



## SHADOW - Kalender pro WEA

**Berechnung:** Zusatzbelastung / Hauptergebnis und Listen **WEA:** WEA 01 - ENERCON \_\_E-115 EP3 E3 4200 115.7 !O! NH: 135,4 m (Ges:193,3 m) (1) Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BREMEN]

### Annahmen für Schattenwurfberechnung

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez  
1,53 2,81 3,16 5,42 7,18 5,91 6,09 6,01 4,64 3,11 1,99 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe  
411 399 508 626 620 504 624 1.257 1.362 951 852 598 8.711  
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

	Januar	Februar	März	April	Mai	Juni
1	08:45 14:44-15:40/56 16:20 10:36-11:15/39	08:16 15:29-16:25/56 17:11	07:19 18:06	07:05 20:03	05:57 07:22-07:41/19 20:57	05:09 06:17-06:59/42 21:46 20:53-21:11/18
2	08:45 14:44-15:40/56 16:22 10:36-11:14/38	08:14 15:31-16:26/55 17:13	07:17 18:08	07:03 20:05	05:55 07:24-07:38/14 20:59	05:08 06:17-07:00/43 21:48 20:52-21:11/19
3	08:45 14:46-15:41/55 16:23 10:37-11:14/37	08:12 15:37-16:28/51 17:15	07:15 18:09	07:00 20:07	05:53 07:29-07:35/6 21:01	05:07 06:16-07:00/44 21:49 20:52-21:11/19
4	08:45 14:46-15:41/55 16:24 10:37-11:13/36	08:11 15:39-16:29/50 17:17	07:12 18:11	06:58 20:08	05:51 21:03	05:06 06:17-07:01/44 21:50 20:52-21:11/19
5	08:44 14:48-15:42/54 16:25 10:38-11:11/33	08:09 08:47-08:56/9 17:19 15:40-16:30/50	07:10 18:13	06:56 20:10	05:49 21:04	05:05 06:16-07:01/45 21:51 20:52-21:12/20
6	08:44 14:48-15:42/54 16:26 10:39-11:08/29	08:07 08:45-08:59/14 17:21 15:41-16:31/50	07:08 18:15	06:53 20:12	05:47 21:06	05:04 06:16-07:01/45 21:52 20:52-21:12/20
7	08:43 14:51-15:43/52 16:28 10:41-11:07/26	08:05 08:43-09:01/18 17:23 15:43-16:31/48	07:05 18:17	06:51 07:15-07:21/6 20:14	05:45 21:08	05:04 06:16-07:02/46 21:53 20:53-21:12/19
8	08:43 14:53-15:43/50 16:29 10:41-11:00/19	08:03 08:42-09:02/20 17:25 15:45-16:32/47	07:03 18:19	06:48 07:12-07:23/11 20:16 07:33-07:43/10	05:43 21:10	05:03 06:16-07:01/45 21:54 20:52-21:12/20
9	08:42 14:57-15:43/46 16:31 10:43-10:59/16	08:01 08:41-09:03/22 15:50-15:53/3 17:27 15:54-16:32/38	07:01 18:21	06:46 07:10-07:25/15 20:18 07:29-07:47/18	05:41 21:11	05:03 06:16-07:02/46 21:55 20:53-21:13/20
10	08:42 15:00-15:44/44 16:32 10:45-10:59/14	08:00 08:38-09:04/26 17:29 15:54-16:32/38	06:58 18:23	06:44 07:09-07:25/16 20:19 07:26-07:48/22	05:40 21:13	05:02 06:17-07:03/46 21:56 20:53-21:13/20
11	08:41 15:01-15:45/44 16:34 10:47-10:58/11	07:58 08:36-09:05/29 17:31 15:54-16:32/38	06:56 18:25	06:41 07:08-07:50/42 20:21	05:38 21:15	05:02 06:16-07:03/47 21:56 20:53-21:13/20
12	08:40 15:02-15:45/43 16:35 10:50-10:56/6	07:56 08:34-09:05/31 17:33 15:55-16:32/37	06:53 18:26	06:39 07:04-07:51/47 20:23	05:36 21:17	05:01 06:17-07:03/46 21:57 20:53-21:13/20
13	08:40 15:03-15:45/42 16:37	07:54 08:32-09:05/33 17:34 15:54-16:31/37	06:51 18:28	06:37 07:00-07:51/51 20:25	05:34 21:18	05:01 06:17-07:04/47 21:58 20:54-21:14/20
14	08:39 15:03-15:48/45 16:38	07:52 08:31-09:05/34 17:36 15:55-16:31/36	06:49 18:30	06:34 06:58-07:52/54 20:27	05:33 21:20	05:01 06:17-07:04/47 21:58 20:54-21:14/20
15	08:38 15:04-15:51/47 16:40	07:50 08:31-09:05/34 17:38 15:56-16:30/34	06:46 18:32	06:32 06:57-07:52/55 20:28	05:31 21:22	05:01 06:17-07:04/47 21:59 20:54-21:13/19
16	08:37 15:04-15:54/50 16:41	07:48 08:30-09:05/35 17:40 15:57-16:30/33	06:44 18:34	06:30 06:56-07:53/57 20:30	05:29 21:23	05:00 06:17-07:04/47 20:54-21:14/20 22:00 21:18-21:20/2
17	08:36 15:05-15:57/52 16:43	07:45 08:30-09:05/35 17:42 15:58-16:29/31	06:41 18:36	06:27 06:55-07:52/57 20:32	05:28 06:35-06:38/3 21:25	05:00 06:17-07:04/47 20:54-21:14/20 22:00 21:17-21:21/4
18	08:35 15:07-15:58/51 16:45	07:43 08:30-09:05/35 17:44 16:00-16:28/28	06:39 18:37	06:25 06:54-07:52/58 20:34	05:26 06:30-06:44/14 21:26	05:00 06:17-07:04/47 20:54-21:14/20 22:00 21:17-21:22/5
19	08:34 15:08-16:00/52 16:47	07:41 08:29-09:03/34 17:46 16:01-16:25/24	06:37 18:39	06:23 06:54-07:53/59 20:36	05:25 06:27-06:47/20 21:28	05:00 06:18-07:05/47 20:55-21:14/19 22:01 21:16-21:22/6
20	08:33 15:09-16:01/52 16:48	07:39 08:29-09:02/33 17:48 16:05-16:22/17	06:34 18:41	06:21 06:54-07:52/58 20:38	05:23 06:25-06:48/23 21:30	05:00 06:18-07:06/48 20:56-21:15/19 22:01 21:17-21:24/7
21	08:31 15:11-16:02/51 16:50	07:37 08:30-09:01/31 17:50	06:32 18:43	06:18 06:54-07:52/58 20:39	05:22 06:24-06:50/26 21:31	05:00 06:18-07:06/48 20:56-21:15/19 22:01 21:17-21:24/7
22	08:30 15:12-16:04/52 16:52	07:35 08:30-08:59/29 17:52	06:29 18:45	06:16 06:55-07:52/57 20:41	05:20 06:23-06:51/28 21:33	05:01 06:18-07:06/48 20:56-21:15/19 22:02 21:17-21:24/7
23	08:29 15:13-16:04/51 16:54	07:33 08:30-08:56/26 17:54	06:27 18:47	06:14 06:56-07:51/55 20:43	05:19 06:22-06:53/31 21:34	05:01 06:18-07:05/47 20:56-21:15/19 22:02 21:17-21:23/6
24	08:28 15:14-16:05/51 16:56	07:30 08:31-08:55/24 17:56	06:24 18:48	06:12 06:56-07:50/54 20:45	05:18 06:20-06:53/33 21:36 20:58-21:02/4	05:01 06:19-07:06/47 20:56-21:16/20 22:02 21:19-21:24/5
25	08:26 15:15-16:05/50 16:57	07:28 08:32-08:54/22 17:58	06:22 18:50	06:10 06:58-07:05/7 20:47 07:06-07:49/43	05:16 06:20-06:54/34 21:37 20:56-21:04/8	05:02 06:19-07:06/47 20:56-21:16/20 22:02 21:19-21:24/5
26	08:25 15:16-16:06/50 16:59	07:26 08:34-08:52/18 18:00	06:20 18:52	06:07 07:08-07:48/40 20:48	05:15 06:19-06:55/36 21:38 20:55-21:05/10	05:02 06:20-07:07/47 20:56-21:16/20 22:02 21:19-21:23/4
27	08:23 15:19-16:07/48 17:01	07:24 08:35-08:49/14 18:02	06:17 18:54	06:05 07:12-07:15/3 20:50 07:18-07:47/29	05:14 06:18-06:56/38 21:40 20:54-21:06/12	05:02 06:20-07:07/47 22:02 20:57-21:16/19
28	08:22 15:21-16:12/51 17:03	07:21 08:39-08:46/7 18:04	06:15 18:56	06:03 07:19-07:46/27 20:52	05:13 06:18-06:56/38 21:41 20:53-21:08/15	05:03 06:20-07:07/47 22:02 20:56-21:16/20
29	08:20 15:24-16:14/50 17:05		07:12 19:58	06:01 07:20-07:45/25 20:54	05:12 06:18-06:57/39 21:43 20:53-21:08/15	05:03 06:20-07:07/47 22:02 20:57-21:17/20
30	08:19 15:26-16:20/54 17:07		07:10 19:59	05:59 07:21-07:43/22 20:56	05:10 06:17-06:58/41 21:44 20:52-21:09/17	05:04 06:21-07:07/46 22:01 20:58-21:17/19
31	08:17 15:27-16:23/56 17:09		07:08 20:01		05:09 06:18-06:59/41 21:45 20:52-21:09/17	
Sonneneinstrahlung	252	274	367	419	492	507
Anzahl Minuten mit Schatten	1868	1414	0	1056	582	2031

**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 / Hauptergebnis und Listen**WEA:** WEA 01 - ENERCON \_\_E-115 EP3 E3 4200 115.7 !O! NH: 135,4 m (Ges:193,3 m) (1) Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BREMEN]

### Annahmen für Schattenwurfberechnung

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez  
1,53 2,81 3,16 5,42 7,18 5,91 6,09 6,01 4,64 3,11 1,99 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe  
411 399 508 626 620 504 624 1.257 1.362 951 852 598 8.711  
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

	Juli		August		September		Oktober		November		Dezember	
1	05:05	06:20-07:07/47	05:44		06:37	07:07-07:49/42	07:29		07:26	08:08-08:34/26	08:20	14:43-15:27/44
	22:01	20:57-21:17/20	21:27		20:21		19:08		16:59	15:23-16:01/38	16:15	10:29-10:40/11
2	05:05	06:21-07:07/46	05:45		06:39	07:08-07:24/16	07:31		07:28	08:11-08:33/22	08:22	14:43-15:27/44
	22:01	20:58-21:17/19	21:25		20:19	07:25-07:47/22	19:06		16:57	15:18-16:02/44	16:15	10:27-10:41/14
3	05:06	06:22-07:08/46	05:47		06:40	07:07-07:22/15	07:33		07:30	08:12-08:32/20	08:23	14:42-15:28/46
	22:00	20:58-21:18/20	21:23		20:16	07:26-07:44/18	19:04		16:55	15:15-16:02/47	16:14	10:27-10:43/16
4	05:07	06:22-07:08/46	05:49		06:42	07:09-07:20/11	07:35		07:32	08:13-08:30/17	08:25	14:37-15:27/50
	22:00	20:58-21:17/19	21:21		20:14	07:30-07:40/10	19:01		16:53	15:12-16:01/49	16:13	10:26-10:44/18
5	05:08	06:22-07:07/45	05:50		06:44	07:12-07:18/6	07:36		07:34	08:15-08:28/13	08:26	14:36-15:28/52
	21:59	20:58-21:18/20	21:19		20:12		18:59		16:51	15:11-16:01/50	16:13	10:26-10:52/26
6	05:09	06:22-07:07/45	05:52		06:46		07:38		07:36	08:17-08:26/9	08:28	14:35-15:28/53
	21:59	20:58-21:18/20	21:17		20:09		18:56		16:49	15:10-16:00/50	16:12	10:25-10:54/29
7	05:10	06:23-07:07/44	05:54		06:47		07:40		07:38	15:09-15:59/50	08:29	14:35-15:29/54
	21:58	20:59-21:18/19	21:15		20:07		18:54		16:47		16:12	10:26-10:58/32
8	05:11	06:23-07:07/44	05:55		06:49		07:42		07:40	15:08-15:58/50	08:30	14:34-15:29/55
	21:57	20:59-21:18/19	21:14		20:04		18:52		16:46		16:11	10:25-11:01/36
9	05:12	06:24-07:07/43	05:57		06:51		07:44		07:42	15:02-15:57/55	08:31	14:34-15:29/55
	21:57	20:59-21:18/19	21:12		20:02		18:49		16:44		16:11	10:25-11:02/37
10	05:13	06:24-07:07/43	05:59	07:36-07:45/9	06:53		07:45		07:44	14:59-15:56/57	08:33	14:34-15:30/56
	21:56	21:00-21:18/18	21:10		20:00		18:47		16:42		16:11	10:26-11:04/38
11	05:14	06:24-07:07/43	06:01	07:33-07:49/16	06:54		07:47		07:45	14:58-15:54/56	08:34	14:34-15:30/56
	21:55	21:00-21:18/18	21:08		19:57		18:45		16:41		16:11	10:26-11:05/39
12	05:15	06:25-07:07/42	06:02	07:30-07:50/20	06:56		07:49		07:47	14:57-15:51/54	08:35	14:34-15:31/57
	21:54	21:00-21:18/18	21:06		19:55		18:42		16:39		16:10	10:26-11:07/41
13	05:16	06:25-07:06/41	06:04	07:29-07:52/23	06:58		07:51		07:49	14:56-15:46/50	08:36	14:33-15:31/58 10:26-11:09/43
	21:53	21:01-21:18/17	21:03		19:52		18:40		16:37		16:10	11:10-11:11/1
14	05:17	06:26-07:06/40	06:06	07:28-07:54/26	07:00		07:53	09:10-09:21/11	07:51	14:53-15:43/50	08:37	14:31-15:31/60
	21:52	21:01-21:17/16	21:01		19:50		18:38		16:36		16:10	10:26-11:14/48
15	05:19	06:27-07:06/39	06:07	07:26-07:54/28	07:01		07:55	09:06-09:22/16	07:53	14:51-15:39/48	08:38	14:31-15:31/60
	21:51	21:02-21:17/15	20:59		19:47		18:35		16:34		16:10	10:26-11:16/50
16	05:20	06:28-07:06/38	06:09	07:18-07:24/6	07:03		07:56	09:04-09:24/20	07:55	14:50-15:39/49	08:39	14:31-15:32/61
	21:50	21:03-21:16/13	20:57	07:25-07:55/30	19:45		18:33		16:33		16:10	10:27-11:17/50
17	05:21	06:28-07:05/37	06:11	07:14-07:55/41	07:05		07:58	09:03-09:25/22	07:57	14:49-15:39/50	08:40	14:31-15:32/61
	21:49	21:04-21:15/11	20:55		19:42		18:31		16:31		16:11	10:27-11:18/51
18	05:23	06:29-07:04/35	06:13	07:04-07:12/8	07:06		08:00	09:02-09:26/24	07:58	14:48-15:39/51	08:40	14:30-15:32/62
	21:48	21:05-21:14/9	20:53	07:13-07:56/43	19:40		18:28		16:30		16:11	10:27-11:20/53
19	05:24	06:30-07:04/34	06:14	07:02-07:57/55	07:08		08:02	09:01-09:28/27	08:00	14:48-15:39/51	08:41	14:30-15:33/63
	21:46	21:06-21:13/7	20:51		19:38		18:26		16:28		16:11	10:28-11:21/53
20	05:25	06:31-07:03/32	06:16	07:00-07:56/56	07:10		08:04	09:00-09:30/30	08:02	14:46-15:38/52	08:42	14:31-15:34/63
	21:45		20:49		19:35		18:24		16:27		16:11	10:29-11:23/54
21	05:27	06:32-07:02/30	06:18	06:59-07:57/58	07:12		08:06	09:00-09:32/32	08:04	14:46-15:37/51	08:42	14:30-15:33/63
	21:44		20:46		19:33		18:22		16:26		16:12	10:28-11:23/55
22	05:28	06:34-07:01/27	06:20	06:59-07:57/58	07:13		08:07	09:00-09:33/33	08:06	14:45-15:37/52	08:43	14:31-15:34/63
	21:42		20:44		19:30		18:20	16:34-16:53/19	16:24		16:12	10:29-11:24/55
23	05:30	06:35-07:00/25	06:21	06:58-07:56/58	07:15		08:09	08:59-09:34/35	08:07	14:44-15:36/52	08:43	14:32-15:35/63
	21:41		20:42		19:28		18:17	16:31-16:56/25	16:23		16:13	10:29-11:24/55
24	05:31	06:36-06:58/22	06:23	06:58-07:56/58	07:17		08:11	08:59-09:34/35	08:09	14:44-15:36/52	08:44	14:32-15:35/63
	21:39		20:40		19:25		18:15	16:29-16:57/28	16:22		16:13	10:30-11:24/54
25	05:33	06:39-06:56/17	06:25	06:58-07:56/58	07:19		07:13	08:00-08:34/34	08:11	14:43-15:35/52	08:44	14:33-15:36/63
	21:38		20:37		19:23		17:13	15:27-15:59/32	16:21		16:14	10:31-11:24/53
26	05:34	06:42-06:52/10	06:27	06:57-07:55/58	07:20		07:15	08:00-08:35/35	08:12	14:43-15:33/50	08:44	14:34-15:36/62
	21:36		20:35		19:20		17:11	15:26-15:59/33	16:20		16:15	10:31-11:23/52
27	05:36		06:28	06:58-07:55/57	07:22		07:17	08:00-08:35/35	08:14	14:43-15:31/48	08:45	14:35-15:37/62
	21:35		20:33		19:18		17:09	15:25-16:00/35	16:19		16:15	10:32-11:22/50
28	05:37		06:30	06:59-07:54/55	07:24		07:19	08:01-08:35/34	08:16	14:42-15:27/45	08:45	14:37-15:37/60
	21:33		20:30		19:16		17:07	15:24-16:01/37	16:18		16:16	10:32-11:22/50
29	05:39		06:32	06:59-07:53/54	07:26		07:21	08:02-08:34/32	08:17	14:43-15:25/42	08:45	14:38-15:38/60
	21:32		20:28		19:13		17:05	15:24-16:01/37	16:17		16:17	10:33-11:21/48
30	05:41		06:34	07:01-07:52/51	07:27		07:23	08:03-08:34/31	08:19	14:43-15:26/43	08:45	14:40-15:39/59
	21:30		20:26		19:11		17:03	15:23-16:01/38	16:16	10:31-10:36/5	16:18	10:34-11:20/46
31	05:42		06:35	07:04-07:50/46			07:25	08:06-08:34/28			08:45	14:42-15:39/57
	21:28		20:23				17:01	15:23-16:01/38			16:19	10:34-11:16/42
Sonnenscheinstunden	510		458		382		329		261		236	
Anzahl Minuten mit Schatten	1278		972		140		836		1600		3085	

**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 / Hauptergebnis und Listen **WEA:** WEA 02 - ENERCON \_\_E-115 EP3 E3 4200 115.7 !O! NH: 135,4 m (Ges:193,3 m) (2) Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BREMEN]

### Annahmen für Schattenwurfberechnung

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez  
1,53 2,81 3,16 5,42 7,18 5,91 6,09 6,01 4,64 3,11 1,99 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe  
411 399 508 626 620 504 624 1.257 1.362 951 852 598 8.711  
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

	Januar	Februar	März	April	Mai	Juni
1	08:45 13:57-15:04/67 16:20 09:31-11:19/108	08:16 14:42-15:41/59 17:11	07:19 07:58-08:24/26 18:06	07:05 20:03	05:57 06:36-06:58/22 20:57	05:09 21:46
2	08:45 13:57-15:04/67 16:22 09:30-11:17/107	08:14 14:42-15:41/59 17:13	07:17 07:57-08:21/24 18:08	07:03 20:05	05:55 06:34-06:59/25 20:59	05:08 21:48
3	08:45 13:58-15:05/67 16:23 09:31-11:15/104	08:12 14:43-15:40/57 17:15	07:15 07:58-08:19/21 18:09	07:00 20:07	05:53 06:34-07:01/27 21:01	05:07 21:49
4	08:44 13:58-15:05/67 16:24 09:30-11:14/104	08:11 14:44-15:41/57 17:17	07:12 07:58-08:16/18 18:11	06:58 20:08	05:51 06:33-07:01/28 21:03	05:06 21:50
5	08:44 14:00-15:06/66 09:31-10:57/86 16:25 10:59-11:11/12	08:09 14:45-15:41/56 17:19	07:10 07:59-08:15/16 18:13	06:56 20:10	05:49 06:32-07:01/29 21:04	05:05 21:51
6	08:44 14:00-15:06/66 09:30-10:54/84 16:26 11:01-11:09/8	08:07 14:46-15:40/54 17:21	07:08 08:01-08:14/13 18:15	06:53 07:24-07:36/12 20:12	05:47 06:32-07:01/29 21:06	05:04 21:52
7	08:43 14:02-15:08/66 16:28 09:31-10:52/81	08:05 14:46-15:40/54 17:23	07:05 08:04-08:09/5 18:17	06:51 07:21-07:38/17 20:14	05:45 06:31-07:01/30 21:08	05:04 21:53
8	08:43 14:02-15:09/67 09:31-10:51/80 16:29 15:10-15:17/7	08:03 14:48-15:39/51 17:25	07:03 18:19	06:48 07:13-07:39/26 20:16	05:43 06:31-07:02/31 21:10	05:03 21:54
9	08:42 14:03-15:20/77 16:31 09:30-10:49/79	08:01 14:49-15:38/49 17:27	07:01 18:21	06:46 07:10-07:40/30 20:18	05:41 06:31-07:02/31 21:11	05:03 21:55
10	08:42 14:04-15:22/78 16:32 09:31-10:48/77	08:00 14:50-15:37/47 17:29	06:58 18:23	06:44 07:08-07:40/32 20:19	05:40 06:31-07:02/31 21:13	05:02 21:56
11	08:41 14:06-15:25/79 16:33 09:31-10:46/75	07:58 14:52-15:35/43 17:31	06:56 18:25	06:41 07:07-07:41/34 20:21	05:38 06:31-07:02/31 21:15	05:02 21:56
12	08:40 14:07-15:26/79 16:35 09:31-10:43/72	07:56 14:55-15:34/39 17:33	06:53 18:26	06:39 07:07-07:41/34 20:23	05:36 06:31-07:02/31 21:17	05:01 21:57
13	08:40 14:08-15:28/80 16:37 09:32-10:42/70	07:54 14:57-15:12/15 17:34 15:15-15:30/15	06:51 18:28	06:37 07:05-07:40/35 20:25	05:34 06:31-07:01/30 21:18	05:01 21:58
14	08:39 14:10-15:29/79 16:38 09:32-10:38/66	07:52 15:21-15:25/4 17:36	06:49 18:30	06:34 07:05-07:40/35 20:27	05:33 06:31-07:01/30 21:20	05:01 21:58
15	08:38 14:12-15:30/78 16:40 09:32-10:37/65	07:50 17:38	06:46 18:32	06:32 07:05-07:40/35 20:28	05:31 06:31-07:01/30 21:22	05:01 21:59
16	08:37 14:14-15:31/77 16:41 09:31-10:34/63	07:48 17:40	06:44 18:34	06:30 07:06-07:39/33 20:30	05:29 06:32-07:01/29 21:23	05:00 22:00
17	08:36 14:15-15:32/77 16:43 09:32-10:31/59	07:45 17:42	06:41 18:36	06:27 07:05-07:38/33 20:32	05:28 06:32-07:00/28 21:25	05:00 22:00
18	08:35 14:17-15:33/76 16:45 09:32-10:29/57	07:43 08:12-08:22/10 17:44	06:39 18:37	06:25 07:06-07:37/31 20:34	05:26 06:33-07:00/27 21:26	05:00 22:00
19	08:34 14:19-15:35/76 16:47 09:33-10:26/53	07:41 08:09-08:23/14 17:46	06:37 18:39	06:23 07:08-07:36/28 20:36	05:25 06:34-06:59/25 21:28	05:00 22:01
20	08:33 14:20-15:35/75 16:48 09:33-10:22/49	07:39 08:08-08:25/17 17:48	06:34 18:41	06:21 07:10-07:17/7 20:38 07:18-07:34/16	05:23 06:34-06:58/24 21:30	05:00 22:01
21	08:31 14:22-15:36/74 16:50 09:34-10:20/46	07:37 08:07-08:26/19 17:50	06:32 18:43	06:18 07:20-07:33/13 20:39	05:22 06:35-06:58/23 21:31	05:00 22:01
22	08:30 14:25-15:37/72 16:52 09:35-10:18/43	07:35 08:04-08:27/23 17:52	06:29 18:45	06:16 07:23-07:29/6 20:41	05:20 06:36-06:57/21 21:33	05:01 22:02
23	08:29 14:31-15:37/66 16:54 09:35-10:14/39	07:33 08:01-08:26/25 17:54	06:27 18:47	06:14 20:43	05:19 06:37-06:56/19 21:34	05:01 22:02
24	08:28 14:33-15:39/66 16:56 09:36-10:11/35	07:30 08:00-08:27/27 17:56	06:24 18:48	06:12 20:45	05:18 06:37-06:55/18 21:36	05:01 22:02
25	08:26 14:33-15:39/66 16:57 09:36-10:09/33	07:28 07:59-08:27/28 17:58	06:22 18:50	06:10 20:47	05:16 06:39-06:53/14 21:37	05:02 22:02
26	08:25 14:34-15:39/65 16:59 09:37-10:05/28	07:26 07:59-08:27/28 18:00	06:20 18:52	06:07 20:48	05:15 06:41-06:52/11 21:38	05:02 22:02
27	08:23 14:36-15:40/64 17:01 09:39-10:03/24	07:24 07:57-08:25/28 18:02	06:17 18:54	06:05 20:50	05:14 06:43-06:50/7 21:40	05:02 22:02
28	08:22 14:37-15:40/63 17:03 09:40-09:57/17	07:21 07:57-08:25/28 18:04	06:15 18:56	06:03 06:43-06:52/9 20:52	05:13 21:41	05:03 22:02
29	08:20 14:39-15:40/61 17:05 09:41-09:55/14	 17:05 09:41-09:55/14	 19:58	06:01 06:39-06:55/16 20:54	05:12 21:43	05:03 22:01
30	08:19 14:41-15:41/60 17:07 09:44-09:54/10	 17:07 09:44-09:54/10	 19:59	05:59 06:37-06:57/20 20:56	05:10 21:44	05:04 22:01
31	08:17 14:42-15:41/59 17:09	 17:09	 20:01	 20:56	05:09 21:45	 22:01
Sonnenscheinstunden	252	274	367	419	492	507
Anzahl Minuten mit Schatten	4035	906	123	502	681	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:** Zusatzbelastung / Hauptergebnis und Listen**WEA:** WEA 02 - ENERCON \_\_E-115 EP3 E3 4200 115.7 !O! NH: 135,4 m (Ges:193,3 m) (2) Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BREMEN]

### Annahmen für Schattenwurfberechnung

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez  
1,53 2,81 3,16 5,42 7,18 5,91 6,09 6,01 4,64 3,11 1,99 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe  
411 399 508 626 620 504 624 1.257 1.362 951 852 598 8.711  
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

	July	August	September	Oktober	November	Dezember
1	05:05 22:01	05:44 06:41-07:12/31 21:27	06:37 07:06-07:40/34 20:21	07:29 19:08	07:26 14:19-15:06/47 16:59	08:20 13:48-15:07/79 16:15 09:13-10:28/75
2	05:05 22:01	05:45 06:42-07:13/31 21:25	06:39 07:07-07:39/32 20:19	07:31 19:06	07:28 14:18-15:08/50 16:57	08:22 13:47-15:05/78 16:15 09:13-10:30/77
3	05:06 22:00	05:47 06:41-07:12/31 21:23	06:40 07:07-07:37/30 20:16	07:33 19:03	07:30 14:17-15:09/52 16:55	08:23 13:47-15:04/77 16:14 09:15-10:33/78
4	05:07 22:00	05:49 06:41-07:12/31 21:21	06:42 07:10-07:36/26 20:14	07:35 19:01	07:32 14:16-15:09/53 16:53	08:25 13:46-14:53/67 09:15-10:35/80 16:13 14:54-15:02/8
5	05:08 21:59	05:50 06:41-07:12/31 21:19	06:44 07:18-07:35/17 20:12	07:36 18:59	07:34 14:15-15:10/55 16:51	08:26 13:47-14:53/66 16:13 09:16-10:37/81
6	05:09 21:59	05:52 06:42-07:12/30 21:17	06:46 07:19-07:32/13 20:09	07:38 18:56	07:36 14:14-15:10/56 16:49	08:28 13:46-14:53/67 09:16-10:39/83 16:12 10:47-10:55/8
7	05:10 21:58	05:54 06:41-07:11/30 21:15	06:47 07:24-07:26/2 20:07	07:40 08:37-08:47/10 18:54	07:38 14:14-15:11/57 16:47	08:29 13:47-14:53/66 09:18-10:44/86 16:12 10:47-10:58/11
8	05:11 21:57	05:55 06:42-07:11/29 21:14	06:49 20:04	07:42 08:35-08:49/14 18:52	07:40 14:13-15:11/58 16:46	08:30 13:47-14:53/66 16:11 09:18-11:02/104
9	05:12 21:56	05:57 06:42-07:09/27 21:12	06:51 20:02	07:44 08:34-08:51/17 18:49	07:42 14:13-15:11/58 16:44	08:31 13:46-14:53/67 16:11 09:19-11:03/104
10	05:13 21:56	05:59 06:43-07:09/26 21:10	06:53 19:59	07:45 08:32-08:52/20 18:47	07:44 14:13-15:12/59 16:42	08:33 13:47-14:54/67 16:11 09:20-11:07/107
11	05:14 21:55	06:01 06:44-07:08/24 21:08	06:54 19:57	07:47 08:32-08:54/22 18:45	07:45 14:12-15:12/60 16:41	08:34 13:47-14:54/67 16:11 09:21-11:09/108
12	05:15 21:54	06:02 06:45-07:06/21 21:06	06:56 19:55	07:49 08:31-08:56/25 18:42	07:47 14:12-15:12/60 16:39 09:15-09:25/10	08:35 13:48-14:54/66 16:10 09:22-11:11/109
13	05:16 21:53	06:04 06:46-07:05/19 21:03	06:58 19:52	07:51 08:31-08:58/27 18:40	07:49 14:11-15:12/61 16:37 09:13-09:27/14	08:36 13:48-14:54/66 16:10 09:23-11:12/109
14	05:17 21:52	06:06 06:49-07:03/14 21:01	07:00 19:50	07:53 08:31-08:58/27 18:38	07:51 14:09-15:12/63 16:36 09:12-09:29/17	08:37 13:48-14:55/67 16:10 09:23-11:13/110
15	05:19 21:51	06:07 06:51-06:59/8 20:59	07:01 19:47	07:54 08:30-08:58/28 18:35	07:53 14:08-15:12/64 16:34 09:12-09:36/24	08:38 13:49-14:55/66 16:10 09:24-11:14/110
16	05:20 21:50	06:09 20:57	07:03 19:45	07:56 08:30-08:58/28 18:33	07:55 14:08-15:12/64 16:33 09:11-09:39/28	08:39 13:49-14:55/66 16:10 09:25-11:15/110
17	05:21 21:49	06:11 20:55	07:05 19:42	07:58 08:31-08:58/27 18:31	07:57 14:07-15:13/66 16:31 09:10-09:43/33	08:40 13:50-14:56/66 16:11 09:26-11:16/110
18	05:23 21:47	06:13 20:53	07:06 19:40	08:00 08:31-08:58/27 18:28	07:58 14:07-15:13/66 16:30 09:10-09:45/35	08:40 13:49-14:56/67 16:11 09:26-11:16/110
19	05:24 21:46	06:14 20:51	07:08 19:38	08:02 08:33-08:57/24 18:26	08:00 14:06-15:12/66 16:28 09:10-09:49/39	08:41 13:50-14:56/66 16:11 09:27-11:17/110
20	05:25 21:45	06:16 20:48	07:10 19:35	08:04 08:35-08:57/22 18:24	08:02 13:59-15:11/72 16:27 09:10-09:53/43	08:42 13:51-14:57/66 16:11 09:28-11:18/110
21	05:27 21:44	06:18 07:27-07:35/8 20:46	07:12 19:33	08:06 08:38-08:56/18 18:22	08:04 13:57-15:11/74 16:26 09:10-09:56/46	08:42 13:51-14:57/66 16:12 09:28-11:18/110
22	05:28 21:42	06:19 07:24-07:38/14 20:44	07:13 19:30	08:07 08:39-08:55/16 18:20	08:06 13:56-15:11/75 16:24 09:09-09:58/49	08:43 13:52-14:58/66 16:12 09:29-11:19/110
23	05:30 21:41	06:19 07:13-07:38/25 20:42	07:15 19:28	08:09 08:40-08:53/13 18:17	08:07 13:55-15:11/76 16:23 09:09-10:02/53	08:43 13:52-14:58/66 16:13 09:29-11:19/110
24	05:31 21:39	06:19 07:11-07:40/29 20:40	07:17 19:25	08:11 08:43-08:50/7 18:15	08:09 13:54-15:10/76 16:22 09:09-10:05/56	08:44 13:52-14:58/66 16:13 09:29-11:19/110
25	05:33 21:38	06:25 07:10-07:41/31 20:37	07:19 19:23	07:13 17:13	08:11 13:54-15:10/76 16:21 09:10-10:09/59	08:44 13:53-15:00/67 16:14 09:30-11:20/110
26	05:34 21:36	06:27 07:08-07:41/33 20:35	07:20 19:20	07:15 17:11	08:12 13:53-15:10/77 16:20 09:10-10:13/63	08:44 13:53-15:00/67 16:15 09:30-11:20/110
27	05:36 21:35	06:28 07:08-07:41/33 20:33	07:22 19:18	07:17 17:09	08:14 13:51-15:09/78 16:19 09:11-10:16/65	08:45 13:54-15:00/66 16:15 09:30-11:20/110
28	05:37 21:33	06:28 07:07-07:42/35 20:30	07:24 19:16	07:19 14:31-14:38/7 17:07 14:48-14:56/8	08:16 13:49-15:08/79 16:18 09:12-10:18/66	08:45 13:54-15:01/67 16:16 09:30-11:20/110
29	05:39 21:32	06:32 07:06-07:41/35 20:28	07:26 19:13	07:21 14:26-14:43/17 17:05 14:44-15:00/16	08:17 13:48-15:08/80 16:17 09:12-10:22/70	08:45 13:55-15:01/66 16:17 09:30-11:20/110
30	05:41 21:30	06:34 07:06-07:41/35 20:26	07:27 19:11	07:23 14:23-15:03/40 17:03	08:19 13:48-15:07/79 16:16 09:12-10:24/72	08:45 13:56-15:02/66 16:18 09:31-11:20/109
31	05:42 21:28	06:35 07:06-07:40/34 20:23		07:25 14:21-15:04/43 17:01		08:45 13:56-15:03/67 16:19 09:31-11:20/109
Sonnenscheinstunden	510	458	382	329	261	236
Anzahl Minuten mit Schatten	348	695	154	503	2799	5299

**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