

Projekt:

19-095-GBK-02

Beschreibung:

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

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 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 Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 4 - WEA 4

Voraussetzungen für Berechnung des Schattenwurfs

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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
Anzahl Minuten mit Schatten		0	0	45	1136	1492

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

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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 5 - WEA 5

Voraussetzungen für Berechnung des Schattenwurfs

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2019

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Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	May	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 17:01 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):

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Projekt:

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20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung WEA: 5 - WEA 5****Voraussetzungen für Berechnung des Schattenwurfs**

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1	04:47 21:08-21:18/10 21:52 05:22-05:59/37	05:26 21:17 05:28 21:18/10	06:21 20:11 06:23 07:16	07:15 18:56 07:16 07:15	07:13 16:45 07:15 07:15	08:09 14:49-15:19/30 15:59 08:11 14:48-15:18/30
2	04:47 21:08-21:18/10 21:52 05:23-06:00/37	05:28 21:15 05:30 21:14	06:24 20:08 20:06 07:18	07:18 18:54 18:51 16:41	07:17 16:43 16:41 07:19	08:12 14:49-15:19/30 15:58 08:14 14:50-15:20/30
3	04:48 21:09-21:18/9 21:51 05:24-06:00/36	05:30 21:14 05:31 21:12	06:26 20:03 20:03 07:22	07:20 18:49 18:49 07:21	07:19 16:39 07:21 16:37	08:15 14:50-15:19/29 15:57 08:17 14:51-15:20/29
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31	05:24 21:36-21:37/0 05:24 05:52-05:60/0	06:19 20:10-20:18/0 20:13 20:11-20:19/0	07:15 20:03 16:47 08:14	08:12 18:00 16:47 08:16	14:48-15:21/30 16:00 14:48-15:22/31	08:53 15:00-15:29/26 16:01 08:54 15:00-15:30/27
	Sonnenscheinstunden 515 Anzahl Minuten mit Schatten 558	462 227	384 0	330 0	259 414	232 722

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

Projekt:

19-095-GBK-02

Beschreibung:

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

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 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

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 6 - WEA 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
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 07:15 20:11 18:56		07:13 16:08-16:15/7 16:45	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 07:16 20:08 18:54		07:15 16:10-16:13/3 16:43	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 07:18 20:06 18:51		07:17 16:41 16:41	08:12 14:20-14:41/21 15:57 12:48-13:18/30
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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 07:27 19:54 18:39		07:27 16:31 16:31	08:19 14:20-14:45/25 15:55 12:47-13:24/37
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10	04:55 20:56-21:14/18 21:47 05:38-06:01/23	05:42 21:00 21:00	06:37 07:31 19:49 18:34		07:31 16:28 16:28	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 20:58	06:39 07:33 19:46 18:32		07:33 16:26 16:26	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 20:56	06:41 07:35 19:44 18:30		07:35 16:24 16:24	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 20:54	06:42 07:37 19:41 18:27		07:37 16:22 16:22	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 20:52	06:44 07:39 19:39 18:25		07:39 16:21 16:21	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 20:50	06:46 07:41 19:36 18:22		07:41 16:19 16:19	08:27 14:22-14:49/27 15:53 12:48-13:28/40
16	05:02 21:06-21:08/2 21:41 05:38-06:10/32	05:52 20:47 20:47	06:48 07:42 19:34 18:20		07:43 16:18 16:18	08:28 14:22-14:49/27 15:53 12:48-13:29/41
17	05:03 05:38-06:11/33 21:40	05:54 20:45 20:45	06:49 07:44 19:31 18:18		07:44 16:16 16:16	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 20:43	06:51 07:46 19:29 18:15	17:10-17:21/11	07:46 16:14 16:14	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 20:41	06:53 07:48 19:26 18:13	17:08-17:23/15	07:48 16:13 16:13	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 20:39	06:55 07:50 19:24 18:11	17:06-17:24/18	07:50 16:12 16:12	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 20:36	06:57 07:52 19:21 18:09	17:05-17:25/20	07:52 16:10 16:10	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 20:34	06:58 07:54 19:19 18:06	17:04-17:26/22	07:54 16:09 16:09	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 20:32	07:00 07:56 19:16 18:04	17:03-17:26/23	07:55 16:08 16:08	08:33 14:25-14:53/28 15:55 12:51-13:33/42
24	05:13 05:47-06:16/29 21:30	06:07 20:29 20:29	07:02 07:58 19:14 18:02	17:03-17:26/23	07:57 16:06 16:06	08:34 14:26-14:53/27 15:55 12:51-13:33/42
25	05:15 05:49-06:17/28 21:29	06:08 20:27 20:27	07:04 08:00 19:11 18:00	17:03-17:26/23	07:59 16:05 16:05	08:34 14:26-14:53/27 15:56 12:51-13:33/42
26	05:16 05:50-06:17/27 21:27	06:10 20:25 20:25	07:06 08:02 19:09 17:57	17:03-17:25/22	08:01 16:04 16:04	08:35 14:27-14:54/27 15:57 12:52-13:34/42
27	05:18 05:52-06:18/26 21:26	06:12 20:22 20:22	07:07 07:04 19:06 16:55	16:03-16:25/22	08:03 14:25-14:31/6 16:03 12:57-13:05/8	08:35 14:27-14:54/27 15:57 12:53-13:34/41
28	05:20 05:53-06:18/25 21:24	06:14 20:20 20:20	07:09 07:05 19:04 16:53	16:03-16:24/21	08:04 14:23-14:34/11 16:02 12:54-13:09/15	08:35 14:28-14:55/27 15:58 12:53-13:35/42
29	05:21 05:55-06:18/23 21:22	06:15 20:18 20:18	07:11 07:07 19:01 16:51	16:04-16:22/18	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 20:15	07:13 07:09 18:59 16:49	16:05-16:20/15	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 20:13	07:11 16:06-16:18/12 16:47			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:	Beschreibung:	Lizenzierter Anwender:
19-095-GBK-02	Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdaorf	T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

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

Projekt:

19-095-GBK-02

Beschreibung:

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

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 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 Sonneneinstrahlung

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 19:49	06:53 19:49 20:45	05:43 21:36 21:52	04:52 21:52 21:17	04:47 21:17 20:11	05:26 20:11 18:56	06:21 18:56 16:45	07:15 16:45 15:59	07:13 15:59 15:15	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 16:50 19:51	06:50 19:51 20:47	05:41 21:37 21:52	04:51 21:52 21:15	04:47 21:15 20:08	05:28 20:08 18:54	06:23 18:54 16:43	07:16 16:43 15:58	07:15 15:58 15:15	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 19:53	06:48 19:53 20:48	05:39 21:38 21:53	04:50 21:53 21:14	04:48 21:14 20:06	05:29 20:06 18:51	06:24 18:51 16:41	07:18 16:41 15:57	07:17 15:57 15:15	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 19:54	06:45 19:54 20:50	05:37 21:39 21:51	04:49 21:51 21:12	04:48 21:12 20:03	05:31 20:03 18:49	06:26 18:49 16:39	07:20 16:39 15:57	07:19 15:57 15:15	08:14 15:14-15:22/8 15:57
5	08:35 16:07	07:59 17:01 19:57	06:59 17:57 19:56	06:43 19:56 20:52	05:34 21:41 21:50	04:48 21:50 21:10	04:48 21:10 20:01	05:33 20:01 18:46	06:28 18:46 16:37	07:22 16:37 15:56	07:21 15:56 15:15	08:15 15:16-15:21/5 15:56
6	08:34 16:08	07:57 17:03 19:55	06:57 17:59 19:58	06:41 19:58 20:54	05:32 21:42 21:50	04:47 21:50 21:08	04:47 21:08 19:58	05:35 19:58 18:44	06:30 18:44 16:35	07:24 16:35 15:56	07:23 15:56 15:15	08:17 15:19-15:21/2 15:56
7	08:34 15:34-15:35/1 16:10	07:55 17:05 19:57	06:55 17:59 19:58	06:38 20:00 20:56	05:30 21:43 21:49	04:47 21:49 21:06	04:47 21:06 19:56	05:36 19:56 18:42	06:32 18:42 16:33	07:26 16:33 15:55	07:25 15:55 15:15	08:18 15:15-15:20/9 15:55
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28	08:12 15:30-15:56/26 16:45	07:11 17:48 19:59	06:03 18:41 20:39	05:49 20:39 21:30	04:56 21:30 21:53	04:45 21:53 21:00	04:45 21:00 19:44	06:14 19:44 18:30	07:09 18:30 16:22	08:04 16:22 15:53	08:04 15:53 15:15	08:41 15:15-15:27/18 15:53
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30	08:09 15:32-15:56/24 16:49	07:07 17:52 19:59	05:58 18:45 20:43	05:45 20:43 21:33	04:54 21:33 21:52	04:46 21:52 21:00	04:46 21:00 19:44	06:17 19:44 18:30	07:13 18:30 16:22	08:07 16:22 15:53	08:07 15:53 15:15	08:43 15:15-15:26/16 15:53
31	08:07 15:33-15:56/23 16:51	07:05 17:54 19:59	05:55 18:47 20:45	05:43 20:45 21:34	04:53 21:34 21:51	04:46 21:51 21:00	04:46 21:00 19:44	06:19 19:44 18:30	07:15 18:30 16:22	08:09 16:22 15:53	08:09 15:53 15:15	08:44 15:15-15:26/16 15:53
Sonnenscheinstunden	248	271	365	419	494	511	515	462	384	330	259	521
Anzahl Minuten mit Schatten	501	66	0	0	0	0	0	0	0	0	0	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) 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:
20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung 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	08:06	07:08	06:53 19:09-19:23/14	05:43 20:15-20:16/1 06:35-07:13/38	04:52 20:37-21:03/26 05:25-05:47/22
	16:02	16:53	17:50	19:49 07:18-07:44/26	20:45 19:48-20:13/25	21:36 20:11-20:28/17
2	08:35	08:04	07:06	06:50 19:09-19:26/17	05:41 19:48-20:18/30	04:51 20:37-21:04/27 05:24-05:48/24
	16:03	16:55	17:52	19:51 07:16-07:46/30	20:47 06:35-07:11/36	21:37 20:12-20:27/15
3	08:35	08:02	07:04	06:48 19:07-19:27/20	05:39 19:49-20:21/32	04:50 20:37-21:04/27 05:23-05:48/25
	16:05	16:57	17:54	19:53 07:14-07:47/33	20:48 06:36-07:10/34	21:38 20:13-20:26/13
4	08:35	08:01	07:01	06:45 19:07-19:29/22	05:37 19:49-20:22/33	04:49 20:38-21:05/27 05:23-05:49/26
	16:06	16:59	17:56	19:54 07:11-07:47/36	20:50 06:37-07:09/32	21:39 20:16-20:26/10
5	08:35	07:59	06:59	06:43 19:07-19:30/23	05:35 19:50-20:24/34	04:48 20:38-21:05/27 05:22-05:50/28
	16:07	17:01	17:58	19:56 07:09-07:48/39	20:52 06:37-07:08/31	21:41 20:17-20:23/6
6	08:34	07:57	06:57	06:41 19:06-19:29/23	05:33 19:50-20:25/35	04:48 20:37-21:05/28
	16:08	17:03	17:59	19:58 07:06-07:47/41	20:54 06:38-07:06/28	21:42 05:21-05:50/29
7	08:34	07:55	06:54	06:38 19:07-19:29/22	05:31 19:51-20:27/36	04:47 20:38-21:06/28
	16:10	17:05	18:01	20:00 07:04-07:48/44	20:56 06:39-07:05/26	21:43 05:21-05:51/30
8	08:33	07:53	06:52	06:36 19:06-19:27/21	05:29 19:52-20:28/36	04:46 20:38-21:05/27
	16:11	17:08	18:03	20:02 07:01-07:47/46	20:58 06:41-07:03/22	21:44 05:20-05:51/31
9	08:33	07:51	06:49	06:33 19:07-19:26/19	05:27 19:53-20:31/38	04:46 20:38-21:06/28
	16:12	17:10	18:05	20:04 06:59-07:47/48	20:59 06:43-07:01/18	21:45 05:20-05:51/31
10	08:32	07:49	06:47	06:31 19:09-19:25/16	05:25 19:55-20:32/37	04:45 20:38-21:05/27
	16:14	17:12	18:07	20:06 06:57-07:47/50	21:01 06:46-06:58/12	21:46 05:19-05:51/32
11	08:31	07:47	06:45	06:28 19:10-19:23/13	05:23 20:04-20:33/29	04:44 20:39-21:06/27
	16:15	17:14	18:09	20:08 06:54-07:46/52	21:03 19:59-20:01/2	21:46 05:19-05:52/33
12	08:31	07:46	06:42	06:26 19:13-19:20/7	05:21 20:03-20:33/30	04:44 20:39-21:07/28
	16:17	17:16	18:11	20:09 06:52-07:46/54	21:05	21:47 05:19-05:53/34
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	16:19	17:18	18:13	20:11	21:06	21:48 05:18-05:52/34
14	08:29	07:41	06:37	06:21 06:47-07:45/58	05:17 20:03-20:33/30	04:43 20:39-21:06/27
	16:20	17:20	18:15	20:13	21:08	21:49 05:18-05:53/35
15	08:28	07:39	06:35	06:19 06:45-07:44/59	05:16 20:03-20:34/31	04:43 20:40-21:07/27
	16:22	17:22	18:17	20:15	21:10	21:49 05:18-05:53/35
16	08:27	07:37	06:32	06:17 06:43-07:44/61	05:14 20:03-20:34/31	04:43 20:40-21:07/27
	16:23	17:24	18:19	20:17	21:12	21:50 05:18-05:53/35
17	08:26	07:35	06:30	06:14 06:40-07:42/62	05:12 20:03-20:34/31	04:43 20:40-21:07/27
	16:25	17:26	18:21	20:19	21:13	21:50 05:18-05:54/36
18	08:25	07:33	06:27	06:12 06:38-07:41/63	05:11 20:03-20:33/30	04:43 20:41-21:07/26
	16:27	17:28	18:23	20:21	21:15	21:51 05:18-05:54/36
19	08:24	07:31	06:25	06:10 06:36-07:40/64	05:09 20:03-20:34/31	04:43 20:41-21:08/27
	16:29	17:30	18:24	20:22	21:17	21:51 05:18-05:54/36
20	08:23	07:29	06:23	06:07 06:36-07:39/63	05:08 20:03-20:33/30	04:43 20:41-21:08/27
	16:30	17:32	18:26	20:24	21:18	21:52 05:18-05:54/36
21	08:22	07:27	06:20	06:05 06:35-07:37/62	05:06 20:04-20:33/29	04:43 20:41-21:08/27
	16:32	17:34	18:28	20:26	21:20	21:52 05:18-05:55/37
22	08:21	07:24	06:18	06:03 19:58-20:01/3	05:04 20:41-20:51/10	04:43 20:41-21:08/27
	16:34	17:36	18:30	20:28 06:34-07:34/60	21:21 20:04-20:33/29	21:52 05:18-05:55/37
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	16:40	17:42	18:36	20:34 06:34-07:22/48	21:26 20:06-20:32/26	21:53 05:19-05:55/36
26	08:15	07:15	06:08	05:54 19:51-20:08/17	04:59 20:39-20:56/17 05:31-05:42/11	04:44 20:43-21:09/26
	16:42	17:44	18:38	20:36 06:34-07:21/47	21:28 20:06-20:32/26	21:53 05:20-05:56/36
27	08:14	07:13	06:05	05:51 19:51-20:10/19	04:58 20:38-20:57/19 05:30-05:43/13	04:44 20:42-21:09/27
	16:44	17:46	18:39	20:37 06:34-07:20/46	21:29 20:07-20:31/24	21:53 05:20-05:56/36
28	08:12	07:11	06:03 06:28-06:35/7	05:49 19:50-20:12/22	04:56 20:38-20:59/21 05:29-05:45/16	04:45 20:42-21:09/27
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29	08:11		06:00 18:16-18:19/3	05:47 19:49-20:13/24	04:55 20:38-21:00/22 05:28-05:45/17	04:45 20:43-21:10/27
	16:47		18:43 06:26-06:40/14	20:41 06:34-07:17/43	21:32 20:09-20:30/21	21:52 05:21-05:56/35
30	08:09		05:58 18:13-18:20/7	05:45 19:48-20:13/25	04:54 20:38-21:01/23 05:27-05:46/19	04:46 20:43-21:10/27
	16:49		18:45 06:23-06:41/18	20:43 06:34-07:15/41	21:33 20:10-20:30/20	21:52 05:22-05:57/35
31	08:08		06:55 19:11-19:22/11		04:53 20:38-21:02/24 05:26-05:47/21	
	16:51		19:47 07:21-07:44/23		21:34 20:10-20:29/19	
Sonnenscheinstunden	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 Kesdorf

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 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 19:29	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 19:26	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 19:24	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 19:21	07:52 18:09	07:52 16:10	08:33 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 19:19	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 19:16	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 19:14	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	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 19:09	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 19:06	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 19:04	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 19:01	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 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 Anzahl Minuten mit Schatten 1578	462 1837	384 831	330 0	259 0	232 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: ZusatzbelastungWEA: 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)

Sonnenuntergang (SS:MM)

Zeitpunkt (SS:MM) Schattenanfang

Zeitpunkt (SS:MM) Schattenende

Minuten mit Schatten

Projekt:
19-095-GBK-02

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

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 10 - WEA 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	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 16:45 15:59	08:09 15:59 08:11
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 16:43 15:58	08:11 15:58 08:12
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 16:41 15:58	08:12 15:58 08:14
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 16:39 15:57	08:14 15:57 08:15
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 16:37 15:56	08:15 15:56 08:17
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 16:35 15:56	08:17 15:56 08:18
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 16:33 15:55	08:18 15:55 08:19
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 16:31 15:55	08:19 15:55 08:21
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 16:29 15:54	08:21 15:54 08:22
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 16:28 15:54	08:22 15:54 08:23
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 16:26 15:53	08:23 15:53 08:24
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 16:24 15:53	08:24 15:53 08:25
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 16:22 15:53	08:25 15:53 08:26
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 16:21 15:53	08:26 15:53 08:27
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 16:19 15:53	08:27 15:53 08:28
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 16:18 15:53	08:28 15:53 08:29
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 16:16 15:53	08:29 15:53 08:30
18	05:05 20:24-21:01/37 21:38	05:56 19:16-19:17/1 20:43 06:27-06:30/3	06:51 07:20-07:27/7 19:29	07:46 18:15 16:14	07:46 16:14 15:53	08:30 15:53 08:31
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 16:13 15:53	08:31 15:53 08:31
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 16:12 15:54	08:31 15:54 08:32
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 16:10 15:54	08:32 15:54 08:33
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 16:09 15:54	08:33 15:54 08:33
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 16:08 15:55	08:33 15:55 08:34
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 16:06 15:56	08:34 15:56 08:34
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	08:00 16:05 15:56	08:34 15:56 08:35
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 18:02 16:04	08:02 16:04 15:57	08:35 15:57 08:35
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	08:04 18:04 16:03	08:04 16:03 15:58	08:35 15:58 08:35
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	08:05 18:05 16:02	08:05 16:02 15:58	08:35 15:58 08:35
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 18:06 16:01	08:06 16:01 15:59	08:35 15:59 08:35
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 18:07 16:00	08:07 16:00 16:00	08:35 16:00 08:35
31	05:24 06:01-06:26/25 21:19	06:19 18:54-19:32/38 20:13	07:14 18:58-07:17/19 18:58	08:08 18:08 16:01	08:08 16:01 16:01	08:35 16:01 08:35
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	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

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
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info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung 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

	Januar	Februar	März	April	Mal	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
22	08:21 16:34	07:24 16:57-17:10/13 17:36	06:18 17:52-18:04/12 18:30	06:03 18:21-19:43/82 20:28	05:04 19:32-20:23/51 21:21 05:47-06:25/38	04:43 19:43-20:22/39 21:52 06:07-06:10/3
23	08:19 16:36	07:22 16:54-17:11/17 17:38	06:15 17:49-18:08/19 18:32	06:00 18:22-19:43/81 20:30	05:03 19:32-20:22/50 21:23 05:46-06:24/38	04:43 19:43-20:23/39 21:52 06:08-06:11/3
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)	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang-Zeitpunkt (SS:MM) Schattenende/Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang-Zeitpunkt (SS:MM) Schattenende/Minuten mit 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
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 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung 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

	July	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	08:09 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	08:11 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	08:12 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	08:14 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	08:15 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	08:17 15:56
7	04:52 19:44-20:27/43 21:49 06:01-06:23/22	05:36 19:45-20:29/44 21:06 06:09-06:34/25	06:32 18:21-19:15/54 19:56 07:01-07:28/27	07:26 17:25-17:52/27 18:42 07:54-08:23/29	07:25 08:18 16:33 15:55	08:18 15:55
8	04:53 19:44-20:28/44 21:48 06:01-06:23/22	05:38 19:45-20:28/43 21:04 06:10-06:32/22	06:33 18:20-19:13/53 19:54 07:02-07:27/25	07:27 17:24-17:53/29 18:39 07:56-08:24/28	07:27 08:19 16:31 15:55	08:19 15:55
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	08:21 15:54
10	04:55 19:44-20:29/45 21:47 06:00-06:25/25	05:42 19:46-20:26/40 06:14-06:31/17 21:00 18:47-19:05/18	06:37 18:22-19:11/49 19:49 07:06-07:27/21	07:31 17:23-17:54/31 18:34 08:00-08:25/25	07:31 08:22 16:28 15:54	08:22 15:54
11	04:56 19:44-20:29/45 21:46 06:00-06:26/26	05:43 19:47-20:25/38 06:15-06:29/14 20:58 18:44-19:08/24	06:39 18:22-19:09/47 19:46 07:08-07:27/19	07:33 17:22-17:54/32 18:32 08:02-08:26/24	07:33 08:23 16:26 15:54	08:23 15:54
12	04:57 19:43-20:30/47 21:45 05:59-06:27/28	05:45 19:33-19:34/1 18:42-19:11/29 20:56 19:49-20:24/35 06:17-06:28/11	06:41 18:23-19:08/45 19:44 07:09-07:25/16	07:35 17:22-17:54/32 18:30 08:04-08:26/22	07:35 08:24 16:24 15:53	08:24 15:53
13	04:58 19:43-20:30/47 21:44 05:59-06:28/29	05:47 19:27-19:39/12 18:39-19:12/33 20:54 19:49-20:22/33 06:18-06:25/7	06:42 18:24-19:06/42 19:41 07:11-07:25/14	07:37 17:22-17:53/31 18:27 08:06-08:25/19	07:37 08:25 16:22 15:53	08:25 15:53
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	08:26 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	08:27 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	08:28 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	08:29 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	08:30 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	08:31 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	08:31 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	08:32 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	08:33 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	08:33 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	08:34 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	08:34 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	08:34 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	08:35 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	08:35 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	08:35 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	08:35 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	 	07:11 16:47	 16:01	08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	2396	2631	1495	895	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 Keskorf

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung 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

	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 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 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 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 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 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 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 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 16:47	08:42-09:01/19	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 16:49	08:40-09:01/21	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 16:51	08:38-09:01/23	06:55 18:22-18:49/27 19:47 07:21-07:58/37		04:53 21:34	
	Sonnenscheinstunden 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 Kesdaorf

Lizenzierter Anwender:

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

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung 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

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

Projekt:

19-095-GBK-02

Beschreibung:

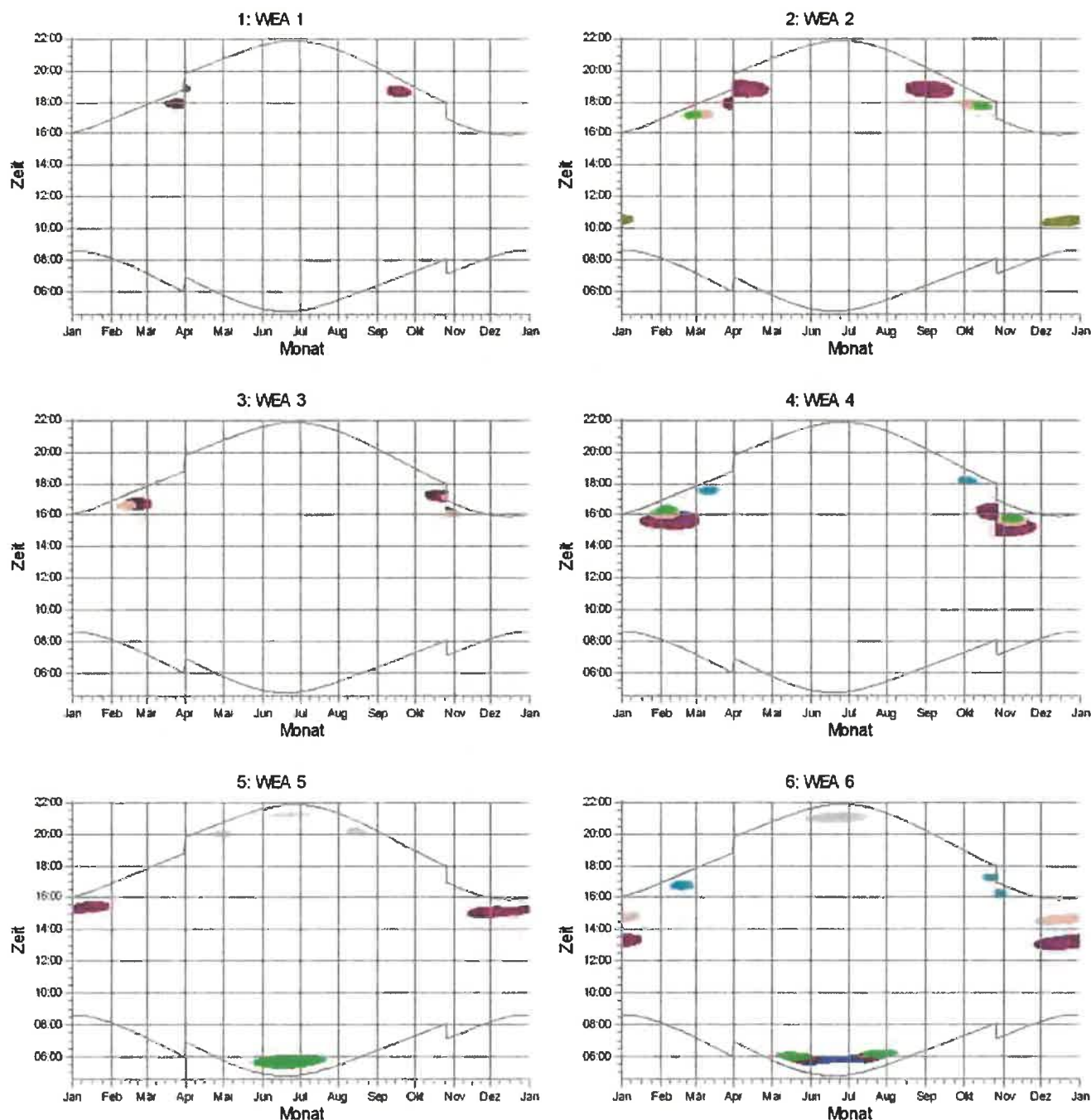
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

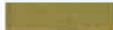
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender pro WEA

Berechnung: Zusatzbelastung



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

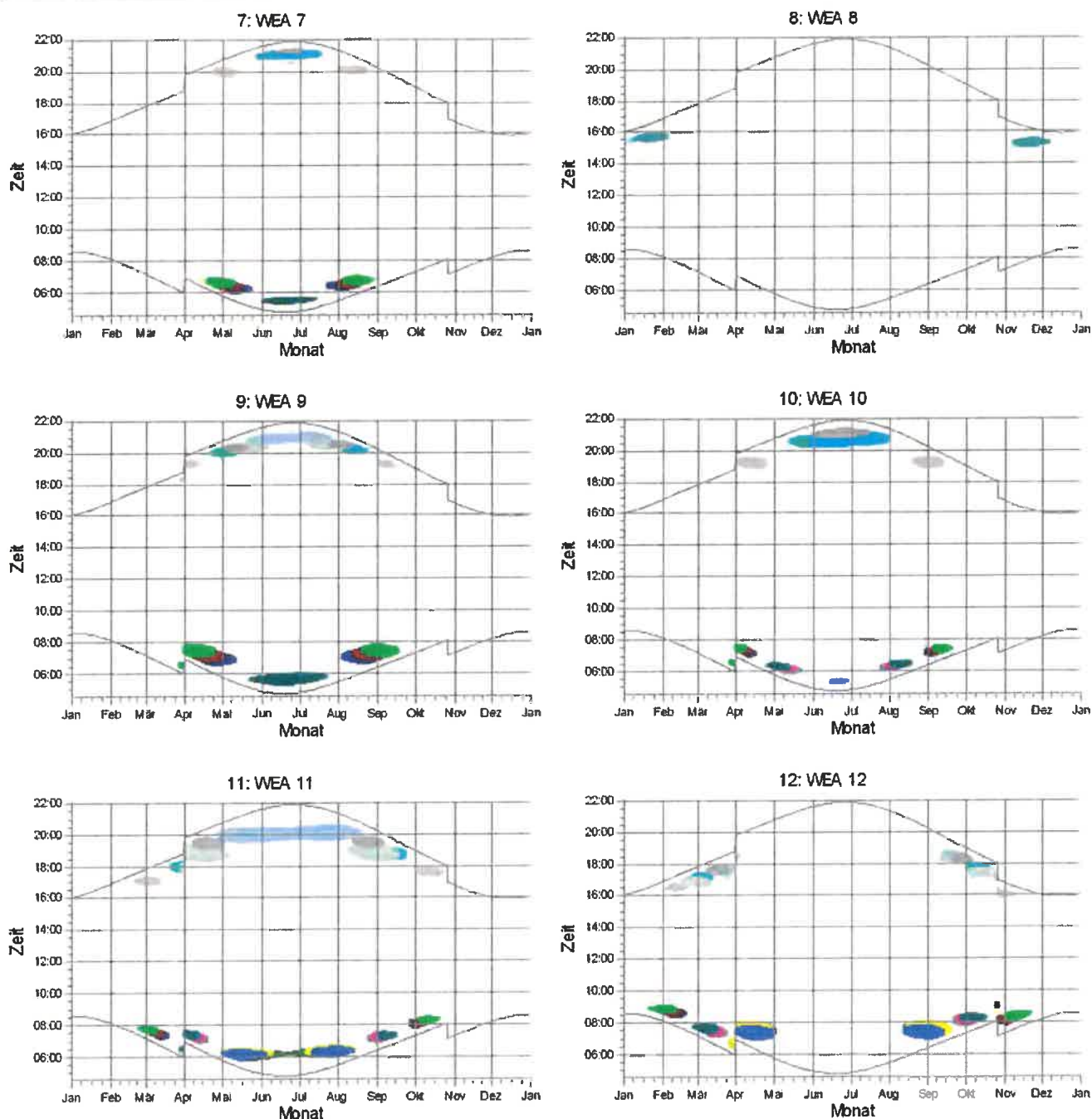
Projekt:
19-095-GBK-02

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

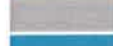
Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

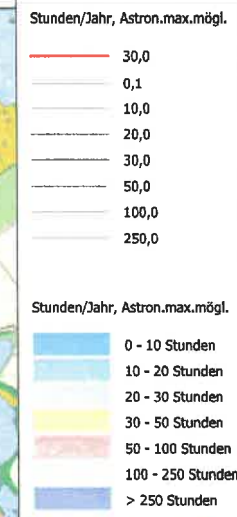
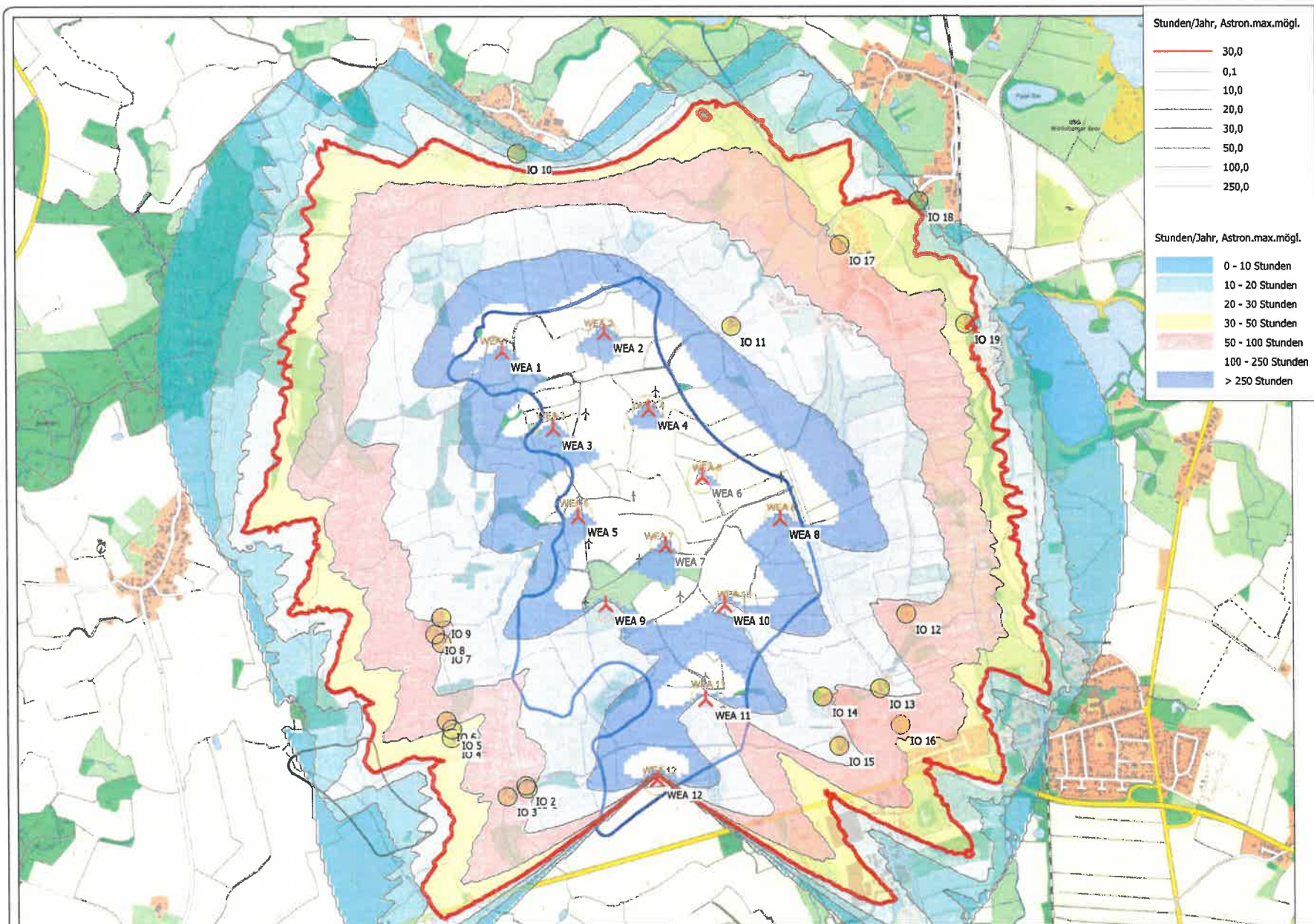
SHADOW - Grafischer Kalender pro WEA

Berechnung: Zusatzbelastung



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

SHADOW - Karte
Berechnung:
Zusatzbelastung

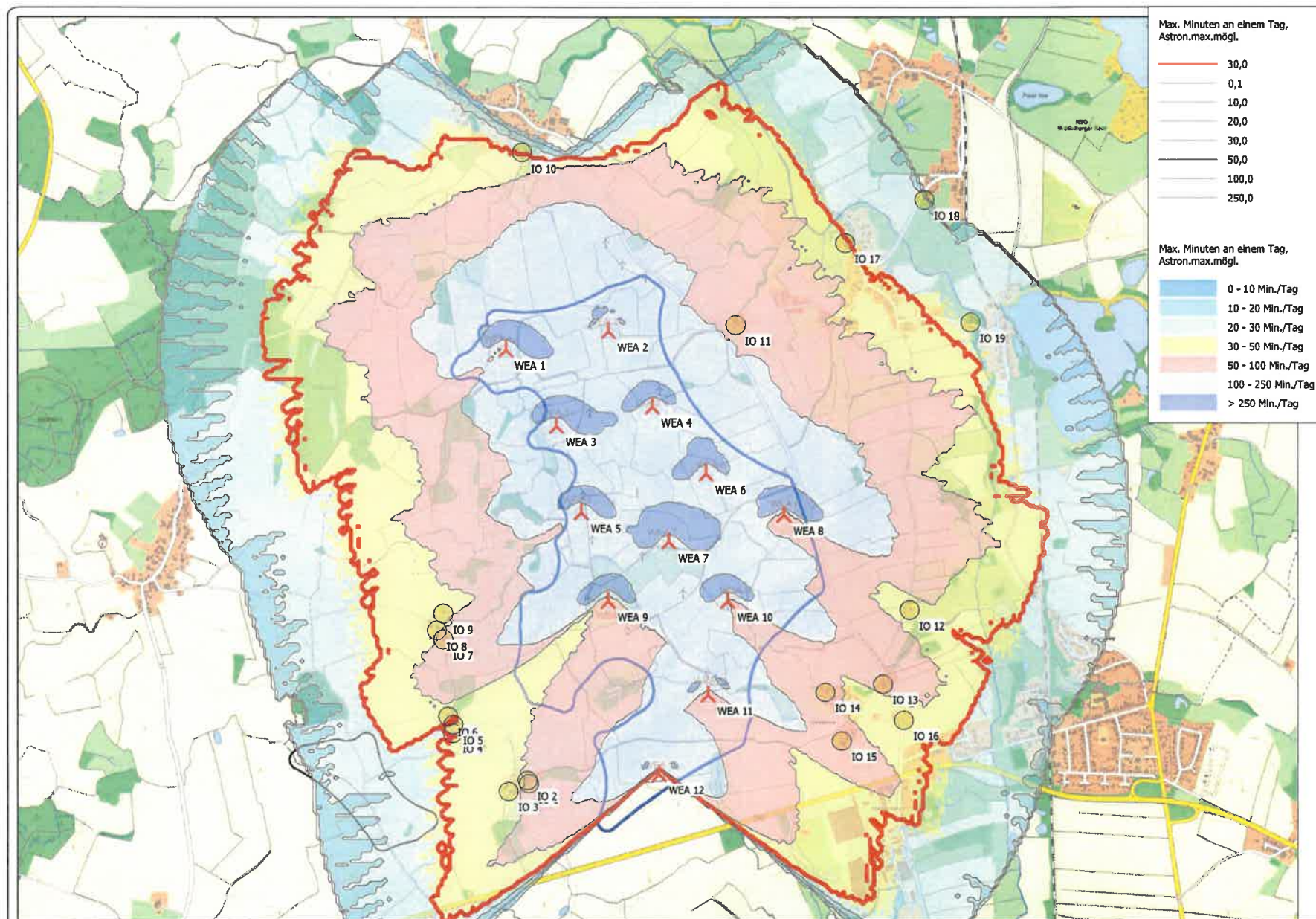
Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
23.08.2019 08:46/3.2.744

Neue WEA

Schattenrezeptor

Karte: Lageplan_TK25, Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175

Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)



Neue WEA

Schattenrezeptor

Karte: Lageplan_TK25 , Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175

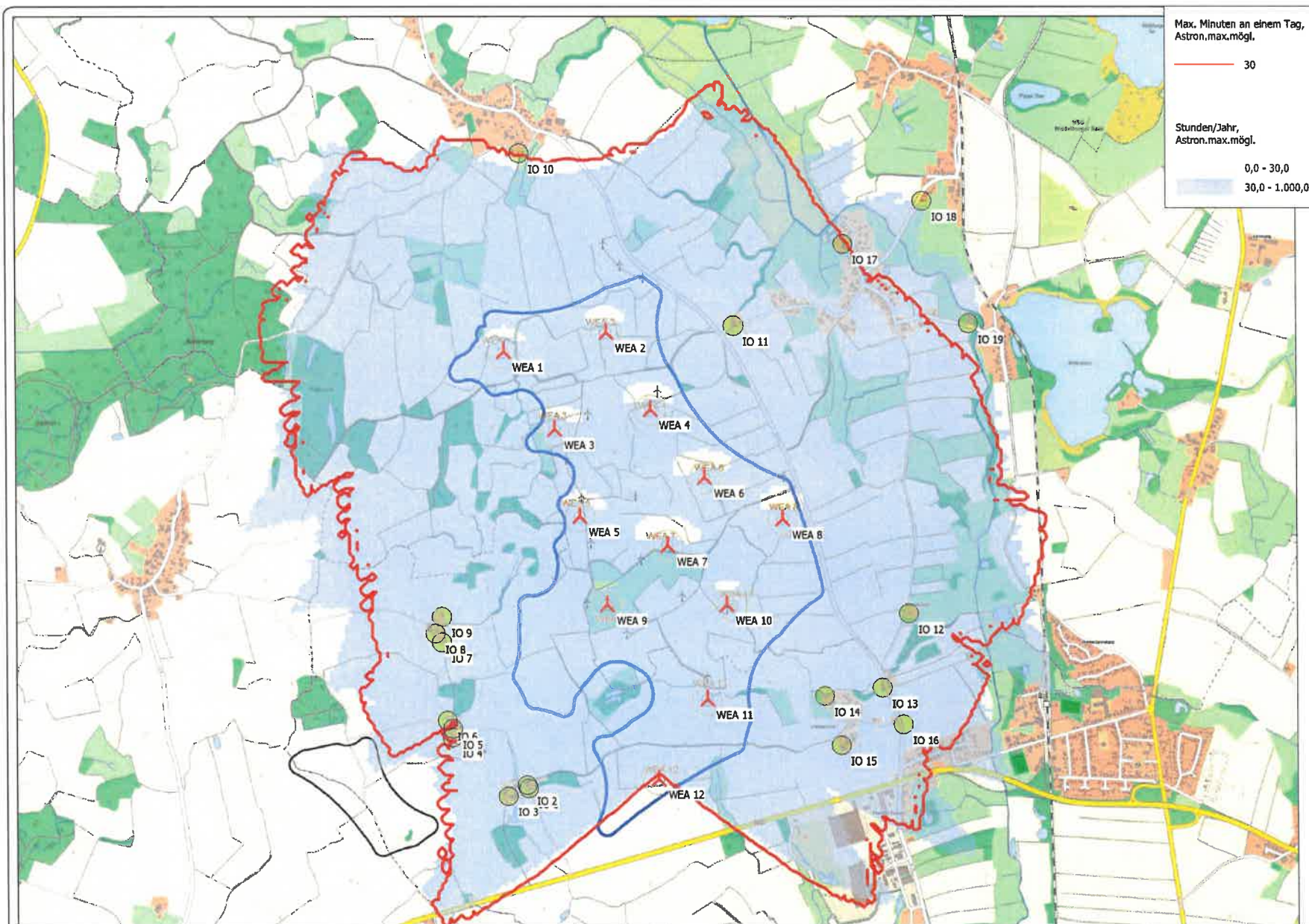
Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Projekt:
19-095-GBK-02

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

**SHADOW -
Karte**
Berechnung:
Zusatzbelastung

Überreichte Anwender:
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+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
23.08.2019 08:54/3.2.744



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

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

**SHADOW -
Karte**
Berechnung:
Zusatzbelastung

Liegender Anwender:
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+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
23.08.2019 09:03/3.2.744

▲ Neue WEA

● Schattenrezeptor

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

Anlage 4
Berechnungsergebnisse Gesamtbelastung

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 - Hauptergebnis

Berechnung: Gesamtbelastung

Voraussetzungen für Berechnung des Schattenwurfs

Beschattungsbereich der WEA

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

Siehe WEA-Tabelle

Minimale relevante Sonnenhöhe über Horizont

3 °

Tage zwischen Berechnungen

1 Tag(e)

Berechnungszeitsprung

1 Minuten

Die dargestellten Zeiten sind die astronomisch maximal mögliche

Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

Verwendete Höhenlinien: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Hindernisse in Berechnung verwendet

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

Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:

UTM (north)-ETRS89 Zone: 32

WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ		Typ	Nenn- leistung	Rotor- durch- messer	Naben- höhe	Schattendaten	
					Ak- tu- ell	Hersteller					Beschatt.- Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
1	606.556	5.991.795	52,4	WEA 1	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
2	607.097	5.991.895	50,0	WEA 2	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
3	606.825	5.991.392	50,0	WEA 3	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
4	607.330	5.991.494	50,0	WEA 4	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
5	606.955	5.990.935	50,0	WEA 5	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
6	607.614	5.991.141	50,0	WEA 6	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
7	607.418	5.990.784	45,2	WEA 7	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
8	608.025	5.990.923	40,7	WEA 8	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
9	607.098	5.990.474	44,3	WEA 9	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
10	607.729	5.990.474	39,9	WEA 10	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
11	607.625	5.989.978	36,8	WEA 11	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
12	607.367	5.989.560	40,0	WEA 12	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
13	605.812	5.989.324	50,5	WEA VB - SWT-...	Ja	Siemens	SWT-3.2-113 2A-3.200	3.200	113,0	127,5	1.685	0,0

Schattenrezeptor-Eingabe

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

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 - Hauptergebnis

Berechnung: Gesamtbelastung

Berechnungsergebnisse

Schattenrezeptor

astron. max. mögl. Beschattungsdauer

Nr.	Name	Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
A IO 1		103:25	204	0:53
B IO 2		96:38	181	0:52
C IO 3		81:51	174	0:48
D IO 4		70:34	200	0:41
E IO 5		77:47	218	0:39
F IO 6		93:35	241	0:39
G IO 7		103:45	265	0:56
H IO 8		89:02	237	0:48
I IO 9		106:42	249	0:43
J IO 10		15:12	39	0:29
K IO 11		199:16	231	1:30
L IO 12		86:30	213	0:41
M IO 13		109:54	205	1:00
N IO 14		117:15	227	0:59
O IO 15		129:30	160	1:14
P IO 16		63:09	169	0:36
Q IO 17		56:29	143	0:43
R IO 18		13:35	57	0:21
S IO 19		34:41	118	0:28

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal [h/a]
1	WEA 1	13:42
2	WEA 2	80:02
3	WEA 3	21:35
4	WEA 4	88:34
5	WEA 5	72:20
6	WEA 6	107:03
7	WEA 7	75:11
8	WEA 8	18:58
9	WEA 9	158:52
10	WEA 10	114:41
11	WEA 11	258:50
12	WEA 12	172:32
13	WEA VB - SWT-3.2-113	95:45

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

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: A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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
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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:** A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47	06:04 (11)	05:26	05:59 (11)	06:21	07:03 (12)	07:15	18:06 (13)	07:13	08:09	
	21:52	13	06:17 (11)	21:17	33	06:32 (11)	20:11	53	07:56 (12)	18:56	13
2	04:47	06:04 (11)	05:28	06:01 (11)	06:23	07:03 (12)	07:17	18:19 (13)	16:45	15:59	
	21:52	14	06:18 (11)	21:15	31	06:32 (11)	20:08	52	07:55 (12)	18:54	4
3	04:48	06:04 (11)	05:30	06:02 (11)	06:25	07:03 (12)	07:18	18:14 (13)	16:43	15:58	
	21:51	15	06:19 (11)	21:14	29	06:31 (11)	20:06	52	07:55 (12)	18:51	
4	04:49	06:03 (11)	05:31	06:04 (11)	06:26	07:03 (12)	07:20		07:19	18:49	
	21:51	18	06:21 (11)	21:12	27	06:31 (11)	20:03	52	07:55 (12)	18:49	
5	04:50	06:02 (11)	05:33	06:05 (11)	06:28	07:03 (12)	07:22		07:21	18:47	
	21:50	19	06:21 (11)	21:10	25	06:30 (11)	20:01	50	07:53 (12)	18:47	
6	04:51	06:02 (11)	05:35	06:07 (11)	06:30	07:03 (12)	07:24		07:23	18:47	
	21:50	20	06:22 (11)	21:08	22	06:29 (11)	19:58	50	07:53 (12)	18:44	
7	04:52	06:01 (11)	05:36	06:09 (11)	06:32	07:04 (12)	07:26		07:25	18:48	
	21:49	22	06:23 (11)	21:06	20	06:29 (11)	19:56	48	07:52 (12)	18:42	
8	04:53	06:01 (11)	05:38	06:10 (11)	06:33	07:04 (12)	07:28		07:27	18:42	
	21:48	22	06:23 (11)	21:04	17	06:27 (11)	19:54	46	07:50 (12)	18:39	
9	04:54	06:01 (11)	05:40	06:12 (11)	06:35	07:04 (12)	07:29		07:29	18:39	
	21:48	23	06:24 (11)	21:02	14	06:26 (11)	19:51	45	07:49 (12)	18:37	
10	04:55	06:00 (11)	05:42	06:14 (11)	06:37	07:06 (12)	07:31		07:31	18:37	
	21:47	25	06:25 (11)	21:00	11	06:25 (11)	19:49	42	07:48 (12)	18:34	
11	04:56	06:00 (11)	05:43	06:15 (11)	06:39	07:08 (12)	07:33		07:33	18:33	
	21:46	26	06:26 (11)	20:58	7	06:22 (11)	19:46	39	07:47 (12)	18:32	
12	04:57	05:59 (11)	05:45	06:17 (11)	06:41	07:09 (12)	07:35		07:35	18:32	
	21:45	27	06:26 (11)	20:56	17	07:41 (12)	19:44	36	07:45 (12)	18:30	
13	04:58	05:59 (11)	05:47	07:23 (12)	06:42	07:11 (12)	07:37		07:37	18:30	
	21:44	28	06:27 (11)	20:54	20	07:43 (12)	19:41	32	07:43 (12)	18:27	
14	04:59	05:58 (11)	05:49	07:21 (12)	06:44	07:13 (12)	07:39		07:39	18:26	
	21:43	29	06:27 (11)	20:52	25	07:46 (12)	19:39	39	18:25 (13)	18:25	
15	05:01	05:59 (11)	05:51	07:19 (12)	06:46	07:14 (12)	07:41		07:41	18:25	
	21:42	30	06:29 (11)	20:50	29	07:48 (12)	19:36	39	18:26 (13)	18:23	
16	05:02	05:58 (11)	05:52	07:16 (12)	06:48	07:16 (12)	07:42		07:43	18:23	
	21:41	31	06:29 (11)	20:47	33	07:49 (12)	19:34	38	18:28 (13)	18:20	
17	05:03	05:58 (11)	05:54	07:15 (12)	06:49	07:19 (12)	07:44		07:44	18:20	
	21:40	31	06:29 (11)	20:45	36	07:51 (12)	19:31	33	18:29 (13)	18:18	
18	05:05	05:57 (11)	05:56	07:14 (12)	06:51	18:05 (13)	07:46		07:46	18:18	
	21:39	33	06:30 (11)	20:43	38	07:52 (12)	19:29	25	18:30 (13)	18:16	
19	05:06	05:57 (11)	05:58	07:12 (12)	06:53	18:03 (13)	07:48		07:48	18:16	
	21:37	33	06:30 (11)	20:41	41	07:53 (12)	19:26	27	18:30 (13)	18:13	
20	05:07	05:57 (11)	05:59	07:11 (12)	06:55	18:02 (13)	07:50		07:50	18:13	
	21:36	34	06:31 (11)	20:39	43	07:54 (12)	19:24	28	18:30 (13)	18:11	
21	05:09	05:57 (11)	06:01	07:10 (12)	06:57	18:02 (13)	07:52		07:52	18:11	
	21:35	34	06:31 (11)	20:36	45	07:55 (12)	19:21	28	18:30 (13)	18:09	
22	05:10	05:56 (11)	06:03	07:10 (12)	06:58	18:01 (13)	07:54		07:54	18:09	
	21:33	35	06:31 (11)	20:34	46	07:56 (12)	19:19	30	18:31 (13)	18:06	
23	05:12	05:57 (11)	06:05	07:08 (12)	07:00	18:01 (13)	07:56		07:55	18:06	
	21:32	35	06:32 (11)	20:32	48	07:56 (12)	19:16	29	18:30 (13)	18:04	
24	05:13	05:56 (11)	06:07	07:08 (12)	07:02	18:00 (13)	07:58		07:57	18:04	
	21:30	36	06:32 (11)	20:29	48	07:56 (12)	19:14	29	18:29 (13)	18:02	
25	05:15	05:57 (11)	06:08	07:07 (12)	07:04	18:00 (13)	08:00		07:59	18:02	
	21:29	36	06:33 (11)	20:27	50	07:57 (12)	19:11	29	18:29 (13)	18:00	
26	05:16	05:56 (11)	06:10	07:06 (12)	07:06	18:01 (13)	08:02		08:01	18:00	
	21:27	36	06:32 (11)	20:25	51	07:57 (12)	19:09	27	18:28 (13)	17:58	
27	05:18	05:56 (11)	06:12	07:05 (12)	07:07	18:01 (13)	07:04		08:02	17:58	
	21:26	37	06:33 (11)	20:22	52	07:57 (12)	19:06	26	18:27 (13)	16:55	
28	05:20	05:56 (11)	06:14	07:05 (12)	07:09	18:02 (13)	07:06		08:04	17:55	
	21:24	36	06:32 (11)	20:20	52	07:57 (12)	19:04	24	18:26 (13)	16:53	
29	05:21	05:57 (11)	06:16	07:04 (12)	07:11	18:02 (13)	07:07		08:06	17:53	
	21:22	36	06:33 (11)	20:18	52	07:56 (12)	19:01	22	18:24 (13)	16:51	
30	05:23	05:56 (11)	06:17	07:04 (12)	07:13	18:03 (13)	07:09		08:07	17:53	
	21:21	36	06:32 (11)	20:15	53	07:57 (12)	18:59	19	18:22 (13)	16:49	
31	05:25	05:58 (11)	06:19	07:04 (12)			07:11			16:47	
	21:19	35	06:33 (11)	20:13	53	07:57 (12)				16:01	
Sonnenscheinstunden		514	462	384	330	259	232				
astr.max.mögl.Beschattung		885	1068	1089	17						

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: B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	07:18 (12) 20:45	06:11 (11) 21:36
2	08:35 16:04	08:04 16:55	07:06 17:52	06:50 19:51	07:16 (12) 20:47	06:09 (11) 21:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:53	07:15 (12) 20:48	06:07 (11) 21:38
4	08:35 16:06	08:01 16:59	07:01 17:56	06:46 19:54	07:14 (12) 20:50	06:05 (11) 21:39
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:56	07:13 (12) 20:52	06:03 (11) 21:41
6	08:34 16:08	07:57 17:04	06:57 18:00	06:41 19:58	07:12 (12) 20:54	06:01 (11) 21:42
7	08:34 16:10	07:55 17:06	06:54 18:01	06:38 20:00	07:11 (12) 20:56	05:59 (11) 21:43
8	08:33 16:11	07:53 17:08	06:52 18:03	06:36 20:02	07:10 (12) 20:58	05:57 (11) 21:44
9	08:33 16:13	07:51 17:10	06:49 18:05	06:33 20:04	07:10 (12) 20:59	05:56 (11) 21:45
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 20:06	07:10 (12) 21:01	05:54 (11) 21:46
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 20:08	07:09 (12) 21:03	05:52 (11) 21:47
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 20:09	07:09 (12) 21:05	05:51 (11) 21:48
13	08:30 16:19	07:43 17:18	06:40 18:13	06:24 20:11	07:09 (12) 21:06	05:49 (11) 21:49
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 20:13	07:08 (12) 21:08	05:49 (11) 21:50
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 20:15	07:08 (12) 21:10	05:50 (11) 21:51
16	08:27 16:24	07:37 17:24	06:32 18:19	06:17 20:17	07:09 (12) 21:12	05:49 (11) 21:52
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 20:19	07:08 (12) 21:13	05:50 (11) 21:53
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 20:21	07:09 (12) 21:15	05:49 (11) 21:54
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 20:22	07:09 (12) 21:17	05:50 (11) 21:55
20	08:23 16:31	07:29 17:32	06:23 18:26	06:07 20:24	07:10 (12) 21:18	05:50 (11) 21:56
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 20:26	07:11 (12) 21:20	05:50 (11) 21:57
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 20:28	07:11 (12) 21:21	05:51 (11) 21:58
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 20:30	07:12 (12) 21:23	05:51 (11) 21:59
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 20:32	07:13 (12) 21:25	05:51 (11) 22:00
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 20:34	07:14 (12) 21:26	05:52 (11) 22:01
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 20:36	07:16 (12) 21:27	05:53 (11) 22:02
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 20:37	07:18 (12) 21:29	05:53 (11) 22:03
28	08:12 16:46	07:11 17:48	06:03 18:41	05:49 20:39	07:20 (12) 21:30	05:54 (11) 22:04
29	08:11 16:48		06:00 18:43	05:47 20:41	07:22 (12) 21:32	05:55 (11) 22:05
30	08:09 16:49		05:58 18:45	05:45 20:43	07:23 (12) 21:33	05:55 (11) 22:06
31	08:08 16:51		06:55 19:47	07:21 (12) 20:43	06:13 (11) 21:34	05:56 (11) 22:07
Sonnenscheinstunden		248	271	365	419	494
astr. max. mögl. Beschattung				588	1268	884

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:** B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47		05:26	06:00 (11)	06:21	07:08 (12)	07:15	17:58 (13)	07:13	08:09	
	21:52		21:17	36	06:36 (11)	20:11	52	08:00 (12)	18:56	21	18:19 (13)
2	04:47		05:28		06:01 (11)	06:23		07:08 (12)	07:17		18:00 (13)
	21:52		21:15	35	06:36 (11)	20:08	52	08:00 (12)	18:54	17	18:17 (13)
3	04:48		05:30		06:02 (11)	06:25		07:08 (12)	07:18		18:03 (13)
	21:51		21:14	33	06:35 (11)	20:06	52	08:00 (12)	18:51	10	18:13 (13)
4	04:49		05:31		06:04 (11)	06:26		07:08 (12)	07:20		07:19
	21:51		21:12	31	06:35 (11)	20:03	52	08:00 (12)	18:49		16:39
5	04:50		05:33		06:05 (11)	06:28		07:07 (12)	07:22		07:21
	21:50	6	06:18 (11)	21:10	29	06:34 (11)	20:01	51	07:58 (12)	18:47	16:37
6	04:51		05:35		06:07 (11)	06:30		07:07 (12)	07:24		07:23
	21:50	10	06:20 (11)	21:08	27	06:34 (11)	19:58	51	07:58 (12)	18:44	16:35
7	04:52		05:36		06:09 (11)	06:32		07:07 (12)	07:26		07:25
	21:49	13	06:22 (11)	21:06	25	06:34 (11)	19:56	51	07:58 (12)	18:42	16:33
8	04:53		05:38		06:10 (11)	06:33		07:07 (12)	07:28		07:27
	21:48	15	06:23 (11)	21:04	22	06:32 (11)	19:54	49	07:56 (12)	18:39	16:31
9	04:54		05:40		06:12 (11)	06:35		07:07 (12)	07:29		07:29
	21:48	16	06:24 (11)	21:02	20	06:32 (11)	19:51	48	07:55 (12)	18:37	16:29
10	04:55		05:42		06:14 (11)	06:37		07:08 (12)	07:31		07:31
	21:47	18	06:25 (11)	21:00	17	06:31 (11)	19:49	47	07:55 (12)	18:34	16:28
11	04:56		05:43		06:15 (11)	06:39		07:09 (12)	07:33		07:33
	21:46	20	06:26 (11)	20:58	14	06:29 (11)	19:46	45	07:54 (12)	18:32	16:26
12	04:57		05:45		06:17 (11)	06:41		07:09 (12)	07:35		07:35
	21:45	22	06:27 (11)	20:56	11	06:28 (11)	19:44	43	07:52 (12)	18:30	16:24
13	04:58		05:47		06:18 (11)	06:42		07:11 (12)	07:37		07:37
	21:44	23	06:28 (11)	20:54	7	06:25 (11)	19:41	39	07:50 (12)	18:27	16:23
14	04:59		05:49		06:20 (11)	06:44		07:13 (12)	07:39		07:39
	21:43	25	06:29 (11)	20:52	2	06:22 (11)	19:39	36	07:49 (12)	18:25	16:21
15	05:01		05:51		07:31 (12)	06:46		07:14 (12)	07:41		07:41
	21:42	26	06:30 (11)	20:50	14	07:45 (12)	19:36	37	18:17 (13)	18:23	16:19
16	05:02		05:52		07:27 (12)	06:48		07:16 (12)	07:42		07:43
	21:41	27	06:31 (11)	20:47	20	07:47 (12)	19:34	42	18:21 (13)	18:20	16:18
17	05:03		05:54		07:25 (12)	06:49		07:18 (12)	07:44		07:44
	21:40	28	06:31 (11)	20:45	25	07:50 (12)	19:31	42	18:23 (13)	18:18	16:16
18	05:05		05:56		07:23 (12)	06:51		07:20 (12)	07:46		07:46
	21:39	30	06:32 (11)	20:43	29	07:52 (12)	19:29	41	18:25 (13)	18:16	16:15
19	05:06		05:58		07:20 (12)	06:53		07:22 (12)	07:48		07:48
	21:37	30	06:32 (11)	20:41	33	07:53 (12)	19:26	35	18:25 (13)	18:13	16:13
20	05:07		05:59		07:19 (12)	06:55		17:59 (13)	07:50		07:50
	21:36	31	06:33 (11)	20:39	36	07:55 (12)	19:24	26	18:25 (13)	18:11	16:12
21	05:09		06:01		07:18 (12)	06:57		17:59 (13)	07:52		07:52
	21:35	33	06:34 (11)	20:36	38	07:56 (12)	19:21	27	18:26 (13)	18:09	16:10
22	05:10		06:03		07:17 (12)	06:58		17:58 (13)	07:54		07:54
	21:33	33	06:34 (11)	20:34	41	07:58 (12)	19:19	28	18:26 (13)	18:06	16:09
23	05:12		06:05		07:15 (12)	07:00		17:57 (13)	07:56		07:55
	21:32	34	06:35 (11)	20:32	43	07:58 (12)	19:16	29	18:26 (13)	18:04	16:08
24	05:13		06:07		07:14 (12)	07:02		17:56 (13)	07:58		07:57
	21:30	35	06:35 (11)	20:29	45	07:59 (12)	19:14	29	18:25 (13)	18:02	16:06
25	05:15		06:08		07:13 (12)	07:04		17:56 (13)	08:00		07:59
	21:29	35	06:36 (11)	20:27	47	08:00 (12)	19:11	29	18:25 (13)	18:00	16:05
26	05:16		06:10		07:12 (12)	07:06		17:56 (13)	08:02		08:01
	21:27	35	06:35 (11)	20:25	47	07:59 (12)	19:09	29	18:25 (13)	17:58	16:04
27	05:18		06:12		07:11 (12)	07:07		17:56 (13)	07:04		08:02
	21:26	36	06:36 (11)	20:22	49	08:00 (12)	19:06	28	18:24 (13)	16:55	16:03
28	05:20		06:14		07:11 (12)	07:09		17:57 (13)	07:06		08:04
	21:24	36	06:36 (11)	20:20	50	08:01 (12)	19:04	26	18:23 (13)	16:53	16:02
29	05:21		06:16		07:09 (12)	07:11		17:56 (13)	07:07		08:06
	21:22	36	06:36 (11)	20:18	51	08:00 (12)	19:01	25	18:21 (13)	16:51	16:01
30	05:23		06:17		07:09 (12)	07:13		17:57 (13)	07:09		08:07
	21:21	36	06:36 (11)	20:15	51	08:00 (12)	18:59	23	18:20 (13)	16:49	16:00
31	05:25		06:19		07:09 (12)				07:11		08:35
	21:19	36	06:36 (11)	20:13	52	08:01 (12)			16:47		16:01
Sonnenscheinstunden	514		462		384		330		259		232
astr.max.mögl.Beschattung	725		980		1164		48				

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)

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: C - IO 3

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:35	08:06	07:08	06:53	07:18 (12)	05:43	06:11 (11) 04:52
	16:02	16:53	17:50	19:49	18:42 (13)	20:45	12 07:21 (12) 21:36
2	08:35	08:04	07:06	06:50	07:16 (12)	05:41	06:09 (11) 04:51
	16:04	16:55	17:52	19:51	18:41 (13)	20:47	5 06:14 (11) 21:37
3	08:35	08:02	07:04	06:48	07:14 (12)	05:39	06:07 (11) 04:50
	16:05	16:57	17:54	19:53	18:40 (13)	20:48	9 06:16 (11) 21:38
4	08:35	08:01	07:01	06:46	07:11 (12)	05:37	06:05 (11) 04:49
	16:06	16:59	17:56	19:54	18:38 (13)	20:50	12 06:17 (11) 21:39
5	08:35	07:59	06:59	06:43	07:09 (12)	05:35	06:03 (11) 04:48
	16:07	17:01	17:58	19:56	18:35 (13)	20:52	15 06:18 (11) 21:41
6	08:34	07:57	06:57	06:41	07:06 (12)	05:33	06:01 (11) 04:48
	16:08	17:04	18:00	19:58	18:30 (13)	20:54	17 06:18 (11) 21:42
7	08:34	07:55	06:54	06:38	07:04 (12)	05:31	05:59 (11) 04:47
	16:10	17:06	18:01	20:00	07:41 (12)	20:56	20 06:19 (11) 21:43
8	08:33	07:53	06:52	06:36	07:01 (12)	05:29	05:57 (11) 04:46
	16:11	17:08	18:03	20:02	07:41 (12)	20:58	22 06:19 (11) 21:44
9	08:33	07:51	06:49	06:33	07:00 (12)	05:27	05:56 (11) 04:46
	16:13	17:10	18:05	20:04	07:42 (12)	20:59	24 06:20 (11) 21:45
10	08:32	07:49	06:47	06:31	06:59 (12)	05:25	05:54 (11) 04:45
	16:14	17:12	18:07	20:06	07:43 (12)	21:01	26 06:20 (11) 21:46
11	08:31	07:48	06:45	06:29	06:58 (12)	05:23	05:52 (11) 04:45
	16:15	17:14	18:09	20:08	07:42 (12)	21:03	28 06:20 (11) 21:46
12	08:31	07:46	06:42	06:26	06:58 (12)	05:21	05:51 (11) 04:44
	16:17	17:16	18:11	20:09	07:43 (12)	21:05	30 06:21 (11) 21:47
13	08:30	07:43	06:40	06:24	06:57 (12)	05:19	05:49 (11) 04:44
	16:19	17:18	18:13	20:11	07:43 (12)	21:06	32 06:21 (11) 21:48
14	08:29	07:41	06:37	06:21	06:56 (12)	05:18	05:48 (11) 04:43
	16:20	17:20	18:15	20:13	07:42 (12)	21:08	33 06:21 (11) 21:49
15	08:28	07:39	06:35	06:19	06:56 (12)	05:16	05:48 (11) 04:43
	16:22	17:22	18:17	20:15	07:42 (12)	21:10	33 06:21 (11) 21:49
16	08:27	07:37	06:32	06:17	06:56 (12)	05:14	05:48 (11) 04:43
	16:24	17:24	18:19	3 17:35 (13)	20:17	46 07:42 (12)	33 06:21 (11) 21:50
17	08:26	07:35	06:30	06:14	06:56 (12)	05:12	05:49 (11) 04:43
	16:25	17:26	18:21	15 17:41 (13)	20:19	45 07:41 (12)	32 06:21 (11) 21:50
18	08:25	07:33	06:27	06:12	06:56 (12)	05:11	05:48 (11) 04:43
	16:27	17:28	18:23	19 17:42 (13)	20:21	45 07:41 (12)	32 06:20 (11) 21:51
19	08:24	07:31	06:25	06:10	06:56 (12)	05:09	05:49 (11) 04:43
	16:29	17:30	18:24	23 17:44 (13)	20:22	44 07:40 (12)	31 06:20 (11) 21:51
20	08:23	07:29	06:23	06:07	06:57 (12)	05:08	05:49 (11) 04:43
	16:31	17:32	18:26	26 17:45 (13)	20:24	43 07:40 (12)	31 06:20 (11) 21:52
21	08:22	07:27	06:20	06:05	06:57 (12)	05:06	05:50 (11) 04:43
	16:32	17:34	18:28	28 17:46 (13)	20:26	42 07:39 (12)	30 06:20 (11) 21:52
22	08:21	07:24	06:18	06:03	06:57 (12)	05:05	05:50 (11) 04:43
	16:34	17:36	18:30	30 17:46 (13)	20:28	40 07:37 (12)	30 06:20 (11) 21:52
23	08:19	07:22	06:15	06:00	06:57 (12)	05:03	05:50 (11) 04:43
	16:36	17:38	18:32	31 17:47 (13)	20:30	40 07:37 (12)	28 06:18 (11) 21:52
24	08:18	07:20	06:13	05:58	06:58 (12)	05:02	05:51 (11) 04:43
	16:38	17:40	18:34	32 17:47 (13)	20:32	38 07:36 (12)	27 06:18 (11) 21:53
25	08:17	07:18	06:10	05:56	06:59 (12)	05:00	05:52 (11) 04:44
	16:40	17:42	18:36	33 17:47 (13)	20:34	35 07:34 (12)	26 06:18 (11) 21:53
26	08:15	07:15	06:08	05:54	07:00 (12)	04:59	05:53 (11) 04:44
	16:42	17:44	18:38	33 17:47 (13)	20:36	33 07:33 (12)	24 06:17 (11) 21:53
27	08:14	07:13	06:05	05:52	07:01 (12)	04:58	05:54 (11) 04:44
	16:44	17:46	18:39	33 17:47 (13)	20:37	31 07:32 (12)	23 06:17 (11) 21:53
28	08:12	07:11	06:03	05:49	07:03 (12)	04:57	05:54 (11) 04:45
	16:46	17:48	18:41	33 17:46 (13)	20:39	27 07:30 (12)	22 06:16 (11) 21:53
29	08:11		06:00	05:47	07:04 (12)	04:55	05:55 (11) 04:45
	16:48		18:43	32 17:46 (13)	20:41	24 07:28 (12)	21 06:16 (11) 21:52
30	08:09		05:58	05:45	07:07 (12)	04:54	05:56 (11) 04:46
	16:50		18:45	32 17:45 (13)	20:43	18 07:25 (12)	19 06:15 (11) 21:52
31	08:08		06:55	07:21 (12)		04:53	05:57 (11)
	16:51		19:47	36 18:44 (13)		21:34	17 06:14 (11)
Sonnenscheinstunden	248	271	365	419	494	511	60
astr.max.mögl.Beschattung				1206	744		

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: C - IO 3

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47	05:26	05:59 (11)	06:21	06:56 (12)	07:15
	21:52	21:17	32	06:31 (11)	20:11	46
2	04:47	05:28	06:01 (11)	06:23	06:57 (12)	07:17
	21:52	21:15	30	06:31 (11)	20:08	44
3	04:48	05:30	06:02 (11)	06:25	06:57 (12)	07:18
	21:51	21:14	29	06:31 (11)	20:06	44
4	04:49	05:31	06:04 (11)	06:26	06:57 (12)	07:20
	21:51	21:12	27	06:31 (11)	20:03	43
5	04:50	05:33	06:05 (11)	06:28	06:57 (12)	07:22
	21:50	21:10	25	06:30 (11)	20:01	42
6	04:51	05:35	06:07 (11)	06:30	06:59 (12)	07:24
	21:50	21:08	23	06:30 (11)	19:58	39
7	04:52	05:36	06:09 (11)	06:32	07:01 (12)	07:26
	21:49	21:06	20	06:29 (11)	19:56	36
8	04:53	05:38	06:10 (11)	06:33	07:02 (12)	07:28
	21:48	21:04	18	06:28 (11)	19:54	44
9	04:54	05:40	06:12 (11)	06:35	07:04 (12)	07:29
	21:48	21:02	15	06:27 (11)	19:51	47
10	04:55	05:42	06:14 (11)	06:37	07:06 (12)	07:31
	21:47	21:00	12	06:26 (11)	19:49	48
11	04:56	06:09 (11)	05:43	06:15 (11)	06:39	07:08 (12)
	21:46	06:17 (11)	20:58	9	06:24 (11)	19:46
12	04:57	06:08 (11)	05:45	06:17 (11)	06:41	07:09 (12)
	21:45	06:19 (11)	20:56	6	06:23 (11)	19:44
13	04:58	06:06 (11)	05:47	06:19 (11)	06:42	07:11 (12)
	21:44	06:21 (11)	20:54	12	07:29 (12)	19:41
14	04:59	06:05 (11)	05:49	07:15 (12)	06:44	18:05 (13)
	21:43	06:22 (11)	20:52	17	07:32 (12)	19:39
15	05:01	06:05 (11)	05:51	07:12 (12)	06:46	18:04 (13)
	21:42	06:24 (11)	20:50	23	07:35 (12)	19:36
16	05:02	06:04 (11)	05:52	07:10 (12)	06:48	18:03 (13)
	21:41	06:25 (11)	20:47	26	07:36 (12)	19:34
17	05:03	06:03 (11)	05:54	07:08 (12)	06:50	18:02 (13)
	21:40	06:25 (11)	20:45	30	07:38 (12)	19:31
18	05:05	06:02 (11)	05:56	07:07 (12)	06:51	18:02 (13)
	21:39	06:26 (11)	20:43	32	07:39 (12)	19:29
19	05:06	06:02 (11)	05:58	07:05 (12)	06:53	18:01 (13)
	21:37	06:26 (11)	20:41	35	07:40 (12)	19:26
20	05:07	06:02 (11)	05:59	07:04 (12)	06:55	18:01 (13)
	21:36	06:28 (11)	20:39	37	07:41 (12)	19:24
21	05:09	06:01 (11)	06:01	07:03 (12)	06:57	18:01 (13)
	21:35	06:28 (11)	20:36	39	07:42 (12)	19:21
22	05:10	06:01 (11)	06:03	07:02 (12)	06:58	18:01 (13)
	21:33	06:29 (11)	20:34	41	07:43 (12)	19:19
23	05:12	06:00 (11)	06:05	07:01 (12)	07:00	18:02 (13)
	21:32	06:30 (11)	20:32	42	07:43 (12)	19:16
24	05:13	06:00 (11)	06:07	07:00 (12)	07:02	18:02 (13)
	21:30	06:30 (11)	20:29	43	07:43 (12)	19:14
25	05:15	06:00 (11)	06:08	07:00 (12)	07:04	18:03 (13)
	21:29	06:31 (11)	20:27	44	07:44 (12)	19:11
26	05:16	05:59 (11)	06:10	06:59 (12)	07:06	18:04 (13)
	21:27	06:30 (11)	20:25	44	07:43 (12)	19:09
27	05:18	05:59 (11)	06:12	06:58 (12)	07:07	18:06 (13)
	21:26	06:31 (11)	20:22	46	07:44 (12)	19:06
28	05:20	05:59 (11)	06:14	06:58 (12)	07:09	18:08 (13)
	21:24	06:31 (11)	20:20	46	07:44 (12)	19:04
29	05:21	05:59 (11)	06:16	06:57 (12)	07:11	18:22 (13)
	21:22	06:32 (11)	20:18	46	07:43 (12)	19:01
30	05:23	05:59 (11)	06:17	06:57 (12)	07:13	18:22 (13)
	21:21	06:31 (11)	20:15	46	07:43 (12)	18:59
31	05:25	05:59 (11)	06:19	06:57 (12)		18:59
	21:19	06:32 (11)	20:13	46	07:43 (12)	
Sonnenscheinstunden	514	462	384	330	259	232
astr.max.mögl.Beschattung	526	941	995			

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

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

Projekt:

19-095-GBK-02

Beschreibung:

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

Berechnung: Gesamtbelastung Schattenrezeptor: D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Januar		Februar		März		April		Mai		Juni	
1	08:35	08:06	15:28 (13)	07:08	06:53	05:43	04:52				
	16:02	16:53	15:55 (13)	17:50	19:49	20:45	21:36				
2	08:35	08:04	15:26 (13)	07:06	06:50	05:41	04:51				
	16:04	16:55	15:56 (13)	17:52	19:51	20:47	21:37				
3	08:35	08:02	15:26 (13)	07:04	06:48	05:39	04:50				
	16:05	16:57	15:58 (13)	17:54	19:53	20:48	21:38				
4	08:35	08:01	15:26 (13)	07:01	06:46	05:37	04:49				
	16:06	16:59	15:59 (13)	17:56	19:54	20:50	21:39				
5	08:35	07:59	15:25 (13)	06:59	07:25 (12)	06:43	05:57 (10)				
	16:07	17:02	16:00 (13)	17:58	07:30 (12)	19:56	20:52				
6	08:34	07:57	15:24 (13)	06:57	07:23 (12)	06:41	05:53				
	16:08	17:04	16:01 (13)	18:00	07:33 (12)	19:58	20:54				
7	08:34	07:55	15:24 (13)	06:54	07:21 (12)	06:38	05:51				
	16:10	17:06	16:02 (13)	18:01	07:35 (12)	20:00	20:56				
8	08:33	07:53	15:24 (13)	06:52	07:18 (12)	06:36	05:49				
	16:11	17:08	16:02 (13)	18:03	07:35 (12)	20:02	20:58				
9	08:33	07:51	15:23 (13)	06:49	07:16 (12)	06:33	05:52				
	16:13	17:10	16:03 (13)	18:05	07:37 (12)	20:04	20:59				
10	08:32	07:49	15:22 (13)	06:47	07:13 (12)	06:31	05:54				
	16:14	17:12	16:02 (13)	18:07	07:37 (12)	20:06	21:01				
11	08:32	07:48	15:22 (13)	06:45	07:11 (12)	06:29	05:52				
	16:15	17:14	16:03 (13)	18:09	07:38 (12)	20:08	21:03				
12	08:31	07:46	15:22 (13)	06:42	07:08 (12)	06:26	05:51				
	16:17	17:16	16:03 (13)	18:11	07:37 (12)	20:09	21:05				
13	08:30	07:44	15:22 (13)	06:40	07:06 (12)	06:24	05:50				
	16:19	17:18	16:03 (13)	18:13	07:38 (12)	20:11	21:06				
14	08:29	07:41	15:23 (13)	06:37	07:04 (12)	06:21	05:52				
	16:20	17:20	16:03 (13)	18:15	07:37 (12)	20:13	21:08				
15	08:28	07:39	15:23 (13)	06:35	07:05 (12)	06:19	05:53				
	16:22	17:22	16:03 (13)	18:17	07:37 (12)	20:15	21:10				
16	08:27	07:37	15:23 (13)	06:32	07:04 (12)	06:17	05:54				
	16:24	17:24	16:02 (13)	18:19	07:36 (12)	20:17	21:12				
17	08:26	07:35	15:23 (13)	06:30	07:05 (12)	06:14	05:55				
	16:25	17:26	16:02 (13)	18:21	07:36 (12)	20:19	21:13				
18	08:25	07:33	15:24 (13)	06:27	07:04 (12)	06:12	05:56				
	16:27	17:28	16:02 (13)	18:23	07:35 (12)	20:21	21:15				
19	08:24	07:31	15:25 (13)	06:25	07:05 (12)	06:10	05:58				
	16:29	17:30	16:01 (13)	18:24	07:34 (12)	20:23	21:17				
20	08:23	07:29	15:25 (13)	06:23	07:05 (12)	06:07	05:59				
	16:31	17:32	16:00 (13)	18:26	07:32 (12)	20:24	21:18				
21	08:22	07:27	15:26 (13)	06:20	07:07 (12)	06:05	05:59				
	16:32	17:34	15:59 (13)	18:28	07:31 (12)	20:26	21:20				
22	08:21	07:24	15:28 (13)	06:18	07:07 (12)	06:03	05:05				
	16:34	17:36	15:58 (13)	18:30	07:29 (12)	20:28	21:21				
23	08:19	07:22	15:29 (13)	06:15	07:10 (12)	06:00	05:03				
	16:36	17:38	15:56 (13)	18:32	07:27 (12)	20:30	21:23				
24	08:18	07:20	15:31 (13)	06:13	07:12 (12)	05:58	05:02				
	16:38	17:40	15:54 (13)	18:34	07:23 (12)	20:32	21:25				
25	08:17	07:18	15:34 (13)	06:10	05:56	05:56	05:00				
	16:40	17:42	15:52 (13)	18:36	05:54	20:34	21:26				
26	08:15	07:15	15:37 (13)	06:08	05:54	20:36	21:28				
	16:42	17:44	15:47 (13)	18:38	05:52	20:37	21:29				
27	08:14	07:13	06:05	18:40	05:49	20:39	21:30				
	16:44	17:46	06:03	18:41	05:47	20:41	21:32				
28	08:12	15:36 (13)	07:11	18:41	05:45	20:43	21:33				
	16:46	15:47 (13)	17:48	06:00	05:44	20:44	21:34				
29	08:11	15:33 (13)	06:00	18:43	05:42	20:46	21:35				
	16:48	15:50 (13)	05:58	18:45	05:41	20:47	21:36				
30	08:09	15:31 (13)	05:58	18:45	05:40	20:48	21:37				
	16:50	15:52 (13)	06:55	19:47	05:39	20:49	21:38				
31	08:08	15:29 (13)	06:55	19:47	05:38	20:50	21:39				
	16:51	15:54 (13)	19:47	05:37	05:37	20:51	21:40				
Sonnenscheinstunden		248									
astr.max.mögl.Beschattung		74									
			271								
			881								
				365							
					468						
						419					
							297				
								293			
									511		
										168	

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

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

Berechnung: Gesamtbelastung Schattenrezeptor: D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

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

	Juli		August		September		Oktober		November		Dezember					
1	04:47		05:22 (9)	05:26	06:01 (10)	06:21	06:51 (11)	07:15	07:44 (12)	07:13	14:52 (13)	08:09				
	21:52	6	05:28 (9)	21:17	22	06:23 (10)	20:11	26	07:17 (11)	18:56	33	08:17 (12)	16:45	40	15:32 (13)	15:59
2	04:47		05:23 (9)	05:28	06:01 (10)	06:23	06:52 (11)	07:17	07:45 (12)	07:15	14:52 (13)	08:11				
	21:52	5	05:28 (9)	21:15	23	06:24 (10)	20:08	26	07:18 (11)	18:54	32	08:17 (12)	16:43	40	15:32 (13)	15:58
3	04:48		05:24 (9)	05:30	06:02 (10)	06:25	06:54 (11)	07:18	07:47 (12)	07:17	14:52 (13)	08:12				
	21:51	3	05:27 (9)	21:14	21	06:23 (10)	20:06	24	07:18 (11)	18:51	29	08:16 (12)	16:41	40	15:32 (13)	15:58
4	04:49		05:25 (9)	05:31	06:04 (10)	06:26	06:56 (11)	07:20	07:49 (12)	07:19	14:52 (13)	08:14				
	21:51	2	05:27 (9)	21:12	20	06:24 (10)	20:03	21	07:17 (11)	18:49	26	08:15 (12)	16:39	39	15:31 (13)	15:57
5	04:50			05:33	06:06 (10)	06:28	06:57 (11)	07:22	07:51 (12)	07:21	14:53 (13)	08:15				
	21:50			21:10	18	06:24 (10)	20:01	19	07:16 (11)	18:47	24	08:15 (12)	16:37	39	15:32 (13)	15:56
6	04:51			05:35	06:07 (10)	06:30	06:59 (11)	07:24	07:52 (12)	07:23	14:54 (13)	08:17				
	21:50			21:08	16	06:23 (10)	19:58	17	07:16 (11)	18:44	21	08:13 (12)	16:35	37	15:31 (13)	15:56
7	04:52			05:36	06:09 (10)	06:32	07:01 (11)	07:26	07:54 (12)	07:25	14:54 (13)	08:18				
	21:49			21:06	14	06:23 (10)	19:56	14	07:15 (11)	18:42	17	08:11 (12)	16:33	36	15:30 (13)	15:55
8	04:53			05:38	06:10 (10)	06:33	07:02 (11)	07:28	07:56 (12)	07:27	14:55 (13)	08:19				
	21:48			21:04	12	06:22 (10)	19:54	11	07:13 (11)	18:39	14	08:10 (12)	16:31	34	15:29 (13)	15:55
9	04:54			05:40	06:12 (10)	06:35	07:04 (11)	07:29	07:58 (12)	07:29	14:56 (13)	08:21				
	21:48			21:02	10	06:22 (10)	19:51	8	07:12 (11)	18:37	10	08:08 (12)	16:30	32	15:28 (13)	15:54
10	04:55			05:42	06:14 (10)	06:37	07:06 (11)	07:31	08:00 (12)	07:31	14:57 (13)	08:22				
	21:47			21:00	8	06:22 (10)	19:49	4	07:10 (11)	18:34	5	08:05 (12)	16:28	30	15:27 (13)	15:54
11	04:56			05:43	06:15 (10)	06:39		07:33		07:33		14:59 (13)	08:23			
	21:46			20:58	5	06:20 (10)	19:46		18:32		16:26	28	15:27 (13)	15:54		
12	04:57			05:45	06:17 (10)	06:41		07:35		07:35		15:00 (13)	08:24			
	21:45			20:56	2	06:19 (10)	19:44		18:30		16:24	26	15:26 (13)	15:53		
13	04:58			05:47		06:42		07:37		07:37		15:02 (13)	08:25			
	21:44			20:54		19:41		18:27		16:23	22	15:24 (13)	15:53			
14	04:59			05:49		06:44		07:39		07:39		15:04 (13)	08:26			
	21:43			20:52		19:39		18:25		16:21	19	15:23 (13)	15:53			
15	05:01			05:51		06:46		07:41		07:41		15:06 (13)	08:27			
	21:42			20:50		19:36		18:23		16:19	14	15:20 (13)	15:53			
16	05:02			05:52		06:48		07:42		07:43		15:10 (13)	08:28			
	21:41			20:47		19:34		18:20		16:18	6	15:16 (13)	15:53			
17	05:03			05:54		06:50		07:44		07:44			08:29			
	21:40			20:45		19:31		18:18	9	16:19 (13)	16:16		15:53			
18	05:05			05:56		06:51		07:46		16:06 (13)	07:46		08:30			
	21:39			20:43		19:29		18:16	17	16:23 (13)	16:15		15:53			
19	05:06			05:58		06:53		07:48		16:03 (13)	07:48		08:31			
	21:37			20:41		19:26		18:13	22	16:25 (13)	16:13		15:54			
20	05:07			05:59		06:55		07:50		16:00 (13)	07:50		08:32			
	21:36			20:39		19:24		18:11	27	16:27 (13)	16:12		15:54			
21	05:09			06:01		06:57		07:52		15:59 (13)	07:52		08:32			
	21:35			20:36		19:21	13	08:10 (12)	18:09	29	16:28 (13)	16:10		15:54		
22	05:10			06:03		06:58		07:54		15:57 (13)	07:54		08:33			
	21:33			20:34		19:19	19	08:13 (12)	18:06	32	16:29 (13)	16:09		15:55		
23	05:12			06:05		07:00		07:52		15:56 (13)	07:56		08:33			
	21:32			20:32		19:16	23	08:15 (12)	18:04	34	16:30 (13)	16:08		15:55		
24	05:13		06:09 (10)	06:07		07:02		07:50		15:55 (13)	07:57		08:34			
	21:30	5	06:14 (10)	20:29		19:14	25	08:15 (12)	18:02	36	16:31 (13)	16:06		15:56		
25	05:15		06:07 (10)	06:08		07:03 (11)	07:04	07:49 (12)	08:00		15:54 (13)	07:59		08:34		
	21:29	10	06:17 (10)	20:27	8	07:11 (11)	19:11	27	08:16 (12)	18:00	37	16:31 (13)	16:05		15:56	
26	05:16		06:05 (10)	06:10		06:59 (11)	07:06	07:48 (12)	08:02		15:53 (13)	08:01		08:35		
	21:27	13	06:18 (10)	20:25	14	07:13 (11)	19:09	29	08:17 (12)	17:58	38	16:31 (13)	16:04		15:57	
27	05:18		06:04 (10)	06:12		06:57 (11)	07:07	07:47 (12)	07:04		14:52 (13)	08:03		08:35		
	21:26	16	06:20 (10)	20:23	18	07:15 (11)	19:06	30	08:17 (12)	16:55	40	15:32 (13)	16:03		15:58	
28	05:20		06:03 (10)	06:14		06:56 (11)	07:09	07:46 (12)	07:06		14:53 (13)	08:04		08:35		
	21:24	18	06:21 (10)	20:20	21	07:17 (11)	19:04	32	08:18 (12)	16:53	40	15:33 (13)	16:02		15:58	
29	05:21		06:03 (10)	06:16		06:54 (11)	07:11	07:45 (12)	07:08		14:52 (13)	08:06		08:35		
	21:22	19	06:22 (10)	20:18	23	07:17 (11)	19:01	32	08:17 (12)	16:51	41	15:33 (13)	16:01		15:59	
30	05:23		06:02 (10)	06:17		06:53 (11)	07:13	07:44 (12)	07:09		14:52 (13)	08:08		08:35		
	21:21	20	06:22 (10)	20:15	24	07:17 (11)	18:59	33	08:17 (12)	16:49	41	15:33 (13)	16:00		16:00	
31	05:25		06:01 (10)	06:19		06:52 (11)		07:11		14:52 (13)			08:35			
	21:19	22	06:23 (10)	20:13	26	07:18 (11)		16:47	40	15:32 (13)			16:01			
Sonnenscheinstunden	514			462			384		330		259		232			
astr.max.mögl.Beschattung	139				305		433		694		482					

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: E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Januar		Februar		März		April		Mai		Juni	
1	08:35	08:06	15:15 (13)	07:08	07:35 (12)	06:53	07:18 (11)	05:43	06:11 (10)	04:52	05:25 (9)
	16:02	16:53	15:50 (13)	17:50	07:38 (12)	19:49	07:24 (11)	20:45	06:18 (10)	21:36	05:27 (9)
2	08:35	08:04	15:14 (13)	07:06	07:33 (12)	06:50	07:16 (11)	05:41	06:09 (10)	04:51	05:24 (9)
	16:04	16:55	15:51 (13)	17:52	07:41 (12)	19:51	07:25 (11)	20:47	06:19 (10)	21:37	05:29 (9)
3	08:35	08:02	15:15 (13)	07:04	07:30 (12)	06:48	07:14 (11)	05:39	06:07 (10)	04:50	05:23 (9)
	16:05	16:57	15:52 (13)	17:54	07:42 (12)	19:53	07:27 (11)	20:48	06:19 (10)	21:38	05:30 (9)
4	08:35	08:01	15:15 (13)	07:01	07:28 (12)	06:46	07:11 (11)	05:37	06:05 (10)	04:49	05:23 (9)
	16:06	16:59	15:53 (13)	17:56	07:44 (12)	19:54	07:27 (11)	20:50	06:19 (10)	21:39	05:32 (9)
5	08:35	07:59	15:15 (13)	06:59	07:25 (12)	06:43	07:09 (11)	05:35	06:03 (10)	04:48	05:22 (9)
	16:07	17:01	15:53 (13)	17:58	07:44 (12)	19:56	07:27 (11)	20:52	06:19 (10)	21:41	05:33 (9)
6	08:34	07:57	15:15 (13)	06:57	07:23 (12)	06:41	07:06 (11)	05:33	06:01 (10)	04:48	05:21 (9)
	16:08	17:04	15:53 (13)	18:00	07:45 (12)	19:58	07:27 (11)	20:54	06:19 (10)	21:42	05:33 (9)
7	08:34	07:55	15:15 (13)	06:54	07:21 (12)	06:38	07:04 (11)	05:31	05:59 (10)	04:47	05:21 (9)
	16:10	17:06	15:54 (13)	18:01	07:46 (12)	20:00	07:27 (11)	20:56	06:19 (10)	21:43	05:35 (9)
8	08:33	07:53	15:15 (13)	06:52	07:18 (12)	06:36	07:01 (11)	05:29	05:57 (10)	04:46	05:20 (9)
	16:11	17:08	15:54 (13)	18:03	07:46 (12)	20:02	07:26 (11)	20:58	06:18 (10)	21:44	05:35 (9)
9	08:33	07:51	15:15 (13)	06:49	07:16 (12)	06:33	06:59 (11)	05:27	05:56 (10)	04:46	05:20 (9)
	16:13	17:10	15:54 (13)	18:05	07:47 (12)	20:04	07:26 (11)	20:59	06:19 (10)	21:45	05:36 (9)
10	08:32	07:49	15:15 (13)	06:47	07:13 (12)	06:31	07:00 (11)	05:25	05:56 (10)	04:45	05:19 (7)
	16:14	17:12	15:53 (13)	18:07	07:46 (12)	20:06	07:25 (11)	21:01	06:18 (10)	21:46	05:36 (9)
11	08:32	07:48	15:15 (13)	06:45	07:14 (12)	06:29	06:59 (11)	05:23	05:56 (10)	04:45	05:19 (7)
	16:15	17:14	15:52 (13)	18:09	07:46 (12)	20:08	07:24 (11)	21:03	06:17 (10)	21:46	05:37 (9)
12	08:31	07:46	15:16 (13)	06:42	07:13 (12)	06:26	07:00 (11)	05:21	05:57 (10)	04:44	05:18 (7)
	16:17	17:16	15:52 (13)	18:11	07:45 (12)	20:09	07:23 (11)	21:05	06:17 (10)	21:47	05:38 (9)
13	08:30	07:44	15:16 (13)	06:40	07:13 (12)	06:24	07:01 (11)	05:19	05:57 (10)	04:44	05:18 (7)
	16:19	17:18	15:52 (13)	18:13	07:45 (12)	20:11	07:22 (11)	21:06	06:16 (10)	21:48	05:38 (9)
14	08:29	07:41	15:17 (13)	06:37	07:13 (12)	06:21	07:02 (11)	05:18	05:58 (10)	04:43	05:18 (7)
	16:20	17:20	15:51 (13)	18:15	07:44 (12)	20:13	07:20 (11)	21:08	06:15 (10)	21:49	05:38 (9)
15	08:28	07:39	15:18 (13)	06:35	07:14 (12)	06:19	07:03 (11)	05:16	06:00 (10)	04:43	05:18 (7)
	16:22	17:22	15:51 (13)	18:17	07:43 (12)	20:15	07:18 (11)	21:10	06:14 (10)	21:49	05:39 (9)
16	08:27	07:37	15:19 (13)	06:32	07:14 (12)	06:17	07:06 (11)	05:14	06:01 (10)	04:43	05:18 (7)
	16:24	17:24	15:49 (13)	18:19	07:42 (12)	20:17	07:15 (11)	21:12	06:12 (10)	21:50	05:39 (9)
17	08:26	07:35	15:20 (13)	06:30	07:15 (12)	06:14	07:06 (11)	05:12	06:03 (10)	04:43	05:18 (7)
	16:25	17:26	15:48 (13)	18:21	07:41 (12)	20:19	07:15 (11)	21:13	06:11 (10)	21:50	05:40 (9)
18	08:25	07:33	15:22 (13)	06:27	07:16 (12)	06:12	07:06 (11)	05:11	06:03 (10)	04:43	05:18 (7)
	16:27	17:28	15:47 (13)	18:23	07:38 (12)	20:21	07:06 (11)	21:15	06:03 (10)	04:43	05:18 (7)
19	08:24	07:31	15:25 (13)	06:25	07:18 (12)	06:10	07:06 (11)	05:09	06:03 (10)	04:43	05:18 (7)
	16:29	17:30	15:45 (13)	18:24	07:37 (12)	20:23	07:06 (11)	21:17	06:03 (10)	04:43	05:18 (7)
20	08:23	07:29	15:27 (13)	06:23	07:20 (12)	06:07	07:06 (11)	05:08	06:03 (10)	04:43	05:18 (7)
	16:31	17:32	15:41 (13)	18:26	07:33 (12)	20:24	07:06 (11)	21:18	06:03 (10)	04:43	05:18 (7)
21	08:22	07:27	15:28 (13)	06:20	07:35 (12)	06:05	07:06 (11)	05:06	06:03 (10)	04:43	05:18 (7)
	16:32	17:34	15:33 (13)	18:28	07:38 (12)	20:26	07:06 (11)	21:20	06:03 (10)	04:43	05:18 (7)
22	08:21	07:24	15:24 (13)	06:18	07:41 (12)	06:03	07:06 (11)	05:05	06:03 (10)	04:43	05:18 (7)
	16:34	17:36	15:37 (13)	18:30	07:44 (12)	20:28	07:06 (11)	21:21	06:03 (10)	04:43	05:18 (7)
23	08:19	07:22	15:22 (13)	06:15	07:46 (12)	06:00	07:06 (11)	05:03	06:03 (10)	04:43	05:18 (7)
	16:36	17:38	15:40 (13)	18:32	07:48 (12)	20:30	07:06 (11)	21:23	06:03 (10)	04:43	05:18 (7)
24	08:18	07:20	15:21 (13)	06:13	07:49 (12)	05:58	07:06 (11)	05:02	06:03 (10)	04:43	05:18 (7)
	16:38	17:40	15:41 (13)	18:34	07:51 (12)	20:32	07:06 (11)	21:25	06:03 (10)	04:43	05:18 (7)
25	08:17	07:18	15:20 (13)	06:10	07:52 (12)	05:56	07:06 (11)	05:00	06:03 (10)	04:43	05:18 (7)
	16:40	17:42	15:44 (13)	18:36	07:54 (12)	20:34	07:06 (11)	21:26	06:03 (10)	04:43	05:18 (7)
26	08:15	07:15	15:19 (13)	06:08	07:56 (12)	05:54	07:06 (11)	04:59	06:03 (10)	04:43	05:18 (7)
	16:42	17:44	15:45 (13)	18:38	07:58 (12)	20:36	07:06 (11)	21:28	06:03 (10)	04:43	05:18 (7)
27	08:14	07:13	15:17 (13)	06:05	07:59 (12)	05:52	07:06 (11)	04:58	06:03 (10)	04:43	05:18 (7)
	16:44	17:46	15:46 (13)	18:40	08:01 (12)	20:37	07:06 (11)	21:29	06:03 (10)	04:43	05:18 (7)
28	08:12	07:11	15:17 (13)	06:03	08:02 (12)	05:49	07:06 (11)	04:57	06:03 (10)	04:43	05:18 (7)
	16:46	17:48	15:48 (13)	18:41	08:04 (12)	20:39	07:06 (11)	21:30	06:03 (10)	04:43	05:18 (7)
29	08:11	07:10	15:17 (13)	06:00	08:06 (12)	05:47	07:06 (11)	04:55	06:03 (10)	04:43	05:18 (7)
	16:48	17:50	15:49 (13)	18:43	08:08 (12)	20:41	07:06 (11)	21:32	06:03 (10)	04:43	05:18 (7)
30	08:09	07:08	15:16 (13)	05:58	08:10 (12)	05:45	07:06 (11)	04:54	06:03 (10)	04:43	05:18 (7)
	16:50	17:52	15:50 (13)	18:45	08:12 (12)	20:43	07:06 (11)	21:33	06:03 (10)	04:43	05:18 (7)
31	08:08	07:07	15:15 (13)	05:55	08:14 (12)	05:43	07:06 (11)	04:53	06:03 (10)	04:43	05:18 (7)
	16:51	17:53	15:51 (13)	19:47	08:16 (12)	05:41	07:06 (11)	21:34	06:03 (10)	04:43	05:18 (7)
Sonneneinstrahlung		248		271		365		419		494	
astr.max.mögl.Beschattung		266		671		463		299		273	
										511	
										535	

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

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

19-095-GBK-02

Beschreibung:

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

Lizenzierter Anwender:

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

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember		
1	04:47		05:22 (7)	05:26	06:08 (10)	06:21	06:59 (11)	07:15	07:53 (12)	07:13	14:45 (13)	08:09	
	21:52	20	05:42 (9)	21:17	18	06:26 (10)	20:11	23	07:22 (11)	18:56	31	15:22 (13)	15:59
2	04:47		05:23 (7)	05:28		06:07 (10)	06:23		06:58 (11)	07:17		14:44 (13)	08:11
	21:52	19	05:42 (9)	21:15	21	06:28 (10)	20:08	25	07:23 (11)	18:54	32	15:22 (13)	15:58
3	04:48		05:24 (7)	05:30		06:06 (10)	06:25		06:58 (11)	07:18		14:44 (13)	08:12
	21:51	18	05:42 (9)	21:14	21	06:27 (10)	20:06	25	07:23 (11)	18:51	32	15:22 (13)	15:58
4	04:49		05:25 (7)	05:31		06:06 (10)	06:26		06:57 (11)	07:20		14:44 (13)	08:14
	21:51	17	05:42 (9)	21:12	22	06:28 (10)	20:03	27	07:24 (11)	18:49	33	15:22 (13)	15:57
5	04:50		05:25 (9)	05:33		06:06 (10)	06:28		06:57 (11)	07:22		14:44 (13)	08:15
	21:50	16	05:41 (9)	21:10	23	06:29 (10)	20:01	26	07:23 (11)	18:47	33	15:23 (13)	15:56
6	04:51		05:26 (9)	05:35		06:07 (10)	06:30		06:59 (11)	07:24		14:44 (13)	08:17
	21:50	15	05:41 (9)	21:08	22	06:29 (10)	19:58	24	07:23 (11)	18:44	30	15:23 (13)	15:56
7	04:52		05:27 (9)	05:36		06:09 (10)	06:32		07:01 (11)	07:26		14:44 (13)	08:18
	21:49	14	05:41 (9)	21:06	20	06:29 (10)	19:56	22	07:23 (11)	18:42	28	15:23 (13)	15:55
8	04:53		05:28 (9)	05:38		06:10 (10)	06:33		07:02 (11)	07:28		14:44 (13)	08:19
	21:48	12	05:40 (9)	21:04	18	06:28 (10)	19:54	19	07:21 (11)	18:39	25	15:23 (13)	15:55
9	04:54		05:29 (9)	05:40		06:12 (10)	06:35		07:04 (11)	07:29		14:45 (13)	08:21
	21:48	11	05:40 (9)	21:02	16	06:28 (10)	19:51	17	07:21 (11)	18:37	22	15:22 (13)	15:54
10	04:55		05:30 (9)	05:42		06:14 (10)	06:37		07:06 (11)	07:31		14:45 (13)	08:22
	21:47	9	05:39 (9)	21:00	14	06:28 (10)	19:49	14	07:20 (11)	18:34	19	15:22 (13)	15:54
11	04:56		05:31 (9)	05:43		06:15 (10)	06:39		07:08 (11)	07:33		14:46 (13)	08:23
	21:46	7	05:38 (9)	20:58	12	06:27 (10)	19:46	11	07:19 (11)	18:32	16	15:22 (13)	15:54
12	04:57		05:32 (9)	05:45		06:17 (10)	06:41		07:09 (11)	07:35		14:47 (13)	08:24
	21:45	5	05:37 (9)	20:56	10	06:27 (10)	19:44	8	07:17 (11)	18:30	13	15:22 (13)	15:53
13	04:58		05:33 (9)	05:47		06:19 (10)	06:42		07:11 (11)	07:37		14:47 (13)	08:25
	21:44	2	05:35 (9)	20:54	8	06:27 (10)	19:41	4	07:15 (11)	18:27	9	15:21 (13)	15:53
14	04:59			05:49		06:20 (10)	06:44			07:39		14:48 (13)	08:26
	21:43			20:52	5	06:25 (10)	19:39			18:25	4	15:21 (13)	15:53
15	05:01			05:51		06:22 (10)	06:46			07:41		14:49 (13)	08:27
	21:42			20:50	2	06:24 (10)	19:36			18:23		15:20 (13)	15:53
16	05:02			05:52			06:48			07:42		14:50 (13)	08:28
	21:41			20:47			19:34			18:20		15:19 (13)	15:53
17	05:03			05:54			06:50			07:44		14:51 (13)	08:29
	21:40			20:45			19:31			18:18		15:18 (13)	15:53
18	05:05			05:56			06:51			07:46		14:52 (13)	08:30
	21:39			20:43			19:29			18:16		15:17 (13)	15:53
19	05:06			05:58			06:53			07:48		14:54 (13)	08:31
	21:37			20:41			19:26			18:13		15:16 (13)	15:54
20	05:07			05:59			06:55			07:50		14:55 (13)	08:32
	21:36			20:39			19:24			18:11		15:15 (13)	15:54
21	05:09			06:01			06:57			07:52		14:59 (13)	08:32
	21:35			20:36			19:21			18:09		15:14 (13)	15:54
22	05:10			06:03			06:58			07:54		15:02 (13)	08:33
	21:33			20:34			19:19			18:06		15:11 (13)	15:55
23	05:12			06:05			07:00			07:56	15:58 (13)	07:56	08:33
	21:32			20:32			19:16			18:04	13	16:11 (13)	16:08
24	05:13			06:07			07:02		08:09 (12)	07:58		15:55 (13)	07:57
	21:30			20:29			19:14	2	08:11 (12)	18:02	19	16:14 (13)	16:06
25	05:15			06:08			07:04		08:03 (12)	08:00		15:52 (13)	07:59
	21:29			20:27			19:11	14	08:17 (12)	18:00	24	16:16 (13)	16:05
26	05:16			06:10			07:06		08:00 (12)	08:02		15:50 (13)	08:01
	21:27			20:25			19:09	20	08:20 (12)	17:58	27	16:17 (13)	16:04
27	05:18			06:12			07:07		07:58 (12)	07:04		14:49 (13)	08:03
	21:26			20:23			19:06	23	08:21 (12)	16:55	29	15:18 (13)	16:03
28	05:20		06:13 (10)	06:14		07:11 (11)	07:09		07:57 (12)	07:06		14:48 (13)	08:04
	21:24	8	06:21 (10)	20:20	3	07:14 (11)	19:04	26	08:23 (12)	16:53	32	15:20 (13)	16:02
29	05:21		06:12 (10)	06:16		07:05 (11)	07:11		07:55 (12)	07:08		14:47 (13)	08:06
	21:22	11	06:23 (10)	20:18	13	07:18 (11)	19:01	27	08:22 (12)	16:51	34	15:21 (13)	16:01
30	05:23		06:10 (10)	06:17		07:03 (11)	07:13		07:54 (12)	07:09		14:46 (13)	08:08
	21:21	14	06:24 (10)	20:15	17	07:20 (11)	18:59	29	08:23 (12)	16:49	35	15:21 (13)	16:00
31	05:25		06:09 (10)	06:19		07:02 (11)			07:11			14:45 (13)	
	21:19	17	06:26 (10)	20:13	20	07:22 (11)			16:47	37	15:22 (13)		
Sonnenscheinstunden		514		462		384		330		259			232
astr.max.mögl.Beschattung		215			285		386		577		697		

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: Gesamtbelastung**Schattenrezeptor:** F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

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

	Januar		Februar		März		April		Mai		Juni						
1	08:35		08:06		14:58 (13)	07:08	07:35 (12)	06:53	07:18 (11)	05:43	06:11 (10)	04:52	05:25 (7)				
	16:02		16:53	39	15:37 (13)	17:50	14	07:49 (12)	19:49	15	07:33 (11)	20:45	15	06:26 (10)	21:36	22	05:47 (9)
2	08:35		08:04		14:58 (13)	07:06	07:33 (12)	06:50	07:16 (11)	05:41	06:09 (10)	04:51	05:24 (7)				
	16:04		16:55	39	15:37 (13)	17:52	17	07:50 (12)	19:51	18	07:34 (11)	20:47	17	06:26 (10)	21:37	24	05:48 (9)
3	08:35		08:02		15:00 (13)	07:04	07:30 (12)	06:48	07:14 (11)	05:39	06:07 (10)	04:50	05:23 (7)				
	16:05		16:57	38	15:38 (13)	17:54	20	07:50 (12)	19:53	20	07:34 (11)	20:49	19	06:26 (10)	21:38	25	05:48 (9)
4	08:35		08:01		15:00 (13)	07:01	07:28 (12)	06:46	07:11 (11)	05:37	06:05 (10)	04:49	05:23 (7)				
	16:06		16:59	38	15:38 (13)	17:56	23	07:51 (12)	19:54	22	07:33 (11)	20:50	20	06:25 (10)	21:39	26	05:49 (9)
5	08:35		07:59		15:00 (13)	06:59	07:25 (12)	06:43	07:09 (11)	05:35	06:03 (10)	04:48	05:22 (7)				
	16:07		17:01	37	15:37 (13)	17:58	26	07:51 (12)	19:56	24	07:33 (11)	20:52	22	06:25 (10)	21:41	28	05:50 (9)
6	08:34		07:57		15:01 (13)	06:57	07:23 (12)	06:41	07:06 (11)	05:33	06:02 (10)	04:48	05:21 (7)				
	16:08		17:04	36	15:37 (13)	18:00	29	07:52 (12)	19:58	26	07:32 (11)	20:54	22	06:24 (10)	21:42	29	05:50 (9)
7	08:34		07:55		15:02 (13)	06:54	07:21 (12)	06:38	07:07 (11)	05:31	06:02 (10)	04:47	05:21 (7)				
	16:10		17:06	35	15:37 (13)	18:01	31	07:52 (12)	20:00	25	07:32 (11)	20:56	22	06:24 (10)	21:43	30	05:51 (9)
8	08:33		07:53		15:02 (13)	06:52	07:20 (12)	06:36	07:06 (11)	05:29	06:03 (10)	04:46	05:20 (7)				
	16:11		17:08	34	15:36 (13)	18:03	31	07:51 (12)	20:02	24	07:30 (11)	20:58	20	06:23 (10)	21:44	31	05:51 (9)
9	08:33		07:51		15:03 (13)	06:49	07:20 (12)	06:33	07:07 (11)	05:27	06:04 (10)	04:46	05:20 (7)				
	16:13		17:10	33	15:36 (13)	18:05	31	07:51 (12)	20:04	22	07:29 (11)	20:59	19	06:23 (10)	21:45	31	05:51 (9)
10	08:32		07:50		15:03 (13)	06:47	07:20 (12)	06:31	07:09 (11)	05:25	06:05 (10)	04:45	05:19 (7)				
	16:14		17:12	31	15:34 (13)	18:07	30	07:50 (12)	20:06	19	07:28 (11)	21:01	16	06:21 (10)	21:46	32	05:51 (9)
11	08:32		07:48		15:05 (13)	06:45	07:20 (12)	06:29	07:09 (11)	05:23	06:06 (10)	04:45	05:19 (7)				
	16:15		17:14	28	15:33 (13)	18:09	30	07:50 (12)	20:08	17	07:26 (11)	21:03	14	06:20 (10)	21:46	33	05:52 (9)
12	08:31	15:08 (13)	07:46		15:06 (13)	06:42	07:20 (12)	06:26	07:11 (11)	05:21	06:08 (10)	04:44	05:19 (7)				
	16:17	9	15:17 (13)	26	15:32 (13)	18:11	28	07:48 (12)	20:09	13	07:24 (11)	21:05	10	06:18 (10)	21:47	34	05:53 (9)
13	08:30	15:06 (13)	07:44		15:09 (13)	06:40	07:21 (12)	06:24	07:17 (11)	05:19	06:11 (10)	04:44	05:18 (7)				
	16:19	14	15:20 (13)	21	15:30 (13)	18:13	27	07:48 (12)	20:11	1	07:18 (11)	21:06	4	06:15 (10)	21:48	34	05:52 (9)
14	08:29	15:05 (13)	07:41		15:11 (13)	06:37	07:22 (12)	06:21		05:18		04:43	05:18 (7)				
	16:20	17	15:22 (13)	17	15:28 (13)	18:15	24	07:46 (12)	20:13		21:08	21:49	35	05:53 (9)			
15	08:28	15:03 (13)	07:39		15:15 (13)	06:35	07:23 (12)	06:19		05:16		04:43	05:18 (7)				
	16:22	20	15:23 (13)	10	15:25 (13)	18:17	21	07:44 (12)	20:15		21:10	21:49	35	05:53 (9)			
16	08:27	15:02 (13)	07:37			06:32		07:24 (12)	06:17		21:14	04:43	05:18 (7)				
	16:24	22	15:24 (13)			18:19	18	07:42 (12)	20:17		21:12	21:50	35	05:53 (9)			
17	08:26	15:02 (13)	07:35			06:30		07:28 (12)	06:14		21:12	04:43	05:18 (7)				
	16:25	24	15:26 (13)			18:21	11	07:39 (12)	20:19		21:13	21:50	36	05:54 (9)			
18	08:25	15:01 (13)	07:33			06:27			20:19		21:13	21:50	36	05:54 (9)			
	16:27	27	15:28 (13)			18:23			20:21		21:15	21:51	36	05:54 (9)			
19	08:24	15:00 (13)	07:31			06:25			20:21		21:15	21:51	36	05:54 (9)			
	16:29	28	15:28 (13)			18:24			20:23		21:17	21:51	36	05:54 (9)			
20	08:23	15:00 (13)	07:29			06:23			20:23		21:17	21:51	36	05:54 (9)			
	16:31	30	15:30 (13)			18:26			20:24		21:18	21:52	36	05:54 (9)			
21	08:22	15:00 (13)	07:27			06:20			20:24		21:18	21:52	36	05:54 (9)			
	16:32	31	15:31 (13)			18:28			20:26		21:20	21:52	37	05:55 (9)			
22	08:21	14:59 (13)	07:24			06:18			20:26		21:20	21:52	37	05:55 (9)			
	16:34	33	15:32 (13)			18:30			20:28		21:21	21:52	37	05:55 (9)			
23	08:19	14:59 (13)	07:22			06:15			20:28		21:21	21:52	37	05:55 (9)			
	16:36	34	15:33 (13)			18:32			20:30		21:23	21:52	37	05:56 (9)			
24	08:18	14:59 (13)	07:20			06:13			20:30		21:23	21:52	37	05:56 (9)			
	16:38	34	15:33 (13)			18:34			20:32		21:25	21:53	36	05:55 (9)			
25	08:17	14:59 (13)	07:18			06:10			20:32		21:25	21:53	36	05:55 (9)			
	16:40	36	15:35 (13)			18:36			20:34		21:26	21:53	36	05:55 (9)			
26	08:15	14:59 (13)	07:15		07:42 (12)	06:08			20:34		21:26	21:53	36	05:55 (9)			
	16:42	36	15:35 (13)	1	07:43 (12)	18:38			20:36	2	06:23 (10)	21:28	11	05:42 (9)	21:53	36	05:56 (9)
27	08:14	14:58 (13)	07:13		07:40 (12)	06:05			20:36		06:19 (10)	21:29	13	05:43 (9)	21:53	36	05:56 (9)
	16:44	37	15:35 (13)	6	07:46 (12)	18:40			20:37	5	06:24 (10)	21:29	13	05:43 (9)	21:53	36	05:56 (9)
28	08:12	14:59 (13)	07:11		07:38 (12)	06:03		06:28 (11)	05:49		06:17 (10)	21:29	13	05:43 (9)	21:53	36	05:56 (9)
	16:46	37	15:36 (13)	10	07:48 (12)	18:41	1	06:29 (11)	20:39	8	06:25 (10)	21:30	16	05:45 (9)	21:53	35	05:56 (9)
29	08:11	14:59 (13)				06:00		06:26 (11)	05:47		06:15 (10)	21:30	16	05:45 (9)	21:53	35	05:56 (9)
	16:48	38	15:37 (13)			18:43	5	06:31 (11)	20:41	10	06:25 (10)	21:32	17	05:45 (9)	21:52	35	05:56 (9)
30	08:09	14:58 (13)				05:58		06:23 (11)	05:45		06:13 (10)	21:32	17	05:45 (9)	21:52	35	05:56 (9)
	16:50	39	15:37 (13)			18:45	9	06:32 (11)	20:43	13	06:26 (10)	21:33	19	05:46 (9)	21:52	35	05:57 (9)
31	08:08	14:58 (13)				06:55		07:21 (11)				04:53		05:26 (9)			
	16:51	39	15:37 (13)			19:47	12	07:33 (11)				21:35	21	05:47 (9)			
Sonnenscheinstunden		248		271		365		419		494		511		988			
astr.max.mögl.Beschattung		585		479		438		284		334		988					

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(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
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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: F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrichtungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47	05:22 (7)	05:26	06:22 (10)	06:21	07:12 (11)	07:15	08:01 (12)	07:13	14:35 (13)	08:09
2	21:52	05:56 (9)	21:17	06:24 (10)	20:11	07:21 (11)	18:56	08:26 (12)	16:45	15:02 (13)	15:59
3	04:47	05:23 (7)	05:28	06:19 (10)	06:23	07:09 (11)	07:17	08:00 (12)	07:15	14:33 (13)	08:11
4	21:52	05:56 (9)	21:15	06:28 (10)	20:08	07:24 (11)	18:54	08:27 (12)	16:43	15:03 (13)	15:58
5	04:48	05:24 (7)	05:30	06:16 (10)	06:25	07:07 (11)	07:18	07:59 (12)	07:17	14:32 (13)	08:12
6	21:51	05:57 (9)	21:14	06:30 (10)	20:06	07:26 (11)	18:51	08:27 (12)	16:41	15:04 (13)	15:58
7	04:49	05:25 (7)	05:31	06:15 (10)	06:26	07:06 (11)	07:20	07:58 (12)	07:19	14:31 (13)	08:14
8	21:51	05:57 (9)	21:12	06:31 (10)	20:03	07:27 (11)	18:49	08:28 (12)	16:39	15:05 (13)	15:57
9	04:50	05:25 (7)	05:33	06:14 (10)	06:28	07:04 (11)	07:22	07:57 (12)	07:21	14:31 (13)	08:15
10	21:50	05:56 (9)	21:10	06:33 (10)	20:01	07:27 (11)	18:47	08:28 (12)	16:37	15:06 (13)	15:56
11	04:51	05:26 (7)	05:35	06:13 (10)	06:30	07:03 (11)	07:24	07:56 (12)	07:23	14:31 (13)	08:17
12	21:50	05:56 (9)	21:08	06:33 (10)	19:58	07:28 (11)	18:44	08:27 (12)	16:35	15:07 (13)	15:56
13	04:52	05:27 (7)	05:36	06:13 (10)	06:32	07:02 (11)	07:26	07:56 (12)	07:25	14:30 (13)	08:18
14	21:49	05:57 (9)	21:06	06:34 (10)	19:56	07:28 (11)	18:42	08:27 (12)	16:33	15:07 (13)	15:55
15	04:53	05:28 (7)	05:38	06:11 (10)	06:33	07:02 (11)	07:28	07:56 (12)	07:27	14:30 (13)	08:19
16	21:48	05:57 (9)	21:04	06:34 (10)	19:54	07:27 (11)	18:39	08:27 (12)	16:31	15:07 (13)	15:55
17	04:54	05:29 (7)	05:40	06:12 (10)	06:35	07:04 (11)	07:29	07:58 (12)	07:29	14:29 (13)	08:21
18	21:48	05:56 (9)	21:02	06:34 (10)	19:51	07:27 (11)	18:37	08:27 (12)	16:30	15:07 (13)	15:54
19	04:55	05:30 (7)	05:42	06:14 (10)	06:37	07:06 (11)	07:31	08:00 (12)	07:31	14:29 (13)	08:22
20	21:47	05:56 (9)	21:00	06:35 (10)	19:49	07:27 (11)	18:34	08:26 (12)	16:28	15:08 (13)	15:54
21	04:56	05:31 (7)	05:43	06:15 (10)	06:39	07:08 (11)	07:33	08:02 (12)	07:33	14:30 (13)	08:23
22	21:46	05:56 (9)	20:58	06:34 (10)	19:46	07:27 (11)	18:32	08:25 (12)	16:26	15:09 (13)	15:54
23	04:57	05:32 (7)	05:45	06:17 (10)	06:41	07:09 (11)	07:35	08:04 (12)	07:35	14:30 (13)	08:24
24	21:45	05:56 (9)	20:56	06:34 (10)	19:44	07:25 (11)	18:30	08:24 (12)	16:24	15:09 (13)	15:53
25	04:58	05:33 (7)	05:47	06:19 (10)	06:42	07:11 (11)	07:37	08:06 (12)	07:37	14:30 (13)	08:25
26	21:44	05:55 (9)	20:54	06:34 (10)	19:41	07:25 (11)	18:27	08:23 (12)	16:23	15:09 (13)	15:53
27	04:59	05:34 (9)	05:49	06:20 (10)	06:44	07:13 (11)	07:39	08:08 (12)	07:39	14:30 (13)	08:26
28	21:43	05:55 (9)	20:52	06:33 (10)	19:39	07:24 (11)	18:25	08:22 (12)	16:21	15:08 (13)	15:53
29	05:01	05:36 (9)	05:51	06:22 (10)	06:46	07:15 (11)	07:41	08:10 (12)	07:41	14:31 (13)	08:27
30	21:42	05:55 (9)	20:50	06:33 (10)	19:36	07:23 (11)	18:23	08:20 (12)	16:19	15:08 (13)	15:53
31	05:02	05:37 (9)	05:52	06:23 (10)	06:48	07:16 (11)	07:42	08:12 (12)	07:43	14:31 (13)	08:28
1	21:41	05:54 (9)	20:47	06:31 (10)	19:34	07:20 (11)	18:20	08:18 (12)	16:18	15:08 (13)	15:53
2	05:03	05:38 (9)	05:54	06:25 (10)	06:50		07:44	08:14 (12)	07:44	14:31 (13)	08:29
3	21:40	05:53 (9)	20:45	06:31 (10)	19:31		18:18	08:15 (12)	16:16	15:08 (13)	15:53
4	05:05	05:39 (9)	05:56	06:27 (10)	06:51		07:46		07:46	14:32 (13)	08:30
5	21:39	05:52 (9)	20:43	06:30 (10)	19:29		18:16		16:15	15:08 (13)	15:53
6	05:06	05:40 (9)	05:58		06:53		07:48		07:48	14:32 (13)	08:31
7	21:37	05:51 (9)	20:41		19:26		18:13		16:13	15:07 (13)	15:54
8	05:07	05:42 (9)	05:59		06:55		07:50		07:50	14:33 (13)	08:32
9	21:36	05:51 (9)	20:39		19:24		18:11		16:12	15:07 (13)	15:54
10	05:09	05:43 (9)	06:01		06:57		07:52		07:52	14:35 (13)	08:32
11	21:35	05:49 (9)	20:36		19:21		18:09		16:10	15:08 (13)	15:54
12	05:10	05:45 (9)	06:03		06:58		07:54		07:54	14:36 (13)	08:33
13	21:33	05:47 (9)	20:34		19:19		18:06		16:09	15:07 (13)	15:55
14	05:12		06:05		07:00		07:56		07:56	14:37 (13)	08:33
15	21:32		20:32		19:16		18:04		16:08	15:07 (13)	15:55
16	05:13		06:07		07:02		07:58		07:57	14:38 (13)	08:34
17	21:30		20:29		19:14		18:02		16:06	15:06 (13)	15:56
18	05:15		06:08		07:04		08:00		07:59	14:38 (13)	08:34
19	21:29		20:27		19:11		18:00		16:05	15:05 (13)	15:56
20	05:16		06:10		07:06		08:02		08:01	14:39 (13)	08:35
21	21:27		20:25		19:09		17:58		16:04	15:04 (13)	15:57
22	05:18		06:12		07:07		07:04		08:03	14:41 (13)	08:35
23	21:26		20:23		19:06		16:55		15:03	15:04 (13)	15:58
24	05:20		06:14		07:09	08:09 (12)	07:06	14:47 (13)	08:04	14:42 (13)	08:35
25	21:24		20:20		19:04	08:21 (12)	16:53	14:52 (13)	16:02	15:03 (13)	15:58
26	05:21		06:16		07:11	08:05 (12)	07:08	14:42 (13)	08:06	14:44 (13)	08:35
27	21:22		20:18		19:01	08:23 (12)	16:51	14:57 (13)	16:01	15:02 (13)	15:59
28	05:23		06:17		07:13	08:03 (12)	07:09	14:39 (13)	08:08	14:46 (13)	08:35
29	21:21		20:15		18:59	08:24 (12)	16:49	14:59 (13)	16:00	15:01 (13)	16:00
30	05:25		06:19				07:11	14:37 (13)			08:35
31	21:19		20:13				16:47	15:01 (13)			16:01
Sonnenscheinstunden		514	462	384	330	444	259	967	18		
astr.max.mögl.Beschattung		489	259	330	444	967	18				

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
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 DE-28717 Bremen
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 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: G - IO 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Januar		Februar		März		April		Mai		Juni	
1	08:35	14:03 (13)	08:06	08:36 (12)	07:08		06:53		05:43	06:11 (7)	04:52
	16:02	14:19 (13)	16:53	08:42 (12)	17:50		19:49		20:45	07:12 (9)	21:36
2	08:35	14:03 (13)	08:04	08:35 (12)	07:06		06:50		05:41	06:09 (7)	04:51
	16:04	14:19 (13)	16:55	08:44 (12)	17:52		19:51	2	07:16 (10)	07:11 (9)	21:37
3	08:35	14:05 (13)	08:02	08:33 (12)	07:04		06:48		05:39	06:07 (7)	04:50
	16:05	14:19 (13)	16:57	08:45 (12)	17:54		19:53	6	07:20 (10)	07:10 (9)	21:38
4	08:35	14:05 (13)	08:01	08:31 (12)	07:01		06:46		05:37	06:05 (7)	04:49
	16:06	14:18 (13)	16:59	08:46 (12)	17:56	3	07:31 (11)	9	07:20 (10)	07:09 (9)	21:39
5	08:35	14:07 (13)	07:59	08:29 (12)	06:59		06:43		05:35	06:03 (7)	04:48
	16:07	14:18 (13)	17:01	08:46 (12)	17:58	7	07:32 (11)	12	07:21 (10)	07:10 (9)	21:41
6	08:34	14:09 (13)	07:57	08:27 (12)	06:57		06:41		05:33	06:01 (7)	04:48
	16:08	14:16 (13)	17:04	08:47 (12)	18:00	10	07:33 (11)	15	07:21 (10)	07:10 (9)	21:42
7	08:34	14:13 (13)	07:55	08:25 (12)	06:54		06:38		05:31	05:59 (7)	04:47
	16:10	14:15 (13)	17:06	08:47 (12)	18:01	13	07:34 (11)	17	07:21 (10)	07:10 (9)	21:43
8	08:33		07:53	08:23 (12)	06:52		06:36		05:29	05:58 (7)	04:46
	16:11		17:08	08:48 (12)	18:03	16	07:34 (11)	19	07:20 (10)	07:09 (9)	21:44
9	08:33		07:51	08:21 (12)	06:49		06:33		05:27	05:57 (7)	04:46
	16:12		17:10	08:48 (12)	18:05	18	07:34 (11)	21	07:20 (10)	07:09 (9)	21:45
10	08:32		07:50	08:19 (12)	06:47		06:31		05:25	05:57 (7)	04:45
	16:14		17:12	08:47 (12)	18:07	21	07:34 (11)	23	07:20 (10)	07:09 (9)	21:46
11	08:32		07:48	08:19 (12)	06:45		06:29		05:23	06:54 (9)	05:23
	16:15		17:14	08:47 (12)	18:09	23	07:34 (11)	25	07:19 (10)	07:08 (9)	21:47
12	08:31		07:46	08:20 (12)	06:42		06:26		05:21	06:52 (9)	05:21
	16:17		17:16	08:47 (12)	18:11	25	07:33 (11)	26	07:18 (10)	07:07 (9)	21:48
13	08:30		07:44	08:21 (12)	06:40		06:24		05:19	06:50 (9)	05:19
	16:19		17:18	08:46 (12)	18:13	24	07:33 (11)	27	07:17 (10)	07:06 (9)	21:48
14	08:29		07:41	08:22 (12)	06:37		06:21		05:18	06:47 (9)	05:18
	16:20		17:20	08:46 (12)	18:15	23	07:31 (11)	28	07:15 (10)	07:04 (9)	21:49
15	08:28		07:39	08:23 (12)	06:35		06:19		05:16	06:45 (9)	05:16
	16:22		17:22	08:45 (12)	18:17	20	07:30 (11)	28	07:13 (10)	07:02 (9)	21:50
16	08:27		07:37	08:23 (12)	06:32		06:17		05:14	06:43 (9)	05:14
	16:24		17:24	08:43 (12)	18:19	18	07:31 (11)	31	07:14 (9)	07:03 (9)	21:51
17	08:26		07:35	08:25 (12)	06:30		06:14		05:12	06:40 (9)	05:12
	16:25		17:26	08:42 (12)	18:21	14	07:26 (11)	34	07:14 (9)	07:03 (9)	21:51
18	08:25		07:33	08:27 (12)	06:27		06:12		05:11	06:38 (9)	05:11
	16:27		17:28	08:40 (12)	18:23	7	07:22 (11)	36	07:14 (9)	07:03 (9)	21:51
19	08:24		07:31	08:33 (12)	06:25		06:10		05:09	06:36 (9)	05:09
	16:29		17:30	08:35 (12)	18:24		06:07		05:08	06:36 (9)	05:08
20	08:23		07:29		06:23		06:07		05:08	06:36 (9)	05:08
	16:31		17:32		18:26		06:05		05:06	06:35 (9)	05:06
21	08:22		07:27		06:20		06:05		05:06	06:35 (9)	05:06
	16:32		17:34		18:28		06:03		05:05	06:34 (9)	05:05
22	08:21		07:24		06:18		06:03		05:05	06:34 (9)	05:05
	16:34		17:36		18:30		06:00		05:03	06:34 (9)	05:03
23	08:19		07:22		06:15		06:00		05:03	06:34 (9)	05:03
	16:36		17:38		18:32		05:58		05:02	06:34 (9)	05:02
24	08:18		07:20		06:13		05:58		05:02	06:34 (9)	05:02
	16:38		17:40		18:34		05:56		05:00	06:34 (9)	05:00
25	08:17		07:18		06:10		05:56		05:00	06:34 (9)	05:00
	16:40		17:42		18:36		05:54		04:59	06:34 (9)	04:59
26	08:15		07:15		06:08		05:54		04:59	06:34 (9)	04:59
	16:42		17:44		18:38		05:52		04:58	06:34 (9)	04:58
27	08:14		07:13		06:05		05:52		04:58	06:34 (9)	04:58
	16:44		17:46		18:40		05:50		04:56	06:34 (9)	04:56
28	08:12		07:11		06:03		05:49		04:56	06:34 (9)	04:56
	16:46		17:48		18:41		05:47		04:55	06:34 (9)	04:55
29	08:11				06:00		05:47		04:55	06:34 (9)	04:55
	16:48				18:43		05:45		04:54	06:34 (9)	04:54
30	08:09				05:58		05:45		04:54	06:34 (9)	04:54
	16:49				18:45		05:43		04:53	06:34 (9)	04:53
31	08:08				06:55		05:43		04:53	06:34 (9)	04:53
	16:51	3	08:38 (12)		19:47		05:43		04:53	06:34 (9)	04:53
	16:51	3	08:41 (12)		19:47		05:43		04:53	06:34 (9)	04:53
Sonnenscheinstunden		248			365		419		494		511
astr.max.mögl.Beschattung		82		359	242		872		1028		441

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: GesamtbelastungSchattenrezeptor: G - IO 7

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

	Juli		August		September		Oktober		November		Dezember	
1	04:47		05:39 (6)	05:26	06:10 (7)	06:21	06:50 (9)	07:15	07:48 (11)	07:13	07:49 (12)	08:09
	21:52	15	05:54 (6)	21:17	06:36 (7)	20:11	07:17 (10)	18:56	08:11 (11)	16:45	08:16 (12)	15:59
2	04:47		05:40 (6)	05:28	06:10 (7)	06:23	06:52 (9)	07:17	07:47 (11)	07:15	07:49 (12)	08:11
	21:52	15	05:55 (6)	21:16	06:37 (7)	20:08	07:17 (10)	18:54	08:11 (11)	16:43	08:17 (12)	15:58
3	04:48		05:40 (6)	05:30	06:09 (7)	06:25	06:54 (9)	07:18	07:47 (11)	07:17	07:49 (12)	08:12
	21:51	16	05:56 (6)	21:14	06:37 (7)	20:06	07:18 (10)	18:51	08:12 (11)	16:41	08:17 (12)	15:58
4	04:49		05:40 (6)	05:31	06:09 (7)	06:26	06:56 (10)	07:20	07:49 (11)	07:19	07:52 (12)	08:14
	21:51	16	05:56 (6)	21:12	07:08 (9)	20:03	07:18 (10)	18:49	08:12 (11)	16:39	08:17 (12)	15:57
5	04:50		05:39 (6)	05:33	06:08 (7)	06:28	06:57 (10)	07:22	07:51 (11)	07:21	07:54 (12)	08:15
	21:50	17	05:56 (6)	21:10	07:10 (9)	20:01	07:17 (10)	18:47	08:12 (11)	16:37	08:17 (12)	15:56
6	04:51		05:39 (6)	05:35	06:08 (7)	06:30	06:59 (10)	07:24	07:52 (11)	07:23	07:56 (12)	08:17
	21:50	18	05:57 (6)	21:08	07:13 (9)	19:59	07:17 (10)	18:44	08:10 (11)	16:35	08:17 (12)	15:56
7	04:52		05:39 (6)	05:36	06:09 (7)	06:32	07:01 (10)	07:26	07:54 (11)	07:25	07:58 (12)	08:18
	21:49	19	05:58 (6)	21:06	07:15 (9)	19:56	07:17 (10)	18:42	08:10 (11)	16:33	08:16 (12)	15:55
8	04:53		05:39 (6)	05:38	06:10 (7)	06:33	07:02 (10)	07:28	07:56 (11)	07:27	08:00 (12)	08:19
	21:48	19	05:58 (6)	21:04	07:15 (9)	19:54	07:15 (10)	18:39	08:09 (11)	16:31	08:16 (12)	15:55
9	04:54		05:39 (6)	05:40	06:12 (7)	06:35	07:04 (10)	07:29	07:58 (11)	07:29	08:02 (12)	08:21
	21:48	20	05:59 (6)	21:02	07:17 (9)	19:51	07:15 (10)	18:37	08:08 (11)	16:29	08:15 (12)	15:54
10	04:55		05:38 (6)	05:42	06:14 (7)	06:37	07:06 (10)	07:31	08:00 (11)	07:31	08:04 (12)	08:22
	21:47	21	05:59 (6)	21:00	07:18 (9)	19:49	07:14 (10)	18:34	08:07 (11)	16:28	08:14 (12)	15:54
11	04:56		05:38 (6)	05:43	06:15 (7)	06:39	07:08 (10)	07:33	08:02 (11)	07:33	08:07 (12)	08:23
	21:46	22	06:00 (6)	20:58	07:18 (9)	19:46	07:12 (10)	18:32	08:05 (11)	16:26	08:14 (12)	15:54
12	04:57		05:38 (6)	05:45	06:17 (7)	06:41		07:35		07:35	08:09 (12)	08:24
	21:45	22	06:00 (6)	20:56	07:19 (9)	19:44		18:30		16:24	08:13 (12)	15:53
13	04:58		05:38 (6)	05:47	06:19 (7)	06:42		07:37		07:37	08:11 (12)	08:25
	21:44	22	06:00 (6)	20:54	07:20 (9)	19:41		18:27		16:23	08:12 (12)	15:53
14	04:59		05:38 (6)	05:49	06:20 (7)	06:44		07:39		07:39		08:26
	21:43	22	06:00 (6)	20:52	07:20 (9)	19:39		18:25		16:21		15:53
15	05:01		05:37 (6)	05:51	06:22 (7)	06:46		07:41		07:41		08:27
	21:42	24	06:01 (6)	20:50	07:21 (9)	19:36		18:23		16:19		15:53
16	05:02		05:38 (6)	05:52	06:23 (7)	06:48		07:43		07:43		08:28
	21:41	24	06:02 (6)	20:47	07:20 (9)	19:34		18:20		16:18		15:53
17	05:03		05:38 (6)	05:54	06:25 (7)	06:50		07:44		07:44		08:29
	21:40	24	06:02 (6)	20:45	07:21 (9)	19:31		18:18		16:16		15:53
18	05:05		05:39 (6)	05:56	06:40 (9)	06:51		07:46		07:46		08:30
	21:39	22	06:01 (6)	20:43	07:21 (9)	19:29		18:16		16:15		15:53
19	05:06		05:40 (6)	05:58	06:39 (9)	06:53		07:48		07:48		08:31
	21:37	21	06:01 (6)	20:41	07:21 (9)	19:26		18:13		16:13		15:54
20	05:07		05:42 (6)	05:59	06:39 (9)	06:55		07:50		07:50		08:32
	21:36	20	06:02 (6)	20:39	07:21 (9)	19:24		18:11		16:12		15:54
21	05:09		05:43 (6)	06:01	06:39 (9)	06:57		07:52		07:52		08:32
	21:35	19	06:02 (6)	20:36	07:21 (9)	19:21		18:09		16:10		15:54
22	05:10		05:44 (6)	06:03	06:39 (9)	06:58		07:54		07:54		08:33
	21:33	17	06:01 (6)	20:34	07:21 (9)	19:19		18:06		16:09		15:55
23	05:12		05:46 (6)	06:05	06:39 (9)	07:00		07:56		07:56		08:33
	21:32	20	06:25 (7)	20:32	07:20 (9)	19:16		18:04		16:08		15:55
24	05:13		05:47 (6)	06:07	06:39 (9)	07:02		07:58		07:57		08:34
	21:30	25	06:28 (7)	20:29	07:19 (9)	19:14		18:02		16:06		15:56
25	05:15		05:49 (6)	06:08	06:40 (9)	07:04		08:00		08:57 (12)	07:59	08:34
	21:29	27	06:31 (7)	20:27	07:19 (9)	19:11		18:00	11	09:08 (12)	16:05	15:56
26	05:16		05:50 (6)	06:10	06:40 (9)	07:06		08:02		08:55 (12)	08:01	08:35
	21:27	28	06:32 (7)	20:25	07:17 (9)	19:09		17:58	16	09:11 (12)	16:04	15:57
27	05:18		05:52 (6)	06:12	06:42 (9)	07:07		07:57 (11)	07:04	07:53 (12)	08:03	08:35
	21:26	27	06:33 (7)	20:23	07:17 (9)	19:06	8	08:05 (11)	16:55	08:12 (12)	16:03	15:58
28	05:20		05:53 (6)	06:14	06:44 (9)	07:09		07:54 (11)	07:06	07:52 (12)	08:04	08:35
	21:24	28	06:34 (7)	20:20	07:16 (9)	19:04	14	08:08 (11)	16:53	08:14 (12)	16:02	15:58
29	05:21		05:55 (6)	06:16	06:45 (9)	07:11		07:51 (11)	07:08	07:51 (12)	08:06	08:35
	21:22	27	06:35 (7)	20:18	07:14 (9)	19:01	18	08:09 (11)	16:51	08:15 (12)	16:01	15:59
30	05:23		05:56 (6)	06:17	06:47 (9)	07:13		07:49 (11)	07:09	07:50 (12)	08:08	08:35
	21:21	25	06:35 (7)	20:15	07:15 (10)	18:59	21	08:10 (11)	16:49	08:16 (12)	16:00	16:00
31	05:25		06:11 (7)	06:19	06:49 (9)			07:11		07:50 (12)		08:35
	21:19	25	06:36 (7)	20:13	07:17 (10)			16:47	26	08:16 (12)		16:01
Sonnenscheinstunden	514		462		384			330		259		232
astr.max.mögl.Beschattung	667		1307		249			327		221		430

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: H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

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

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember					
1	04:47	05:22 (5)	05:26	05:59 (6)	06:21	06:50 (9)	07:15	07:57 (11)	07:13	07:54 (12)	08:09					
2	21:52	18	05:40 (5)	21:17	24	06:39 (7)	20:11	35	07:25 (9)	18:56	15	08:12 (11)	16:45	24	08:18 (12)	15:59
3	04:47	05:23 (5)	05:28	06:01 (6)	06:23	06:52 (9)	07:17	15	07:55 (11)	07:15	07:53 (12)	08:11	25	08:18 (12)	15:58	
4	21:52	17	05:40 (5)	21:16	24	06:41 (7)	20:08	33	07:25 (9)	18:54	18	08:13 (11)	16:43	25	08:18 (12)	15:58
5	04:48	05:24 (5)	05:30	06:02 (6)	06:25	06:54 (9)	07:18	18	07:53 (11)	07:17	07:52 (12)	08:12	27	08:19 (12)	15:58	
6	21:51	16	05:40 (5)	21:14	22	06:41 (7)	20:06	30	07:24 (9)	18:51	21	08:14 (11)	16:41	27	08:19 (12)	15:58
7	04:49	05:25 (5)	05:31	06:20 (7)	06:26	06:56 (9)	07:20	23	07:52 (11)	07:19	07:53 (12)	08:14	27	08:19 (12)	15:57	
8	21:51	15	05:40 (5)	21:12	23	06:43 (7)	20:03	27	07:23 (9)	18:49	23	08:15 (11)	16:39	27	08:20 (12)	15:57
9	04:50	05:25 (5)	05:33	06:19 (7)	06:28	06:57 (9)	07:22	23	07:52 (11)	07:21	07:54 (12)	08:15	26	08:20 (12)	15:56	
10	21:50	13	05:38 (5)	21:10	24	06:43 (7)	20:01	25	07:22 (10)	18:47	23	08:15 (11)	16:37	26	08:20 (12)	15:56
11	04:51	05:26 (5)	05:35	06:18 (7)	06:30	06:59 (9)	07:24	23	07:52 (11)	07:23	07:56 (12)	08:17	24	08:20 (12)	15:56	
12	21:50	12	05:38 (5)	21:08	26	06:44 (7)	19:59	23	07:22 (10)	18:44	23	08:15 (11)	16:35	24	08:20 (12)	15:56
13	04:52	05:27 (5)	05:36	06:18 (7)	06:32	07:01 (10)	07:26	21	07:54 (11)	07:25	07:58 (12)	08:18	21	08:19 (12)	15:55	
14	21:49	10	05:37 (5)	21:06	27	06:45 (7)	19:56	22	07:23 (10)	18:42	21	08:15 (11)	16:33	21	08:19 (12)	15:55
15	04:53	05:28 (5)	05:38	06:17 (7)	06:33	07:02 (10)	07:28	18	07:56 (11)	07:27	07:59 (12)	08:19	19	08:19 (12)	15:55	
16	21:48	13	05:58 (6)	21:04	27	06:44 (7)	19:54	20	07:22 (10)	18:39	18	08:14 (11)	16:31	19	08:19 (12)	15:55
17	04:54	05:29 (5)	05:40	06:17 (7)	06:35	07:04 (10)	07:29	16	07:58 (11)	07:29	08:02 (12)	08:21	17	08:19 (12)	15:54	
18	21:48	14	06:00 (6)	21:02	28	06:45 (7)	19:51	18	07:22 (10)	18:37	16	08:14 (11)	16:29	17	08:19 (12)	15:54
19	04:55	05:30 (5)	05:42	06:17 (7)	06:37	07:06 (10)	07:31	13	08:00 (11)	07:31	08:04 (12)	08:22	14	08:18 (12)	15:54	
20	21:47	13	06:01 (6)	21:00	28	06:45 (7)	19:49	15	07:21 (10)	18:34	13	08:13 (11)	16:28	14	08:18 (12)	15:54
21	04:56	05:50 (6)	05:43	06:16 (7)	06:39	07:08 (10)	07:33	10	08:12 (11)	07:33	08:02 (11)	16:26	12	08:19 (12)	15:54	
22	21:46	12	06:02 (6)	20:58	29	06:45 (7)	19:46	13	07:21 (10)	18:32	10	08:12 (11)	16:26	12	08:19 (12)	15:54
23	04:57	05:49 (6)	05:45	06:17 (7)	06:41	07:09 (10)	07:35	7	08:04 (11)	16:35	08:04 (11)	16:35	9	08:19 (12)	15:53	
24	21:45	14	06:03 (6)	20:56	40	07:18 (9)	19:44	10	07:19 (10)	18:30	7	08:11 (11)	16:24	9	08:18 (12)	15:53
25	04:58	05:48 (6)	05:47	06:19 (7)	06:42	07:11 (10)	07:37	4	08:06 (11)	16:37	08:06 (11)	16:37	6	08:17 (12)	15:53	
26	21:44	16	06:04 (6)	20:54	44	07:21 (9)	19:41	7	07:18 (10)	18:27	4	08:10 (11)	16:23	6	08:17 (12)	15:53
27	04:59	05:48 (6)	05:49	06:20 (7)	06:44	07:13 (10)	07:39	4	07:17 (10)	18:25		16:21	3	08:16 (12)	15:53	
28	21:43	17	06:05 (6)	20:52	46	07:22 (9)	19:39					16:21			15:53	
29	05:01	05:47 (6)	05:51	06:22 (7)	06:46		07:41					16:19			15:53	
30	21:42	18	06:05 (6)	20:50	47	07:24 (9)	19:36								15:53	
31	05:02	05:48 (6)	05:52	06:23 (7)	06:48		07:43								15:53	
32	21:41	19	06:07 (6)	20:47	48	07:25 (9)	19:34								15:53	
33	05:03	05:47 (6)	05:54	06:25 (7)	06:50		07:44								15:53	
34	21:40	20	06:07 (6)	20:45	47	07:26 (9)	19:31								15:53	
35	05:05	05:46 (6)	05:56	06:27 (7)	06:51		07:46								15:53	
36	21:39	21	06:07 (6)	20:43	47	07:28 (9)	19:29								15:53	
37	05:06	05:46 (6)	05:58	06:28 (7)	06:53		07:48								15:54	
38	21:37	21	06:07 (6)	20:41	46	07:28 (9)	19:26								15:54	
39	05:07	05:46 (6)	05:59	06:30 (7)	06:55		07:50								15:54	
40	21:36	22	06:08 (6)	20:39	44	07:28 (9)	19:24								15:54	
41	05:09	05:46 (6)	06:01	06:32 (7)	06:57		07:52								15:54	
42	21:35	22	06:08 (6)	20:36	41	07:29 (9)	19:21								15:54	
43	05:10	05:45 (6)	06:03	06:52 (9)	06:58		07:54								15:54	
44	21:33	23	06:08 (6)	20:34	38	07:30 (9)	19:19								15:55	
45	05:12	05:46 (6)	06:05	06:50 (9)	07:00		07:56								15:55	
46	21:32	23	06:09 (6)	20:32	39	07:29 (9)	19:16								15:55	
47	05:13	05:47 (6)	06:07	06:50 (9)	07:02		07:58								15:55	
48	21:30	22	06:09 (6)	20:30	40	07:30 (9)	19:14								15:56	
49	05:15	05:49 (6)	06:08	06:50 (9)	07:04		08:00								15:56	
50	21:29	21	06:10 (6)	20:27	40	07:30 (9)	19:11								15:56	
51	05:16	05:50 (6)	06:10	06:49 (9)	07:06		08:02								15:57	
52	21:27	19	06:09 (6)	20:25	40	07:29 (9)	19:09								15:57	
53	05:18	05:52 (6)	06:12	06:49 (9)	07:07		07:04								15:58	
54	21:26	17	06:09 (6)	20:23	40	07:29 (9)	19:06								15:58	
55	05:20	05:53 (6)	06:14	06:49 (9)	07:09		07:06								15:58	
56	21:24	16	06:09 (6)	20:20	40	07:29 (9)	19:04								15:58	
57	05:21	05:55 (6)	06:16	06:48 (9)	07:11		07:08								15:59	
58	21:22	14	06:09 (6)	20:18	40	07:28 (9)	19:01								15:59	
59	05:23	05:56 (6)	06:17	06:48 (9)	07:13		07:09								15:59	
60	21:21	18	06:34 (7)	20:15	39	07:27 (9)	18:59								16:00	
61	05:25	05:58 (6)	06:19	06:49 (9)											16:01	
62	21:19	22	06:38 (7)	20:13	38	07:27 (9)									16:01	
Sonnenscheinstunden	514	462	384	293	298	254	232	4								
astr.max.mögl.Beschattung	538	1126	293	298	254	232	4									

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

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: I - IO 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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:

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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: I - IO 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

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

Projekt:

19-095-GBK-02

Beschreibung:

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

Lizenzierter Anwender:

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

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: J - IO 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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: K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) 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: K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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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: L - IO 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Keskorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 28.08.2019 10:21/3.2.744
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SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: L - IO 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

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

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

Tag im Monat	Sonnenaufgang (SS:MM)	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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