20:13	19:12 (11) 21:08	20:08 (9) 21:49
15	08:28 16:22	07:39 17:22	06:35 18:17	17:24 (12) 20:15	19:11 (11) 21:10	20:09 (9) 21:49
16	08:27 16:23	07:37 17:24	06:32 18:19	17:23 (12) 20:17	19:11 (11) 21:11	20:10 (9) 21:50
17	08:26 16:25	07:35 17:26	06:30 18:21	17:23 (12) 20:19	19:10 (11) 21:13	20:11 (9) 21:50
18	08:25 16:27	07:33 17:28	06:27 18:22	17:22 (12) 20:20	19:10 (11) 21:15	20:11 (9) 21:51
19	08:24 16:29	07:31 17:30	06:25 18:24	17:23 (12) 20:22	19:10 (11) 21:16	20:13 (9) 21:51
20	08:23 16:30	07:29 17:32	06:22 18:26	17:23 (12) 20:24	19:10 (11) 21:18	20:14 (9) 21:52
21	08:22 16:32	07:26 17:34	06:20 18:28	17:24 (12) 20:26	19:09 (11) 21:20	20:18 (9) 21:52
22	08:21 16:34	07:24 17:36	06:17 18:30	17:24 (12) 20:28	19:09 (11) 21:21	20:20 (9) 21:52
23	08:19 16:36	07:22 17:38	06:15 18:32	17:25 (12) 20:30	19:09 (11) 21:23	20:13 (9) 21:52
24	08:18 16:38	07:20 17:40	06:13 18:34	17:27 (12) 20:32	19:10 (11) 21:24	20:14 (9) 21:52
25	08:17 16:40	07:17 17:42	06:10 18:36	17:41 (12) 20:34	19:42 (11) 21:26	21:52 21:53
26	08:15 16:42	07:15 17:44	06:08 18:37	17:38 (12) 20:35	19:42 (11) 21:27	21:53 21:53
27	08:14 16:43	07:13 17:46	06:05 18:39	20:37 20:37	19:12 (11) 21:29	21:53 21:53
28	08:12 16:45	07:11 17:48	06:03 18:41	20:39 20:39	19:13 (11) 21:30	21:52 21:52
29	08:11 16:47		06:00 18:43	20:41 20:41	19:14 (11) 21:32	21:52 21:52
30	08:09 16:49		05:58 18:45	20:43 20:43	19:15 (11) 21:33	21:52 21:52
31	08:07 16:51		06:55 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 Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung 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

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

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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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:
28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung 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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	17:21 (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		
Sonneneinstrahlung	248			271		365		419		494		511
astr. max. mögl. Beschattung		481		616		341						

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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender**Berechnung:** Gesamtbelastung 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	08:22 15:49 (4)	14:20 (6) 15:54	14:45 (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 17:50 (2)	07:46 16:14	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	17:48 18:13	07:48 16:13	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	17:50 18:11	07:50 16:11	15:33 16:11	08:32 15:54	14:24 (6) 14:51 (6)
21	05:09 21:35	06:01 20:36	06:57 19:21	07:52 18:09	17:52 18:09	07:52 16:10	15:34 15:54	08:32 15:54	14:25 (6) 14:52 (6)
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	17:54 18:06	07:54 16:09	15:35 15:54	08:33 15:54	14:26 (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	15:36 15:55	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	15:37 15:55	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	15:38 15:56	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	15:39 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	17:46 (2) 17:55 (2)	07:09 16:49	15:26 (4) 16:17 (3)	08:08 16:00	14:21 (6) 14:37 (6)	08:35 16:00
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	232	792	
astr.max.mögl.Beschattung			9	584					

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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung **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	08:06	16:09 (4)	07:08	17:00 (2)	06:53
	16:02	16:53	14	16:23 (4)	17:50	20
2	08:35	08:04	16:09 (4)	07:06	17:01 (2)	06:50
	16:03	16:55	16	16:25 (4)	17:52	19
3	08:35	08:02	16:10 (4)	07:04	17:01 (2)	06:48
	16:04	16:57	18	16:28 (4)	17:53	17
4	08:35	08:01	16:10 (4)	07:01	17:03 (2)	06:45
	16:06	16:59	20	16:30 (4)	17:55	14
5	08:35	07:59	16:10 (4)	06:59	17:04 (2)	06:43
	16:07	17:01	21	16:31 (4)	17:57	10
6	08:34	07:57	16:10 (4)	06:57	17:14 (2)	19:56
	16:08	17:03	21	16:31 (4)	17:59	06:40
7	08:34	07:55	16:10 (4)	06:54	19:58	05:32
	16:09	17:05	20	16:30 (4)	18:01	20:54
8	08:33	07:53	16:11 (4)	06:52	20:00	05:30
	16:11	17:07	19	16:30 (4)	18:03	20:56
9	08:33	07:51	16:11 (4)	06:49	06:36	05:28
	16:12	17:09	17	16:28 (4)	18:05	20:02
10	08:32	07:49	16:12 (4)	06:47	06:33	05:26
	16:14	17:11	16	16:28 (4)	18:07	20:04
11	08:31	07:47	16:14 (4)	06:44	06:31	05:25
	16:15	17:13	12	16:26 (4)	18:09	20:06
12	08:31	07:45	16:16 (4)	06:42	06:28	05:23
	16:17	17:15	8	16:24 (4)	18:11	20:07
13	08:30	07:43		06:40	06:26	05:21
	16:18	17:17		18:13	20:09	21:05
14	08:29	07:41		06:37	06:24	05:19
	16:20	17:20		18:15	20:11	21:06
15	08:28	07:39		06:35	06:21	05:17
	16:22	17:22		18:17	20:13	21:08
16	08:27	07:37		06:32	06:19	05:16
	16:23	17:24		18:19	20:15	21:10
17	08:26	07:35		06:30	06:16	05:14
	16:25	17:26		18:21	20:17	21:12
18	08:25	07:33		06:27	06:14	05:12
	16:27	17:28		18:22	20:19	21:13
19	08:24	07:31		06:25	06:12	05:10
	16:28	17:30		18:24	20:21	21:15
20	08:23	07:29		06:22	06:09	05:09
	16:30	17:32		18:26	20:22	21:17
21	08:22	07:26		06:20	06:07	05:07
	16:32	17:34		18:28	20:24	21:18
22	08:21	07:24	17:05 (2)	06:17	06:05	05:06
	16:34	17:36	5	17:10 (2)	20:26	21:20
23	08:19	07:22	17:03 (2)	06:15	06:02	05:04
	16:36	17:38	8	17:11 (2)	20:28	21:21
24	08:18	07:20	17:02 (2)	06:13	06:00	05:03
	16:38	17:40	12	17:14 (2)	20:30	21:23
25	08:17	07:17	17:02 (2)	06:10	05:58	05:01
	16:40	17:42	14	17:16 (2)	20:32	21:25
26	08:15	07:15	17:01 (2)	06:08	05:56	05:00
	16:41	17:44	17	17:18 (2)	20:34	21:26
27	08:14	07:13	17:01 (2)	06:05	05:53	04:59
	16:43	17:46	19	17:20 (2)	20:35	21:28
28	08:12	07:11	17:00 (2)	06:03	05:51	04:57
	16:45	17:48	20	17:20 (2)	20:37	21:29
29	08:11	16:12 (4)		06:00	05:49	04:56
	16:47	16:17 (4)		18:43	20:39	21:30
30	08:09	16:11 (4)		05:58	05:47	04:55
	16:49	16:19 (4)		18:45	20:41	21:32
31	08:07	16:10 (4)		06:55	05:45	04:54
	16:51	16:21 (4)		19:47	20:43	21:33
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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung **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 Sonneneinstrahlung

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	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	15:57 (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	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	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	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	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	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	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	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	15:57 (4)
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	15:56 (4)
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	15:54 (4)
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	15:52 (4)
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	15:50 (4)
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	15:48 (4)
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)
--------------	-----------------------	-------------------------	----------------------	----------------------------------	--------------------------------	---------------------------	----------------------------

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:

28.08.2019 10:21/3.2.744

SHADOW - Kalender**Berechnung: Gesamtbelastung 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	15:34 (8) 07:08	06:53	05:43	04:52
2	08:35 16:03	08:04 16:55	15:55 (8) 07:06	06:50	05:41	04:51
3	08:35 16:04	08:02 16:57	15:54 (8) 07:04	06:51	05:40	04:50
4	08:35 16:06	08:01 16:59	15:53 (8) 07:01	06:48	05:38	04:49
5	08:34 16:07	07:59 17:01	15:52 (8) 07:00	06:45	05:36	04:48
6	08:34 16:08	07:57 17:03	15:51 (8) 06:59	06:43	05:34	04:47
7	08:34 16:09	15:34 (8) 17:05	06:54 18:01	17:29 (4) 19:56	05:34 20:52	04:48 21:41
8	08:33 16:11	15:33 (8) 17:07	06:52 18:03	17:32 (4) 19:56	05:32 20:52	04:47 21:41
9	08:33 16:12	15:36 (8) 17:09	06:54 18:05	17:34 (4) 19:58	05:30 20:54	04:47 21:42
10	08:32 16:14	15:31 (8) 17:11	06:54 18:01	17:24 (4) 19:58	05:30 20:54	04:47 21:42
11	08:31 16:15	15:30 (8) 17:13	06:52 18:03	17:36 (4) 20:00	05:28 20:56	04:46 21:43
12	08:31 16:17	15:33 (8) 17:15	06:52 18:03	17:24 (4) 19:58	05:28 20:56	04:46 21:43
13	08:30 16:18	15:31 (8) 17:17	06:49 18:05	17:38 (4) 20:02	05:27 20:57	04:45 21:44
14	08:29 16:20	15:37 (8) 17:19	06:49 18:05	17:22 (4) 19:58	05:27 20:57	04:45 21:44
15	08:28 16:22	15:31 (8) 17:21	06:47 18:07	17:40 (4) 20:04	05:25 20:59	04:45 21:45
16	08:27 16:23	15:30 (8) 17:23	06:47 18:07	17:22 (4) 19:58	05:25 20:59	04:45 21:45
17	08:26 16:25	15:31 (8) 17:25	06:44 18:04	17:42 (4) 20:06	05:23 21:01	04:44 21:46
18	08:25 16:27	15:41 (8) 17:27	06:44 18:04	17:22 (4) 19:58	05:23 21:01	04:44 21:46
19	08:24 16:28	15:43 (8) 17:29	06:42 18:02	17:43 (4) 20:07	05:21 21:03	04:44 21:46
20	08:23 16:30	15:30 (8) 17:31	06:42 18:02	17:21 (4) 19:56	05:21 21:03	04:44 21:46
21	08:22 16:32	15:43 (8) 17:33	06:42 18:02	17:42 (4) 20:06	05:21 21:03	04:44 21:46
22	08:21 16:34	15:45 (8) 17:35	06:42 18:02	17:21 (4) 19:56	05:21 21:03	04:44 21:46
23	08:19 16:36	15:43 (8) 17:37	06:40 18:00	17:42 (4) 20:06	05:21 21:03	04:44 21:46
24	08:18 16:38	15:41 (8) 17:39	06:40 18:00	17:22 (4) 19:58	05:19 21:01	04:43 21:44
25	08:17 16:40	15:30 (8) 17:41	06:40 18:00	17:42 (4) 20:06	05:19 21:01	04:43 21:44
26	08:15 16:41	15:47 (8) 17:43	06:35 17:55	17:22 (4) 19:58	05:19 21:01	04:43 21:44
27	08:14 16:43	15:29 (8) 17:45	06:35 17:55	17:42 (4) 20:06	05:19 21:01	04:43 21:44
28	08:12 16:45	15:50 (8) 17:47	06:35 17:55	17:22 (4) 19:58	05:19 21:01	04:43 21:44
29	08:11 16:47	15:52 (8) 17:49	06:35 17:55	17:42 (4) 20:06	05:19 21:01	04:43 21:44
30	08:09 16:49	15:54 (8) 17:51	06:35 17:55	17:22 (4) 19:58	05:19 21:01	04:43 21:44
31	08:07 16:51	15:56 (8) 17:53	06:35 17:55	17:42 (4) 20:06	05:19 21:01	04:43 21:44
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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)		Zeitpunkt (SS:MM) Schattende	(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: GesamtbelastungSchattenrezeptor: S - IO 19

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	04:46 21:52	05:26 21:17	06:21 20:10	07:15 18:56	18:01 (4) 18:21 (4)	07:13 16:45
2	04:47 21:52	05:28 21:15	06:23 20:08	07:16 18:54	18:01 (4) 18:21 (4)	07:15 16:43
3	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:51	18:00 (4) 18:21 (4)	07:17 16:41
4	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	18:00 (4) 18:21 (4)	07:19 16:39
5	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:46	17:59 (4) 18:19 (4)	07:21 16:37
6	04:50 21:50	05:35 21:08	06:30 19:58	07:24 18:44	17:59 (4) 18:17 (4)	07:23 16:35
7	04:51 21:49	05:36 21:06	06:31 19:56	07:26 18:42	18:00 (4) 18:14 (4)	07:25 16:33
8	04:52 21:48	05:38 21:04	06:33 19:53	07:27 18:39	18:00 (4) 18:12 (4)	07:27 16:31
9	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:37	18:02 (4) 18:09 (4)	07:29 16:29
10	04:54 21:47	05:41 21:00	06:37 19:49	07:31 18:34	18:04 (4) 18:07 (4)	07:31 16:27
11	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 16:26	07:33 16:24
12	04:57 21:45	05:45 20:56	06:40 19:44	07:35 18:29	07:35 16:24	07:35 16:22
13	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	07:37 16:22	07:37 16:20
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 18:25	07:39 16:21	07:39 16:19
15	05:00 21:42	05:50 20:49	06:46 19:36	07:40 18:22	07:41 16:19	07:41 16:17
16	05:02 21:41	05:52 20:47	06:48 19:34	07:42 18:20	07:42 16:17	07:42 16:15
17	05:03 21:40	05:54 20:45	06:49 19:31	07:44 18:18	07:44 16:16	07:44 16:14
18	05:04 21:38	05:56 20:43	06:51 19:29	07:46 18:15	17:10 (6) 17:21 (6)	07:46 16:14
19	05:06 21:37	05:57 20:41	06:53 19:26	07:48 18:13	17:08 (6) 17:23 (6)	07:48 16:13
20	05:07 21:36	05:59 20:38	06:55 19:24	07:50 18:11	17:06 (6) 17:24 (6)	07:50 16:11
21	05:09 21:35	06:01 20:36	06:56 19:21	07:52 18:08	17:05 (6) 17:25 (6)	07:52 16:10
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	17:04 (6) 17:26 (6)	07:54 16:09
23	05:12 21:32	06:05 20:32	07:00 19:16	07:56 18:04	17:03 (6) 17:26 (6)	07:55 16:07
24	05:13 21:30	06:06 20:29	07:02 19:14	07:58 18:02	17:03 (6) 17:26 (6)	07:57 16:06
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 18:00	17:03 (6) 17:26 (6)	07:59 16:05
26	05:16 21:27	06:10 20:25	07:05 19:09	08:02 17:57	17:03 (6) 17:25 (6)	08:01 16:04
27	05:18 21:26	06:12 20:22	07:07 19:06	07:03 18:12 (4)	16:03 (6) 16:25 (6)	08:02 16:03
28	05:19 21:24	06:14 20:20	07:09 19:04	07:05 18:06 (4)	16:03 (6) 16:24 (6)	08:04 16:02
29	05:21 21:22	06:15 20:18	07:11 19:01	07:07 18:04 (4)	16:04 (6) 16:22 (6)	08:06 16:01
30	05:23 21:21	06:17 20:15	07:13 18:59	07:09 18:02 (4)	16:05 (6) 16:20 (6)	08:07 16:00
31	05:24 21:19	06:19 20:13		07:11 16:47	16:06 (6) 16:18 (6)	08:35 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)

Projekt:

19-095-GBK-02

Beschreibung:

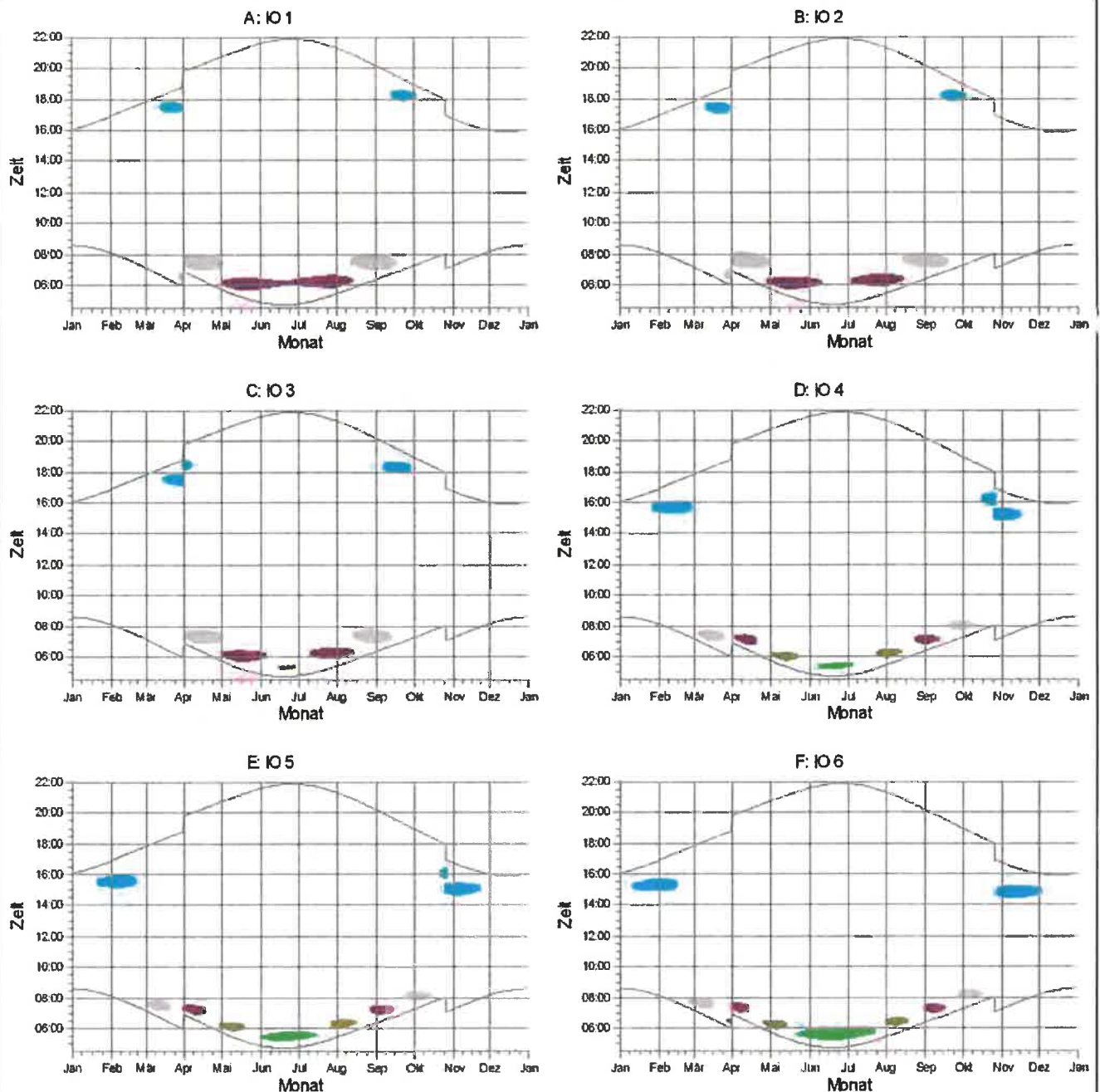
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Gesamtbelastung



WEA



7: WEA 7

9: WEA 9



10: WEA 10

11: WEA 11



12: WEA 12

13: WEA VB - SWT-3.2-113

Projekt:

19-095-GBK-02

Beschreibung:

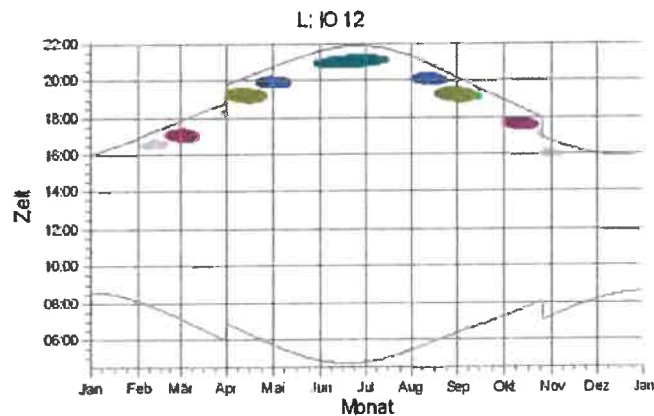
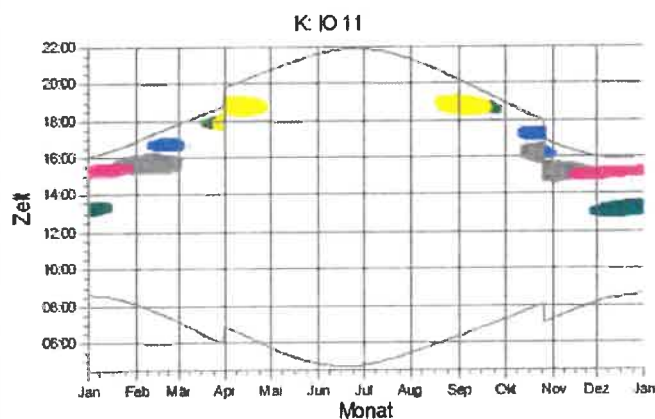
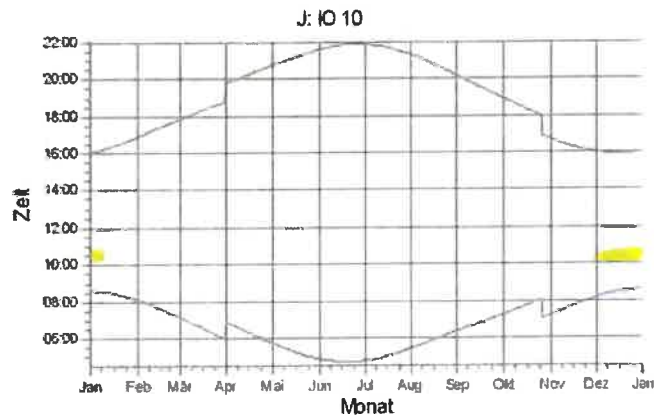
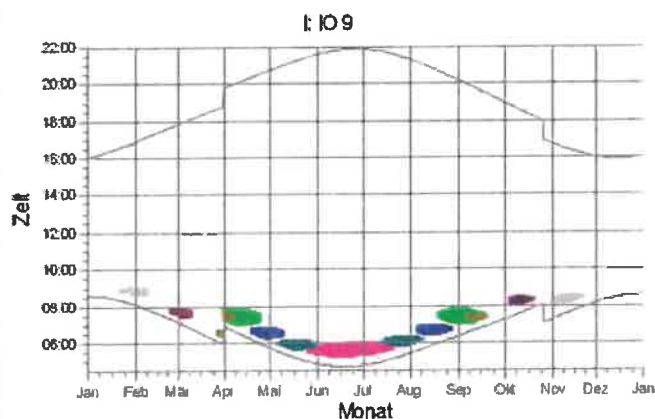
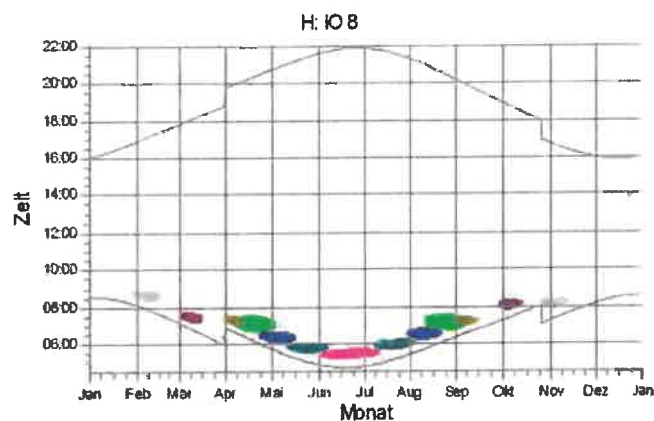
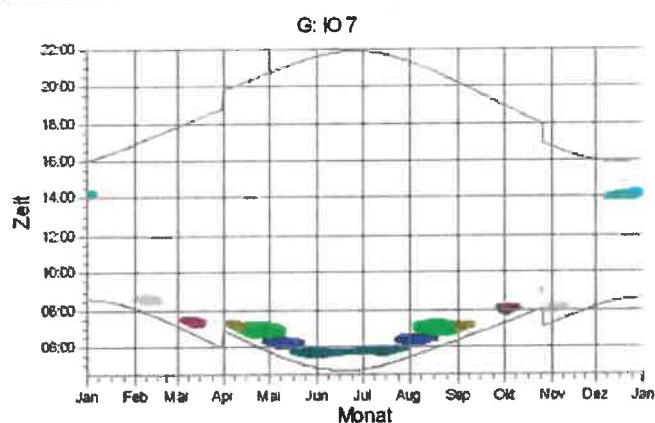
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kisdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Gesamtbelastung



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
13: WEA VB - SWT-3.2-113

Projekt:

19-095-GBK-02

Beschreibung:

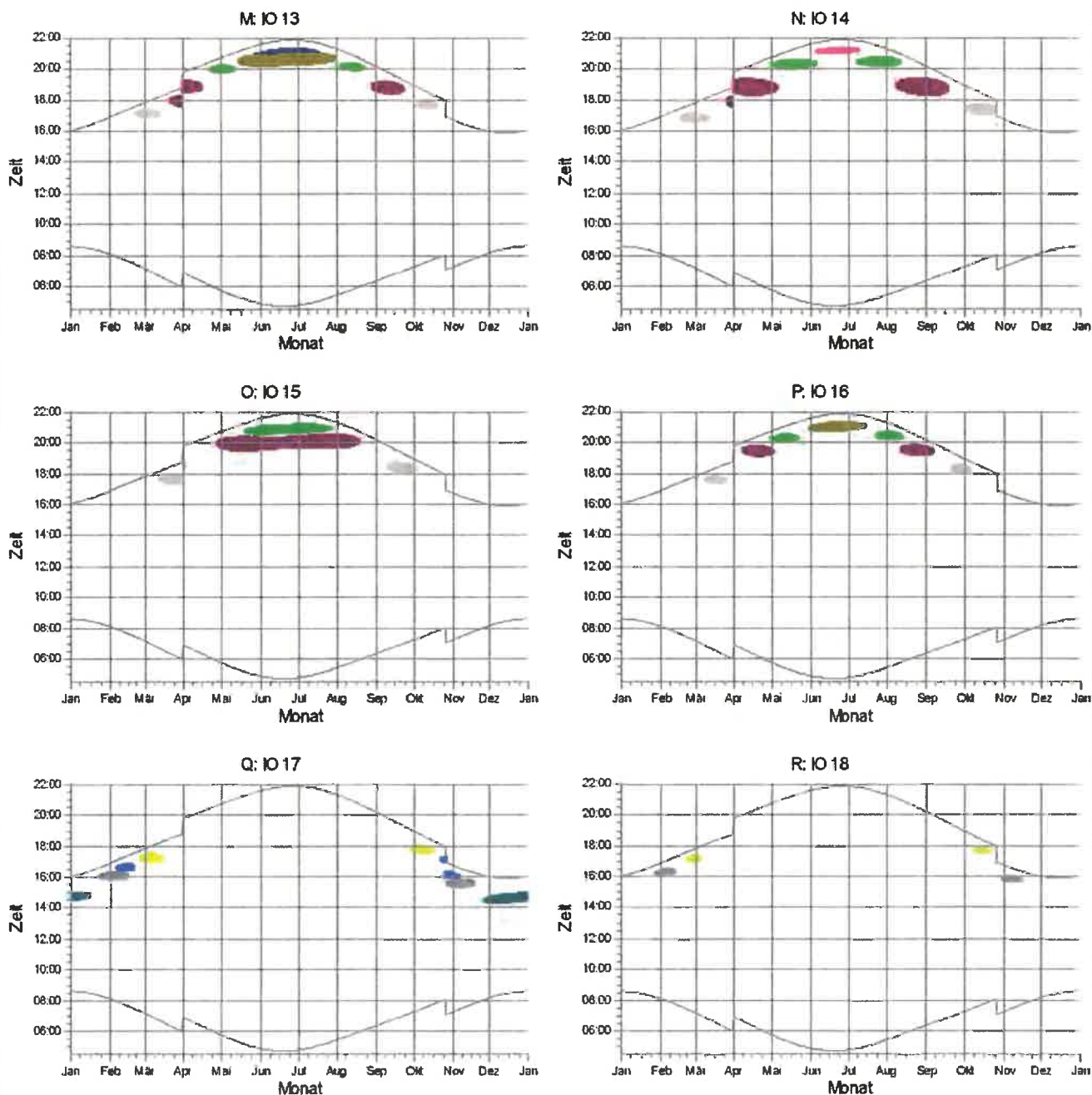
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

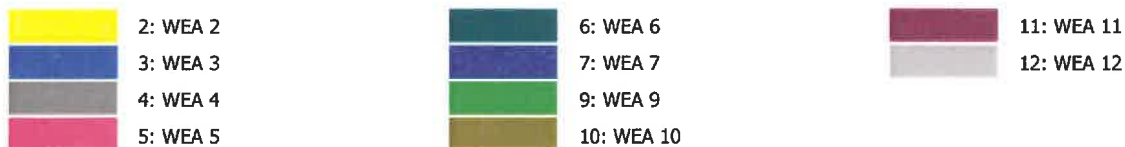
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Gesamtbelastung



WEA



Projekt:

19-095-GBK-02

Beschreibung:

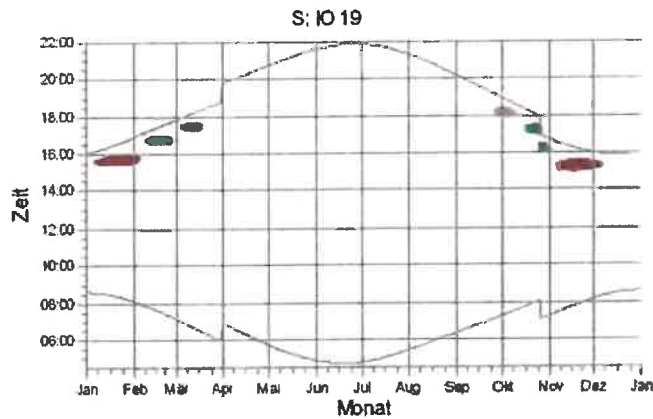
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
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info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender

Berechnung: Gesamtbelastung



WEA



4: WEA 4



6: WEA 6



8: WEA 8

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung 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 Sonneneinstrichtungsrichtung

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

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung 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 17:15	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 17:17	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 17:18	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 17:20	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 17:22	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 17:24	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 17:26	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 17:28	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 17:30	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 17:32	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 17:34	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 17:36	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 17:38	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 17:40	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 17:42	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 17:44	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 17:46	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 17:48	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		06:00 17:33-18:14/41 18:43	05:47 20:41	04:55 21:32	04:45 21:52
30	08:09		05:58 17:31-18:14/43 18:45	05:45 20:43	04:54 21:33	04:46 21:52
31	08:08		06:55 18:30-19:15/45 19:47		04:53 21:35	
	16:51					
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) Schattende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende/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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	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 Kesdaorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung 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	08:06	07:08	16:30-16:54/24	06:53	05:43	04:52	04:47	05:26	06:21	07:15	08:09
	16:02	16:53	17:50		19:49	20:45	21:36	21:52	21:17	20:11	18:56	15:59
2	08:35	08:04	07:06	16:31-16:53/22	06:50	05:41	04:51	04:47	05:28	06:23	07:17	08:11
	16:03	16:55	17:52		19:51	20:47	21:37	21:52	21:16	20:08	18:54	15:58
3	08:35	08:02	07:04	16:33-16:50/17	06:48	05:39	04:50	04:48	05:30	06:24	07:18	08:12
	16:05	16:57	17:54		19:53	20:49	21:38	21:51	21:14	20:06	18:51	15:58
4	08:35	08:01	07:01	16:37-16:47/10	06:45	05:37	04:49	04:49	05:31	06:26	07:20	08:14
	16:06	16:59	17:56		19:54	20:50	21:39	21:51	21:12	20:03	18:49	15:57
5	08:35	07:59	06:59		06:43	05:35	04:48	04:50	05:33	06:28	07:22	08:15
	16:07	17:01	17:58		19:56	20:52	21:41	21:50	21:10	20:01	18:47	15:56
6	08:34	07:57	16:33-16:35/2		06:41	05:33	04:48	04:51	05:35	06:30	07:24	08:17
	16:08	17:03	17:59		19:58	20:54	21:42	21:50	21:08	19:58	18:44	15:56
7	08:34	07:55	16:31-16:37/6		06:38	05:31	04:47	04:52	05:36	06:32	07:26	08:18
	16:10	17:05	18:01		20:00	20:56	21:43	21:49	21:06	19:56	18:42	15:55
8	08:33	07:53	16:30-16:39/9		06:36	05:29	04:46	04:52	05:38	06:33	07:28	08:19
	16:11	17:07	18:03		20:02	20:58	21:44	21:48	21:04	19:54	18:39	15:55
9	08:33	07:51	16:28-16:40/12		06:33	05:27	04:46	04:54	05:40	06:35	07:29	08:21
	16:12	17:10	18:05		20:04	20:59	21:45	21:48	21:02	19:51	18:37	15:54
10	08:32	07:50	16:27-16:43/16		06:31	05:25	04:45	04:55	05:42	06:37	07:31	08:22
	16:14	17:12	18:07		20:06	21:01	21:46	21:47	21:00	19:49	18:34	15:54
11	08:32	07:48	16:27-16:45/18		06:28	05:23	04:44	04:56	05:43	06:39	07:33	08:23
	16:15	17:14	18:09		20:08	21:03	21:46	21:46	20:58	19:46	18:32	15:53
12	08:31	07:46	16:27-16:48/21		06:26	05:21	04:44	04:57	05:45	06:41	07:35	08:24
	16:17	17:16	18:11		20:09	21:05	21:47	21:45	20:56	19:44	18:30	15:53
13	08:30	07:44	16:27-16:50/23		06:24	05:19	04:44	04:58	05:47	06:42	07:37	08:25
	16:18	17:18	18:13		20:11	21:06	21:48	21:44	20:54	19:41	18:27	15:53
14	08:29	07:41	16:27-16:52/25		06:21	05:17	04:43	04:59	05:49	06:44	07:39	08:26
	16:20	17:20	18:15		20:13	21:08	21:49	21:43	20:52	19:39	18:25	15:53
15	08:28	07:39	16:28-16:55/27		06:19	05:16	04:43	05:01	05:50	06:46	07:41	08:27
	16:22	17:22	18:17		20:15	21:10	21:49	21:42	20:50	19:36	18:22	15:53
16	08:27	07:37	16:27-16:56/29		06:17	05:14	04:43	05:02	05:52	06:48	07:42	08:28
	16:23	17:24	18:19		20:17	21:12	21:50	21:41	20:47	19:34	18:20	15:53
17	08:26	07:35	16:27-16:58/31		06:14	05:12	04:43	05:03	05:54	06:49	07:44	08:29
	16:25	17:26	18:21		20:19	21:13	21:51	21:40	20:45	19:31	18:18	15:53
18	08:25	07:33	16:27-16:59/32		06:12	05:11	04:43	05:05	05:56	06:51	07:46	08:30
	16:27	17:28	18:23		20:21	21:15	21:51	21:39	20:43	19:29	18:15	15:53
19	08:24	07:31	16:27-17:00/33		06:10	05:09	04:43	05:06	05:58	06:53	07:48	08:31
	16:29	17:30	18:24		20:23	21:17	21:51	21:37	20:41	19:26	18:13	15:53
20	08:23	07:29	16:26-16:59/33		06:07	05:07	04:43	05:07	05:59	06:55	07:50	08:32
	16:30	17:32	18:26		20:24	21:18	21:52	21:36	20:39	19:24	18:11	15:54
21	08:22	07:27	16:26-17:00/34		06:05	05:06	04:43	05:09	06:01	06:57	07:52	08:32
	16:32	17:34	18:28		20:26	21:20	21:52	21:35	20:36	19:21	18:09	15:54
22	08:21	07:24	16:26-17:00/34		06:03	05:04	04:43	05:10	06:03	06:58	07:54	08:33
	16:34	17:36	18:30		20:28	21:21	21:52	21:33	20:34	19:19	18:06	15:55
23	08:19	07:22	16:26-16:59/33		06:00	05:03	04:43	05:12	06:05	07:00	07:56	08:33
	16:36	17:38	18:32		20:30	21:23	21:53	21:32	20:32	19:16	18:04	15:55
24	08:18	07:20	16:26-16:59/33		05:58	05:02	04:43	05:13	06:07	07:02	07:58	08:34
	16:38	17:40	18:34		20:32	21:25	21:53	21:30	20:29	19:14	18:02	15:56
25	08:17	07:18	16:27-16:59/32		05:56	05:00	04:44	05:15	06:08	07:04	08:00	08:34
	16:40	17:42	18:36		20:34	21:26	21:53	21:29	20:27	19:11	18:00	15:56
26	08:15	07:15	16:27-16:58/31		05:54	04:59	04:44	05:16	06:10	07:06	08:02	08:35
	16:42	17:44	18:38		20:36	21:28	21:53	21:27	20:25	19:09	17:58	15:57
27	08:14	07:13	16:28-16:57/29		05:51	04:58	04:44	05:18	06:12	07:07	08:04	08:35
	16:44	17:46	18:39		20:37	21:29	21:53	21:26	20:23	19:06	17:55	15:58
28	08:12	07:11	16:28-16:55/27		05:49	04:56	04:45	05:20	06:14	07:09	08:06	08:35
	16:45	17:48	18:41		20:39	21:30	21:53	21:24	20:20	19:04	17:53	15:58
29	08:11		06:00		05:47	04:55	04:45	05:21	06:16	07:11	08:08	08:35
	16:47		18:43		20:41	21:32	21:52	21:23	20:18	19:01	17:51	15:59
30	08:09		05:58		05:45	04:54	04:46	05:23	06:17	07:13	08:09	08:35
	16:49		18:45		20:43	21:33	21:52	21:21	20:15	18:59	17:49	16:00
31	08:08		06:55			04:53		05:24	06:19		07:11	08:35
	16:51		19:47			21:35		21:19	20:13		16:47	16:01
Sonnenscheinstunden												
Anzahl Minuten mit Schatten												
	248	271	365	419	494	511	515	462	384	330	259	232
	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) 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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 4 - WEA 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 15:13-16:23/70 16:53	07:08 15:25-15:56/31 17:50	06:53 19:49	05:43 20:45	04:52 21:36
2	08:35 16:03	08:04 15:13-16:25/72 16:55	07:06 15:28-15:54/26 17:52	06:50 19:51	05:41 20:47	04:51 21:37
3	08:35 16:05	08:02 15:13-16:28/75 16:57	07:04 15:31-15:50/19 17:54	06:48 19:53	05:39 20:48	04:50 21:38
4	08:35 16:06	08:01 15:13-16:30/77 16:59	07:01 17:56	06:45 19:54	05:37 20:50	04:49 21:39
5	08:35 16:07	07:59 15:12-16:31/79 17:01	06:59 17:29-17:32/3 17:58	06:43 19:56	05:35 20:52	04:48 21:41
6	08:34 16:08	07:57 15:12-16:31/79 17:03	06:57 17:27-17:34/7 17:59	06:41 19:58	05:32 20:54	04:47 21:42
7	08:34 16:10	07:55 15:12-16:30/78 17:05	06:54 17:24-17:36/12 18:01	06:38 20:00	05:31 20:56	04:47 21:43
8	08:33 16:11	07:53 15:12-16:30/78 17:07	06:52 17:24-17:38/14 18:03	06:36 20:02	05:29 20:58	04:46 21:44
9	08:33 16:12	07:51 15:12-16:28/76 17:09	06:49 17:22-17:40/18 18:05	06:33 20:04	05:27 20:59	04:45 21:45
10	08:32 16:14	07:49 15:11-16:28/77 17:12	06:47 17:22-17:42/20 18:07	06:31 20:06	05:25 21:01	04:45 21:46
11	08:32 16:15	07:48 15:11-16:26/75 17:14	06:45 17:22-17:43/21 18:09	06:28 20:08	05:23 21:03	04:44 21:46
12	08:31 16:17	07:46 15:11-16:24/73 17:16	06:42 17:21-17:42/21 18:11	06:26 20:09	05:21 21:05	04:44 21:47
13	08:30 16:18	07:43 15:11-16:15/64 17:18	06:40 17:22-17:42/20 18:13	06:24 20:11	05:19 21:06	04:44 21:48
14	08:29 16:20	07:41 15:11-16:14/63 17:20	06:37 17:22-17:41/19 18:15	06:21 20:13	05:17 21:08	04:43 21:49
15	08:28 16:22	07:39 15:12-16:11/59 17:22	06:35 17:23-17:40/17 18:17	06:19 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 15:11-16:10/59 17:24	06:32 17:23-17:38/15 18:19	06:17 20:17	05:14 21:12	04:43 21:50
17	08:26 15:32-15:39/7 16:25	07:35 15:12-16:10/58 17:26	06:30 17:26-17:36/10 18:21	06:14 20:19	05:12 21:13	04:43 21:50
18	08:25 15:28-15:44/16 16:27	07:33 15:12-16:09/57 17:28	06:27 18:23	06:12 20:21	05:11 21:15	04:43 21:51
19	08:24 15:25-15:46/21 16:29	07:31 15:13-16:09/56 17:30	06:25 18:24	06:09 20:22	05:09 21:17	04:42 21:51
20	08:23 15:24-15:49/25 16:30	07:29 15:13-16:08/55 17:32	06:22 18:26	06:07 20:24	05:07 21:18	04:43 21:52
21	08:22 15:23-15:52/29 16:32	07:27 15:14-16:08/54 17:34	06:20 18:28	06:05 20:26	05:06 21:20	04:43 21:52
22	08:21 15:21-15:53/32 16:34	07:24 15:15-16:07/52 17:36	06:18 18:30	06:03 20:28	05:04 21:21	04:43 21:52
23	08:19 15:20-15:55/35 16:36	07:22 15:15-16:05/50 17:38	06:15 18:32	06:00 20:30	05:03 21:23	04:43 21:53
24	08:18 16:00-16:06/6 16:38 15:19-15:56/37	07:20 15:17-16:05/48 17:40	06:13 18:34	05:58 20:32	05:02 21:25	04:43 21:53
25	08:17 15:19-16:09/50 16:40	07:18 15:18-16:04/46 17:42	06:10 18:36	05:56 20:34	05:00 21:26	04:43 21:53
26	08:15 15:17-16:10/53 16:42	07:15 15:19-16:02/43 17:44	06:08 18:38	05:54 20:36	04:59 21:28	04:44 21:53
27	08:14 15:16-16:12/56 16:44	07:13 15:21-16:01/40 17:46	06:05 18:39	05:51 20:37	04:58 21:29	04:44 21:53
28	08:12 15:16-16:15/59 16:45	07:11 15:22-15:58/36 17:48	06:03 18:41	05:49 20:39	04:56 21:30	04:45 21:53
29	08:11 15:15-16:17/62 16:47		06:00 18:43	05:47 20:41	04:55 21:32	04:45 21:52
30	08:09 15:15-16:19/64 16:49		05:58 18:45	05:45 20:43	04:54 21:33	04:46 21:52
31	08:08 15:14-16:21/67 16:51		06:55 19:47		04:53 21:35	
Sonnenscheinstunden						
Anzahl Minuten mit Schatten						
	248	271	365	419	494	511
	619	1749	273	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:

28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA**Berechnung: Gesamtbelastung WEA: 4 - WEA 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 Sonneneinstrahlung

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 20:11	07:15 18:01-18:21/20 18:56	07:13 14:40-15:55/75 16:45	08:09 15:59
2	04:47 21:52	05:28 21:15	06:23 20:08	07:16 18:01-18:21/20 18:54	07:15 14:40-15:57/77 16:43	08:11 15:58
3	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:00-18:21/21 18:51	07:17 14:40-15:58/78 16:41	08:12 15:57
4	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:00-18:21/21 18:49	07:19 14:40-15:59/79 16:39	08:14 15:57
5	04:50 21:50	05:33 21:10	06:28 20:01	07:22 17:59-18:19/20 18:46	07:21 14:42-16:00/78 16:37	08:15 15:56
6	04:51 21:50	05:35 21:08	06:30 19:58	07:24 17:59-18:17/18 18:44	07:23 14:42-16:00/78 16:35	08:17 15:56
7	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:00-18:14/14 18:42	07:25 14:42-16:00/78 16:33	08:18 15:55
8	04:52 21:48	05:38 21:04	06:33 19:54	07:27 18:00-18:12/12 18:39	07:27 14:42-16:00/78 16:31	08:19 15:55
9	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:02-18:09/7 18:37	07:29 14:43-15:59/76 16:29	08:21 15:54
10	04:55 21:47	05:42 21:00	06:37 19:49	07:31 18:04-18:07/3 18:34	07:31 14:43-15:57/74 16:28	08:22 15:54
11	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 14:45-15:56/71 16:26	08:23 15:53
12	04:57 21:45	05:45 20:56	06:41 19:44	07:35 16:05-16:23/18 18:30	07:35 14:45-15:54/69 16:24	08:24 15:53
13	04:58 21:44	05:47 20:54	06:42 19:41	07:37 16:01-16:27/26 18:27	07:37 14:46-15:52/66 16:22	08:25 15:53
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 15:58-16:29/31 18:25	07:39 14:47-15:50/63 16:21	08:26 15:53
15	05:00 21:42	05:50 20:50	06:46 19:36	07:41 15:55-16:31/36 18:22	07:41 14:48-15:48/60 16:19	08:27 15:53
16	05:02 21:41	05:52 20:47	06:48 19:34	07:42 15:53-16:33/40 18:20	07:43 14:49-15:46/57 16:18	08:28 15:53
17	05:03 21:40	05:54 20:45	06:49 19:31	07:44 15:51-16:34/43 18:18	07:44 14:50-15:44/54 16:16	08:29 15:53
18	05:04 21:39	05:56 20:43	06:51 19:29	07:46 15:50-16:35/45 18:15	07:46 14:51-15:42/51 16:14	08:30 15:53
19	05:06 21:37	05:58 20:41	06:53 19:26	07:48 15:48-16:36/48 18:13	07:48 15:32-15:41/9 16:13	08:31 15:53
20	05:07 21:36	05:59 20:39	06:55 19:24	07:50 15:47-16:37/50 18:11	07:50 14:55-15:31/36 16:12	08:32 15:54
21	05:09 21:35	06:01 20:36	06:57 19:21	07:52 15:46-16:37/51 18:09	07:52 14:56-15:30/34 16:10	08:32 15:54
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 15:45-16:38/53 18:06	07:54 14:58-15:28/30 16:09	08:33 15:54
23	05:12 21:32	06:05 20:32	07:00 19:16	07:56 15:44-16:38/54 18:04	07:56 15:00-15:27/27 16:08	08:33 15:55
24	05:13 21:30	06:07 20:29	07:02 19:14	07:58 15:43-16:39/56 18:02	07:57 15:02-15:25/23 16:06	08:34 15:55
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 15:42-16:39/57 18:00	07:59 15:04-15:23/19 16:05	08:34 15:56
26	05:16 21:27	06:10 20:25	07:06 19:09	08:02 15:41-16:39/58 17:57	08:01 15:07-15:20/13 16:04	08:35 15:57
27	05:18 21:26	06:12 20:22	07:07 18:12-18:13/1 19:06	07:04 14:41-15:39/58 16:55	08:03 16:03	08:35 15:57
28	05:20 21:24	06:14 20:20	07:09 18:06-18:17/11 19:04	07:06 14:41-15:40/59 16:53	08:04 16:02	08:35 15:58
29	05:21 21:22	06:16 20:18	07:11 18:04-18:19/15 19:01	07:07 14:41-15:43/62 16:51	08:06 16:01	08:35 15:59
30	05:23 21:21	06:17 20:15	07:13 18:02-18:20/18 18:59	07:09 14:41-15:45/64 16:49	08:08 16:00	08:35 16:00
31	05:24 21:19	06:19 20:13		07:11 15:47-15:53/6 16:47		08:35 16:01
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	0	0	45	1136	1492	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

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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 5 - WEA 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 15:04-15:27/23 16:02	08:06 16:53 16:53	07:08 17:50 17:50	06:53 19:49 19:49	05:43 19:51-20:10/19 20:45	04:52 05:25-05:49/24 21:36
2	08:35 15:03-15:28/25 16:03	08:04 16:55 16:55	07:06 17:52 17:52	06:50 19:51 19:51	05:41 19:51-20:10/19 20:47	04:51 05:24-05:49/25 21:37
3	08:35 15:04-15:29/25 16:05	08:02 16:57 16:57	07:04 17:54 17:54	06:48 19:53 19:53	05:39 19:53-20:10/17 20:48	04:50 05:23-05:50/27 21:38
4	08:35 15:04-15:30/26 16:06	08:01 16:59 16:59	07:01 17:56 17:56	06:45 19:54 19:54	05:37 19:54-20:08/14 20:50	04:49 05:23-05:51/28 21:39
5	08:35 15:04-15:32/28 16:07	07:59 16:59 17:01	06:59 17:58 17:58	06:43 19:56 19:56	05:35 19:55-20:07/12 20:52	04:48 05:22-05:52/30 21:41
6	08:34 15:04-15:33/29 16:08	07:57 17:03 17:03	06:57 17:59 17:59	06:41 19:58 19:58	05:33 19:57-20:04/7 20:54	04:48 21:06-21:08/2 21:42
7	08:34 15:05-15:34/29 16:10	07:55 17:05 17:05	06:54 18:01 18:01	06:38 20:00 20:00	05:31 20:56 20:56	04:47 21:06-21:10/4 21:43
8	08:33 15:05-15:35/30 16:11	07:53 17:07 17:07	06:52 18:03 18:03	06:36 20:02 20:02	05:29 20:58 20:58	04:46 21:05-21:10/5 21:44
9	08:33 15:05-15:35/30 16:12	07:51 17:10 17:10	06:49 18:05 18:05	06:33 20:04 20:04	05:27 20:59 20:59	04:46 21:05-21:11/6 21:45
10	08:32 15:05-15:35/30 16:14	07:49 17:12 17:12	06:47 18:07 18:07	06:31 20:06 20:06	05:25 21:01 21:01	04:45 21:04-21:12/8 21:46
11	08:32 15:07-15:37/30 16:15	07:48 17:14 17:14	06:45 18:09 18:09	06:28 20:08 20:08	05:23 21:03 21:03	04:44 21:04-21:13/9 21:46
12	08:31 15:07-15:37/30 16:17	07:46 17:16 17:16	06:42 18:11 18:11	06:26 20:09 20:09	05:21 21:05 21:05	04:44 21:04-21:14/10 21:47
13	08:30 15:07-15:37/30 16:19	07:44 17:18 17:18	06:40 18:13 18:13	06:24 20:11 20:11	05:19 21:06 21:06	04:44 21:04-21:14/10 21:48
14	08:29 15:08-15:38/30 16:20	07:41 17:20 17:20	06:37 18:15 18:15	06:21 20:13 20:13	05:17 21:08 21:08	04:43 21:04-21:15/11 21:49
15	08:28 15:07-15:37/30 16:22	07:39 17:22 17:22	06:35 18:17 18:17	06:19 20:15 20:15	05:16 21:10 21:10	04:43 21:04-21:15/11 21:49
16	08:27 15:08-15:38/30 16:23	07:37 17:24 17:24	06:32 18:19 18:19	06:17 20:17 20:17	05:14 21:12 21:12	04:43 21:04-21:16/12 21:50
17	08:26 15:08-15:38/30 16:25	07:35 17:26 17:26	06:30 18:21 18:21	06:14 20:19 20:19	05:12 21:13 21:13	04:43 21:04-21:17/13 21:50
18	08:25 15:09-15:39/30 16:27	07:33 17:28 17:28	06:27 18:23 18:23	06:12 20:21 20:21	05:11 21:15 21:15	04:43 21:04-21:17/13 21:51
19	08:24 15:09-15:38/29 16:29	07:31 17:30 17:30	06:25 18:24 18:24	06:10 20:22 20:22	05:09 21:17 21:17	04:43 21:04-21:17/13 21:51
20	08:23 15:10-15:38/28 16:30	07:29 17:32 17:32	06:23 18:26 18:26	06:07 20:24 20:24	05:07 21:18 21:18	04:43 21:05-21:18/13 21:52
21	08:22 15:11-15:39/28 16:32	07:27 17:34 17:34	06:20 18:28 18:28	06:05 19:58-19:59/1 20:26	05:06 21:20 21:20	04:43 21:05-21:18/13 21:52
22	08:21 15:11-15:38/27 16:34	07:24 17:36 17:36	06:18 18:30 18:30	06:03 19:56-20:01/5 20:28	05:04 21:21 21:21	04:43 21:05-21:18/13 21:52
23	08:19 15:13-15:38/25 16:36	07:22 17:38 17:38	06:15 18:32 18:32	06:00 19:55-20:03/8 20:30	05:03 21:23 21:23	04:43 21:06-21:19/13 21:53
24	08:18 15:13-15:38/25 16:38	07:20 17:40 17:40	06:13 18:34 18:34	05:58 19:53-20:05/12 20:32	05:02 21:25 21:25	04:43 21:06-21:19/13 21:53
25	08:17 15:15-15:38/23 16:40	07:18 17:42 17:42	06:10 18:36 18:36	05:56 19:53-20:07/14 20:34	05:00 21:26 21:26	04:44 21:05-21:18/13 21:53
26	08:15 15:16-15:36/20 16:42	07:15 17:44 17:44	06:08 18:38 18:38	05:54 19:52-20:08/16 20:36	04:59 05:31-05:40/9 21:28	04:44 21:06-21:19/13 21:53
27	08:14 15:17-15:35/18 16:44	07:13 17:46 17:46	06:05 18:39 18:39	05:51 19:52-20:10/18 20:37	04:58 05:30-05:42/12 21:29	04:44 21:06-21:18/12 21:53
28	08:12 15:20-15:34/14 16:45	07:11 17:48 17:48	06:03 18:41 18:41	05:49 19:51-20:11/20 20:39	04:56 05:29-05:44/15 21:30	04:45 21:06-21:18/12 21:53
29	08:11 15:22-15:32/10 16:47		06:00 18:43 18:43	05:47 19:51-20:11/20 20:41	04:55 05:28-05:46/18 21:32	04:45 21:07-21:18/11 21:52
30	08:09 16:49		05:58 18:45 18:45	05:45 19:51-20:11/20 20:43	04:54 05:27-05:47/20 21:33	04:46 21:08-21:19/11 21:52
31	08:08 16:51		06:55 19:47 19:47		04:53 05:26-05:48/22 21:35	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	762	0	0	134	184	1339

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:
28.08.2019 10:21/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Gesamtbelastung WEA: 5 - WEA 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

	Jul	August	September	Oktober	November	Dezember
1	04:47 21:08-21:18/10	05:26 21:17	06:21 20:11	07:15 18:56	07:13 16:45	08:09 14:49-15:19/30
	21:52 05:22-05:59/37	21:17	20:11	18:56	16:45	15:59
2	04:47 21:08-21:18/10	05:28 21:15	06:23 20:08	07:16 18:54	07:15 16:43	08:11 14:48-15:18/30
	21:52 05:23-06:00/37	21:15	20:08	18:54	16:43	15:58
3	04:48 21:09-21:18/9	05:30 21:14	06:24 20:06	07:18 18:51	07:17 16:41	08:12 14:49-15:19/30
	21:51 05:24-06:00/36	21:14	20:06	18:51	16:41	15:58
4	04:49 21:09-21:16/7	05:31 21:12	06:26 20:03	07:20 18:49	07:19 16:39	08:14 14:50-15:20/30
	21:51 05:25-06:00/35	21:12	20:03	18:49	16:39	15:57
5	04:50 21:10-21:16/6	05:33 21:10	06:28 20:01	07:22 18:47	07:21 16:37	08:15 14:50-15:19/29
	21:50 05:25-05:59/34	21:10	20:01	18:47	16:37	15:56
6	04:51 21:11-21:16/5	05:35 21:08	06:30 19:58	07:24 18:44	07:23 16:35	08:17 14:51-15:20/29
	21:50 05:26-05:59/33	21:08	19:58	18:44	16:35	15:56
7	04:52 21:12-21:16/4	05:36 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 14:51-15:20/29
	21:49 05:27-05:59/32	21:06	19:56	18:42	16:33	15:55
8	04:53 21:13-21:15/2	05:38 20:07-20:13/6	06:33 19:54	07:28 18:39	07:27 16:31	08:19 14:52-15:20/28
	21:48 05:28-05:59/31	21:04	19:54	18:39	16:31	15:55
9	04:54 05:29-05:59/30	05:40 20:05-20:16/11	06:35 19:51	07:29 18:37	07:29 16:29	08:21 14:52-15:19/27
	21:48	21:02	19:51	18:37	16:29	15:54
10	04:55 05:30-05:58/28	05:42 20:02-20:16/14	06:37 19:49	07:31 18:34	07:31 16:28	08:22 14:52-15:18/26
	21:47	21:00	19:49	18:34	16:28	15:54
11	04:56 05:31-05:58/27	05:43 20:01-20:18/17	06:39 19:46	07:33 18:32	07:33 16:26	08:23 14:54-15:19/25
	21:46	20:58	19:46	18:32	16:26	15:53
12	04:57 05:32-05:57/25	05:45 20:01-20:19/18	06:41 19:44	07:35 18:30	07:35 16:24	08:24 14:54-15:18/24
	21:45	20:56	19:44	18:30	16:24	15:53
13	04:58 05:33-05:57/24	05:47 19:59-20:19/20	06:42 19:41	07:37 18:27	07:37 16:22	08:25 14:55-15:18/23
	21:44	20:54	19:41	18:27	16:22	15:53
14	04:59 05:34-05:56/22	05:49 19:59-20:19/20	06:44 19:39	07:39 18:25	07:39 14:56-15:02/6	08:26 14:55-15:17/22
	21:43	20:52	19:39	18:25	16:21	15:53
15	05:01 05:35-05:55/20	05:51 19:59-20:20/21	06:46 19:36	07:41 18:22	07:41 14:53-15:05/12	08:27 14:56-15:17/21
	21:42	20:50	19:36	18:22	16:19	15:53
16	05:02 05:37-05:55/18	05:52 19:58-20:19/21	06:48 19:34	07:42 18:20	07:43 14:51-15:07/16	08:28 14:56-15:17/21
	21:41	20:47	19:34	18:20	16:18	15:53
17	05:03 05:38-05:53/15	05:54 19:58-20:17/19	06:49 19:31	07:44 18:18	07:44 14:49-15:09/20	08:29 14:57-15:17/20
	21:40	20:45	19:31	18:18	16:16	15:53
18	05:05 05:39-05:51/12	05:56 19:59-20:15/16	06:51 19:29	07:46 18:15	07:46 14:48-15:10/22	08:30 14:58-15:18/20
	21:39	20:43	19:29	18:15	16:15	15:53
19	05:06 05:40-05:49/9	05:58 19:58-20:13/15	06:53 19:26	07:48 18:13	07:48 14:48-15:11/23	08:31 14:58-15:17/19
	21:37	20:41	19:26	18:13	16:13	15:53
20	05:07	05:59 19:59-20:11/12	06:55 19:24	07:50 18:11	07:50 14:48-15:13/25	08:32 14:58-15:18/20
	21:36	20:39	19:24	18:11	16:12	15:54
21	05:09	06:01 20:00-20:09/9	06:57 19:21	07:52 18:09	07:52 14:48-15:14/26	08:32 14:59-15:18/19
	21:35	20:36	19:21	18:09	16:10	15:54
22	05:10	06:03 20:00-20:06/6	06:58 19:19	07:54 18:06	07:54 14:47-15:14/27	08:33 14:59-15:18/19
	21:33	20:34	19:19	18:06	16:09	15:55
23	05:12	06:05 20:02-20:04/2	07:00 19:16	07:56 18:04	07:56 14:47-15:15/28	08:33 15:00-15:19/19
	21:32	20:32	19:16	18:04	16:08	15:55
24	05:13	06:07	07:02 19:14	07:58 18:02	07:57 14:47-15:16/29	08:34 15:00-15:19/19
	21:30	20:29	19:14	18:02	16:06	15:56
25	05:15	06:08	07:04 19:11	08:00 18:00	07:59 14:46-15:15/29	08:34 15:00-15:20/20
	21:29	20:27	19:11	18:00	16:05	15:56
26	05:16	06:10	07:06 19:09	08:02 18:01	08:01 14:46-15:16/30	08:35 15:02-15:21/19
	21:27	20:25	19:09	17:58	16:04	15:57
27	05:18	06:12	07:07 19:06	08:03 18:03	08:03 14:47-15:17/30	08:35 15:02-15:22/20
	21:26	20:22	19:06	16:55	16:03	15:58
28	05:20	06:14	07:09 19:04	08:04 18:02	08:04 14:47-15:17/30	08:35 15:02-15:22/20
	21:24	20:20	19:04	16:53	16:02	15:58
29	05:21	06:16	07:11 19:01	08:06 18:01	08:06 14:47-15:18/31	08:35 15:02-15:23/21
	21:22	20:18	19:01	16:51	16:01	15:59
30	05:23	06:17	07:13 18:59	08:08 18:08	08:08 14:48-15:18/30	08:35 15:03-15:24/21
	21:21	20:15	18:59	16:49	16:00	16:00
31	05:24	06:19		07:11		08:35 15:03-15:25/22
	21:19	20:13		16:47		16:01
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	558	227	0	0	414	722

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

SHADOW - Kalender pro WEA

Berechnung: GesamtbelastungWEA: 6 - WEA 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	Mai	Juni
1	08:35 14:30-14:57/27	08:06	07:08	06:53	05:43	04:52 20:50-21:03/13
	16:02 12:57-13:36/39	16:53	17:50	19:49	20:45	21:36 05:30-05:56/26
2	08:35 14:30-14:56/26	08:04	07:06	06:50	05:41	04:51 20:49-21:04/15
	16:03 12:57-13:36/39	16:55	17:52	19:51	20:47	21:37 05:30-05:55/25
3	08:35 14:31-14:57/26	08:02	07:04	06:48	05:39	04:50 20:49-21:05/16
	16:05 12:58-13:36/38	16:57	17:54	19:53	20:48	21:38 05:30-05:54/24
4	08:35 14:31-14:57/26	08:01	07:01	06:45	05:37	04:49 20:49-21:07/18
	16:06 12:58-13:36/38	16:59	17:56	19:54	20:50	21:39 05:32-05:54/22
5	08:35 14:32-14:57/25	07:59	06:59	06:43	05:35	04:48 20:48-21:08/20
	16:07 12:59-13:36/37	17:01	17:57	19:56	20:52	21:41 05:32-05:53/21
6	08:34 14:33-14:57/24	07:57	06:57	06:41	05:32 06:01-06:02/1	04:47 20:47-21:08/21
	16:08 13:00-13:36/36	17:03	17:59	19:58	20:54	21:42 05:32-05:51/19
7	08:34 14:34-14:58/24	07:55	06:54	06:38	05:31 05:59-06:03/4	04:47 20:48-21:10/22
	16:10 13:01-13:36/35	17:05	18:01	20:00	20:56	21:43 05:33-05:52/19
8	08:33 14:35-14:58/23	07:53	06:52	06:36	05:29 05:57-06:04/7	04:46 20:47-21:10/23
	16:11 13:02-13:36/34	17:07	18:03	20:02	20:58	21:44 05:33-05:51/18
9	08:33 14:35-14:58/23	07:51	06:49	06:33	05:27 05:56-06:05/9	04:45 20:47-21:11/24
	16:12 13:03-13:35/32	17:09	18:05	20:04	20:59	21:45 05:34-05:51/17
10	08:32 14:36-14:57/21	07:49 16:42-16:43/1	06:47	06:31	05:25 05:54-06:06/12	04:45 20:47-21:12/25
	16:14 13:04-13:35/31	17:12	18:07	20:06	21:01	21:46 05:34-05:50/16
11	08:31 14:38-14:58/20	07:47 16:39-16:45/6	06:45	06:28	05:23 05:52-06:06/14	04:44 20:47-21:13/26
	16:15 13:06-13:35/29	17:14	18:09	20:08	21:03	21:46 05:35-05:51/16
12	08:31 14:39-14:58/19	07:45 16:37-16:48/11	06:42	06:26	05:21 05:51-06:07/16	04:44 20:47-21:13/26
	16:17 13:08-13:34/26	17:16	18:11	20:09	21:05	21:47 05:36-05:51/15
13	08:30 14:40-14:57/17	07:43 16:36-16:50/14	06:40	06:24	05:19 05:49-06:07/18	04:44 20:47-21:13/26
	16:18 13:09-13:34/25	17:18	18:13	20:11	21:06	21:48 05:36-05:50/14
14	08:29 14:41-14:57/16	07:41 16:35-16:52/17	06:37	06:21	05:17 05:47-06:07/20	04:43 20:47-21:14/27
	16:20 13:11-13:33/22	17:20	18:15	20:13	21:08	21:49 05:36-05:50/14
15	08:28 14:42-14:55/13	07:39 16:35-16:55/20	06:35	06:19	05:16 05:46-06:08/22	04:43 20:47-21:14/27
	16:22 13:13-13:30/17	17:22	18:17	20:15	21:10	21:49 05:37-05:50/13
16	08:27 14:45-14:53/8	07:37 16:33-16:55/22	06:32	06:16	05:14 05:44-06:07/23	04:43 20:47-21:15/28
	16:23 13:16-13:28/12	17:24	18:19	20:17	21:12	21:50 05:38-05:50/12
17	08:26	07:35 16:33-16:56/23	06:30	06:14	05:12 05:43-06:08/25	04:43 20:48-21:15/27
	16:25	17:25	18:21	20:19	21:13	21:50 05:38-05:50/12
18	08:25	07:33 16:33-16:56/23	06:27	06:12	05:11 05:41-06:07/26	04:43 20:48-21:15/27
	16:27	17:28	18:22	20:21	21:15	21:51 05:39-05:50/11
19	08:24	07:31 16:33-16:56/23	06:25	06:09	05:09 05:40-06:07/27	04:42 20:48-21:15/27
	16:29	17:30	18:24	20:22	21:17	21:51 05:39-05:50/11
20	08:23	07:29 16:33-16:55/22	06:22	06:07	05:07 05:38-06:06/28	04:43 20:48-21:16/28
	16:30	17:32	18:26	20:24	21:18	21:52 05:39-05:50/11
21	08:22	07:26 16:34-16:55/21	06:20	06:05	05:06 05:37-06:06/29	04:43 20:48-21:16/28
	16:32	17:34	18:28	20:26	21:20	21:52 05:39-05:50/11
22	08:21	07:24 16:35-16:55/20	06:18	06:03	05:04 05:36-06:06/30	04:43 20:48-21:16/28
	16:34	17:36	18:30	20:28	21:21	21:52 05:39-05:50/11
23	08:19	07:22 16:35-16:53/18	06:15	06:00	05:03 05:34-06:05/31	04:43 20:48-21:16/28
	16:36	17:38	18:32	20:30	21:23	21:52 05:40-05:51/11
24	08:18	07:20 16:36-16:52/16	06:13	05:58	05:02 05:33-06:05/32	04:43 20:49-21:17/28
	16:38	17:40	18:34	20:32	21:25	21:53 05:40-05:51/11
25	08:17	07:18 16:39-16:50/11	06:10	05:56	05:00 05:32-06:04/32	04:44 20:49-21:16/27
	16:40	17:42	18:36	20:34	21:26	21:53 05:40-05:51/11
26	08:15	07:15 16:43-16:45/2	06:08	05:54	04:59 05:31-06:04/33	04:44 20:50-21:17/27
	16:42	17:44	18:38	20:36	21:28	21:53 05:41-05:52/11
27	08:14	07:13	06:05	05:51	04:58 05:30-06:03/33	04:44 20:50-21:17/27
	16:44	17:46	18:39	20:37	21:29	21:53 05:40-05:52/12
28	08:12	07:11	06:03	05:49	04:56 05:29-06:02/33	04:45 20:49-21:16/27
	16:45	17:48	18:41	20:39	21:30	21:53 05:41-05:53/12
29	08:11		06:00	05:47	04:55 20:56-21:00/4	04:45 20:50-21:17/27
	16:47		18:43	20:41	21:32 05:29-06:01/32	21:52 05:40-05:53/13
30	08:09		05:58	05:45	04:54 20:53-21:01/8	04:46 20:51-21:18/27
	16:49		18:45	20:43	21:33 05:29-05:58/29	21:52 05:40-05:54/14
31	08:07		06:55		04:53 20:52-21:02/10	
	16:51		19:47		21:34 05:30-05:57/27	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	828	270	0	0	615	1193

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 Kesdauf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 6 - WEA 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 Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	04:47 20:51-21:17/26 21:52 05:39-05:54/15	05:26 05:59-06:17/18 21:17	06:21 20:11 18:56 06:23 07:16	07:15 18:56 07:16 18:54	07:13 16:08-16:15/7 07:15 16:10-16:13/3	08:09 14:21-14:39/18 15:59 12:50-13:16/26
2	04:47 20:51-21:17/26 21:52 05:40-05:55/15	05:28 06:01-06:17/16 21:15	06:23 20:08 06:24 07:18	07:16 18:54 07:18 18:51	07:17 16:43 07:19 16:39	08:11 14:20-14:39/19 15:58 12:49-13:16/27
3	04:48 20:52-21:18/26 21:51 05:40-05:56/16	05:29 06:02-06:16/14 21:14	06:24 20:06 06:26 07:20	07:18 18:51 07:20 18:49	07:17 16:43 07:21 16:37	08:12 14:20-14:41/21 15:57 12:48-13:18/30
4	04:49 20:52-21:17/25 21:51 05:40-05:56/16	05:31 06:04-06:16/12 21:12	06:26 20:03 06:28 07:22	07:20 18:49 07:22 18:46	07:19 16:39 07:23 16:35	08:14 14:20-14:42/22 15:57 12:48-13:20/32
5	04:50 20:52-21:16/24 21:50 05:39-05:56/17	05:33 06:05-06:15/10 21:10	06:28 20:01 06:30 07:24	07:22 18:46 07:24 18:44	07:21 16:37 07:23 16:35	08:15 14:19-14:42/23 15:56 12:47-13:20/33
6	04:51 20:53-21:16/23 21:50 05:39-05:57/18	05:35 06:07-06:14/7 21:08	06:30 20:03 19:58	07:24 18:44 07:26 18:42	07:23 16:35 07:25 16:33	08:17 14:20-14:43/23 15:56 12:47-13:22/35
7	04:51 20:54-21:16/22 21:49 05:39-05:58/19	05:36 06:09-06:13/4 21:06	06:32 20:01 19:56	07:26 18:42 07:27 18:39	07:25 16:33 07:27 16:31	08:18 14:20-14:44/24 15:55 12:47-13:22/35
8	04:52 20:54-21:15/21 21:48 05:39-05:58/19	05:38 06:10-06:11/1 21:04	06:33 20:03 19:54	07:27 18:39 07:29 18:37	07:27 16:31 07:29 16:29	08:19 14:20-14:45/25 15:55 12:47-13:24/37
9	04:53 20:55-21:14/19 21:48 05:39-06:00/21	05:40 21:02 05:42	06:35 20:03 19:51	07:29 18:37 07:31 18:35	07:29 16:29 07:31 16:28	15:54 12:47-13:24/37 08:22 14:20-14:45/25
10	04:55 20:56-21:14/18 21:47 05:38-06:01/23	05:42 21:00 05:43	06:37 20:03 19:49	07:31 18:35 07:33 18:33	07:31 16:28 07:33 16:26	08:22 14:20-14:45/25 15:54 12:46-13:24/38
11	04:56 20:57-21:13/16 21:46 05:38-06:02/24	05:43 20:58 05:45	06:39 20:03 19:46	07:33 18:33 07:35 18:30	07:33 16:26 07:35 16:24	08:23 14:21-14:47/26 15:53 12:47-13:26/39
12	04:57 20:57-21:12/15 21:45 05:38-06:03/25	05:45 20:56 05:47	06:41 20:03 19:44	07:35 18:30 07:37 18:27	07:35 16:24 07:37 16:22	08:24 14:21-14:47/26 15:53 12:47-13:27/40
13	04:58 20:58-21:11/13 21:44 05:38-06:04/26	05:47 20:54 05:49	06:42 20:03 19:41	07:37 18:27 07:39 18:25	07:37 16:22 07:39 16:20	08:25 14:21-14:48/27 15:53 12:47-13:27/40
14	04:59 21:00-21:10/10 21:43 05:38-06:05/27	05:49 20:52 05:50	06:44 20:03 19:39	07:39 18:25 07:41 18:22	07:39 16:20 07:41 16:19	08:26 14:21-14:48/27 15:53 12:47-13:28/41
15	05:00 21:01-21:09/8 21:42 05:37-06:07/30	05:50 20:50 05:52	06:46 20:03 19:36	07:41 18:22 07:42 18:20	07:41 16:19 07:43 16:18	08:27 14:22-14:49/27 15:53 12:48-13:29/41
16	05:02 21:06-21:08/2 21:41 05:38-06:10/32	05:52 20:47 05:54	06:48 20:03 19:34	07:42 18:20 07:44 18:18	07:43 16:18 07:44 16:16	08:28 14:22-14:49/27 15:53 12:48-13:30/41
17	05:03 05:38-06:11/33 21:40	05:54 20:45 05:56	06:49 20:03 19:31	07:44 18:18 07:46 17:10-17:21/11	07:44 16:16 07:46 16:14	08:29 14:23-14:50/27 15:53 12:48-13:30/42
18	05:04 05:39-06:12/33 21:39	05:56 20:43 05:58	06:51 20:03 19:29	07:46 17:10-17:21/11 07:48 17:08-17:23/15	07:46 16:14 07:48 16:13	08:30 14:23-14:50/27 15:53 12:49-13:30/41
19	05:06 05:40-06:13/33 21:37	05:58 20:41 05:59	06:53 20:03 19:26	07:48 17:08-17:23/15 07:50 17:06-17:24/18	07:48 16:13 07:50 16:12	08:31 14:23-14:50/27 15:53 12:48-13:30/42
20	05:07 05:42-06:14/32 21:36	05:59 20:39 06:01	06:55 20:03 19:24	07:50 17:06-17:24/18 07:52 17:05-17:25/20	07:50 16:12 07:52 16:10	08:32 14:24-14:51/27 15:54 12:49-13:31/42
21	05:09 05:43-06:15/32 21:35	06:01 20:36 06:03	06:57 20:03 19:21	07:52 17:05-17:25/20 07:54 17:04-17:26/22	07:52 16:10 07:54 16:09	08:32 14:25-14:52/27 15:54 12:50-13:32/42
22	05:10 05:44-06:15/31 21:33	06:03 20:34 06:05	06:58 20:03 19:19	07:54 17:04-17:26/22 07:56 17:03-17:26/23	07:54 16:09 07:55 16:08	08:33 14:24-14:52/28 15:54 12:50-13:32/42
23	05:12 05:46-06:16/30 21:32	06:05 20:32 06:07	07:00 20:03 19:16	07:56 17:03-17:26/23 07:58 17:03-17:26/23	07:55 16:08 07:57 16:06	15:55 12:51-13:33/42 08:34 14:26-14:53/27
24	05:13 05:47-06:16/29 21:30	06:07 20:29 06:08	07:02 20:03 19:14	07:58 17:03-17:26/23 08:00 17:03-17:26/23	07:57 16:06 07:59 16:05	15:55 12:51-13:33/42 08:34 14:26-14:53/27
25	05:15 05:49-06:17/28 21:29	06:08 20:27 06:10	07:04 20:03 19:11	08:00 17:03-17:26/23 08:02 17:03-17:25/22	07:59 16:05 08:01 16:04	15:56 12:51-13:33/42 08:35 14:27-14:54/27
26	05:16 05:50-06:17/27 21:27	06:10 20:25 06:12	07:06 20:03 19:09	08:02 17:03-17:25/22 07:04 16:03-16:25/22	08:01 16:04 08:03 14:25-14:51/6	15:57 12:52-13:34/42 08:35 14:27-14:54/27
27	05:18 05:52-06:18/26 21:26	06:12 20:22 06:14	07:07 20:03 19:06	07:04 16:03-16:25/22 07:05 16:03-16:24/21	08:03 14:25-14:51/6 08:04 14:23-14:34/11	15:57 12:53-13:34/41 08:35 14:28-14:55/27
28	05:20 05:53-06:18/25 21:24	06:14 20:20 06:15	07:09 20:03 19:04	07:05 16:03-16:24/21 07:07 16:04-16:22/18	16:02 12:54-13:09/15 08:06 14:22-14:36/14	15:58 12:53-13:35/42 08:35 14:28-14:55/27
29	05:21 05:55-06:18/23 21:22	06:15 20:18 06:17	07:11 20:03 19:01	07:07 16:04-16:22/18 07:09 16:05-16:20/15	08:06 14:22-14:36/14 16:01 12:52-13:11/19	08:35 14:28-14:55/27 15:59 12:54-13:35/41
30	05:23 05:56-06:18/22 21:21	06:17 20:15 06:19	07:13 20:03 18:59	07:09 16:05-16:20/15 07:11 16:06-16:18/12	08:07 14:21-14:37/16 16:00 12:51-13:14/23	08:35 14:29-14:56/27 16:00 12:55-13:35/40
31	05:24 05:58-06:18/20 21:19	06:19 20:13 06:21	07:14 20:03 18:57	07:11 16:06-16:18/12 07:13 16:06-16:18/12	16:00 12:51-13:14/23 16:01 12:55-13:36/41	08:35 14:29-14:56/27 16:01 12:55-13:36/41
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	1061	82	0	265	122	1987

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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung **WEA: 7 - WEA 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember				
1	08:35	08:06	07:08	06:53	05:43	19:41-20:09/28	04:52	20:49-21:03/14	04:47	20:51-21:18/27	05:26	06:10-06:39/29	06:21	07:15	07:13	08:09
2	16:02	16:53	17:50	19:49	20:45	06:11-06:48/37	21:36	05:25-05:27/2	21:52	05:22-05:37/15	21:17	20:11	18:56	16:45	15:59	15:59
3	08:35	08:04	07:06	06:50	05:41	19:41-20:09/28	04:51	20:49-21:04/15	04:47	20:52-21:18/26	05:28	20:01-20:10/9	06:23	07:16	07:15	08:11
4	16:03	16:55	17:52	19:51	20:47	06:09-06:47/38	21:37	05:24-05:28/4	21:52	05:23-05:37/14	21:15	20:10-06:41/31	20:08	18:54	16:43	15:58
5	08:35	08:02	07:04	06:48	05:39	19:42-20:10/28	04:50	20:49-21:05/17	04:48	20:52-21:18/26	05:30	19:58-20:12/14	06:24	07:18	07:17	08:12
6	16:05	16:57	17:54	19:53	20:48	06:07-06:46/39	21:38	05:23-05:28/5	21:51	05:24-05:38/14	21:14	20:09-06:41/32	20:06	18:51	16:41	15:58
7	08:35	08:01	07:01	06:45	05:37	19:42-20:09/27	04:49	20:48-21:07/19	04:49	20:52-21:16/24	05:31	19:57-20:14/17	06:26	07:20	07:19	08:14
8	16:06	16:59	17:56	19:54	20:50	06:05-06:45/40	21:39	05:23-05:30/7	21:51	05:25-05:38/13	21:12	20:09-06:43/34	20:03	18:49	16:39	15:57
9	08:35	07:59	06:59	06:43	05:35	19:42-20:08/26	04:48	20:48-21:08/20	04:50	20:52-21:16/24	05:33	19:55-20:14/19	06:28	07:22	07:21	08:15
10	16:07	17:01	17:58	19:56	20:52	06:03-06:44/41	21:41	05:22-05:30/8	21:50	05:25-05:37/12	21:10	20:08-06:46/38	20:01	18:46	16:37	15:56
11	08:34	07:57	06:57	06:41	05:33	19:42-20:08/26	04:48	20:47-21:08/21	04:51	20:53-21:16/23	05:35	19:54-20:16/22	06:30	07:24	07:23	08:17
12	16:08	17:03	17:59	19:58	20:54	06:01-06:43/42	21:42	05:21-05:30/9	21:50	05:26-05:37/11	21:08	20:08-06:49/41	19:58	18:44	16:35	15:56
13	08:34	07:55	06:54	06:38	05:31	19:43-20:07/24	04:47	20:48-21:10/22	04:52	20:54-21:16/22	05:36	19:53-20:17/24	06:32	07:26	07:25	08:18
14	16:10	17:05	18:01	20:00	20:56	05:59-06:41/42	21:43	05:21-05:31/10	21:49	05:27-05:37/10	21:06	20:09-06:51/42	19:56	18:42	16:33	15:55
15	08:33	07:53	06:52	06:36	05:29	19:43-20:06/23	04:46	20:47-21:10/23	04:52	20:54-21:15/21	05:38	19:52-20:17/25	06:33	07:27	07:27	08:19
16	16:11	17:07	18:03	20:02	20:58	05:58-06:39/41	21:44	05:20-05:31/11	21:48	05:28-05:37/9	21:04	20:10-06:52/42	19:54	18:39	16:31	15:55
17	08:33	07:51	06:49	06:33	05:27	19:44-20:04/20	04:46	20:48-21:11/23	04:54	20:55-21:14/19	05:40	19:51-20:18/27	06:35	07:29	07:29	08:21
18	16:12	17:10	18:05	20:04	20:59	05:59-06:37/38	21:45	05:20-05:32/12	21:48	05:29-05:37/8	21:02	20:12-06:53/41	19:51	18:37	16:29	15:54
19	08:32	07:49	06:47	06:31	05:25	19:46-20:04/18	04:45	20:47-21:12/25	04:55	20:55-21:14/19	05:42	19:50-20:17/27	06:37	07:31	07:31	08:22
20	16:14	17:12	18:07	20:06	21:01	05:59-06:33/34	21:46	05:19-05:32/13	21:47	05:30-05:36/6	21:00	20:14-06:55/41	19:49	18:34	16:28	15:54
21	08:31	07:47	06:45	06:28	05:23	19:48-20:02/14	04:44	20:47-21:13/26	04:56	20:56-21:13/17	05:43	19:50-20:18/28	06:39	07:33	07:33	08:23
22	16:15	17:14	18:09	20:08	21:03	05:58-06:31/33	21:46	05:19-05:33/14	21:46	05:31-05:36/5	20:58	20:15-06:55/40	19:46	18:32	16:26	15:53
23	08:31	07:45	06:42	06:26	05:21	19:49-19:59/10	04:44	20:48-21:14/26	04:57	20:57-21:12/15	05:45	19:50-20:18/28	06:41	07:35	07:35	08:24
24	16:17	17:16	18:11	20:09	21:05	05:59-06:31/32	21:47	05:19-05:33/14	21:45	05:32-05:35/3	20:56	20:17-06:55/38	19:44	18:30	16:24	15:53
25	08:30	07:43	06:40	06:24	05:19	19:59-06:29/30	04:44	20:47-21:14/27	04:58	20:57-21:11/14	05:47	19:49-20:18/29	06:42	07:37	07:37	08:25
26	16:18	17:18	18:13	20:11	21:06	05:58-06:31/33	21:48	05:18-05:33/15	21:44	05:33-05:35/2	20:54	20:19-06:56/37	19:41	18:27	16:22	15:53
27	08:29	07:41	06:37	06:21	05:17	06:00-06:27/27	04:43	20:47-21:15/28	04:59	20:58-21:10/12	05:49	19:49-20:18/29	06:44	07:39	07:39	08:26
28	16:20	17:20	18:15	20:13	21:08	05:58-06:31/33	21:49	05:18-05:33/15	21:43	05:34-05:35/1	20:52	20:20-06:56/36	19:39	18:25	16:21	15:53
29	08:28	07:39	06:35	06:19	05:16	06:01-06:25/24	04:43	20:48-21:15/27	05:01	20:59-21:09/10	05:50	19:50-20:18/28	06:46	07:41	07:41	08:27
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32	16:23	17:24	18:19	20:17	21:12	05:58-06:31/33	21:50	05:18-05:34/16	21:41	05:36-05:37/1	20:47	20:23-06:55/32	19:34	18:20	16:18	15:53
33	08:26	07:35	06:30	06:14	05:12	06:02-06:24/22	04:43	20:48-21:17/29	05:03	21:03-21:08/5	05:54	19:49-20:16/27	06:49	07:44	07:44	08:29
34	16:25	17:26	18:21	20:19	21:13	05:58-06:31/33	21:50	05:18-05:35/17	21:40	05:37-05:38/1	20:45	20:25-06:56/31	19:31	18:18	16:16	15:53
35	08:25	07:33	06:27	06:12	05:11	06:03-06:22/19	04:43	20:48-21:17/29	05:05	05:38-05:39/1	20:43	19:50-20:15/25	06:51	07:46	07:46	08:30
36	16:27	17:28	18:22	20:21	21:15	05:58-06:31/33	21:51	05:18-05:35/17	21:39	05:39-05:40/1	20:43	20:27-06:56/29	19:29	18:15	16:14	15:53
37	08:24	07:31	06:25	06:10	05:09	06:04-06:22/18	04:43	20:48-21:17/29	05:06	05:40-05:41/1	20:58	19:50-20:13/23	06:53	07:48	07:48	08:31
38	16:29	17:30	18:24	20:22	21:17	05:58-06:31/33	21:51	05:18-05:35/17	21:37	05:41-05:42/1	20:41	20:28-06:55/27	19:26	18:13	16:13	15:53
39	08:23	07:29	06:22	06:07	05:07	06:04-06:47/13	04:43	20:49-21:18/29	05:07	05:42-05:43/1	20:59	19:51-20:11/20	06:55	07:50	07:50	08:31
40	16:30	17:32	18:26	20:24	21:18	05:58-06:31/33	21:52	05:18-05:35/17	21:36	05:43-05:44/1	20:39	20:30-06:54/24	19:24	18:11	16:12	15:54
41	08:22	07:26	06:20	06:05	05:05	19:51-19:59/8	04:43	20:49-21:18/29	05:09	05:44-05:45/1	20:01	19:52-20:09/17	06:57	07:52	07:52	08:32
42	16:32	17:34	18:28	20:26	06:03	06:32-06:48/16	21:52	05:18-05:35/17	21:35	05:45-05:46/1	20:36	20:32-06:54/22	19:21	18:09	16:10	15:54
43	08:21	07:24	06:18	06:03	05:04	06:11-06:15/4	04:43	20:49-21:18/29	05:10	05:46-05:47/1	20:03	19:52-20:06/14	06:58	07:54	07:54	08:33
44	16:34	17:36	18:30	20:28	06:04	06:29-06:48/19	21:52	05:18-05:35/17	21:33	05:47-05:48/1	20:34	20:34-06:53/19	19:19	18:06	16:09	15:54
45	08:19	07:22	06:15	06:00	05:00	05:47-20:03/16	04:43	20:49-21:18/29	05:12	06:21-06:25/4	20:05	19:55-20:04/9	07:00	07:56	07:55	08:33
46	16:36	17:38	18:32	20:30	06:07	06:27-06:48/21	21:52	05:19-05:36/17	21:32	05:48-05:49/1	20:32	20:35-06:52/17	19:16	18:04	16:08	15:55
47	08:18	07:20	06:13	06:08	05:08	05:45-20:05/20	04:43	20:50-21:19/29	05:13	06:17-06:28/11	20:07	19:58-20:02/4	07:02	07:58	07:57	08:34
48	16:38	17:40	18:34	20:32	06:05	06:25-06:49/24	21:53	05:19-05:36/17	21:30	05:49-05:50/1	20:29	20:37-06:51/14	19:14	18:02	16:06	15:56
49	08:17	07:18	06:10	06:05	05:00	05:44-20:07/23	04:44	20:49-21:18/29	05:15	06:16-06:31/15	20:08	20:39-06:50/11	07:04	08:00	07:59	08:34
50	16:40	17:42	18:36	20:34	06:06	06:23-06:49/26	21:53	05:19-05:36/17	21:29	05:50-05:51/1	20:27	20:40-06:51/11	19:11	18:00	16:05	15:56
51	08:15	07:15	06:08	06:03	05:04	05:44-20:08/24	04:44	20:50-21:19/29	05:16	06:14-06:32/18	20:06	20:40-06:47/7	07:06	08:02	08:01	08:35
52	16:42	17:44	18:38	20:36	06:06	06:21-06:49/28	21:53	05:20-05:37/17	21:27	05:51-05:52/1	20:25	20:42-06:44/2	19:09	17:58	16:04	15:57
53	08:14	07:13	06:05	06:00	05:05	19:43-20:10/27	04:44	20:50-21:18/28	05:18	06:14-06:33/19	20:12	20:42-06:44/2	07:07	07:04	08:03	08:35
54	16:44	17:46	18:39	20:37	06:06	06:19-06:49/30	21:53	05:20-05:37/17	21:26	05:52-05:53/1	20:22	20:44-06:44/2	19:06	16:55	16:03	15:58
55	08:12	07:11	06:03	06:00	05:05	19:42-20:09/27	04:45	20:50-21:18/28	05:20	06:12-06:34/22	20:14	20:44-06:44/2	07:09	07:06	08:04	08:35
56	16:45	17:48	18:41	20:39	06:07	06:17-06:49/32	21:53	05:21-05:37/16	21:24	05:53-05:54/1	20:20	20:44-06:44/2	19:04	16:53	16:020	

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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 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 8 - WEA 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	[Juli	[August	[September	[Oktober	[November	[Dezember	
1	08:35 16:02	08:06 15:34-15:55/21 16:53	07:08 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 15:11-15:25/14 15:59	
2	08:35 16:03	08:04 15:35-15:54/19 16:55	07:06 17:52	06:50 19:51	05:41 20:47	04:51 21:37	04:47 21:52	05:28 21:15	06:23 20:08	07:16 18:54	07:15 16:43	08:11 15:12-15:24/12 15:58	
3	08:35 16:05	08:02 15:37-15:52/15 16:57	07:04 17:54	06:48 19:53	05:39 20:48	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 15:14-15:23/9 15:57	
4	08:35 16:06	08:01 15:40-15:51/11 16:59	07:01 17:56	06:45 19:54	05:37 20:50	04:49 21:39	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	07:19 16:39	08:14 15:14-15:22/8 15:57	
5	08:35 16:07	07:59 17:01	06:59 17:57	06:43 19:56	05:34 20:52	04:48 21:41	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:46	07:21 16:37	08:15 15:16-15:21/5 15:56	
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 19:58	05:32 20:54	04:47 21:42	04:51 21:50	05:35 21:08	06:30 19:58	07:24 18:44	07:23 16:35	08:17 15:19-15:21/2 15:56	
7	08:34 15:34-15:35/1 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:30 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 15:33-15:36/3 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 19:53	07:27 18:39	07:27 15:11-15:20/9 16:31	08:19 15:54	
9	08:33 15:31-15:37/6 16:12	07:51 17:09	06:49 18:05	06:33 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 15:08-15:22/14 16:29	08:21 15:54	
10	08:32 15:31-15:39/8 16:14	07:49 17:11	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	07:31 18:34	07:31 15:07-15:24/17 16:28	08:22 15:54	
11	08:31 15:31-15:41/10 16:15	07:47 17:14	06:45 18:09	06:28 20:07	05:23 21:03	04:44 21:46	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 15:05-15:25/20 16:26	08:23 15:53	
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13	08:30 15:30-15:45/15 16:18	07:43 17:18	06:40 18:13	06:24 20:11	05:19 21:06	04:44 21:48	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	07:37 15:05-15:28/23 16:22	08:25 15:53	
14	08:29 15:30-15:47/17 16:20	07:41 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	07:39 18:25	07:39 15:04-15:28/24 16:21	08:26 15:53	
15	08:28 15:29-15:48/19 16:22	07:39 17:22	06:35 18:17	06:19 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 15:04-15:29/25 16:19	08:27 15:53	
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17	08:26 15:29-15:52/23 16:25	07:35 17:26	06:30 18:21	06:14 20:19	05:12 21:13	04:43 21:50	05:03 21:40	05:54 20:45	06:49 19:31	07:44 18:18	07:44 15:03-15:30/27 16:16	08:29 15:53	
18	08:25 15:29-15:54/25 16:27	07:33 17:28	06:27 18:22	06:12 20:21	05:11 21:15	04:43 21:51	05:04 21:38	05:56 20:43	06:51 19:29	07:46 18:15	07:46 15:03-15:30/27 16:14	08:30 15:53	
19	08:24 15:28-15:54/26 16:29	07:31 17:30	06:25 18:24	06:09 20:22	05:09 21:17	04:42 21:51	05:06 21:37	05:58 20:41	06:53 19:26	07:48 18:13	07:48 15:03-15:30/27 16:13	08:31 15:53	
20	08:23 15:29-15:55/26 16:30	07:29 17:32	06:22 18:26	06:07 20:24	05:07 21:18	04:43 21:52	05:07 21:36	05:59 20:39	06:55 19:24	07:50 18:11	07:50 15:03-15:30/27 16:12	08:31 15:54	
21	08:22 15:29-15:56/27 16:32	07:26 17:34	06:20 18:28	06:05 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 15:04-15:31/27 16:10	08:32 15:54	
22	08:21 15:29-15:56/27 16:34	07:24 17:36	06:18 18:30	06:03 20:28	05:04 21:21	04:43 21:52	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	07:54 15:04-15:31/27 16:09	08:33 15:54	
23	08:19 15:29-15:57/28 16:36	07:22 17:38	06:15 18:32	06:00 20:30	05:03 21:23	04:43 21:52	05:12 21:32	06:05 20:32	07:00 19:16	07:56 18:04	07:56 15:04-15:31/27 16:08	08:34 15:55	
24	08:18 15:29-15:56/27 16:38	07:20 17:40	06:13 18:34	05:58 20:32	05:02 21:24	04:43 21:53	05:13 21:30	06:07 20:29	07:02 19:14	07:58 18:02	07:58 15:05-15:31/26 16:06	08:35 15:55	
25	08:17 15:29-15:56/27 16:40	07:18 17:42	06:10 18:36	05:56 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 15:06-15:31/25 16:05	08:36 15:56	
26	08:15 15:30-15:57/27 16:42	07:15 17:44	06:08 18:38	05:54 20:35	04:59 21:27	04:44 21:53	05:16 21:27	06:10 20:25	07:06 19:09	08:02 17:57	08:02 15:06-15:31/25 16:04	08:37 15:57	
27	08:14 15:30-15:57/27 16:43	07:13 17:46	06:05 18:39	05:51 20:37	04:58 21:29	04:44 21:53	05:18 21:26	06:12 20:22	07:07 19:06	08:04 16:55	08:04 15:07-15:29/22 16:03	08:38 15:57	
28	08:12 15:30-15:56/26 16:45	07:11 17:48	06:03 18:41	05:49 20:39	04:56 21:30	04:45 21:53	05:20 21:24	06:14 20:20	07:09 19:04	08:07 16:53	08:07 15:08-15:28/20 16:02	08:39 15:58	
29	08:11 15:32-15:57/25 16:47	07:10 17:50	06:00 18:43	05:47 20:41	04:55 21:32	04:45 21:52	05:21 21:22	06:15 20:18	07:11 19:01	08:08 16:51	08:08 15:09-15:27/18 16:01	08:40 16:00	
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31	08:07 15:33-15:56/23 16:51	07:07 17:53	05:57 18:47	05:44 20:44	04:53 21:34	04:47 21:53	05:24 21:19	06:19 20:13	07:14 18:59	08:10 16:47	08:10 15:10-15:26/16 16:00	08:42 16:01	
	Sonnenscheinstunden Anzahl Minuten mit Schatten	248 501	271 66	365 0	419 0	494 0	511 0	515 0	462 0	384 0	330 0	259 521	50

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:
28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 9 - WEA 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 16:02	08:06 16:53	07:08 17:50	06:53 19:09	05:43 20:15	04:52 20:37
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:09	05:41 20:15	04:51 20:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:07	05:39 20:15	04:50 20:37
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:07	05:37 20:15	04:49 20:38
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:07	05:35 20:15	04:48 20:38
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 19:06	05:33 20:15	04:48 20:37
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 19:07	05:31 20:15	04:47 20:38
8	08:33 16:11	07:53 17:08	06:52 18:03	06:36 19:06	05:29 20:15	04:46 20:38
9	08:33 16:12	07:51 17:10	06:49 18:05	06:33 19:07	05:27 20:15	04:46 20:38
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 19:09	05:25 20:15	04:45 20:38
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 19:10	05:23 20:15	04:44 20:39
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 19:13	05:21 20:15	04:44 20:39
13	08:30 16:19	07:43 17:18	06:40 18:13	06:24 19:11	05:19 20:15	04:44 20:39
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 19:13	05:17 20:15	04:43 20:39
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 19:15	05:16 20:15	04:43 20:40
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 19:17	05:14 20:15	04:43 20:40
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 19:19	05:12 20:15	04:43 20:40
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 19:21	05:11 20:15	04:43 20:41
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 19:22	05:09 20:15	04:43 20:41
20	08:23 16:30	07:29 17:32	06:23 18:26	06:07 19:24	05:08 20:15	04:43 20:41
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 19:26	05:06 20:15	04:43 20:41
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 19:28	05:04 20:15	04:43 20:41
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 19:30	05:03 20:15	04:43 20:42
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 19:32	05:02 20:15	04:43 20:42
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 19:34	05:00 20:15	04:44 20:42
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 19:36	04:59 20:15	04:44 20:43
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 19:38	04:58 20:15	04:44 20:42
28	08:12 16:46	07:11 17:48	06:03 18:41	05:49 19:40	04:56 20:15	04:45 20:42
29	08:11 16:47		06:00 18:43	05:47 19:42	04:55 20:15	04:45 20:43
30	08:09 16:49		05:58 18:45	05:45 19:44	04:54 20:15	04:46 20:43
31	08:08 16:51		06:55 19:11	05:43 19:46	04:53 20:15	04:46 20:43
			07:21-07:44/23			
Sonneneinstrahlung	248	271	365	419	494	511
Anzahl Minuten mit Schatten	0	0	83	1851	1492	1860

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 Keskorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Gesamtbelastung WEA: 9 - WEA 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

	Juli	August	September	Oktober	November	Dezember
1	04:47 20:43-21:10/27 21:52 05:22-05:56/34	05:26 20:13-20:44/31 21:17	06:21 06:50-07:45/55 20:11	07:15 18:56	07:13 16:45	08:09 15:59
2	04:47 20:43-21:10/27 21:52 05:23-05:56/33	05:28 20:14-20:44/30 21:15	06:23 19:10-19:21/11 20:08 06:52-07:45/53	07:16 18:54	07:15 16:43	08:11 15:58
3	04:48 20:44-21:11/27 21:51 05:24-05:57/33	05:30 20:14-20:43/29 21:14	06:24 19:07-19:23/16 20:06 06:54-07:45/51	07:18 18:51	07:17 16:41	08:12 15:58
4	04:49 20:43-21:10/27 21:51 05:25-05:57/32	05:31 20:06-20:42/36 21:12 06:56-07:08/12	06:26 19:05-19:23/18 20:03 06:56-07:45/49	07:20 18:49	07:19 16:39	08:14 15:57
5	04:50 20:43-21:11/28 21:50 05:25-05:56/31	05:33 20:03-20:40/37 21:10 06:53-07:10/17	06:28 19:04-19:24/20 20:01 06:57-07:44/47	07:22 18:47	07:21 16:37	08:15 15:56
6	04:51 20:44-21:11/27 21:50 05:26-05:56/30	05:35 20:02-20:39/37 21:08 06:51-07:13/22	06:30 19:03-19:25/22 19:58 06:59-07:44/45	07:24 18:44	07:23 16:35	08:17 15:56
7	04:52 20:44-21:11/27 21:49 05:27-05:57/30	05:36 20:01-20:37/36 21:06 06:50-07:15/25	06:32 19:03-19:25/22 19:56 07:01-07:44/43	07:26 18:42	07:25 16:33	08:18 15:55
8	04:53 20:44-21:12/28 21:48 05:28-05:57/29	05:38 20:00-20:35/35 21:04 06:48-07:15/27	06:33 19:01-19:24/23 19:54 07:02-07:42/40	07:28 18:39	07:27 16:31	08:19 15:55
9	04:54 20:45-21:12/27 05:29-05:56/27 21:48 20:24-20:31/7	05:40 19:59-20:33/34 21:02 06:47-07:17/30	06:35 19:01-19:24/23 19:51 07:04-07:41/37	07:29 18:37	07:29 16:29	08:21 15:54
10	04:55 20:45-21:12/27 05:30-05:56/26 21:47 20:22-20:33/11	05:42 19:58-20:31/33 21:00 06:46-07:18/32	06:37 19:01-19:22/21 19:49 07:06-07:40/34	07:31 18:34	07:31 16:28	08:22 15:54
11	04:56 20:45-21:12/27 05:31-05:56/25 21:46 20:21-20:34/13	05:43 19:58-20:29/31 20:58 06:44-07:18/34	06:39 19:00-19:19/19 19:46 07:08-07:39/31	07:33 18:32	07:33 16:26	08:23 15:54
12	04:57 20:45-21:12/27 05:32-05:56/24 21:45 20:20-20:35/15	05:45 19:58-20:28/30 20:56 06:44-07:19/35	06:41 19:01-19:17/16 19:44 07:09-07:37/28	07:35 18:30	07:35 16:24	08:24 15:53
13	04:58 20:45-21:11/26 05:33-05:55/22 21:44 20:19-20:36/17	05:47 20:23-20:25/2 06:43-07:21/38 20:54 19:57-20:21/24	06:42 19:02-19:15/13 19:41 07:11-07:36/25	07:37 18:27	07:37 16:22	08:25 15:53
14	04:59 20:45-21:10/25 05:34-05:55/21 21:43 20:18-20:37/19	05:49 19:57-20:22/25 20:52 06:42-07:22/40	06:44 19:03-19:13/10 19:39 07:13-07:34/21	07:39 18:25	07:39 16:21	08:26 15:53
15	05:01 20:46-21:09/23 05:36-05:55/19 21:42 20:17-20:38/21	05:51 19:57-20:22/25 20:50 06:42-07:24/42	06:46 19:04-19:09/5 19:36 07:15-07:32/17	07:41 18:22	07:41 16:19	08:27 15:53
16	05:02 20:47-21:09/22 05:37-05:54/17 21:41 20:18-20:39/21	05:52 19:56-20:19/23 20:47 06:40-07:25/45	06:48 07:16-07:28/12 19:34	07:42 18:20	07:43 16:18	08:28 15:53
17	05:03 20:47-21:08/21 05:38-05:53/15 21:40 20:17-20:40/23	05:54 19:57-20:17/20 20:45 06:40-07:26/46	06:49 07:18-07:22/4 19:31	07:44 18:18	07:44 16:16	08:29 15:53
18	05:05 20:47-21:06/19 05:39-05:52/13 21:39 20:16-20:40/24	05:56 19:58-20:15/17 20:43 06:40-07:28/48	06:51 19:03-19:13/10 19:29	07:46 18:15	07:46 16:15	08:30 15:53
19	05:06 20:48-21:05/17 05:40-05:51/11 21:37 20:15-20:41/26	05:58 19:58-20:13/15 20:41 06:39-07:28/49	06:53 19:04-19:14/9 19:26	07:48 18:13	07:48 16:13	08:31 15:53
20	05:07 20:49-21:04/15 05:42-05:51/9 21:36 20:16-20:42/26	05:59 19:59-20:11/12 20:39 06:39-07:32/53	06:55 19:05-19:15/9 19:24	07:50 18:11	07:50 16:12	08:32 15:54
21	05:09 20:49-21:03/14 05:43-05:49/6 21:35 20:15-20:42/27	06:01 20:00-20:09/9 20:36 06:39-07:37/58	06:57 19:06-19:16/8 19:21	07:52 18:09	07:52 16:10	08:32 15:54
22	05:10 20:50-21:01/11 05:45-05:47/2 21:33 20:14-20:42/28	06:03 20:01-20:06/5 20:34 06:39-07:39/60	06:58 19:07-19:17/7 19:19	07:54 18:06	07:54 16:09	08:33 15:55
23	05:12 20:51-21:01/10 21:32 20:14-20:43/29	06:05 06:39-07:40/61 20:32	07:00 19:08-19:18/6 19:16	07:56 18:04	07:55 16:08	08:33 15:55
24	05:13 20:14-20:43/29 21:30 20:52-20:59/7	06:07 06:39-07:42/63 20:29	07:02 19:09-19:19/5 19:14	07:58 18:02	07:57 16:06	08:34 15:56
25	05:15 20:14-20:44/30 21:29 20:55-20:58/3	06:08 06:40-07:43/63 20:27	07:04 19:11-19:21/4 19:11	08:00 18:00	07:59 16:05	08:34 15:56
26	05:16 20:13-20:44/31 21:27	06:10 06:40-07:43/63 20:25	07:06 19:12-19:22/3 19:09	08:02 17:58	08:01 16:04	08:35 15:57
27	05:18 20:14-20:44/30 21:26	06:12 06:42-07:44/62 20:22	07:07 19:13-19:23/2 19:06	07:04 16:55	08:03 16:03	08:35 15:58
28	05:20 20:13-20:44/31 21:24	06:14 06:44-07:45/61 20:20	07:09 19:14-19:24/1 19:04	07:06 16:53	08:04 16:02	08:35 15:58
29	05:21 20:13-20:44/31 21:22	06:16 06:45-07:45/60 20:18	07:11 19:15-19:25/0 19:01	07:07 16:51	08:06 16:01	08:35 15:59
30	05:23 20:13-20:44/31 21:21	06:17 06:47-07:45/58 20:15	07:13 19:16-19:26/0 18:59	07:09 16:49	08:08 16:00	08:35 16:00
31	05:24 20:14-20:44/30 21:19	06:19 06:49-07:46/57 20:13		07:11 16:47		08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	1578	1837	831	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

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 10 - WEA 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
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:09-19:22/13 19:49 07:18-07:39/21	05:43 06:11-06:26/15 20:45	04:52 20:14-21:03/49 21:36
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:06-19:25/19 19:51 07:16-07:39/23	05:41 06:09-06:26/17 20:47	04:51 20:13-21:04/51 21:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:03-19:27/24 19:53 07:14-07:39/25	05:39 06:07-06:26/19 20:48	04:50 20:13-21:05/52 21:38
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:01-19:28/27 19:54 07:11-07:37/26	05:37 06:05-06:25/20 20:50	04:49 20:14-21:07/53 21:39
5	08:35 16:07	07:59 17:01	06:59 17:57	06:43 19:00-19:30/30 19:56 07:09-07:36/27	05:35 06:03-06:25/22 20:52	04:48 20:14-21:08/54 21:41
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 18:58-19:30/32 19:58 07:06-07:34/28	05:33 06:01-06:24/23 20:54	04:48 20:13-21:08/55 21:42
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 18:57-19:31/34 20:00 07:04-07:32/28	05:31 05:59-06:24/25 20:56	04:47 20:14-21:10/56 21:43
8	08:33 16:11	07:53 17:07	06:52 18:03	06:36 18:56-19:31/35 20:02 07:01-07:28/27	05:29 05:57-06:23/26 20:58	04:46 20:14-21:10/56 21:44
9	08:33 16:12	07:51 17:09	06:49 18:05	06:33 18:55-19:32/37 20:04 06:59-07:24/25	05:27 05:56-06:23/27 20:59	04:46 20:14-21:11/57 21:45
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 18:55-19:32/37 20:06 06:57-07:23/26	05:25 05:54-06:21/27 21:01	04:45 20:14-21:12/58 21:46
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 18:54-19:31/37 20:07 06:56-07:21/25	05:23 05:52-06:20/28 21:03	04:44 20:14-21:13/59 21:46
12	08:31 16:17	07:45 17:16	06:42 18:11	06:26 18:54-19:32/38 20:09 06:57-07:19/22	05:21 05:51-06:18/27 21:05	04:44 20:15-21:14/59 21:47
13	08:30 16:18	07:43 17:18	06:40 18:13	06:24 18:54-19:32/38 20:11 06:58-07:17/19	05:19 05:50-06:16/26 21:06	04:44 20:14-21:14/60 21:48
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 18:53-19:31/38 20:13 06:58-07:15/17	05:17 05:50-06:15/25 21:08	04:43 20:15-21:15/60 21:49
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 18:53-19:31/38 20:15 07:00-07:13/13	05:16 20:30-20:36/6 21:10	04:43 20:15-21:15/60 21:49
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 18:53-19:30/37 20:17 07:03-07:10/7	05:14 20:25-20:39/14 21:12	04:43 20:15-21:16/61 21:50
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 18:53-19:29/36 20:19	05:12 20:23-20:42/19 21:13	04:43 20:16-21:16/60 21:50
18	08:25 16:27	07:33 17:28	06:27 18:22	06:12 18:54-19:28/34 20:21	05:11 20:21-20:43/22 21:15	04:43 20:16-21:16/60 21:51
19	08:24 16:29	07:31 17:30	06:25 18:24	06:09 18:54-19:28/34 20:22	05:09 20:20-20:45/25 21:17	04:43 20:16-21:17/61 21:51
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 18:55-19:27/32 20:24	05:07 20:18-20:46/28 21:18	04:43 20:16-21:17/61 21:52
21	08:22 16:32	07:26 17:34	06:20 18:28	06:05 18:55-19:25/30 20:26	05:06 20:18-20:47/29 21:20	04:43 20:16-21:17/61 21:52
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 18:56-19:24/28 20:28	05:04 20:17-20:48/31 21:21	04:43 20:16-21:17/61 21:52
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 18:58-19:22/24 20:30	05:03 20:16-20:48/32 21:23	04:43 20:16-21:17/61 21:52
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 19:00-19:20/20 20:32	05:02 20:15-20:49/34 21:24	04:43 20:17-21:18/61 21:53
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 19:02-19:18/16 20:34	05:00 20:15-20:50/35 21:26	04:44 20:17-21:18/61 21:53
26	08:15 16:42	07:15 17:44	06:08 06:33-06:38/5 18:38	05:54 19:06-19:14/8 20:35	04:59 20:15-20:51/36 21:27	04:44 20:18-21:18/60 21:53
27	08:14 16:44	07:13 17:46	06:05 06:31-06:39/8 18:39	05:51 06:19-06:24/5 20:37	04:58 20:15-20:52/37 21:29	04:44 20:18-21:18/60 21:53
28	08:12 16:45	07:11 17:48	06:03 06:28-06:39/11 18:41	05:49 06:17-06:25/8 20:39	04:56 20:14-20:52/38 21:30	04:45 20:17-21:18/61 21:53
29	08:11 16:47		06:00 06:26-06:40/14 18:43	05:47 06:15-06:25/10 20:41	04:55 20:14-20:53/39 21:32	04:45 20:18-21:18/60 21:52
30	08:09 16:49		05:58 06:23-06:39/16 18:45	05:45 06:13-06:26/13 20:43	04:54 20:14-20:53/39 21:33	04:46 20:19-21:18/59 21:52
31	08:07 16:51		06:55 07:21-07:40/19 19:47		04:53 20:55-21:02/7 21:34	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	0	0	73	1173	942	1775

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:

28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA**Berechnung: Gesamtbelastung WEA: 10 - WEA 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	04:47 20:18-21:18/60 21:52	05:26 06:01-06:26/25 21:17	06:21 18:53-19:31/38 20:11 06:56-07:17/21	07:15 18:56 16:45	07:13 15:59	08:09 15:59
2	04:47 20:19-21:18/59 21:52	05:28 06:01-06:28/27 21:15	06:23 18:53-19:30/37 20:08 06:55-07:19/24	07:16 18:54 16:43	07:15 15:58	08:11 15:58
3	04:48 20:19-21:18/59 21:51	05:30 06:02-06:30/28 21:14	06:24 18:53-19:30/37 20:06 06:55-07:21/26	07:18 18:51 16:41	07:17 15:58	08:12 15:58
4	04:49 20:19-21:16/57 21:51	05:31 06:04-06:31/27 21:12	06:26 18:52-19:29/37 20:03 06:56-07:22/26	07:20 18:49 16:39	07:19 15:57	08:14 15:57
5	04:50 20:19-21:16/57 21:50	05:33 06:06-06:33/27 21:10	06:28 18:52-19:28/36 20:01 06:57-07:22/25	07:22 18:46 16:37	07:21 15:56	08:15 15:56
6	04:51 20:20-21:16/56 21:50	05:35 06:07-06:33/26 21:08	06:30 18:53-19:28/35 19:58 06:59-07:27/28	07:24 18:44 16:35	07:23 15:56	08:17 15:56
7	04:52 20:20-21:15/55 21:49	05:36 06:09-06:34/25 21:06	06:32 18:54-19:27/33 19:56 07:01-07:29/28	07:26 18:42 16:33	07:25 15:55	08:18 15:55
8	04:52 20:20-21:15/55 21:48	05:38 06:10-06:34/24 21:04	06:33 18:54-19:25/31 19:54 07:02-07:30/28	07:27 18:39 16:31	07:27 15:55	08:19 15:55
9	04:54 20:21-21:14/53 21:48	05:40 06:12-06:34/22 21:02	06:35 18:55-19:23/28 19:51 07:04-07:31/27	07:29 18:37 16:29	07:29 15:54	08:21 15:54
10	04:55 20:21-21:14/53 21:47	05:42 06:14-06:35/21 21:00	06:37 18:56-19:22/26 19:49 07:06-07:31/25	07:31 18:34 16:28	07:31 15:54	08:22 15:54
11	04:56 20:21-21:13/52 21:46	05:43 06:15-06:34/19 20:58	06:39 18:57-19:19/22 19:46 07:08-07:32/24	07:33 18:32 16:26	07:33 15:53	08:23 15:53
12	04:57 20:21-21:12/51 21:45	05:45 06:17-06:34/17 20:56	06:41 18:59-19:16/17 19:44 07:09-07:31/22	07:35 18:30 16:24	07:35 15:53	08:24 15:53
13	04:58 20:22-21:11/49 21:44	05:47 06:19-06:34/15 20:54	06:42 19:03-19:12/9 19:41 07:11-07:31/20	07:37 18:27 16:22	07:37 15:53	08:25 15:53
14	04:59 21:03-21:10/7 21:43	05:49 06:20-06:33/13 20:52	06:44 07:13-07:31/18 19:39	07:39 18:25 16:21	07:39 15:53	08:26 15:53
15	05:01 20:22-21:01/39 21:42	05:50 06:22-06:33/11 20:50	06:46 07:15-07:31/16 19:36	07:41 18:22 16:19	07:41 15:53	08:27 15:53
16	05:02 20:23-21:02/39 21:41	05:52 06:23-06:31/8 20:47	06:48 07:16-07:29/13 19:34	07:42 18:20 16:18	07:42 15:53	08:28 15:53
17	05:03 20:23-21:01/38 21:40	05:54 06:25-06:31/6 20:45	06:49 07:18-07:28/10 19:31	07:44 18:18 16:16	07:44 15:53	08:29 15:53
18	05:05 20:24-21:01/37 21:38	05:56 19:16-19:17/1 20:43	06:51 07:20-07:27/7 19:29	07:46 18:15 16:14	07:46 15:53	08:30 15:53
19	05:06 20:24-21:00/36 21:37	05:58 19:09-19:23/14 20:41	06:53 07:22-07:25/3 19:26	07:48 18:13 16:13	07:48 15:53	08:31 15:53
20	05:07 20:25-21:00/35 21:36	05:59 19:06-19:25/19 20:39	06:55 19:24 19:24	07:50 18:11 16:12	07:50 15:54	08:31 15:54
21	05:09 20:25-20:59/34 21:35	06:01 19:04-19:27/23 20:36	06:57 19:21 19:21	07:52 18:09 16:10	07:52 15:54	08:32 15:54
22	05:10 20:26-20:58/32 21:33	06:03 19:02-19:28/26 20:34	06:58 19:19 19:19	07:54 18:06 16:09	07:54 15:54	08:33 15:54
23	05:12 20:27-20:58/31 21:32	06:05 19:00-19:29/29 20:32	07:00 19:16 19:16	07:56 18:04 16:08	07:56 15:55	08:33 15:55
24	05:13 20:28-20:57/29 21:30	06:07 18:59-19:30/31 20:29	07:02 19:14 19:14	07:58 18:02 16:06	07:58 15:56	08:34 15:56
25	05:15 20:29-20:57/28 21:29	06:08 18:57-19:30/33 20:27	07:04 19:11 19:11	08:00 18:00 16:05	07:59 15:56	08:34 15:56
26	05:16 20:30-20:55/25 21:27	06:10 18:57-19:31/34 20:25	07:06 19:09 19:09	08:02 17:57 16:04	08:01 15:57	08:35 15:57
27	05:18 20:31-20:53/22 21:26	06:12 18:56-19:31/35 20:22	07:07 19:06 19:06	08:02 17:55 16:03	08:02 15:58	08:35 15:58
28	05:20 20:33-20:52/19 21:24	06:14 18:55-19:32/37 20:20	07:09 19:04 19:04	08:04 16:53 16:02	08:04 15:58	08:35 15:58
29	05:21 20:35-20:49/14 21:22	06:16 18:54-19:31/37 20:18	07:11 19:01 19:01	08:06 16:51 16:01	08:06 15:59	08:35 15:59
30	05:23 20:39-20:46/7 21:21	06:17 18:54-19:32/38 20:15	07:13 18:59 18:59	08:07 16:49 16:00	08:07 15:59	08:35 15:59
31	05:24 06:01-06:26/25 21:19	06:19 18:54-19:32/38 20:13	07:13 16:47 16:47	08:07 16:47 16:47	08:07 16:01	08:35 16:01
Sonnenscheinstunden						
Anzahl Minuten mit Schatten						
	514	462	384	330	259	232
	1356	785	777	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

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung**WEA: 11** - WEA 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 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 16:49-17:20/31 17:50 07:35-07:52/17	06:53 18:31-19:15/44 19:49 07:18-07:33/15	05:43 19:18-19:32/14 18:30-19:04/34 20:45 19:41-20:13/32 06:11-06:17/6	04:52 19:35-20:22/47 21:36 05:51-06:20/29	
2	08:35 16:03	08:04 16:55	07:06 16:49-17:20/31 17:52 07:33-07:52/19	06:50 18:30-19:16/46 19:51 07:16-07:34/18	05:41 19:22-19:27/5 18:33-19:03/30 20:47 19:41-20:15/34 06:09-06:19/10	04:51 19:35-20:22/47 21:37 05:52-06:19/27	
3	08:35 16:05	08:02 16:57	07:04 16:48-17:19/31 17:54 07:30-07:52/22	06:48 18:28-19:16/48 19:53 07:14-07:34/20	05:39 19:39-20:16/37 06:07-06:20/13 20:48 18:35-19:00/25	04:50 19:36-20:21/45 21:38 05:52-06:18/26	
4	08:35 16:06	08:01 16:59	07:01 16:48-17:20/32 17:56 07:28-07:52/24	06:45 18:27-19:17/50 19:54 07:11-07:33/22	05:37 19:38-20:17/39 06:05-06:21/16 20:50 18:38-18:57/19	04:49 19:37-20:22/45 21:39 05:53-06:18/25	
5	08:34 16:07	07:59 17:01	06:59 16:48-17:19/31 17:58 07:25-07:50/25	06:43 18:27-19:18/51 19:56 07:09-07:33/24	05:35 19:37-20:18/41 06:03-06:22/19 20:52 18:42-18:53/11	04:48 19:37-20:21/44 21:40 05:54-06:17/23	
6	08:34 16:08	07:57 17:03	06:57 16:48-17:18/30 17:59 07:23-07:50/27	06:41 18:25-19:18/53 19:58 07:06-07:32/26	05:33 19:36-20:19/43 20:54 06:01-06:23/22	04:48 19:37-20:21/44 21:42 05:54-06:16/22	
7	08:34 16:10	07:55 17:05	06:54 16:48-17:17/29 18:01 07:21-07:49/28	06:38 18:24-19:19/55 20:00 07:04-07:32/28	05:31 19:35-20:19/44 20:56 05:59-06:23/24	04:47 19:38-20:22/44 21:43 05:56-06:17/21	
8	08:33 16:11	07:53 17:07	06:52 16:49-17:16/27 18:03 07:18-07:47/29	06:36 19:23-19:36/13 07:01-07:30/29 20:02 18:23-19:19/56	05:29 19:34-20:20/46 20:58 05:57-06:24/27	04:46 19:38-20:21/43 21:44 05:56-06:16/20	
9	08:33 16:12	07:51 17:10	06:49 16:50-17:14/24 18:05 07:16-07:46/30	06:33 19:20-19:38/18 06:59-07:29/30 20:04 18:23-19:19/56	05:27 19:34-20:21/47 20:59 05:56-06:25/29	04:46 19:39-20:21/42 21:45 05:57-06:16/19	
10	08:32 16:14	07:49 17:12	06:47 16:52-17:13/21 18:07 07:13-07:42/29	06:31 18:22-19:40/78 20:06 06:57-07:28/31	05:25 19:33-20:21/48 21:01 05:54-06:25/31	04:45 19:39-20:21/42 21:45 05:57-06:15/18	
11	08:31 16:15	07:47 17:14	06:45 16:54-17:12/18 18:09 07:11-07:37/26	06:28 18:21-19:41/80 20:07 06:54-07:26/32	05:23 19:33-20:21/48 21:03 05:52-06:25/33	04:44 19:40-20:21/41 21:46 05:59-06:14/15	
12	08:31 16:17	07:45 17:16	06:42 16:56-17:08/12 18:11 07:08-07:36/28	06:26 18:21-19:43/82 20:09 06:52-07:24/32	05:21 19:32-20:21/49 21:05 05:51-06:26/35	04:44 19:41-20:21/40 21:47 06:00-06:14/14	
13	08:30 16:19	07:43 17:18	06:40 07:09-07:35/26 18:13	06:24 18:21-19:44/83 20:11 06:52-07:22/30	05:19 19:32-20:22/50 21:06 05:49-06:26/37	04:44 19:40-20:21/41 21:48 06:00-06:13/13	
14	08:29 16:20	07:41 17:20	06:37 07:08-07:32/24 18:15	06:21 18:20-19:44/84 20:13 06:52-07:20/28	05:17 19:32-20:22/50 21:08 05:47-06:25/38	04:43 19:41-20:21/40 21:49 06:01-06:13/12	
15	08:28 16:22	07:39 17:22	06:35 07:10-07:30/20 18:17	06:19 18:20-19:45/85 20:15 06:53-07:18/25	05:16 19:32-20:23/51 21:10 05:46-06:26/40	04:43 19:41-20:21/40 21:49 06:02-06:13/11	
16	08:27 16:23	07:37 17:24	06:32 07:10-07:28/18 18:19	06:17 18:21-19:45/84 20:17 06:54-07:15/21	05:14 19:31-20:22/51 21:12 05:45-06:25/40	04:43 19:42-20:21/39 21:50 06:03-06:12/9	
17	08:26 16:25	07:35 17:26	06:30 07:12-07:26/14 18:21	06:14 18:20-19:45/85 20:19 06:54-07:13/19	05:12 19:32-20:23/51 21:13 05:46-06:26/40	04:43 19:42-20:21/39 21:50 06:04-06:12/8	
18	08:25 16:27	07:33 17:28	06:27 07:15-07:22/7 18:22	06:12 18:20-19:45/85 20:21 06:55-07:11/16	05:11 19:31-20:22/51 21:15 05:45-06:25/40	04:43 19:43-20:22/39 21:51 06:05-06:11/6	
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 18:21-19:45/84 20:22 06:58-07:09/11	05:09 19:32-20:23/51 21:17 05:46-06:25/39	04:43 19:43-20:22/39 21:51 06:06-06:11/5	
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 18:21-19:45/84 20:24	05:08 19:31-20:22/51 21:18 05:45-06:25/40	04:43 19:43-20:22/39 21:52 06:07-06:10/3	
21	08:22 16:32	07:26 16:59-17:07/8 17:34	06:20 18:28	06:05 18:21-19:44/83 20:26	05:06 19:32-20:23/51 21:20 05:46-06:25/39	04:43 19:43-20:22/39 21:52 06:07-06:10/3	
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24	08:18 16:38	07:20 16:53-17:14/21 17:40 07:47-07:48/1	06:13 17:46-18:09/23 18:34	05:58 18:23-19:42/79 20:32	05:02 19:32-20:22/50 21:24 05:47-06:24/37	04:43 19:44-20:23/39 21:53 06:08-06:11/3	
25	08:17 16:40	07:18 16:52-17:16/24 17:42 07:45-07:50/5	06:10 17:44-18:11/27 18:36	05:56 18:24-19:42/78 20:34	05:00 19:33-20:22/49 21:26 05:47-06:23/36	04:44 19:44-20:23/39 21:53 06:07-06:12/5	
26	08:15 16:42	07:15 16:50-17:18/28 17:44 07:42-07:50/8	06:08 17:42-18:12/30 18:38	05:54 18:25-19:41/76 20:35	04:59 19:33-20:23/50 21:27 05:48-06:23/35	04:44 19:45-20:24/39 21:53 06:07-06:13/6	
27	08:14 16:44	07:13 16:50-17:19/29 17:46 07:40-07:51/11	06:05 17:41-18:13/32 18:39	05:51 19:12-19:40/28 18:26-19:10/44 20:37 19:55-20:03/8	04:58 19:33-20:23/50 21:29 05:48-06:23/35	04:44 19:44-20:23/39 21:53 06:06-06:14/8	
28	08:12 16:45	07:11 16:49-17:19/30 17:48 07:38-07:52/14	06:03 17:39-18:13/34 18:41 06:28-06:29/1	05:49 19:13-19:39/26 18:27-19:09/42 20:39 19:50-20:08/18	04:56 19:34-20:23/49 21:30 05:49-06:22/33	04:45 19:44-20:23/39 21:52 06:06-06:15/9	
29	08:11 16:47		06:00 17:38-18:14/36 18:43 06:26-06:31/5	05:47 19:14-19:36/22 18:27-19:07/40 20:41 19:46-20:09/23	04:55 19:34-20:22/48 21:32 05:50-06:22/32	04:45 19:44-20:24/40 21:52 06:05-06:16/11	
30	08:09 16:49		05:58 17:35-18:14/39 18:45 06:23-06:32/9	05:45 19:15-19:34/19 18:28-19:05/37 20:43 19:43-20:11/28 06:13-06:14/1	04:54 19:35-20:22/47 21:33 05:50-06:21/31	04:46 19:45-20:25/40 21:52 06:05-06:17/12	
31	08:07 16:51		06:55 18:34-19:15/41 19:47 07:21-07:33/12		04:53 19:35-20:22/47 21:34 05:51-06:21/30		
Sonnenscheinstunden	248	271	365	419	494	511	
Anzahl Minuten mit Schatten	0	209	1050	2676	2557	1621	

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:
28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 11 - WEA 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

	Juli	August	September	Oktober	November	Dezember
1	04:47 19:44-20:25/41 21:52 06:04-06:17/13	05:26 19:42-20:32/50 21:17 05:59-06:36/37	06:21 18:20-19:43/83 20:11 06:51-07:22/31	07:15 07:48-08:12/24 18:56	07:13 08:09 16:45 15:59	
2	04:47 19:45-20:25/40 21:51 06:04-06:18/14	05:28 19:43-20:32/49 21:15 06:01-06:36/35	06:23 18:20-19:41/81 20:08 06:52-07:24/32	07:16 07:47-08:13/26 18:54	07:15 08:11 16:43 15:58	
3	04:48 19:45-20:26/41 21:51 06:04-06:19/15	05:30 19:43-20:31/48 21:14 06:02-06:35/33	06:24 18:20-19:39/79 20:06 06:54-07:26/32	07:18 17:34-17:47/13 18:51 07:47-08:14/27	07:17 08:12 16:41 15:58	
4	04:49 19:44-20:26/42 21:51 06:03-06:21/18	05:31 19:43-20:31/48 21:12 06:04-06:35/31	06:26 18:20-19:36/76 20:03 06:56-07:27/31	07:20 17:31-17:50/19 18:49 07:49-08:15/26	07:19 08:14 16:39 15:57	
5	04:50 19:44-20:26/42 21:50 06:02-06:21/19	05:33 19:43-20:30/47 21:10 06:05-06:34/29	06:28 19:18-19:34/16 06:57-07:27/30 20:01 18:20-19:16/56	07:22 17:28-17:50/22 18:46 07:51-08:20/29	07:21 08:15 16:37 15:56	
6	04:51 19:44-20:27/43 21:50 06:02-06:22/20	05:35 19:44-20:30/46 21:08 06:07-06:34/27	06:30 19:21-19:32/11 06:59-07:28/29 19:58 18:20-19:15/55	07:24 17:27-17:51/24 18:44 07:52-08:22/30	07:23 08:17 16:35 15:56	
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9	04:54 19:44-20:28/44 21:47 06:01-06:24/23	05:40 19:46-20:28/42 06:12-06:32/20 21:02 18:52-19:01/9	06:35 18:21-19:12/51 19:51 07:04-07:27/23	07:29 17:23-17:53/30 18:37 07:58-08:25/27	07:29 08:21 16:29 15:54	
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14	04:59 19:43-20:30/47 21:43 05:58-06:29/31	05:49 19:24-19:42/18 18:37-19:13/36 20:52 19:51-20:20/29 06:20-06:22/2	06:44 18:26-19:06/40 19:39 07:13-07:24/11	07:39 17:22-17:53/31 18:25 08:08-08:25/17	07:39 08:26 16:21 15:53	
15	05:01 19:43-20:30/47 21:42 05:59-06:30/31	05:50 19:22-19:44/22 18:36-19:15/39 20:50 19:53-20:18/25	06:46 18:26-19:04/38 19:36 07:15-07:23/8	07:41 17:22-17:52/30 18:22 08:10-08:25/15	07:41 08:27 16:19 15:53	
16	05:02 19:43-20:31/48 21:41 05:58-06:31/33	05:52 19:20-19:45/25 18:33-19:15/42 20:47 19:55-20:15/20	06:48 18:28-19:03/35 19:34 07:16-07:20/4	07:42 17:22-17:52/30 18:20 08:12-08:24/12	07:42 08:28 16:18 15:53	
17	05:03 19:43-20:32/49 21:40 05:58-06:31/33	05:54 19:19-19:46/27 18:32-19:16/44 20:45 19:59-20:11/12	06:49 18:28-19:02/34 19:31	07:44 17:22-17:50/28 18:18 08:14-08:23/9	07:44 08:29 16:16 15:53	
18	05:05 19:42-20:32/50 21:38 05:57-06:32/35	05:56 18:31-19:47/76 20:43	06:51 18:29-19:01/32 19:29	07:46 17:23-17:48/25 18:15 08:16-08:21/5	07:46 08:30 16:15 15:53	
19	05:06 19:42-20:32/50 21:37 05:57-06:32/35	05:58 18:29-19:47/78 20:41	06:53 18:29-18:59/30 19:26	07:48 17:24-17:45/21 18:13 08:18-08:20/2	07:48 08:31 16:13 15:53	
20	05:07 19:43-20:32/49 21:36 05:57-06:33/36	05:59 18:29-19:48/79 20:39	06:55 18:31-18:57/26 19:24	07:50 17:25-17:43/18 18:11	07:50 08:31 16:12 15:54	
21	05:09 19:42-20:32/50 21:35 05:57-06:34/37	06:01 18:28-19:48/80 20:36	06:57 18:33-18:55/22 19:21	07:52 17:27-17:41/14 18:09	07:52 08:32 16:10 15:54	
22	05:10 19:42-20:32/50 21:33 05:56-06:34/38	06:03 18:26-19:48/82 20:34	06:58 18:35-18:52/17 19:19	07:54 17:29-17:38/9 18:06	07:54 08:33 16:09 15:55	
23	05:12 19:42-20:33/51 21:32 05:57-06:35/38	06:05 18:26-19:48/82 20:32	07:00 18:38-18:47/9 19:16	07:56 17:33-17:36/3 18:04	07:55 08:33 16:08 15:55	
24	05:13 19:42-20:33/51 21:30 05:56-06:35/39	06:07 18:25-19:48/83 20:29	07:02 19:14	07:58 18:02	07:57 08:34 16:06 15:56	
25	05:15 19:42-20:33/51 21:29 05:57-06:36/39	06:08 18:24-19:48/84 20:27 07:03-07:11/8	07:04 19:11	08:00 18:00	07:59 08:34 16:05 15:56	
26	05:16 19:42-20:33/51 21:27 05:56-06:35/39	06:10 18:23-19:48/85 20:25 06:59-07:13/14	07:06 19:09	08:02 17:58	08:01 08:34 16:04 15:57	
27	05:18 19:42-20:33/51 21:26 05:56-06:36/40	06:12 18:23-19:47/84 20:22 06:57-07:15/18	07:07 07:57-08:05/8 19:06	07:04 16:55	08:02 08:35 16:03 15:58	
28	05:20 19:42-20:33/51 21:24 05:56-06:36/40	06:14 18:22-19:47/85 20:20 06:56-07:17/21	07:09 07:54-08:08/14 19:04	07:05 16:53	08:04 08:35 16:02 15:58	
29	05:21 19:42-20:32/50 21:22 05:57-06:36/39	06:16 18:21-19:46/85 20:18 06:54-07:18/24	07:11 07:51-08:09/18 19:01	07:07 16:51	08:06 08:35 16:01 15:59	
30	05:23 19:42-20:33/51 21:21 05:56-06:36/40	06:17 18:21-19:45/84 20:15 06:53-07:20/27	07:13 07:49-08:10/21 18:59	07:09 16:49	08:07 08:35 16:00 16:00	
31	05:24 19:43-20:33/50 21:19 05:58-06:36/38	06:19 18:21-19:45/84 20:13 06:52-07:22/30	 18:54	07:11 16:47	 16:01	08:35 16:01
	Sonnenscheinstunden 1514 Anzahl Minuten mit Schatten 2396	462 2631	384 1495	330 895	259 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	Zeitpunkt (SS:MM) Schattenanfang-Zeitpunkt (SS:MM) Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)		

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
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 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 12 - WEA 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 Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 08:36-09:01/25 16:53	07:08 16:32-17:22/50 17:50 07:35-07:49/14	06:53 18:23-18:47/24 19:49 07:18-07:59/41	05:43 07:10-07:37/27 20:45	04:52 21:36
2	08:35 16:03	08:04 08:35-09:02/27 16:55	07:06 16:32-17:23/51 17:52 07:33-07:50/17	06:50 18:25-18:45/20 19:51 07:16-08:00/44	05:41 07:18-07:33/15 20:47	04:51 21:37
3	08:35 16:05	08:02 08:33-09:02/29 16:57	07:04 16:32-17:22/50 17:54 07:30-07:50/20	06:48 18:27-18:41/14 19:53 07:14-08:01/47	05:39 20:48	04:50 21:38
4	08:35 16:06	08:01 16:27-16:30/3 16:59 08:31-09:02/31	07:01 16:32-17:22/50 17:56 07:28-07:51/23	06:45 07:11-08:01/50 19:54	05:37 20:50	04:49 21:39
5	08:34 16:07	07:59 16:25-16:33/8 17:01 08:29-09:02/33	06:59 16:32-17:21/49 17:58 07:25-07:51/26	06:43 07:09-08:02/53 19:56	05:35 20:52	04:48 21:40
6	08:34 16:08	07:57 16:24-16:35/11 17:03 08:27-09:01/34	06:57 16:33-17:21/48 17:59 07:23-07:52/29	06:41 07:06-08:01/55 19:58	05:33 20:54	04:48 21:42
7	08:34 16:10	07:55 16:23-16:37/14 17:05 08:25-09:00/35	06:54 16:33-17:20/47 18:01 07:21-07:52/31	06:38 07:04-08:02/58 20:00	05:31 20:56	04:47 21:43
8	08:33 16:11	07:53 16:22-16:38/16 17:08 08:23-08:59/36	06:52 17:37-17:38/1 07:18-07:51/33 18:03 16:35-17:19/44	06:36 07:01-08:01/60 20:02	05:29 20:58	04:46 21:44
9	08:33 16:12	07:51 16:22-16:41/19 17:10 08:21-08:58/37	06:49 17:31-17:40/9 07:16-07:51/35 18:05 16:36-17:17/41	06:33 07:00-08:02/62 20:04	05:27 20:59	04:46 21:45
10	08:32 16:14	07:49 16:21-16:43/22 17:12 08:19-08:55/36	06:47 17:29-17:42/13 07:13-07:50/37 18:07 16:38-17:16/38	06:31 06:59-08:02/63 20:06	05:25 21:01	04:45 21:45
11	08:31 16:15	07:47 16:21-16:45/24 17:14 08:19-08:52/33	06:45 17:28-17:45/17 17:00-17:14/14 18:09 16:41-16:57/16 07:11-07:50/39	06:28 06:58-08:01/63 20:07	05:23 21:03	04:45 21:46
12	08:31 16:17	07:45 16:22-16:45/23 17:16 08:20-08:48/28	06:42 17:26-17:46/20 17:03-17:09/6 18:11 16:45-16:51/6 07:08-07:48/40	06:26 06:58-08:01/63 20:09	05:21 21:05	04:44 21:47
13	08:30 16:19	07:43 16:22-16:45/23 17:18 08:21-08:47/26	06:40 17:25-17:49/24 18:13 07:06-07:48/42	06:24 06:57-08:01/64 20:11	05:19 21:06	04:44 21:48
14	08:29 16:20	07:41 16:22-16:45/23 17:20 08:22-08:46/24	06:37 17:24-17:50/26 18:15 07:04-07:46/42	06:21 06:56-08:00/64 20:13	05:17 21:08	04:43 21:49
15	08:28 16:22	07:39 16:22-16:44/22 17:22 08:23-08:45/22	06:35 17:24-17:52/28 18:17 07:05-07:44/39	06:19 06:56-07:59/63 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 16:46-16:56/10 08:23-08:43/20 17:24 16:23-16:43/20	06:32 17:23-17:54/31 18:19 07:04-07:42/38	06:17 06:56-07:59/63 20:17	05:14 21:12	04:43 21:50
17	08:26 16:25	07:35 16:24-16:59/35 17:26 08:25-08:42/17	06:30 17:23-17:55/32 18:21 07:05-07:41/36	06:14 06:56-07:57/61 20:19	05:12 21:13	04:43 21:50
18	08:25 16:27	07:33 16:26-17:01/35 17:28 08:27-08:40/13	06:27 17:22-17:55/33 18:23 07:04-07:38/34	06:12 06:56-07:57/61 20:21	05:11 21:15	04:43 21:51
19	08:24 16:29	07:31 16:28-17:03/35 17:30 08:33-08:35/2	06:25 17:22-17:56/34 18:24 07:05-07:37/32	06:10 06:56-07:56/60 20:22	05:09 21:17	04:43 21:51
20	08:23 16:30	07:29 16:37-17:05/28 17:32	06:22 17:21-17:56/35 18:26 07:05-07:33/28	06:07 06:57-07:55/58 20:24	05:08 21:18	04:43 21:52
21	08:22 16:32	07:26 16:36-17:07/31 17:34	06:20 17:20-17:57/37 18:28 07:07-07:31/24	06:05 06:57-07:54/57 20:26	05:06 21:20	04:43 21:52
22	08:21 08:53-08:55/2 16:34	07:24 16:35-17:10/35 17:36	06:18 17:19-17:56/37 18:30 07:07-07:29/22	06:03 06:57-07:52/55 20:28	05:05 21:21	04:43 21:52
23	08:19 08:52-08:56/4 16:36	07:22 16:34-17:11/37 17:38	06:15 17:19-17:56/37 18:32 07:10-07:27/17	06:00 06:57-07:51/54 20:30	05:03 21:23	04:43 21:52
24	08:18 08:50-08:57/7 16:38	07:20 16:34-17:14/40 17:40	06:13 17:19-17:56/37 18:34 07:12-07:23/11	05:58 06:58-07:50/52 20:32	05:02 21:24	04:43 21:53
25	08:17 08:49-08:59/10 16:40	07:18 16:33-17:16/43 17:42	06:10 17:19-17:56/37 18:36	05:56 06:59-07:48/49 20:34	05:00 21:26	04:44 21:53
26	08:15 08:47-08:59/12 16:42	07:15 16:32-17:18/46 17:44 07:42-07:43/1	06:08 17:19-17:54/35 18:38 06:33-06:47/14	05:54 07:00-07:46/46 20:35	04:59 21:27	04:44 21:53
27	08:14 08:45-09:00/15 16:44	07:13 16:32-17:20/48 17:46 07:40-07:46/6	06:05 17:19-17:54/35 18:39 06:31-06:51/20	05:51 07:01-07:45/44 20:37	04:58 21:29	04:44 21:53
28	08:12 08:44-09:01/17 16:46	07:11 16:31-17:22/51 17:48 07:38-07:48/10	06:03 17:19-17:53/34 18:41 06:28-06:53/25	05:49 07:03-07:43/40 20:39	04:56 21:30	04:45 21:52
29	08:11 08:42-09:01/19 16:47		06:00 17:20-17:52/32 18:43 06:26-06:56/30	05:47 07:04-07:41/37 20:41	04:55 21:32	04:45 21:52
30	08:09 08:40-09:01/21 16:49		05:58 17:20-17:50/30 18:45 06:23-06:57/34	05:45 07:07-07:39/32 20:43	04:54 21:33	04:46 21:52
31	08:07 08:38-09:01/23 16:51		06:55 18:22-18:49/27 19:47 07:21-07:58/37		04:53 21:34	
Sonneneinstrahlung	248	271	365	419	494	511
Anzahl Minuten mit Schatten	130	1227	2060	1677	42	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:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 12 - WEA 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

	Juli	August	September	Oktober	November	Dezember
1	04:47 21:52	05:26 21:17	06:21 06:56-08:00/64 20:11	07:15 18:04-18:29/25 18:56 07:44-08:26/42	07:13 15:51-16:15/24 16:45 07:49-08:18/29	08:09 15:59
2	04:47 21:51	05:28 21:15	06:23 06:57-08:00/63 20:08	07:16 18:04-18:27/23 18:54 07:45-08:27/42	07:15 15:51-16:13/22 16:43 07:49-08:24/35	08:11 15:58
3	04:48 21:51	05:30 21:14	06:24 06:57-08:00/63 20:06	07:18 18:05-18:25/20 17:41-17:49/8 18:51 17:23-17:31/8 07:47-08:27/40	07:17 15:51-16:11/20 16:41 07:49-08:26/37	08:12 15:58
4	04:49 21:51	05:31 21:12	06:26 06:57-08:00/63 20:03	07:20 18:06-18:22/16 17:37-17:52/15 18:49 17:19-17:35/16 07:49-08:28/39	07:19 15:51-16:09/18 16:39 07:52-08:29/37	08:14 15:57
5	04:50 21:50	05:33 21:10	06:28 06:57-07:58/61 20:01	07:22 18:06-18:19/13 07:51-08:28/37 18:47 17:15-17:53/38	07:21 15:53-16:08/15 16:37 07:54-08:30/36	08:15 15:56
6	04:51 21:50	05:35 21:08	06:30 06:59-07:58/59 19:58	07:24 18:08-18:17/9 07:52-08:27/35 18:44 17:13-17:54/41	07:23 15:54-16:05/11 16:35 07:56-08:31/35	08:17 15:56
7	04:52 21:49	05:36 21:06	06:32 07:01-07:58/57 19:56	07:26 17:11-17:55/44 18:42 07:54-08:27/33	07:25 15:55-16:03/8 16:33 07:58-08:31/33	08:18 15:55
8	04:53 21:48	05:38 21:04	06:33 07:02-07:56/54 19:54	07:27 17:09-17:56/47 18:39 07:56-08:27/31	07:27 15:56-16:01/5 16:31 08:00-08:32/32	08:19 15:55
9	04:54 21:47	05:40 21:02	06:35 07:04-07:55/51 19:51	07:29 17:08-17:56/48 18:37 07:58-08:27/29	07:29 15:58-15:59/1 16:29 08:02-08:32/30	08:21 15:54
10	04:55 21:47	05:42 21:00	06:37 18:24-18:33/9 19:49 07:06-07:55/49	07:31 17:07-17:56/49 18:34 08:00-08:26/26	07:31 08:04-08:32/28 16:28	08:22 15:54
11	04:56 21:46	05:43 20:58	06:39 18:19-18:36/17 19:46 07:08-07:54/46	07:33 17:06-17:56/50 18:32 08:02-08:25/23	07:33 08:07-08:33/26 16:26	08:23 15:54
12	04:57 21:45	05:45 07:27-07:41/14 20:56	06:41 18:16-18:38/22 19:44 07:09-07:52/43	07:35 17:06-17:56/50 18:30 08:04-08:24/20	07:35 08:09-08:33/24 16:24	08:24 15:53
13	04:58 21:44	05:47 07:19-07:43/24 20:54	06:42 18:14-18:39/25 19:41 07:11-07:50/39	07:37 17:05-17:56/51 18:27 08:06-08:23/17	07:37 08:11-08:33/22 16:22	08:25 15:53
14	04:59 21:43	05:49 07:15-07:46/31 20:52	06:44 18:13-18:41/28 19:39 07:13-07:49/36	07:39 17:05-17:56/51 18:25 08:08-08:22/14	07:39 08:13-08:33/20 16:21	08:26 15:53
15	05:01 21:42	05:51 07:12-07:48/36 20:50	06:46 18:10-18:41/31 19:36 07:14-07:46/32	07:41 17:05-17:55/50 18:22 08:10-08:20/10	07:41 08:15-08:33/18 16:19	08:27 15:53
16	05:02 21:41	05:52 07:10-07:49/39 20:47	06:48 18:09-18:42/33 19:34 07:16-07:44/28	07:42 17:04-17:53/49 18:20 08:12-08:18/6	07:42 08:17-08:33/16 16:18	08:28 15:53
17	05:03 21:40	05:54 07:08-07:51/43 20:45	06:49 18:08-18:42/34 19:31 07:18-07:42/24	07:44 17:04-17:50/46 18:18 08:14-08:15/1	07:44 08:19-08:32/13 16:16	08:29 15:53
18	05:05 21:38	05:56 07:07-07:52/45 20:43	06:51 18:07-18:43/36 19:29 07:20-07:39/19	07:46 17:05-17:48/43 18:15	07:46 08:21-08:32/11 16:15	08:30 15:53
19	05:06 21:37	05:58 07:05-07:53/48 20:41	06:53 18:06-18:42/36 19:26 07:22-07:32/10	07:48 17:05-17:45/40 18:13	07:48 08:23-08:31/8 16:13	08:31 15:54
20	05:07 21:36	05:59 07:04-07:55/51 20:39	06:55 18:05-18:42/37 19:24	07:50 17:05-17:43/38 18:11	07:50 08:26-08:32/6 16:12	08:31 15:54
21	05:09 21:35	06:01 07:03-07:56/53 20:36	06:57 18:05-18:42/37 19:21 07:57-08:10/13	07:52 17:06-17:41/35 18:09	07:52 08:28-08:31/3 16:10	08:32 15:54
22	05:10 21:33	06:03 07:02-07:58/56 20:34	06:58 18:05-18:42/37 19:19 07:54-08:13/19	07:54 17:06-17:37/31 18:06	07:54 08:29-08:33/1 16:09	08:33 15:55
23	05:12 21:32	06:05 07:01-07:58/57 20:32	07:00 18:04-18:41/37 19:16 07:52-08:15/23	07:56 17:07-17:36/29 18:04	07:55 08:28-08:33/1 16:08	08:33 15:55
24	05:13 21:30	06:07 07:00-07:59/59 20:29	07:02 18:04-18:40/36 19:14 07:50-08:15/25	07:58 16:58-17:33/35 18:02	07:57 08:27-08:33/1 16:06	08:34 15:56
25	05:15 21:29	06:08 07:00-08:00/60 20:27	07:04 18:04-18:40/36 19:11 07:49-08:17/28	08:00 16:56-17:31/35 18:00 08:57-09:08/11	07:59 08:26-08:33/1 16:05	08:34 15:56
26	05:16 21:27	06:10 06:59-07:59/60 20:25	07:06 18:05-18:39/34 19:09 07:48-08:20/32	08:02 16:54-17:29/35 17:58 08:55-09:11/16	08:01 08:25-08:33/1 16:04	08:34 15:57
27	05:18 21:26	06:12 06:58-08:00/62 20:22	07:07 18:05-18:38/33 19:06 07:47-08:21/34	07:04 16:15-16:26/11 07:53-08:12/19 16:55 15:53-16:13/20	08:02 08:24-08:33/1 16:03	08:35 15:58
28	05:20 21:24	06:14 06:58-08:01/63 20:20	07:09 18:03-18:36/33 19:04 07:46-08:23/37	07:05 15:52-16:13/21 16:53 07:52-08:14/22	08:04 08:23-08:33/1 16:02	08:35 15:58
29	05:21 21:22	06:16 06:57-08:00/63 20:18	07:11 18:03-18:34/31 19:01 07:45-08:23/38	07:07 15:52-16:15/23 16:51 07:51-08:15/24	08:06 08:22-08:33/1 16:01	08:35 15:59
30	05:23 21:21	06:17 06:57-08:00/63 20:15	07:13 18:03-18:32/29 18:59 07:44-08:24/40	07:09 15:52-16:15/23 16:49 07:50-08:17/27	08:07 08:21-08:33/1 16:00	08:35 16:00
31	05:25 21:19	06:19 06:57-08:01/64 20:13		07:11 15:51-16:15/24 16:47 07:50-08:17/27		08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	0	991	1801	1801	623	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: 28.08.2019 10:21/3.2.744
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SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: 13 - WEA VB - SWT-3.2-113

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 14:03-14:19/16 16:03	08:06 14:58-15:55/57 16:54	07:08 17:50	06:53 18:14-18:42/28 19:49	05:43 20:45	04:52 21:36
2	08:35 14:03-14:19/16 16:04	08:04 14:58-15:56/58 16:56	07:06 17:52	06:50 18:15-18:41/26 19:51	05:41 20:47	04:51 21:37
3	08:35 14:05-14:19/14 16:05	08:02 15:00-15:58/58 16:58	07:04 17:54	06:48 18:17-18:40/23 19:53	05:39 20:49	04:50 21:38
4	08:35 14:05-14:18/13 16:06	08:01 15:00-15:59/59 17:00	07:01 17:56	06:46 18:18-18:38/20 19:55	05:37 20:50	04:49 21:39
5	08:35 14:07-14:18/11 16:07	07:59 15:00-16:00/60 17:02	06:59 17:58	06:43 18:21-18:35/14 19:56	05:35 20:52	04:48 21:41
6	08:34 14:09-14:16/7 16:08	07:57 15:01-16:01/60 17:04	06:57 18:00	06:41 18:24-18:30/6 19:58	05:33 20:54	04:48 21:42
7	08:34 14:13-14:15/2 16:10	07:55 15:02-16:02/60 17:06	06:54 18:02	06:38 20:00	05:31 20:56	04:47 21:43
8	08:33 16:11	07:53 15:02-16:02/60 17:08	06:52 18:03	06:36 20:02	05:29 20:58	04:46 21:44
9	08:33 16:13	07:51 15:03-16:03/60 17:10	06:49 18:05	06:33 20:04	05:27 20:59	04:46 21:45
10	08:32 16:14	07:50 15:03-16:02/59 17:12	06:47 18:07	06:31 20:06	05:25 21:01	04:45 21:46
11	08:32 16:16	07:48 15:05-16:03/58 17:14	06:45 18:09	06:29 20:08	05:23 21:03	04:45 21:46
12	08:31 15:08-15:17/9 16:17	07:46 15:06-16:03/57 17:16	06:42 17:24-17:35/11 18:11	06:26 20:09	05:21 21:05	04:44 21:47
13	08:30 15:06-15:20/14 16:19	07:44 15:09-16:03/54 17:18	06:40 17:21-17:38/17 18:13	06:24 20:11	05:19 21:06	04:44 21:48
14	08:29 15:05-15:22/17 16:20	07:41 15:11-16:03/52 17:20	06:37 17:18-17:40/22 18:15	06:21 20:13	05:18 21:08	04:43 21:49
15	08:28 15:03-15:23/20 16:22	07:39 15:15-16:03/48 17:22	06:35 17:17-17:42/25 18:17	06:19 20:15	05:16 21:10	04:43 21:49
16	08:27 15:02-15:24/22 16:24	07:37 15:19-16:02/43 17:24	06:32 17:15-17:43/28 18:19	06:17 20:17	05:14 21:12	04:43 21:50
17	08:26 15:02-15:26/24 16:25	07:35 15:20-16:02/42 17:26	06:30 17:15-17:45/30 18:21	06:14 20:19	05:12 21:13	04:43 21:50
18	08:25 15:01-15:28/27 16:27	07:33 15:22-16:02/40 17:28	06:28 17:13-17:45/32 18:23	06:12 20:21	05:11 21:15	04:43 21:51
19	08:24 15:00-15:28/28 16:29	07:31 15:25-16:01/36 17:30	06:25 17:13-17:46/33 18:24	06:10 20:23	05:09 21:17	04:43 21:51
20	08:23 15:00-15:30/30 16:31	07:29 15:25-16:00/35 17:32	06:23 17:12-17:45/33 18:26	06:07 20:24	05:08 21:18	04:43 21:52
21	08:22 15:00-15:33/33 16:32	07:27 15:26-15:59/33 17:34	06:20 17:13-17:46/33 18:28	06:05 20:26	05:06 21:20	04:43 21:52
22	08:21 14:59-15:37/38 16:34	07:24 15:28-15:58/30 17:36	06:18 17:12-17:46/34 18:30	06:03 20:28	05:05 21:21	04:43 21:52
23	08:19 14:59-15:40/41 16:36	07:22 15:29-15:56/27 17:38	06:15 17:12-17:47/35 18:32	06:00 20:30	05:03 21:23	04:43 21:52
24	08:18 14:59-15:41/42 16:38	07:20 15:31-15:54/23 17:40	06:13 17:12-17:47/35 18:34	05:58 20:32	05:02 21:25	04:43 21:53
25	08:17 14:59-15:44/45 16:40	07:18 15:34-15:52/18 17:42	06:10 17:13-17:47/34 18:36	05:56 20:34	05:00 21:26	04:44 21:53
26	08:15 14:59-15:45/46 16:42	07:15 15:37-15:47/10 17:44	06:08 17:13-17:47/34 18:38	05:54 20:36	04:59 21:28	04:44 21:53
27	08:14 14:58-15:46/48 16:44	07:13 17:46	06:05 17:14-17:47/33 18:40	05:52 20:37	04:58 21:29	04:45 21:53
28	08:12 14:59-15:48/49 16:46	07:11 17:48	06:03 17:13-17:46/33 18:41	05:49 20:39	04:57 21:30	04:45 21:53
29	08:11 14:59-15:50/51 16:48		06:00 17:14-17:46/32 18:43	05:47 20:41	04:55 21:32	04:46 21:52
30	08:09 14:58-15:52/54 16:50		05:58 17:13-17:45/32 18:45	05:45 20:43	04:54 21:33	04:46 21:52
31	08:08 14:58-15:54/56 16:52		06:55 18:14-18:44/30 19:47		04:53 21:35	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	773	1197	596	117	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) Schattende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende/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:
28.08.2019 10:21/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Gesamtbelastung WEA: 13 - WEA VB - SWT-3.2-113****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 20:11	07:15 18:56	07:13 16:45	08:09 15:59
2	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	04:48 21:51	05:30 21:14	06:25 20:06	07:18 18:52	07:17 16:41	08:12 15:58
4	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	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	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	04:52 21:49	05:37 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 15:55
8	04:53 21:48	05:38 21:04	06:34 19:54	07:28 18:39	07:27 16:31	08:19 15:55
9	04:54 21:48	05:40 21:02	06:35 19:51	07:29 18:37	07:29 16:30	08:21 15:54
10	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	04:56 21:46	05:44 20:58	06:39 19:46	07:33 18:32	07:33 16:26	08:23 15:54
12	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	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	07:37 16:23	08:25 15:53
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 18:25	07:39 16:21	08:26 15:53
15	05:01 21:42	05:51 20:50	06:46 19:36	07:41 18:23	07:41 16:19	08:27 15:53
16	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	05:03 21:40	05:54 20:45	06:50 19:31	07:44 18:18	07:44 16:16	08:29 15:53
18	05:05 21:39	05:56 20:43	06:51 19:29	07:46 18:16	07:46 16:15	08:30 15:53
19	05:06 21:37	05:58 20:41	06:53 19:26	07:48 18:13	07:48 16:13	08:31 15:54
20	05:07 21:36	06:00 20:39	06:55 19:24	07:50 18:11	07:50 16:12	08:32 15:54
21	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	05:10 21:33	06:03 20:34	06:58 19:19	07:54 18:06	07:54 16:09	08:33 15:55
23	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	05:13 21:30	06:07 20:30	07:02 19:14	07:58 18:02	07:57 16:07	08:34 15:56
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 18:00	07:59 16:05	08:34 15:56
26	05:17 21:27	06:10 20:25	07:06 19:09	08:02 17:58	08:01 16:04	08:35 15:57
27	05:18 21:26	06:12 20:23	07:07 19:06	08:04 17:55	08:03 16:03	08:35 15:58
28	05:20 21:24	06:14 20:20	07:09 19:04	08:06 17:53	08:04 16:02	08:35 15:58
29	05:21 21:22	06:16 20:18	07:11 19:01	08:08 17:51	08:06 16:01	08:35 15:59
30	05:23 21:21	06:17 20:15	07:13 18:59	08:09 17:49	08:08 16:00	08:35 16:00
31	05:25 21:19	06:19 20:13		08:11 17:47	08:08 16:00	08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	0	0	678	583	1349	452

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:

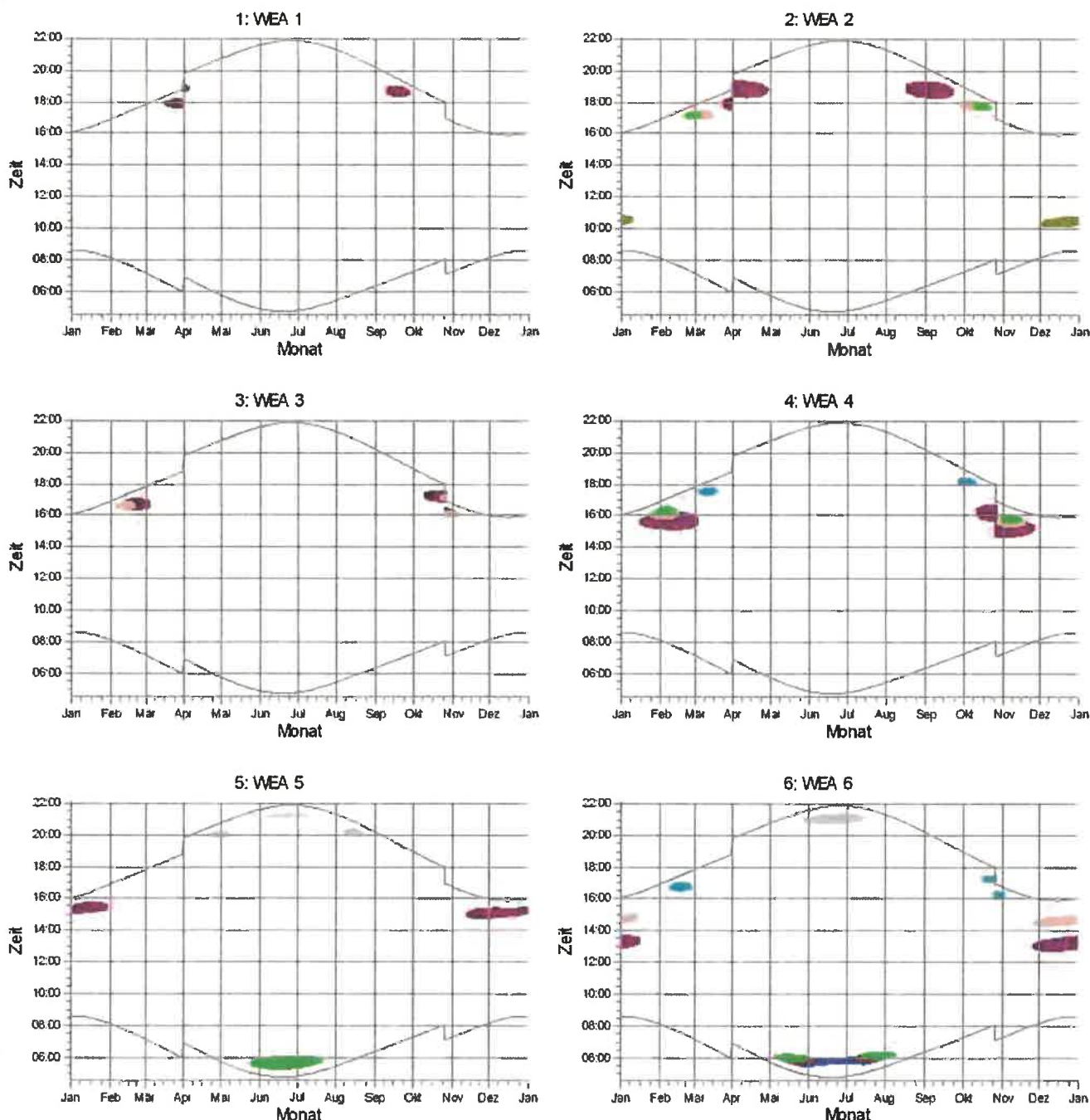
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



Schattenrezeptoren

G: IO 7	I: IO 9	K: IO 11	N: IO 14	R: IO 18
H: IO 8	J: IO 10	L: IO 12	Q: IO 17	S: IO 19

Projekt:

19-095-GBK-02

Beschreibung:

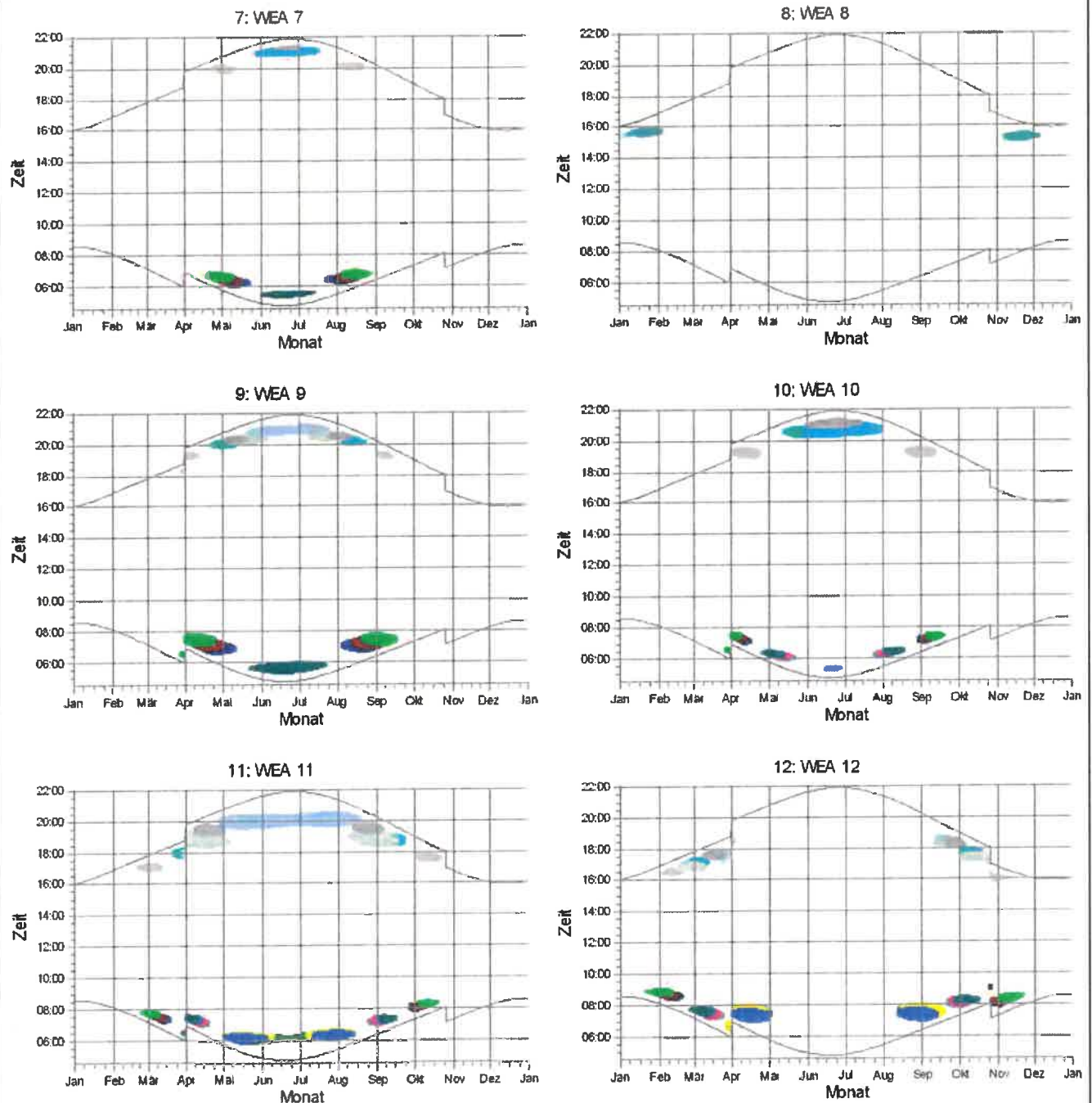
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



Schattenrezeptoren

	A: IO 1		D: IO 4		G: IO 7		L: IO 12		O: IO 15
	B: IO 2		E: IO 5		H: IO 8		M: IO 13		P: IO 16
	C: IO 3		F: IO 6		I: IO 9		N: IO 14		S: IO 19

Projekt:

19-095-GBK-02

Beschreibung:

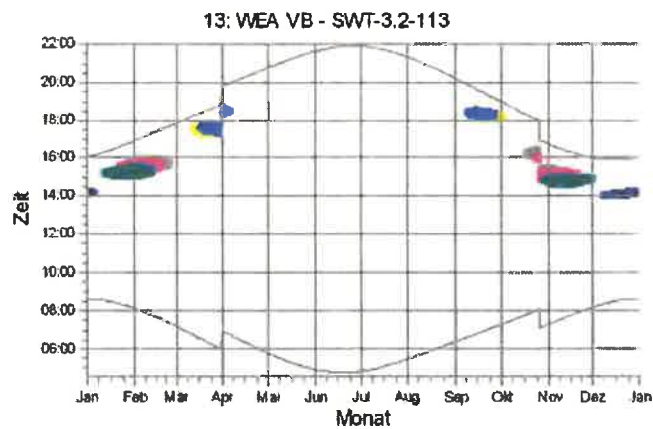
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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Berechnet:
28.08.2019 10:21/3.2.744

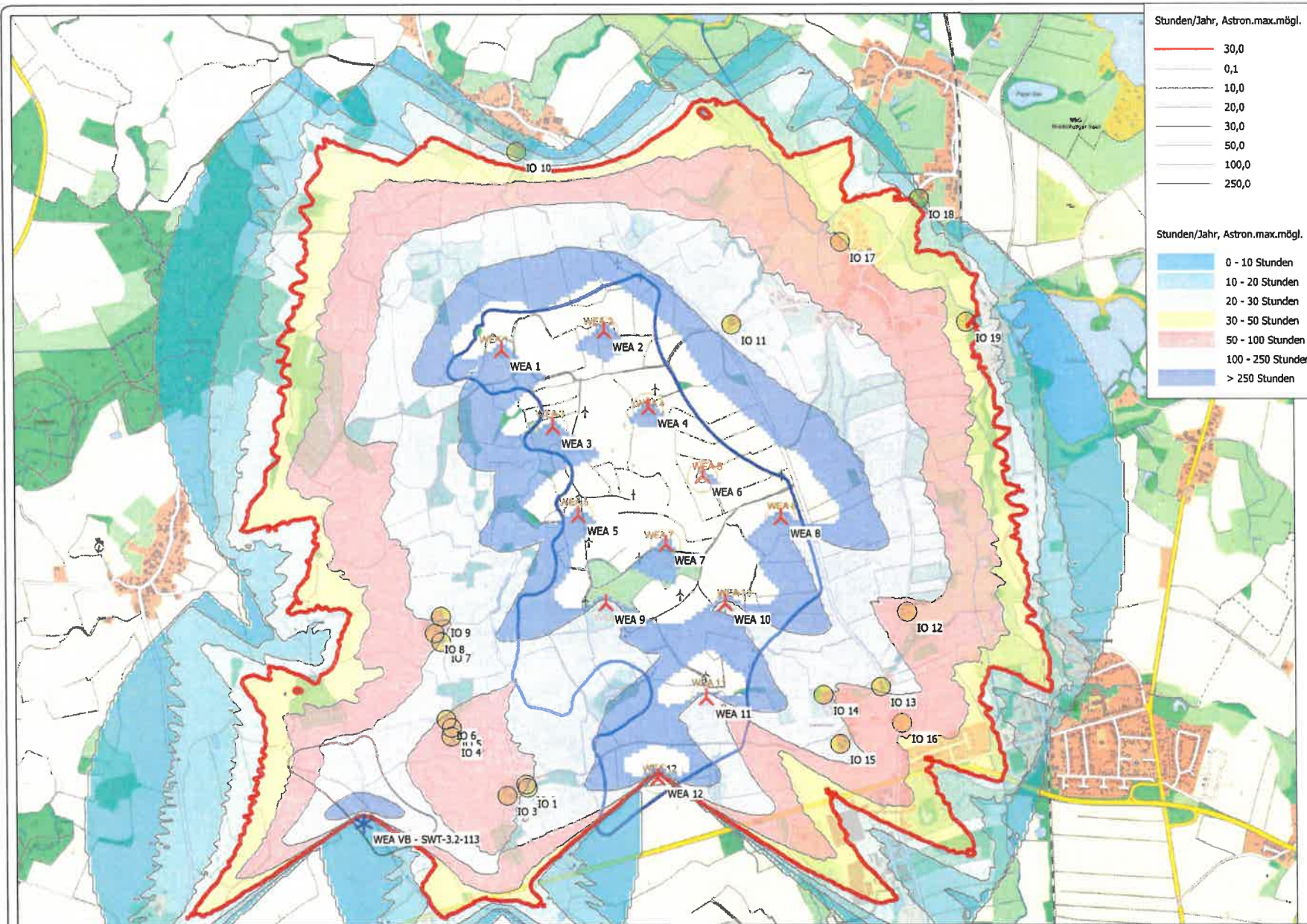
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



Schattenrezeptoren

	A: IO 1		C: IO 3		E: IO 5		G: IO 7
	B: IO 2		D: IO 4		F: IO 6		H: IO 8



Stunden/Jahr, Astron.max.mögl.

- 30,0
- 0,1
- 10,0
- 20,0
- 30,0
- 50,0
- 100,0
- 250,0

Stunden/Jahr, Astron.max.mögl.

- 0 - 10 Stunden
- 10 - 20 Stunden
- 20 - 30 Stunden
- 30 - 50 Stunden
- 50 - 100 Stunden
- 100 - 250 Stunden
- > 250 Stunden

Projekt:
19-095-GBK-02

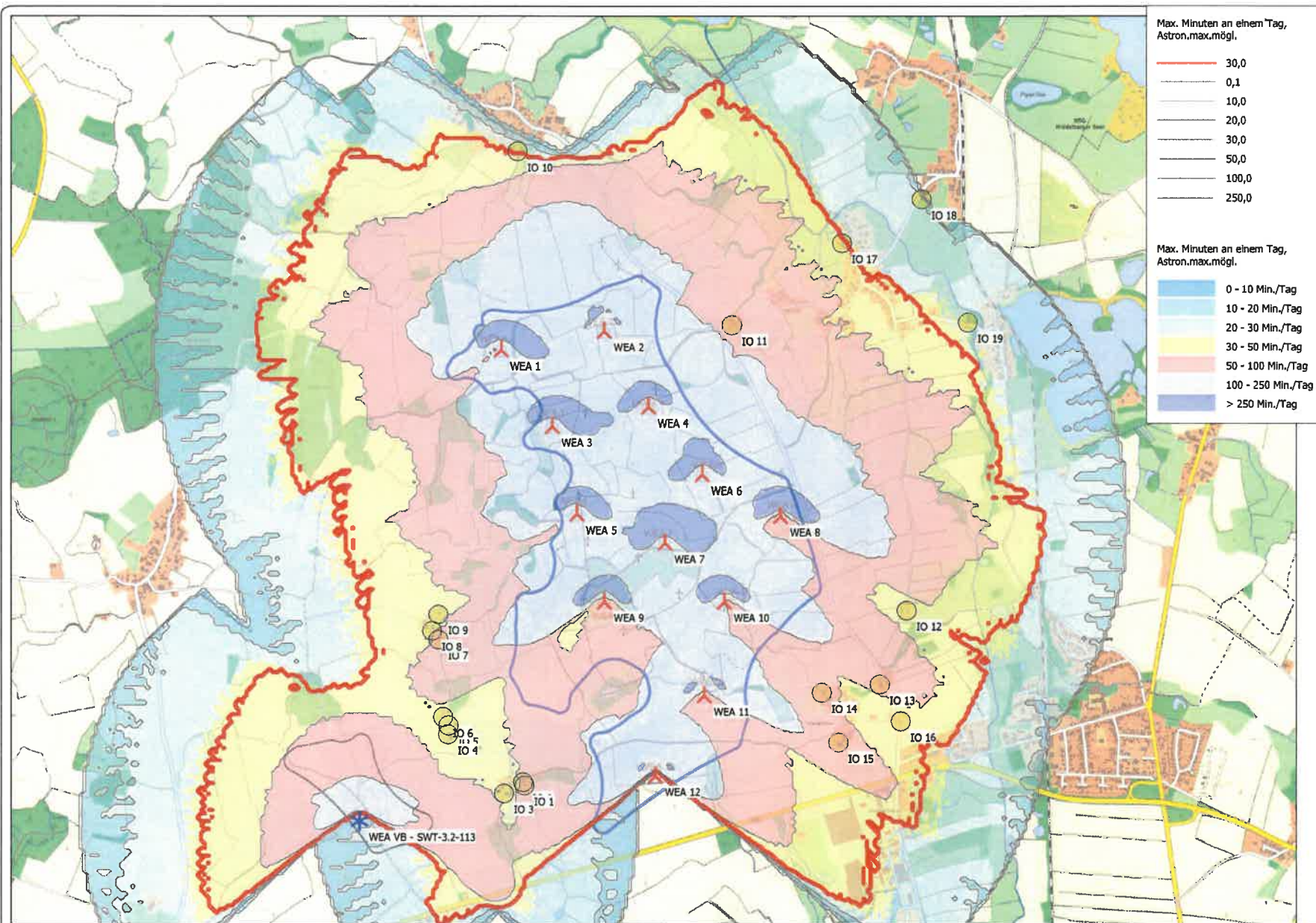
Beschreibung:
Schattenwurfgutachten für die
Errichtung und den Betrieb neuer
Windenergieanlagen im Rahmen des
Repowering-Vorhabens im Windpark
Kesdorf

**SHADOW -
Karte**
Berechnung:
Gesamtbelastung

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
23.08.2019 09:15/3.2.744

▲ Neue WEA
★ Existierende WEA

Karte: Lageplan_TK25 , Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175
Schattenrezeptor
Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)



▲ Neue WEA

★ Existierende WEA

Karte: Lageplan_TK25 , Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175
 Schattenrezeptor
 Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Max. Minuten an einem Tag,
Astron.max.mögl.

30,0
0,1
10,0
20,0
30,0
50,0
100,0
250,0

Max. Minuten an einem Tag,
Astron.max.mögl.

0 - 10 Min./Tag
10 - 20 Min./Tag
20 - 30 Min./Tag
30 - 50 Min./Tag
50 - 100 Min./Tag
100 - 250 Min./Tag
> 250 Min./Tag

Projekt:

19-095-GBK-02

Beschreibung:

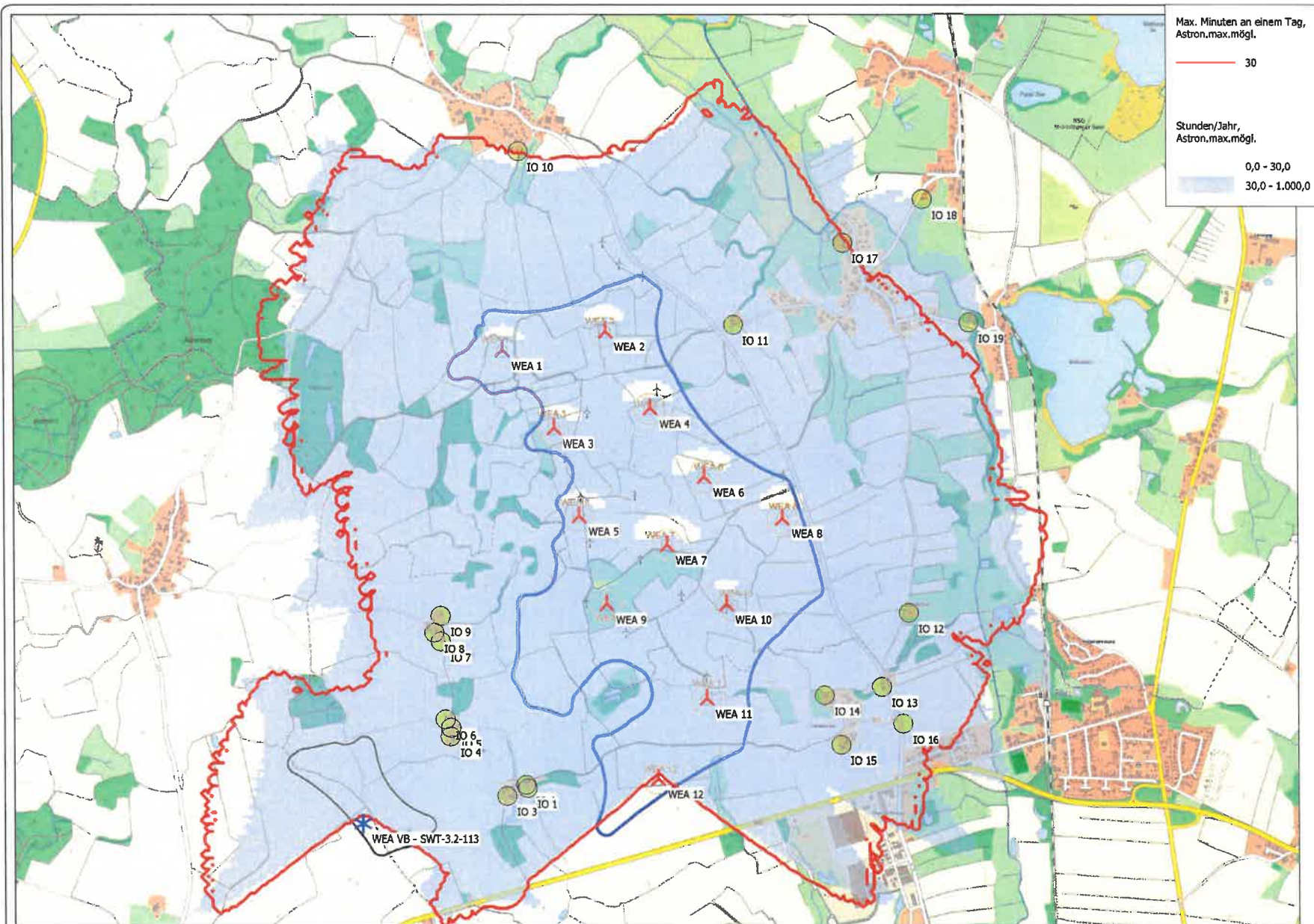
Schattenwurfgutachten für die
Errichtung und den Betrieb neuer
Windenergieanlagen im Rahmen des
Repowering-Vorhabens im Windpark
Kedorf

**SHADOW -
Karte**

Berechnung:
Gesamtbelastung

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
Info@th-ingenieure.de
Berechnet:
23.08.2019 09:22/3.2.744



▲ Neue WEA

★ Existierende WEA

Karte: Lageplan_TK25, Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175
 ● Schattenrezeptor
 Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Max. Minuten an einem Tag,
Astron.max.mögl.

— 30

Stunden/Jahr,
Astron.max.mögl.

0,0 - 30,0

30,0 - 1.000,0

Projekt:
19-095-GBK-02

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

**SHADOW -
Karte**
Berechnung:
Gesamtbelastung

Lizenzierter Anwender:
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Berechnung:
28.08.2019 10:21/3.2.744