SCHATTENWURFPROGNOSE NR. R-2-2021-0491.04

über die optischen Immissionen in der Umgebung von zwei geplanten Windenergieanlagen, eine vom Typ Enercon E-147 EP5 E2 TES und eine vom Typ Nordex N149/5.X STE am Standort 49377 Vechta

Dieser Bericht Nr. R-2-2021-0491.04 ersetzt den vorangegangenen Bericht Nr. R-2-2021-0491.02 vom 29.08.2022 vollständig

Datum:
22.09.2022

Auftraggeber:
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1.) Zusammenfassung

Die vorliegende Untersuchung bezieht sich auf den Betrieb von zwei geplanten Windenergieanlagen (WEA), eine vom Typ Enercon E-147 EP5 E2 TES (Trailing Edge Serrations) der Windpark Krimpenfort GmbH & Co. KG (WEA 05) und eine vom Typ Nordex N149/5.X STE (Serrated Trailing Edge) der UMania GmbH & Co. Windpark Krimpenfort II KG (WEA 04) am Standort Vechta. Es wird die Schattenausbreitung der astronomisch maximal möglichen Beschattungsdauer nach den Vorgaben der Bund/Länder-Arbeitsgemeinschaft Immissionsschutz (LAI) [1] im Rahmen der Gesamtbelastung an den ermittelten Immissionsorten untersucht. Am Standort Vechta befinden sich drei existierende WEA, die als Vorbelastung zu berücksichtigen sind.

Bei Normalbetrieb der WEA ergeben die Berechnungen unzulässige Überschreitungen der Immissionsrichtwerte durch den kumulativen periodischen Schattenwurf (Gesamtbelastung mit Einfluss der Zusatzbelastung). Im Rahmen dieser Berechnung werden insgesamt 49 Schattenrezeptoren untersucht. Der jährliche Grenzwert der Schattenwurfdauer wird am SR-10 um maximal 134:44 Stunden pro Jahr überschritten (der jährliche Grenzwert wird an insgesamt 48 Immissionsorten seitens der Gesamtbelastung überschritten). Der tägliche Grenzwert wird um maximal 40 Minuten an SR-38 überschritten (der tägliche Grenzwert wird an insgesamt 32 Immissionsorten seitens der Gesamtbelastung überschritten).

Eine Überprüfung der Schutzwürdigkeit der an der relevanten Fassadenseite liegenden Räume wurde nicht durchgeführt.

Die Untersuchung entspricht der Maximalbetrachtung (Worst Case) mit Immissionsrichtwerten von 30 Stunden pro Kalenderjahr und 30 Minuten pro Kalendertag.

Zur Einhaltung der Immissionsrichtwerte durch die Gesamtbelastung ist die Installation einer Abschalteinrichtung bei Schattenschlag erforderlich.

Grundlage der Berechnung sind die in Kapitel 4.3 und 4.4 aufgeführten Anlagendaten.

Dieser Bericht Nr. R-2-2021-0491.04 ersetzt den vorangegangenen Bericht Nr. R-2-2021-0491.02 vom 29.08.2022 vollständig. Die Dimension der Schattenrezeptoren wurde angepasst und es wurden drei zusätzliche Schattenrezeptoren ergänzt, dies sind die SR-48 bis SR-50.

Nachfolgender Bericht wurde nach bestem Wissen und Gewissen mit größter Sorgfalt erstellt. *

Rheine, 22.09.2022 AR/vG

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* Die Weitergabe von Daten oder Informationen ist dem Auftraggeber gestattet. Authentisch ist dieses Dokument nur mit Originalunterschrift. Bezüglich der Urheberrechte verweisen wir auf die aktuell gültigen KCE-Beratungsbedingungen.

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2.) Situation und Aufgabenstellung

Die Betreibergesellschaften UMania GmbH & Co. Windpark Krimpenfort II KG und Windpark Krimpenfort GmbH & Co. KG planen die Errichtung von zwei Windenergieanlagen (WEA) am Standort 49377 Vechta, Landkreis Vechta in Niedersachsen. Zum Erlangen der Genehmigung für die Errichtung der neuen Windenergieanlagen ist der Nachweis der Schattenwurfausbreitung notwendig. Für die Berechnungen werden die Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windkraftanlagen nach den Vorgaben der Bund/Länder-Arbeitsgemeinschaft Immissionsschutz (LAI) [1] angewendet.

In der Umgebung des Standortes befinden sich drei Windenergieanlagen, die als Vorbelastung an den Immissionsorten zu berücksichtigen sind.

In der Prognose soll ermittelt werden, ob die Gesamtbelastung die Immissionsrichtwerte des kumulativen periodischen Schattenwurfes (Grenzwertüberschreitung der Gesamtbelastung mit Einfluss der Zusatzbelastung) an den umliegenden Immissionspunkten einhält.

In der Nachbarschaft des geplanten Standortes befinden sich mehrere immissionsrelevante Gehöfte und Wohnhäuser, welche um die geplanten WEA angeordnet sind. Eine Beurteilung der Schutzwürdigkeit hat nicht stattgefunden.

Die Ergebnisse der Untersuchung sind in Form eines Schattenwurfgutachtens vorzulegen.

3.) Berechnungs- und Beurteilungsgrundlagen

Für die Berechnung und Bearbeitung werden folgende Vorschriften und Unterlagen herangezogen:

[1] Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windkraftanlagen (WKA-Schattenwurf-Hinweise), Bund/Länder-Arbeitsgemeinschaft Immissionsschutz (LAI), Aktualisierung 2019, 23.01.2020

[2] Bundes-Immissionsschutzgesetz in der Fassung der Bekanntmachung vom 17. Mai 2013 (BGBI. S. 1274), das durch Artikel 1 des Gesetzes vom 20. November 2014 (BGBI. S. 1740) geändert worden ist

[3] WindPRO 3.5.584, Herausgeber EMD International A/S (DK)

[4] Ausschnitt aus der Deutschen Grundkarte Maßstab 1:5.000 in digitaler Form (UTM, Zone 32: untere linke Ecke: RW = 447.000, HW = 5.837.400; obere rechte Ecke: RW = 451.200, HW = 5.841.300). Herausgeber: Landesamt für Geoinformationen und Landentwicklung Niedersachsen (LGLN) © 2022

[5] Ortstermine zur Besichtigung der Immissionspunkte am 25.08.2014 durch Herrn Matthias Humpohl, B. Sc. und am 19.08.2020 durch Herrn Dipl.-Ing. Timm Schaer, M. Sc., beide von KÖTTER Consulting Engineers GmbH & Co. KG

4.) Berechnungsvoraussetzungen für optische Immissionen

4.1. Grundlagen

Die optischen Immissionen von WEA beziehen sich auf den dynamischen Rotorschlag (periodischer Schattenwurf). Der statische, vom Turm erzeugte Schatten bildet keinen relevanten und zu berücksichtigenden Effekt, da primär die frequentierenden Lichtwechsel als Immissionen gelten und beim Menschen zu Belästigungswirkungen führen können [2].

Die Schattenlänge einer WEA hängt stark von der jeweiligen Jahreszeit ab. So sind die Einwirkbereiche in den Wintermonaten länger, da der Sonnenstand zu einem späteren Zeitpunkt morgens und zu einem früheren Zeitpunkt abends niedriger ist als in den Sommermonaten. Die Berechnung berücksichtigt einen Sonnenstand von mindestens 3°.

Eine Untersuchung der optischen Immissionen soll an Immissionsorten mit schutzwürdigen Räumen oder an Bereichen, die planungsrechtlich Potential für eine entsprechende Bebauung geben, stattfinden [1]. Die Schutzwürdigkeit besteht bei:

- Wohnräumen
- Schlafräumen
- Unterrichtsräumen
- Büroräumen, Praxisräumen, Arbeitsräumen etc.

An den einzelnen Immissionsorten wurde die Schutzwürdigkeit nicht untersucht. Für alle Fassadenseiten wird eine Worst Case-Betrachtung durchgeführt.

Eine Unterscheidung zwischen Kern- und Halbschatten findet in der Berechnung des Worst Case-Szenarios keine Anwendung.

4.2. Astronomisch maximal mögliche Beschattungsdauer

Auf Grundlage der Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windkraftanlagen der Bund/Länder-Arbeitsgemeinschaft Immissionsschutz (LAI), Arbeitskreis Lichtimmissionen [1], sind die Berechnungen für eine Maximalbetrachtung durch die astronomisch maximal möglichen Beschattungszeiten durchzuführen.

Sofern die Grenzwerte für die astronomisch maximal mögliche Beschattungsdauer

30 Stunden / Jahr und
30 Minuten / Tag

von allen WEA im Umkreis an den Immissionsorten überschritten werden, wird davon ebenfalls eine Überschreitung der realen Beschattungszeiten abgeleitet (8 Stunden / Jahr). In entsprechenden Fällen werden Abschaltvorrichtungen in den WEA installiert und zeitliche Strategien entwickelt.

Die folgenden Annahmen werden für eine Betrachtung der astronomisch maximal möglichen Beschattungsdauer vorausgesetzt:

- Die Sonne scheint durchgehend täglich von Sonnenauf- bis -untergang.
- Ausreichender Wind für eine dauerhafte Bewegung der Rotoren (100 % Verfügbarkeit).
- Die WEA sind immer in Betrieb und stehen mit der Rotorfläche immer senkrecht zur Sonneneinfallsrichtung.
- Minimale relevante Sonnenhöhe über Horizont mit 3°.
- Es werden keine Hindernisse angenommen, die eine abschirmende Wirkung besitzen.
- An den Wohngebäuden werden die Schattenrezeptoren im Gewächshausmodus platziert, d. h. der Schatten wirkt von allen Seiten ein.

Die Berechnung der optischen Immissionen erfolgt mit Hilfe des Berechnungsprogramms WindPRO, Version 3.5.584 [3]. Als Immissionspunkt wird ein Schattenrezeptor (SR) an der kritischen Fensterseite der Gebäude angesetzt. Im Modell wird dieser mit einer Breite x Höhe von 0,1 m x 0,1 m in 2 m Höhe über Grund platziert.

Die Sonne wird als Punktquelle angesehen und die Rotorfläche als Kreisfläche im Zuge der Maximalbetrachtung betrachtet.

4.3. Windenergieanlagen der Vorbelastung

In der nahen Umgebung des Standortes befinden sich drei weitere Windenergieanlagen, die als Vorbelastung zu berücksichtigen sind. Die Informationen über die anzusetzende Vorbelastung am Standort sind von den Auftraggebern vorgegeben und wurden bei den Ortsbesichtigungen bestätigt [5]. Die UTM/ETRS 89-Koordinaten (Zone 32) befinden sich im SHADOW-Hauptergebnis in Anlage A2.

Typ	E-115	E-92
Bezeichnung	WEA 1, WEA 2	WEA 3
Hersteller	Enercon	
Nabenhöhe h_N [m]	149,0	138,4
Rotordurchmesser [m]	115,7	92,0
Nennleistung [kW]	3.000	2.350
Maximale Blatttiefe [m]	4,53 [3]	3,63 [3]
Schattenbereich [m]	2.066 [3]	1.513 [3]

Tabelle 1: Anlagendaten der vorhandenen Windenergieanlagen der Vorbelastung am Standort Vechta

4.4. Windenergieanlagen der Zusatzbelastung

Die Zusatzbelastung im Windpark Vechta besteht aus den zwei geplanten WEA vom Typ Enercon E-147 EP5 E2 TES und Nordex N149/5.X STE. Die Nabenhöhen sind von den Auftraggebern vorgegeben. Die UTM/ETRS 89-Koordinaten (Zone 32) befinden sich im SHADOW-Hauptergebnis in Anlage A2.

Typ	E-147 EP5 E2 TES	N149/5.X STE
Bezeichnung	WEA 5	WEA 4
Hersteller	Enercon	Nordex
Nabenhöhe h_N [m]	126,4	125,0
Rotordurchmesser [m]	147,0	149,0
Nennleistung [kW]	5.000	5.700
Maximale Blatttiefe [m]	4,50 [3]	4,15 [3]
Schattenbereich [m]	1.968 [3]	1.808 [3]

Tabelle 2: Anlagendaten der Windenergieanlagen der Zusatzbelastung am Standort Vechta

Der Schattenbereich berechnet sich aus den Abmaßen der WEA (Rotordurchmesser, Nabenhöhe und Blatttiefe) und dem variierenden Sonnenstand.

4.5. Immissionsorte

Die Aufnahme der relevanten Immissionsorte, die die Grenzwerte überschreiten, erfolgt auf Grundlage der Schattenausbreitungsdarstellung. Demnach werden alle Gebäude mit schutzwürdigen Räumen innerhalb der jährlichen und täglichen Grenzwerte der Gesamtbelastung, bei denen die Zusatzbelastung einen Einfluss hat, im Rahmen der weiteren Berechnung der einzelnen Schattenwurfzeiten untersucht. Innerhalb dieser Auflistung sind 49 maßgebliche Schattenrezeptoren aufgenommen worden. Neu sind SR-48 bis SR-50. Die Tabelle 3 zeigt die Schattenrezeptoren mit deren Adressen und den UTM/ETRS 89-Koordinaten (Zone 32) auf.

Be-zeich-nung	Adresse	UTM-Koordinaten	
		Ost	Nord
SR-01	Weidenweg 2, 49377 Vechta	448.073	5.840.490
SR-02	Weidenweg 3, 49377 Vechta	448.281	5.840.451
SR-03	Plaggenweg 2, 49377 Vechta	449.389	5.840.595
SR-04	Westmark 3a, 49377 Vechta	449.315	5.840.143
SR-05	Kötterweg 2, 49377 Vechta	449.945	5.839.851
SR-05a	Kötterweg 4, 49377 Vechta	449.919	5.839.956
SR-06	Kötterweg 1, 49377 Vechta	450.037	5.839.822
SR-06a	Kötterweg 1a, 49377 Vechta	450.063	5.839.803
SR-07	Hagen-Ring-Straße 46, 49377 Vechta	450.166	5.839.608
SR-07a	Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	450.166	5.839.759
SR-08	Südmark 3, 49377 Vechta	449.600	5.839.713
SR-09	Südmark 2, 49377 Vechta	449.606	5.839.678
SR-10	Südmark 2a, 49377 Vechta	449.598	5.839.665
SR-11	Südmark 1, 49377 Vechta	449.816	5.839.457
SR-12	Siebengestirn 16a, 49393 Lohne (Oldenburg)	450.102	5.838.953
SR-18	Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	447.635	5.839.033
SR-19	Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	447.615	5.839.040
SR-20	Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	447.576	5.839.055
SR-21	Am Sillbruch 10, 49393 Lohne (Oldenburg)	447.910	5.839.335
SR-22	Am Sillbruch 21, 49393 Lohne (Oldenburg)	448.011	5.839.372
SR-23	Am Sillbruch 15, 49393 Lohne (Oldenburg)	447.844	5.839.380
SR-24	Am Sillbruch 13, 49393 Lohne (Oldenburg)	447.810	5.839.384
SR-25	Am Sillbruch 11, 49393 Lohne (Oldenburg)	447.794	5.839.382
SR-26	Am Sillbruch 11A, 49393 Lohne (Oldenburg)	447.794	5.839.401
SR-27	Am Sillbruch 9, 49393 Lohne (Oldenburg)	447.777	5.839.386
SR-27a	Am Sillbruch 9a, 49393 Lohne (Oldenburg)	447.767	5.839.392
SR-28	Am Sillbruch 23, 49393 Lohne (Oldenburg)	448.141	5.839.458
SR-29	Am Sillbruch 25, 49393 Lohne (Oldenburg)	448.270	5.839.534
SR-30	Westmark 4, 49377 Vechta	448.304	5.839.556
SR-31	Försterweg 1, 49377 Vechta	447.953	5.840.333

Teil 1 von Tabelle 3

Bezeichnung	Adresse	UTM-Koordinaten	
		Ost	Nord
SR-32	Försterweg 2, 49377 Vechta	447.861	5.840.432
SR-33	Am Sillbruch 3A, 49393 Lohne (Oldenburg)	447.614	5.839.409
SR-34	Am Sillbruch 3, 49393 Lohne (Oldenburg)	447.589	5.839.407
SR-35	Am Sillbruch 1, 49393 Lohne (Oldenburg)	447.496	5.839.420
SR-36	Köhlerweg 6, 49393 Lohne (Oldenburg)	447.691	5.839.830
SR-37	Weidenweg 1A, 49377 Vechta	448.943	5.840.549
SR-38	Weidenweg 1, 49377 Vechta	448.956	5.840.541
SR-39	Siegeweg 3, 49377 Vechta	449.313	5.840.855
SR-40	Plaggenweg 1, 49377 Vechta	449.393	5.840.664
SR-41	Bussen Weg 3, 49377 Vechta	449.831	5.840.770
SR-42	Bussen Weg 1, 49377 Vechta	449.885	5.840.780
SR-43	Bussen Weg 2, 49377 Vechta	449.850	5.840.729
SR-44	Bussen Weg 4, 49377 Vechta	449.890	5.840.737
SR-45	Siebengestirn 15, 49393 Lohne (Oldenburg)	450.376	5.839.096
SR-46	Bakumer Straße 140a, 49393 Lohne (Oldenburg)	447.454	5.840.258
SR-47	Krimpenforter Weg 18/20, 49377 Vechta	449.923	5.839.566
SR-48	Westmark 2a, 49377 Vechta	449.532	5.840.337
SR-49	Plaggenweg 4 (Neubau), 49377 Vechta	449.388	5.840.527
SR-50	Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	447.985	5.839.330

Die Schattenrezeptoren SR-13 bis SR-17 zeigen keine Schattenwurfbelastung der geplanten Zusatzbelastung. Daher wurden diese Punkte aus der Berechnung herausgenommen. Die Nummerierung der restlichen Schattenrezeptoren orientiert sich an den Schattenwurfgutachten der vorrangegangenen Ausbaustufen.

Tabelle 3: Immissionsorte am Standort Vechta

Aus den Koordinaten der untersuchten Immissionsorte (IO) und der WEA der Zusatzbelastung, s. Anlage A, ergeben sich folgende horizontale Abstände:

Bezeichnung	Abstand WEA 04 [m]	Abstand WEA 05 [m]
SR-01	1.099	786
SR-02	926	605
SR-03	982	903
SR-04	580	631
SR-05	1.063	1.257
SR-05a	1.052	1.222
SR-06	1.152	1.353
SR-06a	1.177	1.381
SR-07	1.287	1.523
SR-07a	1.279	1.490
SR-08	714	951
SR-09	723	968
SR-10	716	965
SR-11	974	1.249
SR-12	1.454	1.759
SR-18	1.443	1.446
SR-19	1.457	1.456
SR-20	1.484	1.475
SR-21	1.062	1.040
SR-22	954	940
SR-23	1.107	1.063
SR-24	1.138	1.088
SR-25	1.154	1.102
SR-26	1.148	1.092
SR-27	1.168	1.114
SR-27a	1.176	1.119
SR-28	801	786
SR-29	654	642
SR-30	615	603
SR-31	1.100	811
SR-32	1.231	936
SR-33	1.318	1.241
SR-34	1.343	1.264

Teil 1 von Tabelle 4

Bezeichnung	Abstand WEA 04 [m]	Abstand WEA 05 [m]
SR-35	1.430	1.340
SR-36	1.199	1.023
SR-37	800	589
SR-38	793	588
SR-39	1.183	1.043
SR-40	1.044	952
SR-41	1.389	1.363
SR-42	1.433	1.413
SR-43	1.373	1.356
SR-44	1.406	1.395
SR-45	1.627	1.912
SR-46	1.520	1.268
SR-47	1.052	1.304
SR-48	871	895
SR-49	924	860
SR-50	995	987

Tabelle 4: Horizontale Abstände der Zusatzbelastung am Standort Vechta zu den untersuchten Immissionsorten (Angaben auf volle Meter gerundet)

5.) Berechnung der Schattenwurfimmissionen

Auf Grundlage des Kapitels 4.) wurden folgende Ergebnisse ermittelt. In den Berechnungen wurden keine vorhandenen Abschaltzeiten berücksichtigt und stellen somit das Worst Case-Szenario dar.

5.1. Astronomisch maximal mögliche Beschattungsdauer der Vorbelastung

Im Folgenden wird die maximal mögliche jährliche Schattenwurfdauer (Grenzwert 30 Stunden/Jahr) und maximal mögliche tägliche Schattendauer (30 Minuten/Tag) der Vorbelastung mit drei WEA dargestellt:

Immissionsorte	Maximal mögliche Schattendauer jährlich VB [hh:mm]	Grenzwertüberschreitung 30 h/a VB [hh:mm]	Maximal mögliche Schattendauer täglich VB [hh:mm]	Grenzwertüberschreitung 30 min/d VB [hh:mm]
SR-01	23:50	--	00:30	--
SR-02	15:27	--	00:33	00:03
SR-03	00:00	--	00:00	--
SR-04	27:12	--	00:28	--
SR-05	45:39	15:39	00:27	--
SR-05a	39:40	09:40	00:26	--
SR-06	34:14	04:14	00:25	--
SR-06a	31:35	01:35	00:25	--
SR-07	25:25	--	00:25	--
SR-07a	25:23	--	00:23	--
SR-08	77:16	47:16	00:41	00:11
SR-09	83:24	53:24	00:42	00:12
SR-10	86:18	56:18	00:42	00:12
SR-11	54:50	24:50	00:37	00:07
SR-12	39:04	09:04	00:41	00:11
SR-18	16:43	--	00:18	--
SR-20	15:01	--	00:17	--
SR-21	22:56	--	00:22	--

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Immissionsorte	Maximal mögliche Schattendauer jährlich VB [hh:mm]	Grenzwertüberschreitung 30 h/a VB [hh:mm]	Maximal mögliche Schattendauer täglich VB [hh:mm]	Grenzwertüberschreitung 30 min/d VB [hh:mm]
SR-22	27:26	--	00:24	--
SR-23	19:59	--	00:21	--
SR-24	18:57	--	00:20	--
SR-25	18:24	--	00:20	--
SR-26	18:28	--	00:20	--
SR-27	18:01	--	00:20	--
SR-27a	17:37	--	00:19	--
SR-28	34:21	04:21	00:28	--
SR-29	44:08	14:08	00:34	00:04
SR-30	47:06	17:06	00:35	00:05
SR-31	19:18	--	00:25	--
SR-32	17:08	--	00:24	--
SR-33	14:11	--	00:18	--
SR-34	13:38	--	00:17	--
SR-35	12:02	--	00:17	--
SR-36	14:10	--	00:24	--
SR-37	00:00	--	00:00	--
SR-38	00:00	--	00:00	--
SR-39	00:00	--	00:00	--
SR-40	00:00	--	00:00	--
SR-41	00:00	--	00:00	--
SR-42	00:00	--	00:00	--
SR-43	00:00	--	00:00	--
SR-44	00:00	--	00:00	--
SR-45	16:55	--	00:23	--
SR-46	03:34	--	00:14	--
SR-47	41:12	11:12	00:31	00:01
SR-48	16:30	--	00:21	--
SR-49	00:00	--	00:00	--
SR-50	26:40	--	00:24	--

Tabelle 5: Schattenwurfzeiten der Vorbelastung am Standort Vechta; Überschreitung der Grenzwerte an den Immissionsorten

Im Rahmen der Schattenwurfzeiten führen die WEA der Vorbelastung an 14 Schattenrezeptoren zu unzulässigen Überschreitungen mindestens eines Grenzwertes. Der jährliche Grenzwert der Schattenwurfdauer wird am SR-10 um maximal 56:18 Stunden pro Jahr überschritten. Der tägliche Grenzwert wird um maximal 12 Minuten an SR-09 und SR-10 überschritten.

5.2. Astronomisch maximal mögliche Beschattungsdauer der Zusatzbelastung

Im Folgenden wird die maximal mögliche jährliche Schattenwurfdauer (Grenzwert 30 Stunden/Jahr) und maximal mögliche tägliche Schattendauer (30 Minuten/Tag) der Zusatzbelastung der E-147 EP5 E2 TES und N149/5.X STE dargestellt:

Immissionsorte	Maximal mögliche Schattendauer jährlich ZB [hh:mm]	Grenzwertüberschreitung 30 h/a ZB [hh:mm]	Maximal mögliche Schattendauer täglich ZB [hh:mm]	Grenzwertüberschreitung 30 min/d ZB [hh:mm]
SR-01	53:44	23:44	00:46	00:16
SR-02	92:44	62:44	00:57	00:27
SR-03	57:57	27:57	00:39	00:09
SR-04	118:08	88:08	00:59	00:29
SR-05	28:33	--	00:32	00:02
SR-05a	29:08	--	00:32	00:02
SR-06	23:42	--	00:30	--
SR-06a	22:47	--	00:29	--
SR-07	19:23	--	00:27	--
SR-07a	18:37	--	00:27	--
SR-08	72:00	42:00	00:56	00:26
SR-09	74:17	44:17	00:59	00:29
SR-10	78:26	48:26	01:03	00:33
SR-11	53:38	23:38	00:52	00:22
SR-12	20:10	--	00:28	--
SR-18	24:44	--	00:26	--
SR-19	24:51	--	00:25	--

Teil 1 von Tabelle 6

Immissionsorte	Maximal mögliche Schattendauer jährlich ZB [hh:mm]	Grenzwertüberschreitung 30 h/a ZB [hh:mm]	Maximal mögliche Schattendauer täglich ZB [hh:mm]	Grenzwertüberschreitung 30 min/d ZB [hh:mm]
SR-20	22:18	--	00:25	--
SR-21	35:23	05:23	00:34	00:04
SR-22	50:30	20:30	00:38	00:08
SR-23	26:45	--	00:32	00:02
SR-24	30:28	00:28	00:31	00:01
SR-25	31:36	01:36	00:31	00:01
SR-26	35:30	05:30	00:31	00:01
SR-27	33:53	03:53	00:31	00:01
SR-27a	36:04	06:04	00:30	--
SR-28	66:12	36:12	00:45	00:15
SR-29	87:28	57:28	00:55	00:25
SR-30	95:09	65:09	00:58	00:28
SR-31	47:21	17:21	00:48	00:18
SR-32	37:20	07:20	00:44	00:14
SR-33	44:04	14:04	00:30	--
SR-34	43:23	13:23	00:29	--
SR-35	33:06	03:06	00:27	--
SR-36	33:48	03:48	00:34	00:04
SR-37	83:50	53:50	01:01	00:31
SR-38	87:55	57:55	01:10	00:40
SR-39	33:13	03:13	00:35	00:05
SR-40	49:28	19:28	00:37	00:07
SR-41	36:59	06:59	00:27	--
SR-42	33:03	03:03	00:26	--
SR-43	35:28	05:28	00:27	--
SR-44	31:40	01:40	00:26	--
SR-45	14:49	--	00:25	--
SR-46	18:13	--	00:27	--
SR-47	33:45	03:45	00:36	00:06
SR-48	64:00	34:00	00:41	00:11
SR-49	69:27	39:27	00:40	00:10
SR-50	47:34	17:34	00:37	00:07

Tabelle 6: Schattenwurfzeiten der Zusatzbelastung am Standort Vechta; Überschreitung der Grenzwerte an den Immissionsorten

Im Rahmen der Schattenwurfzeiten führen die WEA der Zusatzbelastung an 39 Schattenrezeptoren zu unzulässigen Überschreitungen mindestens eines Grenzwertes. Der jährliche Grenzwert der Schattenwurfdauer wird am SR-04 um maximal 88:08 Stunden pro Jahr überschritten. Der tägliche Grenzwert wird um maximal 40 Minuten am SR-38 überschritten.

5.3. Astronomisch maximal mögliche Beschattungsdauer der Gesamtbelastung

Die Tabelle 7 zeigt die auf Basis der Schattenwurfzeiten von Vor- und Zusatzbelastung kumulativ überschrittenen Grenzwerte.

Immissionsorte	Maximal mögliche Schattendauer jährlich GB [hh:mm]	Grenzwertüberschreitung 30 h/a GB [hh:mm]	Maximal mögliche Schattendauer täglich GB [hh:mm]	Grenzwertüberschreitung 30 min/d GB [hh:mm]
SR-01	77:34	47:34	00:46	00:16
SR-02	105:00	75:00	00:57	00:27
SR-03	57:57	27:57	00:39	00:09
SR-04	145:20	115:20	00:59	00:29
SR-05	74:12	44:12	00:32	00:02
SR-05a	68:48	38:48	00:32	00:02
SR-06	57:56	27:56	00:30	--
SR-06a	54:22	24:22	00:29	--
SR-07	44:48	14:48	00:27	--
SR-07a	44:00	14:00	00:27	--
SR-08	149:16	119:16	00:56	00:26
SR-09	157:41	127:41	00:59	00:29
SR-10	164:44	134:44	01:03	00:33
SR-11	108:28	78:28	00:52	00:22
SR-12	59:14	29:14	00:41	00:11
SR-18	41:27	11:27	00:26	--
SR-19	40:45	10:45	00:25	--
SR-20	37:19	07:19	00:25	--

Teil 1 von Tabelle 7

Immissionsorte	Maximal mögliche Schattendauer jährlich GB [hh:mm]	Grenzwertüberschreitung 30 h/a GB [hh:mm]	Maximal mögliche Schattendauer täglich GB [hh:mm]	Grenzwertüberschreitung 30 min/d GB [hh:mm]
SR-21	58:19	28:19	00:34	00:04
SR-22	77:56	47:56	00:38	00:08
SR-23	46:44	16:44	00:32	00:02
SR-24	49:25	19:25	00:31	00:01
SR-25	50:00	20:00	00:31	00:01
SR-26	53:58	23:58	00:31	00:01
SR-27	51:54	21:54	00:31	00:01
SR-27a	53:41	23:41	00:30	--
SR-28	100:33	70:33	00:45	00:15
SR-29	131:36	101:36	00:55	00:25
SR-30	142:15	112:15	00:58	00:28
SR-31	66:39	36:39	00:48	00:18
SR-32	54:28	24:28	00:44	00:14
SR-33	58:15	28:15	00:30	--
SR-34	57:01	27:01	00:29	--
SR-35	45:08	15:08	00:27	--
SR-36	47:58	17:58	00:34	00:04
SR-37	83:50	53:50	01:01	00:31
SR-38	87:55	57:55	01:10	00:40
SR-39	33:13	03:13	00:35	00:05
SR-40	49:28	19:28	00:37	00:07
SR-41	36:59	06:59	00:27	--
SR-42	33:03	03:03	00:26	--
SR-43	35:28	05:28	00:27	--
SR-44	31:40	01:40	00:26	--
SR-45	31:44	01:44	00:25	--
SR-46	21:47	--	00:27	--
SR-47	74:57	44:57	00:36	00:06
SR-48	80:30	50:30	00:41	00:11
SR-49	69:27	39:27	00:40	00:10
SR-50	74:14	44:14	00:37	00:07

Tabelle 7: Schattenwurfzeiten der Gesamtbelastung am Standort Vechta; Überschreitung der Grenzwerte an den Immissionsorten

Die Berechnung zeigt an allen untersuchten Schattenrezeptoren, bis auf SR-46 unzulässige Überschreitungen durch periodischen Schattenwurf der Gesamtbelastung bei mindestens einem zu berücksichtigenden Grenzwert auf.

Das Ergebnis stellt eine Maximalbetrachtung dar. Der jährliche Grenzwert der Schattenwurfdauer wird am SR-10 um maximal 134:44 Stunden pro Jahr überschritten. Der tägliche Grenzwert wird um maximal 40 Minuten am SR-38 überschritten.

6.) Bewertung

Im Zuge der Bewertung weist die Zusatzbelastung eine Relevanz auf, sofern die zwei geplanten WEA zu einer Überschreitung der jährlichen Grenzwerte von 30 Stunden/Jahr oder die täglichen Grenzwerte von 30 Minuten/Tag führen. Weiterhin besteht für die Zusatzbelastung eine Relevanz, sofern zusätzliche Schattenwurfzeiten an den schon seitens der Vorbelastung überschrittenen Immissionsorte zu erwarten sind.

6.1. Maximal mögliche jährliche Schattendauer

Im Folgenden wird die maximal mögliche jährliche Schattenwurfdauer in Bezug auf die durch die Zusatzbelastung verursachten Überschreitungen bewertet:

IO	Maximal mögliche Schattendauer jährlich VB [hh:mm]	Maximal mögliche Schattendauer jährlich GB [hh:mm]	Grenzwertüberschreitung 30 h/a GB [hh:mm]	Erhöhung durch ZB [hh:mm]	Relevanz
SR-01	23:50	77:34	47:34	53:44	ja
SR-02	15:27	105:00	75:00	89:33	ja
SR-03	00:00	57:57	27:57	57:57	ja
SR-04	27:12	145:20	115:20	118:08	ja
SR-05	45:39	74:12	44:12	28:33	ja
SR-05a	39:40	68:48	38:48	29:08	ja
SR-06	34:14	57:56	27:56	23:42	ja
SR-06a	31:35	54:22	24:22	22:47	ja
SR-07	25:25	44:48	14:48	19:23	ja
SR-07a	25:23	44:00	14:00	18:37	ja
SR-08	77:16	149:16	119:16	72:00	ja
SR-09	83:24	157:41	127:41	74:17	ja
SR-10	86:18	164:44	134:44	78:26	ja
SR-11	54:50	108:28	78:28	53:38	ja
SR-12	39:04	59:14	29:14	20:10	ja
SR-18	16:43	41:27	11:27	24:44	ja
SR-19	15:54	40:45	10:45	24:51	ja
SR-20	15:01	37:19	07:19	22:18	ja

Teil 1 von Tabelle 8

IO	Maximal mögliche Schattendauer jährlich VB [hh:mm]	Maximal mögliche Schattendauer jährlich GB [hh:mm]	Grenzwertüberschreitung 30 h/a GB [hh:mm]	Erhöhung durch ZB [hh:mm]	Relevanz
SR-21	22:56	58:19	28:19	35:23	ja
SR-22	27:26	77:56	47:56	50:30	ja
SR-23	19:59	46:44	16:44	26:45	ja
SR-24	18:57	49:25	19:25	30:28	ja
SR-25	18:24	50:00	20:00	31:36	ja
SR-26	18:28	53:58	23:58	35:30	ja
SR-27	18:01	51:54	21:54	33:53	ja
SR-27a	17:37	53:41	23:41	36:04	ja
SR-28	34:21	100:33	70:33	66:12	ja
SR-29	44:08	131:36	101:36	87:28	ja
SR-30	47:06	142:15	112:15	95:09	ja
SR-31	19:18	66:39	36:39	47:21	ja
SR-32	17:08	54:28	24:28	37:20	ja
SR-33	14:11	58:15	28:15	44:04	ja
SR-34	13:38	57:01	27:01	43:23	ja
SR-35	12:02	45:08	15:08	33:06	ja
SR-36	14:10	47:58	17:58	33:48	ja
SR-37	00:00	83:50	53:50	83:50	ja
SR-38	00:00	87:55	57:55	87:55	ja
SR-39	00:00	33:13	03:13	33:13	ja
SR-40	00:00	49:28	19:28	49:28	ja
SR-41	00:00	36:59	06:59	36:59	ja
SR-42	00:00	33:03	03:03	33:03	ja
SR-43	00:00	35:28	05:28	35:28	ja
SR-44	00:00	31:40	01:40	31:40	ja
SR-45	16:55	31:44	01:44	14:49	ja
SR-46	03:34	21:47	--	18:13	nein
SR-47	41:12	74:57	44:57	33:45	ja
SR-48	16:30	80:30	50:30	64:00	ja
SR-49	00:00	69:27	39:27	69:27	ja
SR-50	26:40	74:14	44:14	47:34	ja

Tabelle 8: Bewertung der maximal möglichen jährlichen Schattendauer der Vor- und Gesamtbelastung, Grenzwertüberschreitung der Gesamtbelastung, Darstellung der Erhöhung durch die Zusatzbelastung

An 48 Immissionsorten kommt es zu einer Überschreitung des Grenzwertes der Gesamtbelastung. Diese tritt an den Immissionsorten SR-05 bis SR-06, SR-08 bis SR-12 sowie SR-28 bis SR-30 und SR-47 durch die Vorbelastung auf und wird durch die Zusatzbelastung weiter erhöht. Die maximale Erhöhung der Zusatzbelastung tritt an SR-04 mit zusätzlichen 118:08 Stunden im Jahr auf.

6.2. Maximal mögliche tägliche Schattendauer

Im Folgenden wird die maximal mögliche tägliche Schattenwurfdauer in Bezug auf die durch die Zusatzbelastung verursachten Überschreitungen bewertet:

IO	Maximal mögliche Schattendauer täglich VB [hh:mm]	Maximal mögliche Schattendauer täglich GB [hh:mm]	Grenzwertüberschreitung 30 min/d GB [hh:mm]	Erhöhung durch ZB [hh:mm]	Relevanz
SR-01	00:30	00:46	00:16	00:16	ja
SR-02	00:33	00:57	00:27	00:24	ja
SR-03	00:00	00:39	00:09	00:39	ja
SR-04	00:28	00:59	00:29	00:31	ja
SR-05	00:27	00:32	00:02	00:05	ja
SR-05a	00:26	00:32	00:02	00:06	ja
SR-06	00:25	00:30	--	00:05	nein
SR-06a	00:25	00:29	--	00:04	nein
SR-07	00:25	00:27	--	00:02	nein
SR-07a	00:23	00:27	--	00:04	nein
SR-08	00:41	00:56	00:26	00:15	ja
SR-09	00:42	00:59	00:29	00:17	ja
SR-10	00:42	01:03	00:33	00:21	ja
SR-11	00:37	00:52	00:22	00:15	ja
SR-12	00:41	00:41	00:11	00:00	nein
SR-18	00:18	00:26	--	00:08	nein
SR-19	00:17	00:25	--	00:08	nein
SR-20	00:17	00:25	--	00:08	nein

Teil 1 von Tabelle 9

IO	Maximal mögliche Schattendauer täglich VB [hh:mm]	Maximal mögliche Schattendauer täglich GB [hh:mm]	Grenzwertüberschreitung 30 min/d GB [hh:mm]	Erhöhung durch ZB [hh:mm]	Relevanz
SR-21	00:22	00:34	00:04	00:12	ja
SR-22	00:24	00:38	00:08	00:14	ja
SR-23	00:21	00:32	00:02	00:11	ja
SR-24	00:20	00:31	00:01	00:11	ja
SR-25	00:20	00:31	00:01	00:11	ja
SR-26	00:20	00:31	00:01	00:11	ja
SR-27	00:20	00:31	00:01	00:11	ja
SR-27a	00:19	00:30	--	00:11	nein
SR-28	00:28	00:45	00:15	00:17	ja
SR-29	00:34	00:55	00:25	00:21	ja
SR-30	00:35	00:58	00:28	00:23	ja
SR-31	00:25	00:48	00:18	00:23	ja
SR-32	00:24	00:44	00:14	00:20	ja
SR-33	00:18	00:30	--	00:12	nein
SR-34	00:17	00:29	--	00:12	nein
SR-35	00:17	00:27	--	00:10	nein
SR-36	00:24	00:34	00:04	00:10	ja
SR-37	00:00	01:01	00:31	01:01	ja
SR-38	00:00	01:10	00:40	01:10	ja
SR-39	00:00	00:35	00:05	00:35	ja
SR-40	00:00	00:37	00:07	00:37	ja
SR-41	00:00	00:27	--	00:27	nein
SR-42	00:00	00:26	--	00:26	nein
SR-43	00:00	00:27	--	00:27	nein
SR-44	00:00	00:26	--	00:26	nein
SR-45	00:23	00:25	--	00:02	nein
SR-46	00:14	00:27	--	00:13	nein
SR-47	00:31	00:36	00:06	00:05	ja
SR-48	00:21	00:41	00:11	00:20	ja
SR-49	00:00	00:40	00:10	00:40	ja
SR-50	00:24	00:37	00:07	00:13	ja

Tabelle 9: Bewertung der maximal möglichen täglichen Schattendauer der Vor- und Gesamtbelastung, Grenzwertüberschreitung der Gesamtbelastung, Darstellung der Erhöhung durch die Zusatzbelastung

An 32 Immissionsorten führt die Gesamtbelastung zu einer Überschreitung der Schattenwurfdauer bzw. des Grenzwertes. An den Immissionsorten SR-02, SR-08 bis SR-11 sowie SR-29, SR-30 und SR-47 tritt diese bereits durch die Vorbelastung auf und wird durch die Zusatzbelastung weiter erhöht. Die maximale Erhöhung der Zusatzbelastung tritt am SR-38 mit zusätzlichen 70 Minuten am Tag auf.

7.) Anlagen

Anlage A: Schattenausbreitung der Gesamtbelastung

Anlage A1: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Gesamtbelastung unterteilt in Minuten / Tag und Stunden / Jahr (Grenzwerte)

Anlage A2: SHADOW-Hauptergebnis mit Darstellung der Gesamtbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage A3: SHADOW-Kalender mit Darstellung der Schattenzeiten je Immissionsort SR-01 bis SR-50 über das ganze Jahr

Anlage A4: SHADOW-Grafischer Kalender mit Darstellung der Schattenzeiten je Immissionsort durch die einzelnen WEA über das ganze Jahr

Anlage A5: SHADOW-Kalender pro WEA mit Darstellung der Beschattungszeiten je WEA über das ganze Jahr

Anlage A6: SHADOW-Grafischer Kalender pro WEA mit Darstellung der Beschattungszeiten je WEA an den Immissionsorten über das ganze Jahr

Anlage B: Schattenausbreitung der Vor- und Zusatzbelastung

Anlage B1: SHADOW-Hauptergebnis mit Darstellung der Vorbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage B2: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Vorbelastung unterteilt in Minuten / Tag und Stunden / Jahr

Anlage B3: SHADOW-Hauptergebnis mit Darstellung der Zusatzbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage B4: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Zusatzbelastung unterteilt in Minuten / Tag und Stunden / Jahr

Anlage C: Bilder der untersuchten Immissionsorte

Anlage A: Schattenausbreitung der Gesamtbelastung

Anlage A1: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Gesamtbelastung unterteilt in Minuten / Tag und Stunden / Jahr (Grenzwerte)

Projekt:
R-2-2021-0491 WP am Standort Vechta

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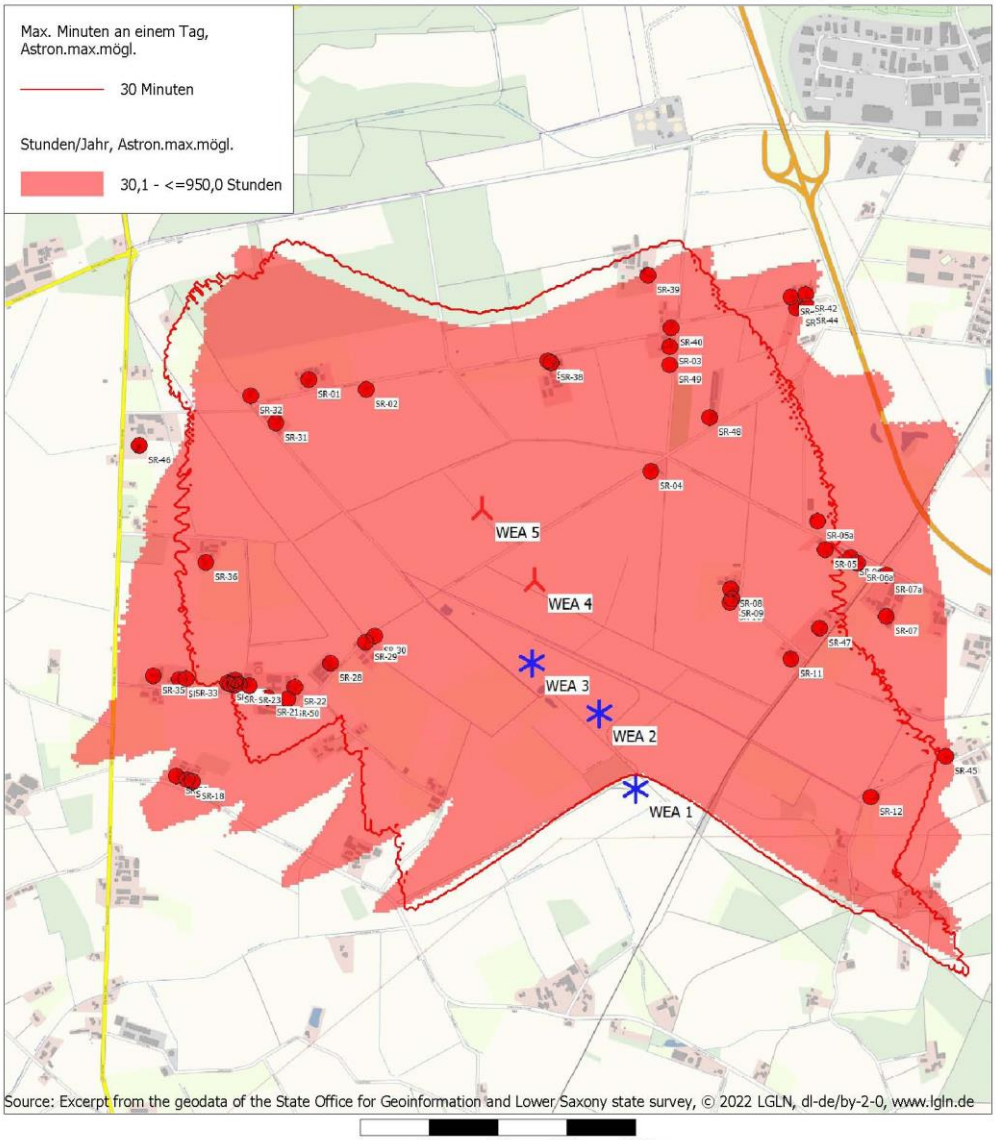
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Karte

Berechnung: Schattenwurfausbreitung Gesamtbelastung



0 250 500 750 1000m

Karte: DE Niedersachsen Webatlas , Maßstab 1:20.000, Mitte: UTM (north)-WGS84 Zone: 32 Ost: 448.770 Nord: 5.839.850

Neue WEA Existierende WEA Schattenrezeptor

Höhe der Schattenkarte: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer Mark Nord_EMDGrid_0.wpg (1)
Zeitschritt: 2 Minuten, Schrittweite: 3 Tag(e), Kartenauflösung: 10 m, Sichtbarkeit Auflösung: 5 m, Augenhöhe: 1,5 m

Anlage A2: SHADOW-Hauptergebnis mit Darstellung der Gesamtbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Gesamtbelastung

Annahmen für Schattenwurfberechnung

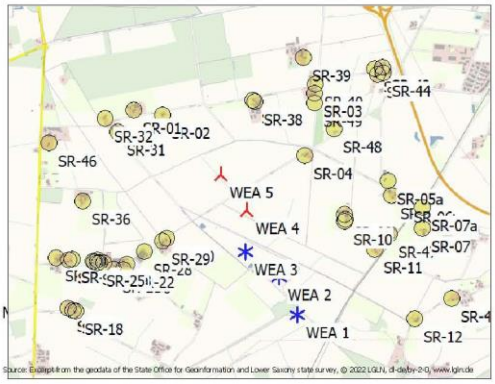
Beschattungsbereich der WEA
Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt
Siehe WEA-Tabelle

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 Sonneneinfallsrichtung
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: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer N
Hindernisse in Berechnung verwendet
Rasterauflösung: 5,0 m

Alle Koordinatenangaben in:
UTM (north)-WGS84 Zone: 32



WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ Aktuell	Hersteller	Typ	Nennleistung	Rotordurchmesser	Nabenhöhe	Schattendaten Beschatt.-Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
WEA 1	449.247	5.838.992	30,0	WEA 1, ENERCON E-115 ...	Nein	ENERCON	E-115-3.000	3.000	115,7	149,0	2.066	12,4
WEA 2	449.116	5.839.268	28,0	WEA 2, ENERCON E-115 ...	Nein	ENERCON	E-115-3.000	3.000	115,7	149,0	2.066	12,4
WEA 3	448.874	5.839.452	28,0	WEA 3, ENERCON E-92 2,...	Ja	ENERCON	E-92 2,3 MW-2.350	2.350	92,0	138,4	1.513	16,0
WEA 4	448.887	5.839.751	28,1	NORDEX N149/5.X 5700 ...	Ja	NORDEX	N149/5.X-5.700	5.700	149,0	125,0	1.808	10,7
WEA 5	448.698	5.840.013	28,9	ENERCON E-147 EP5 E2 ...	Ja	ENERCON	E-147 EP5 E2-5.000	5.000	147,0	126,4	1.968	15,5

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	448.073	5.840.490	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-02	SR-02, Weidenweg 3, 49377 Vechta	448.281	5.840.451	29,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	449.389	5.840.595	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-04	SR-04, Westmark 3a, 49377 Vechta	449.315	5.840.143	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05	SR-05, Kötterweg 2, 49377 Vechta	449.945	5.839.851	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	449.919	5.839.956	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06	SR-06, Kötterweg 1, 49377 Vechta	450.037	5.839.822	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	450.063	5.839.803	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	450.166	5.839.608	33,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	450.166	5.839.759	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-08	SR-08, Südmark 3, 49377 Vechta	449.600	5.839.713	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-09	SR-09, Südmark 2, 49377 Vechta	449.606	5.839.678	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-10	SR-10, Südmark 2a, 49377 Vechta	449.598	5.839.665	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-11	SR-11, Südmark 1, 49377 Vechta	449.816	5.839.457	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	450.102	5.838.953	37,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	447.635	5.839.033	29,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	447.615	5.839.040	29,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	447.576	5.839.055	28,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	447.910	5.839.335	31,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	448.011	5.839.372	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	447.844	5.839.380	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	447.810	5.839.384	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	447.794	5.839.382	30,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	447.794	5.839.401	30,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	447.777	5.839.386	30,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	447.767	5.839.392	29,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	448.141	5.839.458	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	448.270	5.839.534	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-30	SR-30, Westmark 4, 49377 Vechta	448.304	5.839.556	28,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Gesamtbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	Ost	Nord	Z [m]	Breite [m]	Höhe [m]	Höhe ü.Gr. [m]	Neigung des Fensters [°]	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr. [m]
SR-31	SR-31, Försterweg 1, 49377 Vechta	447.953	5.840.333	30,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-32	SR-32, Försterweg 2, 49377 Vechta	447.861	5.840.432	28,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	447.614	5.839.409	28,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	447.589	5.839.407	29,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	447.496	5.839.420	30,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	447.691	5.839.830	31,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	448.943	5.840.549	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-38	SR-38, Weidenweg 1, 49377 Vechta	448.956	5.840.541	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-39	SR-39, Siegeweg 3, 49377 Vechta	449.313	5.840.855	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	449.393	5.840.664	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	449.831	5.840.770	31,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	449.885	5.840.780	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	449.850	5.840.729	31,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	449.890	5.840.737	31,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	450.376	5.839.096	37,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	447.454	5.840.258	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	449.923	5.839.566	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-48	SR-48, Westmark 2a, 49377 Vechta	449.532	5.840.337	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	449.388	5.840.527	30,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	447.985	5.839.330	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

Berechnungsergebnisse

Schattenrezeptor

Nr.	Name	astron. max. mögl. Beschattungsdauer Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	77:34	135	0:46
SR-02	SR-02, Weidenweg 3, 49377 Vechta	105:00	133	0:57
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	57:57	115	0:39
SR-04	SR-04, Westmark 3a, 49377 Vechta	145:20	209	0:59
SR-05	SR-05, Kötterweg 2, 49377 Vechta	74:12	211	0:32
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	68:48	200	0:32
SR-06	SR-06, Kötterweg 1, 49377 Vechta	57:56	185	0:30
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	54:22	176	0:29
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	44:48	148	0:27
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	44:00	152	0:27
SR-08	SR-08, Südmark 3, 49377 Vechta	149:16	275	0:56
SR-09	SR-09, Südmark 2, 49377 Vechta	157:41	285	0:59
SR-10	SR-10, Südmark 2a, 49377 Vechta	164:44	292	1:03
SR-11	SR-11, Südmark 1, 49377 Vechta	108:28	231	0:52
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	59:14	149	0:41
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	41:27	145	0:26
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	40:45	149	0:25
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	37:19	151	0:25
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	58:19	170	0:34
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	77:56	190	0:38
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	46:44	156	0:32
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	49:25	166	0:31
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	50:00	166	0:31
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	53:58	171	0:31
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	51:54	170	0:31
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	53:41	170	0:30
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	100:33	206	0:45
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	131:36	225	0:55
SR-30	SR-30, Westmark 4, 49377 Vechta	142:15	229	0:58
SR-31	SR-31, Försterweg 1, 49377 Vechta	66:39	159	0:48
SR-32	SR-32, Försterweg 2, 49377 Vechta	54:28	149	0:44
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	58:15	178	0:30
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	57:01	180	0:29
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	45:08	169	0:27
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	47:58	144	0:34
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	83:50	94	1:01
SR-38	SR-38, Weidenweg 1, 49377 Vechta	87:55	96	1:10
SR-39	SR-39, Siegeweg 3, 49377 Vechta	33:13	66	0:35

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Gesamtbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	astron. max. mögl. Beschattungsdauer Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	49:28	104	0:37
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	36:59	108	0:27
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	33:03	107	0:26
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	35:28	112	0:27
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	31:40	112	0:26
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	31:44	115	0:25
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	21:47	81	0:27
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	74:57	190	0:36
SR-48	SR-48, Westmark 2a, 49377 Vechta	80:30	161	0:41
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	69:27	128	0:40
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	74:14	182	0:37

Gesamtdauer Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal [h/a]
WEA 1	WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)	230:48
WEA 2	WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)	236:28
WEA 3	WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)	204:16
WEA 4	NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)	564:39
WEA 5	ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)	588:18

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.

Anlage A3: SHADOW-Kalender mit Darstellung der Schattenzeiten je Immissionsort SR-01 bis SR-50 über das ganze Jahr

Projekt:
R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-01 - SR-01, Weidenweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März	April	Mai	Juni
1	08:40		09:20 (WEA 2) | 08:11		08:44 (WEA 5) | 07:16	07:04	05:57	05:11
	16:22	30	09:50 (WEA 3) | 17:12	45	09:29 (WEA 4) | 18:05	20:01	20:53	21:41
2	08:40		09:21 (WEA 2) | 08:10		08:44 (WEA 5) | 07:14	07:02	05:55	05:10
	16:23	29	09:50 (WEA 3) | 17:13	45	09:29 (WEA 4) | 18:07	20:02	20:55	21:42
3	08:39		09:20 (WEA 2) | 08:08		08:43 (WEA 5) | 07:12	06:59	05:54	05:09
	16:25	30	09:50 (WEA 3) | 17:15	46	09:29 (WEA 4) | 18:09	20:04	20:57	21:43
4	08:39		09:21 (WEA 2) | 08:07		08:43 (WEA 5) | 07:10	06:57	05:52	05:08
	16:26	30	09:51 (WEA 3) | 17:17	45	09:28 (WEA 4) | 18:10	20:06	20:58	21:44
5	08:39		09:22 (WEA 2) | 08:05		08:42 (WEA 5) | 07:07	06:55	05:50	05:07
	16:27	30	09:52 (WEA 3) | 17:19	45	09:27 (WEA 4) | 18:12	20:08	21:00	21:45
6	08:38		09:22 (WEA 2) | 08:03		08:42 (WEA 5) | 07:05	06:52	05:48	05:07
	16:28	30	09:52 (WEA 3) | 17:21	44	09:26 (WEA 4) | 18:14	20:09	21:02	21:46
7	08:38		09:22 (WEA 2) | 08:01		08:41 (WEA 5) | 07:03	06:50	05:46	05:06
	16:30	29	09:51 (WEA 3) | 17:23	43	09:24 (WEA 4) | 18:16	20:11	21:04	21:47
8	08:38		09:23 (WEA 2) | 07:59		08:41 (WEA 5) | 07:01	06:48	05:44	05:05
	16:31	29	09:52 (WEA 3) | 17:25	42	09:23 (WEA 5) | 18:18	20:13	21:05	21:48
9	08:37		09:08 (WEA 4) | 07:58		08:40 (WEA 5) | 06:58	06:45	05:42	05:05
	16:32	30	09:52 (WEA 3) | 17:27	43	09:23 (WEA 5) | 18:20	20:15	21:07	21:49
10	08:37		09:07 (WEA 4) | 07:56		08:40 (WEA 5) | 06:56	06:43	05:41	05:04
	16:34	33	09:52 (WEA 3) | 17:29	44	09:24 (WEA 5) | 18:21	20:16	21:09	21:50
11	08:36		09:07 (WEA 4) | 07:54		08:40 (WEA 5) | 06:54	06:41	05:39	05:04
	16:35	35	09:52 (WEA 3) | 17:31	44	09:24 (WEA 5) | 18:23	20:18	21:10	21:50
12	08:35		09:06 (WEA 4) | 07:52		08:40 (WEA 5) | 06:51	06:38	05:37	05:04
	16:37	37	09:52 (WEA 3) | 17:33	44	09:24 (WEA 5) | 18:25	20:20	21:12	21:51
13	08:34		09:05 (WEA 4) | 07:50		08:40 (WEA 5) | 06:49	06:36	05:35	05:03
	16:38	37	09:51 (WEA 3) | 17:35	44	09:24 (WEA 5) | 18:27	20:22	21:14	21:52
14	08:34		09:04 (WEA 4) | 07:48		08:41 (WEA 5) | 06:47	06:34	05:34	05:03
	16:40	35	09:50 (WEA 3) | 17:36	43	09:24 (WEA 5) | 18:29	20:24	21:15	21:53
15	08:33		09:03 (WEA 4) | 07:46		08:41 (WEA 5) | 06:44	06:32	05:32	05:03
	16:41	30	09:41 (WEA 2) | 17:38	43	09:24 (WEA 5) | 18:30	20:25	21:17	21:53
16	08:32		09:02 (WEA 4) | 07:44		08:41 (WEA 5) | 06:42	06:29	05:31	05:03
	16:43	31	09:41 (WEA 2) | 17:40	42	09:23 (WEA 5) | 18:32	20:27	21:18	21:54
17	08:31		09:00 (WEA 4) | 07:42		08:42 (WEA 5) | 06:40	06:27	05:29	05:03
	16:45	30	09:39 (WEA 2) | 17:42	41	09:23 (WEA 5) | 18:34	20:29	21:20	21:54
18	08:30		08:59 (WEA 4) | 07:40		08:42 (WEA 5) | 06:37	06:25	05:27	05:03
	16:46	26	09:36 (WEA 2) | 17:44	40	09:22 (WEA 5) | 18:36	20:31	21:22	21:55
19	08:29		08:58 (WEA 4) | 07:38		08:43 (WEA 5) | 06:35	06:23	05:26	05:03
	16:48	26	09:24 (WEA 4) | 17:46	39	09:22 (WEA 5) | 18:38	20:32	21:23	21:55
20	08:28		08:57 (WEA 4) | 07:36		08:44 (WEA 5) | 06:32	06:21	05:25	05:03
	16:50	28	09:25 (WEA 4) | 17:48	37	09:21 (WEA 5) | 18:39	20:34	21:25	21:55
21	08:27		08:56 (WEA 4) | 07:34		08:44 (WEA 5) | 06:30	06:18	05:23	05:03
	16:51	30	09:26 (WEA 4) | 17:50	35	09:19 (WEA 5) | 18:41	20:36	21:26	21:55
22	08:26		08:56 (WEA 4) | 07:32		08:46 (WEA 5) | 06:28	06:16	05:22	05:03
	16:53	31	09:27 (WEA 4) | 17:52	32	09:18 (WEA 5) | 18:43	20:38	21:28	21:56
23	08:24		08:56 (WEA 4) | 07:30		08:47 (WEA 5) | 06:25	06:14	05:20	05:03
	16:55	32	09:28 (WEA 4) | 17:54	29	09:16 (WEA 5) | 18:45	20:39	21:29	21:56
24	08:23		08:56 (WEA 4) | 07:27		08:49 (WEA 5) | 06:23	06:12	05:19	05:04
	16:57	32	09:28 (WEA 4) | 17:55	25	09:14 (WEA 5) | 18:46	20:41	21:30	21:56
25	08:22		08:56 (WEA 4) | 07:25		08:50 (WEA 5) | 06:21	06:10	05:18	05:04
	16:58	33	09:29 (WEA 4) | 17:57	21	09:11 (WEA 5) | 18:48	20:43	21:32	21:56
26	08:20		08:53 (WEA 5) | 07:23		08:54 (WEA 5) | 06:18	06:08	05:17	05:04
	17:00	35	09:28 (WEA 4) | 17:59	14	09:08 (WEA 5) | 18:50	20:45	21:33	21:56
27	08:19		08:51 (WEA 5) | 07:21		| 06:16	06:06	05:16	05:05
	17:02	38	09:29 (WEA 4) | 18:01		| 18:52	20:46	21:35	21:56
28	08:18		08:49 (WEA 5) | 07:19		| 06:13	06:04	05:14	05:05
	17:04	40	09:29 (WEA 4) | 18:03		| 18:54	20:48	21:36	21:56
29	08:16		08:47 (WEA 5) |		| 07:11	06:01	05:13	05:06
	17:06	42	09:29 (WEA 4) |		| 19:55	20:50	21:37	21:56
30	08:15		08:47 (WEA 5) |		| 07:09	05:59	05:12	05:06
	17:08	43	09:30 (WEA 4) |		| 19:57	20:52	21:38	21:55
31	08:13		08:46 (WEA 5) |		| 07:06	|	05:11	|
	17:10	43	09:29 (WEA 4) |		| 19:59	|	21:40	|
Sonnenscheinstunden	255		276		367	418	489	503
astr.max.mögl.Beschattung	|	1014	|	1015	|	|	|	|

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-01 - SR-01, Weidenweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		08:10 (WEA 5)	08:15		08:49 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	43	08:53 (WEA 5)	16:17	35	09:34 (WEA 3)
2	05:08	05:47	06:38	07:29			07:25		08:10 (WEA 5)	08:17		08:50 (WEA 4)
	21:55	21:20	20:16	19:05			16:57	43	08:53 (WEA 5)	16:16	33	09:35 (WEA 3)
3	05:09	05:48	06:40	07:31			07:26		08:10 (WEA 5)	08:18		08:52 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	43	08:53 (WEA 5)	16:16	30	09:36 (WEA 3)
4	05:09	05:50	06:42	07:32			07:28		08:11 (WEA 5)	08:20		09:07 (WEA 2)
	21:54	21:17	20:11	19:00			16:53	43	08:54 (WEA 4)	16:15	29	09:36 (WEA 3)
5	05:10	05:51	06:43	07:34			07:30		08:11 (WEA 5)	08:21		09:08 (WEA 2)
	21:53	21:15	20:09	18:57			16:51	44	08:55 (WEA 4)	16:14	29	09:37 (WEA 3)
6	05:11	05:53	06:45	07:36			07:32		08:12 (WEA 5)	08:22		09:08 (WEA 2)
	21:53	21:13	20:06	18:55			16:50	45	08:57 (WEA 4)	16:14	30	09:38 (WEA 3)
7	05:12	05:55	06:47	07:38			07:34		08:13 (WEA 5)	08:24		09:08 (WEA 2)
	21:52	21:11	20:04	18:53			16:48	45	08:58 (WEA 4)	16:14	30	09:38 (WEA 3)
8	05:13	05:56	06:48	07:39			07:36		08:13 (WEA 5)	08:25		09:09 (WEA 2)
	21:52	21:09	20:02	18:50			16:46	45	08:58 (WEA 4)	16:13	30	09:39 (WEA 3)
9	05:14	05:58	06:50	07:41			07:38		08:14 (WEA 5)	08:26		09:10 (WEA 2)
	21:51	21:07	19:59	18:48			16:45	45	08:59 (WEA 4)	16:13	29	09:39 (WEA 3)
10	05:15	06:00	06:52	07:43			07:39		08:15 (WEA 5)	08:27		09:10 (WEA 2)
	21:50	21:05	19:57	18:46			16:43	45	09:00 (WEA 4)	16:13	30	09:40 (WEA 3)
11	05:16	06:01	06:53	07:45			07:41		08:16 (WEA 5)	08:28		09:10 (WEA 2)
	21:49	21:03	19:55	18:44			16:41	44	09:00 (WEA 4)	16:12	30	09:40 (WEA 3)
12	05:17	06:03	06:55	07:46			07:43		08:18 (WEA 5)	08:29		09:11 (WEA 2)
	21:48	21:02	19:52	18:41			16:40	42	09:00 (WEA 4)	16:12	29	09:40 (WEA 3)
13	05:18	06:05	06:57	07:48			07:45		08:19 (WEA 5)	08:30		09:11 (WEA 2)
	21:47	21:00	19:50	18:39			16:38	42	09:01 (WEA 4)	16:12	30	09:41 (WEA 3)
14	05:19	06:06	06:58	07:50			07:47		08:21 (WEA 5)	08:31		09:12 (WEA 2)
	21:47	20:57	19:47	18:37			16:36	40	09:01 (WEA 4)	16:12	29	09:41 (WEA 3)
15	05:21	06:08	07:00	07:52		09:30 (WEA 5)	07:49		08:23 (WEA 5)	08:32		09:12 (WEA 2)
	21:46	20:55	19:45	18:35	6	09:36 (WEA 5)	16:35	38	09:01 (WEA 4)	16:12	30	09:42 (WEA 3)
16	05:22	06:10	07:02	07:54		09:25 (WEA 5)	07:50		08:26 (WEA 5)	08:33		09:13 (WEA 2)
	21:44	20:53	19:43	18:32	16	09:41 (WEA 5)	16:34	35	09:01 (WEA 4)	16:12	29	09:42 (WEA 3)
17	05:23	06:11	07:03	07:55		09:22 (WEA 5)	07:52		08:29 (WEA 4)	08:34		09:14 (WEA 2)
	21:43	20:51	19:40	18:30	22	09:44 (WEA 5)	16:32	33	09:02 (WEA 4)	16:13	29	09:43 (WEA 3)
18	05:24	06:13	07:05	07:57		09:20 (WEA 5)	07:54		08:30 (WEA 4)	08:35		09:14 (WEA 2)
	21:42	20:49	19:38	18:28	26	09:46 (WEA 5)	16:31	32	09:02 (WEA 4)	16:13	30	09:44 (WEA 3)
19	05:26	06:15	07:07	07:59		09:18 (WEA 5)	07:56		08:30 (WEA 4)	08:36		09:14 (WEA 2)
	21:41	20:47	19:35	18:26	30	09:48 (WEA 5)	16:29	32	09:02 (WEA 4)	16:13	29	09:43 (WEA 3)
20	05:27	06:16	07:08	08:01		09:16 (WEA 5)	07:57		08:31 (WEA 4)	08:36		09:15 (WEA 2)
	21:40	20:45	19:33	18:24	33	09:49 (WEA 5)	16:28	31	09:02 (WEA 4)	16:13	29	09:44 (WEA 3)
21	05:28	06:18	07:10	08:03		09:15 (WEA 5)	07:59		08:32 (WEA 4)	08:37		09:16 (WEA 2)
	21:38	20:43	19:31	18:21	36	09:51 (WEA 5)	16:27	30	09:02 (WEA 4)	16:14	29	09:45 (WEA 3)
22	05:30	06:20	07:12	08:04		09:13 (WEA 5)	08:01		08:33 (WEA 4)	08:37		09:16 (WEA 2)
	21:37	20:41	19:28	18:19	38	09:51 (WEA 5)	16:26	29	09:02 (WEA 4)	16:14	29	09:45 (WEA 3)
23	05:31	06:21	07:14	08:06		09:12 (WEA 5)	08:03		08:35 (WEA 4)	08:38		09:16 (WEA 2)
	21:36	20:38	19:26	18:17	39	09:51 (WEA 5)	16:25	26	09:01 (WEA 4)	16:15	29	09:45 (WEA 3)
24	05:33	06:23	07:15	08:08		09:12 (WEA 5)	08:04		08:37 (WEA 4)	08:38		09:17 (WEA 2)
	21:34	20:36	19:24	18:15	40	09:52 (WEA 5)	16:23	25	09:14 (WEA 2)	16:15	29	09:46 (WEA 3)
25	05:34	06:25	07:17	07:10		08:11 (WEA 5)	08:06		08:38 (WEA 4)	08:39		09:17 (WEA 2)
	21:33	20:34	19:21	17:13	41	08:52 (WEA 5)	16:22	30	09:17 (WEA 2)	16:16	29	09:46 (WEA 3)
26	05:36	06:26	07:19	07:12		08:11 (WEA 5)	08:08		08:40 (WEA 4)	08:39		09:17 (WEA 2)
	21:32	20:32	19:19	17:11	42	08:53 (WEA 5)	16:21	31	09:19 (WEA 2)	16:17	30	09:47 (WEA 3)
27	05:37	06:28	07:20	07:14		08:10 (WEA 5)	08:09		08:42 (WEA 4)	08:39		09:18 (WEA 2)
	21:30	20:29	19:16	17:09	43	08:53 (WEA 5)	16:20	30	09:20 (WEA 2)	16:17	29	09:47 (WEA 3)
28	05:39	06:30	07:22	07:15		08:10 (WEA 5)	08:11		08:44 (WEA 4)	08:39		09:19 (WEA 2)
	21:28	20:27	19:14	17:07	43	08:53 (WEA 5)	16:19	35	09:30 (WEA 3)	16:18	29	09:48 (WEA 3)
29	05:40	06:31	07:24	07:17		08:10 (WEA 5)	08:12		08:45 (WEA 4)	08:40		09:19 (WEA 2)
	21:27	20:25	19:12	17:05	43	08:53 (WEA 5)	16:19	37	09:31 (WEA 3)	16:19	30	09:49 (WEA 3)
30	05:42	06:33	07:25	07:19		08:10 (WEA 5)	08:14		08:47 (WEA 4)	08:40		09:19 (WEA 2)
	21:25	20:23	19:09	17:03	43	08:53 (WEA 5)	16:18	37	09:33 (WEA 3)	16:20	29	09:48 (WEA 3)
31	05:43	06:35		07:21		08:10 (WEA 5)				08:40		09:19 (WEA 2)
	21:24	20:20		17:01	43	08:53 (WEA 5)				16:21	30	09:49 (WEA 3)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					584			1120			921	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-02 - SR-02, Weidenweg 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		09:16 (WEA 4)	08:11		09:12 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	52	10:15 (WEA 3)	17:11	55	10:07 (WEA 5)	18:05	20:01	20:53	21:41
2	08:40		09:16 (WEA 4)	08:10		09:12 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	51	10:15 (WEA 3)	17:13	56	10:08 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		09:16 (WEA 4)	08:08		09:12 (WEA 5)	07:12	06:59	05:54	05:09
	16:25	47	10:13 (WEA 3)	17:15	56	10:08 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		09:16 (WEA 4)	08:07		09:12 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	44	10:00 (WEA 2)	17:17	56	10:08 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		09:17 (WEA 4)	08:05		09:12 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	43	10:00 (WEA 2)	17:19	56	10:08 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		09:17 (WEA 4)	08:03		09:12 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	43	10:00 (WEA 2)	17:21	56	10:08 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		09:17 (WEA 4)	08:01		09:12 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	42	09:59 (WEA 2)	17:23	56	10:08 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		09:17 (WEA 4)	07:59		09:12 (WEA 5)	07:01	06:48	05:44	05:05
	16:31	42	09:59 (WEA 2)	17:25	56	10:08 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		09:17 (WEA 4)	07:58		09:12 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	41	09:58 (WEA 2)	17:27	56	10:08 (WEA 5)	18:20	20:15	21:07	21:49
10	08:37		09:17 (WEA 4)	07:56		09:12 (WEA 5)	06:56	06:43	05:41	05:04
	16:34	40	09:57 (WEA 2)	17:29	56	10:08 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		09:18 (WEA 4)	07:54		09:12 (WEA 5)	06:54	06:41	05:39	05:04
	16:35	37	09:55 (WEA 4)	17:31	55	10:07 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		09:18 (WEA 4)	07:52		09:13 (WEA 5)	06:51	06:38	05:37	05:04
	16:37	37	09:55 (WEA 4)	17:33	54	10:07 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		09:18 (WEA 4)	07:50		09:13 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	38	09:56 (WEA 4)	17:34	54	10:07 (WEA 5)	18:27	20:22	21:14	21:52
14	08:34		09:18 (WEA 4)	07:48		09:14 (WEA 5)	06:47	06:34	05:34	05:03
	16:40	38	09:56 (WEA 4)	17:36	52	10:06 (WEA 5)	18:29	20:24	21:15	21:52
15	08:33		09:19 (WEA 4)	07:46		09:14 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	38	09:57 (WEA 4)	17:38	51	10:05 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		09:19 (WEA 4)	07:44		09:15 (WEA 5)	06:42	06:29	05:31	05:03
	16:43	39	09:58 (WEA 4)	17:40	50	10:05 (WEA 5)	18:32	20:27	21:18	21:54
17	08:31		09:17 (WEA 5)	07:42		09:16 (WEA 5)	06:40	06:27	05:29	05:03
	16:45	40	09:57 (WEA 4)	17:42	48	10:04 (WEA 5)	18:34	20:29	21:20	21:54
18	08:30		09:17 (WEA 5)	07:40		09:17 (WEA 5)	06:37	06:25	05:27	05:03
	16:46	41	09:58 (WEA 4)	17:44	46	10:03 (WEA 5)	18:36	20:31	21:21	21:54
19	08:29		09:16 (WEA 5)	07:38		09:18 (WEA 5)	06:35	06:23	05:26	05:03
	16:48	42	09:58 (WEA 4)	17:46	44	10:02 (WEA 5)	18:38	20:32	21:23	21:55
20	08:28		09:16 (WEA 5)	07:36		09:19 (WEA 5)	06:32	06:20	05:25	05:03
	16:50	43	09:59 (WEA 4)	17:48	40	09:59 (WEA 5)	18:39	20:34	21:25	21:55
21	08:27		09:15 (WEA 5)	07:34		09:20 (WEA 5)	06:30	06:18	05:23	05:03
	16:51	43	09:58 (WEA 4)	17:50	38	09:58 (WEA 5)	18:41	20:36	21:26	21:55
22	08:26		09:15 (WEA 5)	07:32		09:22 (WEA 5)	06:28	06:16	05:22	05:03
	16:53	45	10:00 (WEA 5)	17:52	34	09:56 (WEA 5)	18:43	20:38	21:28	21:56
23	08:24		09:15 (WEA 5)	07:30		09:24 (WEA 5)	06:25	06:14	05:20	05:03
	16:55	46	10:01 (WEA 5)	17:54	30	09:54 (WEA 5)	18:45	20:39	21:29	21:56
24	08:23		09:14 (WEA 5)	07:27		09:27 (WEA 5)	06:23	06:12	05:19	05:04
	16:57	47	10:01 (WEA 5)	17:55	24	09:51 (WEA 5)	18:46	20:41	21:30	21:56
25	08:22		09:14 (WEA 5)	07:25		09:30 (WEA 5)	06:21	06:10	05:18	05:04
	16:58	49	10:03 (WEA 5)	17:57	16	09:46 (WEA 5)	18:48	20:43	21:32	21:56
26	08:20		09:13 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	50	10:03 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		09:13 (WEA 5)	07:21			06:16	06:06	05:16	05:05
	17:02	51	10:04 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:18		09:13 (WEA 5)	07:19			06:13	06:04	05:14	05:05
	17:04	52	10:05 (WEA 5)	18:03			18:54	20:48	21:36	21:56
29	08:16		09:12 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	53	10:05 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		09:12 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	54	10:06 (WEA 5)				19:57	20:52	21:38	21:55
31	08:13		09:12 (WEA 5)				07:06		05:11	
	17:10	55	10:07 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		1383			1195					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-02 - SR-02, Weidenweg 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		08:42 (WEA 5)	08:15		09:00 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	55	09:37 (WEA 5)	16:17	37	09:37 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		08:41 (WEA 5)	08:17		09:00 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	57	09:38 (WEA 5)	16:16	40	09:40 (WEA 2)
3	05:09	05:48	06:40	07:31			07:26		08:41 (WEA 5)	08:18		09:01 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	57	09:38 (WEA 5)	16:16	41	09:42 (WEA 2)
4	05:09	05:50	06:42	07:32			07:28		08:41 (WEA 5)	08:20		09:01 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	57	09:38 (WEA 5)	16:15	42	09:43 (WEA 2)
5	05:10	05:51	06:43	07:34			07:30		08:41 (WEA 5)	08:21		09:03 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	57	09:38 (WEA 5)	16:14	42	09:45 (WEA 2)
6	05:11	05:53	06:45	07:36			07:32		08:41 (WEA 5)	08:22		09:03 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	57	09:38 (WEA 5)	16:14	43	09:46 (WEA 2)
7	05:12	05:55	06:47	07:38			07:34		08:42 (WEA 5)	08:24		09:03 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	56	09:38 (WEA 5)	16:14	43	09:46 (WEA 2)
8	05:13	05:56	06:48	07:39			07:36		08:42 (WEA 5)	08:25		09:05 (WEA 4)
	21:52	21:09	20:02	18:50			16:46	56	09:38 (WEA 5)	16:13	43	09:48 (WEA 2)
9	05:14	05:58	06:50	07:41			07:38		08:42 (WEA 5)	08:26		09:05 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	56	09:38 (WEA 5)	16:13	47	10:02 (WEA 3)
10	05:15	06:00	06:52	07:43			07:39		08:42 (WEA 5)	08:27		09:05 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	56	09:38 (WEA 5)	16:13	51	10:04 (WEA 3)
11	05:16	06:01	06:53	07:45			07:41		08:43 (WEA 5)	08:28		09:06 (WEA 4)
	21:49	21:03	19:55	18:44			16:41	54	09:37 (WEA 5)	16:12	52	10:05 (WEA 3)
12	05:17	06:03	06:55	07:46			07:43		08:43 (WEA 5)	08:29		09:07 (WEA 4)
	21:48	21:01	19:52	18:41			16:40	54	09:37 (WEA 5)	16:12	53	10:06 (WEA 3)
13	05:18	06:05	06:57	07:48			07:45		08:44 (WEA 5)	08:30		09:07 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	53	09:37 (WEA 5)	16:12	55	10:07 (WEA 3)
14	05:19	06:06	06:58	07:50			07:47		08:45 (WEA 5)	08:31		09:08 (WEA 4)
	21:47	20:57	19:47	18:37			16:36	52	09:37 (WEA 5)	16:12	55	10:08 (WEA 3)
15	05:21	06:08	07:00	07:52			07:49		08:45 (WEA 5)	08:32		09:09 (WEA 4)
	21:46	20:55	19:45	18:35			16:35	51	09:36 (WEA 5)	16:12	56	10:09 (WEA 3)
16	05:22	06:10	07:02	07:53		10:07 (WEA 5)	07:50		08:46 (WEA 5)	08:33		09:09 (WEA 4)
	21:44	20:53	19:43	18:32	6	10:13 (WEA 5)	16:34	50	09:36 (WEA 5)	16:12	57	10:10 (WEA 3)
17	05:23	06:11	07:03	07:55		10:01 (WEA 5)	07:52		08:47 (WEA 5)	08:34		09:10 (WEA 4)
	21:43	20:51	19:40	18:30	19	10:20 (WEA 5)	16:32	49	09:36 (WEA 5)	16:13	56	10:10 (WEA 3)
18	05:24	06:13	07:05	07:57		09:57 (WEA 5)	07:54		08:48 (WEA 5)	08:35		09:11 (WEA 4)
	21:42	20:49	19:38	18:28	26	10:23 (WEA 5)	16:31	47	09:35 (WEA 5)	16:13	57	10:11 (WEA 3)
19	05:26	06:15	07:07	07:59		09:55 (WEA 5)	07:56		08:49 (WEA 5)	08:36		09:11 (WEA 4)
	21:41	20:47	19:35	18:26	31	10:26 (WEA 5)	16:29	46	09:35 (WEA 5)	16:13	57	10:11 (WEA 3)
20	05:27	06:16	07:08	08:01		09:53 (WEA 5)	07:57		08:50 (WEA 5)	08:36		09:12 (WEA 4)
	21:40	20:45	19:33	18:24	35	10:28 (WEA 5)	16:28	45	09:35 (WEA 5)	16:13	57	10:12 (WEA 3)
21	05:28	06:18	07:10	08:03		09:51 (WEA 5)	07:59		08:51 (WEA 5)	08:37		09:13 (WEA 4)
	21:38	20:43	19:31	18:21	39	10:30 (WEA 5)	16:27	43	09:34 (WEA 4)	16:14	57	10:13 (WEA 3)
22	05:30	06:20	07:12	08:04		09:49 (WEA 5)	08:01		08:52 (WEA 5)	08:37		09:13 (WEA 4)
	21:37	20:41	19:28	18:19	41	10:30 (WEA 5)	16:26	43	09:35 (WEA 4)	16:14	57	10:13 (WEA 3)
23	05:31	06:21	07:14	08:06		09:47 (WEA 5)	08:03		08:53 (WEA 5)	08:38		09:13 (WEA 4)
	21:36	20:38	19:26	18:17	45	10:32 (WEA 5)	16:25	42	09:35 (WEA 4)	16:15	57	10:13 (WEA 3)
24	05:33	06:23	07:15	08:08		09:46 (WEA 5)	08:04		08:54 (WEA 5)	08:38		09:14 (WEA 4)
	21:34	20:36	19:24	18:15	47	10:33 (WEA 5)	16:23	41	09:35 (WEA 4)	16:15	57	10:14 (WEA 3)
25	05:34	06:25	07:17	07:10		08:45 (WEA 5)	08:06		08:55 (WEA 5)	08:39		09:14 (WEA 4)
	21:33	20:34	19:21	17:13	49	09:34 (WEA 5)	16:22	40	09:35 (WEA 4)	16:16	57	10:14 (WEA 3)
26	05:36	06:26	07:19	07:12		08:45 (WEA 5)	08:08		08:57 (WEA 4)	08:39		09:14 (WEA 4)
	21:31	20:32	19:19	17:11	49	09:34 (WEA 5)	16:21	39	09:36 (WEA 4)	16:17	56	10:14 (WEA 3)
27	05:37	06:28	07:20	07:14		08:44 (WEA 5)	08:09		08:58 (WEA 4)	08:39		09:14 (WEA 4)
	21:30	20:29	19:16	17:09	51	09:35 (WEA 5)	16:20	38	09:36 (WEA 4)	16:17	56	10:14 (WEA 3)
28	05:39	06:30	07:22	07:15		08:43 (WEA 5)	08:11		08:58 (WEA 4)	08:39		09:15 (WEA 4)
	21:28	20:27	19:14	17:07	53	09:36 (WEA 5)	16:19	39	09:37 (WEA 4)	16:18	56	10:15 (WEA 3)
29	05:40	06:31	07:24	07:17		08:43 (WEA 5)	08:12		08:58 (WEA 4)	08:40		09:16 (WEA 4)
	21:27	20:25	19:12	17:05	53	09:36 (WEA 5)	16:19	38	09:36 (WEA 4)	16:19	55	10:16 (WEA 3)
30	05:42	06:33	07:25	07:19		08:42 (WEA 5)	08:14		08:59 (WEA 4)	08:40		09:15 (WEA 4)
	21:25	20:23	19:09	17:03	55	09:37 (WEA 5)	16:18	38	09:37 (WEA 4)	16:20	55	10:15 (WEA 3)
31	05:43	06:35		07:21		08:42 (WEA 5)				08:40		09:15 (WEA 4)
	21:24	20:20		17:01	55	09:37 (WEA 5)				16:21	55	10:15 (WEA 3)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					654			1466			1602	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-03 - SR-03, Plaggenweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		14:27 (WEA 4)	08:11		15:47 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	32	14:59 (WEA 4)	17:11	38	16:25 (WEA 5)	18:05	20:01	20:53	21:41
2	08:39		14:28 (WEA 4)	08:10		15:47 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	32	15:00 (WEA 4)	17:13	38	16:25 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		14:28 (WEA 4)	08:08		15:48 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	32	15:00 (WEA 4)	17:15	38	16:26 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		14:29 (WEA 4)	08:06		15:48 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	31	15:00 (WEA 4)	17:17	38	16:26 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		14:30 (WEA 4)	08:05		15:48 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	31	15:01 (WEA 4)	17:19	38	16:26 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		14:30 (WEA 4)	08:03		15:48 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	30	15:00 (WEA 4)	17:21	38	16:26 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		14:31 (WEA 4)	08:01		15:48 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	29	15:00 (WEA 4)	17:23	37	16:25 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		14:33 (WEA 4)	07:59		15:49 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	27	15:00 (WEA 4)	17:25	36	16:25 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		14:33 (WEA 4)	07:58		15:50 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	27	15:00 (WEA 4)	17:27	34	16:24 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		14:34 (WEA 4)	07:56		15:50 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	25	14:59 (WEA 4)	17:29	34	16:24 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		14:35 (WEA 4)	07:54		15:51 (WEA 5)	06:54	06:41	05:39	05:04
	16:35	24	14:59 (WEA 4)	17:31	32	16:23 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		14:37 (WEA 4)	07:52		15:53 (WEA 5)	06:51	06:38	05:37	05:04
	16:37	22	14:59 (WEA 4)	17:33	29	16:22 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		14:39 (WEA 4)	07:50		15:54 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	19	14:58 (WEA 4)	17:34	27	16:21 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		14:41 (WEA 4)	07:48		15:56 (WEA 5)	06:47	06:34	05:34	05:03
	16:40	16	14:57 (WEA 4)	17:36	23	16:19 (WEA 5)	18:29	20:23	21:15	21:52
15	08:33		14:43 (WEA 4)	07:46		15:58 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	21	16:06 (WEA 5)	17:38	19	16:17 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		14:47 (WEA 4)	07:44		16:01 (WEA 5)	06:42	06:29	05:30	05:03
	16:43	20	16:09 (WEA 5)	17:40	13	16:14 (WEA 5)	18:32	20:27	21:18	21:54
17	08:31		15:53 (WEA 5)	07:42			06:39	06:27	05:29	05:03
	16:44	17	16:10 (WEA 5)	17:42			18:34	20:29	21:20	21:54
18	08:30		15:52 (WEA 5)	07:40			06:37	06:25	05:27	05:03
	16:46	20	16:12 (WEA 5)	17:44			18:36	20:30	21:21	21:54
19	08:29		15:51 (WEA 5)	07:38			06:35	06:23	05:26	05:03
	16:48	23	16:14 (WEA 5)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:51 (WEA 5)	07:36			06:32	06:20	05:24	05:03
	16:50	25	16:16 (WEA 5)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:49 (WEA 5)	07:34			06:30	06:18	05:23	05:03
	16:51	28	16:17 (WEA 5)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:49 (WEA 5)	07:32			06:28	06:16	05:22	05:03
	16:53	30	16:19 (WEA 5)	17:52			18:43	20:38	21:27	21:56
23	08:24		15:49 (WEA 5)	07:29			06:25	06:14	05:20	05:03
	16:55	31	16:20 (WEA 5)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:48 (WEA 5)	07:27			06:23	06:12	05:19	05:04
	16:57	32	16:20 (WEA 5)	17:55			18:46	20:41	21:30	21:56
25	08:22		15:48 (WEA 5)	07:25			06:21	06:10	05:18	05:04
	16:58	34	16:22 (WEA 5)	17:57			18:48	20:43	21:32	21:56
26	08:20		15:47 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	35	16:22 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		15:48 (WEA 5)	07:21			06:16	06:05	05:16	05:05
	17:02	35	16:23 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:17		15:47 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	37	16:24 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		15:47 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	37	16:24 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		15:47 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	38	16:25 (WEA 5)				19:57	20:51	21:38	21:55
31	08:13		15:47 (WEA 5)				07:06		05:11	
	17:10	38	16:25 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		878			512					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-03 - SR-03, Plaggenweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:20 (WEA 5)	08:15		14:17 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	33	15:53 (WEA 5)	16:17	24	14:41 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		15:19 (WEA 5)	08:17		14:17 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	35	15:54 (WEA 5)	16:16	25	14:42 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		15:19 (WEA 5)	08:18		14:17 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	36	15:55 (WEA 5)	16:16	27	14:44 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		15:18 (WEA 5)	08:20		14:17 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	37	15:55 (WEA 5)	16:15	27	14:44 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		15:18 (WEA 5)	08:21		14:17 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	37	15:55 (WEA 5)	16:14	29	14:46 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		15:18 (WEA 5)	08:22		14:17 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	38	15:56 (WEA 5)	16:14	29	14:46 (WEA 4)
7	05:12	05:55	06:46	07:38			07:34		15:17 (WEA 5)	08:24		14:16 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	39	15:56 (WEA 5)	16:13	31	14:47 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		15:17 (WEA 5)	08:25		14:17 (WEA 4)
	21:52	21:09	20:02	18:50			16:46	39	15:56 (WEA 5)	16:13	31	14:48 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		15:17 (WEA 5)	08:26		14:17 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	39	15:56 (WEA 5)	16:13	32	14:49 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		15:18 (WEA 5)	08:27		14:17 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	38	15:56 (WEA 5)	16:13	32	14:49 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		15:18 (WEA 5)	08:28		14:17 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	38	15:56 (WEA 5)	16:12	33	14:50 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43		15:18 (WEA 5)	08:29		14:17 (WEA 4)
	21:48	21:01	19:52	18:41			16:40	38	15:56 (WEA 5)	16:12	33	14:50 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45		15:19 (WEA 5)	08:30		14:17 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	37	15:56 (WEA 5)	16:12	34	14:51 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47		15:19 (WEA 5)	08:31		14:17 (WEA 4)
	21:46	20:57	19:47	18:37			16:36	37	15:56 (WEA 5)	16:12	34	14:51 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		15:20 (WEA 5)	08:32		14:18 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	35	15:55 (WEA 5)	16:12	34	14:52 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50		15:20 (WEA 5)	08:33		14:18 (WEA 4)
	21:44	20:53	19:43	18:32			16:33	35	15:55 (WEA 5)	16:12	35	14:53 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:21 (WEA 5)	08:34		14:19 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	34	15:55 (WEA 5)	16:12	34	14:53 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:22 (WEA 5)	08:35		14:20 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	32	15:54 (WEA 5)	16:13	34	14:54 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:23 (WEA 5)	08:35		14:19 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	31	15:54 (WEA 5)	16:13	35	14:54 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:24 (WEA 5)	08:36		14:20 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	30	15:54 (WEA 5)	16:13	35	14:55 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:25 (WEA 5)	08:37		14:20 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	28	15:53 (WEA 5)	16:14	35	14:55 (WEA 4)
22	05:30	06:20	07:12	08:04			08:01		15:27 (WEA 5)	08:37		14:21 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	25	15:52 (WEA 5)	16:14	35	14:56 (WEA 4)
23	05:31	06:21	07:13	08:06			08:03		15:28 (WEA 5)	08:38		14:21 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	24	15:52 (WEA 5)	16:15	35	14:56 (WEA 4)
24	05:33	06:23	07:15	08:08			08:04		15:29 (WEA 5)	08:38		14:22 (WEA 4)
	21:34	20:36	19:23	18:15			16:23	20	15:49 (WEA 5)	16:15	35	14:57 (WEA 4)
25	05:34	06:25	07:17	07:10		15:36 (WEA 5)	08:06		15:31 (WEA 5)	08:39		14:22 (WEA 4)
	21:33	20:34	19:21	17:13	3	15:39 (WEA 5)	16:22	17	15:48 (WEA 5)	16:16	35	14:57 (WEA 4)
26	05:36	06:26	07:19	07:12		15:30 (WEA 5)	08:07		14:25 (WEA 4)	08:39		14:23 (WEA 4)
	21:31	20:32	19:19	17:11	15	15:45 (WEA 5)	16:21	20	15:47 (WEA 5)	16:17	34	14:57 (WEA 4)
27	05:37	06:28	07:20	07:13		15:27 (WEA 5)	08:09		14:22 (WEA 4)	08:39		14:23 (WEA 4)
	21:30	20:29	19:16	17:09	20	15:47 (WEA 5)	16:20	23	15:46 (WEA 5)	16:17	34	14:57 (WEA 4)
28	05:39	06:30	07:22	07:15		15:25 (WEA 5)	08:11		14:20 (WEA 4)	08:39		14:24 (WEA 4)
	21:28	20:27	19:14	17:07	24	15:49 (WEA 5)	16:19	16	14:36 (WEA 4)	16:18	34	14:58 (WEA 4)
29	05:40	06:31	07:24	07:17		15:23 (WEA 5)	08:12		14:19 (WEA 4)	08:39		14:24 (WEA 4)
	21:27	20:25	19:12	17:05	27	15:50 (WEA 5)	16:18	19	14:38 (WEA 4)	16:19	34	14:58 (WEA 4)
30	05:42	06:33	07:25	07:19		15:22 (WEA 5)	08:14		14:19 (WEA 4)	08:40		14:25 (WEA 4)
	21:25	20:23	19:09	17:03	30	15:52 (WEA 5)	16:18	21	14:40 (WEA 4)	16:20	33	14:58 (WEA 4)
31	05:43	06:35		07:21		15:21 (WEA 5)				08:40		14:26 (WEA 4)
	21:24	20:20		17:01	32	15:53 (WEA 5)				16:21	33	14:59 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					151			931			1005	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-04 - SR-04, Westmark 3a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai		Juni
1	08:40		14:34 (WEA 3)	08:11		15:22 (WEA 4)	07:16		15:42 (WEA 4)	07:04		18:03 (WEA 5)	05:57		05:10
	16:22	26	15:00 (WEA 3)	17:11	55	16:17 (WEA 4)	18:05	18	16:00 (WEA 4)	20:01	45	18:48 (WEA 5)	20:53		21:41
2	08:39		14:34 (WEA 3)	08:10		15:22 (WEA 4)	07:14			07:02		18:04 (WEA 5)	05:55		05:10
	16:23	27	15:01 (WEA 3)	17:13	55	16:17 (WEA 4)	18:07			20:02	43	18:47 (WEA 5)	20:55		21:42
3	08:39		14:34 (WEA 3)	08:08		15:22 (WEA 4)	07:12			06:59		18:05 (WEA 5)	05:53		05:09
	16:24	27	15:01 (WEA 3)	17:15	57	16:19 (WEA 4)	18:08			20:04	40	18:45 (WEA 5)	20:57		21:43
4	08:39		14:35 (WEA 3)	08:06		15:22 (WEA 4)	07:10			06:57		18:06 (WEA 5)	05:52		05:08
	16:26	27	15:02 (WEA 3)	17:17	57	16:19 (WEA 4)	18:10			20:06	38	18:44 (WEA 5)	20:58		21:44
5	08:39		14:36 (WEA 3)	08:05		15:21 (WEA 4)	07:07			06:55		18:08 (WEA 5)	05:50		05:07
	16:27	27	15:03 (WEA 3)	17:19	58	16:19 (WEA 4)	18:12			20:08	34	18:42 (WEA 5)	21:00		21:45
6	08:38		14:35 (WEA 3)	08:03		15:21 (WEA 4)	07:05			06:52		18:09 (WEA 5)	05:48		05:07
	16:28	28	15:03 (WEA 3)	17:21	59	16:20 (WEA 4)	18:14			20:09	30	18:39 (WEA 5)	21:02		21:46
7	08:38		14:35 (WEA 3)	08:01		15:21 (WEA 4)	07:03		17:30 (WEA 5)	06:50		18:11 (WEA 5)	05:46		05:06
	16:29	28	15:03 (WEA 3)	17:23	59	16:20 (WEA 4)	18:16	4	17:34 (WEA 5)	20:11	26	18:37 (WEA 5)	21:04		21:47
8	08:38		14:37 (WEA 3)	07:59		15:21 (WEA 4)	07:00		17:23 (WEA 5)	06:48		18:14 (WEA 5)	05:44		05:05
	16:31	27	15:04 (WEA 3)	17:25	59	16:20 (WEA 4)	18:18	18	17:41 (WEA 5)	20:13	20	18:34 (WEA 5)	21:05		21:48
9	08:37		14:37 (WEA 3)	07:58		15:21 (WEA 4)	06:58		17:20 (WEA 5)	06:45		18:19 (WEA 5)	05:42		05:05
	16:32	27	15:04 (WEA 3)	17:27	59	16:20 (WEA 4)	18:19	25	17:45 (WEA 5)	20:15	9	18:28 (WEA 5)	21:07		21:49
10	08:36		14:37 (WEA 3)	07:56		15:21 (WEA 4)	06:56		17:16 (WEA 5)	06:43			05:40		05:04
	16:34	27	15:04 (WEA 3)	17:29	59	16:20 (WEA 4)	18:21	30	17:46 (WEA 5)	20:16			21:09		21:50
11	08:36		14:37 (WEA 3)	07:54		15:21 (WEA 4)	06:54		17:14 (WEA 5)	06:41			05:39		05:04
	16:35	27	15:04 (WEA 3)	17:31	59	16:20 (WEA 4)	18:23	35	17:49 (WEA 5)	20:18			21:10		21:50
12	08:35		14:39 (WEA 3)	07:52		15:21 (WEA 4)	06:51		17:12 (WEA 5)	06:38			05:37		05:04
	16:37	26	15:05 (WEA 3)	17:33	59	16:20 (WEA 4)	18:25	37	17:49 (WEA 5)	20:20			21:12		21:51
13	08:34		14:39 (WEA 3)	07:50		15:21 (WEA 4)	06:49		17:10 (WEA 5)	06:36			05:35		05:03
	16:38	27	15:06 (WEA 3)	17:34	59	16:20 (WEA 4)	18:27	41	17:51 (WEA 5)	20:22			21:13		21:52
14	08:34		14:40 (WEA 3)	07:48		15:22 (WEA 4)	06:47		17:09 (WEA 5)	06:34			05:34		05:03
	16:40	35	15:50 (WEA 4)	17:36	58	16:20 (WEA 4)	18:29	43	17:52 (WEA 5)	20:23			21:15		21:52
15	08:33		14:41 (WEA 3)	07:46		15:22 (WEA 4)	06:44		17:07 (WEA 5)	06:32			05:32		05:03
	16:41	41	15:54 (WEA 4)	17:38	58	16:20 (WEA 4)	18:30	45	17:52 (WEA 5)	20:25			21:17		21:53
16	08:32		14:41 (WEA 3)	07:44		15:23 (WEA 4)	06:42		17:07 (WEA 5)	06:29			05:30		05:03
	16:43	46	15:57 (WEA 4)	17:40	57	16:20 (WEA 4)	18:32	46	17:53 (WEA 5)	20:27			21:18		21:54
17	08:31		14:41 (WEA 3)	07:42		15:23 (WEA 4)	06:39		17:06 (WEA 5)	06:27			05:29		05:03
	16:44	49	15:58 (WEA 4)	17:42	56	16:19 (WEA 4)	18:34	48	17:54 (WEA 5)	20:29			21:20		21:54
18	08:30		14:43 (WEA 3)	07:40		15:24 (WEA 4)	06:37		17:04 (WEA 5)	06:25			05:27		05:03
	16:46	50	16:00 (WEA 4)	17:44	55	16:19 (WEA 4)	18:36	50	17:54 (WEA 5)	20:30			21:21		21:54
19	08:29		14:44 (WEA 3)	07:38		15:25 (WEA 4)	06:35		17:04 (WEA 5)	06:23			05:26		05:03
	16:48	52	16:02 (WEA 4)	17:46	53	16:18 (WEA 4)	18:37	50	17:54 (WEA 5)	20:32			21:23		21:55
20	08:28		14:45 (WEA 3)	07:36		15:25 (WEA 4)	06:32		17:03 (WEA 5)	06:20			05:24		05:03
	16:50	53	16:04 (WEA 4)	17:48	52	16:17 (WEA 4)	18:39	51	17:54 (WEA 5)	20:34			21:24		21:55
21	08:27		14:46 (WEA 3)	07:34		15:26 (WEA 4)	06:30		17:03 (WEA 5)	06:18			05:23		05:03
	16:51	53	16:05 (WEA 4)	17:50	50	16:16 (WEA 4)	18:41	51	17:54 (WEA 5)	20:36			21:26		21:55
22	08:25		14:48 (WEA 3)	07:32		15:27 (WEA 4)	06:28		17:03 (WEA 5)	06:16			05:22		05:03
	16:53	53	16:07 (WEA 4)	17:52	48	16:15 (WEA 4)	18:43	52	17:55 (WEA 5)	20:38			21:27		21:56
23	08:24		14:51 (WEA 3)	07:29		15:29 (WEA 4)	06:25		17:02 (WEA 5)	06:14			05:20		05:03
	16:55	51	16:09 (WEA 4)	17:53	45	16:14 (WEA 4)	18:45	52	17:54 (WEA 5)	20:39			21:29		21:56
24	08:23		15:26 (WEA 4)	07:27		15:30 (WEA 4)	06:23		17:02 (WEA 5)	06:12			05:19		05:04
	16:57	44	16:10 (WEA 4)	17:55	43	16:13 (WEA 4)	18:46	52	17:54 (WEA 5)	20:41			21:30		21:56
25	08:22		15:26 (WEA 4)	07:25		15:31 (WEA 4)	06:21		17:01 (WEA 5)	06:10			05:18		05:04
	16:58	45	16:11 (WEA 4)	17:57	40	16:11 (WEA 4)	18:48	52	17:53 (WEA 5)	20:43			21:32		21:56
26	08:20		15:25 (WEA 4)	07:23		15:33 (WEA 4)	06:18		17:01 (WEA 5)	06:08			05:17		05:04
	17:00	47	16:12 (WEA 4)	17:59	36	16:09 (WEA 4)	18:50	52	17:53 (WEA 5)	20:45			21:33		21:56
27	08:19		15:25 (WEA 4)	07:21		15:35 (WEA 4)	06:16		17:02 (WEA 5)	06:06			05:16		05:05
	17:02	49	16:14 (WEA 4)	18:01	32	16:07 (WEA 4)	18:52	51	17:53 (WEA 5)	20:46			21:34		21:56
28	08:17		15:24 (WEA 4)	07:19		15:38 (WEA 4)	06:13		17:01 (WEA 5)	06:03			05:14		05:05
	17:04	50	16:14 (WEA 4)	18:03	27	16:05 (WEA 4)	18:53	50	17:51 (WEA 5)	20:48			21:36		21:56
29	08:16		15:23 (WEA 4)				07:11		18:02 (WEA 5)	06:01			05:13		05:06
	17:06	52	16:15 (WEA 4)				19:55	49	18:51 (WEA 5)	20:50			21:37		21:56
30	08:14		15:24 (WEA 4)				07:09		18:02 (WEA 5)	05:59			05:12		05:06
	17:08	52	16:16 (WEA 4)				19:57	48	18:50 (WEA 5)	20:51			21:38		21:55
31	08:13		15:23 (WEA 4)				07:06		18:02 (WEA 5)				05:11		
	17:10	54	16:17 (WEA 4)				19:59	47	18:49 (WEA 5)				21:39		
Sonnenscheinstunden	255			276			367			418			489		503
astr.max.mögl.Beschattung		1227			1464			1097			285				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-04 - SR-04, Westmark 3a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September			Oktober			November			Dezember		
1	05:07	05:45	06:36			07:27		17:51 (WEA 5)	07:23		14:51 (WEA 4)	08:15		14:19 (WEA 3)
	21:55	21:22	20:18			19:07	39	18:30 (WEA 5)	16:59	59	15:50 (WEA 4)	16:17	27	14:46 (WEA 3)
2	05:08	05:46	06:38			07:29		17:51 (WEA 5)	07:25		14:51 (WEA 4)	08:17		14:20 (WEA 3)
	21:55	21:20	20:16			19:04	36	18:27 (WEA 5)	16:57	59	15:50 (WEA 4)	16:16	27	14:47 (WEA 3)
3	05:08	05:48	06:40		18:17 (WEA 5)	07:31		17:53 (WEA 5)	07:26		14:51 (WEA 4)	08:18		14:21 (WEA 3)
	21:54	21:18	20:13	9	18:26 (WEA 5)	19:02	32	18:25 (WEA 5)	16:55	59	15:50 (WEA 4)	16:16	27	14:48 (WEA 3)
4	05:09	05:50	06:41		18:12 (WEA 5)	07:32		17:55 (WEA 5)	07:28		14:51 (WEA 4)	08:20		14:21 (WEA 3)
	21:54	21:17	20:11	19	18:31 (WEA 5)	19:00	28	18:23 (WEA 5)	16:53	59	15:50 (WEA 4)	16:15	27	14:48 (WEA 3)
5	05:10	05:51	06:43		18:07 (WEA 5)	07:34		17:58 (WEA 5)	07:30		14:51 (WEA 4)	08:21		14:21 (WEA 3)
	21:53	21:15	20:09	26	18:33 (WEA 5)	18:57	22	18:20 (WEA 5)	16:51	58	15:49 (WEA 4)	16:14	27	14:48 (WEA 3)
6	05:11	05:53	06:45		18:05 (WEA 5)	07:36		18:02 (WEA 5)	07:32		14:51 (WEA 4)	08:22		14:22 (WEA 3)
	21:53	21:13	20:06	30	18:35 (WEA 5)	18:55	13	18:15 (WEA 5)	16:50	58	15:49 (WEA 4)	16:14	27	14:49 (WEA 3)
7	05:12	05:55	06:47		18:03 (WEA 5)	07:38			07:34		14:52 (WEA 4)	08:24		14:22 (WEA 3)
	21:52	21:11	20:04	34	18:37 (WEA 5)	18:53			16:48	57	15:49 (WEA 4)	16:14	27	14:49 (WEA 3)
8	05:13	05:56	06:48		18:00 (WEA 5)	07:39			07:36		14:52 (WEA 4)	08:25		14:23 (WEA 3)
	21:51	21:09	20:02	38	18:38 (WEA 5)	18:50			16:46	57	15:49 (WEA 4)	16:13	27	14:50 (WEA 3)
9	05:14	05:58	06:50		17:59 (WEA 5)	07:41			07:38		14:53 (WEA 4)	08:26		14:23 (WEA 3)
	21:51	21:07	19:59	40	18:39 (WEA 5)	18:48			16:44	55	15:48 (WEA 4)	16:13	27	14:50 (WEA 3)
10	05:15	05:59	06:52		17:58 (WEA 5)	07:43			07:39		14:53 (WEA 4)	08:27		14:23 (WEA 3)
	21:50	21:05	19:57	42	18:40 (WEA 5)	18:46			16:43	55	15:48 (WEA 4)	16:13	27	14:50 (WEA 3)
11	05:16	06:01	06:53		17:56 (WEA 5)	07:45			07:41		14:54 (WEA 4)	08:28		14:24 (WEA 3)
	21:49	21:03	19:55	44	18:40 (WEA 5)	18:44			16:41	53	15:47 (WEA 4)	16:12	27	14:51 (WEA 3)
12	05:17	06:03	06:55		17:55 (WEA 5)	07:46		16:18 (WEA 4)	07:43		14:54 (WEA 4)	08:29		14:24 (WEA 3)
	21:48	21:01	19:52	46	18:41 (WEA 5)	18:41	12	16:30 (WEA 4)	16:40	53	15:47 (WEA 4)	16:12	27	14:51 (WEA 3)
13	05:18	06:04	06:57		17:53 (WEA 5)	07:48		16:13 (WEA 4)	07:45		14:55 (WEA 4)	08:30		14:24 (WEA 3)
	21:47	20:59	19:50	48	18:41 (WEA 5)	18:39	22	16:35 (WEA 4)	16:38	51	15:46 (WEA 4)	16:12	27	14:51 (WEA 3)
14	05:19	06:06	06:58		17:52 (WEA 5)	07:50		16:09 (WEA 4)	07:47		14:56 (WEA 4)	08:31		14:25 (WEA 3)
	21:46	20:57	19:47	49	18:41 (WEA 5)	18:37	29	16:38 (WEA 4)	16:36	50	15:46 (WEA 4)	16:12	27	14:52 (WEA 3)
15	05:21	06:08	07:00		17:52 (WEA 5)	07:52		16:07 (WEA 4)	07:48		14:57 (WEA 4)	08:32		14:26 (WEA 3)
	21:45	20:55	19:45	50	18:42 (WEA 5)	18:34	33	16:40 (WEA 4)	16:35	48	15:45 (WEA 4)	16:12	26	14:52 (WEA 3)
16	05:22	06:09	07:02		17:50 (WEA 5)	07:53		16:04 (WEA 4)	07:50		14:58 (WEA 4)	08:33		14:26 (WEA 3)
	21:44	20:53	19:43	51	18:41 (WEA 5)	18:32	38	16:42 (WEA 4)	16:33	47	15:45 (WEA 4)	16:12	27	14:53 (WEA 3)
17	05:23	06:11	07:03		17:50 (WEA 5)	07:55		16:03 (WEA 4)	07:52		14:59 (WEA 4)	08:34		14:27 (WEA 3)
	21:43	20:51	19:40	51	18:41 (WEA 5)	18:30	41	16:44 (WEA 4)	16:32	45	15:44 (WEA 4)	16:12	26	14:53 (WEA 3)
18	05:24	06:13	07:05		17:49 (WEA 5)	07:57		16:01 (WEA 4)	07:54		15:00 (WEA 4)	08:35		14:28 (WEA 3)
	21:42	20:49	19:38	52	18:41 (WEA 5)	18:28	44	16:45 (WEA 4)	16:31	44	15:44 (WEA 4)	16:13	26	14:54 (WEA 3)
19	05:26	06:14	07:07		17:48 (WEA 5)	07:59		15:59 (WEA 4)	07:56		14:25 (WEA 3)	08:35		14:28 (WEA 3)
	21:41	20:47	19:35	52	18:40 (WEA 5)	18:26	47	16:46 (WEA 4)	16:29	51	15:43 (WEA 4)	16:13	26	14:54 (WEA 3)
20	05:27	06:16	07:08		17:48 (WEA 5)	08:01		15:58 (WEA 4)	07:57		14:23 (WEA 3)	08:36		14:28 (WEA 3)
	21:40	20:45	19:33	52	18:40 (WEA 5)	18:23	49	16:47 (WEA 4)	16:28	53	15:42 (WEA 4)	16:13	26	14:54 (WEA 3)
21	05:28	06:18	07:10		17:48 (WEA 5)	08:02		15:56 (WEA 4)	07:59		14:22 (WEA 3)	08:37		14:28 (WEA 3)
	21:38	20:43	19:31	52	18:40 (WEA 5)	18:21	51	16:47 (WEA 4)	16:27	53	15:41 (WEA 4)	16:14	26	14:54 (WEA 3)
22	05:30	06:20	07:12		17:47 (WEA 5)	08:04		15:55 (WEA 4)	08:01		14:21 (WEA 3)	08:37		14:29 (WEA 3)
	21:37	20:40	19:28	52	18:39 (WEA 5)	18:19	52	16:47 (WEA 4)	16:26	54	15:41 (WEA 4)	16:14	26	14:55 (WEA 3)
23	05:31	06:21	07:13		17:47 (WEA 5)	08:06		15:54 (WEA 4)	08:02		14:21 (WEA 3)	08:38		14:29 (WEA 3)
	21:36	20:38	19:26	52	18:39 (WEA 5)	18:17	54	16:48 (WEA 4)	16:24	53	15:40 (WEA 4)	16:15	26	14:55 (WEA 3)
24	05:33	06:23	07:15		17:48 (WEA 5)	08:08		15:53 (WEA 4)	08:04		14:20 (WEA 3)	08:38		14:30 (WEA 3)
	21:34	20:36	19:23	50	18:38 (WEA 5)	18:15	55	16:48 (WEA 4)	16:23	51	15:38 (WEA 4)	16:15	26	14:56 (WEA 3)
25	05:34	06:25	07:17		17:47 (WEA 5)	07:10		14:53 (WEA 4)	08:06		14:20 (WEA 3)	08:39		14:31 (WEA 3)
	21:33	20:34	19:21	50	18:37 (WEA 5)	17:13	56	15:49 (WEA 4)	16:22	48	15:36 (WEA 4)	16:16	26	14:57 (WEA 3)
26	05:36	06:26	07:19		17:47 (WEA 5)	07:12		14:52 (WEA 4)	08:07		14:20 (WEA 3)	08:39		14:31 (WEA 3)
	21:31	20:32	19:19	49	18:36 (WEA 5)	17:11	57	15:49 (WEA 4)	16:21	45	15:35 (WEA 4)	16:17	26	14:57 (WEA 3)
27	05:37	06:28	07:20		17:48 (WEA 5)	07:13		14:52 (WEA 4)	08:09		14:20 (WEA 3)	08:39		14:31 (WEA 3)
	21:30	20:29	19:16	47	18:35 (WEA 5)	17:09	57	15:49 (WEA 4)	16:20	42	15:33 (WEA 4)	16:17	26	14:57 (WEA 3)
28	05:39	06:30	07:22		17:49 (WEA 5)	07:15		14:51 (WEA 4)	08:11		14:19 (WEA 3)	08:39		14:31 (WEA 3)
	21:28	20:27	19:14	45	18:34 (WEA 5)	17:07	59	15:50 (WEA 4)	16:19	36	15:29 (WEA 4)	16:18	27	14:58 (WEA 3)
29	05:40	06:31	07:24		17:49 (WEA 5)	07:17		14:51 (WEA 4)	08:12		14:19 (WEA 3)	08:39		14:32 (WEA 3)
	21:27	20:25	19:12	43	18:32 (WEA 5)	17:05	59	15:50 (WEA 4)	16:19	27	14:46 (WEA 3)	16:19	26	14:58 (WEA 3)
30	05:42	06:33	07:25		17:50 (WEA 5)	07:19		14:51 (WEA 4)	08:14		14:20 (WEA 3)	08:40		14:32 (WEA 3)
	21:25	20:23	19:09	41	18:31 (WEA 5)	17:03	59	15:50 (WEA 4)	16:18	26	14:46 (WEA 3)	16:20	27	14:59 (WEA 3)
31	05:43	06:35				07:21		14:51 (WEA 4)				08:40		14:33 (WEA 3)
	21:24	20:20				17:01	59	15:50 (WEA 4)				16:21	27	15:00 (WEA 3)
Sonnenscheinstunden	506	456	381			330			263			240		
astr.max.mögl.Beschattung				1214			1103			1506			824	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-05 - SR-05, Kötterweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai	Juni
1	08:40		15:05 (WEA 1)	08:11			07:16		17:07 (WEA 3)	07:04		18:47 (WEA 4)	05:57	05:10
	16:22	22	15:27 (WEA 1)	17:11			18:05	18	17:25 (WEA 3)	20:00	20	19:07 (WEA 4)	20:53	21:41
2	08:39		15:05 (WEA 1)	08:10		16:18 (WEA 2)	07:14		17:07 (WEA 3)	07:02		18:49 (WEA 4)	05:55	05:10
	16:23	23	15:28 (WEA 1)	17:13	10	16:28 (WEA 2)	18:07	18	17:25 (WEA 3)	20:02	16	19:05 (WEA 4)	20:55	21:42
3	08:39		15:05 (WEA 1)	08:08		16:17 (WEA 2)	07:12		17:07 (WEA 3)	06:59		18:51 (WEA 4)	05:53	05:09
	16:24	23	15:28 (WEA 1)	17:15	14	16:31 (WEA 2)	18:08	18	17:25 (WEA 3)	20:04	12	19:38 (WEA 5)	20:57	21:43
4	08:39		15:05 (WEA 1)	08:06		16:15 (WEA 2)	07:10		17:06 (WEA 3)	06:57		19:31 (WEA 5)	05:51	05:08
	16:26	24	15:29 (WEA 1)	17:17	18	16:33 (WEA 2)	18:10	18	17:24 (WEA 3)	20:06	9	19:40 (WEA 5)	20:58	21:44
5	08:39		15:05 (WEA 1)	08:05		16:14 (WEA 2)	07:07		17:07 (WEA 3)	06:55		19:29 (WEA 5)	05:50	05:07
	16:27	24	15:29 (WEA 1)	17:19	20	16:34 (WEA 2)	18:12	17	17:24 (WEA 3)	20:08	13	19:42 (WEA 5)	21:00	21:45
6	08:38		15:06 (WEA 1)	08:03		16:13 (WEA 2)	07:05		17:08 (WEA 3)	06:52		19:27 (WEA 5)	05:48	05:07
	16:28	24	15:30 (WEA 1)	17:21	22	16:35 (WEA 2)	18:14	15	17:23 (WEA 3)	20:09	16	19:43 (WEA 5)	21:02	21:46
7	08:38		15:06 (WEA 1)	08:01		16:12 (WEA 2)	07:03		17:09 (WEA 3)	06:50		19:26 (WEA 5)	05:46	05:06
	16:29	24	15:30 (WEA 1)	17:23	24	16:36 (WEA 2)	18:16	11	17:20 (WEA 3)	20:11	19	19:45 (WEA 5)	21:03	21:47
8	08:37		15:07 (WEA 1)	07:59		16:11 (WEA 2)	07:00		17:13 (WEA 3)	06:48		19:25 (WEA 5)	05:44	05:05
	16:31	24	15:31 (WEA 1)	17:25	25	16:36 (WEA 2)	18:18	4	17:17 (WEA 3)	20:13	22	19:47 (WEA 5)	21:05	21:48
9	08:37		15:07 (WEA 1)	07:58		16:11 (WEA 2)	06:58			06:45		19:23 (WEA 5)	05:42	05:05
	16:32	25	15:32 (WEA 1)	17:27	26	16:37 (WEA 2)	18:19			20:15	25	19:48 (WEA 5)	21:07	21:49
10	08:36		15:07 (WEA 1)	07:56		16:11 (WEA 2)	06:56			06:43		19:23 (WEA 5)	05:40	05:04
	16:34	25	15:32 (WEA 1)	17:29	26	16:37 (WEA 2)	18:21			20:16	26	19:49 (WEA 5)	21:09	21:50
11	08:36		15:07 (WEA 1)	07:54		16:11 (WEA 2)	06:53			06:41		19:23 (WEA 5)	05:39	05:04
	16:35	25	15:32 (WEA 1)	17:31	26	16:37 (WEA 2)	18:23			20:18	27	19:50 (WEA 5)	21:10	21:50
12	08:35		15:08 (WEA 1)	07:52		16:11 (WEA 2)	06:51			06:38		19:23 (WEA 5)	05:37	05:04
	16:37	26	15:34 (WEA 1)	17:32	26	16:37 (WEA 2)	18:25			20:20	27	19:50 (WEA 5)	21:12	21:51
13	08:34		15:08 (WEA 1)	07:50		16:11 (WEA 2)	06:49			06:36		19:22 (WEA 5)	05:35	05:03
	16:38	26	15:34 (WEA 1)	17:34	26	16:37 (WEA 2)	18:27			20:22	27	19:49 (WEA 5)	21:13	21:52
14	08:34		15:09 (WEA 1)	07:48		16:11 (WEA 2)	06:46			06:34		19:22 (WEA 5)	05:34	05:03
	16:40	25	15:34 (WEA 1)	17:36	26	16:37 (WEA 2)	18:28			20:23	26	19:48 (WEA 5)	21:15	21:52
15	08:33		15:09 (WEA 1)	07:46		16:12 (WEA 2)	06:44		17:55 (WEA 4)	06:32		19:23 (WEA 5)	05:32	05:03
	16:41	26	15:35 (WEA 1)	17:38	25	16:37 (WEA 2)	18:30	9	18:04 (WEA 4)	20:25	25	19:48 (WEA 5)	21:17	21:53
16	08:32		15:09 (WEA 1)	07:44		16:13 (WEA 2)	06:42		17:52 (WEA 4)	06:29		19:23 (WEA 5)	05:30	05:03
	16:43	25	15:34 (WEA 1)	17:40	23	16:36 (WEA 2)	18:32	14	18:06 (WEA 4)	20:27	24	19:47 (WEA 5)	21:18	21:53
17	08:31		15:10 (WEA 1)	07:42		16:14 (WEA 2)	06:39		17:50 (WEA 4)	06:27		19:24 (WEA 5)	05:29	05:03
	16:44	24	15:34 (WEA 1)	17:42	22	16:36 (WEA 2)	18:34	19	18:09 (WEA 4)	20:29	22	19:46 (WEA 5)	21:20	21:54
18	08:30		15:10 (WEA 1)	07:40		16:15 (WEA 2)	06:37		17:48 (WEA 4)	06:25		19:24 (WEA 5)	05:27	05:03
	16:46	24	15:34 (WEA 1)	17:44	19	16:34 (WEA 2)	18:36	22	18:10 (WEA 4)	20:30	20	19:44 (WEA 5)	21:21	21:54
19	08:29		15:11 (WEA 1)	07:38		16:17 (WEA 2)	06:35		17:47 (WEA 4)	06:23		19:26 (WEA 5)	05:26	05:03
	16:48	24	15:35 (WEA 1)	17:46	16	16:33 (WEA 2)	18:37	25	18:12 (WEA 4)	20:32	16	19:42 (WEA 5)	21:23	21:55
20	08:28		15:12 (WEA 1)	07:36		16:18 (WEA 2)	06:32		17:45 (WEA 4)	06:20		19:28 (WEA 5)	05:24	05:03
	16:50	23	15:35 (WEA 1)	17:48	12	16:30 (WEA 2)	18:39	28	18:13 (WEA 4)	20:34	12	19:40 (WEA 5)	21:24	21:55
21	08:27		15:13 (WEA 1)	07:34			06:30		17:45 (WEA 4)	06:18			05:23	05:03
	16:51	21	15:34 (WEA 1)	17:50			18:41	30	18:15 (WEA 4)	20:36			21:26	21:55
22	08:25		15:14 (WEA 1)	07:32			06:28		17:44 (WEA 4)	06:16			05:22	05:03
	16:53	20	15:34 (WEA 1)	17:52			18:43	32	18:16 (WEA 4)	20:37			21:27	21:56
23	08:24		15:16 (WEA 1)	07:29			06:25		17:43 (WEA 4)	06:14			05:20	05:03
	16:55	18	15:34 (WEA 1)	17:53			18:45	32	18:15 (WEA 4)	20:39			21:29	21:56
24	08:23		15:16 (WEA 1)	07:27			06:23		17:43 (WEA 4)	06:12			05:19	05:04
	16:57	16	15:32 (WEA 1)	17:55			18:46	32	18:15 (WEA 4)	20:41			21:30	21:56
25	08:22		15:19 (WEA 1)	07:25		17:12 (WEA 3)	06:20		17:42 (WEA 4)	06:10			05:18	05:04
	16:58	12	15:31 (WEA 1)	17:57	9	17:21 (WEA 3)	18:48	32	18:14 (WEA 4)	20:43			21:32	21:56
26	08:20		15:21 (WEA 1)	07:23		17:10 (WEA 3)	06:18		17:43 (WEA 4)	06:08			05:17	05:04
	17:00	8	15:29 (WEA 1)	17:59	13	17:23 (WEA 3)	18:50	31	18:14 (WEA 4)	20:44			21:33	21:56
27	08:19			07:21		17:09 (WEA 3)	06:16		17:43 (WEA 4)	06:05			05:16	05:05
	17:02			18:01	15	17:24 (WEA 3)	18:52	31	18:14 (WEA 4)	20:46			21:34	21:56
28	08:17			07:19		17:07 (WEA 3)	06:13		17:43 (WEA 4)	06:03			05:14	05:05
	17:04			18:03	17	17:24 (WEA 3)	18:53	29	18:12 (WEA 4)	20:48			21:36	21:56
29	08:16						07:11		18:44 (WEA 4)	06:01			05:13	05:06
	17:06						19:55	28	19:12 (WEA 4)	20:50			21:37	21:55
30	08:14						07:09		18:45 (WEA 4)	05:59			05:12	05:06
	17:08						19:57	26	19:11 (WEA 4)	20:51			21:38	21:55
31	08:13						07:06		18:45 (WEA 4)				05:11	
	17:10						19:59	24	19:09 (WEA 4)				21:39	
Sonnenscheinstunden	255			276			367			418			489	503
astr.max.mögl.Beschattung		581			460			563			404			

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-05 - SR-05, Kötterweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember		
1	05:07	05:45			06:36		19:22 (WEA 5)	07:27			07:23		15:41 (WEA 2)	08:15		14:49 (WEA 1)
	21:55	21:22			20:18	27	19:49 (WEA 5)	19:07			16:59	26	16:07 (WEA 2)	16:17	25	15:14 (WEA 1)
2	05:08	05:46			06:38		19:22 (WEA 5)	07:29			07:25		15:41 (WEA 2)	08:17		14:50 (WEA 1)
	21:55	21:20			20:16	26	19:48 (WEA 5)	19:04			16:57	25	16:06 (WEA 2)	16:16	25	15:15 (WEA 1)
3	05:08	05:48			06:40		19:21 (WEA 5)	07:31			07:26		15:41 (WEA 2)	08:18		14:50 (WEA 1)
	21:54	21:18			20:13	25	19:46 (WEA 5)	19:02			16:55	25	16:06 (WEA 2)	16:16	25	15:15 (WEA 1)
4	05:09	05:50			06:41		19:22 (WEA 5)	07:32			07:28		15:42 (WEA 2)	08:20		14:51 (WEA 1)
	21:54	21:17			20:11	22	19:44 (WEA 5)	19:00			16:53	23	16:05 (WEA 2)	16:15	25	15:16 (WEA 1)
5	05:10	05:51			06:43		19:22 (WEA 5)	07:34			07:30		15:43 (WEA 2)	08:21		14:51 (WEA 1)
	21:53	21:15			20:09	19	19:41 (WEA 5)	18:57			16:51	22	16:05 (WEA 2)	16:14	24	15:15 (WEA 1)
6	05:11	05:53			06:45		19:23 (WEA 5)	07:36		17:48 (WEA 3)	07:32		15:44 (WEA 2)	08:22		14:52 (WEA 1)
	21:53	21:13			20:06	16	19:39 (WEA 5)	18:55	8	17:56 (WEA 3)	16:50	20	16:04 (WEA 2)	16:14	24	15:16 (WEA 1)
7	05:12	05:55			06:46		19:24 (WEA 5)	07:37		17:44 (WEA 3)	07:34		15:45 (WEA 2)	08:24		14:52 (WEA 1)
	21:52	21:11			20:04	13	19:37 (WEA 5)	18:53	13	17:57 (WEA 3)	16:48	17	16:02 (WEA 2)	16:13	24	15:16 (WEA 1)
8	05:13	05:56			06:48		19:25 (WEA 5)	07:39		17:43 (WEA 3)	07:36		15:47 (WEA 2)	08:25		14:54 (WEA 1)
	21:51	21:09			20:02	9	19:34 (WEA 5)	18:50	15	17:58 (WEA 3)	16:46	14	16:01 (WEA 2)	16:13	23	15:17 (WEA 1)
9	05:14	05:58			06:50		18:46 (WEA 4)	07:41		17:42 (WEA 3)	07:37		15:49 (WEA 2)	08:26		14:54 (WEA 1)
	21:51	21:07			19:59	11	19:32 (WEA 5)	18:48	17	17:59 (WEA 3)	16:44	10	15:59 (WEA 2)	16:13	23	15:17 (WEA 1)
10	05:15	05:59			06:52		18:42 (WEA 4)	07:43		17:41 (WEA 3)	07:39			08:27		14:54 (WEA 1)
	21:50	21:05			19:57	16	18:58 (WEA 4)	18:46	18	17:59 (WEA 3)	16:43			16:13	23	15:17 (WEA 1)
11	05:16	06:01			06:53		18:39 (WEA 4)	07:45		17:41 (WEA 3)	07:41			08:28		14:55 (WEA 1)
	21:49	21:03			19:54	20	18:59 (WEA 4)	18:43	18	17:59 (WEA 3)	16:41			16:12	22	15:17 (WEA 1)
12	05:17	06:03			06:55		18:37 (WEA 4)	07:46		17:40 (WEA 3)	07:43			08:29		14:55 (WEA 1)
	21:48	21:01			19:52	24	19:01 (WEA 4)	18:41	18	17:58 (WEA 3)	16:40			16:12	22	15:17 (WEA 1)
13	05:18	06:04			06:57		18:35 (WEA 4)	07:48		17:40 (WEA 3)	07:45			08:30		14:56 (WEA 1)
	21:47	20:59			19:50	26	19:01 (WEA 4)	18:39	18	17:58 (WEA 3)	16:38			16:12	21	15:17 (WEA 1)
14	05:19	06:06			06:58		18:34 (WEA 4)	07:50		17:41 (WEA 3)	07:47			08:31		14:57 (WEA 1)
	21:46	20:57			19:47	28	19:02 (WEA 4)	18:37	16	17:57 (WEA 3)	16:36			16:12	21	15:18 (WEA 1)
15	05:21	06:08			07:00		18:33 (WEA 4)	07:52		17:41 (WEA 3)	07:48			08:32		14:57 (WEA 1)
	21:45	20:55			19:45	29	19:02 (WEA 4)	18:34	15	17:56 (WEA 3)	16:35			16:12	21	15:18 (WEA 1)
16	05:22	06:09			07:02		18:32 (WEA 4)	07:53		17:43 (WEA 3)	07:50		14:54 (WEA 1)	08:33		14:58 (WEA 1)
	21:44	20:53			19:43	30	19:02 (WEA 4)	18:32	12	17:55 (WEA 3)	16:33	8	15:02 (WEA 1)	16:12	20	15:18 (WEA 1)
17	05:23	06:11			07:03		18:31 (WEA 4)	07:55		17:45 (WEA 3)	07:52		14:52 (WEA 1)	08:34		14:59 (WEA 1)
	21:43	20:51			19:40	31	19:02 (WEA 4)	18:30	7	17:52 (WEA 3)	16:32	12	15:04 (WEA 1)	16:12	20	15:19 (WEA 1)
18	05:24	06:13			07:05		18:31 (WEA 4)	07:57			07:54		14:50 (WEA 1)	08:35		15:00 (WEA 1)
	21:42	20:49			19:38	32	19:03 (WEA 4)	18:28			16:31	16	15:06 (WEA 1)	16:13	20	15:20 (WEA 1)
19	05:26	06:14			07:07		18:30 (WEA 4)	07:59			07:56		14:50 (WEA 1)	08:35		14:59 (WEA 1)
	21:41	20:47			19:35	32	19:02 (WEA 4)	18:26			16:29	18	15:08 (WEA 1)	16:13	20	15:19 (WEA 1)
20	05:27	06:16			07:08		18:30 (WEA 4)	08:01			07:57		14:49 (WEA 1)	08:36		15:00 (WEA 1)
	21:40	20:45			19:33	32	19:02 (WEA 4)	18:23			16:28	20	15:09 (WEA 1)	16:13	20	15:20 (WEA 1)
21	05:28	06:18			07:10		18:30 (WEA 4)	08:02		16:52 (WEA 2)	07:59		14:49 (WEA 1)	08:37		15:00 (WEA 1)
	21:38	20:43			19:31	31	19:01 (WEA 4)	18:21	5	16:57 (WEA 2)	16:27	21	15:10 (WEA 1)	16:14	20	15:20 (WEA 1)
22	05:30	06:20		19:36 (WEA 5)	07:12		18:29 (WEA 4)	08:04		16:48 (WEA 2)	08:01		14:48 (WEA 1)	08:37		15:01 (WEA 1)
	21:37	20:40	4	19:40 (WEA 5)	19:28	31	19:00 (WEA 4)	18:19	13	17:01 (WEA 2)	16:26	23	15:11 (WEA 1)	16:14	20	15:21 (WEA 1)
23	05:31	06:21		19:32 (WEA 5)	07:13		18:30 (WEA 4)	08:06		16:46 (WEA 2)	08:02		14:48 (WEA 1)	08:38		15:01 (WEA 1)
	21:36	20:38	13	19:45 (WEA 5)	19:26	28	18:58 (WEA 4)	18:17	17	17:03 (WEA 2)	16:24	24	15:12 (WEA 1)	16:15	20	15:21 (WEA 1)
24	05:33	06:23		19:29 (WEA 5)	07:15		18:30 (WEA 4)	08:08		16:44 (WEA 2)	08:04		14:47 (WEA 1)	08:38		15:02 (WEA 1)
	21:34	20:36	17	19:46 (WEA 5)	19:23	26	18:56 (WEA 4)	18:15	20	17:04 (WEA 2)	16:23	24	15:11 (WEA 1)	16:15	20	15:22 (WEA 1)
25	05:34	06:25		19:28 (WEA 5)	07:17		18:30 (WEA 4)	07:10		15:43 (WEA 2)	08:06		14:48 (WEA 1)	08:39		15:03 (WEA 1)
	21:33	20:34	20	19:48 (WEA 5)	19:21	23	18:53 (WEA 4)	17:13	22	16:05 (WEA 2)	16:22	24	15:12 (WEA 1)	16:16	19	15:22 (WEA 1)
26	05:36	06:26		19:26 (WEA 5)	07:19		18:32 (WEA 4)	07:12		15:42 (WEA 2)	08:07		14:48 (WEA 1)	08:39		15:03 (WEA 1)
	21:31	20:32	22	19:48 (WEA 5)	19:19	19	18:51 (WEA 4)	17:11	24	16:06 (WEA 2)	16:21	25	15:13 (WEA 1)	16:17	20	15:23 (WEA 1)
27	05:37	06:28		19:25 (WEA 5)	07:20		18:33 (WEA 4)	07:13		15:41 (WEA 2)	08:09		14:48 (WEA 1)	08:39		15:03 (WEA 1)
	21:30	20:29	24	19:49 (WEA 5)	19:16	16	18:49 (WEA 4)	17:09	25	16:06 (WEA 2)	16:20	26	15:14 (WEA 1)	16:17	20	15:23 (WEA 1)
28	05:39	06:30		19:24 (WEA 5)	07:22		18:35 (WEA 4)	07:15		15:41 (WEA 2)	08:11		14:48 (WEA 1)	08:39		15:03 (WEA 1)
	21:28	20:27	26	19:50 (WEA 5)	19:14	12	18:47 (WEA 4)	17:07	26	16:07 (WEA 2)	16:19	25	15:13 (WEA 1)	16:18	21	15:24 (WEA 1)
29	05:40	06:31		19:23 (WEA 5)	07:24		18:38 (WEA 4)	07:17		15:41 (WEA 2)	08:12		14:48 (WEA 1)	08:39		15:03 (WEA 1)
	21:27	20:25	26	19:49 (WEA 5)	19:12	6	18:44 (WEA 4)	17:05	26	16:07 (WEA 2)	16:18	26	15:14 (WEA 1)	16:19	21	15:24 (WEA 1)
30	05:42	06:33		19:23 (WEA 5)	07:25			07:19		15:40 (WEA 2)	08:14		14:49 (WEA 1)	08:40		15:04 (WEA 1)
	21:25	20:23	26	19:49 (WEA 5)	19:09			17:03	27	16:07 (WEA 2)	16:18	26	15:15 (WEA 1)	16:20	21	15:25 (WEA 1)
31	05:43	06:35		19:22 (WEA 5)				07:21		15:40 (WEA 2)				08:40		15:04 (WEA 1)
	21:23	20:20	27	19:49 (WEA 5)				17:01	27	16:07 (WEA 2)				16:21	22	15:26 (WEA 1)
Sonnenscheinstunden	506	456			381			330			263			240		
astr.max.mögl.Beschattung			205			660			407			500			672	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-05a - SR-05a, Kötterweg 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai	Juni
1	08:40		14:48 (WEA 1)	08:11		15:51 (WEA 2)	07:16			07:04		19:11 (WEA 5)	05:57	05:10
	16:22	24	15:12 (WEA 1)	17:11	26	16:17 (WEA 2)	18:05			20:00	23	19:34 (WEA 5)	20:53	21:41
2	08:39		14:48 (WEA 1)	08:10		15:51 (WEA 2)	07:14			07:02		19:10 (WEA 5)	05:55	05:10
	16:23	24	15:12 (WEA 1)	17:13	26	16:17 (WEA 2)	18:07			20:02	27	19:37 (WEA 5)	20:55	21:42
3	08:39		14:48 (WEA 1)	08:08		15:52 (WEA 2)	07:12			06:59		19:09 (WEA 5)	05:53	05:09
	16:24	24	15:12 (WEA 1)	17:15	26	16:18 (WEA 2)	18:08			20:04	27	19:36 (WEA 5)	20:57	21:43
4	08:39		14:49 (WEA 1)	08:06		15:52 (WEA 2)	07:10			06:57		19:09 (WEA 5)	05:51	05:08
	16:26	24	15:13 (WEA 1)	17:17	26	16:18 (WEA 2)	18:10			20:06	27	19:36 (WEA 5)	20:58	21:44
5	08:39		14:49 (WEA 1)	08:05		15:52 (WEA 2)	07:07			06:55		19:09 (WEA 5)	05:50	05:07
	16:27	23	15:12 (WEA 1)	17:19	25	16:17 (WEA 2)	18:12			20:08	27	19:36 (WEA 5)	21:00	21:45
6	08:38		14:50 (WEA 1)	08:03		15:53 (WEA 2)	07:05		17:40 (WEA 4)	06:52		19:08 (WEA 5)	05:48	05:07
	16:28	23	15:13 (WEA 1)	17:21	24	16:17 (WEA 2)	18:14	8	17:48 (WEA 4)	20:09	27	19:35 (WEA 5)	21:02	21:46
7	08:38		14:51 (WEA 1)	08:01		15:53 (WEA 2)	07:03		17:36 (WEA 4)	06:50		19:08 (WEA 5)	05:46	05:06
	16:29	22	15:13 (WEA 1)	17:23	23	16:16 (WEA 2)	18:16	13	17:49 (WEA 4)	20:11	27	19:35 (WEA 5)	21:03	21:47
8	08:37		14:52 (WEA 1)	07:59		15:54 (WEA 2)	07:00		17:34 (WEA 4)	06:48		19:09 (WEA 5)	05:44	05:05
	16:31	22	15:14 (WEA 1)	17:25	22	16:16 (WEA 2)	18:18	18	17:52 (WEA 4)	20:13	25	19:34 (WEA 5)	21:05	21:48
9	08:37		14:52 (WEA 1)	07:58		15:55 (WEA 2)	06:58		17:32 (WEA 4)	06:45		19:09 (WEA 5)	05:42	05:05
	16:32	22	15:14 (WEA 1)	17:27	20	16:15 (WEA 2)	18:19	22	17:54 (WEA 4)	20:15	24	19:33 (WEA 5)	21:07	21:49
10	08:36		14:53 (WEA 1)	07:56		15:57 (WEA 2)	06:56		17:30 (WEA 4)	06:43		19:10 (WEA 5)	05:40	05:04
	16:34	20	15:13 (WEA 1)	17:29	16	16:13 (WEA 2)	18:21	25	17:55 (WEA 4)	20:16	22	19:32 (WEA 5)	21:09	21:50
11	08:36		14:54 (WEA 1)	07:54		15:59 (WEA 2)	06:53		17:29 (WEA 4)	06:41		19:11 (WEA 5)	05:39	05:04
	16:35	19	15:13 (WEA 1)	17:31	12	16:11 (WEA 2)	18:23	28	17:57 (WEA 4)	20:18	19	19:30 (WEA 5)	21:10	21:50
12	08:35		14:55 (WEA 1)	07:52		16:02 (WEA 2)	06:51		17:28 (WEA 4)	06:38		19:13 (WEA 5)	05:37	05:04
	16:37	19	15:14 (WEA 1)	17:32	6	16:08 (WEA 2)	18:25	30	17:58 (WEA 4)	20:20	15	19:28 (WEA 5)	21:12	21:51
13	08:34		14:56 (WEA 1)	07:50			06:49		17:27 (WEA 4)	06:36		19:15 (WEA 5)	05:35	05:03
	16:38	17	15:13 (WEA 1)	17:34			18:27	32	17:59 (WEA 4)	20:22	9	19:24 (WEA 5)	21:13	21:52
14	08:34		14:58 (WEA 1)	07:48			06:46		17:27 (WEA 4)	06:34			05:34	05:03
	16:40	15	15:13 (WEA 1)	17:36			18:28	32	17:59 (WEA 4)	20:23			21:15	21:52
15	08:33		14:59 (WEA 1)	07:46			06:44		17:26 (WEA 4)	06:32			05:32	05:03
	16:41	13	15:12 (WEA 1)	17:38			18:30	32	17:58 (WEA 4)	20:25			21:17	21:53
16	08:32		15:00 (WEA 1)	07:44		16:58 (WEA 3)	06:42		17:26 (WEA 4)	06:29			05:30	05:03
	16:43	10	15:10 (WEA 1)	17:40	3	17:01 (WEA 3)	18:32	32	17:58 (WEA 4)	20:27			21:18	21:53
17	08:31		15:03 (WEA 1)	07:42		16:55 (WEA 3)	06:39		17:27 (WEA 4)	06:27			05:29	05:03
	16:44	5	15:08 (WEA 1)	17:42	10	17:05 (WEA 3)	18:34	31	17:58 (WEA 4)	20:29			21:20	21:54
18	08:30			07:40		16:53 (WEA 3)	06:37		17:26 (WEA 4)	06:25			05:27	05:03
	16:46			17:44	14	17:07 (WEA 3)	18:36	31	17:57 (WEA 4)	20:30			21:21	21:54
19	08:29			07:38		16:52 (WEA 3)	06:35		17:26 (WEA 4)	06:23			05:26	05:03
	16:48			17:46	16	17:08 (WEA 3)	18:37	31	17:57 (WEA 4)	20:32			21:23	21:55
20	08:28			07:36		16:50 (WEA 3)	06:32		17:26 (WEA 4)	06:20			05:24	05:03
	16:50			17:48	18	17:08 (WEA 3)	18:39	29	17:55 (WEA 4)	20:34			21:24	21:55
21	08:27			07:34		16:50 (WEA 3)	06:30		17:27 (WEA 4)	06:18			05:23	05:03
	16:51			17:50	18	17:08 (WEA 3)	18:41	28	17:55 (WEA 4)	20:36			21:26	21:55
22	08:25		15:58 (WEA 2)	07:32		16:50 (WEA 3)	06:28		17:28 (WEA 4)	06:16			05:22	05:03
	16:53	7	16:05 (WEA 2)	17:52	18	17:08 (WEA 3)	18:43	26	17:54 (WEA 4)	20:37			21:27	21:56
23	08:24		15:56 (WEA 2)	07:29		16:50 (WEA 3)	06:25		17:29 (WEA 4)	06:14			05:20	05:03
	16:55	12	16:08 (WEA 2)	17:53	18	17:08 (WEA 3)	18:45	22	17:51 (WEA 4)	20:39			21:29	21:56
24	08:23		15:55 (WEA 2)	07:27		16:51 (WEA 3)	06:23		17:31 (WEA 4)	06:12			05:19	05:04
	16:57	15	16:10 (WEA 2)	17:55	17	17:08 (WEA 3)	18:46	18	17:49 (WEA 4)	20:41			21:30	21:56
25	08:22		15:54 (WEA 2)	07:25		16:50 (WEA 3)	06:20		17:33 (WEA 4)	06:10			05:18	05:04
	16:58	18	16:12 (WEA 2)	17:57	17	17:07 (WEA 3)	18:48	13	17:46 (WEA 4)	20:43			21:32	21:56
26	08:20		15:53 (WEA 2)	07:23		16:52 (WEA 3)	06:18			06:08			05:17	05:04
	17:00	20	16:13 (WEA 2)	17:59	14	17:06 (WEA 3)	18:50			20:44			21:33	21:56
27	08:19		15:53 (WEA 2)	07:21		16:53 (WEA 3)	06:16		18:21 (WEA 5)	06:05			05:16	05:05
	17:02	21	16:14 (WEA 2)	18:01	12	17:05 (WEA 3)	18:52	5	18:26 (WEA 5)	20:46			21:34	21:56
28	08:17		15:52 (WEA 2)	07:19		16:55 (WEA 3)	06:13		18:17 (WEA 5)	06:03			05:14	05:05
	17:04	23	16:15 (WEA 2)	18:03	6	17:01 (WEA 3)	18:53	10	18:27 (WEA 5)	20:48			21:36	21:56
29	08:16		15:51 (WEA 2)				07:11		19:15 (WEA 5)	06:01			05:13	05:06
	17:06	24	16:15 (WEA 2)				19:55	14	19:29 (WEA 5)	20:50			21:37	21:55
30	08:14		15:52 (WEA 2)				07:09		19:14 (WEA 5)	05:59			05:12	05:06
	17:08	24	16:16 (WEA 2)				19:57	17	19:31 (WEA 5)	20:51			21:38	21:55
31	08:13		15:51 (WEA 2)				07:06		19:12 (WEA 5)				05:11	
	17:10	26	16:17 (WEA 2)				19:59	20	19:32 (WEA 5)				21:39	
Sonnenscheinstunden	255			276			367			418			489	503
astr.max.mögl.Beschattung		516			433			567			299			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-05a - SR-05a, Kötterweg 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember		
1	05:07	05:45			06:36		19:10 (WEA 5)	07:27		18:08 (WEA 4)	07:23		15:26 (WEA 2)	08:15		14:36 (WEA 1)
	21:55	21:22			20:18	19	19:29 (WEA 5)	19:07	30	18:38 (WEA 4)	16:59	17	15:43 (WEA 2)	16:17	19	14:55 (WEA 1)
2	05:08	05:46			06:38		19:09 (WEA 5)	07:29		18:07 (WEA 4)	07:25		15:25 (WEA 2)	08:17		14:36 (WEA 1)
	21:55	21:20			20:16	22	19:31 (WEA 5)	19:04	29	18:36 (WEA 4)	16:57	19	15:44 (WEA 2)	16:16	20	14:56 (WEA 1)
3	05:08	05:48			06:40		19:07 (WEA 5)	07:31		18:08 (WEA 4)	07:26		15:24 (WEA 2)	08:18		14:35 (WEA 1)
	21:54	21:18			20:13	24	19:31 (WEA 5)	19:02	26	18:34 (WEA 4)	16:55	21	15:45 (WEA 2)	16:16	22	14:57 (WEA 1)
4	05:09	05:50			06:41		19:06 (WEA 5)	07:32		18:09 (WEA 4)	07:28		15:23 (WEA 2)	08:20		14:36 (WEA 1)
	21:54	21:17			20:11	25	19:31 (WEA 5)	19:00	23	18:32 (WEA 4)	16:53	23	15:46 (WEA 2)	16:15	22	14:58 (WEA 1)
5	05:10	05:51			06:43		19:05 (WEA 5)	07:34		18:10 (WEA 4)	07:30		15:22 (WEA 2)	08:21		14:36 (WEA 1)
	21:53	21:15			20:09	26	19:31 (WEA 5)	18:57	20	18:30 (WEA 4)	16:51	25	15:47 (WEA 2)	16:14	22	14:58 (WEA 1)
6	05:11	05:53			06:45		19:04 (WEA 5)	07:36		18:12 (WEA 4)	07:32		15:22 (WEA 2)	08:22		14:36 (WEA 1)
	21:53	21:13			20:06	27	19:31 (WEA 5)	18:55	15	18:27 (WEA 4)	16:50	25	15:47 (WEA 2)	16:14	23	14:59 (WEA 1)
7	05:12	05:55			06:46		19:04 (WEA 5)	07:37		18:13 (WEA 4)	07:34		15:22 (WEA 2)	08:24		14:36 (WEA 1)
	21:52	21:11			20:04	28	19:32 (WEA 5)	18:53	11	18:24 (WEA 4)	16:48	25	15:47 (WEA 2)	16:13	23	14:59 (WEA 1)
8	05:13	05:56			06:48		19:03 (WEA 5)	07:39		18:18 (WEA 4)	07:36		15:22 (WEA 2)	08:25		14:37 (WEA 1)
	21:51	21:09			20:02	28	19:31 (WEA 5)	18:50	4	18:22 (WEA 4)	16:46	25	15:47 (WEA 2)	16:13	24	15:01 (WEA 1)
9	05:14	05:58			06:50		19:03 (WEA 5)	07:41			07:37		15:22 (WEA 2)	08:26		14:37 (WEA 1)
	21:51	21:07			19:59	27	19:30 (WEA 5)	18:48			16:44	26	15:48 (WEA 2)	16:13	24	15:01 (WEA 1)
10	05:15	05:59			06:52		19:03 (WEA 5)	07:43			07:39		15:22 (WEA 2)	08:27		14:37 (WEA 1)
	21:50	21:05			19:57	27	19:30 (WEA 5)	18:46			16:43	26	15:48 (WEA 2)	16:13	24	15:01 (WEA 1)
11	05:16	06:01			06:53		19:03 (WEA 5)	07:45			07:41		15:22 (WEA 2)	08:28		14:38 (WEA 1)
	21:49	21:03			19:54	24	19:27 (WEA 5)	18:43			16:41	25	15:47 (WEA 2)	16:12	24	15:02 (WEA 1)
12	05:17	06:03			06:55		19:04 (WEA 5)	07:46			07:43		15:23 (WEA 2)	08:29		14:38 (WEA 1)
	21:48	21:01			19:52	21	19:25 (WEA 5)	18:41			16:40	24	15:47 (WEA 2)	16:12	24	15:02 (WEA 1)
13	05:18	06:04			06:57		19:04 (WEA 5)	07:48			07:45		15:23 (WEA 2)	08:30		14:38 (WEA 1)
	21:47	20:59			19:50	18	19:22 (WEA 5)	18:39			16:38	24	15:47 (WEA 2)	16:12	24	15:02 (WEA 1)
14	05:19	06:06			06:58		19:05 (WEA 5)	07:50		17:27 (WEA 3)	07:47		15:24 (WEA 2)	08:31		14:39 (WEA 1)
	21:46	20:57			19:47	15	19:20 (WEA 5)	18:37	8	17:35 (WEA 3)	16:36	23	15:47 (WEA 2)	16:12	24	15:03 (WEA 1)
15	05:21	06:08			07:00		19:07 (WEA 5)	07:52		17:25 (WEA 3)	07:48		15:25 (WEA 2)	08:32		14:39 (WEA 1)
	21:45	20:55			19:45	11	19:18 (WEA 5)	18:34	12	17:37 (WEA 3)	16:35	21	15:46 (WEA 2)	16:12	25	15:04 (WEA 1)
16	05:22	06:09			07:02		19:09 (WEA 5)	07:53		17:23 (WEA 3)	07:50		15:26 (WEA 2)	08:33		14:40 (WEA 1)
	21:44	20:53			19:43	6	19:15 (WEA 5)	18:32	16	17:39 (WEA 3)	16:33	19	15:45 (WEA 2)	16:12	24	15:04 (WEA 1)
17	05:23	06:11			07:03			07:55		17:22 (WEA 3)	07:52		15:27 (WEA 2)	08:34		14:40 (WEA 1)
	21:43	20:51			19:40			18:30	17	17:39 (WEA 3)	16:32	18	15:45 (WEA 2)	16:12	25	15:05 (WEA 1)
18	05:24	06:13			07:05		18:22 (WEA 4)	07:57		17:22 (WEA 3)	07:54		15:29 (WEA 2)	08:35		14:41 (WEA 1)
	21:42	20:49			19:38	11	18:33 (WEA 4)	18:28	18	17:40 (WEA 3)	16:31	15	15:44 (WEA 2)	16:13	25	15:06 (WEA 1)
19	05:26	06:14			07:07		18:18 (WEA 4)	07:59		17:21 (WEA 3)	07:56		15:30 (WEA 2)	08:35		14:41 (WEA 1)
	21:41	20:47			19:35	17	18:35 (WEA 4)	18:26	19	17:40 (WEA 3)	16:29	12	15:42 (WEA 2)	16:13	24	15:05 (WEA 1)
20	05:27	06:16			07:08		18:16 (WEA 4)	08:01		17:20 (WEA 3)	07:57		15:33 (WEA 2)	08:36		14:42 (WEA 1)
	21:40	20:45			19:33	21	18:37 (WEA 4)	18:23	19	17:39 (WEA 3)	16:28	7	15:40 (WEA 2)	16:13	24	15:06 (WEA 1)
21	05:28	06:18			07:10		18:14 (WEA 4)	08:02		17:21 (WEA 3)	07:59			08:37		14:42 (WEA 1)
	21:38	20:43			19:31	25	18:39 (WEA 4)	18:21	17	17:38 (WEA 3)	16:27			16:14	24	15:06 (WEA 1)
22	05:30	06:20			07:12		18:12 (WEA 4)	08:04		17:21 (WEA 3)	08:01			08:37		14:43 (WEA 1)
	21:37	20:40			19:28	27	18:39 (WEA 4)	18:19	17	17:38 (WEA 3)	16:26			16:14	24	15:07 (WEA 1)
23	05:31	06:21			07:13		18:11 (WEA 4)	08:06		17:22 (WEA 3)	08:02			08:38		14:43 (WEA 1)
	21:36	20:38			19:26	29	18:40 (WEA 4)	18:17	15	17:37 (WEA 3)	16:24			16:15	24	15:07 (WEA 1)
24	05:33	06:23			07:15		18:10 (WEA 4)	08:08		17:23 (WEA 3)	08:04			08:38		14:44 (WEA 1)
	21:34	20:36			19:23	30	18:40 (WEA 4)	18:15	13	17:36 (WEA 3)	16:23			16:15	24	15:08 (WEA 1)
25	05:34	06:25			07:17		18:09 (WEA 4)	07:10		16:25 (WEA 3)	08:06		14:41 (WEA 1)	08:39		14:44 (WEA 1)
	21:33	20:34			19:21	31	18:40 (WEA 4)	17:13	9	16:34 (WEA 3)	16:22	5	14:46 (WEA 1)	16:16	24	15:08 (WEA 1)
26	05:36	06:26			07:19		18:08 (WEA 4)	07:12			08:07		14:39 (WEA 1)	08:39		14:44 (WEA 1)
	21:31	20:32			19:19	32	18:40 (WEA 4)	17:11			16:21	10	14:49 (WEA 1)	16:17	25	15:09 (WEA 1)
27	05:37	06:28			07:20		18:08 (WEA 4)	07:13			08:09		14:38 (WEA 1)	08:39		14:45 (WEA 1)
	21:30	20:29			19:16	32	18:40 (WEA 4)	17:09			16:20	13	14:51 (WEA 1)	16:17	24	15:09 (WEA 1)
28	05:39	06:30			07:22		18:08 (WEA 4)	07:15			08:11		14:37 (WEA 1)	08:39		14:45 (WEA 1)
	21:28	20:27			19:14	32	18:40 (WEA 4)	17:07			16:19	15	14:52 (WEA 1)	16:18	24	15:09 (WEA 1)
29	05:40	06:31			07:24		18:07 (WEA 4)	07:17			08:12		14:37 (WEA 1)	08:39		14:45 (WEA 1)
	21:27	20:25			19:12	32	18:39 (WEA 4)	17:05			16:18	17	14:54 (WEA 1)	16:19	25	15:10 (WEA 1)
30	05:42	06:33		19:16 (WEA 5)	07:25		18:07 (WEA 4)	07:19		15:31 (WEA 2)	08:14		14:37 (WEA 1)	08:40		14:46 (WEA 1)
	21:25	20:23	10	19:26 (WEA 5)	19:09	32	18:39 (WEA 4)	17:03	8	15:39 (WEA 2)	16:18	18	14:55 (WEA 1)	16:20	24	15:10 (WEA 1)
31	05:43	06:35		19:12 (WEA 5)				07:21		15:28 (WEA 2)				08:40		14:47 (WEA 1)
	21:23	20:20	15	19:27 (WEA 5)				17:01	13	15:41 (WEA 2)				16:21	24	15:11 (WEA 1)
Sonnenscheinstunden	506	456			381			330			263			240		
astr.max.mögl.Beschattung			25			699			359			498			732	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-06 - SR-06, Kötterweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai		Juni
1	08:40			08:11		15:41 (WEA 1)	07:16		17:21 (WEA 3)	07:04		18:52 (WEA 4)	05:57		05:10
	16:22			17:11	6	15:47 (WEA 1)	18:05	10	17:31 (WEA 3)	20:00	23	19:15 (WEA 4)	20:53		21:41
2	08:39			08:10			07:14		17:19 (WEA 3)	07:02		18:54 (WEA 4)	05:55		05:10
	16:23			17:13			18:07	14	17:33 (WEA 3)	20:02	20	19:14 (WEA 4)	20:55		21:42
3	08:39			08:08			07:12		17:18 (WEA 3)	06:59		18:55 (WEA 4)	05:53		05:09
	16:24			17:15			18:08	16	17:34 (WEA 3)	20:04	16	19:11 (WEA 4)	20:57		21:43
4	08:39			08:06			07:10		17:17 (WEA 3)	06:57		18:58 (WEA 4)	05:51		05:08
	16:26			17:17			18:10	17	17:34 (WEA 3)	20:06	12	19:40 (WEA 5)	20:58		21:44
5	08:39		15:32 (WEA 1)	08:05			07:07		17:17 (WEA 3)	06:55		19:35 (WEA 5)	05:50		05:07
	16:27	6	15:38 (WEA 1)	17:19			18:12	17	17:34 (WEA 3)	20:08	7	19:42 (WEA 5)	21:00		21:45
6	08:38		15:31 (WEA 1)	08:03			07:05		17:17 (WEA 3)	06:52		19:32 (WEA 5)	05:48		05:07
	16:28	9	15:40 (WEA 1)	17:21			18:14	17	17:34 (WEA 3)	20:09	11	19:43 (WEA 5)	21:02		21:46
7	08:38		15:30 (WEA 1)	08:01			07:03		17:16 (WEA 3)	06:50		19:31 (WEA 5)	05:46		05:06
	16:29	12	15:42 (WEA 1)	17:23			18:16	17	17:33 (WEA 3)	20:11	14	19:45 (WEA 5)	21:03		21:47
8	08:37		15:30 (WEA 1)	07:59		16:35 (WEA 2)	07:00		17:17 (WEA 3)	06:48		19:30 (WEA 5)	05:44		05:05
	16:31	14	15:44 (WEA 1)	17:25	8	16:43 (WEA 2)	18:18	15	17:32 (WEA 3)	20:13	17	19:47 (WEA 5)	21:05		21:48
9	08:37		15:29 (WEA 1)	07:58		16:32 (WEA 2)	06:58		17:18 (WEA 3)	06:45		19:28 (WEA 5)	05:42		05:05
	16:32	16	15:45 (WEA 1)	17:27	14	16:46 (WEA 2)	18:19	14	17:32 (WEA 3)	20:15	20	19:48 (WEA 5)	21:07		21:49
10	08:36		15:29 (WEA 1)	07:56		16:31 (WEA 2)	06:56		17:19 (WEA 3)	06:43		19:27 (WEA 5)	05:40		05:04
	16:34	16	15:45 (WEA 1)	17:29	17	16:48 (WEA 2)	18:21	10	17:29 (WEA 3)	20:16	22	19:49 (WEA 5)	21:08		21:50
11	08:36		15:28 (WEA 1)	07:54		16:30 (WEA 2)	06:53			06:41		19:27 (WEA 5)	05:39		05:04
	16:35	18	15:46 (WEA 1)	17:31	19	16:49 (WEA 2)	18:23			20:18	24	19:51 (WEA 5)	21:10		21:50
12	08:35		15:29 (WEA 1)	07:52		16:29 (WEA 2)	06:51			06:38		19:27 (WEA 5)	05:37		05:04
	16:37	19	15:48 (WEA 1)	17:32	21	16:50 (WEA 2)	18:25			20:20	25	19:52 (WEA 5)	21:12		21:51
13	08:34		15:29 (WEA 1)	07:50		16:28 (WEA 2)	06:49			06:36		19:26 (WEA 5)	05:35		05:03
	16:38	20	15:49 (WEA 1)	17:34	23	16:51 (WEA 2)	18:27			20:22	25	19:51 (WEA 5)	21:13		21:52
14	08:34		15:29 (WEA 1)	07:48		16:28 (WEA 2)	06:46			06:34		19:26 (WEA 5)	05:34		05:03
	16:40	21	15:50 (WEA 1)	17:36	23	16:51 (WEA 2)	18:28			20:23	25	19:51 (WEA 5)	21:15		21:52
15	08:33		15:29 (WEA 1)	07:46		16:27 (WEA 2)	06:44			06:32		19:27 (WEA 5)	05:32		05:03
	16:41	22	15:51 (WEA 1)	17:38	25	16:52 (WEA 2)	18:30			20:25	23	19:50 (WEA 5)	21:17		21:53
16	08:32		15:28 (WEA 1)	07:44		16:27 (WEA 2)	06:42			06:29		19:27 (WEA 5)	05:30		05:03
	16:43	22	15:50 (WEA 1)	17:40	25	16:52 (WEA 2)	18:32			20:27	22	19:49 (WEA 5)	21:18		21:53
17	08:31		15:28 (WEA 1)	07:42		16:27 (WEA 2)	06:39		18:05 (WEA 4)	06:27		19:28 (WEA 5)	05:29		05:03
	16:44	23	15:51 (WEA 1)	17:42	25	16:52 (WEA 2)	18:34	4	18:09 (WEA 4)	20:29	20	19:48 (WEA 5)	21:20		21:54
18	08:30		15:28 (WEA 1)	07:40		16:28 (WEA 2)	06:37		18:00 (WEA 4)	06:25		19:28 (WEA 5)	05:27		05:03
	16:46	24	15:52 (WEA 1)	17:44	24	16:52 (WEA 2)	18:36	10	18:10 (WEA 4)	20:30	18	19:46 (WEA 5)	21:21		21:54
19	08:29		15:29 (WEA 1)	07:38		16:28 (WEA 2)	06:35		17:58 (WEA 4)	06:23		19:30 (WEA 5)	05:26		05:03
	16:48	24	15:53 (WEA 1)	17:46	24	16:52 (WEA 2)	18:37	14	18:12 (WEA 4)	20:32	14	19:44 (WEA 5)	21:23		21:55
20	08:28		15:29 (WEA 1)	07:36		16:28 (WEA 2)	06:32		17:56 (WEA 4)	06:20		19:32 (WEA 5)	05:24		05:03
	16:50	24	15:53 (WEA 1)	17:48	23	16:51 (WEA 2)	18:39	17	18:13 (WEA 4)	20:34	10	19:42 (WEA 5)	21:24		21:55
21	08:27		15:29 (WEA 1)	07:34		16:29 (WEA 2)	06:30		17:55 (WEA 4)	06:18			05:23		05:03
	16:51	24	15:53 (WEA 1)	17:50	21	16:50 (WEA 2)	18:41	20	18:15 (WEA 4)	20:36			21:26		21:55
22	08:25		15:29 (WEA 1)	07:32		16:30 (WEA 2)	06:28		17:54 (WEA 4)	06:16			05:22		05:03
	16:53	25	15:54 (WEA 1)	17:52	19	16:49 (WEA 2)	18:43	23	18:17 (WEA 4)	20:37			21:27		21:56
23	08:24		15:30 (WEA 1)	07:29		16:31 (WEA 2)	06:25		17:52 (WEA 4)	06:14			05:20		05:03
	16:55	24	15:54 (WEA 1)	17:53	17	16:48 (WEA 2)	18:45	27	18:19 (WEA 4)	20:39			21:29		21:56
24	08:23		15:30 (WEA 1)	07:27		16:34 (WEA 2)	06:23		17:52 (WEA 4)	06:12			05:19		05:04
	16:57	24	15:54 (WEA 1)	17:55	12	16:46 (WEA 2)	18:46	29	18:21 (WEA 4)	20:41			21:30		21:56
25	08:22		15:31 (WEA 1)	07:25		16:37 (WEA 2)	06:20		17:51 (WEA 4)	06:10			05:18		05:04
	16:58	23	15:54 (WEA 1)	17:57	3	16:40 (WEA 2)	18:48	29	18:20 (WEA 4)	20:43			21:32		21:56
26	08:20		15:31 (WEA 1)	07:23			06:18		17:51 (WEA 4)	06:08			05:17		05:04
	17:00	23	15:54 (WEA 1)	17:59			18:50	29	18:20 (WEA 4)	20:44			21:33		21:56
27	08:19		15:33 (WEA 1)	07:21			06:16		17:51 (WEA 4)	06:05			05:15		05:05
	17:02	21	15:54 (WEA 1)	18:01			18:52	29	18:20 (WEA 4)	20:46			21:34		21:56
28	08:17		15:33 (WEA 1)	07:19		17:24 (WEA 3)	06:13		17:50 (WEA 4)	06:03			05:14		05:05
	17:04	20	15:53 (WEA 1)	18:03	4	17:28 (WEA 3)	18:53	29	18:19 (WEA 4)	20:48			21:36		21:56
29	08:16		15:34 (WEA 1)				07:11		18:51 (WEA 4)	06:01			05:13		05:06
	17:06	18	15:52 (WEA 1)				19:55	28	19:19 (WEA 4)	20:50			21:37		21:55
30	08:14		15:36 (WEA 1)				07:09		18:51 (WEA 4)	05:59			05:12		05:06
	17:08	16	15:52 (WEA 1)				19:57	27	19:18 (WEA 4)	20:51			21:38		21:55
31	08:13		15:38 (WEA 1)				07:06		18:51 (WEA 4)				05:11		
	17:10	12	15:50 (WEA 1)				19:59	25	19:16 (WEA 4)				21:39		
Sonnenscheinstunden	255			276			367			418			489		503
astr.max.mögl.Beschattung		520			353			487			368				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-06 - SR-06, Kötterweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember		
1	05:07	05:45			06:36		19:26 (WEA 5)	07:27			07:23		16:01 (WEA 2)	08:15		15:10 (WEA 1)
	21:55	21:22			20:18	24	19:50 (WEA 5)	19:07			16:59	16	16:17 (WEA 2)	16:17	18	15:28 (WEA 1)
2	05:08	05:46			06:38		19:26 (WEA 5)	07:29			07:24		16:02 (WEA 2)	08:17		15:12 (WEA 1)
	21:55	21:20			20:16	22	19:48 (WEA 5)	19:04			16:57	13	16:15 (WEA 2)	16:16	17	15:29 (WEA 1)
3	05:08	05:48			06:40		19:26 (WEA 5)	07:31		17:58 (WEA 3)	07:26		16:06 (WEA 2)	08:18		15:12 (WEA 1)
	21:54	21:18			20:13	20	19:46 (WEA 5)	19:02	8	18:06 (WEA 3)	16:55	6	16:12 (WEA 2)	16:16	16	15:28 (WEA 1)
4	05:09	05:50			06:41		19:27 (WEA 5)	07:32		17:56 (WEA 3)	07:28			08:20		15:14 (WEA 1)
	21:54	21:17			20:11	17	19:44 (WEA 5)	19:00	12	18:08 (WEA 3)	16:53			16:15	14	15:28 (WEA 1)
5	05:10	05:51			06:43		19:27 (WEA 5)	07:34		17:55 (WEA 3)	07:30			08:21		15:15 (WEA 1)
	21:53	21:15			20:09	14	19:41 (WEA 5)	18:57	14	18:09 (WEA 3)	16:51			16:14	12	15:27 (WEA 1)
6	05:11	05:53			06:45		19:28 (WEA 5)	07:36		17:54 (WEA 3)	07:32			08:22		15:17 (WEA 1)
	21:53	21:13			20:06	11	19:39 (WEA 5)	18:55	16	18:10 (WEA 3)	16:50			16:14	10	15:27 (WEA 1)
7	05:12	05:54			06:46		19:30 (WEA 5)	07:37		17:52 (WEA 3)	07:34			08:23		15:18 (WEA 1)
	21:52	21:11			20:04	7	19:37 (WEA 5)	18:53	17	18:09 (WEA 3)	16:48			16:13	7	15:25 (WEA 1)
8	05:13	05:56			06:48		18:53 (WEA 4)	07:39		17:52 (WEA 3)	07:36			08:25		15:22 (WEA 1)
	21:51	21:09			20:02	11	19:34 (WEA 5)	18:50	17	18:09 (WEA 3)	16:46			16:13	2	15:24 (WEA 1)
9	05:14	05:58			06:50		18:49 (WEA 4)	07:41		17:52 (WEA 3)	07:37			08:26		
	21:51	21:07			19:59	16	19:05 (WEA 4)	18:48	17	18:09 (WEA 3)	16:44			16:13		
10	05:15	05:59			06:52		18:47 (WEA 4)	07:43		17:52 (WEA 3)	07:39		15:11 (WEA 1)	08:27		
	21:50	21:05			19:57	20	19:07 (WEA 4)	18:46	16	18:08 (WEA 3)	16:43	7	15:18 (WEA 1)	16:13		
11	05:16	06:01			06:53		18:45 (WEA 4)	07:44		17:53 (WEA 3)	07:41		15:09 (WEA 1)	08:28		
	21:49	21:03			19:54	22	19:07 (WEA 4)	18:43	15	18:08 (WEA 3)	16:41	12	15:21 (WEA 1)	16:12		
12	05:17	06:03			06:55		18:44 (WEA 4)	07:46		17:53 (WEA 3)	07:43		15:07 (WEA 1)	08:29		
	21:48	21:01			19:52	24	19:08 (WEA 4)	18:41	12	18:05 (WEA 3)	16:40	16	15:23 (WEA 1)	16:12		
13	05:18	06:04			06:57		18:42 (WEA 4)	07:48		17:55 (WEA 3)	07:45		15:06 (WEA 1)	08:30		
	21:47	20:59			19:50	26	19:08 (WEA 4)	18:39	8	18:03 (WEA 3)	16:38	18	15:24 (WEA 1)	16:12		
14	05:19	06:06			06:58		18:41 (WEA 4)	07:50			07:47		15:05 (WEA 1)	08:31		
	21:46	20:57			19:47	28	19:09 (WEA 4)	18:37			16:36	20	15:25 (WEA 1)	16:12		
15	05:21	06:08			07:00		18:41 (WEA 4)	07:52			07:48		15:05 (WEA 1)	08:32		
	21:45	20:55			19:45	28	19:09 (WEA 4)	18:34			16:35	21	15:26 (WEA 1)	16:12		
16	05:22	06:09			07:02		18:39 (WEA 4)	07:53			07:50		15:04 (WEA 1)	08:33		
	21:44	20:53			19:43	30	19:09 (WEA 4)	18:32			16:33	23	15:27 (WEA 1)	16:12		
17	05:23	06:11			07:03		18:39 (WEA 4)	07:55		17:07 (WEA 2)	07:52		15:04 (WEA 1)	08:34		
	21:43	20:51			19:40	30	19:09 (WEA 4)	18:30	8	17:15 (WEA 2)	16:32	23	15:27 (WEA 1)	16:12		
18	05:24	06:13			07:05		18:39 (WEA 4)	07:57		17:04 (WEA 2)	07:54		15:04 (WEA 1)	08:35		
	21:42	20:49			19:38	29	19:08 (WEA 4)	18:28	14	17:18 (WEA 2)	16:31	24	15:28 (WEA 1)	16:13		
19	05:26	06:14			07:07		18:38 (WEA 4)	07:59		17:02 (WEA 2)	07:56		15:04 (WEA 1)	08:35		
	21:41	20:47			19:35	29	19:07 (WEA 4)	18:26	18	17:20 (WEA 2)	16:29	24	15:28 (WEA 1)	16:13		
20	05:27	06:16			07:08		18:39 (WEA 4)	08:01		17:00 (WEA 2)	07:57		15:04 (WEA 1)	08:36		
	21:40	20:45			19:33	27	19:06 (WEA 4)	18:23	20	17:20 (WEA 2)	16:28	25	15:29 (WEA 1)	16:13		
21	05:28	06:18			07:10		18:39 (WEA 4)	08:02		16:59 (WEA 2)	07:59		15:05 (WEA 1)	08:37		
	21:38	20:43			19:31	24	19:03 (WEA 4)	18:21	22	17:21 (WEA 2)	16:27	24	15:29 (WEA 1)	16:14		
22	05:30	06:20			07:12		18:39 (WEA 4)	08:04		16:58 (WEA 2)	08:01		15:05 (WEA 1)	08:37		
	21:37	20:40			19:28	21	19:00 (WEA 4)	18:19	23	17:21 (WEA 2)	16:26	24	15:29 (WEA 1)	16:14		
23	05:31	06:21		19:37 (WEA 5)	07:13		18:40 (WEA 4)	08:06		16:57 (WEA 2)	08:02		15:06 (WEA 1)	08:38		
	21:36	20:38	10	19:47 (WEA 5)	19:26	18	18:58 (WEA 4)	18:17	24	17:21 (WEA 2)	16:24	24	15:30 (WEA 1)	16:15		
24	05:33	06:23		19:33 (WEA 5)	07:15		18:41 (WEA 4)	08:08		16:57 (WEA 2)	08:04		15:05 (WEA 1)	08:38		
	21:34	20:36	15	19:48 (WEA 5)	19:23	15	18:56 (WEA 4)	18:15	25	17:22 (WEA 2)	16:23	24	15:29 (WEA 1)	16:15		
25	05:34	06:25		19:32 (WEA 5)	07:17		18:42 (WEA 4)	07:10		15:57 (WEA 2)	08:06		15:06 (WEA 1)	08:38		
	21:33	20:34	18	19:50 (WEA 5)	19:21	11	18:53 (WEA 4)	17:13	25	16:22 (WEA 2)	16:22	23	15:29 (WEA 1)	16:16		
26	05:36	06:26		19:30 (WEA 5)	07:19		18:45 (WEA 4)	07:12		15:57 (WEA 2)	08:07		15:07 (WEA 1)	08:39		
	21:31	20:32	20	19:50 (WEA 5)	19:19	6	18:51 (WEA 4)	17:11	25	16:22 (WEA 2)	16:21	23	15:30 (WEA 1)	16:17		
27	05:37	06:28		19:29 (WEA 5)	07:20			07:13		15:57 (WEA 2)	08:09		15:08 (WEA 1)	08:39		
	21:30	20:29	22	19:51 (WEA 5)	19:16			17:09	24	16:21 (WEA 2)	16:20	22	15:30 (WEA 1)	16:17		
28	05:39	06:30		19:28 (WEA 5)	07:22			07:15		15:57 (WEA 2)	08:11		15:08 (WEA 1)	08:39		
	21:28	20:27	24	19:52 (WEA 5)	19:14			17:07	24	16:21 (WEA 2)	16:19	21	15:29 (WEA 1)	16:18		
29	05:40	06:31		19:27 (WEA 5)	07:24			07:17		15:58 (WEA 2)	08:12		15:09 (WEA 1)	08:39		
	21:27	20:25	25	19:52 (WEA 5)	19:11			17:05	22	16:20 (WEA 2)	16:18	20	15:29 (WEA 1)	16:19		
30	05:42	06:33		19:27 (WEA 5)	07:25			07:19		15:58 (WEA 2)	08:14		15:10 (WEA 1)	08:39		
	21:25	20:23	25	19:52 (WEA 5)	19:09			17:03	21	16:19 (WEA 2)	16:18	19	15:29 (WEA 1)	16:20		
31	05:43	06:35		19:26 (WEA 5)				07:21		15:59 (WEA 2)				08:40		
	21:23	20:20	25	19:51 (WEA 5)				17:01	19	16:18 (WEA 2)				16:21		
Sonnenscheinstunden	506	456			381			330			263			240		
astr.max.mögl.Beschattung			184			530			466			472			96	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-06a - SR-06a, Kötterweg 1a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai	Juni
1	08:39			08:11		15:41 (WEA 1)	07:16			07:04		18:55 (WEA 4)	05:57	05:10
	16:22			17:11	17	15:58 (WEA 1)	18:05			20:00	25	19:20 (WEA 4)	20:53	21:41
2	08:39			08:10		15:43 (WEA 1)	07:14		17:27 (WEA 3)	07:02		18:56 (WEA 4)	05:55	05:10
	16:23			17:13	13	15:56 (WEA 1)	18:07	6	17:33 (WEA 3)	20:02	23	19:19 (WEA 4)	20:55	21:42
3	08:39			08:08		15:46 (WEA 1)	07:12		17:24 (WEA 3)	06:59		18:56 (WEA 4)	05:53	05:09
	16:24			17:15	9	15:55 (WEA 1)	18:08	12	17:36 (WEA 3)	20:04	20	19:16 (WEA 4)	20:57	21:43
4	08:39			08:06			07:10		17:22 (WEA 3)	06:57		18:58 (WEA 4)	05:51	05:08
	16:26			17:17			18:10	14	17:36 (WEA 3)	20:06	16	19:14 (WEA 4)	20:58	21:44
5	08:39			08:05			07:07		17:22 (WEA 3)	06:55		19:01 (WEA 4)	05:50	05:07
	16:27			17:19			18:12	15	17:37 (WEA 3)	20:08	13	19:42 (WEA 5)	21:00	21:45
6	08:38			08:03			07:05		17:21 (WEA 3)	06:52		19:36 (WEA 5)	05:48	05:07
	16:28			17:21			18:14	17	17:38 (WEA 3)	20:09	7	19:43 (WEA 5)	21:02	21:46
7	08:38			08:01			07:03		17:20 (WEA 3)	06:50		19:34 (WEA 5)	05:46	05:06
	16:29			17:23			18:16	17	17:37 (WEA 3)	20:11	11	19:45 (WEA 5)	21:03	21:47
8	08:37			07:59			07:00		17:20 (WEA 3)	06:48		19:33 (WEA 5)	05:44	05:05
	16:31			17:25			18:18	17	17:37 (WEA 3)	20:13	14	19:47 (WEA 5)	21:05	21:48
9	08:37			07:58			06:58		17:21 (WEA 3)	06:45		19:31 (WEA 5)	05:42	05:05
	16:32			17:27			18:19	16	17:37 (WEA 3)	20:15	17	19:48 (WEA 5)	21:07	21:49
10	08:36		15:41 (WEA 1)	07:56		16:44 (WEA 2)	06:56		17:21 (WEA 3)	06:43		19:30 (WEA 5)	05:40	05:04
	16:34	4	15:45 (WEA 1)	17:29	1	16:45 (WEA 2)	18:21	14	17:35 (WEA 3)	20:16	19	19:49 (WEA 5)	21:08	21:50
11	08:36		15:39 (WEA 1)	07:54		16:39 (WEA 2)	06:53		17:22 (WEA 3)	06:41		19:30 (WEA 5)	05:39	05:04
	16:35	9	15:48 (WEA 1)	17:31	11	16:50 (WEA 2)	18:23	12	17:34 (WEA 3)	20:18	21	19:51 (WEA 5)	21:10	21:50
12	08:35		15:38 (WEA 1)	07:52		16:37 (WEA 2)	06:51		17:24 (WEA 3)	06:38		19:29 (WEA 5)	05:37	05:04
	16:37	12	15:50 (WEA 1)	17:32	15	16:52 (WEA 2)	18:25	7	17:31 (WEA 3)	20:20	24	19:53 (WEA 5)	21:12	21:51
13	08:34		15:38 (WEA 1)	07:50		16:36 (WEA 2)	06:49			06:36		19:28 (WEA 5)	05:35	05:03
	16:38	14	15:52 (WEA 1)	17:34	18	16:54 (WEA 2)	18:27			20:22	25	19:53 (WEA 5)	21:13	21:52
14	08:34		15:37 (WEA 1)	07:48		16:35 (WEA 2)	06:46			06:34		19:28 (WEA 5)	05:34	05:03
	16:40	16	15:53 (WEA 1)	17:36	20	16:55 (WEA 2)	18:28			20:23	25	19:53 (WEA 5)	21:15	21:52
15	08:33		15:37 (WEA 1)	07:46		16:34 (WEA 2)	06:44			06:32		19:29 (WEA 5)	05:32	05:03
	16:41	17	15:54 (WEA 1)	17:38	22	16:56 (WEA 2)	18:30			20:25	23	19:52 (WEA 5)	21:17	21:53
16	08:32		15:35 (WEA 1)	07:44		16:33 (WEA 2)	06:42			06:29		19:29 (WEA 5)	05:30	05:03
	16:43	19	15:54 (WEA 1)	17:40	24	16:57 (WEA 2)	18:32			20:27	23	19:52 (WEA 5)	21:18	21:53
17	08:31		15:35 (WEA 1)	07:42		16:33 (WEA 2)	06:39			06:27		19:30 (WEA 5)	05:29	05:03
	16:44	21	15:56 (WEA 1)	17:42	24	16:57 (WEA 2)	18:34			20:29	21	19:51 (WEA 5)	21:20	21:54
18	08:30		15:35 (WEA 1)	07:40		16:33 (WEA 2)	06:37			06:25		19:30 (WEA 5)	05:27	05:03
	16:46	22	15:57 (WEA 1)	17:44	24	16:57 (WEA 2)	18:36			20:30	19	19:49 (WEA 5)	21:21	21:54
19	08:29		15:35 (WEA 1)	07:38		16:33 (WEA 2)	06:35		18:05 (WEA 4)	06:23		19:31 (WEA 5)	05:26	05:03
	16:48	23	15:58 (WEA 1)	17:46	25	16:58 (WEA 2)	18:37	7	18:12 (WEA 4)	20:32	17	19:48 (WEA 5)	21:23	21:55
20	08:28		15:36 (WEA 1)	07:36		16:32 (WEA 2)	06:32		18:02 (WEA 4)	06:20		19:33 (WEA 5)	05:24	05:03
	16:50	23	15:59 (WEA 1)	17:48	25	16:57 (WEA 2)	18:39	11	18:13 (WEA 4)	20:34	13	19:46 (WEA 5)	21:24	21:55
21	08:27		15:35 (WEA 1)	07:34		16:33 (WEA 2)	06:30		18:00 (WEA 4)	06:18		19:35 (WEA 5)	05:23	05:03
	16:51	23	15:58 (WEA 1)	17:50	23	16:56 (WEA 2)	18:41	15	18:15 (WEA 4)	20:36	8	19:43 (WEA 5)	21:26	21:55
22	08:25		15:35 (WEA 1)	07:32		16:33 (WEA 2)	06:28		17:59 (WEA 4)	06:16			05:22	05:03
	16:53	24	15:59 (WEA 1)	17:52	23	16:56 (WEA 2)	18:43	18	18:17 (WEA 4)	20:37			21:27	21:56
23	08:24		15:36 (WEA 1)	07:29		16:34 (WEA 2)	06:25		17:57 (WEA 4)	06:14			05:20	05:03
	16:55	24	16:00 (WEA 1)	17:53	21	16:55 (WEA 2)	18:45	22	18:19 (WEA 4)	20:39			21:29	21:56
24	08:23		15:36 (WEA 1)	07:27		16:35 (WEA 2)	06:23		17:56 (WEA 4)	06:12			05:19	05:04
	16:57	24	16:00 (WEA 1)	17:55	20	16:55 (WEA 2)	18:46	25	18:21 (WEA 4)	20:41			21:30	21:56
25	08:22		15:37 (WEA 1)	07:25		16:36 (WEA 2)	06:20		17:55 (WEA 4)	06:10			05:18	05:04
	16:58	24	16:01 (WEA 1)	17:57	16	16:52 (WEA 2)	18:48	27	18:22 (WEA 4)	20:43			21:32	21:56
26	08:20		15:36 (WEA 1)	07:23		16:38 (WEA 2)	06:18		17:54 (WEA 4)	06:08			05:17	05:04
	17:00	24	16:00 (WEA 1)	17:59	12	16:50 (WEA 2)	18:50	29	18:23 (WEA 4)	20:44			21:33	21:56
27	08:19		15:37 (WEA 1)	07:21		16:44 (WEA 2)	06:16		17:54 (WEA 4)	06:05			05:15	05:05
	17:02	24	16:01 (WEA 1)	18:01	1	16:45 (WEA 2)	18:52	29	18:23 (WEA 4)	20:46			21:34	21:56
28	08:17		15:38 (WEA 1)	07:19			06:13		17:53 (WEA 4)	06:03			05:14	05:05
	17:04	22	16:00 (WEA 1)	18:03			18:53	29	18:22 (WEA 4)	20:48			21:36	21:56
29	08:16		15:38 (WEA 1)				07:11		18:54 (WEA 4)	06:01			05:13	05:06
	17:06	22	16:00 (WEA 1)				19:55	28	19:22 (WEA 4)	20:50			21:37	21:55
30	08:14		15:40 (WEA 1)				07:09		18:54 (WEA 4)	05:59			05:12	05:06
	17:08	20	16:00 (WEA 1)				19:57	28	19:22 (WEA 4)	20:51			21:38	21:55
31	08:13		15:40 (WEA 1)				07:06		18:54 (WEA 4)				05:11	
	17:10	19	15:59 (WEA 1)				19:59	26	19:20 (WEA 4)				21:39	
Sonnenscheinstunden	255			276			367			418			489	503
astr.max.mögl.Beschattung		430			364			441			384			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-06a - SR-06a, Kötterweg 1a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember		
1	05:07	05:45			06:36		19:29 (WEA 5)	07:27		18:06 (WEA 3)	07:23			08:15		15:21 (WEA 1)
	21:55	21:22			20:18	21	19:50 (WEA 5)	19:07	2	18:08 (WEA 3)	16:59			16:17	9	15:30 (WEA 1)
2	05:08	05:46			06:38		19:29 (WEA 5)	07:29		18:01 (WEA 3)	07:24			08:17		15:23 (WEA 1)
	21:55	21:20			20:16	19	19:48 (WEA 5)	19:04	10	18:11 (WEA 3)	16:57			16:16	6	15:29 (WEA 1)
3	05:08	05:48			06:40		19:29 (WEA 5)	07:31		17:59 (WEA 3)	07:26			08:18		
	21:54	21:18			20:13	17	19:46 (WEA 5)	19:02	14	18:13 (WEA 3)	16:55			16:16		
4	05:09	05:50			06:41		19:30 (WEA 5)	07:32		17:58 (WEA 3)	07:28			08:20		
	21:54	21:17			20:11	14	19:44 (WEA 5)	19:00	15	18:13 (WEA 3)	16:53			16:15		
5	05:10	05:51			06:43		19:30 (WEA 5)	07:34		17:58 (WEA 3)	07:30			08:21		
	21:53	21:15			20:09	11	19:41 (WEA 5)	18:57	16	18:14 (WEA 3)	16:51			16:14		
6	05:11	05:53			06:45		19:32 (WEA 5)	07:36		17:57 (WEA 3)	07:32			08:22		
	21:53	21:13			20:06	7	19:39 (WEA 5)	18:55	17	18:14 (WEA 3)	16:50			16:14		
7	05:12	05:54			06:46		18:56 (WEA 4)	07:37		17:56 (WEA 3)	07:34			08:23		
	21:52	21:11			20:04	13	19:37 (WEA 5)	18:53	17	18:13 (WEA 3)	16:48			16:13		
8	05:13	05:56			06:48		18:52 (WEA 4)	07:39		17:56 (WEA 3)	07:36		15:16 (WEA 1)	08:25		
	21:51	21:09			20:02	16	19:08 (WEA 4)	18:50	17	18:13 (WEA 3)	16:46	9	15:25 (WEA 1)	16:13		
9	05:14	05:58			06:50		18:50 (WEA 4)	07:41		17:57 (WEA 3)	07:37		15:13 (WEA 1)	08:26		
	21:51	21:07			19:59	20	19:10 (WEA 4)	18:48	15	18:12 (WEA 3)	16:44	14	15:27 (WEA 1)	16:13		
10	05:15	05:59			06:52		18:49 (WEA 4)	07:43		17:58 (WEA 3)	07:39		15:12 (WEA 1)	08:27		
	21:50	21:05			19:57	23	19:12 (WEA 4)	18:46	13	18:11 (WEA 3)	16:43	17	15:29 (WEA 1)	16:13		
11	05:16	06:01			06:53		18:47 (WEA 4)	07:44		17:59 (WEA 3)	07:41		15:11 (WEA 1)	08:28		
	21:49	21:03			19:54	25	19:12 (WEA 4)	18:43	10	18:09 (WEA 3)	16:41	19	15:30 (WEA 1)	16:12		
12	05:17	06:03			06:55		18:46 (WEA 4)	07:46			07:43		15:10 (WEA 1)	08:29		
	21:48	21:01			19:52	26	19:12 (WEA 4)	18:41			16:39	21	15:31 (WEA 1)	16:12		
13	05:18	06:04			06:57		18:45 (WEA 4)	07:48			07:45		15:10 (WEA 1)	08:30		
	21:47	20:59			19:50	27	19:12 (WEA 4)	18:39			16:38	22	15:32 (WEA 1)	16:12		
14	05:19	06:06			06:58		18:44 (WEA 4)	07:50			07:47		15:10 (WEA 1)	08:31		
	21:46	20:57			19:47	28	19:12 (WEA 4)	18:37			16:36	22	15:32 (WEA 1)	16:12		
15	05:21	06:08			07:00		18:44 (WEA 4)	07:52		17:13 (WEA 2)	07:48		15:09 (WEA 1)	08:32		
	21:45	20:55			19:45	29	19:13 (WEA 4)	18:34	7	17:20 (WEA 2)	16:35	24	15:33 (WEA 1)	16:12		
16	05:22	06:09			07:02		18:43 (WEA 4)	07:53		17:10 (WEA 2)	07:50		15:09 (WEA 1)	08:33		
	21:44	20:53			19:43	29	19:12 (WEA 4)	18:32	13	17:23 (WEA 2)	16:33	24	15:33 (WEA 1)	16:12		
17	05:23	06:11			07:03		18:43 (WEA 4)	07:55		17:08 (WEA 2)	07:52		15:09 (WEA 1)	08:34		
	21:43	20:51			19:40	28	19:11 (WEA 4)	18:30	17	17:25 (WEA 2)	16:32	25	15:34 (WEA 1)	16:12		
18	05:24	06:13			07:05		18:43 (WEA 4)	07:57		17:06 (WEA 2)	07:54		15:10 (WEA 1)	08:35		
	21:42	20:49			19:38	28	19:11 (WEA 4)	18:28	20	17:26 (WEA 2)	16:31	24	15:34 (WEA 1)	16:13		
19	05:26	06:14			07:07		18:42 (WEA 4)	07:59		17:05 (WEA 2)	07:56		15:10 (WEA 1)	08:35		
	21:41	20:47			19:35	26	19:08 (WEA 4)	18:26	22	17:27 (WEA 2)	16:29	24	15:34 (WEA 1)	16:13		
20	05:27	06:16			07:08		18:43 (WEA 4)	08:01		17:03 (WEA 2)	07:57		15:10 (WEA 1)	08:36		
	21:40	20:45			19:33	23	19:06 (WEA 4)	18:23	24	17:27 (WEA 2)	16:28	24	15:34 (WEA 1)	16:13		
21	05:28	06:18			07:10		18:44 (WEA 4)	08:02		17:03 (WEA 2)	07:59		15:11 (WEA 1)	08:37		
	21:38	20:43			19:31	19	19:03 (WEA 4)	18:21	24	17:27 (WEA 2)	16:27	23	15:34 (WEA 1)	16:14		
22	05:30	06:20		19:40 (WEA 5)	07:12		18:44 (WEA 4)	08:04		17:03 (WEA 2)	08:01		15:12 (WEA 1)	08:37		
	21:37	20:40	8	19:48 (WEA 5)	19:28	16	19:00 (WEA 4)	18:19	24	17:27 (WEA 2)	16:26	23	15:35 (WEA 1)	16:14		
23	05:31	06:21		19:37 (WEA 5)	07:13		18:46 (WEA 4)	08:06		17:02 (WEA 2)	08:02		15:12 (WEA 1)	08:38		
	21:36	20:38	14	19:51 (WEA 5)	19:26	12	18:58 (WEA 4)	18:17	25	17:27 (WEA 2)	16:24	23	15:35 (WEA 1)	16:15		
24	05:33	06:23		19:34 (WEA 5)	07:15		18:48 (WEA 4)	08:08		17:02 (WEA 2)	08:04		15:12 (WEA 1)	08:38		
	21:34	20:36	18	19:52 (WEA 5)	19:23	8	18:56 (WEA 4)	18:15	25	17:27 (WEA 2)	16:23	22	15:34 (WEA 1)	16:15		
25	05:34	06:25		19:33 (WEA 5)	07:17		18:52 (WEA 4)	07:10		16:03 (WEA 2)	08:06		15:13 (WEA 1)	08:38		
	21:33	20:34	20	19:53 (WEA 5)	19:21	1	18:53 (WEA 4)	17:13	24	16:27 (WEA 2)	16:22	21	15:34 (WEA 1)	16:16		
26	05:36	06:26		19:31 (WEA 5)	07:19			07:12		16:03 (WEA 2)	08:07		15:14 (WEA 1)	08:39		
	21:31	20:32	22	19:53 (WEA 5)	19:19			17:11	23	16:26 (WEA 2)	16:21	20	15:34 (WEA 1)	16:17		
27	05:37	06:28		19:31 (WEA 5)	07:20			07:13		16:04 (WEA 2)	08:09		15:16 (WEA 1)	08:39		
	21:30	20:29	23	19:54 (WEA 5)	19:16			17:09	21	16:25 (WEA 2)	16:20	17	15:33 (WEA 1)	16:17		
28	05:39	06:30		19:30 (WEA 5)	07:22			07:15		16:04 (WEA 2)	08:11		15:16 (WEA 1)	08:39		
	21:28	20:27	24	19:54 (WEA 5)	19:14			17:07	20	16:24 (WEA 2)	16:19	16	15:32 (WEA 1)	16:18		
29	05:40	06:31		19:29 (WEA 5)	07:24			07:17		16:05 (WEA 2)	08:12		15:18 (WEA 1)	08:39		
	21:27	20:25	25	19:54 (WEA 5)	19:11			17:05	18	16:23 (WEA 2)	16:18	14	15:32 (WEA 1)	16:19		
30	05:42	06:33		19:29 (WEA 5)	07:25			07:19		16:07 (WEA 2)	08:14		15:19 (WEA 1)	08:39		
	21:25	20:23	25	19:54 (WEA 5)	19:09			17:03	15	16:22 (WEA 2)	16:18	13	15:32 (WEA 1)	16:20		
31	05:43	06:35		19:28 (WEA 5)				07:21		16:09 (WEA 2)				08:40		
	21:23	20:20	24	19:52 (WEA 5)				17:01	10	16:19 (WEA 2)				16:21		
Sonnenscheinstunden	506	456			381			330			263			240		
astr.max.mögl.Beschattung			203			486			478			461			15	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-07 - SR-07, Hagen-Ring-Straße 46, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar			März			April			Mai			Juni
1	08:39	08:11			07:16		17:15 (WEA 2)	07:04		19:32 (WEA 4)	05:57		19:56 (WEA 5)	05:10
	16:22	17:11			18:05	14	17:29 (WEA 2)	20:00	2	19:34 (WEA 4)	20:53	8	20:04 (WEA 5)	21:41
2	08:39	08:10			07:14		17:14 (WEA 2)	07:02		19:29 (WEA 4)	05:55			05:10
	16:23	17:13			18:07	17	17:31 (WEA 2)	20:02	7	19:36 (WEA 4)	20:55			21:42
3	08:39	08:08		16:26 (WEA 1)	07:12		17:13 (WEA 2)	06:59		19:26 (WEA 4)	05:53			05:09
	16:24	17:15	8	16:34 (WEA 1)	18:08	19	17:32 (WEA 2)	20:04	12	19:38 (WEA 4)	20:57			21:43
4	08:39	08:06		16:23 (WEA 1)	07:10		17:11 (WEA 2)	06:57		19:25 (WEA 4)	05:51			05:08
	16:26	17:17	13	16:36 (WEA 1)	18:10	21	17:32 (WEA 2)	20:06	15	19:40 (WEA 4)	20:58			21:44
5	08:39	08:05		16:22 (WEA 1)	07:07		17:10 (WEA 2)	06:55		19:24 (WEA 4)	05:50			05:07
	16:27	17:19	16	16:38 (WEA 1)	18:12	23	17:33 (WEA 2)	20:08	18	19:42 (WEA 4)	21:00			21:45
6	08:38	08:03		16:20 (WEA 1)	07:05		17:10 (WEA 2)	06:52		19:22 (WEA 4)	05:48			05:07
	16:28	17:21	19	16:39 (WEA 1)	18:14	24	17:34 (WEA 2)	20:09	21	19:43 (WEA 4)	21:02			21:46
7	08:38	08:01		16:19 (WEA 1)	07:03		17:09 (WEA 2)	06:50		19:22 (WEA 4)	05:46			05:06
	16:29	17:23	21	16:40 (WEA 1)	18:16	24	17:33 (WEA 2)	20:11	23	19:45 (WEA 4)	21:03			21:47
8	08:37	07:59		16:19 (WEA 1)	07:00		17:09 (WEA 2)	06:48		19:22 (WEA 4)	05:44			05:05
	16:31	17:25	22	16:41 (WEA 1)	18:18	24	17:33 (WEA 2)	20:13	25	19:47 (WEA 4)	21:05			21:48
9	08:37	07:58		16:18 (WEA 1)	06:58		17:10 (WEA 2)	06:45		19:20 (WEA 4)	05:42			05:05
	16:32	17:27	23	16:41 (WEA 1)	18:19	23	17:33 (WEA 2)	20:15	27	19:47 (WEA 4)	21:07			21:49
10	08:36	07:56		16:18 (WEA 1)	06:56		17:09 (WEA 2)	06:43		19:20 (WEA 4)	05:40			05:04
	16:34	17:29	24	16:42 (WEA 1)	18:21	23	17:32 (WEA 2)	20:16	27	19:47 (WEA 4)	21:08			21:50
11	08:36	07:54		16:18 (WEA 1)	06:53		17:10 (WEA 2)	06:41		19:21 (WEA 4)	05:39			05:04
	16:35	17:31	24	16:42 (WEA 1)	18:23	21	17:31 (WEA 2)	20:18	26	19:47 (WEA 4)	21:10			21:50
12	08:35	07:52		16:18 (WEA 1)	06:51		17:10 (WEA 2)	06:38		19:21 (WEA 4)	05:37			05:04
	16:37	17:32	24	16:42 (WEA 1)	18:25	19	17:29 (WEA 2)	20:20	25	19:46 (WEA 4)	21:12			21:51
13	08:34	07:50		16:18 (WEA 1)	06:49		17:12 (WEA 2)	06:36		19:21 (WEA 4)	05:35			05:03
	16:38	17:34	24	16:42 (WEA 1)	18:27	16	17:28 (WEA 2)	20:22	24	19:45 (WEA 4)	21:13			21:52
14	08:34	07:48		16:18 (WEA 1)	06:46		17:14 (WEA 2)	06:34		19:21 (WEA 4)	05:34			05:03
	16:40	17:36	24	16:42 (WEA 1)	18:28	12	17:26 (WEA 2)	20:23	23	19:44 (WEA 4)	21:15			21:52
15	08:33	07:46		16:19 (WEA 1)	06:44			06:32		19:22 (WEA 4)	05:32			05:03
	16:41	17:38	23	16:42 (WEA 1)	18:30			20:25	21	19:43 (WEA 4)	21:17			21:53
16	08:32	07:44		16:20 (WEA 1)	06:42		17:55 (WEA 3)	06:29		19:24 (WEA 4)	05:30			05:03
	16:43	17:40	21	16:41 (WEA 1)	18:32	7	18:02 (WEA 3)	20:27	19	20:00 (WEA 5)	21:18			21:53
17	08:31	07:42		16:21 (WEA 1)	06:39		17:53 (WEA 3)	06:27		19:26 (WEA 4)	05:29			05:03
	16:44	17:42	19	16:40 (WEA 1)	18:34	11	18:04 (WEA 3)	20:29	19	20:02 (WEA 5)	21:20			21:54
18	08:30	07:40		16:22 (WEA 1)	06:37		17:51 (WEA 3)	06:25		19:28 (WEA 4)	05:27			05:03
	16:46	17:44	17	16:39 (WEA 1)	18:36	13	18:04 (WEA 3)	20:30	16	20:02 (WEA 5)	21:21			21:54
19	08:29	07:38		16:24 (WEA 1)	06:35		17:50 (WEA 3)	06:23		19:52 (WEA 5)	05:26			05:03
	16:48	17:46	13	16:37 (WEA 1)	18:37	15	18:05 (WEA 3)	20:32	12	20:04 (WEA 5)	21:23			21:55
20	08:28	07:36		16:26 (WEA 1)	06:32		17:49 (WEA 3)	06:20		19:51 (WEA 5)	05:24			05:03
	16:50	17:48	8	16:34 (WEA 1)	18:39	16	18:05 (WEA 3)	20:34	15	20:06 (WEA 5)	21:24			21:55
21	08:27	07:34			06:30		17:49 (WEA 3)	06:18		19:51 (WEA 5)	05:23			05:03
	16:51	17:50			18:41	16	18:05 (WEA 3)	20:36	17	20:08 (WEA 5)	21:26			21:55
22	08:25	07:32			06:28		17:49 (WEA 3)	06:16		19:50 (WEA 5)	05:22			05:03
	16:53	17:52			18:43	16	18:05 (WEA 3)	20:37	20	20:10 (WEA 5)	21:27			21:55
23	08:24	07:29			06:25		17:49 (WEA 3)	06:14		19:50 (WEA 5)	05:20			05:03
	16:55	17:53			18:45	14	18:03 (WEA 3)	20:39	21	20:11 (WEA 5)	21:29			21:56
24	08:23	07:27			06:23		17:50 (WEA 3)	06:12		19:50 (WEA 5)	05:19			05:04
	16:57	17:55			18:46	12	18:02 (WEA 3)	20:41	23	20:13 (WEA 5)	21:30			21:56
25	08:22	07:25			06:20		17:51 (WEA 3)	06:10		19:50 (WEA 5)	05:18			05:04
	16:58	17:57			18:48	8	17:59 (WEA 3)	20:43	22	20:12 (WEA 5)	21:32			21:56
26	08:20	07:23			06:18			06:08		19:50 (WEA 5)	05:17			05:04
	17:00	17:59			18:50			20:44	22	20:12 (WEA 5)	21:33			21:56
27	08:19	07:21			06:16			06:05		19:51 (WEA 5)	05:16			05:05
	17:02	18:01			18:52			20:46	20	20:11 (WEA 5)	21:34			21:56
28	08:17	07:19		17:18 (WEA 2)	06:13			06:03		19:51 (WEA 5)	05:14			05:05
	17:04	18:03	8	17:26 (WEA 2)	18:53			20:48	19	20:10 (WEA 5)	21:36			21:56
29	08:16				07:11			06:01		19:52 (WEA 5)	05:13			05:06
	17:06				19:55			20:50	17	20:09 (WEA 5)	21:37			21:55
30	08:14				07:09			05:59		19:54 (WEA 5)	05:12			05:06
	17:08				19:57			20:51	13	20:07 (WEA 5)	21:38			21:55
31	08:13				07:06						05:11			
	17:10				19:59						21:39			
Sonnenscheinstunden	255	276			367			418			489			503
astr.max.mögl.Beschattung			351			408			571			8		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-07 - SR-07, Hagen-Ring-Straße 46, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember
1	05:07	05:45			06:36		19:20 (WEA 4)	07:27		17:51 (WEA 2)	07:23		15:48 (WEA 1)	08:15
	21:55	21:22			20:18	26	19:46 (WEA 4)	19:07	17	18:08 (WEA 2)	16:59	23	16:11 (WEA 1)	16:17
2	05:08	05:46			06:38		19:19 (WEA 4)	07:29		17:49 (WEA 2)	07:24		15:48 (WEA 1)	08:17
	21:55	21:20			20:16	27	19:46 (WEA 4)	19:04	20	18:09 (WEA 2)	16:57	23	16:11 (WEA 1)	16:16
3	05:08	05:48			06:40		19:18 (WEA 4)	07:31		17:48 (WEA 2)	07:26		15:48 (WEA 1)	08:18
	21:54	21:18			20:13	27	19:45 (WEA 4)	19:02	21	18:09 (WEA 2)	16:55	22	16:10 (WEA 1)	16:16
4	05:09	05:50			06:41		19:19 (WEA 4)	07:32		17:47 (WEA 2)	07:28		15:49 (WEA 1)	08:19
	21:54	21:17			20:11	25	19:44 (WEA 4)	19:00	23	18:10 (WEA 2)	16:53	21	16:10 (WEA 1)	16:15
5	05:10	05:51			06:43		19:18 (WEA 4)	07:34		17:46 (WEA 2)	07:30		15:50 (WEA 1)	08:21
	21:53	21:15			20:09	23	19:41 (WEA 4)	18:57	24	18:10 (WEA 2)	16:51	19	16:09 (WEA 1)	16:14
6	05:11	05:53			06:45		19:18 (WEA 4)	07:36		17:46 (WEA 2)	07:32		15:51 (WEA 1)	08:22
	21:53	21:13			20:06	21	19:39 (WEA 4)	18:55	24	18:10 (WEA 2)	16:50	17	16:08 (WEA 1)	16:14
7	05:12	05:54			06:46		19:19 (WEA 4)	07:37		17:45 (WEA 2)	07:34		15:53 (WEA 1)	08:23
	21:52	21:11			20:04	18	19:37 (WEA 4)	18:53	24	18:09 (WEA 2)	16:48	13	16:06 (WEA 1)	16:13
8	05:13	05:56			06:48		19:19 (WEA 4)	07:39		17:45 (WEA 2)	07:36		15:56 (WEA 1)	08:25
	21:51	21:09			20:02	15	19:34 (WEA 4)	18:50	24	18:09 (WEA 2)	16:46	7	16:03 (WEA 1)	16:13
9	05:14	05:58			06:50		19:20 (WEA 4)	07:41		17:46 (WEA 2)	07:37			08:26
	21:51	21:07			19:59	12	19:32 (WEA 4)	18:48	22	18:08 (WEA 2)	16:44			16:13
10	05:15	05:59			06:52		19:22 (WEA 4)	07:43		17:46 (WEA 2)	07:39			08:27
	21:50	21:05			19:57	8	19:30 (WEA 4)	18:46	21	18:07 (WEA 2)	16:43			16:13
11	05:16	06:01			06:53		19:24 (WEA 4)	07:44		17:47 (WEA 2)	07:41			08:28
	21:49	21:03			19:54	3	19:27 (WEA 4)	18:43	19	18:06 (WEA 2)	16:41			16:12
12	05:17	06:03		20:03 (WEA 5)	06:55			07:46		17:48 (WEA 2)	07:43			08:29
	21:48	21:01	11	20:14 (WEA 5)	19:52			18:41	15	18:03 (WEA 2)	16:39			16:12
13	05:18	06:04		20:02 (WEA 5)	06:57			07:48		17:50 (WEA 2)	07:45			08:30
	21:47	20:59	14	20:16 (WEA 5)	19:50			18:39	11	18:01 (WEA 2)	16:38			16:12
14	05:19	06:06		20:00 (WEA 5)	06:58			07:50			07:47			08:31
	21:46	20:57	16	20:16 (WEA 5)	19:47			18:37			16:36			16:12
15	05:21	06:08		19:59 (WEA 5)	07:00			07:52			07:48			08:32
	21:45	20:55	19	20:18 (WEA 5)	19:45			18:34			16:35			16:12
16	05:22	06:09		19:57 (WEA 5)	07:02			07:53			07:50			08:33
	21:44	20:53	21	20:18 (WEA 5)	19:43			18:32			16:33			16:12
17	05:23	06:11		19:57 (WEA 5)	07:03			07:55			07:52			08:34
	21:43	20:51	21	20:18 (WEA 5)	19:40			18:30			16:32			16:12
18	05:24	06:13		19:57 (WEA 5)	07:05		18:40 (WEA 3)	07:57			07:54			08:35
	21:42	20:49	22	20:19 (WEA 5)	19:38	7	18:47 (WEA 3)	18:28			16:31			16:13
19	05:26	06:14		19:56 (WEA 5)	07:07		18:37 (WEA 3)	07:59			07:56			08:35
	21:41	20:47	22	20:18 (WEA 5)	19:35	11	18:48 (WEA 3)	18:26			16:29			16:13
20	05:27	06:16		19:56 (WEA 5)	07:08		18:36 (WEA 3)	08:01			07:57			08:36
	21:40	20:45	21	20:17 (WEA 5)	19:33	13	18:49 (WEA 3)	18:23			16:28			16:13
21	05:28	06:18		19:55 (WEA 5)	07:10		18:35 (WEA 3)	08:02			07:59			08:37
	21:38	20:43	19	20:14 (WEA 5)	19:31	15	18:50 (WEA 3)	18:21			16:27			16:14
22	05:30	06:20		19:56 (WEA 5)	07:12		18:33 (WEA 3)	08:04		16:55 (WEA 1)	08:01			08:37
	21:37	20:40	16	20:12 (WEA 5)	19:28	16	18:49 (WEA 3)	18:19	10	17:05 (WEA 1)	16:26			16:14
23	05:31	06:21		19:56 (WEA 5)	07:13		18:33 (WEA 3)	08:06		16:53 (WEA 1)	08:02			08:38
	21:36	20:38	15	20:11 (WEA 5)	19:26	16	18:49 (WEA 3)	18:17	14	17:07 (WEA 1)	16:24			16:15
24	05:33	06:23		19:56 (WEA 5)	07:15		18:33 (WEA 3)	08:08		16:51 (WEA 1)	08:04			08:38
	21:34	20:36	12	20:08 (WEA 5)	19:23	16	18:49 (WEA 3)	18:15	18	17:09 (WEA 1)	16:23			16:15
25	05:34	06:25		19:31 (WEA 4)	07:17		18:33 (WEA 3)	07:10		15:50 (WEA 1)	08:06			08:38
	21:33	20:34	17	20:06 (WEA 5)	19:21	14	18:47 (WEA 3)	17:13	20	16:10 (WEA 1)	16:22			16:16
26	05:36	06:26		19:27 (WEA 4)	07:18		18:34 (WEA 3)	07:12		15:49 (WEA 1)	08:07			08:39
	21:31	20:32	19	20:03 (WEA 5)	19:19	12	18:46 (WEA 3)	17:11	22	16:11 (WEA 1)	16:21			16:17
27	05:37	06:28		19:25 (WEA 4)	07:20		18:36 (WEA 3)	07:13		15:48 (WEA 1)	08:09			08:39
	21:30	20:29	20	20:02 (WEA 5)	19:16	8	18:44 (WEA 3)	17:09	23	16:11 (WEA 1)	16:20			16:17
28	05:39	06:30		19:24 (WEA 4)	07:22			07:15		15:48 (WEA 1)	08:11			08:39
	21:28	20:27	21	19:45 (WEA 4)	19:14			17:07	24	16:12 (WEA 1)	16:19			16:18
29	05:40	06:31		19:22 (WEA 4)	07:24		17:56 (WEA 2)	07:17		15:47 (WEA 1)	08:12			08:39
	21:27	20:25	23	19:45 (WEA 4)	19:11	8	18:04 (WEA 2)	17:05	25	16:12 (WEA 1)	16:18			16:19
30	05:42	06:33		19:21 (WEA 4)	07:25		17:53 (WEA 2)	07:19		15:47 (WEA 1)	08:14			08:39
	21:25	20:23	25	19:46 (WEA 4)	19:09	14	18:07 (WEA 2)	17:03	25	16:12 (WEA 1)	16:18			16:20
31	05:43	06:35		19:20 (WEA 4)				07:21		15:47 (WEA 1)				08:39
	21:23	20:20	25	19:45 (WEA 4)				17:01	25	16:12 (WEA 1)				16:21
Sonnenscheinstunden	506	456			381			330			263			240
astr.max.mögl.Beschattung			379			355			471			145		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung **Schattenrezeptor:** SR-07a - SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai	Juni
1	08:39			08:11		15:57 (WEA 1)	07:16		16:51 (WEA 2)	07:04		19:02 (WEA 4)	05:57	05:10
	16:22			17:11	23	16:20 (WEA 1)	18:05	18	17:09 (WEA 2)	20:00	26	19:28 (WEA 4)	20:53	21:41
2	08:39			08:10		15:57 (WEA 1)	07:14		16:52 (WEA 2)	07:02		19:03 (WEA 4)	05:55	05:10
	16:23			17:13	23	16:20 (WEA 1)	18:07	15	17:07 (WEA 2)	20:02	25	19:28 (WEA 4)	20:55	21:42
3	08:39			08:08		15:58 (WEA 1)	07:12		16:55 (WEA 2)	06:59		19:03 (WEA 4)	05:53	05:09
	16:24			17:15	23	16:21 (WEA 1)	18:08	10	17:05 (WEA 2)	20:04	23	19:26 (WEA 4)	20:57	21:43
4	08:39			08:06		15:59 (WEA 1)	07:10			06:57		19:04 (WEA 4)	05:51	05:08
	16:26			17:17	21	16:20 (WEA 1)	18:10			20:06	21	19:25 (WEA 4)	20:58	21:44
5	08:39			08:05		15:59 (WEA 1)	07:07			06:55		19:05 (WEA 4)	05:50	05:07
	16:27			17:19	21	16:20 (WEA 1)	18:12			20:08	18	19:23 (WEA 4)	21:00	21:45
6	08:38			08:03		16:00 (WEA 1)	07:05		17:38 (WEA 3)	06:52		19:06 (WEA 4)	05:48	05:07
	16:28			17:21	19	16:19 (WEA 1)	18:14	5	17:43 (WEA 3)	20:09	15	19:21 (WEA 4)	21:02	21:46
7	08:38			08:01		16:01 (WEA 1)	07:03		17:34 (WEA 3)	06:50		19:10 (WEA 4)	05:46	05:06
	16:29			17:23	17	16:18 (WEA 1)	18:16	11	17:45 (WEA 3)	20:11	10	19:45 (WEA 5)	21:03	21:47
8	08:37			07:59		16:02 (WEA 1)	07:00		17:33 (WEA 3)	06:48		19:40 (WEA 5)	05:44	05:05
	16:31			17:25	15	16:17 (WEA 1)	18:18	13	17:46 (WEA 3)	20:13	7	19:47 (WEA 5)	21:05	21:48
9	08:37			07:58		16:05 (WEA 1)	06:58		17:33 (WEA 3)	06:45		19:37 (WEA 5)	05:42	05:05
	16:32			17:27	9	16:14 (WEA 1)	18:19	14	17:47 (WEA 3)	20:15	11	19:48 (WEA 5)	21:07	21:49
10	08:36			07:56			06:56		17:31 (WEA 3)	06:43		19:36 (WEA 5)	05:40	05:04
	16:34			17:29			18:21	16	17:47 (WEA 3)	20:16	13	19:49 (WEA 5)	21:08	21:50
11	08:36			07:54			06:53		17:31 (WEA 3)	06:41		19:35 (WEA 5)	05:39	05:04
	16:35			17:31			18:23	16	17:47 (WEA 3)	20:18	16	19:51 (WEA 5)	21:10	21:50
12	08:35			07:52			06:51		17:31 (WEA 3)	06:38		19:35 (WEA 5)	05:37	05:04
	16:37			17:32			18:25	15	17:46 (WEA 3)	20:20	18	19:53 (WEA 5)	21:12	21:51
13	08:34			07:50			06:49		17:31 (WEA 3)	06:36		19:34 (WEA 5)	05:35	05:03
	16:38			17:34			18:27	15	17:46 (WEA 3)	20:22	20	19:54 (WEA 5)	21:13	21:52
14	08:34			07:48			06:46		17:33 (WEA 3)	06:34		19:34 (WEA 5)	05:34	05:03
	16:40			17:36			18:28	12	17:45 (WEA 3)	20:23	22	19:56 (WEA 5)	21:15	21:52
15	08:33			07:46			06:44		17:34 (WEA 3)	06:32		19:34 (WEA 5)	05:32	05:03
	16:41			17:38			18:30	8	17:42 (WEA 3)	20:25	22	19:56 (WEA 5)	21:17	21:53
16	08:32			07:44			06:42			06:29		19:34 (WEA 5)	05:30	05:03
	16:43			17:40			18:32			20:27	22	19:56 (WEA 5)	21:18	21:53
17	08:31			07:42		16:57 (WEA 2)	06:39			06:27		19:34 (WEA 5)	05:29	05:03
	16:44			17:42	9	17:06 (WEA 2)	18:34			20:29	21	19:55 (WEA 5)	21:20	21:54
18	08:30			07:40		16:54 (WEA 2)	06:37			06:25		19:34 (WEA 5)	05:27	05:03
	16:46			17:44	14	17:08 (WEA 2)	18:36			20:30	19	19:53 (WEA 5)	21:21	21:54
19	08:29			07:38		16:53 (WEA 2)	06:35			06:23		19:35 (WEA 5)	05:26	05:03
	16:48			17:46	17	17:10 (WEA 2)	18:37			20:32	17	19:52 (WEA 5)	21:23	21:55
20	08:28			07:36		16:51 (WEA 2)	06:32			06:20		19:37 (WEA 5)	05:24	05:03
	16:50			17:48	19	17:10 (WEA 2)	18:39			20:34	14	19:51 (WEA 5)	21:24	21:55
21	08:27			07:34		16:50 (WEA 2)	06:30			06:18		19:39 (WEA 5)	05:23	05:03
	16:51			17:50	21	17:11 (WEA 2)	18:41			20:36	9	19:48 (WEA 5)	21:26	21:55
22	08:25		16:02 (WEA 1)	07:32		16:50 (WEA 2)	06:28		18:13 (WEA 4)	06:16			05:22	05:03
	16:53	9	16:11 (WEA 1)	17:52	22	17:12 (WEA 2)	18:43	4	18:17 (WEA 4)	20:37			21:27	21:56
23	08:24		16:01 (WEA 1)	07:29		16:49 (WEA 2)	06:25		18:10 (WEA 4)	06:14			05:20	05:03
	16:55	12	16:13 (WEA 1)	17:53	23	17:12 (WEA 2)	18:45	9	18:19 (WEA 4)	20:39			21:29	21:56
24	08:23		15:59 (WEA 1)	07:27		16:49 (WEA 2)	06:23		18:08 (WEA 4)	06:12			05:19	05:04
	16:57	15	16:14 (WEA 1)	17:55	23	17:12 (WEA 2)	18:46	13	18:21 (WEA 4)	20:41			21:30	21:56
25	08:22		15:59 (WEA 1)	07:25		16:49 (WEA 2)	06:20		18:06 (WEA 4)	06:10			05:18	05:04
	16:58	17	16:16 (WEA 1)	17:57	23	17:12 (WEA 2)	18:48	16	18:22 (WEA 4)	20:43			21:32	21:56
26	08:20		15:58 (WEA 1)	07:23		16:49 (WEA 2)	06:18		18:05 (WEA 4)	06:08			05:17	05:04
	17:00	19	16:17 (WEA 1)	17:59	22	17:11 (WEA 2)	18:50	19	18:24 (WEA 4)	20:44			21:33	21:56
27	08:19		15:58 (WEA 1)	07:21		16:50 (WEA 2)	06:16		18:04 (WEA 4)	06:05			05:15	05:05
	17:02	20	16:18 (WEA 1)	18:01	21	17:11 (WEA 2)	18:52	22	18:26 (WEA 4)	20:46			21:34	21:56
28	08:17		15:57 (WEA 1)	07:19		16:50 (WEA 2)	06:13		18:03 (WEA 4)	06:03			05:14	05:05
	17:04	22	16:19 (WEA 1)	18:03	19	17:09 (WEA 2)	18:53	24	18:27 (WEA 4)	20:48			21:36	21:56
29	08:16		15:57 (WEA 1)				07:11		19:03 (WEA 4)	06:01			05:13	05:06
	17:06	22	16:19 (WEA 1)				19:55	26	19:29 (WEA 4)	20:50			21:37	21:55
30	08:14		15:57 (WEA 1)				07:09		19:03 (WEA 4)	05:59			05:12	05:06
	17:08	23	16:20 (WEA 1)				19:57	26	19:29 (WEA 4)	20:51			21:38	21:55
31	08:13		15:57 (WEA 1)				07:06		19:02 (WEA 4)				05:11	
	17:10	23	16:20 (WEA 1)				19:59	26	19:28 (WEA 4)				21:39	
Sonnenscheinstunden	255			276			367			418			489	503
astr.max.mögl.Beschattung		182			404			353			369			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung **Schattenrezeptor:** SR-07a - SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November			Dezember
1	05:07	05:45			06:36		19:34 (WEA 5)	07:27		18:11 (WEA 3)	07:23		15:38 (WEA 1)	08:15
	21:55	21:22			20:18	16	19:50 (WEA 5)	19:07	15	18:26 (WEA 3)	16:59	2	15:40 (WEA 1)	16:17
2	05:08	05:46			06:38		19:35 (WEA 5)	07:29		18:09 (WEA 3)	07:24		15:34 (WEA 1)	08:17
	21:55	21:20			20:16	13	19:48 (WEA 5)	19:04	16	18:25 (WEA 3)	16:57	11	15:45 (WEA 1)	16:16
3	05:08	05:48			06:40		19:35 (WEA 5)	07:31		18:09 (WEA 3)	07:26		15:32 (WEA 1)	08:18
	21:54	21:18			20:13	11	19:46 (WEA 5)	19:02	16	18:25 (WEA 3)	16:55	15	15:47 (WEA 1)	16:16
4	05:09	05:50			06:41		19:37 (WEA 5)	07:32		18:09 (WEA 3)	07:28		15:30 (WEA 1)	08:20
	21:54	21:17			20:11	7	19:44 (WEA 5)	19:00	16	18:25 (WEA 3)	16:53	18	15:48 (WEA 1)	16:15
5	05:10	05:51			06:43		19:06 (WEA 4)	07:34		18:10 (WEA 3)	07:30		15:30 (WEA 1)	08:21
	21:53	21:15			20:09	10	19:41 (WEA 5)	18:57	14	18:24 (WEA 3)	16:51	19	15:49 (WEA 1)	16:14
6	05:11	05:53			06:45		19:02 (WEA 4)	07:36		18:11 (WEA 3)	07:32		15:29 (WEA 1)	08:22
	21:53	21:13			20:06	14	19:16 (WEA 4)	18:55	12	18:23 (WEA 3)	16:50	21	15:50 (WEA 1)	16:14
7	05:12	05:54			06:46		19:00 (WEA 4)	07:37		18:11 (WEA 3)	07:34		15:28 (WEA 1)	08:23
	21:52	21:11			20:04	18	19:18 (WEA 4)	18:53	9	18:20 (WEA 3)	16:48	22	15:50 (WEA 1)	16:13
8	05:13	05:56			06:48		18:58 (WEA 4)	07:39			07:36		15:28 (WEA 1)	08:25
	21:51	21:09			20:02	21	19:19 (WEA 4)	18:50			16:46	22	15:50 (WEA 1)	16:13
9	05:14	05:58			06:50		18:57 (WEA 4)	07:41			07:37		15:28 (WEA 1)	08:26
	21:51	21:07			19:59	23	19:20 (WEA 4)	18:48			16:44	23	15:51 (WEA 1)	16:13
10	05:15	05:59			06:52		18:56 (WEA 4)	07:43		17:32 (WEA 2)	07:39		15:28 (WEA 1)	08:27
	21:50	21:05			19:57	25	19:21 (WEA 4)	18:46	5	17:37 (WEA 2)	16:43	23	15:51 (WEA 1)	16:13
11	05:16	06:01			06:53		18:55 (WEA 4)	07:44		17:28 (WEA 2)	07:41		15:28 (WEA 1)	08:28
	21:49	21:03			19:54	25	19:20 (WEA 4)	18:43	12	17:40 (WEA 2)	16:41	23	15:51 (WEA 1)	16:12
12	05:17	06:03			06:55		18:54 (WEA 4)	07:46		17:25 (WEA 2)	07:43		15:28 (WEA 1)	08:29
	21:48	21:01			19:52	27	19:21 (WEA 4)	18:41	16	17:41 (WEA 2)	16:39	23	15:51 (WEA 1)	16:12
13	05:18	06:04			06:57		18:53 (WEA 4)	07:48		17:23 (WEA 2)	07:45		15:29 (WEA 1)	08:30
	21:47	20:59			19:50	27	19:20 (WEA 4)	18:39	19	17:42 (WEA 2)	16:38	22	15:51 (WEA 1)	16:12
14	05:19	06:06			06:58		18:53 (WEA 4)	07:50		17:22 (WEA 2)	07:47		15:29 (WEA 1)	08:31
	21:46	20:57			19:47	27	19:20 (WEA 4)	18:37	21	17:43 (WEA 2)	16:36	22	15:51 (WEA 1)	16:12
15	05:21	06:08			07:00		18:53 (WEA 4)	07:52		17:22 (WEA 2)	07:48		15:30 (WEA 1)	08:32
	21:45	20:55			19:45	25	19:18 (WEA 4)	18:34	21	17:43 (WEA 2)	16:35	20	15:50 (WEA 1)	16:12
16	05:22	06:09			07:02		18:53 (WEA 4)	07:53		17:21 (WEA 2)	07:50		15:31 (WEA 1)	08:33
	21:44	20:53			19:43	22	19:15 (WEA 4)	18:32	23	17:44 (WEA 2)	16:33	19	15:50 (WEA 1)	16:12
17	05:23	06:11			07:03		18:53 (WEA 4)	07:55		17:21 (WEA 2)	07:52		15:32 (WEA 1)	08:34
	21:43	20:51			19:40	20	19:13 (WEA 4)	18:30	23	17:44 (WEA 2)	16:32	17	15:49 (WEA 1)	16:12
18	05:24	06:13			07:05		18:54 (WEA 4)	07:57		17:21 (WEA 2)	07:54		15:33 (WEA 1)	08:35
	21:42	20:49			19:38	17	19:11 (WEA 4)	18:28	23	17:44 (WEA 2)	16:31	15	15:48 (WEA 1)	16:13
19	05:26	06:14			07:07		18:54 (WEA 4)	07:59		17:21 (WEA 2)	07:56		15:35 (WEA 1)	08:35
	21:41	20:47			19:35	14	19:08 (WEA 4)	18:26	22	17:43 (WEA 2)	16:29	12	15:47 (WEA 1)	16:13
20	05:27	06:16			07:08		18:56 (WEA 4)	08:01		17:20 (WEA 2)	07:57		15:37 (WEA 1)	08:36
	21:40	20:45			19:33	10	19:06 (WEA 4)	18:23	22	17:42 (WEA 2)	16:28	9	15:46 (WEA 1)	16:13
21	05:28	06:18			07:10		18:58 (WEA 4)	08:02		17:21 (WEA 2)	07:59			08:37
	21:38	20:43			19:31	5	19:03 (WEA 4)	18:21	20	17:41 (WEA 2)	16:27			16:14
22	05:30	06:20		19:43 (WEA 5)	07:12			08:04		17:21 (WEA 2)	08:01			08:37
	21:37	20:40	10	19:53 (WEA 5)	19:28			18:19	19	17:40 (WEA 2)	16:26			16:14
23	05:31	06:21		19:41 (WEA 5)	07:13			08:06		17:23 (WEA 2)	08:02			08:38
	21:36	20:38	15	19:56 (WEA 5)	19:26			18:17	16	17:39 (WEA 2)	16:24			16:15
24	05:33	06:23		19:39 (WEA 5)	07:15			08:08		17:24 (WEA 2)	08:04			08:38
	21:34	20:36	17	19:56 (WEA 5)	19:23			18:15	13	17:37 (WEA 2)	16:23			16:15
25	05:34	06:25		19:38 (WEA 5)	07:17			07:10		16:27 (WEA 2)	08:06			08:38
	21:33	20:34	19	19:57 (WEA 5)	19:21			17:13	7	16:34 (WEA 2)	16:22			16:16
26	05:36	06:26		19:36 (WEA 5)	07:18			07:12			08:07			08:39
	21:31	20:32	21	19:57 (WEA 5)	19:19			17:11			16:21			16:17
27	05:37	06:28		19:36 (WEA 5)	07:20			07:13			08:09			08:39
	21:30	20:29	22	19:58 (WEA 5)	19:16			17:09			16:20			16:17
28	05:39	06:30		19:36 (WEA 5)	07:22		18:15 (WEA 3)	07:15			08:11			08:39
	21:28	20:27	22	19:58 (WEA 5)	19:14	7	18:22 (WEA 3)	17:07			16:19			16:18
29	05:40	06:31		19:35 (WEA 5)	07:24		18:13 (WEA 3)	07:17			08:12			08:39
	21:27	20:25	22	19:57 (WEA 5)	19:11	11	18:24 (WEA 3)	17:05			16:18			16:19
30	05:42	06:33		19:35 (WEA 5)	07:25		18:12 (WEA 3)	07:19			08:14			08:39
	21:25	20:23	20	19:55 (WEA 5)	19:09	13	18:25 (WEA 3)	17:03			16:18			16:20
31	05:43	06:35		19:34 (WEA 5)				07:21						08:40
	21:23	20:20	18	19:52 (WEA 5)				17:01						16:21
Sonnenscheinstunden	506	456			381			330			263			240
astr.max.mögl.Beschattung			186			408			380			358		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-08 - SR-08, Südmark 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni	
1	08:40		14:02 (WEA 1)	08:11		15:33 (WEA 2)	07:16			07:04		19:00 (WEA 4)	05:57		19:45 (WEA 5)	05:10
	16:22	35	14:37 (WEA 1)	17:11	30	16:03 (WEA 2)	18:05			20:00	31	19:31 (WEA 4)	20:53	35	20:20 (WEA 5)	21:41
2	08:39		14:03 (WEA 1)	08:10		15:32 (WEA 2)	07:14		17:05 (WEA 3)	07:02		18:58 (WEA 4)	05:55		19:45 (WEA 5)	05:10
	16:23	35	14:38 (WEA 1)	17:13	32	16:04 (WEA 2)	18:07	12	17:17 (WEA 3)	20:02	35	19:33 (WEA 4)	20:55	35	20:20 (WEA 5)	21:42
3	08:39		14:02 (WEA 1)	08:08		15:32 (WEA 2)	07:12		17:03 (WEA 3)	06:59		18:56 (WEA 4)	05:53		19:45 (WEA 5)	05:09
	16:24	35	14:37 (WEA 1)	17:15	33	16:05 (WEA 2)	18:08	16	17:19 (WEA 3)	20:04	37	19:33 (WEA 4)	20:57	36	20:21 (WEA 5)	21:43
4	08:39		14:03 (WEA 1)	08:06		15:31 (WEA 2)	07:10		17:00 (WEA 3)	06:57		18:55 (WEA 4)	05:52		19:45 (WEA 5)	05:08
	16:26	35	14:38 (WEA 1)	17:17	35	16:06 (WEA 2)	18:10	20	17:20 (WEA 3)	20:06	39	19:34 (WEA 4)	20:58	36	20:21 (WEA 5)	21:44
5	08:39		14:03 (WEA 1)	08:05		15:31 (WEA 2)	07:07		16:59 (WEA 3)	06:55		18:54 (WEA 4)	05:50		19:44 (WEA 5)	05:07
	16:27	35	14:38 (WEA 1)	17:19	36	16:07 (WEA 2)	18:12	22	17:21 (WEA 3)	20:08	41	19:35 (WEA 4)	21:00	37	20:21 (WEA 5)	21:45
6	08:38		14:04 (WEA 1)	08:03		15:30 (WEA 2)	07:05		16:58 (WEA 3)	06:52		18:52 (WEA 4)	05:48		19:44 (WEA 5)	05:07
	16:28	35	14:39 (WEA 1)	17:21	37	16:07 (WEA 2)	18:14	24	17:22 (WEA 3)	20:09	43	19:35 (WEA 4)	21:02	37	20:21 (WEA 5)	21:46
7	08:38		14:05 (WEA 1)	08:01		15:30 (WEA 2)	07:03		16:57 (WEA 3)	06:50		18:52 (WEA 4)	05:46		19:44 (WEA 5)	05:06
	16:29	34	14:39 (WEA 1)	17:23	38	16:08 (WEA 2)	18:16	25	17:22 (WEA 3)	20:11	44	19:36 (WEA 4)	21:03	36	20:20 (WEA 5)	21:47
8	08:37		14:06 (WEA 1)	07:59		15:29 (WEA 2)	07:00		16:56 (WEA 3)	06:48		18:51 (WEA 4)	05:44		19:44 (WEA 5)	05:05
	16:31	34	14:40 (WEA 1)	17:25	39	16:08 (WEA 2)	18:18	27	17:23 (WEA 3)	20:13	45	19:36 (WEA 4)	21:05	37	20:21 (WEA 5)	21:48
9	08:37		14:06 (WEA 1)	07:58		15:29 (WEA 2)	06:58		16:56 (WEA 3)	06:45		18:50 (WEA 4)	05:42		19:44 (WEA 5)	05:05
	16:32	34	14:40 (WEA 1)	17:27	40	16:09 (WEA 2)	18:19	27	17:23 (WEA 3)	20:15	46	19:36 (WEA 4)	21:07	36	20:20 (WEA 5)	21:49
10	08:36		14:07 (WEA 1)	07:56		15:29 (WEA 2)	06:56		16:55 (WEA 3)	06:43		18:49 (WEA 4)	05:40		19:45 (WEA 5)	05:04
	16:34	32	14:39 (WEA 1)	17:29	40	16:09 (WEA 2)	18:21	27	17:22 (WEA 3)	20:16	47	19:36 (WEA 4)	21:09	35	20:20 (WEA 5)	21:50
11	08:36		14:07 (WEA 1)	07:54		15:29 (WEA 2)	06:54		16:56 (WEA 3)	06:41		18:49 (WEA 4)	05:39		19:45 (WEA 5)	05:04
	16:35	32	14:39 (WEA 1)	17:31	40	16:09 (WEA 2)	18:23	26	17:22 (WEA 3)	20:18	47	19:36 (WEA 4)	21:10	35	20:20 (WEA 5)	21:50
12	08:35		14:09 (WEA 1)	07:52		15:29 (WEA 2)	06:51		16:55 (WEA 3)	06:38		18:49 (WEA 4)	05:37		19:45 (WEA 5)	05:04
	16:37	31	14:40 (WEA 1)	17:33	40	16:09 (WEA 2)	18:25	26	17:21 (WEA 3)	20:20	47	19:36 (WEA 4)	21:12	34	20:19 (WEA 5)	21:51
13	08:34		14:09 (WEA 1)	07:50		15:29 (WEA 2)	06:49		16:56 (WEA 3)	06:36		18:48 (WEA 4)	05:35		19:46 (WEA 5)	05:03
	16:38	31	14:40 (WEA 1)	17:34	40	16:09 (WEA 2)	18:27	25	17:21 (WEA 3)	20:22	47	19:35 (WEA 4)	21:13	33	20:19 (WEA 5)	21:52
14	08:34		14:10 (WEA 1)	07:48		15:29 (WEA 2)	06:46		16:57 (WEA 3)	06:34		18:48 (WEA 4)	05:34		19:46 (WEA 5)	05:03
	16:40	30	14:40 (WEA 1)	17:36	40	16:09 (WEA 2)	18:29	23	17:20 (WEA 3)	20:23	47	19:35 (WEA 4)	21:15	32	20:18 (WEA 5)	21:52
15	08:33		14:11 (WEA 1)	07:46		15:30 (WEA 2)	06:44		16:57 (WEA 3)	06:32		18:48 (WEA 4)	05:32		19:47 (WEA 5)	05:03
	16:41	29	14:40 (WEA 1)	17:38	39	16:09 (WEA 2)	18:30	21	17:18 (WEA 3)	20:25	47	19:35 (WEA 4)	21:17	31	20:18 (WEA 5)	21:53
16	08:32		14:11 (WEA 1)	07:44		15:30 (WEA 2)	06:42		16:59 (WEA 3)	06:29		18:48 (WEA 4)	05:30		19:47 (WEA 5)	05:03
	16:43	28	14:39 (WEA 1)	17:40	39	16:09 (WEA 2)	18:32	18	17:17 (WEA 3)	20:27	47	19:35 (WEA 4)	21:18	30	20:17 (WEA 5)	21:53
17	08:31		14:12 (WEA 1)	07:42		15:31 (WEA 2)	06:39		17:01 (WEA 3)	06:27		18:48 (WEA 4)	05:29		19:48 (WEA 5)	05:03
	16:44	27	14:39 (WEA 1)	17:42	38	16:09 (WEA 2)	18:34	14	17:15 (WEA 3)	20:29	46	19:34 (WEA 4)	21:20	28	20:16 (WEA 5)	21:54
18	08:30		14:14 (WEA 1)	07:40		15:32 (WEA 2)	06:37		17:04 (WEA 3)	06:25		18:48 (WEA 4)	05:27		19:50 (WEA 5)	05:03
	16:46	24	14:38 (WEA 1)	17:44	36	16:08 (WEA 2)	18:36	6	17:10 (WEA 3)	20:30	45	19:33 (WEA 4)	21:21	26	20:16 (WEA 5)	21:54
19	08:29		14:15 (WEA 1)	07:38		15:33 (WEA 2)	06:35			06:23		18:48 (WEA 4)	05:26		19:50 (WEA 5)	05:03
	16:48	23	14:38 (WEA 1)	17:46	34	16:07 (WEA 2)	18:37			20:32	44	19:32 (WEA 4)	21:23	24	20:14 (WEA 5)	21:55
20	08:28		14:17 (WEA 1)	07:36		15:33 (WEA 2)	06:32			06:20		18:49 (WEA 4)	05:24		19:51 (WEA 5)	05:03
	16:50	20	14:37 (WEA 1)	17:48	33	16:06 (WEA 2)	18:39			20:34	43	19:32 (WEA 4)	21:24	23	20:14 (WEA 5)	21:55
21	08:27		14:19 (WEA 1)	07:34		15:34 (WEA 2)	06:30			06:18		18:50 (WEA 4)	05:23		19:53 (WEA 5)	05:03
	16:51	16	14:35 (WEA 1)	17:50	31	16:05 (WEA 2)	18:41			20:36	41	19:31 (WEA 4)	21:26	20	20:13 (WEA 5)	21:55
22	08:25		14:21 (WEA 1)	07:32		15:36 (WEA 2)	06:28			06:16		18:50 (WEA 4)	05:22		19:55 (WEA 5)	05:03
	16:53	13	14:34 (WEA 1)	17:52	27	16:03 (WEA 2)	18:43			20:37	47	20:08 (WEA 5)	21:27	17	20:12 (WEA 5)	21:56
23	08:24		14:26 (WEA 1)	07:29		15:38 (WEA 2)	06:25			06:14		18:51 (WEA 4)	05:20		19:56 (WEA 5)	05:03
	16:55	5	14:31 (WEA 1)	17:53	24	16:02 (WEA 2)	18:45			20:39	52	20:11 (WEA 5)	21:29	13	20:09 (WEA 5)	21:56
24	08:23			07:27		15:40 (WEA 2)	06:23			06:12		18:52 (WEA 4)	05:19		19:58 (WEA 5)	05:04
	16:57			17:55	20	16:00 (WEA 2)	18:46			20:41	55	20:13 (WEA 5)	21:30	9	20:07 (WEA 5)	21:56
25	08:22			07:25		15:43 (WEA 2)	06:20			06:10		18:53 (WEA 4)	05:18			05:04
	16:58			17:57	12	15:55 (WEA 2)	18:48			20:43	56	20:15 (WEA 5)	21:32			21:56
26	08:20			07:23			06:18			06:08		18:55 (WEA 4)	05:17			05:04
	17:00			17:59			18:50			20:44	55	20:16 (WEA 5)	21:33			21:56
27	08:19		15:44 (WEA 2)	07:21			06:16			06:06		18:56 (WEA 4)	05:16			05:05
	17:02	8	15:52 (WEA 2)	18:01			18:52			20:46	56	20:18 (WEA 5)	21:34			21:56
28	08:17		15:40 (WEA 2)	07:19			06:13			06:03		18:58 (WEA 4)	05:14			05:05
	17:04	15	15:55 (WEA 2)	18:03			18:53			20:48	53	20:19 (WEA 5)	21:36			21:56
29	08:16		15:37 (WEA 2)				07:11		19:09 (WEA 4)	06:01		19:01 (WEA 4)	05:13			05:06
	17:06	20	15:57 (WEA 2)				19:55	15	19:24 (WEA 4)	20:50	48	20:19 (WEA 5)	21:37			21:55
30	08:14		15:36 (WEA 2)				07:09		19:06 (WEA 4)	05:59		19:06 (WEA 4)	05:12			05:06
	17:08	24	16:00 (WEA 2)				19:57	21	19:27 (WEA 4)	20:51	40	20:20 (WEA 5)	21:38			21:55
31	08:13		15:35 (WEA 2)				07:06		19:02 (WEA 4)				05:11			
	17:10	26	16:01 (WEA 2)				19:59	27	19:29 (WEA 4)				21:39			
Sonnenscheinstunden	255			276			367			418			489			503
astr.max.mögl.Beschattung		746			853			422			1371			715		

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-08 - SR-08, Südmark 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November			Dezember		
1	05:07			05:45		19:55 (WEA 5)	06:36		18:48 (WEA 4)	07:27		17:35 (WEA 3)	07:23		14:59 (WEA 2)	08:15		13:49 (WEA 1)
	21:55			21:22	34	20:29 (WEA 5)	20:18	47	19:35 (WEA 4)	19:07	26	18:01 (WEA 3)	16:59	40	15:39 (WEA 2)	16:17	33	14:22 (WEA 1)
2	05:08			05:46		19:55 (WEA 5)	06:38		18:48 (WEA 4)	07:29		17:34 (WEA 3)	07:25		14:59 (WEA 2)	08:17		13:50 (WEA 1)
	21:55			21:20	35	20:30 (WEA 5)	20:16	47	19:35 (WEA 4)	19:04	26	18:00 (WEA 3)	16:57	39	15:38 (WEA 2)	16:16	33	14:23 (WEA 1)
3	05:08			05:48		19:54 (WEA 5)	06:40		18:48 (WEA 4)	07:31		17:33 (WEA 3)	07:26		14:59 (WEA 2)	08:18		13:50 (WEA 1)
	21:54			21:18	36	20:30 (WEA 5)	20:13	46	19:34 (WEA 4)	19:02	27	18:00 (WEA 3)	16:55	39	15:38 (WEA 2)	16:16	34	14:24 (WEA 1)
4	05:09			05:50		19:55 (WEA 5)	06:41		18:48 (WEA 4)	07:32		17:33 (WEA 3)	07:28		14:59 (WEA 2)	08:20		13:50 (WEA 1)
	21:54			21:17	36	20:31 (WEA 5)	20:11	45	19:33 (WEA 4)	19:00	27	18:00 (WEA 3)	16:53	39	15:38 (WEA 2)	16:15	34	14:24 (WEA 1)
5	05:10			05:51		19:54 (WEA 5)	06:43		18:48 (WEA 4)	07:34		17:33 (WEA 3)	07:30		15:00 (WEA 2)	08:21		13:50 (WEA 1)
	21:53			21:15	36	20:30 (WEA 5)	20:09	44	19:32 (WEA 4)	18:57	27	18:00 (WEA 3)	16:51	37	15:37 (WEA 2)	16:14	34	14:24 (WEA 1)
6	05:11			05:53		19:54 (WEA 5)	06:45		18:48 (WEA 4)	07:36		17:33 (WEA 3)	07:32		15:01 (WEA 2)	08:22		13:51 (WEA 1)
	21:53			21:13	37	20:31 (WEA 5)	20:06	43	19:31 (WEA 4)	18:55	26	17:59 (WEA 3)	16:50	36	15:37 (WEA 2)	16:14	34	14:25 (WEA 1)
7	05:12			05:55		19:53 (WEA 5)	06:46		18:49 (WEA 4)	07:37		17:33 (WEA 3)	07:34		15:01 (WEA 2)	08:24		13:50 (WEA 1)
	21:52			21:11	37	20:30 (WEA 5)	20:04	42	19:31 (WEA 4)	18:53	25	17:58 (WEA 3)	16:48	35	15:36 (WEA 2)	16:14	35	14:25 (WEA 1)
8	05:13			05:56		19:54 (WEA 5)	06:48		18:49 (WEA 4)	07:39		17:34 (WEA 3)	07:36		15:02 (WEA 2)	08:25		13:51 (WEA 1)
	21:51			21:09	36	20:30 (WEA 5)	20:02	40	19:29 (WEA 4)	18:50	23	17:57 (WEA 3)	16:46	33	15:35 (WEA 2)	16:13	35	14:26 (WEA 1)
9	05:14			05:58		19:53 (WEA 5)	06:50		18:50 (WEA 4)	07:41		17:34 (WEA 3)	07:37		15:03 (WEA 2)	08:26		13:52 (WEA 1)
	21:51			21:07	36	20:29 (WEA 5)	19:59	37	19:27 (WEA 4)	18:48	22	17:56 (WEA 3)	16:44	31	15:34 (WEA 2)	16:13	35	14:27 (WEA 1)
10	05:15			05:59		19:54 (WEA 5)	06:52		18:51 (WEA 4)	07:43		17:36 (WEA 3)	07:39		15:04 (WEA 2)	08:27		13:52 (WEA 1)
	21:50			21:05	36	20:30 (WEA 5)	19:57	35	19:26 (WEA 4)	18:46	18	17:54 (WEA 3)	16:43	29	15:33 (WEA 2)	16:13	35	14:27 (WEA 1)
11	05:16			06:01		19:54 (WEA 5)	06:53		18:52 (WEA 4)	07:45		17:37 (WEA 3)	07:41		15:06 (WEA 2)	08:28		13:52 (WEA 1)
	21:49			21:03	36	20:30 (WEA 5)	19:55	32	19:24 (WEA 4)	18:43	15	17:52 (WEA 3)	16:41	26	15:32 (WEA 2)	16:12	35	14:27 (WEA 1)
12	05:17			06:03		19:54 (WEA 5)	06:55		18:54 (WEA 4)	07:46		17:39 (WEA 3)	07:43		15:07 (WEA 2)	08:29		13:52 (WEA 1)
	21:48			21:01	34	20:28 (WEA 5)	19:52	28	19:22 (WEA 4)	18:41	9	17:48 (WEA 3)	16:40	24	15:31 (WEA 2)	16:12	35	14:27 (WEA 1)
13	05:18			06:04		19:13 (WEA 4)	06:57		18:55 (WEA 4)	07:48			07:45		15:09 (WEA 2)	08:30		13:53 (WEA 1)
	21:47			20:59	42	20:28 (WEA 5)	19:50	23	19:18 (WEA 4)	18:39			16:38	20	15:29 (WEA 2)	16:12	35	14:28 (WEA 1)
14	05:19			06:06		19:08 (WEA 4)	06:58		18:59 (WEA 4)	07:50			07:47		15:12 (WEA 2)	08:31		13:53 (WEA 1)
	21:46			20:57	50	20:27 (WEA 5)	19:47	16	19:15 (WEA 4)	18:37			16:36	15	15:27 (WEA 2)	16:12	35	14:28 (WEA 1)
15	05:21			06:08		19:05 (WEA 4)	07:00			07:52			07:48		15:16 (WEA 2)	08:32		13:54 (WEA 1)
	21:45			20:55	53	20:26 (WEA 5)	19:45			18:34			16:35	7	15:23 (WEA 2)	16:12	35	14:29 (WEA 1)
16	05:22			06:09		19:03 (WEA 4)	07:02			07:53			07:50			08:33		13:54 (WEA 1)
	21:44			20:53	55	20:24 (WEA 5)	19:43			18:32			16:33			16:12	36	14:30 (WEA 1)
17	05:23			06:11		19:01 (WEA 4)	07:03			07:55		16:14 (WEA 2)	07:52			08:34		13:55 (WEA 1)
	21:43			20:51	55	20:22 (WEA 5)	19:40			18:30	15	16:29 (WEA 2)	16:32			16:12	35	14:30 (WEA 1)
18	05:24			06:13		19:00 (WEA 4)	07:05			07:57		16:11 (WEA 2)	07:54			08:35		13:55 (WEA 1)
	21:42			20:49	55	20:21 (WEA 5)	19:38			18:28	21	16:32 (WEA 2)	16:31			16:13	36	14:31 (WEA 1)
19	05:26		20:10 (WEA 5)	06:14		18:58 (WEA 4)	07:07			07:59		16:08 (WEA 2)	07:56		14:00 (WEA 1)	08:35		13:55 (WEA 1)
	21:41	4	20:14 (WEA 5)	20:47	53	20:18 (WEA 5)	19:35			18:26	26	16:34 (WEA 2)	16:29	5	14:05 (WEA 1)	16:13	36	14:31 (WEA 1)
20	05:27		20:07 (WEA 5)	06:16		18:57 (WEA 4)	07:08			08:01		16:06 (WEA 2)	07:57		13:56 (WEA 1)	08:36		13:56 (WEA 1)
	21:40	12	20:19 (WEA 5)	20:45	52	20:17 (WEA 5)	19:33			18:23	28	16:34 (WEA 2)	16:28	13	14:09 (WEA 1)	16:13	36	14:32 (WEA 1)
21	05:28		20:05 (WEA 5)	06:18		18:55 (WEA 4)	07:10			08:02		16:04 (WEA 2)	07:59		13:55 (WEA 1)	08:37		13:56 (WEA 1)
	21:38	15	20:20 (WEA 5)	20:43	42	20:10 (WEA 5)	19:31			18:21	31	16:35 (WEA 2)	16:27	16	14:11 (WEA 1)	16:14	35	14:31 (WEA 1)
22	05:30		20:03 (WEA 5)	06:20		18:54 (WEA 4)	07:12			08:04		16:03 (WEA 2)	08:01		13:53 (WEA 1)	08:37		13:57 (WEA 1)
	21:37	19	20:22 (WEA 5)	20:40	42	19:36 (WEA 4)	19:28			18:19	33	16:36 (WEA 2)	16:26	20	14:13 (WEA 1)	16:14	35	14:32 (WEA 1)
23	05:31		20:03 (WEA 5)	06:21		18:53 (WEA 4)	07:13			08:06		16:02 (WEA 2)	08:02		13:53 (WEA 1)	08:38		13:57 (WEA 1)
	21:36	21	20:24 (WEA 5)	20:38	43	19:36 (WEA 4)	19:26			18:17	35	16:37 (WEA 2)	16:24	22	14:15 (WEA 1)	16:15	35	14:32 (WEA 1)
24	05:33		20:01 (WEA 5)	06:23		18:52 (WEA 4)	07:15			08:08		16:01 (WEA 2)	08:04		13:51 (WEA 1)	08:38		13:58 (WEA 1)
	21:34	24	20:25 (WEA 5)	20:36	44	19:36 (WEA 4)	19:23			18:15	37	16:38 (WEA 2)	16:23	24	14:15 (WEA 1)	16:15	36	14:34 (WEA 1)
25	05:34		20:00 (WEA 5)	06:25		18:52 (WEA 4)	07:17			07:10		15:00 (WEA 2)	08:06		13:51 (WEA 1)	08:39		13:58 (WEA 1)
	21:33	25	20:25 (WEA 5)	20:34	45	19:37 (WEA 4)	19:21			17:13	38	15:38 (WEA 2)	16:22	26	14:17 (WEA 1)	16:16	36	14:34 (WEA 1)
26	05:36		20:00 (WEA 5)	06:26		18:50 (WEA 4)	07:19		17:44 (WEA 3)	07:12		15:00 (WEA 2)	08:07		13:50 (WEA 1)	08:39		13:59 (WEA 1)
	21:31	27	20:27 (WEA 5)	20:32	46	19:36 (WEA 4)	19:19	11	17:55 (WEA 3)	17:11	38	15:38 (WEA 2)	16:21	28	14:18 (WEA 1)	16:17	35	14:34 (WEA 1)
27	05:37		19:58 (WEA 5)	06:28		18:50 (WEA 4)	07:20		17:41 (WEA 3)	07:13		14:59 (WEA 2)	08:09		13:50 (WEA 1)	08:39		13:59 (WEA 1)
	21:30	29	20:27 (WEA 5)	20:29	47	19:37 (WEA 4)	19:16	17	17:58 (WEA 3)	17:09	40	15:39 (WEA 2)	16:20	29	14:19 (WEA 1)	16:17	35	14:34 (WEA 1)
28	05:39		19:58 (WEA 5)	06:30		18:50 (WEA 4)	07:22		17:39 (WEA 3)	07:15		14:59 (WEA 2)	08:11		13:49 (WEA 1)	08:39		13:59 (WEA 1)
	21:28	30	20:28 (WEA 5)	20:27	47	19:37 (WEA 4)	19:14	20	17:59 (WEA 3)	17:07	40	15:39 (WEA 2)	16:19	30	14:19 (WEA 1)	16:18	36	14:35 (WEA 1)
29	05:40		19:57 (WEA 5)	06:31		18:49 (WEA 4)	07:24		17:37 (WEA 3)	07:17		14:59 (WEA 2)	08:12		13:50 (WEA 1)	08:39		14:00 (WEA 1)
	21:27	32	20:29 (WEA 5)	20:25	47	19:36 (WEA 4)	19:12	22	17:59 (WEA 3)	17:05	40	15:39 (WEA 2)	16:19	30	14:20 (WEA 1)	16:19	35	14:35 (WEA 1)
30	05:42		19:56 (WEA 5)	06:33		18:49 (WEA 4)	07:25		17:36 (WEA 3)	07:19		14:58 (WEA 2)	08:14		13:50 (WEA 1)	08:40		14:00 (WEA 1)
	21:25	33	20:29 (WEA 5)	20:23	47	19:36 (WEA 4)	19:09	24	18:00 (WEA 3)	17:03	41	15:39 (WEA 2)	16:18	31	14:21 (WEA 1)	16:20	36	14:36 (WEA 1)
31	05:43		19:56 (WEA 5)	06:35		18:48 (WEA 4)				07:21		14:58 (WEA 2)				08:40		14:01 (WEA 1)
	21:23	34	20:30 (WEA 5)	20:20	47	19:35 (WEA 4)				17:01	41	15:39 (WEA 2)				16:21	35	14:36 (WEA 1)
Sonnenscheinstunden	506			456			381			330			263			240		
astr.max.mögl.Beschattung		305			1341			619			775			724			1085	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-09 - SR-09, Südmark 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai			Juni	
1	08:40		14:07 (WEA 1)	08:11		15:56 (WEA 2)	07:16		15:49 (WEA 2)	07:04			05:57		19:03 (WEA 4)	05:10
	16:22	36	14:43 (WEA 1)	17:11	2	15:58 (WEA 2)	18:05	17	16:06 (WEA 2)	20:00			20:53	58	20:24 (WEA 5)	21:41
2	08:39		14:08 (WEA 1)	08:10		15:50 (WEA 2)	07:14		15:55 (WEA 2)	07:02		19:20 (WEA 4)	05:55		19:04 (WEA 4)	05:10
	16:23	36	14:44 (WEA 1)	17:13	14	16:04 (WEA 2)	18:07	5	16:00 (WEA 2)	20:02	9	19:29 (WEA 4)	20:55	58	20:24 (WEA 5)	21:42
3	08:39		14:08 (WEA 1)	08:08		15:48 (WEA 2)	07:12			06:59		19:14 (WEA 4)	05:53		19:07 (WEA 4)	05:09
	16:24	36	14:44 (WEA 1)	17:15	20	16:08 (WEA 2)	18:08			20:04	19	19:33 (WEA 4)	20:57	55	20:26 (WEA 5)	21:43
4	08:39		14:08 (WEA 1)	08:06		15:46 (WEA 2)	07:10			06:57		19:11 (WEA 4)	05:52		19:09 (WEA 4)	05:08
	16:26	37	14:45 (WEA 1)	17:17	24	16:10 (WEA 2)	18:10			20:06	25	19:36 (WEA 4)	20:58	50	20:26 (WEA 5)	21:44
5	08:39		14:08 (WEA 1)	08:05		15:44 (WEA 2)	07:07			06:55		19:09 (WEA 4)	05:50		19:13 (WEA 4)	05:07
	16:27	37	14:45 (WEA 1)	17:19	27	16:11 (WEA 2)	18:12			20:08	29	19:38 (WEA 4)	21:00	43	20:26 (WEA 5)	21:45
6	08:38		14:09 (WEA 1)	08:03		15:43 (WEA 2)	07:05		17:13 (WEA 3)	06:52		19:06 (WEA 4)	05:48		19:51 (WEA 5)	05:07
	16:28	37	14:46 (WEA 1)	17:21	30	16:13 (WEA 2)	18:14	11	17:24 (WEA 3)	20:09	33	19:39 (WEA 4)	21:02	35	20:26 (WEA 5)	21:46
7	08:38		14:09 (WEA 1)	08:01		15:42 (WEA 2)	07:03		17:09 (WEA 3)	06:50		19:05 (WEA 4)	05:46		19:51 (WEA 5)	05:06
	16:29	37	14:46 (WEA 1)	17:23	32	16:14 (WEA 2)	18:16	17	17:26 (WEA 3)	20:11	36	19:41 (WEA 4)	21:03	35	20:26 (WEA 5)	21:47
8	08:37		14:10 (WEA 1)	07:59		15:41 (WEA 2)	07:00		17:08 (WEA 3)	06:48		19:04 (WEA 4)	05:44		19:51 (WEA 5)	05:05
	16:31	37	14:47 (WEA 1)	17:25	34	16:15 (WEA 2)	18:18	20	17:28 (WEA 3)	20:13	38	19:42 (WEA 4)	21:05	36	20:27 (WEA 5)	21:48
9	08:37		14:11 (WEA 1)	07:58		15:40 (WEA 2)	06:58		17:07 (WEA 3)	06:45		19:02 (WEA 4)	05:42		19:51 (WEA 5)	05:05
	16:32	36	14:47 (WEA 1)	17:27	36	16:16 (WEA 2)	18:19	22	17:29 (WEA 3)	20:15	40	19:42 (WEA 4)	21:07	36	20:27 (WEA 5)	21:49
10	08:36		14:11 (WEA 1)	07:56		15:39 (WEA 2)	06:56		17:05 (WEA 3)	06:43		19:01 (WEA 4)	05:40		19:51 (WEA 5)	05:04
	16:34	36	14:47 (WEA 1)	17:29	37	16:16 (WEA 2)	18:21	24	17:29 (WEA 3)	20:16	42	19:43 (WEA 4)	21:09	36	20:27 (WEA 5)	21:50
11	08:36		14:11 (WEA 1)	07:54		15:39 (WEA 2)	06:54		17:04 (WEA 3)	06:41		19:00 (WEA 4)	05:39		19:51 (WEA 5)	05:04
	16:35	36	14:47 (WEA 1)	17:31	38	16:17 (WEA 2)	18:23	26	17:30 (WEA 3)	20:18	43	19:43 (WEA 4)	21:10	36	20:27 (WEA 5)	21:50
12	08:35		14:13 (WEA 1)	07:52		15:38 (WEA 2)	06:51		17:03 (WEA 3)	06:38		18:59 (WEA 4)	05:37		19:50 (WEA 5)	05:04
	16:37	35	14:48 (WEA 1)	17:33	40	16:18 (WEA 2)	18:25	27	17:30 (WEA 3)	20:20	45	19:44 (WEA 4)	21:12	36	20:26 (WEA 5)	21:51
13	08:34		14:13 (WEA 1)	07:50		15:38 (WEA 2)	06:49		17:03 (WEA 3)	06:36		18:58 (WEA 4)	05:35		19:51 (WEA 5)	05:03
	16:38	35	14:48 (WEA 1)	17:34	40	16:18 (WEA 2)	18:27	27	17:30 (WEA 3)	20:22	45	19:43 (WEA 4)	21:13	36	20:27 (WEA 5)	21:52
14	08:34		14:14 (WEA 1)	07:48		15:38 (WEA 2)	06:46		17:03 (WEA 3)	06:34		18:57 (WEA 4)	05:34		19:51 (WEA 5)	05:03
	16:40	34	14:48 (WEA 1)	17:36	40	16:18 (WEA 2)	18:29	27	17:30 (WEA 3)	20:23	47	19:44 (WEA 4)	21:15	35	20:26 (WEA 5)	21:52
15	08:33		14:14 (WEA 1)	07:46		15:38 (WEA 2)	06:44		17:02 (WEA 3)	06:32		18:57 (WEA 4)	05:32		19:52 (WEA 5)	05:03
	16:41	35	14:49 (WEA 1)	17:38	41	16:19 (WEA 2)	18:30	27	17:29 (WEA 3)	20:25	47	19:44 (WEA 4)	21:17	34	20:26 (WEA 5)	21:53
16	08:32		14:14 (WEA 1)	07:44		15:38 (WEA 2)	06:42		17:03 (WEA 3)	06:29		18:57 (WEA 4)	05:30		19:51 (WEA 5)	05:03
	16:43	34	14:48 (WEA 1)	17:40	41	16:19 (WEA 2)	18:32	26	17:29 (WEA 3)	20:27	47	19:44 (WEA 4)	21:18	34	20:25 (WEA 5)	21:53
17	08:31		14:15 (WEA 1)	07:42		15:38 (WEA 2)	06:39		17:04 (WEA 3)	06:27		18:57 (WEA 4)	05:29		19:52 (WEA 5)	05:03
	16:44	33	14:48 (WEA 1)	17:42	41	16:19 (WEA 2)	18:34	25	17:29 (WEA 3)	20:29	47	19:44 (WEA 4)	21:20	33	20:25 (WEA 5)	21:54
18	08:30		14:16 (WEA 1)	07:40		15:38 (WEA 2)	06:37		17:04 (WEA 3)	06:25		18:56 (WEA 4)	05:27		19:53 (WEA 5)	05:03
	16:46	32	14:48 (WEA 1)	17:44	41	16:19 (WEA 2)	18:36	23	17:27 (WEA 3)	20:30	47	19:43 (WEA 4)	21:21	32	20:25 (WEA 5)	21:54
19	08:29		14:17 (WEA 1)	07:38		15:38 (WEA 2)	06:35		17:05 (WEA 3)	06:23		18:56 (WEA 4)	05:26		19:53 (WEA 5)	05:03
	16:48	31	14:48 (WEA 1)	17:46	41	16:19 (WEA 2)	18:37	21	17:26 (WEA 3)	20:32	47	19:43 (WEA 4)	21:23	31	20:24 (WEA 5)	21:55
20	08:28		14:19 (WEA 1)	07:36		15:38 (WEA 2)	06:32		17:05 (WEA 3)	06:20		18:56 (WEA 4)	05:24		19:54 (WEA 5)	05:03
	16:50	29	14:48 (WEA 1)	17:48	40	16:18 (WEA 2)	18:39	19	17:24 (WEA 3)	20:34	46	19:42 (WEA 4)	21:24	30	20:24 (WEA 5)	21:55
21	08:27		14:19 (WEA 1)	07:34		15:39 (WEA 2)	06:30		17:08 (WEA 3)	06:18		18:56 (WEA 4)	05:23		19:55 (WEA 5)	05:03
	16:51	28	14:47 (WEA 1)	17:50	39	16:18 (WEA 2)	18:41	14	17:22 (WEA 3)	20:36	46	19:42 (WEA 4)	21:26	28	20:23 (WEA 5)	21:55
22	08:25		14:21 (WEA 1)	07:32		15:39 (WEA 2)	06:28		17:11 (WEA 3)	06:16		18:56 (WEA 4)	05:22		19:56 (WEA 5)	05:03
	16:53	25	14:46 (WEA 1)	17:52	38	16:17 (WEA 2)	18:43	7	17:18 (WEA 3)	20:37	46	19:42 (WEA 4)	21:27	27	20:23 (WEA 5)	21:56
23	08:24		14:22 (WEA 1)	07:29		15:40 (WEA 2)	06:25			06:14		18:57 (WEA 4)	05:20		19:56 (WEA 5)	05:03
	16:55	24	14:46 (WEA 1)	17:53	37	16:17 (WEA 2)	18:45			20:39	44	19:41 (WEA 4)	21:29	26	20:22 (WEA 5)	21:56
24	08:23		14:23 (WEA 1)	07:27		15:41 (WEA 2)	06:23			06:12		18:57 (WEA 4)	05:19		19:57 (WEA 5)	05:04
	16:57	22	14:45 (WEA 1)	17:55	35	16:16 (WEA 2)	18:46			20:41	43	19:40 (WEA 4)	21:30	24	20:21 (WEA 5)	21:56
25	08:22		14:26 (WEA 1)	07:25		15:42 (WEA 2)	06:20			06:10		18:57 (WEA 4)	05:18		19:58 (WEA 5)	05:04
	16:58	18	14:44 (WEA 1)	17:57	32	16:14 (WEA 2)	18:48			20:43	43	19:40 (WEA 4)	21:32	22	20:20 (WEA 5)	21:56
26	08:20		14:28 (WEA 1)	07:23		15:43 (WEA 2)	06:18			06:08		18:58 (WEA 4)	05:17		19:59 (WEA 5)	05:04
	17:00	13	14:41 (WEA 1)	17:59	30	16:13 (WEA 2)	18:50			20:44	53	20:16 (WEA 5)	21:33	20	20:19 (WEA 5)	21:56
27	08:19		14:34 (WEA 1)	07:21		15:45 (WEA 2)	06:16			06:06		18:59 (WEA 4)	05:16		20:01 (WEA 5)	05:05
	17:02	3	14:37 (WEA 1)	18:01	26	16:11 (WEA 2)	18:52			20:46	56	20:18 (WEA 5)	21:34	17	20:18 (WEA 5)	21:56
28	08:17			07:19		15:47 (WEA 2)	06:13			06:03		19:00 (WEA 4)	05:14		20:02 (WEA 5)	05:05
	17:04			18:03	23	16:10 (WEA 2)	18:53			20:48	57	20:19 (WEA 5)	21:36	15	20:17 (WEA 5)	21:56
29	08:16						07:11			06:01		19:00 (WEA 4)	05:13		20:04 (WEA 5)	05:06
	17:06						19:55			20:50	59	20:21 (WEA 5)	21:37	11	20:15 (WEA 5)	21:55
30	08:14						07:09			05:59		19:01 (WEA 4)	05:12		20:06 (WEA 5)	05:06
	17:08						19:57			20:51	59	20:22 (WEA 5)	21:38	7	20:13 (WEA 5)	21:55
31	08:13						07:06						05:11			
	17:10						19:59						21:39			
Sonnenscheinstunden		255			276			367			418			489			503
astr.max.mögl.Beschattung			832			919			385			1238			976		

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-09 - SR-09, Südmark 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November			Dezember		
1	05:07			05:45		20:01 (WEA 5)	06:36		18:59 (WEA 4)	07:27		17:43 (WEA 3)	07:23		15:09 (WEA 2)	08:15		13:53 (WEA 1)
	21:55			21:22	36	20:37 (WEA 5)	20:18	43	19:42 (WEA 4)	19:07	27	18:10 (WEA 3)	16:59	37	15:46 (WEA 2)	16:17	36	14:29 (WEA 1)
2	05:08			05:46		20:01 (WEA 5)	06:38		19:00 (WEA 4)	07:29		17:42 (WEA 3)	07:25		15:10 (WEA 2)	08:17		13:54 (WEA 1)
	21:55			21:20	36	20:37 (WEA 5)	20:16	42	19:42 (WEA 4)	19:04	26	18:08 (WEA 3)	16:57	35	15:45 (WEA 2)	16:16	36	14:30 (WEA 1)
3	05:08			05:48		20:01 (WEA 5)	06:40		19:00 (WEA 4)	07:31		17:43 (WEA 3)	07:26		15:11 (WEA 2)	08:18		13:55 (WEA 1)
	21:54			21:18	36	20:37 (WEA 5)	20:13	40	19:40 (WEA 4)	19:02	25	18:08 (WEA 3)	16:55	33	15:44 (WEA 2)	16:16	36	14:31 (WEA 1)
4	05:09			05:50		20:01 (WEA 5)	06:41		19:01 (WEA 4)	07:32		17:43 (WEA 3)	07:28		15:12 (WEA 2)	08:20		13:55 (WEA 1)
	21:54			21:17	36	20:37 (WEA 5)	20:11	38	19:39 (WEA 4)	19:00	24	18:07 (WEA 3)	16:53	31	15:43 (WEA 2)	16:15	36	14:31 (WEA 1)
5	05:10			05:51		20:01 (WEA 5)	06:43		19:01 (WEA 4)	07:34		17:44 (WEA 3)	07:30		15:13 (WEA 2)	08:21		13:54 (WEA 1)
	21:53			21:15	35	20:36 (WEA 5)	20:09	36	19:37 (WEA 4)	18:57	22	18:06 (WEA 3)	16:51	29	15:42 (WEA 2)	16:14	37	14:31 (WEA 1)
6	05:11			05:53		20:01 (WEA 5)	06:45		19:02 (WEA 4)	07:36		17:46 (WEA 3)	07:32		15:14 (WEA 2)	08:22		13:55 (WEA 1)
	21:53			21:13	36	20:37 (WEA 5)	20:06	33	19:35 (WEA 4)	18:55	18	18:04 (WEA 3)	16:50	27	15:41 (WEA 2)	16:14	37	14:32 (WEA 1)
7	05:12			05:55		20:01 (WEA 5)	06:46		19:04 (WEA 4)	07:37		17:47 (WEA 3)	07:34		15:16 (WEA 2)	08:24		13:55 (WEA 1)
	21:52			21:11	35	20:36 (WEA 5)	20:04	30	19:34 (WEA 4)	18:53	14	18:01 (WEA 3)	16:48	23	15:39 (WEA 2)	16:14	37	14:32 (WEA 1)
8	05:13			05:56		19:21 (WEA 4)	06:48		19:05 (WEA 4)	07:39		17:50 (WEA 3)	07:36		15:18 (WEA 2)	08:25		13:57 (WEA 1)
	21:51			21:09	47	20:36 (WEA 5)	20:02	26	19:31 (WEA 4)	18:50	7	17:57 (WEA 3)	16:46	19	15:37 (WEA 2)	16:13	36	14:33 (WEA 1)
9	05:14			05:58		19:17 (WEA 4)	06:50		19:08 (WEA 4)	07:41			07:37		15:21 (WEA 2)	08:26		13:57 (WEA 1)
	21:51			21:07	52	20:34 (WEA 5)	19:59	20	19:28 (WEA 4)	18:48			16:44	13	15:34 (WEA 2)	16:13	36	14:33 (WEA 1)
10	05:15			05:59		19:15 (WEA 4)	06:52		19:12 (WEA 4)	07:43			07:39			08:27		13:57 (WEA 1)
	21:50			21:05	55	20:34 (WEA 5)	19:57	11	19:23 (WEA 4)	18:46			16:43			16:13	36	14:33 (WEA 1)
11	05:16			06:01		19:13 (WEA 4)	06:53			07:45			07:41			08:28		13:57 (WEA 1)
	21:49			21:03	59	20:34 (WEA 5)	19:55			18:43			16:41			16:12	37	14:34 (WEA 1)
12	05:17			06:03		19:11 (WEA 4)	06:55			07:46		16:25 (WEA 2)	07:43			08:29		13:58 (WEA 1)
	21:48			21:01	59	20:32 (WEA 5)	19:52			18:41	12	16:37 (WEA 2)	16:40			16:12	36	14:34 (WEA 1)
13	05:18			06:04		19:10 (WEA 4)	06:57			07:48		16:21 (WEA 2)	07:45			08:30		13:58 (WEA 1)
	21:47			20:59	59	20:31 (WEA 5)	19:50			18:39	19	16:40 (WEA 2)	16:38			16:12	36	14:34 (WEA 1)
14	05:19		20:13 (WEA 5)	06:06		19:08 (WEA 4)	06:58			07:50		16:18 (WEA 2)	07:47			08:31		13:59 (WEA 1)
	21:46	10	20:23 (WEA 5)	20:57	58	20:28 (WEA 5)	19:47			18:37	25	16:43 (WEA 2)	16:36			16:12	36	14:35 (WEA 1)
15	05:21		20:12 (WEA 5)	06:08		19:07 (WEA 4)	07:00			07:52		16:16 (WEA 2)	07:48		14:05 (WEA 1)	08:32		13:59 (WEA 1)
	21:45	14	20:26 (WEA 5)	20:55	57	20:27 (WEA 5)	19:45			18:34	28	16:44 (WEA 2)	16:35	4	14:09 (WEA 1)	16:12	36	14:35 (WEA 1)
16	05:22		20:11 (WEA 5)	06:09		19:05 (WEA 4)	07:02			07:53		16:15 (WEA 2)	07:50		14:01 (WEA 1)	08:33		14:00 (WEA 1)
	21:44	16	20:27 (WEA 5)	20:53	56	20:24 (WEA 5)	19:43			18:32	31	16:46 (WEA 2)	16:33	13	14:14 (WEA 1)	16:12	36	14:36 (WEA 1)
17	05:23		20:09 (WEA 5)	06:11		19:04 (WEA 4)	07:03			07:55		16:13 (WEA 2)	07:52		13:59 (WEA 1)	08:34		14:00 (WEA 1)
	21:43	19	20:28 (WEA 5)	20:51	52	20:22 (WEA 5)	19:40			18:30	34	16:47 (WEA 2)	16:32	18	14:17 (WEA 1)	16:12	36	14:36 (WEA 1)
18	05:24		20:08 (WEA 5)	06:13		19:04 (WEA 4)	07:05			07:57		16:12 (WEA 2)	07:54		13:57 (WEA 1)	08:35		14:01 (WEA 1)
	21:42	21	20:29 (WEA 5)	20:49	42	19:46 (WEA 4)	19:38			18:28	35	16:47 (WEA 2)	16:31	22	14:19 (WEA 1)	16:13	36	14:37 (WEA 1)
19	05:26		20:07 (WEA 5)	06:14		19:03 (WEA 4)	07:07			07:59		16:11 (WEA 2)	07:56		13:56 (WEA 1)	08:35		14:01 (WEA 1)
	21:41	23	20:30 (WEA 5)	20:47	43	19:46 (WEA 4)	19:35			18:26	37	16:48 (WEA 2)	16:29	24	14:20 (WEA 1)	16:13	36	14:37 (WEA 1)
20	05:27		20:07 (WEA 5)	06:16		19:02 (WEA 4)	07:08			08:01		16:09 (WEA 2)	07:57		13:56 (WEA 1)	08:36		14:02 (WEA 1)
	21:40	25	20:32 (WEA 5)	20:45	45	19:47 (WEA 4)	19:33			18:23	39	16:48 (WEA 2)	16:28	25	14:21 (WEA 1)	16:13	36	14:38 (WEA 1)
21	05:28		20:06 (WEA 5)	06:18		19:01 (WEA 4)	07:10			08:02		16:09 (WEA 2)	07:59		13:55 (WEA 1)	08:37		14:02 (WEA 1)
	21:38	26	20:32 (WEA 5)	20:43	45	19:46 (WEA 4)	19:31			18:21	39	16:48 (WEA 2)	16:27	28	14:23 (WEA 1)	16:14	36	14:38 (WEA 1)
22	05:30		20:05 (WEA 5)	06:20		19:01 (WEA 4)	07:12		17:53 (WEA 3)	08:04		16:08 (WEA 2)	08:01		13:55 (WEA 1)	08:37		14:03 (WEA 1)
	21:37	28	20:33 (WEA 5)	20:40	46	19:47 (WEA 4)	19:28	12	18:05 (WEA 3)	18:19	40	16:48 (WEA 2)	16:26	29	14:24 (WEA 1)	16:14	35	14:38 (WEA 1)
23	05:31		20:05 (WEA 5)	06:21		19:00 (WEA 4)	07:13		17:51 (WEA 3)	08:06		16:08 (WEA 2)	08:02		13:54 (WEA 1)	08:38		14:03 (WEA 1)
	21:36	29	20:34 (WEA 5)	20:38	47	19:47 (WEA 4)	19:26	17	18:08 (WEA 3)	18:17	41	16:49 (WEA 2)	16:24	31	14:25 (WEA 1)	16:15	36	14:39 (WEA 1)
24	05:33		20:04 (WEA 5)	06:23		18:59 (WEA 4)	07:15		17:49 (WEA 3)	08:08		16:07 (WEA 2)	08:04		13:53 (WEA 1)	08:38		14:04 (WEA 1)
	21:34	30	20:34 (WEA 5)	20:36	47	19:46 (WEA 4)	19:23	20	18:09 (WEA 3)	18:15	42	16:49 (WEA 2)	16:23	32	14:25 (WEA 1)	16:15	36	14:40 (WEA 1)
25	05:34		20:03 (WEA 5)	06:25		18:59 (WEA 4)	07:17		17:47 (WEA 3)	07:10		15:07 (WEA 2)	08:06		13:53 (WEA 1)	08:39		14:04 (WEA 1)
	21:33	32	20:35 (WEA 5)	20:34	48	19:47 (WEA 4)	19:21	22	18:09 (WEA 3)	17:13	42	15:49 (WEA 2)	16:22	33	14:26 (WEA 1)	16:16	36	14:40 (WEA 1)
26	05:36		20:03 (WEA 5)	06:26		18:59 (WEA 4)	07:19		17:46 (WEA 3)	07:12		15:07 (WEA 2)	08:07		13:53 (WEA 1)	08:39		14:04 (WEA 1)
	21:31	33	20:36 (WEA 5)	20:32	47	19:46 (WEA 4)	19:19	24	18:10 (WEA 3)	17:11	41	15:48 (WEA 2)	16:21	34	14:27 (WEA 1)	16:17	36	14:40 (WEA 1)
27	05:37		20:02 (WEA 5)	06:28		18:59 (WEA 4)	07:20		17:45 (WEA 3)	07:13		15:07 (WEA 2)	08:09		13:54 (WEA 1)	08:39		14:05 (WEA 1)
	21:30	34	20:36 (WEA 5)	20:29	47	19:46 (WEA 4)	19:16	26	18:11 (WEA 3)	17:09	41	15:48 (WEA 2)	16:20	34	14:28 (WEA 1)	16:17	36	14:41 (WEA 1)
28	05:39		20:03 (WEA 5)	06:30		18:59 (WEA 4)	07:22		17:44 (WEA 3)	07:15		15:07 (WEA 2)	08:11		13:53 (WEA 1)	08:39		14:05 (WEA 1)
	21:28	34	20:37 (WEA 5)	20:27	47	19:46 (WEA 4)	19:14	27	18:11 (WEA 3)	17:07	41	15:48 (WEA 2)	16:19	34	14:27 (WEA 1)	16:18	36	14:41 (WEA 1)
29	05:40		20:02 (WEA 5)	06:31		18:58 (WEA 4)	07:24		17:43 (WEA 3)	07:17		15:08 (WEA 2)	08:12		13:53 (WEA 1)	08:39		14:05 (WEA 1)
	21:27	35	20:37 (WEA 5)	20:25	46	19:44 (WEA 4)	19:12	27	18:10 (WEA 3)	17:05	40	15:48 (WEA 2)	16:19	35	14:28 (WEA 1)	16:19	36	14:41 (WEA 1)
30	05:42		20:01 (WEA 5)	06:33		18:59 (WEA 4)	07:25		17:43 (WEA 3)	07:19		15:08 (WEA 2)	08:14		13:54 (WEA 1)	08:40		14:06 (WEA 1)
	21:25	35	20:36 (WEA 5)	20:23	45	19:44 (WEA 4)	19:09	27	18:10 (WEA 3)	17:03	39	15:47 (WEA 2)	16:18	35	14:29 (WEA 1)	16:20	36	14:42 (WEA 1)
31	05:43		20:01 (WEA 5)	06:35		18:58 (WEA 4)				07:21		15:08 (WEA 2)				08:40		14:06 (WEA 1)
	21:23	36	20:37 (WEA 5)	20:20	45	19:43 (WEA 4)				17:01	39	15:47 (WEA 2)				16:21	37	14:43 (WEA 1)
Sonnenscheinstunden	506			456			381			330			263			240		
astr.mögl.Beschattung		480			1444			521			868			678			1120	

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-10 - SR-10, Südmark 2a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai			Juni		
1	08:40		14:06 (WEA 1)	08:11			07:16		15:46 (WEA 2)	07:04			05:57		19:02 (WEA 4)	05:10		20:06 (WEA 5)
	16:22	37	14:43 (WEA 1)	17:11			18:05	25	16:11 (WEA 2)	20:00			20:53	62	20:24 (WEA 5)	21:41	14	20:20 (WEA 5)
2	08:39		14:07 (WEA 1)	08:10			07:14		15:49 (WEA 2)	07:02			05:55		19:03 (WEA 4)	05:10		20:08 (WEA 5)
	16:23	37	14:44 (WEA 1)	17:13			18:07	19	16:08 (WEA 2)	20:02			20:55	61	20:25 (WEA 5)	21:42	11	20:19 (WEA 5)
3	08:39		14:07 (WEA 1)	08:08		15:52 (WEA 2)	07:12		15:53 (WEA 2)	06:59			05:53		19:05 (WEA 4)	05:09		20:10 (WEA 5)
	16:24	37	14:44 (WEA 1)	17:15	13	16:05 (WEA 2)	18:08	12	16:05 (WEA 2)	20:04			20:57	62	20:27 (WEA 5)	21:43	6	20:16 (WEA 5)
4	08:39		14:07 (WEA 1)	08:06		15:49 (WEA 2)	07:10			06:57		19:20 (WEA 4)	05:52		19:06 (WEA 4)	05:08		
	16:26	38	14:45 (WEA 1)	17:17	19	16:08 (WEA 2)	18:10			20:06	13	19:33 (WEA 4)	20:58	61	20:28 (WEA 5)	21:44		
5	08:39		14:07 (WEA 1)	08:05		15:47 (WEA 2)	07:07			06:55		19:16 (WEA 4)	05:50		19:08 (WEA 4)	05:07		
	16:27	37	14:44 (WEA 1)	17:19	23	16:10 (WEA 2)	18:12			20:08	21	19:37 (WEA 4)	21:00	58	20:28 (WEA 5)	21:45		
6	08:38		14:08 (WEA 1)	08:03		15:45 (WEA 2)	07:05			06:52		19:13 (WEA 4)	05:48		19:10 (WEA 4)	05:07		
	16:28	37	14:45 (WEA 1)	17:21	27	16:12 (WEA 2)	18:14			20:09	26	19:39 (WEA 4)	21:02	54	20:28 (WEA 5)	21:46		
7	08:38		14:08 (WEA 1)	08:01		15:44 (WEA 2)	07:03		17:15 (WEA 3)	06:50		19:11 (WEA 4)	05:46		19:12 (WEA 4)	05:06		
	16:29	37	14:45 (WEA 1)	17:23	29	16:13 (WEA 2)	18:16	10	17:25 (WEA 3)	20:11	30	19:41 (WEA 4)	21:03	50	20:28 (WEA 5)	21:47		
8	08:37		14:09 (WEA 1)	07:59		15:43 (WEA 2)	07:00		17:12 (WEA 3)	06:48		19:09 (WEA 4)	05:44		19:18 (WEA 4)	05:05		
	16:31	37	14:46 (WEA 1)	17:25	32	16:15 (WEA 2)	18:18	16	17:28 (WEA 3)	20:13	34	19:43 (WEA 4)	21:05	41	20:29 (WEA 5)	21:48		
9	08:37		14:10 (WEA 1)	07:58		15:42 (WEA 2)	06:58		17:10 (WEA 3)	06:45		19:06 (WEA 4)	05:42		19:53 (WEA 5)	05:05		
	16:32	37	14:47 (WEA 1)	17:27	34	16:16 (WEA 2)	18:19	20	17:30 (WEA 3)	20:15	37	19:43 (WEA 4)	21:07	36	20:29 (WEA 5)	21:49		
10	08:36		14:10 (WEA 1)	07:56		15:41 (WEA 2)	06:56		17:08 (WEA 3)	06:43		19:05 (WEA 4)	05:40		19:54 (WEA 5)	05:04		
	16:34	37	14:47 (WEA 1)	17:29	36	16:17 (WEA 2)	18:21	22	17:30 (WEA 3)	20:16	39	19:44 (WEA 4)	21:09	36	20:30 (WEA 5)	21:50		
11	08:36		14:10 (WEA 1)	07:54		15:40 (WEA 2)	06:54		17:07 (WEA 3)	06:41		19:04 (WEA 4)	05:39		19:53 (WEA 5)	05:04		
	16:35	37	14:47 (WEA 1)	17:31	38	16:18 (WEA 2)	18:23	24	17:31 (WEA 3)	20:18	41	19:45 (WEA 4)	21:10	37	20:30 (WEA 5)	21:50		
12	08:35		14:12 (WEA 1)	07:52		15:39 (WEA 2)	06:51		17:06 (WEA 3)	06:38		19:03 (WEA 4)	05:37		19:53 (WEA 5)	05:04		
	16:37	36	14:48 (WEA 1)	17:33	39	16:18 (WEA 2)	18:25	25	17:31 (WEA 3)	20:20	43	19:46 (WEA 4)	21:12	36	20:29 (WEA 5)	21:51		
13	08:34		14:12 (WEA 1)	07:50		15:39 (WEA 2)	06:49		17:05 (WEA 3)	06:36		19:02 (WEA 4)	05:35		19:53 (WEA 5)	05:03		
	16:38	36	14:48 (WEA 1)	17:34	40	16:19 (WEA 2)	18:27	27	17:32 (WEA 3)	20:22	44	19:46 (WEA 4)	21:13	37	20:30 (WEA 5)	21:52		
14	08:34		14:13 (WEA 1)	07:48		15:39 (WEA 2)	06:46		17:05 (WEA 3)	06:34		19:01 (WEA 4)	05:34		19:53 (WEA 5)	05:03		
	16:40	35	14:48 (WEA 1)	17:36	40	16:19 (WEA 2)	18:29	27	17:32 (WEA 3)	20:23	45	19:46 (WEA 4)	21:15	36	20:29 (WEA 5)	21:52		
15	08:33		14:13 (WEA 1)	07:46		15:38 (WEA 2)	06:44		17:04 (WEA 3)	06:32		19:01 (WEA 4)	05:32		19:54 (WEA 5)	05:03		
	16:41	35	14:48 (WEA 1)	17:38	42	16:20 (WEA 2)	18:30	27	17:31 (WEA 3)	20:25	46	19:47 (WEA 4)	21:17	36	20:30 (WEA 5)	21:53		
16	08:32		14:13 (WEA 1)	07:44		15:38 (WEA 2)	06:42		17:04 (WEA 3)	06:29		19:00 (WEA 4)	05:30		19:53 (WEA 5)	05:03		
	16:43	35	14:48 (WEA 1)	17:40	42	16:20 (WEA 2)	18:32	28	17:32 (WEA 3)	20:27	47	19:47 (WEA 4)	21:18	36	20:29 (WEA 5)	21:53		
17	08:31		14:14 (WEA 1)	07:42		15:38 (WEA 2)	06:39		17:05 (WEA 3)	06:27		19:00 (WEA 4)	05:29		19:54 (WEA 5)	05:03		
	16:44	34	14:48 (WEA 1)	17:42	42	16:20 (WEA 2)	18:34	26	17:31 (WEA 3)	20:29	47	19:47 (WEA 4)	21:20	35	20:29 (WEA 5)	21:54		
18	08:30		14:15 (WEA 1)	07:40		15:38 (WEA 2)	06:37		17:04 (WEA 3)	06:25		18:59 (WEA 4)	05:27		19:55 (WEA 5)	05:03		
	16:46	33	14:48 (WEA 1)	17:44	42	16:20 (WEA 2)	18:36	26	17:30 (WEA 3)	20:30	47	19:46 (WEA 4)	21:21	34	20:29 (WEA 5)	21:54		
19	08:29		14:16 (WEA 1)	07:38		15:39 (WEA 2)	06:35		17:05 (WEA 3)	06:23		18:58 (WEA 4)	05:26		19:54 (WEA 5)	05:03		
	16:48	32	14:48 (WEA 1)	17:46	42	16:21 (WEA 2)	18:37	24	17:29 (WEA 3)	20:32	48	19:46 (WEA 4)	21:23	34	20:28 (WEA 5)	21:55		
20	08:28		14:17 (WEA 1)	07:36		15:38 (WEA 2)	06:32		17:05 (WEA 3)	06:20		18:58 (WEA 4)	05:24		19:55 (WEA 5)	05:03		
	16:50	31	14:48 (WEA 1)	17:48	41	16:19 (WEA 2)	18:39	23	17:28 (WEA 3)	20:34	48	19:46 (WEA 4)	21:24	33	20:28 (WEA 5)	21:55		
21	08:27		14:17 (WEA 1)	07:34		15:38 (WEA 2)	06:30		17:07 (WEA 3)	06:18		18:58 (WEA 4)	05:23		19:56 (WEA 5)	05:03		
	16:51	30	14:47 (WEA 1)	17:50	41	16:19 (WEA 2)	18:41	20	17:27 (WEA 3)	20:36	48	19:46 (WEA 4)	21:26	32	20:28 (WEA 5)	21:55		
22	08:25		14:19 (WEA 1)	07:32		15:39 (WEA 2)	06:28		17:08 (WEA 3)	06:16		18:58 (WEA 4)	05:22		19:57 (WEA 5)	05:03		
	16:53	28	14:47 (WEA 1)	17:52	40	16:19 (WEA 2)	18:43	17	17:25 (WEA 3)	20:37	48	19:46 (WEA 4)	21:27	31	20:28 (WEA 5)	21:56		
23	08:24		14:20 (WEA 1)	07:29		15:40 (WEA 2)	06:25		17:10 (WEA 3)	06:14		18:58 (WEA 4)	05:20		19:57 (WEA 5)	05:03		
	16:55	27	14:47 (WEA 1)	17:53	39	16:19 (WEA 2)	18:45	11	17:21 (WEA 3)	20:39	47	19:45 (WEA 4)	21:29	29	20:26 (WEA 5)	21:56		
24	08:23		14:21 (WEA 1)	07:27		15:41 (WEA 2)	06:23			06:12		18:59 (WEA 4)	05:19		19:57 (WEA 5)	05:04		
	16:57	24	14:45 (WEA 1)	17:55	37	16:18 (WEA 2)	18:46			20:41	46	19:45 (WEA 4)	21:30	29	20:26 (WEA 5)	21:56		
25	08:22		14:23 (WEA 1)	07:25		15:41 (WEA 2)	06:20			06:10		18:59 (WEA 4)	05:18		19:58 (WEA 5)	05:04		
	16:58	22	14:45 (WEA 1)	17:57	36	16:17 (WEA 2)	18:48			20:43	45	19:44 (WEA 4)	21:32	28	20:26 (WEA 5)	21:56		
26	08:20		14:25 (WEA 1)	07:23		15:42 (WEA 2)	06:18			06:08		18:59 (WEA 4)	05:17		19:59 (WEA 5)	05:04		
	17:00	18	14:43 (WEA 1)	17:59	34	16:16 (WEA 2)	18:50			20:44	45	19:44 (WEA 4)	21:33	26	20:25 (WEA 5)	21:56		
27	08:19		14:28 (WEA 1)	07:21		15:43 (WEA 2)	06:16			06:06		19:00 (WEA 4)	05:16		20:00 (WEA 5)	05:05		
	17:02	13	14:41 (WEA 1)	18:01	32	16:15 (WEA 2)	18:52			20:46	49	20:16 (WEA 5)	21:34	24	20:24 (WEA 5)	21:56		
28	08:17		14:34 (WEA 1)	07:19		15:45 (WEA 2)	06:13			06:03		19:00 (WEA 4)	05:14		20:01 (WEA 5)	05:05		
	17:04	2	14:36 (WEA 1)	18:03	28	16:13 (WEA 2)	18:53			20:48	56	20:19 (WEA 5)	21:36	23	20:24 (WEA 5)	21:56		
29	08:16						07:11			06:01		19:01 (WEA 4)	05:13		20:02 (WEA 5)	05:06		
	17:06						19:55			20:50	58	20:21 (WEA 5)	21:37	21	20:23 (WEA 5)	21:55		
30	08:14						07:09			05:59		19:02 (WEA 4)	05:12		20:03 (WEA 5)	05:06		
	17:08						19:57			20:51	59	20:22 (WEA 5)	21:38	19	20:22 (WEA 5)	21:55		
31	08:13						07:06						05:11		20:05 (WEA 5)			
	17:10						19:59						21:39	17	20:22 (WEA 5)			
Sonnenscheinstunden	255			276			367			418			489			503		
astr.max.mögl.Beschattung		879			908			429			1157			1154			31	

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-10 - SR-10, Südmark 2a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November			Dezember		
1	05:07			05:45		20:03 (WEA 5)	06:36		19:03 (WEA 4)	07:27		17:45 (WEA 3)	07:23		15:11 (WEA 2)	08:15		13:52 (WEA 1)
	21:55			21:22	37	20:40 (WEA 5)	20:18	41	19:44 (WEA 4)	19:07	26	18:11 (WEA 3)	16:59	35	15:46 (WEA 2)	16:17	37	14:29 (WEA 1)
2	05:08			05:46		20:04 (WEA 5)	06:38		19:04 (WEA 4)	07:29		17:45 (WEA 3)	07:25		15:11 (WEA 2)	08:17		13:53 (WEA 1)
	21:55			21:20	36	20:40 (WEA 5)	20:16	39	19:43 (WEA 4)	19:04	25	18:10 (WEA 3)	16:57	34	15:45 (WEA 2)	16:16	37	14:30 (WEA 1)
3	05:08			05:48		20:03 (WEA 5)	06:40		19:04 (WEA 4)	07:31		17:46 (WEA 3)	07:26		15:12 (WEA 2)	08:18		13:54 (WEA 1)
	21:54			21:18	36	20:39 (WEA 5)	20:13	37	19:41 (WEA 4)	19:02	23	18:09 (WEA 3)	16:55	32	15:44 (WEA 2)	16:16	37	14:31 (WEA 1)
4	05:09			05:50		20:04 (WEA 5)	06:41		19:06 (WEA 4)	07:32		17:47 (WEA 3)	07:28		15:14 (WEA 2)	08:20		13:53 (WEA 1)
	21:54			21:17	36	20:40 (WEA 5)	20:11	34	19:40 (WEA 4)	19:00	20	18:07 (WEA 3)	16:53	29	15:43 (WEA 2)	16:15	38	14:31 (WEA 1)
5	05:10			05:51		19:25 (WEA 4)	06:43		19:07 (WEA 4)	07:34		17:48 (WEA 3)	07:30		15:15 (WEA 2)	08:21		13:53 (WEA 1)
	21:53			21:15	45	20:39 (WEA 5)	20:09	30	19:37 (WEA 4)	18:57	18	18:06 (WEA 3)	16:51	27	15:42 (WEA 2)	16:14	38	14:31 (WEA 1)
6	05:11			05:53		19:22 (WEA 4)	06:45		19:09 (WEA 4)	07:36		17:50 (WEA 3)	07:32		15:17 (WEA 2)	08:22		13:54 (WEA 1)
	21:53			21:13	52	20:39 (WEA 5)	20:06	26	19:35 (WEA 4)	18:55	13	18:03 (WEA 3)	16:50	23	15:40 (WEA 2)	16:14	38	14:32 (WEA 1)
7	05:12			05:55		19:18 (WEA 4)	06:46		19:11 (WEA 4)	07:37		17:54 (WEA 3)	07:34		15:19 (WEA 2)	08:24		13:54 (WEA 1)
	21:52			21:11	57	20:38 (WEA 5)	20:04	22	19:33 (WEA 4)	18:53	3	17:57 (WEA 3)	16:48	19	15:38 (WEA 2)	16:14	38	14:32 (WEA 1)
8	05:13			05:56		19:17 (WEA 4)	06:48		19:14 (WEA 4)	07:39			07:36		15:22 (WEA 2)	08:25		13:56 (WEA 1)
	21:51			21:09	59	20:38 (WEA 5)	20:02	14	19:28 (WEA 4)	18:50			16:46	13	15:35 (WEA 2)	16:13	37	14:33 (WEA 1)
9	05:14		20:19 (WEA 5)	05:58		19:14 (WEA 4)	06:50			07:41			07:37			08:26		13:56 (WEA 1)
	21:51	3	20:22 (WEA 5)	21:07	61	20:36 (WEA 5)	19:59			18:48			16:44			16:13	37	14:33 (WEA 1)
10	05:15		20:16 (WEA 5)	05:59		19:13 (WEA 4)	06:52			07:43			07:39			08:27		13:56 (WEA 1)
	21:50	9	20:25 (WEA 5)	21:05	63	20:36 (WEA 5)	19:57			18:46			16:43			16:13	37	14:33 (WEA 1)
11	05:16		20:14 (WEA 5)	06:01		19:12 (WEA 4)	06:53			07:45		16:25 (WEA 2)	07:41			08:28		13:56 (WEA 1)
	21:49	13	20:27 (WEA 5)	21:03	61	20:34 (WEA 5)	19:55			18:43	16	16:41 (WEA 2)	16:41			16:12	37	14:33 (WEA 1)
12	05:17		20:13 (WEA 5)	06:03		19:11 (WEA 4)	06:55			07:46		16:21 (WEA 2)	07:43			08:29		13:57 (WEA 1)
	21:48	16	20:29 (WEA 5)	21:01	61	20:32 (WEA 5)	19:52			18:41	22	16:43 (WEA 2)	16:40			16:12	36	14:33 (WEA 1)
13	05:18		20:12 (WEA 5)	06:04		19:10 (WEA 4)	06:57			07:48		16:18 (WEA 2)	07:45			08:30		13:57 (WEA 1)
	21:47	18	20:30 (WEA 5)	20:59	60	20:31 (WEA 5)	19:50			18:39	27	16:45 (WEA 2)	16:38			16:12	37	14:34 (WEA 1)
14	05:19		20:11 (WEA 5)	06:06		19:08 (WEA 4)	06:58			07:50		16:16 (WEA 2)	07:47		14:05 (WEA 1)	08:31		13:58 (WEA 1)
	21:46	20	20:31 (WEA 5)	20:57	58	20:28 (WEA 5)	19:47			18:37	30	16:46 (WEA 2)	16:36	3	14:08 (WEA 1)	16:12	36	14:34 (WEA 1)
15	05:21		20:11 (WEA 5)	06:08		19:08 (WEA 4)	07:00			07:52		16:15 (WEA 2)	07:48		14:00 (WEA 1)	08:32		13:58 (WEA 1)
	21:45	22	20:33 (WEA 5)	20:55	55	20:27 (WEA 5)	19:45			18:34	32	16:47 (WEA 2)	16:35	13	14:13 (WEA 1)	16:12	37	14:35 (WEA 1)
16	05:22		20:10 (WEA 5)	06:09		19:06 (WEA 4)	07:02			07:53		16:14 (WEA 2)	07:50		13:58 (WEA 1)	08:33		13:59 (WEA 1)
	21:44	23	20:33 (WEA 5)	20:53	44	19:50 (WEA 4)	19:43			18:32	34	16:48 (WEA 2)	16:33	18	14:16 (WEA 1)	16:12	36	14:35 (WEA 1)
17	05:23		20:09 (WEA 5)	06:11		19:06 (WEA 4)	07:03			07:55		16:12 (WEA 2)	07:52		13:56 (WEA 1)	08:34		14:00 (WEA 1)
	21:43	25	20:34 (WEA 5)	20:51	44	19:50 (WEA 4)	19:40			18:30	37	16:49 (WEA 2)	16:32	22	14:18 (WEA 1)	16:12	36	14:36 (WEA 1)
18	05:24		20:08 (WEA 5)	06:13		19:06 (WEA 4)	07:05			07:57		16:12 (WEA 2)	07:54		13:55 (WEA 1)	08:35		14:00 (WEA 1)
	21:42	27	20:35 (WEA 5)	20:49	45	19:51 (WEA 4)	19:38			18:28	38	16:50 (WEA 2)	16:31	24	14:19 (WEA 1)	16:13	36	14:36 (WEA 1)
19	05:26		20:07 (WEA 5)	06:14		19:04 (WEA 4)	07:07			07:59		16:11 (WEA 2)	07:56		13:54 (WEA 1)	08:35		14:00 (WEA 1)
	21:41	28	20:35 (WEA 5)	20:47	46	19:50 (WEA 4)	19:35			18:26	39	16:50 (WEA 2)	16:29	27	14:21 (WEA 1)	16:13	36	14:36 (WEA 1)
20	05:27		20:08 (WEA 5)	06:16		19:04 (WEA 4)	07:08		17:58 (WEA 3)	08:01		16:09 (WEA 2)	07:57		13:54 (WEA 1)	08:36		14:01 (WEA 1)
	21:40	29	20:37 (WEA 5)	20:45	47	19:51 (WEA 4)	19:33	9	18:07 (WEA 3)	18:23	41	16:50 (WEA 2)	16:28	28	14:22 (WEA 1)	16:13	36	14:37 (WEA 1)
21	05:28		20:07 (WEA 5)	06:18		19:03 (WEA 4)	07:10		17:55 (WEA 3)	08:02		16:09 (WEA 2)	07:59		13:53 (WEA 1)	08:37		14:01 (WEA 1)
	21:38	30	20:37 (WEA 5)	20:43	47	19:50 (WEA 4)	19:31	15	18:10 (WEA 3)	18:21	41	16:50 (WEA 2)	16:27	30	14:23 (WEA 1)	16:14	36	14:37 (WEA 1)
22	05:30		20:06 (WEA 5)	06:20		19:03 (WEA 4)	07:12		17:52 (WEA 3)	08:04		16:08 (WEA 2)	08:01		13:53 (WEA 1)	08:37		14:02 (WEA 1)
	21:37	31	20:37 (WEA 5)	20:40	48	19:51 (WEA 4)	19:28	19	18:11 (WEA 3)	18:19	42	16:50 (WEA 2)	16:26	31	14:24 (WEA 1)	16:14	36	14:38 (WEA 1)
23	05:31		20:06 (WEA 5)	06:21		19:03 (WEA 4)	07:13		17:50 (WEA 3)	08:06		16:08 (WEA 2)	08:02		13:53 (WEA 1)	08:38		14:02 (WEA 1)
	21:36	32	20:38 (WEA 5)	20:38	48	19:51 (WEA 4)	19:26	22	18:12 (WEA 3)	18:17	42	16:50 (WEA 2)	16:24	32	14:25 (WEA 1)	16:15	36	14:38 (WEA 1)
24	05:33		20:05 (WEA 5)	06:23		19:02 (WEA 4)	07:15		17:49 (WEA 3)	08:08		16:08 (WEA 2)	08:04		13:52 (WEA 1)	08:38		14:03 (WEA 1)
	21:34	34	20:39 (WEA 5)	20:36	48	19:50 (WEA 4)	19:23	24	18:13 (WEA 3)	18:15	42	16:50 (WEA 2)	16:23	33	14:25 (WEA 1)	16:15	36	14:39 (WEA 1)
25	05:34		20:05 (WEA 5)	06:25		19:02 (WEA 4)	07:17		17:47 (WEA 3)	07:10		15:08 (WEA 2)	08:06		13:52 (WEA 1)	08:39		14:03 (WEA 1)
	21:33	34	20:39 (WEA 5)	20:34	48	19:50 (WEA 4)	19:21	26	18:13 (WEA 3)	17:13	42	15:50 (WEA 2)	16:22	34	14:26 (WEA 1)	16:16	36	14:39 (WEA 1)
26	05:36		20:05 (WEA 5)	06:26		19:02 (WEA 4)	07:19		17:46 (WEA 3)	07:12		15:08 (WEA 2)	08:07		13:52 (WEA 1)	08:39		14:03 (WEA 1)
	21:31	35	20:40 (WEA 5)	20:32	47	19:49 (WEA 4)	19:19	27	18:13 (WEA 3)	17:11	42	15:50 (WEA 2)	16:21	35	14:27 (WEA 1)	16:17	37	14:40 (WEA 1)
27	05:37		20:04 (WEA 5)	06:28		19:02 (WEA 4)	07:20		17:46 (WEA 3)	07:13		15:08 (WEA 2)	08:09		13:52 (WEA 1)	08:39		14:04 (WEA 1)
	21:30	35	20:39 (WEA 5)	20:29	47	19:49 (WEA 4)	19:16	27	18:13 (WEA 3)	17:09	41	15:49 (WEA 2)	16:20	36	14:28 (WEA 1)	16:17	36	14:40 (WEA 1)
28	05:39		20:05 (WEA 5)	06:30		19:02 (WEA 4)	07:22		17:46 (WEA 3)	07:15		15:08 (WEA 2)	08:11		13:52 (WEA 1)	08:39		14:04 (WEA 1)
	21:28	35	20:40 (WEA 5)	20:27	46	19:48 (WEA 4)	19:14	27	18:13 (WEA 3)	17:07	41	15:49 (WEA 2)	16:19	35	14:27 (WEA 1)	16:18	36	14:40 (WEA 1)
29	05:40		20:04 (WEA 5)	06:31		19:02 (WEA 4)	07:24		17:45 (WEA 3)	07:17		15:09 (WEA 2)	08:12		13:52 (WEA 1)	08:39		14:05 (WEA 1)
	21:27	36	20:40 (WEA 5)	20:25	45	19:47 (WEA 4)	19:12	27	18:12 (WEA 3)	17:05	39	15:48 (WEA 2)	16:19	36	14:28 (WEA 1)	16:19	36	14:41 (WEA 1)
30	05:42		20:03 (WEA 5)	06:33		19:03 (WEA 4)	07:25		17:45 (WEA 3)	07:19		15:09 (WEA 2)	08:14		13:53 (WEA 1)	08:40		14:05 (WEA 1)
	21:25	37	20:40 (WEA 5)	20:23	43	19:46 (WEA 4)	19:09	27	18:12 (WEA 3)	17:03	39	15:48 (WEA 2)	16:18	36	14:29 (WEA 1)	16:20	37	14:42 (WEA 1)
31	05:43		20:04 (WEA 5)	06:35		19:02 (WEA 4)				07:21		15:10 (WEA 2)				08:40		14:06 (WEA 1)
	21:23	36	20:40 (WEA 5)	20:20	43	19:45 (WEA 4)				17:01	37	15:47 (WEA 2)				16:21	36	14:42 (WEA 1)
Sonnenscheinstunden	506			456			381			330			263			240		
astr.mögl.Beschattung		608			1513			493			892			685			1135	

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-11 - SR-11, Südmark 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai			Juni		
1	08:39			08:11		15:54 (WEA 1)	07:16			07:04		18:59 (WEA 3)	05:57		19:43 (WEA 4)	05:10		20:24 (WEA 5)
	16:22			17:11	16	16:10 (WEA 1)	18:05			20:00	20	19:19 (WEA 3)	20:53	36	20:19 (WEA 4)	21:41	22	20:46 (WEA 5)
2	08:39			08:10		15:52 (WEA 1)	07:14			07:02		18:58 (WEA 3)	05:55		19:43 (WEA 4)	05:10		20:25 (WEA 5)
	16:23			17:13	20	16:12 (WEA 1)	18:07			20:02	21	19:19 (WEA 3)	20:55	36	20:19 (WEA 4)	21:42	20	20:45 (WEA 5)
3	08:39			08:08		15:51 (WEA 1)	07:12			06:59		18:57 (WEA 3)	05:53		19:43 (WEA 4)	05:09		20:25 (WEA 5)
	16:24			17:15	24	16:15 (WEA 1)	18:08			20:04	22	19:19 (WEA 3)	20:57	36	20:19 (WEA 4)	21:43	20	20:45 (WEA 5)
4	08:39			08:06		15:50 (WEA 1)	07:10			06:57		18:57 (WEA 3)	05:52		19:43 (WEA 4)	05:08		20:27 (WEA 5)
	16:26			17:17	26	16:16 (WEA 1)	18:10			20:06	22	19:19 (WEA 3)	20:58	36	20:19 (WEA 4)	21:44	18	20:45 (WEA 5)
5	08:39			08:05		15:49 (WEA 1)	07:07			06:55		18:57 (WEA 3)	05:50		19:43 (WEA 4)	05:07		20:27 (WEA 5)
	16:27			17:19	28	16:17 (WEA 1)	18:12			20:08	22	19:19 (WEA 3)	21:00	36	20:19 (WEA 4)	21:45	17	20:44 (WEA 5)
6	08:38			08:03		15:48 (WEA 1)	07:05			06:52		18:56 (WEA 3)	05:48		19:43 (WEA 4)	05:07		20:28 (WEA 5)
	16:28			17:21	30	16:18 (WEA 1)	18:14			20:09	22	19:18 (WEA 3)	21:02	35	20:18 (WEA 4)	21:46	16	20:44 (WEA 5)
7	08:38			08:01		15:47 (WEA 1)	07:03			06:50		18:57 (WEA 3)	05:46		19:43 (WEA 4)	05:06		20:29 (WEA 5)
	16:29			17:23	32	16:19 (WEA 1)	18:16			20:11	20	19:17 (WEA 3)	21:03	40	20:33 (WEA 5)	21:47	14	20:43 (WEA 5)
8	08:37			07:59		15:47 (WEA 1)	07:00			06:48		18:57 (WEA 3)	05:44		19:44 (WEA 4)	05:05		20:30 (WEA 5)
	16:31			17:25	33	16:20 (WEA 1)	18:18			20:13	20	19:17 (WEA 3)	21:05	43	20:35 (WEA 5)	21:48	13	20:43 (WEA 5)
9	08:37			07:58		15:46 (WEA 1)	06:58		17:14 (WEA 2)	06:45		18:57 (WEA 3)	05:42		19:44 (WEA 4)	05:05		20:31 (WEA 5)
	16:32			17:27	34	16:20 (WEA 1)	18:19	15	17:29 (WEA 2)	20:15	18	19:15 (WEA 3)	21:07	46	20:37 (WEA 5)	21:49	11	20:42 (WEA 5)
10	08:36			07:56		15:46 (WEA 1)	06:56		17:11 (WEA 2)	06:43		18:59 (WEA 3)	05:40		19:44 (WEA 4)	05:04		20:32 (WEA 5)
	16:34			17:29	35	16:21 (WEA 1)	18:21	20	17:31 (WEA 2)	20:16	14	19:13 (WEA 3)	21:08	47	20:38 (WEA 5)	21:50	10	20:42 (WEA 5)
11	08:36			07:54		15:45 (WEA 1)	06:53		17:09 (WEA 2)	06:41		19:01 (WEA 3)	05:39		19:45 (WEA 4)	05:04		20:34 (WEA 5)
	16:35			17:31	36	16:21 (WEA 1)	18:23	24	17:33 (WEA 2)	20:18	10	19:11 (WEA 3)	21:10	49	20:40 (WEA 5)	21:50	7	20:41 (WEA 5)
12	08:35			07:52		15:45 (WEA 1)	06:51		17:06 (WEA 2)	06:38			05:37		19:45 (WEA 4)	05:04		20:34 (WEA 5)
	16:37			17:33	36	16:21 (WEA 1)	18:25	28	17:34 (WEA 2)	20:20			21:12	50	20:41 (WEA 5)	21:51	5	20:39 (WEA 5)
13	08:34			07:50		15:45 (WEA 1)	06:49		17:05 (WEA 2)	06:36			05:35		19:46 (WEA 4)	05:03		
	16:38			17:34	36	16:21 (WEA 1)	18:27	30	17:35 (WEA 2)	20:22			21:13	51	20:43 (WEA 5)	21:52		
14	08:34			07:48		15:45 (WEA 1)	06:46		17:04 (WEA 2)	06:34			05:34		19:47 (WEA 4)	05:03		
	16:40			17:36	37	16:22 (WEA 1)	18:28	32	17:36 (WEA 2)	20:23			21:15	51	20:44 (WEA 5)	21:52		
15	08:33			07:46		15:46 (WEA 1)	06:44		17:03 (WEA 2)	06:32			05:32		19:48 (WEA 4)	05:03		
	16:41			17:38	36	16:22 (WEA 1)	18:30	33	17:36 (WEA 2)	20:25			21:17	51	20:46 (WEA 5)	21:53		
16	08:32			07:44		15:46 (WEA 1)	06:42		17:02 (WEA 2)	06:29			05:30		19:49 (WEA 4)	05:03		
	16:43			17:40	35	16:21 (WEA 1)	18:32	34	17:36 (WEA 2)	20:27			21:18	51	20:47 (WEA 5)	21:53		
17	08:31			07:42		15:46 (WEA 1)	06:39		17:02 (WEA 2)	06:27			05:29		19:50 (WEA 4)	05:03		
	16:44			17:42	35	16:21 (WEA 1)	18:34	35	17:37 (WEA 2)	20:29			21:20	49	20:48 (WEA 5)	21:54		
18	08:30			07:40		15:47 (WEA 1)	06:37		17:01 (WEA 2)	06:25			05:27		19:52 (WEA 4)	05:03		
	16:46			17:44	34	16:21 (WEA 1)	18:36	35	17:36 (WEA 2)	20:30			21:21	46	20:48 (WEA 5)	21:54		
19	08:29			07:38		15:48 (WEA 1)	06:35		17:01 (WEA 2)	06:23			05:26		19:53 (WEA 4)	05:03		
	16:48			17:46	32	16:20 (WEA 1)	18:37	36	17:37 (WEA 2)	20:32			21:23	43	20:48 (WEA 5)	21:55		
20	08:28			07:36		15:48 (WEA 1)	06:32		17:00 (WEA 2)	06:20		20:00 (WEA 4)	05:24		19:57 (WEA 4)	05:03		
	16:50			17:48	31	16:19 (WEA 1)	18:39	36	17:36 (WEA 2)	20:34	6	20:06 (WEA 4)	21:24	36	20:48 (WEA 5)	21:55		
21	08:27			07:34		15:49 (WEA 1)	06:30		17:00 (WEA 2)	06:18		19:55 (WEA 4)	05:23		20:20 (WEA 5)	05:03		
	16:51			17:50	29	16:18 (WEA 1)	18:41	36	17:36 (WEA 2)	20:36	13	20:08 (WEA 4)	21:26	28	20:48 (WEA 5)	21:55		
22	08:25			07:32		15:50 (WEA 1)	06:28		17:01 (WEA 2)	06:16		19:53 (WEA 4)	05:22		20:20 (WEA 5)	05:03		
	16:53			17:52	27	16:17 (WEA 1)	18:43	34	17:35 (WEA 2)	20:37	17	20:10 (WEA 4)	21:27	28	20:48 (WEA 5)	21:56		
23	08:24			07:29		15:52 (WEA 1)	06:25		17:00 (WEA 2)	06:14		19:51 (WEA 4)	05:20		20:20 (WEA 5)	05:03		
	16:55			17:53	23	16:15 (WEA 1)	18:45	34	17:34 (WEA 2)	20:39	20	20:11 (WEA 4)	21:29	28	20:48 (WEA 5)	21:56		
24	08:23			07:27		15:54 (WEA 1)	06:23		17:01 (WEA 2)	06:12		19:49 (WEA 4)	05:19		20:20 (WEA 5)	05:04		
	16:57			17:55	19	16:13 (WEA 1)	18:46	33	17:34 (WEA 2)	20:41	24	20:13 (WEA 4)	21:30	28	20:48 (WEA 5)	21:56		
25	08:22			07:25		15:57 (WEA 1)	06:20		17:01 (WEA 2)	06:10		19:48 (WEA 4)	05:18		20:20 (WEA 5)	05:04		
	16:58			17:57	13	16:10 (WEA 1)	18:48	31	17:32 (WEA 2)	20:43	27	20:15 (WEA 4)	21:32	28	20:48 (WEA 5)	21:56		
26	08:20			07:23			06:18		17:02 (WEA 2)	06:08		19:47 (WEA 4)	05:17		20:21 (WEA 5)	05:04		
	17:00			17:59			18:50	29	17:31 (WEA 2)	20:44	29	20:16 (WEA 4)	21:33	26	20:47 (WEA 5)	21:56		
27	08:19			07:21			06:16		17:04 (WEA 2)	06:05		19:46 (WEA 4)	05:16		20:21 (WEA 5)	05:05		
	17:02			18:01			18:52	26	17:30 (WEA 2)	20:46	32	20:18 (WEA 4)	21:34	26	20:47 (WEA 5)	21:56		
28	08:17			07:19			06:13		17:04 (WEA 2)	06:03		19:45 (WEA 4)	05:14		20:22 (WEA 5)	05:05		
	17:04			18:03			18:53	23	17:27 (WEA 2)	20:48	33	20:18 (WEA 4)	21:36	25	20:47 (WEA 5)	21:56		
29	08:16						07:11		18:07 (WEA 2)	06:01		19:44 (WEA 4)	05:13		20:22 (WEA 5)	05:06		
	17:06						19:55	29	19:15 (WEA 3)	20:50	35	20:19 (WEA 4)	21:37	25	20:47 (WEA 5)	21:55		
30	08:14						07:09		18:10 (WEA 2)	05:59		19:44 (WEA 4)	05:12		20:23 (WEA 5)	05:06		20:39 (WEA 5)
	17:08						19:57	27	19:17 (WEA 3)	20:51	35	20:19 (WEA 4)	21:38	23	20:46 (WEA 5)	21:55	4	20:43 (WEA 5)
31	08:13		15:58 (WEA 1)				07:06		19:00 (WEA 3)				05:11		20:24 (WEA 5)			
	17:10	9	16:07 (WEA 1)				19:59	18	19:18 (WEA 3)				21:39	23	20:47 (WEA 5)			
Sonnenscheinstunden	255			276			367			418			489			503		
astr.max.mögl.Beschattung		9			737			678			482			1156			177	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-11 - SR-11, Südmark 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember
1	05:07		20:38 (WEA 5) | 05:45		19:55 (WEA 4) | 06:36		19:00 (WEA 3) | 07:27		17:46 (WEA 2) | 07:23		15:15 (WEA 1) | 08:15
	21:55	7	20:45 (WEA 5) | 21:22	50	20:51 (WEA 5) | 20:18	10	19:10 (WEA 3) | 19:07	28	18:14 (WEA 2) | 16:59	35	15:50 (WEA 1) | 16:17
2	05:08		20:37 (WEA 5) | 05:46		19:55 (WEA 4) | 06:38		18:58 (WEA 3) | 07:29		17:46 (WEA 2) | 07:24		15:16 (WEA 1) | 08:17
	21:55	8	20:45 (WEA 5) | 21:20	49	20:50 (WEA 5) | 20:16	14	19:12 (WEA 3) | 19:04	25	18:11 (WEA 2) | 16:57	34	15:50 (WEA 1) | 16:16
3	05:08		20:36 (WEA 5) | 05:48		19:54 (WEA 4) | 06:40		18:55 (WEA 3) | 07:31		17:48 (WEA 2) | 07:26		15:16 (WEA 1) | 08:18
	21:54	11	20:47 (WEA 5) | 21:18	47	20:48 (WEA 5) | 20:13	18	19:13 (WEA 3) | 19:02	22	18:10 (WEA 2) | 16:55	33	15:49 (WEA 1) | 16:16
4	05:09		20:36 (WEA 5) | 05:50		19:54 (WEA 4) | 06:41		18:54 (WEA 3) | 07:32		17:50 (WEA 2) | 07:28		15:17 (WEA 1) | 08:20
	21:54	12	20:48 (WEA 5) | 21:17	45	20:46 (WEA 5) | 20:11	20	19:14 (WEA 3) | 19:00	17	18:07 (WEA 2) | 16:53	32	15:49 (WEA 1) | 16:15
5	05:10		20:35 (WEA 5) | 05:51		19:53 (WEA 4) | 06:43		18:53 (WEA 3) | 07:34		17:54 (WEA 2) | 07:30		15:18 (WEA 1) | 08:21
	21:53	14	20:49 (WEA 5) | 21:15	43	20:44 (WEA 5) | 20:09	20	19:13 (WEA 3) | 18:57	9	18:03 (WEA 2) | 16:51	30	15:48 (WEA 1) | 16:14
6	05:11		20:35 (WEA 5) | 05:53		19:53 (WEA 4) | 06:45		18:52 (WEA 3) | 07:36		| 07:32		15:19 (WEA 1) | 08:22
	21:53	15	20:50 (WEA 5) | 21:13	39	20:43 (WEA 5) | 20:06	22	19:14 (WEA 3) | 18:55		| 16:50	28	15:47 (WEA 1) | 16:14
7	05:12		20:34 (WEA 5) | 05:55		19:52 (WEA 4) | 06:46		18:52 (WEA 3) | 07:37		| 07:34		15:20 (WEA 1) | 08:23
	21:52	16	20:50 (WEA 5) | 21:11	36	20:28 (WEA 4) | 20:04	22	19:14 (WEA 3) | 18:53		| 16:48	26	15:46 (WEA 1) | 16:14
8	05:13		20:33 (WEA 5) | 05:56		19:52 (WEA 4) | 06:48		18:51 (WEA 3) | 07:39		| 07:36		15:21 (WEA 1) | 08:25
	21:51	18	20:51 (WEA 5) | 21:09	36	20:28 (WEA 4) | 20:02	22	19:13 (WEA 3) | 18:50		| 16:46	23	15:44 (WEA 1) | 16:13
9	05:14		20:33 (WEA 5) | 05:58		19:52 (WEA 4) | 06:50		18:51 (WEA 3) | 07:41		| 07:37		15:23 (WEA 1) | 08:26
	21:51	19	20:52 (WEA 5) | 21:07	36	20:28 (WEA 4) | 19:59	22	19:13 (WEA 3) | 18:48		| 16:44	20	15:43 (WEA 1) | 16:13
10	05:15		20:32 (WEA 5) | 05:59		19:52 (WEA 4) | 06:52		18:52 (WEA 3) | 07:43		| 07:39		15:25 (WEA 1) | 08:27
	21:50	21	20:53 (WEA 5) | 21:05	36	20:28 (WEA 4) | 19:57	21	19:13 (WEA 3) | 18:46		| 16:43	16	15:41 (WEA 1) | 16:13
11	05:16		20:32 (WEA 5) | 06:01		19:52 (WEA 4) | 06:53		18:51 (WEA 3) | 07:45		| 07:41		15:29 (WEA 1) | 08:28
	21:49	21	20:53 (WEA 5) | 21:03	36	20:28 (WEA 4) | 19:54	20	19:11 (WEA 3) | 18:43		| 16:41	9	15:38 (WEA 1) | 16:12
12	05:17		20:32 (WEA 5) | 06:03		19:52 (WEA 4) | 06:55		18:52 (WEA 3) | 07:46		| 07:43		| 08:29
	21:48	22	20:54 (WEA 5) | 21:01	35	20:27 (WEA 4) | 19:52	18	19:10 (WEA 3) | 18:41		| 16:40		| 16:12
13	05:18		20:31 (WEA 5) | 06:04		19:52 (WEA 4) | 06:57		18:01 (WEA 2) | 07:48		| 07:45		| 08:30
	21:47	23	20:54 (WEA 5) | 20:59	35	20:27 (WEA 4) | 19:50	26	19:08 (WEA 3) | 18:39		| 16:38		| 16:12
14	05:19		20:31 (WEA 5) | 06:06		19:52 (WEA 4) | 06:58		17:58 (WEA 2) | 07:50		| 07:47		| 08:31
	21:46	24	20:55 (WEA 5) | 20:57	34	20:26 (WEA 4) | 19:47	29	19:06 (WEA 3) | 18:37		| 16:36		| 16:12
15	05:21		20:31 (WEA 5) | 06:08		19:53 (WEA 4) | 07:00		17:55 (WEA 2) | 07:52		| 07:48		| 08:32
	21:45	25	20:56 (WEA 5) | 20:55	33	20:26 (WEA 4) | 19:45	23	19:01 (WEA 3) | 18:34		| 16:35		| 16:12
16	05:22		20:31 (WEA 5) | 06:09		19:53 (WEA 4) | 07:02		17:52 (WEA 2) | 07:53		16:33 (WEA 1) | 07:50		| 08:33
	21:44	26	20:57 (WEA 5) | 20:53	31	20:24 (WEA 4) | 19:43	26	18:18 (WEA 2) | 18:32	5	16:38 (WEA 1) | 16:33		| 16:12
17	05:23		20:31 (WEA 5) | 06:11		19:54 (WEA 4) | 07:03		17:51 (WEA 2) | 07:55		16:28 (WEA 1) | 07:52		| 08:34
	21:43	26	20:57 (WEA 5) | 20:51	28	20:22 (WEA 4) | 19:40	28	18:19 (WEA 2) | 18:30	15	16:43 (WEA 1) | 16:32		| 16:12
18	05:24		20:30 (WEA 5) | 06:13		19:55 (WEA 4) | 07:05		17:50 (WEA 2) | 07:57		16:25 (WEA 1) | 07:54		| 08:35
	21:42	27	20:57 (WEA 5) | 20:49	26	20:21 (WEA 4) | 19:38	30	18:20 (WEA 2) | 18:28	21	16:46 (WEA 1) | 16:31		| 16:13
19	05:26		20:30 (WEA 5) | 06:14		19:55 (WEA 4) | 07:07		17:48 (WEA 2) | 07:59		16:23 (WEA 1) | 07:56		| 08:35
	21:41	27	20:57 (WEA 5) | 20:47	23	20:18 (WEA 4) | 19:35	32	18:20 (WEA 2) | 18:26	24	16:47 (WEA 1) | 16:29		| 16:13
20	05:27		20:30 (WEA 5) | 06:16		19:57 (WEA 4) | 07:08		17:47 (WEA 2) | 08:01		16:20 (WEA 1) | 07:57		| 08:36
	21:40	28	20:58 (WEA 5) | 20:45	20	20:17 (WEA 4) | 19:33	33	18:20 (WEA 2) | 18:23	28	16:48 (WEA 1) | 16:28		| 16:13
21	05:28		20:30 (WEA 5) | 06:18		19:58 (WEA 4) | 07:10		17:46 (WEA 2) | 08:02		16:19 (WEA 1) | 07:59		| 08:37
	21:38	28	20:58 (WEA 5) | 20:43	16	20:14 (WEA 4) | 19:31	35	18:21 (WEA 2) | 18:21	30	16:49 (WEA 1) | 16:27		| 16:14
22	05:30		20:30 (WEA 5) | 06:20		20:00 (WEA 4) | 07:12		17:45 (WEA 2) | 08:04		16:18 (WEA 1) | 08:01		| 08:37
	21:37	28	20:58 (WEA 5) | 20:40	12	20:12 (WEA 4) | 19:28	35	18:20 (WEA 2) | 18:19	31	16:49 (WEA 1) | 16:26		| 16:14
23	05:31		20:10 (WEA 4) | 06:21		20:06 (WEA 4) | 07:13		17:45 (WEA 2) | 08:06		16:17 (WEA 1) | 08:02		| 08:38
	21:36	31	20:59 (WEA 5) | 20:38	4	20:10 (WEA 4) | 19:26	35	18:20 (WEA 2) | 18:17	33	16:50 (WEA 1) | 16:24		| 16:15
24	05:33		20:05 (WEA 4) | 06:23		| 07:15		17:45 (WEA 2) | 08:08		16:16 (WEA 1) | 08:04		| 08:38
	21:34	40	20:58 (WEA 5) | 20:36		| 19:23	35	18:20 (WEA 2) | 18:15	34	16:50 (WEA 1) | 16:23		| 16:15
25	05:34		20:03 (WEA 4) | 06:25		| 07:17		17:44 (WEA 2) | 07:10		15:16 (WEA 1) | 08:06		| 08:38
	21:33	44	20:58 (WEA 5) | 20:34		| 19:21	35	18:19 (WEA 2) | 17:13	35	15:51 (WEA 1) | 16:22		| 16:16
26	05:36		20:02 (WEA 4) | 06:26		| 07:19		17:44 (WEA 2) | 07:12		15:15 (WEA 1) | 08:07		| 08:39
	21:31	48	20:59 (WEA 5) | 20:32		| 19:19	35	18:19 (WEA 2) | 17:11	36	15:51 (WEA 1) | 16:21		| 16:17
27	05:37		20:00 (WEA 4) | 06:28		| 07:20		17:44 (WEA 2) | 07:13		15:15 (WEA 1) | 08:09		| 08:39
	21:30	50	20:58 (WEA 5) | 20:29		| 19:16	34	18:18 (WEA 2) | 17:09	36	15:51 (WEA 1) | 16:20		| 16:17
28	05:39		19:59 (WEA 4) | 06:30		| 07:22		17:44 (WEA 2) | 07:15		15:15 (WEA 1) | 08:11		| 08:39
	21:28	52	20:58 (WEA 5) | 20:27		| 19:14	34	18:18 (WEA 2) | 17:07	36	15:51 (WEA 1) | 16:19		| 16:18
29	05:40		19:58 (WEA 4) | 06:31		| 07:24		17:44 (WEA 2) | 07:17		15:15 (WEA 1) | 08:12		| 08:39
	21:27	51	20:56 (WEA 5) | 20:25		| 19:12	32	18:16 (WEA 2) | 17:05	36	15:51 (WEA 1) | 16:19		| 16:19
30	05:42		19:57 (WEA 4) | 06:33		| 07:25		17:45 (WEA 2) | 07:19		15:15 (WEA 1) | 08:14		| 08:39
	21:25	51	20:54 (WEA 5) | 20:23		| 19:09	30	18:15 (WEA 2) | 17:03	36	15:51 (WEA 1) | 16:18		| 16:20
31	05:43		19:56 (WEA 4) | 06:35		|		| 07:21		15:15 (WEA 1) |		| 08:40
	21:23	51	20:53 (WEA 5) | 20:20		|		| 17:01	36	15:51 (WEA 1) |		| 16:21
Sonnenscheinstunden	| 506		| 456		| 381		| 330		| 263		| 240
astr.max.mögl.Beschattung	|	864	|	750	|	796	|	573	|	286	|

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-12 - SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April			Mai			Juni		
1	08:39	08:11	07:16	07:04			05:57		19:48 (WEA 2)	05:10		20:50 (WEA 4)
	16:22	17:11	18:05	20:00			20:53	24	20:12 (WEA 2)	21:41	18	21:08 (WEA 4)
2	08:39	08:10	07:14	07:02		19:11 (WEA 1)	05:55		19:47 (WEA 2)	05:10		20:49 (WEA 4)
	16:23	17:13	18:07	20:02	8	19:19 (WEA 1)	20:55	28	20:21 (WEA 3)	21:42	19	21:08 (WEA 4)
3	08:39	08:08	07:12	06:59		19:06 (WEA 1)	05:53		19:47 (WEA 2)	05:09		20:49 (WEA 4)
	16:24	17:15	18:08	20:04	15	19:21 (WEA 1)	20:57	35	20:25 (WEA 3)	21:43	20	21:09 (WEA 4)
4	08:39	08:06	07:10	06:57		19:04 (WEA 1)	05:52		19:47 (WEA 2)	05:08		20:50 (WEA 4)
	16:26	17:17	18:10	20:06	20	19:24 (WEA 1)	20:58	38	20:26 (WEA 3)	21:44	21	21:11 (WEA 4)
5	08:39	08:05	07:07	06:55		19:02 (WEA 1)	05:50		19:46 (WEA 2)	05:07		20:50 (WEA 4)
	16:27	17:19	18:12	20:08	23	19:25 (WEA 1)	21:00	40	20:26 (WEA 3)	21:45	21	21:11 (WEA 4)
6	08:38	08:03	07:05	06:52		19:00 (WEA 1)	05:48		19:46 (WEA 2)	05:07		20:50 (WEA 4)
	16:28	17:21	18:14	20:09	25	19:25 (WEA 1)	21:02	41	20:27 (WEA 3)	21:46	23	21:13 (WEA 4)
7	08:38	08:01	07:03	06:50		18:59 (WEA 1)	05:46		19:46 (WEA 2)	05:06		20:50 (WEA 4)
	16:29	17:23	18:16	20:11	27	19:26 (WEA 1)	21:03	41	20:27 (WEA 3)	21:47	23	21:13 (WEA 4)
8	08:37	07:59	07:00	06:48		18:59 (WEA 1)	05:44		19:47 (WEA 2)	05:05		20:50 (WEA 4)
	16:31	17:25	18:18	20:13	28	19:27 (WEA 1)	21:05	41	20:28 (WEA 3)	21:48	24	21:14 (WEA 4)
9	08:37	07:58	06:58	06:45		18:57 (WEA 1)	05:42		19:47 (WEA 2)	05:05		20:50 (WEA 4)
	16:32	17:27	18:19	20:15	30	19:27 (WEA 1)	21:07	40	20:27 (WEA 3)	21:49	24	21:14 (WEA 4)
10	08:36	07:56	06:56	06:43		18:57 (WEA 1)	05:40		19:47 (WEA 2)	05:04		20:51 (WEA 4)
	16:34	17:29	18:21	20:16	30	19:27 (WEA 1)	21:08	40	20:27 (WEA 3)	21:49	24	21:15 (WEA 4)
11	08:36	07:54	06:53	06:41		18:56 (WEA 1)	05:39		19:48 (WEA 2)	05:04		20:51 (WEA 4)
	16:35	17:31	18:23	20:18	31	19:27 (WEA 1)	21:10	39	20:27 (WEA 3)	21:50	25	21:16 (WEA 4)
12	08:35	07:52	06:51	06:38		18:56 (WEA 1)	05:37		19:48 (WEA 2)	05:04		20:51 (WEA 4)
	16:37	17:33	18:25	20:20	31	19:27 (WEA 1)	21:12	37	20:26 (WEA 3)	21:51	25	21:16 (WEA 4)
13	08:34	07:50	06:49	06:36		18:55 (WEA 1)	05:35		19:49 (WEA 2)	05:03		20:51 (WEA 4)
	16:38	17:34	18:27	20:22	31	19:26 (WEA 1)	21:13	35	20:26 (WEA 3)	21:52	26	21:17 (WEA 5)
14	08:34	07:48	06:46	06:34		18:56 (WEA 1)	05:34		19:50 (WEA 2)	05:03		20:51 (WEA 4)
	16:40	17:36	18:28	20:23	30	19:26 (WEA 1)	21:15	30	20:25 (WEA 3)	21:52	27	21:18 (WEA 5)
15	08:33	07:46	06:44	06:32		18:56 (WEA 1)	05:32		19:51 (WEA 2)	05:03		20:52 (WEA 4)
	16:41	17:38	18:30	20:25	29	19:25 (WEA 1)	21:17	27	20:24 (WEA 3)	21:53	27	21:19 (WEA 5)
16	08:32	07:44	06:42	06:29		18:56 (WEA 1)	05:30		19:52 (WEA 2)	05:03		20:52 (WEA 4)
	16:43	17:40	18:32	20:27	29	19:25 (WEA 1)	21:18	21	20:22 (WEA 3)	21:53	27	21:19 (WEA 5)
17	08:31	07:42	06:39	06:27		18:57 (WEA 1)	05:29		19:54 (WEA 2)	05:03		20:52 (WEA 4)
	16:44	17:42	18:34	20:29	27	19:24 (WEA 1)	21:20	10	20:04 (WEA 2)	21:54	28	21:20 (WEA 5)
18	08:30	07:40	06:37	06:25		18:57 (WEA 1)	05:27		19:59 (WEA 2)	05:03		20:52 (WEA 4)
	16:46	17:44	18:36	20:30	25	19:22 (WEA 1)	21:21	1	20:00 (WEA 2)	21:54	28	21:20 (WEA 5)
19	08:29	07:38	06:35	06:23		18:58 (WEA 1)	05:26			05:03		20:53 (WEA 4)
	16:48	17:46	18:37	20:32	23	19:21 (WEA 1)	21:23			21:55	27	21:20 (WEA 5)
20	08:28	07:36	06:32	06:20		19:00 (WEA 1)	05:24			05:03		20:53 (WEA 4)
	16:50	17:48	18:39	20:34	19	19:19 (WEA 1)	21:24			21:55	27	21:20 (WEA 5)
21	08:27	07:34	06:30	06:18		19:01 (WEA 1)	05:23			05:03		20:53 (WEA 4)
	16:51	17:50	18:41	20:36	16	19:17 (WEA 1)	21:26			21:55	27	21:20 (WEA 5)
22	08:25	07:32	06:28	06:16		19:04 (WEA 1)	05:22		20:54 (WEA 4)	05:03		20:54 (WEA 4)
	16:53	17:52	18:43	20:37	10	19:14 (WEA 1)	21:27	2	20:56 (WEA 4)	21:55	27	21:21 (WEA 5)
23	08:24	07:29	06:25	06:14			05:20		20:52 (WEA 4)	05:03		20:54 (WEA 4)
	16:55	17:53	18:45	20:39			21:29	4	20:56 (WEA 4)	21:56	27	21:21 (WEA 5)
24	08:23	07:27	06:23	06:12			05:19		20:52 (WEA 4)	05:04		20:54 (WEA 4)
	16:57	17:55	18:46	20:41			21:30	6	20:58 (WEA 4)	21:56	27	21:21 (WEA 5)
25	08:22	07:25	06:20	06:10			05:18		20:51 (WEA 4)	05:04		20:54 (WEA 4)
	16:58	17:57	18:48	20:43			21:32	8	20:59 (WEA 4)	21:56	28	21:22 (WEA 5)
26	08:20	07:23	06:18	06:08		19:55 (WEA 2)	05:17		20:51 (WEA 4)	05:04		20:54 (WEA 4)
	17:00	17:59	18:50	20:44	11	20:06 (WEA 2)	21:33	9	21:00 (WEA 4)	21:56	27	21:21 (WEA 5)
27	08:19	07:21	06:16	06:05		19:53 (WEA 2)	05:16		20:50 (WEA 4)	05:05		20:54 (WEA 4)
	17:02	18:01	18:52	20:46	15	20:08 (WEA 2)	21:34	12	21:02 (WEA 4)	21:56	27	21:21 (WEA 5)
28	08:17	07:19	06:13	06:03		19:51 (WEA 2)	05:14		20:50 (WEA 4)	05:05		20:55 (WEA 4)
	17:04	18:03	18:53	20:48	19	20:10 (WEA 2)	21:36	13	21:03 (WEA 4)	21:56	26	21:21 (WEA 5)
29	08:16		07:11	06:01		19:50 (WEA 2)	05:13		20:50 (WEA 4)	05:06		20:54 (WEA 4)
	17:06		19:55	20:50	21	20:11 (WEA 2)	21:37	14	21:04 (WEA 4)	21:55	27	21:21 (WEA 5)
30	08:14		07:09	05:59		19:49 (WEA 2)	05:12		20:49 (WEA 4)	05:06		20:55 (WEA 4)
	17:08		19:57	20:51	22	20:11 (WEA 2)	21:38	16	21:05 (WEA 4)	21:55	26	21:21 (WEA 5)
31	08:13		07:06				05:11		20:50 (WEA 4)			
	17:10		19:59				21:39	17	21:07 (WEA 4)			
Sonnenscheinstunden	255	276	367	418			489			503		
astr.max.mögl.Beschattung					595			669			753	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-12 - SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September			Oktober	November	Dezember
1	05:07		20:55 (WEA 4)	05:45		19:58 (WEA 2)	06:36		18:55 (WEA 1)	07:27	07:23	08:15
	21:55	26	21:21 (WEA 4)	21:22	39	20:37 (WEA 3)	20:18	31	19:26 (WEA 1)	19:07	16:59	16:17
2	05:08		20:55 (WEA 4)	05:46		19:58 (WEA 2)	06:38		18:56 (WEA 1)	07:29	07:24	08:17
	21:55	25	21:20 (WEA 4)	21:20	40	20:38 (WEA 3)	20:16	30	19:26 (WEA 1)	19:04	16:57	16:16
3	05:09		20:55 (WEA 4)	05:48		19:57 (WEA 2)	06:40		18:55 (WEA 1)	07:31	07:26	08:18
	21:54	25	21:20 (WEA 4)	21:18	40	20:37 (WEA 3)	20:13	30	19:25 (WEA 1)	19:02	16:55	16:16
4	05:09		20:56 (WEA 4)	05:50		19:57 (WEA 2)	06:41		18:56 (WEA 1)	07:32	07:28	08:19
	21:54	24	21:20 (WEA 4)	21:17	41	20:38 (WEA 3)	20:11	28	19:24 (WEA 1)	19:00	16:53	16:15
5	05:10		20:56 (WEA 4)	05:51		19:56 (WEA 2)	06:43		18:55 (WEA 1)	07:34	07:30	08:21
	21:53	23	21:19 (WEA 4)	21:15	41	20:37 (WEA 3)	20:09	28	19:23 (WEA 1)	18:57	16:51	16:14
6	05:11		20:56 (WEA 4)	05:53		19:56 (WEA 2)	06:45		18:56 (WEA 1)	07:36	07:32	08:22
	21:53	23	21:19 (WEA 4)	21:13	41	20:37 (WEA 3)	20:06	26	19:22 (WEA 1)	18:55	16:50	16:14
7	05:12		20:56 (WEA 4)	05:55		19:56 (WEA 2)	06:46		18:57 (WEA 1)	07:37	07:34	08:23
	21:52	22	21:18 (WEA 4)	21:11	40	20:36 (WEA 3)	20:04	23	19:20 (WEA 1)	18:53	16:48	16:14
8	05:13		20:56 (WEA 4)	05:56		19:56 (WEA 2)	06:48		18:58 (WEA 1)	07:39	07:36	08:25
	21:51	21	21:17 (WEA 4)	21:09	40	20:36 (WEA 3)	20:02	20	19:18 (WEA 1)	18:50	16:46	16:13
9	05:14		20:56 (WEA 4)	05:58		19:55 (WEA 2)	06:50		19:00 (WEA 1)	07:41	07:37	08:26
	21:51	21	21:17 (WEA 4)	21:07	37	20:34 (WEA 3)	19:59	16	19:16 (WEA 1)	18:48	16:44	16:13
10	05:15		20:57 (WEA 4)	05:59		19:56 (WEA 2)	06:52		19:04 (WEA 1)	07:43	07:39	08:27
	21:50	19	21:16 (WEA 4)	21:05	33	20:33 (WEA 3)	19:57	8	19:12 (WEA 1)	18:46	16:43	16:13
11	05:16		20:57 (WEA 4)	06:01		19:57 (WEA 2)	06:53			07:44	07:41	08:28
	21:49	18	21:15 (WEA 4)	21:03	24	20:21 (WEA 2)	19:54			18:43	16:41	16:12
12	05:17		20:57 (WEA 4)	06:03		19:56 (WEA 2)	06:55			07:46	07:43	08:29
	21:48	18	21:15 (WEA 4)	21:01	24	20:20 (WEA 2)	19:52			18:41	16:40	16:12
13	05:18		20:58 (WEA 4)	06:04		19:57 (WEA 2)	06:57			07:48	07:45	08:30
	21:47	16	21:14 (WEA 4)	20:59	23	20:20 (WEA 2)	19:50			18:39	16:38	16:12
14	05:19		20:58 (WEA 4)	06:06		19:58 (WEA 2)	06:58			07:50	07:47	08:31
	21:46	15	21:13 (WEA 4)	20:57	20	20:18 (WEA 2)	19:47			18:37	16:36	16:12
15	05:21		20:59 (WEA 4)	06:08		19:59 (WEA 2)	07:00			07:52	07:48	08:32
	21:45	14	21:13 (WEA 4)	20:55	18	20:17 (WEA 2)	19:45			18:34	16:35	16:12
16	05:22		21:00 (WEA 4)	06:09		20:00 (WEA 2)	07:02			07:53	07:50	08:33
	21:44	12	21:12 (WEA 4)	20:53	15	20:15 (WEA 2)	19:43			18:32	16:33	16:12
17	05:23		21:00 (WEA 4)	06:11		20:03 (WEA 2)	07:03			07:55	07:52	08:34
	21:43	10	21:10 (WEA 4)	20:51	9	20:12 (WEA 2)	19:40			18:30	16:32	16:12
18	05:24		21:00 (WEA 4)	06:13			07:05			07:57	07:54	08:35
	21:42	9	21:09 (WEA 4)	20:49			19:38			18:28	16:31	16:13
19	05:26		21:01 (WEA 4)	06:14			07:07			07:59	07:56	08:35
	21:41	7	21:08 (WEA 4)	20:47			19:35			18:26	16:29	16:13
20	05:27		21:03 (WEA 4)	06:16			07:08			08:01	07:57	08:36
	21:40	5	21:08 (WEA 4)	20:45			19:33			18:23	16:28	16:13
21	05:28		21:03 (WEA 4)	06:18		19:08 (WEA 1)	07:10			08:02	07:59	08:37
	21:38	3	21:06 (WEA 4)	20:43	11	19:19 (WEA 1)	19:31			18:21	16:27	16:14
22	05:30			06:20		19:06 (WEA 1)	07:12			08:04	08:01	08:37
	21:37			20:40	16	19:22 (WEA 1)	19:28			18:19	16:26	16:14
23	05:31			06:21		19:04 (WEA 1)	07:13			08:06	08:02	08:38
	21:36			20:38	20	19:24 (WEA 1)	19:26			18:17	16:24	16:15
24	05:33			06:23		19:02 (WEA 1)	07:15			08:08	08:04	08:38
	21:34			20:36	23	19:25 (WEA 1)	19:23			18:15	16:23	16:15
25	05:34			06:25		19:01 (WEA 1)	07:17			07:10	08:06	08:38
	21:33			20:34	25	19:26 (WEA 1)	19:21			17:13	16:22	16:16
26	05:36		20:07 (WEA 2)	06:26		18:59 (WEA 1)	07:18			07:12	08:07	08:39
	21:31	6	20:13 (WEA 2)	20:32	27	19:26 (WEA 1)	19:19			17:11	16:21	16:17
27	05:37		20:04 (WEA 2)	06:28		18:58 (WEA 1)	07:20			07:13	08:09	08:39
	21:30	17	20:32 (WEA 3)	20:29	29	19:27 (WEA 1)	19:16			17:09	16:20	16:17
28	05:39		20:03 (WEA 2)	06:30		18:58 (WEA 1)	07:22			07:15	08:11	08:39
	21:28	23	20:34 (WEA 3)	20:27	29	19:27 (WEA 1)	19:14			17:07	16:19	16:18
29	05:40		20:01 (WEA 2)	06:31		18:56 (WEA 1)	07:24			07:17	08:12	08:39
	21:27	29	20:35 (WEA 3)	20:25	31	19:27 (WEA 1)	19:11			17:05	16:19	16:19
30	05:42		20:00 (WEA 2)	06:33		18:56 (WEA 1)	07:25			07:19	08:14	08:39
	21:25	32	20:36 (WEA 3)	20:23	31	19:27 (WEA 1)	19:09			17:03	16:18	16:20
31	05:43		19:59 (WEA 2)	06:35		18:55 (WEA 1)				07:21		08:39
	21:23	36	20:37 (WEA 3)	20:20	31	19:26 (WEA 1)				17:01		16:21
Sonnenscheinstunden	506			456			381			330	263	240
astr.max.mögl.Beschattung		499			798			240				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-18 - SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:39 (WEA 1)	05:58		06:29 (WEA 3)	05:11		05:42 (WEA 4)
	16:22	17:12	18:05			20:01	15	07:54 (WEA 1)	20:53	13	06:42 (WEA 3)	21:41	26	06:08 (WEA 4)
2	08:39	08:10	07:14			07:02		07:40 (WEA 1)	05:56		06:29 (WEA 3)	05:10		05:42 (WEA 4)
	16:24	17:13	18:07			20:02	13	07:53 (WEA 1)	20:55	14	06:43 (WEA 3)	21:42	26	06:08 (WEA 4)
3	08:39	08:08	07:12			06:59		07:40 (WEA 1)	05:54		06:28 (WEA 3)	05:09		05:43 (WEA 4)
	16:25	17:15	18:09			20:04	10	07:50 (WEA 1)	20:57	16	06:44 (WEA 3)	21:43	25	06:08 (WEA 4)
4	08:39	08:07	07:10			06:57			05:52		06:27 (WEA 3)	05:08		05:43 (WEA 4)
	16:26	17:17	18:10			20:06			20:58	17	06:44 (WEA 3)	21:44	25	06:08 (WEA 4)
5	08:39	08:05	07:07			06:55			05:50		06:27 (WEA 3)	05:07		05:43 (WEA 4)
	16:27	17:19	18:12			20:08			21:00	16	06:43 (WEA 3)	21:45	25	06:08 (WEA 4)
6	08:38	08:03	07:05			06:52			05:48		06:26 (WEA 3)	05:07		05:44 (WEA 4)
	16:28	17:21	18:14			20:09			21:02	17	06:43 (WEA 3)	21:46	24	06:08 (WEA 4)
7	08:38	08:01	07:03			06:50			05:46		06:27 (WEA 3)	05:06		05:44 (WEA 4)
	16:30	17:23	18:16			20:11			21:04	16	06:43 (WEA 3)	21:47	24	06:08 (WEA 4)
8	08:38	07:59	07:01			06:48			05:44		06:27 (WEA 3)	05:06		05:44 (WEA 4)
	16:31	17:25	18:18			20:13			21:05	16	06:43 (WEA 3)	21:48	24	06:08 (WEA 4)
9	08:37	07:58	06:58			06:45			05:42		06:27 (WEA 3)	05:05		05:44 (WEA 4)
	16:32	17:27	18:20			20:15			21:07	15	06:42 (WEA 3)	21:49	24	06:08 (WEA 4)
10	08:36	07:56	06:56			06:43			05:41		06:29 (WEA 3)	05:05		05:45 (WEA 4)
	16:34	17:29	18:21			20:16			21:09	12	06:41 (WEA 3)	21:50	23	06:08 (WEA 4)
11	08:36	07:54	06:54			06:41		07:06 (WEA 2)	05:39		06:29 (WEA 3)	05:04		05:45 (WEA 4)
	16:35	17:31	18:23			20:18	9	07:15 (WEA 2)	21:10	11	06:40 (WEA 3)	21:50	24	06:09 (WEA 4)
12	08:35	07:52	06:51			06:38		07:04 (WEA 2)	05:37		06:31 (WEA 3)	05:04		05:46 (WEA 4)
	16:37	17:33	18:25			20:20	13	07:17 (WEA 2)	21:12	6	06:37 (WEA 3)	21:51	23	06:09 (WEA 4)
13	08:34	07:50	06:49			06:36		07:03 (WEA 2)	05:35			05:03		05:46 (WEA 4)
	16:38	17:35	18:27			20:22	15	07:18 (WEA 2)	21:14			21:52	22	06:08 (WEA 4)
14	08:34	07:48	06:47			06:34		07:01 (WEA 2)	05:34			05:03		05:46 (WEA 4)
	16:40	17:36	18:29			20:24	17	07:18 (WEA 2)	21:15			21:52	22	06:08 (WEA 4)
15	08:33	07:46	06:44			06:32		07:01 (WEA 2)	05:32			05:03		05:46 (WEA 4)
	16:41	17:38	18:30			20:25	17	07:18 (WEA 2)	21:17			21:53	23	06:09 (WEA 4)
16	08:32	07:44	06:42			06:29		07:00 (WEA 2)	05:31			05:03		05:47 (WEA 4)
	16:43	17:40	18:32			20:27	18	07:18 (WEA 2)	21:18			21:54	22	06:09 (WEA 4)
17	08:31	07:42	06:40			06:27		07:00 (WEA 2)	05:29		05:56 (WEA 4)	05:03		05:47 (WEA 4)
	16:45	17:42	18:34			20:29	18	07:18 (WEA 2)	21:20	4	06:00 (WEA 4)	21:54	22	06:09 (WEA 4)
18	08:30	07:40	06:37			06:25		07:01 (WEA 2)	05:28		05:55 (WEA 4)	05:03		05:47 (WEA 4)
	16:46	17:44	18:36			20:31	17	07:18 (WEA 2)	21:21	7	06:02 (WEA 4)	21:54	22	06:09 (WEA 4)
19	08:29	07:38	06:35			06:23		07:00 (WEA 2)	05:26		05:53 (WEA 4)	05:03		05:47 (WEA 4)
	16:48	17:46	18:38			20:32	16	07:16 (WEA 2)	21:23	9	06:02 (WEA 4)	21:55	22	06:09 (WEA 4)
20	08:28	07:36	06:32			06:21		07:01 (WEA 2)	05:25		05:52 (WEA 4)	05:03		05:48 (WEA 4)
	16:50	17:48	18:39			20:34	14	07:15 (WEA 2)	21:25	11	06:03 (WEA 4)	21:55	21	06:09 (WEA 4)
21	08:27	07:34	06:30			06:18		07:02 (WEA 2)	05:23		05:51 (WEA 4)	05:03		05:48 (WEA 4)
	16:51	17:50	18:41			20:36	12	07:14 (WEA 2)	21:26	13	06:04 (WEA 4)	21:55	21	06:09 (WEA 4)
22	08:26	07:32	06:28			06:16		07:04 (WEA 2)	05:22		05:50 (WEA 4)	05:03		05:49 (WEA 4)
	16:53	17:52	18:43			20:38	8	07:12 (WEA 2)	21:27	15	06:05 (WEA 4)	21:56	21	06:10 (WEA 4)
23	08:24	07:30	06:25			06:14			05:21		05:49 (WEA 4)	05:03		05:49 (WEA 4)
	16:55	17:54	18:45			20:39			21:29	17	06:06 (WEA 4)	21:56	21	06:10 (WEA 4)
24	08:23	07:27	06:23			06:12			05:19		05:47 (WEA 4)	05:04		05:48 (WEA 4)
	16:57	17:55	18:46			20:41			21:30	18	06:05 (WEA 4)	21:56	22	06:10 (WEA 4)
25	08:22	07:25	06:21		06:45 (WEA 1)	06:10			05:18		05:46 (WEA 4)	05:04		05:49 (WEA 4)
	16:59	17:57	18:48	8	06:53 (WEA 1)	20:43			21:32	20	06:06 (WEA 4)	21:56	22	06:11 (WEA 4)
26	08:20	07:23	06:18		06:42 (WEA 1)	06:08			05:17		05:45 (WEA 4)	05:04		05:49 (WEA 4)
	17:00	17:59	18:50	12	06:54 (WEA 1)	20:45			21:33	21	06:06 (WEA 4)	21:56	22	06:11 (WEA 4)
27	08:19	07:21	06:16		06:41 (WEA 1)	06:06			05:16		05:44 (WEA 4)	05:05		05:50 (WEA 4)
	17:02	18:01	18:52	14	06:55 (WEA 1)	20:46			21:34	23	06:07 (WEA 4)	21:56	22	06:12 (WEA 4)
28	08:18	07:19	06:14		06:39 (WEA 1)	06:04			05:15		05:43 (WEA 4)	05:05		05:49 (WEA 4)
	17:04	18:03	18:54	16	06:55 (WEA 1)	20:48			21:36	24	06:07 (WEA 4)	21:56	23	06:12 (WEA 4)
29	08:16		07:11		07:39 (WEA 1)	06:02		06:32 (WEA 3)	05:14		05:42 (WEA 4)	05:06		05:50 (WEA 4)
	17:06		19:55	16	07:55 (WEA 1)	20:50	7	06:39 (WEA 3)	21:37	25	06:07 (WEA 4)	21:56	22	06:12 (WEA 4)
30	08:15		07:09		07:39 (WEA 1)	06:00		06:30 (WEA 3)	05:12		05:43 (WEA 4)	05:07		05:49 (WEA 4)
	17:08		19:57	16	07:55 (WEA 1)	20:52	11	06:41 (WEA 3)	21:38	25	06:08 (WEA 4)	21:55	23	06:12 (WEA 4)
31	08:13		07:06		07:38 (WEA 1)				05:12		05:42 (WEA 4)			
	17:10		19:59	16	07:54 (WEA 1)				21:40	26	06:08 (WEA 4)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				98			230			427			688	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung **Schattenrezeptor:** SR-18 - SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober	November	Dezember
1	05:07		05:50 (WEA 4)	05:45		06:40 (WEA 3)	06:37		07:05 (WEA 2)	07:27	07:23	08:15
	21:55	23	06:13 (WEA 4)	21:22	9	06:49 (WEA 3)	20:18	9	07:14 (WEA 2)	19:07	16:59	16:17
2	05:08		05:50 (WEA 4)	05:47		06:39 (WEA 3)	06:38			07:29	07:25	08:17
	21:55	23	06:13 (WEA 4)	21:20	12	06:51 (WEA 3)	20:16			19:05	16:57	16:16
3	05:09		05:49 (WEA 4)	05:48		06:38 (WEA 3)	06:40			07:31	07:26	08:18
	21:54	24	06:13 (WEA 4)	21:18	13	06:51 (WEA 3)	20:13			19:02	16:55	16:16
4	05:09		05:50 (WEA 4)	05:50		06:38 (WEA 3)	06:42			07:32	07:28	08:20
	21:54	24	06:14 (WEA 4)	21:17	14	06:52 (WEA 3)	20:11			19:00	16:53	16:15
5	05:10		05:50 (WEA 4)	05:51		06:36 (WEA 3)	06:43			07:34	07:30	08:21
	21:53	24	06:14 (WEA 4)	21:15	16	06:52 (WEA 3)	20:09			18:57	16:52	16:15
6	05:11		05:50 (WEA 4)	05:53		06:37 (WEA 3)	06:45			07:36	07:32	08:22
	21:53	25	06:15 (WEA 4)	21:13	16	06:53 (WEA 3)	20:06			18:55	16:50	16:14
7	05:12		05:50 (WEA 4)	05:55		06:37 (WEA 3)	06:47			07:38	07:34	08:24
	21:52	25	06:15 (WEA 4)	21:11	16	06:53 (WEA 3)	20:04			18:53	16:48	16:14
8	05:13		05:49 (WEA 4)	05:56		06:36 (WEA 3)	06:48			07:39	07:36	08:25
	21:52	25	06:14 (WEA 4)	21:09	17	06:53 (WEA 3)	20:02			18:51	16:46	16:13
9	05:14		05:50 (WEA 4)	05:58		06:37 (WEA 3)	06:50		07:35 (WEA 1)	07:41	07:38	08:26
	21:51	25	06:15 (WEA 4)	21:07	16	06:53 (WEA 3)	19:59	9	07:44 (WEA 1)	18:48	16:45	16:13
10	05:15		05:50 (WEA 4)	06:00		06:36 (WEA 3)	06:52		07:33 (WEA 1)	07:43	07:39	08:27
	21:50	25	06:15 (WEA 4)	21:05	16	06:52 (WEA 3)	19:57	13	07:46 (WEA 1)	18:46	16:43	16:13
11	05:16		05:50 (WEA 4)	06:01		06:37 (WEA 3)	06:53		07:31 (WEA 1)	07:45	07:41	08:28
	21:49	25	06:15 (WEA 4)	21:03	15	06:52 (WEA 3)	19:55	15	07:46 (WEA 1)	18:44	16:41	16:13
12	05:17		05:50 (WEA 4)	06:03		06:37 (WEA 3)	06:55		07:31 (WEA 1)	07:46	07:43	08:29
	21:48	25	06:15 (WEA 4)	21:01	13	06:50 (WEA 3)	19:52	15	07:46 (WEA 1)	18:41	16:40	16:12
13	05:18		05:51 (WEA 4)	06:05		06:39 (WEA 3)	06:57		07:30 (WEA 1)	07:48	07:45	08:30
	21:47	25	06:16 (WEA 4)	20:59	10	06:49 (WEA 3)	19:50	17	07:47 (WEA 1)	18:39	16:38	16:12
14	05:20		05:51 (WEA 4)	06:06		06:41 (WEA 3)	06:58		07:29 (WEA 1)	07:50	07:47	08:31
	21:46	25	06:16 (WEA 4)	20:57	5	06:46 (WEA 3)	19:47	17	07:46 (WEA 1)	18:37	16:37	16:12
15	05:21		05:52 (WEA 4)	06:08			07:00		07:30 (WEA 1)	07:52	07:49	08:32
	21:45	24	06:16 (WEA 4)	20:55			19:45	15	07:45 (WEA 1)	18:35	16:35	16:12
16	05:22		05:53 (WEA 4)	06:10			07:02		07:29 (WEA 1)	07:54	07:50	08:33
	21:44	23	06:16 (WEA 4)	20:53			19:43	15	07:44 (WEA 1)	18:32	16:34	16:12
17	05:23		05:54 (WEA 4)	06:11			07:03		07:30 (WEA 1)	07:55	07:52	08:34
	21:43	22	06:16 (WEA 4)	20:51			19:40	13	07:43 (WEA 1)	18:30	16:32	16:13
18	05:25		05:55 (WEA 4)	06:13			07:05		07:32 (WEA 1)	07:57	07:54	08:35
	21:42	21	06:16 (WEA 4)	20:49			19:38	9	07:41 (WEA 1)	18:28	16:31	16:13
19	05:26		05:57 (WEA 4)	06:15			07:07			07:59	07:56	08:35
	21:41	19	06:16 (WEA 4)	20:47			19:36			18:26	16:30	16:13
20	05:27		05:58 (WEA 4)	06:16			07:08			08:01	07:57	08:36
	21:40	18	06:16 (WEA 4)	20:45			19:33			18:24	16:28	16:13
21	05:29		05:59 (WEA 4)	06:18		07:09 (WEA 2)	07:10			08:03	07:59	08:37
	21:38	16	06:15 (WEA 4)	20:43	9	07:18 (WEA 2)	19:31			18:21	16:27	16:14
22	05:30		06:00 (WEA 4)	06:20		07:06 (WEA 2)	07:12			08:04	08:01	08:37
	21:37	14	06:14 (WEA 4)	20:41	13	07:19 (WEA 2)	19:28			18:19	16:26	16:14
23	05:31		06:02 (WEA 4)	06:21		07:05 (WEA 2)	07:14			08:06	08:03	08:38
	21:36	12	06:14 (WEA 4)	20:38	15	07:20 (WEA 2)	19:26			18:17	16:25	16:15
24	05:33		06:03 (WEA 4)	06:23		07:04 (WEA 2)	07:15			08:08	08:04	08:38
	21:34	10	06:13 (WEA 4)	20:36	16	07:20 (WEA 2)	19:24			18:15	16:23	16:15
25	05:34		06:04 (WEA 4)	06:25		07:03 (WEA 2)	07:17			07:10	08:06	08:39
	21:33	8	06:12 (WEA 4)	20:34	18	07:21 (WEA 2)	19:21			17:13	16:22	16:16
26	05:36		06:06 (WEA 4)	06:26		07:02 (WEA 2)	07:19			07:12	08:08	08:39
	21:31	6	06:12 (WEA 4)	20:32	18	07:20 (WEA 2)	19:19			17:11	16:21	16:17
27	05:37		06:07 (WEA 4)	06:28		07:02 (WEA 2)	07:20			07:14	08:09	08:39
	21:30	2	06:09 (WEA 4)	20:29	18	07:20 (WEA 2)	19:16			17:09	16:20	16:18
28	05:39			06:30		07:03 (WEA 2)	07:22			07:15	08:11	08:39
	21:28			20:27	17	07:20 (WEA 2)	19:14			17:07	16:20	16:18
29	05:40			06:31		07:02 (WEA 2)	07:24			07:17	08:12	08:40
	21:27			20:25	17	07:19 (WEA 2)	19:12			17:05	16:19	16:19
30	05:42			06:33		07:03 (WEA 2)	07:25			07:19	08:14	08:40
	21:25			20:23	15	07:18 (WEA 2)	19:09			17:03	16:18	16:20
31	05:43		06:44 (WEA 3)	06:35		07:04 (WEA 2)				07:21		08:40
	21:24	2	06:46 (WEA 3)	20:20	13	07:17 (WEA 2)				17:01		16:21
Sonnenscheinstunden	506			456			381			330	263	240
astr.max.mögl.Beschattung		540			357			147				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-19 - SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:40 (WEA 1)	05:58		06:30 (WEA 3)	05:11		05:45 (WEA 4)
	16:22	17:12	18:05			20:01	14	07:54 (WEA 1)	20:53	14	06:44 (WEA 3)	21:41	25	06:10 (WEA 4)
2	08:39	08:10	07:14			07:02		07:41 (WEA 1)	05:56		06:30 (WEA 3)	05:10		05:45 (WEA 4)
	16:24	17:13	18:07			20:02	11	07:52 (WEA 1)	20:55	16	06:46 (WEA 3)	21:42	24	06:09 (WEA 4)
3	08:39	08:08	07:12			06:59		07:43 (WEA 1)	05:54		06:29 (WEA 3)	05:09		05:46 (WEA 4)
	16:25	17:15	18:09			20:04	6	07:49 (WEA 1)	20:57	17	06:46 (WEA 3)	21:43	24	06:10 (WEA 4)
4	08:39	08:07	07:10			06:57			05:52		06:29 (WEA 3)	05:08		05:46 (WEA 4)
	16:26	17:17	18:10			20:06			20:58	16	06:45 (WEA 3)	21:44	24	06:10 (WEA 4)
5	08:39	08:05	07:07			06:55			05:50		06:29 (WEA 3)	05:07		05:46 (WEA 4)
	16:27	17:19	18:12			20:08			21:00	16	06:45 (WEA 3)	21:45	23	06:09 (WEA 4)
6	08:38	08:03	07:05			06:52			05:48		06:29 (WEA 3)	05:07		05:47 (WEA 4)
	16:28	17:21	18:14			20:09			21:02	15	06:44 (WEA 3)	21:46	23	06:10 (WEA 4)
7	08:38	08:01	07:03			06:50			05:46		06:30 (WEA 3)	05:06		05:47 (WEA 4)
	16:30	17:23	18:16			20:11			21:04	14	06:44 (WEA 3)	21:47	22	06:09 (WEA 4)
8	08:38	07:59	07:01			06:48			05:44		06:30 (WEA 3)	05:06		05:47 (WEA 4)
	16:31	17:25	18:18			20:13			21:05	13	06:43 (WEA 3)	21:48	23	06:10 (WEA 4)
9	08:37	07:58	06:58			06:45			05:42		06:31 (WEA 3)	05:05		05:47 (WEA 4)
	16:32	17:27	18:20			20:15			21:07	11	06:42 (WEA 3)	21:49	22	06:09 (WEA 4)
10	08:36	07:56	06:56			06:43		07:08 (WEA 2)	05:41		06:33 (WEA 3)	05:05		05:48 (WEA 4)
	16:34	17:29	18:21			20:16	7	07:15 (WEA 2)	21:09	8	06:41 (WEA 3)	21:50	21	06:09 (WEA 4)
11	08:36	07:54	06:54			06:41		07:06 (WEA 2)	05:39		06:36 (WEA 3)	05:04		05:49 (WEA 4)
	16:35	17:31	18:23			20:18	12	07:18 (WEA 2)	21:10	1	06:37 (WEA 3)	21:50	21	06:10 (WEA 4)
12	08:35	07:52	06:51			06:38		07:05 (WEA 2)	05:37			05:04		05:49 (WEA 4)
	16:37	17:33	18:25			20:20	14	07:19 (WEA 2)	21:12			21:51	21	06:10 (WEA 4)
13	08:34	07:50	06:49			06:36		07:04 (WEA 2)	05:35			05:03		05:49 (WEA 4)
	16:38	17:35	18:27			20:22	16	07:20 (WEA 2)	21:14			21:52	20	06:09 (WEA 4)
14	08:34	07:48	06:47			06:34		07:02 (WEA 2)	05:34			05:03		05:49 (WEA 4)
	16:40	17:36	18:29			20:24	17	07:19 (WEA 2)	21:15			21:52	20	06:09 (WEA 4)
15	08:33	07:46	06:44			06:32		07:02 (WEA 2)	05:32		05:59 (WEA 4)	05:03		05:50 (WEA 4)
	16:41	17:38	18:30			20:25	17	07:19 (WEA 2)	21:17	2	06:01 (WEA 4)	21:53	20	06:10 (WEA 4)
16	08:32	07:44	06:42			06:29		07:02 (WEA 2)	05:31		05:58 (WEA 4)	05:03		05:50 (WEA 4)
	16:43	17:40	18:32			20:27	17	07:19 (WEA 2)	21:18	6	06:04 (WEA 4)	21:54	20	06:10 (WEA 4)
17	08:31	07:42	06:40			06:27		07:02 (WEA 2)	05:29		05:56 (WEA 4)	05:03		05:51 (WEA 4)
	16:45	17:42	18:34			20:29	17	07:19 (WEA 2)	21:20	8	06:04 (WEA 4)	21:54	19	06:10 (WEA 4)
18	08:30	07:40	06:37			06:25		07:02 (WEA 2)	05:28		05:55 (WEA 4)	05:03		05:51 (WEA 4)
	16:46	17:44	18:36			20:31	16	07:18 (WEA 2)	21:21	11	06:06 (WEA 4)	21:54	19	06:10 (WEA 4)
19	08:29	07:38	06:35			06:23		07:02 (WEA 2)	05:26		05:53 (WEA 4)	05:03		05:51 (WEA 4)
	16:48	17:46	18:38			20:32	14	07:16 (WEA 2)	21:23	13	06:06 (WEA 4)	21:55	19	06:10 (WEA 4)
20	08:28	07:36	06:32			06:21		07:03 (WEA 2)	05:25		05:52 (WEA 4)	05:03		05:51 (WEA 4)
	16:50	17:48	18:39			20:34	12	07:15 (WEA 2)	21:25	15	06:07 (WEA 4)	21:55	19	06:10 (WEA 4)
21	08:27	07:34	06:30			06:18		07:05 (WEA 2)	05:23		05:51 (WEA 4)	05:03		05:51 (WEA 4)
	16:51	17:50	18:41			20:36	8	07:13 (WEA 2)	21:26	16	06:07 (WEA 4)	21:55	19	06:10 (WEA 4)
22	08:26	07:32	06:28			06:16			05:22		05:50 (WEA 4)	05:03		05:52 (WEA 4)
	16:53	17:52	18:43			20:38			21:27	18	06:08 (WEA 4)	21:56	19	06:11 (WEA 4)
23	08:24	07:30	06:25			06:14			05:21		05:49 (WEA 4)	05:03		05:52 (WEA 4)
	16:55	17:54	18:45			20:39			21:29	20	06:09 (WEA 4)	21:56	19	06:11 (WEA 4)
24	08:23	07:27	06:23			06:12			05:19		05:47 (WEA 4)	05:04		05:52 (WEA 4)
	16:57	17:55	18:46			20:41			21:30	21	06:08 (WEA 4)	21:56	19	06:11 (WEA 4)
25	08:22	07:25	06:21		06:45 (WEA 1)	06:10			05:18		05:46 (WEA 4)	05:04		05:53 (WEA 4)
	16:59	17:57	18:48	9	06:54 (WEA 1)	20:43			21:32	22	06:08 (WEA 4)	21:56	19	06:12 (WEA 4)
26	08:20	07:23	06:18		06:42 (WEA 1)	06:08			05:17		05:45 (WEA 4)	05:04		05:52 (WEA 4)
	17:00	17:59	18:50	13	06:55 (WEA 1)	20:45			21:33	24	06:09 (WEA 4)	21:56	20	06:12 (WEA 4)
27	08:19	07:21	06:16		06:41 (WEA 1)	06:06			05:16		05:44 (WEA 4)	05:05		05:53 (WEA 4)
	17:02	18:01	18:52	15	06:56 (WEA 1)	20:46			21:34	25	06:09 (WEA 4)	21:56	20	06:13 (WEA 4)
28	08:18	07:19	06:14		06:40 (WEA 1)	06:04		06:34 (WEA 3)	05:15		05:44 (WEA 4)	05:05		05:53 (WEA 4)
	17:04	18:03	18:54	16	06:56 (WEA 1)	20:48	7	06:41 (WEA 3)	21:36	25	06:09 (WEA 4)	21:56	19	06:12 (WEA 4)
29	08:16		07:11		07:40 (WEA 1)	06:02		06:32 (WEA 3)	05:14		05:44 (WEA 4)	05:06		05:53 (WEA 4)
	17:06		19:55	16	07:56 (WEA 1)	20:50	11	06:43 (WEA 3)	21:37	25	06:09 (WEA 4)	21:56	20	06:13 (WEA 4)
30	08:15		07:09		07:40 (WEA 1)	06:00		06:31 (WEA 3)	05:12		05:45 (WEA 4)	05:07		05:53 (WEA 4)
	17:08		19:57	16	07:56 (WEA 1)	20:52	13	06:44 (WEA 3)	21:38	25	06:10 (WEA 4)	21:55	20	06:13 (WEA 4)
31	08:13		07:06		07:39 (WEA 1)				05:12		05:45 (WEA 4)			
	17:10		19:59	15	07:54 (WEA 1)				21:40	25	06:10 (WEA 4)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				100			229			442			623	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung **Schattenrezeptor:** SR-19 - SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober	November	Dezember
1	05:07		05:53 (WEA 4)	05:45			06:37		07:05 (WEA 2)	07:27	07:23	08:15
	21:55	21	06:14 (WEA 4)	21:22			20:18	12	07:17 (WEA 2)	19:07	16:59	16:17
2	05:08		05:53 (WEA 4)	05:47		06:44 (WEA 3)	06:38		07:07 (WEA 2)	07:29	07:25	08:17
	21:55	22	06:15 (WEA 4)	21:20	5	06:49 (WEA 3)	20:16	7	07:14 (WEA 2)	19:05	16:57	16:16
3	05:09		05:53 (WEA 4)	05:48		06:42 (WEA 3)	06:40			07:31	07:26	08:18
	21:54	21	06:14 (WEA 4)	21:18	9	06:51 (WEA 3)	20:13			19:02	16:55	16:16
4	05:09		05:53 (WEA 4)	05:50		06:41 (WEA 3)	06:42			07:32	07:28	08:20
	21:54	22	06:15 (WEA 4)	21:17	12	06:53 (WEA 3)	20:11			19:00	16:53	16:15
5	05:10		05:53 (WEA 4)	05:51		06:39 (WEA 3)	06:43			07:34	07:30	08:21
	21:53	22	06:15 (WEA 4)	21:15	14	06:53 (WEA 3)	20:09			18:57	16:52	16:15
6	05:11		05:53 (WEA 4)	05:53		06:39 (WEA 3)	06:45			07:36	07:32	08:22
	21:53	23	06:16 (WEA 4)	21:13	15	06:54 (WEA 3)	20:06			18:55	16:50	16:14
7	05:12		05:53 (WEA 4)	05:55		06:39 (WEA 3)	06:47			07:38	07:34	08:24
	21:52	24	06:17 (WEA 4)	21:11	16	06:55 (WEA 3)	20:04			18:53	16:48	16:14
8	05:13		05:52 (WEA 4)	05:56		06:38 (WEA 3)	06:48			07:39	07:36	08:25
	21:52	24	06:16 (WEA 4)	21:09	16	06:54 (WEA 3)	20:02			18:51	16:46	16:13
9	05:14		05:52 (WEA 4)	05:58		06:38 (WEA 3)	06:50		07:37 (WEA 1)	07:41	07:38	08:26
	21:51	24	06:16 (WEA 4)	21:07	17	06:55 (WEA 3)	19:59	6	07:43 (WEA 1)	18:48	16:45	16:13
10	05:15		05:52 (WEA 4)	06:00		06:38 (WEA 3)	06:52		07:35 (WEA 1)	07:43	07:39	08:27
	21:50	25	06:17 (WEA 4)	21:05	16	06:54 (WEA 3)	19:57	10	07:45 (WEA 1)	18:46	16:43	16:13
11	05:16		05:52 (WEA 4)	06:01		06:38 (WEA 3)	06:53		07:32 (WEA 1)	07:45	07:41	08:28
	21:49	25	06:17 (WEA 4)	21:03	16	06:54 (WEA 3)	19:55	14	07:46 (WEA 1)	18:44	16:41	16:13
12	05:17		05:52 (WEA 4)	06:03		06:38 (WEA 3)	06:55		07:32 (WEA 1)	07:46	07:43	08:29
	21:48	25	06:17 (WEA 4)	21:01	15	06:53 (WEA 3)	19:52	15	07:47 (WEA 1)	18:41	16:40	16:12
13	05:18		05:53 (WEA 4)	06:05		06:39 (WEA 3)	06:57		07:31 (WEA 1)	07:48	07:45	08:30
	21:47	25	06:18 (WEA 4)	20:59	13	06:52 (WEA 3)	19:50	16	07:47 (WEA 1)	18:39	16:38	16:12
14	05:20		05:53 (WEA 4)	06:06		06:40 (WEA 3)	06:58		07:30 (WEA 1)	07:50	07:47	08:31
	21:46	25	06:18 (WEA 4)	20:57	10	06:50 (WEA 3)	19:47	16	07:46 (WEA 1)	18:37	16:37	16:12
15	05:21		05:53 (WEA 4)	06:08		06:42 (WEA 3)	07:00		07:30 (WEA 1)	07:52	07:49	08:32
	21:45	25	06:18 (WEA 4)	20:55	6	06:48 (WEA 3)	19:45	16	07:46 (WEA 1)	18:35	16:35	16:12
16	05:22		05:53 (WEA 4)	06:10			07:02		07:30 (WEA 1)	07:54	07:50	08:33
	21:44	25	06:18 (WEA 4)	20:53			19:43	15	07:45 (WEA 1)	18:32	16:34	16:12
17	05:23		05:54 (WEA 4)	06:11			07:03		07:30 (WEA 1)	07:55	07:52	08:34
	21:43	24	06:18 (WEA 4)	20:51			19:40	14	07:44 (WEA 1)	18:30	16:32	16:13
18	05:25		05:55 (WEA 4)	06:13			07:05		07:32 (WEA 1)	07:57	07:54	08:35
	21:42	23	06:18 (WEA 4)	20:49			19:38	10	07:42 (WEA 1)	18:28	16:31	16:13
19	05:26		05:57 (WEA 4)	06:15			07:07		07:34 (WEA 1)	07:59	07:56	08:35
	21:41	22	06:19 (WEA 4)	20:47			19:36	4	07:38 (WEA 1)	18:26	16:30	16:13
20	05:27		05:58 (WEA 4)	06:16			07:08			08:01	07:57	08:36
	21:40	20	06:18 (WEA 4)	20:45			19:33			18:24	16:28	16:13
21	05:29		05:59 (WEA 4)	06:18			07:10			08:03	07:59	08:37
	21:38	19	06:18 (WEA 4)	20:43			19:31			18:21	16:27	16:14
22	05:30		06:00 (WEA 4)	06:20		07:09 (WEA 2)	07:12			08:04	08:01	08:37
	21:37	17	06:17 (WEA 4)	20:41	9	07:18 (WEA 2)	19:28			18:19	16:26	16:14
23	05:31		06:02 (WEA 4)	06:21		07:08 (WEA 2)	07:14			08:06	08:03	08:38
	21:36	16	06:18 (WEA 4)	20:38	12	07:20 (WEA 2)	19:26			18:17	16:25	16:15
24	05:33		06:03 (WEA 4)	06:23		07:06 (WEA 2)	07:15			08:08	08:04	08:38
	21:34	14	06:17 (WEA 4)	20:36	14	07:20 (WEA 2)	19:24			18:15	16:23	16:15
25	05:34		06:04 (WEA 4)	06:25		07:05 (WEA 2)	07:17			07:10	08:06	08:39
	21:33	12	06:16 (WEA 4)	20:34	16	07:21 (WEA 2)	19:21			17:13	16:22	16:16
26	05:36		06:06 (WEA 4)	06:26		07:04 (WEA 2)	07:19			07:12	08:08	08:39
	21:31	10	06:16 (WEA 4)	20:32	17	07:21 (WEA 2)	19:19			17:11	16:21	16:17
27	05:37		06:07 (WEA 4)	06:28		07:04 (WEA 2)	07:20			07:14	08:09	08:39
	21:30	7	06:14 (WEA 4)	20:29	17	07:21 (WEA 2)	19:16			17:09	16:20	16:18
28	05:39		06:09 (WEA 4)	06:30		07:04 (WEA 2)	07:22			07:15	08:11	08:39
	21:28	4	06:13 (WEA 4)	20:27	17	07:21 (WEA 2)	19:14			17:07	16:20	16:18
29	05:40		06:10 (WEA 4)	06:31		07:03 (WEA 2)	07:24			07:17	08:12	08:40
	21:27	1	06:11 (WEA 4)	20:25	17	07:20 (WEA 2)	19:12			17:05	16:19	16:19
30	05:42			06:33		07:04 (WEA 2)	07:25			07:19	08:14	08:40
	21:25			20:23	16	07:20 (WEA 2)	19:09			17:03	16:18	16:20
31	05:43			06:35		07:05 (WEA 2)				07:21		08:40
	21:24			20:20	14	07:19 (WEA 2)				17:01		16:21
Sonnenscheinstunden	506			456			381			330	263	240
astr.max.mögl.Beschattung		567			329			155				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-20 - SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:43 (WEA 1)	05:58		06:32 (WEA 3)	05:11		05:51 (WEA 4)
	16:22	17:12	18:05			20:01	11	07:54 (WEA 1)	20:53	16	06:48 (WEA 3)	21:41	21	06:12 (WEA 4)
2	08:39	08:10	07:14			07:02		07:45 (WEA 1)	05:56		06:33 (WEA 3)	05:10		05:51 (WEA 4)
	16:24	17:13	18:07			20:02	6	07:51 (WEA 1)	20:55	16	06:49 (WEA 3)	21:42	21	06:12 (WEA 4)
3	08:39	08:08	07:12			06:59			05:54		06:33 (WEA 3)	05:09		05:52 (WEA 4)
	16:25	17:15	18:09			20:04			20:57	16	06:49 (WEA 3)	21:43	21	06:13 (WEA 4)
4	08:39	08:07	07:10			06:57			05:52		06:33 (WEA 3)	05:08		05:52 (WEA 4)
	16:26	17:17	18:10			20:06			20:58	15	06:48 (WEA 3)	21:44	20	06:12 (WEA 4)
5	08:39	08:05	07:07			06:55			05:50		06:34 (WEA 3)	05:07		05:52 (WEA 4)
	16:27	17:19	18:12			20:08			21:00	13	06:47 (WEA 3)	21:45	19	06:11 (WEA 4)
6	08:38	08:03	07:05			06:52			05:48		06:34 (WEA 3)	05:07		05:53 (WEA 4)
	16:28	17:21	18:14			20:09			21:02	11	06:45 (WEA 3)	21:46	19	06:12 (WEA 4)
7	08:38	08:01	07:03			06:50			05:46		06:36 (WEA 3)	05:06		05:53 (WEA 4)
	16:30	17:23	18:16			20:11			21:04	9	06:45 (WEA 3)	21:47	18	06:11 (WEA 4)
8	08:38	07:59	07:01			06:48			05:44		06:39 (WEA 3)	05:06		05:54 (WEA 4)
	16:31	17:25	18:18			20:13			21:05	2	06:41 (WEA 3)	21:48	17	06:11 (WEA 4)
9	08:37	07:58	06:58			06:45		07:11 (WEA 2)	05:42			05:05		05:54 (WEA 4)
	16:32	17:27	18:20			20:15	8	07:19 (WEA 2)	21:07			21:49	16	06:10 (WEA 4)
10	08:36	07:56	06:56			06:43		07:08 (WEA 2)	05:41			05:05		05:55 (WEA 4)
	16:34	17:29	18:21			20:16	12	07:20 (WEA 2)	21:09			21:50	15	06:10 (WEA 4)
11	08:36	07:54	06:54			06:41		07:07 (WEA 2)	05:39			05:04		05:56 (WEA 4)
	16:35	17:31	18:23			20:18	14	07:21 (WEA 2)	21:10			21:50	15	06:11 (WEA 4)
12	08:35	07:52	06:51			06:38		07:06 (WEA 2)	05:37		06:03 (WEA 4)	05:04		05:57 (WEA 4)
	16:37	17:33	18:25			20:20	16	07:22 (WEA 2)	21:12	2	06:05 (WEA 4)	21:51	14	06:11 (WEA 4)
13	08:34	07:50	06:49			06:36		07:05 (WEA 2)	05:35		06:02 (WEA 4)	05:03		05:57 (WEA 4)
	16:38	17:35	18:27			20:22	17	07:22 (WEA 2)	21:14	5	06:07 (WEA 4)	21:52	13	06:10 (WEA 4)
14	08:34	07:48	06:47			06:34		07:04 (WEA 2)	05:34		06:00 (WEA 4)	05:03		05:58 (WEA 4)
	16:40	17:36	18:29			20:24	17	07:21 (WEA 2)	21:15	8	06:08 (WEA 4)	21:52	11	06:09 (WEA 4)
15	08:33	07:46	06:44			06:32		07:04 (WEA 2)	05:32		05:59 (WEA 4)	05:03		05:58 (WEA 4)
	16:41	17:38	18:30			20:25	17	07:21 (WEA 2)	21:17	10	06:09 (WEA 4)	21:53	11	06:09 (WEA 4)
16	08:32	07:44	06:42			06:29		07:05 (WEA 2)	05:31		05:58 (WEA 4)	05:03		05:59 (WEA 4)
	16:43	17:40	18:32			20:27	16	07:21 (WEA 2)	21:18	13	06:11 (WEA 4)	21:54	10	06:09 (WEA 4)
17	08:31	07:42	06:40			06:27		07:05 (WEA 2)	05:29		05:56 (WEA 4)	05:03		06:00 (WEA 4)
	16:45	17:42	18:34			20:29	15	07:20 (WEA 2)	21:20	15	06:11 (WEA 4)	21:54	9	06:09 (WEA 4)
18	08:30	07:40	06:37			06:25		07:06 (WEA 2)	05:28		05:55 (WEA 4)	05:03		06:00 (WEA 4)
	16:46	17:44	18:36			20:31	13	07:19 (WEA 2)	21:21	17	06:12 (WEA 4)	21:54	9	06:09 (WEA 4)
19	08:29	07:38	06:35			06:23		07:06 (WEA 2)	05:26		05:53 (WEA 4)	05:03		06:00 (WEA 4)
	16:48	17:46	18:38			20:32	10	07:16 (WEA 2)	21:23	18	06:11 (WEA 4)	21:55	9	06:09 (WEA 4)
20	08:28	07:36	06:32			06:21		07:10 (WEA 2)	05:25		05:52 (WEA 4)	05:03		06:01 (WEA 4)
	16:50	17:48	18:39			20:34	3	07:13 (WEA 2)	21:25	20	06:12 (WEA 4)	21:55	8	06:09 (WEA 4)
21	08:27	07:34	06:30			06:18			05:23		05:51 (WEA 4)	05:03		06:01 (WEA 4)
	16:51	17:50	18:41			20:36			21:26	21	06:12 (WEA 4)	21:55	8	06:09 (WEA 4)
22	08:26	07:32	06:28			06:16			05:22		05:50 (WEA 4)	05:03		06:02 (WEA 4)
	16:53	17:52	18:43			20:38			21:27	23	06:13 (WEA 4)	21:56	8	06:10 (WEA 4)
23	08:24	07:30	06:25			06:14			05:21		05:49 (WEA 4)	05:03		06:01 (WEA 4)
	16:55	17:54	18:45			20:39			21:29	24	06:13 (WEA 4)	21:56	9	06:10 (WEA 4)
24	08:23	07:27	06:23		06:47 (WEA 1)	06:12			05:19		05:48 (WEA 4)	05:04		06:01 (WEA 4)
	16:57	17:55	18:46	8	06:55 (WEA 1)	20:41			21:30	24	06:12 (WEA 4)	21:56	9	06:10 (WEA 4)
25	08:22	07:25	06:21		06:45 (WEA 1)	06:10			05:18		05:48 (WEA 4)	05:04		06:02 (WEA 4)
	16:59	17:57	18:48	12	06:57 (WEA 1)	20:43			21:32	25	06:13 (WEA 4)	21:56	9	06:11 (WEA 4)
26	08:20	07:23	06:18		06:43 (WEA 1)	06:08		06:37 (WEA 3)	05:17		05:48 (WEA 4)	05:04		06:01 (WEA 4)
	17:00	17:59	18:50	14	06:57 (WEA 1)	20:45	9	06:46 (WEA 3)	21:33	25	06:13 (WEA 4)	21:56	10	06:11 (WEA 4)
27	08:19	07:21	06:16		06:42 (WEA 1)	06:06		06:36 (WEA 3)	05:16		05:48 (WEA 4)	05:05		06:02 (WEA 4)
	17:02	18:01	18:52	16	06:58 (WEA 1)	20:46	11	06:47 (WEA 3)	21:34	25	06:13 (WEA 4)	21:56	10	06:12 (WEA 4)
28	08:18	07:19	06:14		06:41 (WEA 1)	06:04		06:34 (WEA 3)	05:15		05:49 (WEA 4)	05:05		06:01 (WEA 4)
	17:04	18:03	18:54	16	06:57 (WEA 1)	20:48	14	06:48 (WEA 3)	21:36	23	06:12 (WEA 4)	21:56	11	06:12 (WEA 4)
29	08:16		07:11		07:41 (WEA 1)	06:02		06:33 (WEA 3)	05:14		05:49 (WEA 4)	05:06		06:01 (WEA 4)
	17:06		19:55	16	07:57 (WEA 1)	20:50	15	06:48 (WEA 3)	21:37	23	06:12 (WEA 4)	21:56	13	06:14 (WEA 4)
30	08:15		07:09		07:42 (WEA 1)	06:00		06:33 (WEA 3)	05:12		05:50 (WEA 4)	05:07		06:00 (WEA 4)
	17:08		19:57	15	07:57 (WEA 1)	20:52	15	06:48 (WEA 3)	21:38	23	06:13 (WEA 4)	21:55	14	06:14 (WEA 4)
31	08:13		07:06		07:41 (WEA 1)				05:12		05:50 (WEA 4)			
	17:10		19:59	14	07:55 (WEA 1)				21:40	23	06:13 (WEA 4)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				111			239			465			397	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung **Schattenrezeptor:** SR-20 - SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober	November	Dezember
1	05:07		06:01 (WEA 4)	05:45			06:37		07:06 (WEA 2)	07:27	07:23	08:15
	21:55	14	06:15 (WEA 4)	21:22			20:18	14	07:20 (WEA 2)	19:07	16:59	16:17
2	05:08		06:01 (WEA 4)	05:47			06:38		07:07 (WEA 2)	07:29	07:25	08:17
	21:55	14	06:15 (WEA 4)	21:20			20:16	12	07:19 (WEA 2)	19:05	16:57	16:16
3	05:09		06:00 (WEA 4)	05:48			06:40		07:08 (WEA 2)	07:31	07:26	08:18
	21:54	15	06:15 (WEA 4)	21:18			20:13	8	07:16 (WEA 2)	19:02	16:55	16:16
4	05:09		06:00 (WEA 4)	05:50			06:42			07:32	07:28	08:20
	21:54	16	06:16 (WEA 4)	21:17			20:11			19:00	16:53	16:15
5	05:10		06:00 (WEA 4)	05:51		06:47 (WEA 3)	06:43			07:34	07:30	08:21
	21:53	17	06:17 (WEA 4)	21:15	5	06:52 (WEA 3)	20:09			18:57	16:52	16:15
6	05:11		06:00 (WEA 4)	05:53		06:45 (WEA 3)	06:45			07:36	07:32	08:22
	21:53	18	06:18 (WEA 4)	21:13	10	06:55 (WEA 3)	20:06			18:55	16:50	16:14
7	05:12		06:00 (WEA 4)	05:55		06:44 (WEA 3)	06:47			07:38	07:34	08:24
	21:52	18	06:18 (WEA 4)	21:11	12	06:56 (WEA 3)	20:04			18:53	16:48	16:14
8	05:13		05:59 (WEA 4)	05:56		06:43 (WEA 3)	06:48			07:39	07:36	08:25
	21:52	19	06:18 (WEA 4)	21:09	14	06:57 (WEA 3)	20:02			18:51	16:46	16:13
9	05:14		05:58 (WEA 4)	05:58		06:42 (WEA 3)	06:50			07:41	07:38	08:26
	21:51	21	06:19 (WEA 4)	21:07	15	06:57 (WEA 3)	19:59			18:48	16:45	16:13
10	05:15		05:58 (WEA 4)	06:00		06:41 (WEA 3)	06:52		07:39 (WEA 1)	07:43	07:39	08:27
	21:50	21	06:19 (WEA 4)	21:05	16	06:57 (WEA 3)	19:57	5	07:44 (WEA 1)	18:46	16:43	16:13
11	05:16		05:58 (WEA 4)	06:01		06:42 (WEA 3)	06:53		07:35 (WEA 1)	07:45	07:41	08:28
	21:49	22	06:20 (WEA 4)	21:03	16	06:58 (WEA 3)	19:55	11	07:46 (WEA 1)	18:44	16:41	16:13
12	05:17		05:58 (WEA 4)	06:03		06:41 (WEA 3)	06:55		07:34 (WEA 1)	07:46	07:43	08:29
	21:48	22	06:20 (WEA 4)	21:01	16	06:57 (WEA 3)	19:52	13	07:47 (WEA 1)	18:41	16:40	16:12
13	05:18		05:59 (WEA 4)	06:05		06:41 (WEA 3)	06:57		07:33 (WEA 1)	07:48	07:45	08:30
	21:47	22	06:21 (WEA 4)	20:59	16	06:57 (WEA 3)	19:50	15	07:48 (WEA 1)	18:39	16:38	16:12
14	05:20		05:58 (WEA 4)	06:06		06:41 (WEA 3)	06:58		07:32 (WEA 1)	07:50	07:47	08:31
	21:46	24	06:22 (WEA 4)	20:57	15	06:56 (WEA 3)	19:47	15	07:47 (WEA 1)	18:37	16:37	16:12
15	05:21		05:58 (WEA 4)	06:08		06:42 (WEA 3)	07:00		07:31 (WEA 1)	07:52	07:49	08:32
	21:45	24	06:22 (WEA 4)	20:55	13	06:55 (WEA 3)	19:45	16	07:47 (WEA 1)	18:35	16:35	16:12
16	05:22		05:58 (WEA 4)	06:10		06:43 (WEA 3)	07:02		07:31 (WEA 1)	07:54	07:50	08:33
	21:44	24	06:22 (WEA 4)	20:53	11	06:54 (WEA 3)	19:43	15	07:46 (WEA 1)	18:32	16:34	16:12
17	05:23		05:58 (WEA 4)	06:11		06:45 (WEA 3)	07:03		07:31 (WEA 1)	07:55	07:52	08:34
	21:43	24	06:22 (WEA 4)	20:51	7	06:52 (WEA 3)	19:40	15	07:46 (WEA 1)	18:30	16:32	16:13
18	05:25		05:58 (WEA 4)	06:13			07:05		07:32 (WEA 1)	07:57	07:54	08:35
	21:42	24	06:22 (WEA 4)	20:49			19:38	13	07:45 (WEA 1)	18:28	16:31	16:13
19	05:26		05:58 (WEA 4)	06:15			07:07		07:33 (WEA 1)	07:59	07:56	08:35
	21:41	25	06:23 (WEA 4)	20:47			19:36	9	07:42 (WEA 1)	18:26	16:30	16:13
20	05:27		05:58 (WEA 4)	06:16			07:08			08:01	07:57	08:36
	21:40	25	06:23 (WEA 4)	20:45			19:33			18:24	16:28	16:13
21	05:29		05:59 (WEA 4)	06:18			07:10			08:03	07:59	08:37
	21:38	24	06:23 (WEA 4)	20:43			19:31			18:21	16:27	16:14
22	05:30		06:00 (WEA 4)	06:20			07:12			08:04	08:01	08:37
	21:37	22	06:22 (WEA 4)	20:41			19:28			18:19	16:26	16:14
23	05:31		06:02 (WEA 4)	06:21		07:14 (WEA 2)	07:14			08:06	08:03	08:38
	21:36	21	06:23 (WEA 4)	20:38	4	07:18 (WEA 2)	19:26			18:17	16:25	16:15
24	05:33		06:03 (WEA 4)	06:23		07:10 (WEA 2)	07:15			08:08	08:04	08:38
	21:34	19	06:22 (WEA 4)	20:36	10	07:20 (WEA 2)	19:24			18:15	16:23	16:15
25	05:34		06:04 (WEA 4)	06:25		07:09 (WEA 2)	07:17			07:10	08:06	08:39
	21:33	17	06:21 (WEA 4)	20:34	13	07:22 (WEA 2)	19:21			17:13	16:22	16:16
26	05:36		06:06 (WEA 4)	06:26		07:08 (WEA 2)	07:19			07:12	08:08	08:39
	21:31	16	06:22 (WEA 4)	20:32	15	07:23 (WEA 2)	19:19			17:11	16:21	16:17
27	05:37		06:07 (WEA 4)	06:28		07:06 (WEA 2)	07:20			07:14	08:09	08:39
	21:30	14	06:21 (WEA 4)	20:29	17	07:23 (WEA 2)	19:16			17:09	16:20	16:18
28	05:39		06:09 (WEA 4)	06:30		07:06 (WEA 2)	07:22			07:15	08:11	08:39
	21:28	12	06:21 (WEA 4)	20:27	17	07:23 (WEA 2)	19:14			17:07	16:20	16:18
29	05:40		06:10 (WEA 4)	06:31		07:05 (WEA 2)	07:24			07:17	08:12	08:40
	21:27	9	06:19 (WEA 4)	20:25	17	07:22 (WEA 2)	19:12			17:05	16:19	16:19
30	05:42		06:12 (WEA 4)	06:33		07:05 (WEA 2)	07:25			07:19	08:14	08:40
	21:25	7	06:19 (WEA 4)	20:23	17	07:22 (WEA 2)	19:09			17:03	16:18	16:20
31	05:43		06:13 (WEA 4)	06:35		07:06 (WEA 2)				07:21		08:40
	21:24	4	06:17 (WEA 4)	20:20	16	07:22 (WEA 2)				17:01		16:21
Sonnenscheinstunden	506			456			381			330	263	240
astr.max.mögl.Beschattung		574			292			161				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-21 - SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:45 (WEA 2)	05:57			05:11		06:10 (WEA 4)
	16:22	17:12	18:05			20:01	21	08:06 (WEA 2)	20:53			21:41	25	06:35 (WEA 4)
2	08:39	08:10	07:14			07:02		07:46 (WEA 2)	05:56		06:20 (WEA 4)	05:10		06:11 (WEA 4)
	16:23	17:13	18:07			20:02	20	08:06 (WEA 2)	20:55	4	06:24 (WEA 4)	21:42	23	06:34 (WEA 4)
3	08:39	08:08	07:12			06:59		07:45 (WEA 2)	05:54		06:19 (WEA 4)	05:09		06:12 (WEA 4)
	16:25	17:15	18:09			20:04	19	08:04 (WEA 2)	20:57	10	06:29 (WEA 4)	21:43	23	06:35 (WEA 4)
4	08:39	08:06	07:10			06:57		07:47 (WEA 2)	05:52		06:17 (WEA 4)	05:08		06:12 (WEA 4)
	16:26	17:17	18:10			20:06	16	08:03 (WEA 2)	20:58	14	06:31 (WEA 4)	21:44	22	06:34 (WEA 4)
5	08:39	08:05	07:07			06:55		07:48 (WEA 2)	05:50		06:15 (WEA 4)	05:07		06:13 (WEA 4)
	16:27	17:19	18:12			20:08	13	08:01 (WEA 2)	21:00	17	06:32 (WEA 4)	21:45	20	06:33 (WEA 4)
6	08:38	08:03	07:05		07:34 (WEA 1)	06:52		07:51 (WEA 2)	05:48		06:13 (WEA 4)	05:07		06:14 (WEA 4)
	16:28	17:21	18:14	7	07:41 (WEA 1)	20:09	6	07:57 (WEA 2)	21:02	20	06:33 (WEA 4)	21:46	19	06:33 (WEA 4)
7	08:38	08:01	07:03		07:30 (WEA 1)	06:50			05:46		06:12 (WEA 4)	05:06		06:15 (WEA 4)
	16:30	17:23	18:16	13	07:43 (WEA 1)	20:11			21:04	23	06:35 (WEA 4)	21:47	17	06:32 (WEA 4)
8	08:38	07:59	07:01		07:29 (WEA 1)	06:48			05:44		06:10 (WEA 4)	05:06		06:16 (WEA 4)
	16:31	17:25	18:18	15	07:44 (WEA 1)	20:13			21:05	26	06:36 (WEA 4)	21:48	16	06:32 (WEA 4)
9	08:37	07:58	06:58		07:28 (WEA 1)	06:45			05:42		06:08 (WEA 4)	05:05		06:16 (WEA 4)
	16:32	17:27	18:20	17	07:45 (WEA 1)	20:15			21:07	28	06:36 (WEA 4)	21:49	15	06:31 (WEA 4)
10	08:36	07:56	06:56		07:27 (WEA 1)	06:43			05:41		06:07 (WEA 4)	05:05		06:18 (WEA 4)
	16:34	17:29	18:21	18	07:45 (WEA 1)	20:16			21:09	30	06:37 (WEA 4)	21:50	12	06:30 (WEA 4)
11	08:36	07:54	06:54		07:26 (WEA 1)	06:41		07:19 (WEA 3)	05:39		06:06 (WEA 4)	05:04		06:19 (WEA 4)
	16:35	17:31	18:23	19	07:45 (WEA 1)	20:18	9	07:28 (WEA 3)	21:10	31	06:37 (WEA 4)	21:50	11	06:30 (WEA 4)
12	08:35	07:52	06:51		07:27 (WEA 1)	06:38		07:16 (WEA 3)	05:37		06:05 (WEA 4)	05:04		06:20 (WEA 4)
	16:37	17:33	18:25	19	07:46 (WEA 1)	20:20	14	07:30 (WEA 3)	21:12	32	06:37 (WEA 4)	21:51	10	06:30 (WEA 4)
13	08:34	07:50	06:49		07:26 (WEA 1)	06:36		07:15 (WEA 3)	05:35		06:05 (WEA 4)	05:03		06:21 (WEA 4)
	16:38	17:35	18:27	18	07:44 (WEA 1)	20:22	16	07:31 (WEA 3)	21:14	33	06:38 (WEA 4)	21:52	7	06:28 (WEA 4)
14	08:34	07:48	06:47		07:26 (WEA 1)	06:34		07:13 (WEA 3)	05:34		06:04 (WEA 4)	05:03		06:22 (WEA 4)
	16:40	17:36	18:29	18	07:44 (WEA 1)	20:24	18	07:31 (WEA 3)	21:15	34	06:38 (WEA 4)	21:52	5	06:27 (WEA 4)
15	08:33	07:46	06:44		07:26 (WEA 1)	06:32		07:12 (WEA 3)	05:32		06:05 (WEA 4)	05:03		
	16:41	17:38	18:30	16	07:42 (WEA 1)	20:25	20	07:32 (WEA 3)	21:17	33	06:38 (WEA 4)	21:53		
16	08:32	07:44	06:42		07:28 (WEA 1)	06:29		07:11 (WEA 3)	05:31		06:05 (WEA 4)	05:03		
	16:43	17:40	18:32	13	07:41 (WEA 1)	20:27	21	07:32 (WEA 3)	21:18	34	06:39 (WEA 4)	21:54		
17	08:31	07:42	06:40		07:30 (WEA 1)	06:27		07:11 (WEA 3)	05:29		06:04 (WEA 4)	05:03		
	16:45	17:42	18:34	9	07:39 (WEA 1)	20:29	22	07:33 (WEA 3)	21:20	34	06:38 (WEA 4)	21:54		
18	08:30	07:40	06:37			06:25		07:11 (WEA 3)	05:28		06:05 (WEA 4)	05:03		
	16:46	17:44	18:36			20:31	22	07:33 (WEA 3)	21:21	34	06:39 (WEA 4)	21:54		
19	08:29	07:38	06:35			06:23		07:10 (WEA 3)	05:26		06:04 (WEA 4)	05:03		
	16:48	17:46	18:38			20:32	21	07:31 (WEA 3)	21:23	34	06:38 (WEA 4)	21:55		
20	08:28	07:36	06:32			06:21		07:10 (WEA 3)	05:25		06:05 (WEA 4)	05:03		
	16:50	17:48	18:39			20:34	21	07:31 (WEA 3)	21:25	33	06:38 (WEA 4)	21:55		
21	08:27	07:34	06:30			06:18		07:10 (WEA 3)	05:23		06:05 (WEA 4)	05:03		
	16:51	17:50	18:41			20:36	20	07:30 (WEA 3)	21:26	33	06:38 (WEA 4)	21:55		
22	08:26	07:32	06:28			06:16		07:11 (WEA 3)	05:22		06:06 (WEA 4)	05:03		
	16:53	17:52	18:43			20:38	18	07:29 (WEA 3)	21:27	32	06:38 (WEA 4)	21:56		
23	08:24	07:30	06:25			06:14		07:12 (WEA 3)	05:21		06:06 (WEA 4)	05:03		
	16:55	17:54	18:45			20:39	16	07:28 (WEA 3)	21:29	32	06:38 (WEA 4)	21:56		
24	08:23	07:27	06:23		06:53 (WEA 2)	06:12		07:13 (WEA 3)	05:19		06:05 (WEA 4)	05:04		
	16:57	17:55	18:46	10	07:03 (WEA 2)	20:41	14	07:27 (WEA 3)	21:30	32	06:37 (WEA 4)	21:56		
25	08:22	07:25	06:21		06:51 (WEA 2)	06:10		07:15 (WEA 3)	05:18		06:06 (WEA 4)	05:04		
	16:59	17:57	18:48	15	07:06 (WEA 2)	20:43	9	07:24 (WEA 3)	21:32	31	06:37 (WEA 4)	21:56		
26	08:20	07:23	06:18		06:49 (WEA 2)	06:08			05:17		06:06 (WEA 4)	05:04		
	17:00	17:59	18:50	17	07:06 (WEA 2)	20:45			21:33	31	06:37 (WEA 4)	21:56		
27	08:19	07:21	06:16		06:48 (WEA 2)	06:06			05:16		06:07 (WEA 4)	05:05		
	17:02	18:01	18:52	19	07:07 (WEA 2)	20:46			21:34	29	06:36 (WEA 4)	21:56		
28	08:18	07:19	06:13		06:46 (WEA 2)	06:04			05:15		06:07 (WEA 4)	05:05		06:26 (WEA 4)
	17:04	18:03	18:54	21	07:07 (WEA 2)	20:48			21:36	29	06:36 (WEA 4)	21:56	3	06:29 (WEA 4)
29	08:16		07:11		07:46 (WEA 2)	06:02			05:13		06:08 (WEA 4)	05:06		06:25 (WEA 4)
	17:06		19:55	21	08:07 (WEA 2)	20:50			21:37	28	06:36 (WEA 4)	21:56	7	06:32 (WEA 4)
30	08:15		07:09		07:46 (WEA 2)	05:59			05:12		06:09 (WEA 4)	05:07		06:24 (WEA 4)
	17:08		19:57	22	08:08 (WEA 2)	20:52			21:38	27	06:36 (WEA 4)	21:55	8	06:32 (WEA 4)
31	08:13		07:06		07:45 (WEA 2)				05:11		06:10 (WEA 4)			
	17:10		19:59	21	08:06 (WEA 2)				21:40	26	06:36 (WEA 4)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				328			356			834			243	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-21 - SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:23 (WEA 4)	05:45		06:15 (WEA 4)	06:37		07:18 (WEA 3)	07:27		08:05 (WEA 1)	07:23	08:15
	21:55	11	06:34 (WEA 4)	21:22	32	06:47 (WEA 4)	20:18	9	07:27 (WEA 3)	19:07	19	08:24 (WEA 1)	16:59	16:17
2	05:08		06:23 (WEA 4)	05:47		06:16 (WEA 4)	06:38			07:29		08:05 (WEA 1)	07:25	08:17
	21:55	12	06:35 (WEA 4)	21:20	31	06:47 (WEA 4)	20:16			19:05	19	08:24 (WEA 1)	16:57	16:16
3	05:09		06:22 (WEA 4)	05:48		06:17 (WEA 4)	06:40			07:31		08:04 (WEA 1)	07:26	08:18
	21:54	13	06:35 (WEA 4)	21:18	29	06:46 (WEA 4)	20:13			19:02	19	08:23 (WEA 1)	16:55	16:16
4	05:09		06:22 (WEA 4)	05:50		06:19 (WEA 4)	06:42			07:32		08:05 (WEA 1)	07:28	08:20
	21:54	15	06:37 (WEA 4)	21:17	27	06:46 (WEA 4)	20:11			19:00	18	08:23 (WEA 1)	16:53	16:15
5	05:10		06:21 (WEA 4)	05:51		06:20 (WEA 4)	06:43			07:34		08:06 (WEA 1)	07:30	08:21
	21:53	17	06:38 (WEA 4)	21:15	25	06:45 (WEA 4)	20:09			18:57	16	08:22 (WEA 1)	16:52	16:15
6	05:11		06:21 (WEA 4)	05:53		06:22 (WEA 4)	06:45		07:47 (WEA 2)	07:36		08:07 (WEA 1)	07:32	08:22
	21:53	18	06:39 (WEA 4)	21:13	22	06:44 (WEA 4)	20:06	6	07:53 (WEA 2)	18:55	13	08:20 (WEA 1)	16:50	16:14
7	05:12		06:19 (WEA 4)	05:55		06:24 (WEA 4)	06:47		07:44 (WEA 2)	07:38		08:07 (WEA 1)	07:34	08:24
	21:52	20	06:39 (WEA 4)	21:11	19	06:43 (WEA 4)	20:04	12	07:56 (WEA 2)	18:53	10	08:17 (WEA 1)	16:48	16:14
8	05:13		06:19 (WEA 4)	05:56		06:25 (WEA 4)	06:48		07:41 (WEA 2)	07:39			07:36	08:25
	21:52	21	06:40 (WEA 4)	21:09	16	06:41 (WEA 4)	20:02	16	07:57 (WEA 2)	18:50			16:46	16:13
9	05:14		06:19 (WEA 4)	05:58		06:27 (WEA 4)	06:50		07:40 (WEA 2)	07:41			07:38	08:26
	21:51	22	06:41 (WEA 4)	21:07	13	06:40 (WEA 4)	19:59	18	07:58 (WEA 2)	18:48			16:45	16:13
10	05:15		06:18 (WEA 4)	06:00		06:28 (WEA 4)	06:52		07:39 (WEA 2)	07:43			07:39	08:27
	21:50	23	06:41 (WEA 4)	21:05	9	06:37 (WEA 4)	19:57	20	07:59 (WEA 2)	18:46			16:43	16:13
11	05:16		06:18 (WEA 4)	06:01			06:53		07:37 (WEA 2)	07:45			07:41	08:28
	21:49	24	06:42 (WEA 4)	21:03			19:55	21	07:58 (WEA 2)	18:44			16:41	16:13
12	05:17		06:17 (WEA 4)	06:03			06:55		07:37 (WEA 2)	07:46			07:43	08:29
	21:48	26	06:43 (WEA 4)	21:01			19:52	22	07:59 (WEA 2)	18:41			16:40	16:12
13	05:18		06:17 (WEA 4)	06:05			06:57		07:37 (WEA 2)	07:48			07:45	08:30
	21:47	26	06:43 (WEA 4)	20:59			19:50	22	07:59 (WEA 2)	18:39			16:38	16:12
14	05:19		06:18 (WEA 4)	06:06			06:58		07:36 (WEA 2)	07:50			07:47	08:31
	21:46	27	06:45 (WEA 4)	20:57			19:47	22	07:58 (WEA 2)	18:37			16:37	16:12
15	05:21		06:17 (WEA 4)	06:08			07:00		07:36 (WEA 2)	07:52			07:49	08:32
	21:45	28	06:45 (WEA 4)	20:55			19:45	21	07:57 (WEA 2)	18:35			16:35	16:12
16	05:22		06:17 (WEA 4)	06:10			07:02		07:36 (WEA 2)	07:53			07:50	08:33
	21:44	29	06:46 (WEA 4)	20:53			19:43	20	07:56 (WEA 2)	18:32			16:34	16:12
17	05:23		06:16 (WEA 4)	06:11			07:03		07:37 (WEA 2)	07:55			07:52	08:34
	21:43	30	06:46 (WEA 4)	20:51			19:40	18	07:55 (WEA 2)	18:30			16:32	16:13
18	05:24		06:16 (WEA 4)	06:13		07:21 (WEA 3)	07:05		07:38 (WEA 2)	07:57			07:54	08:35
	21:42	30	06:46 (WEA 4)	20:49	10	07:31 (WEA 3)	19:38	15	07:53 (WEA 2)	18:28			16:31	16:13
19	05:26		06:16 (WEA 4)	06:15		07:18 (WEA 3)	07:07		07:39 (WEA 2)	07:59			07:56	08:35
	21:41	32	06:48 (WEA 4)	20:47	15	07:33 (WEA 3)	19:36	11	07:50 (WEA 2)	18:26			16:29	16:13
20	05:27		06:16 (WEA 4)	06:16		07:17 (WEA 3)	07:08			08:01			07:57	08:36
	21:40	32	06:48 (WEA 4)	20:45	17	07:34 (WEA 3)	19:33			18:24			16:28	16:13
21	05:29		06:15 (WEA 4)	06:18		07:15 (WEA 3)	07:10			08:03			07:59	08:37
	21:38	33	06:48 (WEA 4)	20:43	19	07:34 (WEA 3)	19:31			18:21			16:27	16:14
22	05:30		06:15 (WEA 4)	06:20		07:15 (WEA 3)	07:12			08:04			08:01	08:37
	21:37	33	06:48 (WEA 4)	20:41	20	07:35 (WEA 3)	19:28			18:19			16:26	16:14
23	05:31		06:15 (WEA 4)	06:21		07:15 (WEA 3)	07:14			08:06			08:03	08:38
	21:36	34	06:49 (WEA 4)	20:38	21	07:36 (WEA 3)	19:26			18:17			16:25	16:15
24	05:33		06:15 (WEA 4)	06:23		07:13 (WEA 3)	07:15			08:08			08:04	08:38
	21:34	33	06:48 (WEA 4)	20:36	22	07:35 (WEA 3)	19:24			18:15			16:23	16:15
25	05:34		06:15 (WEA 4)	06:25		07:14 (WEA 3)	07:17			07:10			08:06	08:39
	21:33	33	06:48 (WEA 4)	20:34	21	07:35 (WEA 3)	19:21			17:13			16:22	16:16
26	05:36		06:15 (WEA 4)	06:26		07:13 (WEA 3)	07:19		08:13 (WEA 1)	07:12			08:08	08:39
	21:31	34	06:49 (WEA 4)	20:32	21	07:34 (WEA 3)	19:19	7	08:20 (WEA 1)	17:11			16:21	16:17
27	05:37		06:15 (WEA 4)	06:28		07:13 (WEA 3)	07:20		08:10 (WEA 1)	07:13			08:09	08:39
	21:30	34	06:49 (WEA 4)	20:29	21	07:34 (WEA 3)	19:16	12	08:22 (WEA 1)	17:09			16:20	16:18
28	05:39		06:15 (WEA 4)	06:30		07:14 (WEA 3)	07:22		08:09 (WEA 1)	07:15			08:11	08:39
	21:28	34	06:49 (WEA 4)	20:27	20	07:34 (WEA 3)	19:14	15	08:24 (WEA 1)	17:07			16:20	16:18
29	05:40		06:15 (WEA 4)	06:31		07:14 (WEA 3)	07:24		08:06 (WEA 1)	07:17			08:12	08:40
	21:27	34	06:49 (WEA 4)	20:25	18	07:32 (WEA 3)	19:12	18	08:24 (WEA 1)	17:05			16:19	16:19
30	05:42		06:16 (WEA 4)	06:33		07:15 (WEA 3)	07:25		08:06 (WEA 1)	07:19			08:14	08:40
	21:25	33	06:49 (WEA 4)	20:23	16	07:31 (WEA 3)	19:09	18	08:24 (WEA 1)	17:03			16:18	16:20
31	05:43		06:16 (WEA 4)	06:35		07:15 (WEA 3)				07:21				08:40
	21:24	32	06:48 (WEA 4)	20:20	14	07:29 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		823			478			323			114			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-22 - SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April			Mai			Juni		
1	08:40	08:11	07:16		07:04		07:54 (WEA 2)	05:57			05:11		06:06 (WEA 4)
	16:22	17:12	18:05		20:01	20	08:14 (WEA 2)	20:53			21:41	34	06:40 (WEA 4)
2	08:39	08:10	07:14		07:46 (WEA 1)		07:55 (WEA 2)	05:56			05:10		06:06 (WEA 4)
	16:23	17:13	18:07	3	07:49 (WEA 1)	18	08:13 (WEA 2)	20:55			21:42	34	06:40 (WEA 4)
3	08:39	08:08	07:12		07:42 (WEA 1)		07:56 (WEA 2)	05:54		06:22 (WEA 4)	05:09		06:07 (WEA 4)
	16:25	17:15	18:09	11	07:53 (WEA 1)	14	08:10 (WEA 2)	20:57	2	06:24 (WEA 4)	21:43	33	06:40 (WEA 4)
4	08:39	08:06	07:10		07:39 (WEA 1)		07:58 (WEA 2)	05:52		06:17 (WEA 4)	05:08		06:08 (WEA 4)
	16:26	17:17	18:10	15	07:54 (WEA 1)	10	08:08 (WEA 2)	20:58	12	06:29 (WEA 4)	21:44	32	06:40 (WEA 4)
5	08:39	08:05	07:07		07:38 (WEA 1)			05:50		06:15 (WEA 4)	05:07		06:08 (WEA 4)
	16:27	17:19	18:12	17	07:55 (WEA 1)			21:00	17	06:32 (WEA 4)	21:45	31	06:39 (WEA 4)
6	08:38	08:03	07:05		07:38 (WEA 1)			05:48		06:13 (WEA 4)	05:07		06:09 (WEA 4)
	16:28	17:21	18:14	18	07:56 (WEA 1)			21:02	20	06:33 (WEA 4)	21:46	31	06:40 (WEA 4)
7	08:38	08:01	07:03		07:36 (WEA 1)			05:46		06:12 (WEA 4)	05:06		06:09 (WEA 4)
	16:30	17:23	18:16	20	07:56 (WEA 1)			21:04	23	06:35 (WEA 4)	21:47	30	06:39 (WEA 4)
8	08:38	07:59	07:01		07:36 (WEA 1)			05:44		06:10 (WEA 4)	05:05		06:10 (WEA 4)
	16:31	17:25	18:18	20	07:56 (WEA 1)			21:05	26	06:36 (WEA 4)	21:48	29	06:39 (WEA 4)
9	08:37	07:58	06:58		07:36 (WEA 1)		07:28 (WEA 3)	05:42		06:08 (WEA 4)	05:05		06:09 (WEA 4)
	16:32	17:27	18:20	20	07:56 (WEA 1)	5	07:33 (WEA 3)	21:07	29	06:37 (WEA 4)	21:49	30	06:39 (WEA 4)
10	08:36	07:56	06:56		07:35 (WEA 1)		07:24 (WEA 3)	05:41		06:07 (WEA 4)	05:05		06:10 (WEA 4)
	16:34	17:29	18:21	20	07:55 (WEA 1)	13	07:37 (WEA 3)	21:09	31	06:38 (WEA 4)	21:50	29	06:39 (WEA 4)
11	08:36	07:54	06:54		07:36 (WEA 1)		07:22 (WEA 3)	05:39		06:06 (WEA 4)	05:04		06:11 (WEA 4)
	16:35	17:31	18:23	19	07:55 (WEA 1)	17	07:39 (WEA 3)	21:10	32	06:38 (WEA 4)	21:50	28	06:39 (WEA 4)
12	08:35	07:52	06:51		07:37 (WEA 1)		07:21 (WEA 3)	05:37		06:05 (WEA 4)	05:04		06:11 (WEA 4)
	16:37	17:33	18:25	17	07:54 (WEA 1)	19	07:40 (WEA 3)	21:12	33	06:38 (WEA 4)	21:51	27	06:38 (WEA 4)
13	08:34	07:50	06:49		07:37 (WEA 1)		07:20 (WEA 3)	05:35		06:05 (WEA 4)	05:03		06:11 (WEA 4)
	16:38	17:35	18:27	15	07:52 (WEA 1)	21	07:41 (WEA 3)	21:14	34	06:39 (WEA 4)	21:52	27	06:38 (WEA 4)
14	08:34	07:48	06:47		07:39 (WEA 1)		07:18 (WEA 3)	05:34		06:04 (WEA 4)	05:03		06:12 (WEA 4)
	16:40	17:36	18:29	11	07:50 (WEA 1)	23	07:41 (WEA 3)	21:15	35	06:39 (WEA 4)	21:52	26	06:38 (WEA 4)
15	08:33	07:46	06:44			06:32	07:17 (WEA 3)	05:32		06:04 (WEA 4)	05:03		06:13 (WEA 4)
	16:41	17:38	18:30			20:25	24 07:41 (WEA 3)	21:17	36	06:40 (WEA 4)	21:53	26	06:39 (WEA 4)
16	08:32	07:44	06:42			06:29	07:17 (WEA 3)	05:31		06:04 (WEA 4)	05:03		06:13 (WEA 4)
	16:43	17:40	18:32			20:27	24 07:41 (WEA 3)	21:18	37	06:41 (WEA 4)	21:54	26	06:39 (WEA 4)
17	08:31	07:42	06:40			06:27	07:17 (WEA 3)	05:29		06:03 (WEA 4)	05:03		06:13 (WEA 4)
	16:45	17:42	18:34			20:29	24 07:41 (WEA 3)	21:20	37	06:40 (WEA 4)	21:54	26	06:39 (WEA 4)
18	08:30	07:40	06:37			06:25	07:17 (WEA 3)	05:28		06:03 (WEA 4)	05:03		06:14 (WEA 4)
	16:46	17:44	18:36			20:31	24 07:41 (WEA 3)	21:21	38	06:41 (WEA 4)	21:54	25	06:39 (WEA 4)
19	08:29	07:38	06:35			06:23	07:16 (WEA 3)	05:26		06:03 (WEA 4)	05:03		06:14 (WEA 4)
	16:48	17:46	18:38			20:32	24 07:40 (WEA 3)	21:23	37	06:40 (WEA 4)	21:55	25	06:39 (WEA 4)
20	08:28	07:36	06:32			06:21	07:16 (WEA 3)	05:25		06:03 (WEA 4)	05:03		06:14 (WEA 4)
	16:50	17:48	18:39			20:34	23 07:39 (WEA 3)	21:25	38	06:41 (WEA 4)	21:55	25	06:39 (WEA 4)
21	08:27	07:34	06:30		07:03 (WEA 2)	06:18	07:17 (WEA 3)	05:23		06:03 (WEA 4)	05:03		06:14 (WEA 4)
	16:51	17:50	18:41	9	07:12 (WEA 2)	20:36	21 07:38 (WEA 3)	21:26	38	06:41 (WEA 4)	21:55	25	06:39 (WEA 4)
22	08:26	07:32	06:28		07:00 (WEA 2)	06:16	07:17 (WEA 3)	05:22		06:04 (WEA 4)	05:03		06:15 (WEA 4)
	16:53	17:52	18:43	15	07:15 (WEA 2)	20:38	20 07:37 (WEA 3)	21:27	37	06:41 (WEA 4)	21:56	25	06:40 (WEA 4)
23	08:24	07:30	06:25		06:58 (WEA 2)	06:14	07:18 (WEA 3)	05:21		06:04 (WEA 4)	05:03		06:15 (WEA 4)
	16:55	17:54	18:45	17	07:15 (WEA 2)	20:39	18 07:36 (WEA 3)	21:29	37	06:41 (WEA 4)	21:56	25	06:40 (WEA 4)
24	08:23	07:27	06:23		06:57 (WEA 2)	06:12	07:20 (WEA 3)	05:19		06:03 (WEA 4)	05:04		06:15 (WEA 4)
	16:57	17:55	18:46	20	07:17 (WEA 2)	20:41	15 07:35 (WEA 3)	21:30	38	06:41 (WEA 4)	21:56	25	06:40 (WEA 4)
25	08:22	07:25	06:21		06:56 (WEA 2)	06:10	07:21 (WEA 3)	05:18		06:03 (WEA 4)	05:04		06:15 (WEA 4)
	16:59	17:57	18:48	22	07:18 (WEA 2)	20:43	11 07:32 (WEA 3)	21:32	38	06:41 (WEA 4)	21:56	26	06:41 (WEA 4)
26	08:20	07:23	06:18		06:54 (WEA 2)	06:08		05:17		06:04 (WEA 4)	05:04		06:15 (WEA 4)
	17:00	17:59	18:50	23	07:17 (WEA 2)	20:45		21:33	37	06:41 (WEA 4)	21:56	26	06:41 (WEA 4)
27	08:19	07:21	06:16		06:54 (WEA 2)	06:06		05:16		06:04 (WEA 4)	05:05		06:16 (WEA 4)
	17:02	18:01	18:52	23	07:17 (WEA 2)	20:46		21:34	36	06:40 (WEA 4)	21:56	26	06:42 (WEA 4)
28	08:18	07:19	06:13		06:53 (WEA 2)	06:04		05:15		06:04 (WEA 4)	05:05		06:15 (WEA 4)
	17:04	18:03	18:54	24	07:17 (WEA 2)	20:48		21:36	36	06:40 (WEA 4)	21:56	26	06:41 (WEA 4)
29	08:16		07:11		07:53 (WEA 2)	06:02		05:13		06:05 (WEA 4)	05:06		06:16 (WEA 4)
	17:06		19:55	24	08:17 (WEA 2)	20:50		21:37	35	06:40 (WEA 4)	21:56	26	06:42 (WEA 4)
30	08:15		07:09		07:53 (WEA 2)	05:59		05:12		06:06 (WEA 4)	05:07		06:15 (WEA 4)
	17:08		19:57	23	08:16 (WEA 2)	20:52		21:38	35	06:41 (WEA 4)	21:55	27	06:42 (WEA 4)
31	08:13		07:06		07:53 (WEA 2)			05:11		06:06 (WEA 4)			
	17:10		19:59	22	08:15 (WEA 2)			21:40	34	06:40 (WEA 4)			
Sonnenscheinstunden	255	276	367			418		489			503		
astr.max.mögl.Beschattung				428			388		918			831	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-22 - SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:15 (WEA 4)	05:45		06:15 (WEA 4)	06:36		07:21 (WEA 3)	07:27		08:16 (WEA 1)	07:23	08:15
	21:55	28	06:43 (WEA 4)	21:22	34	06:49 (WEA 4)	20:18	17	07:38 (WEA 3)	19:07	17	08:33 (WEA 1)	16:59	16:17
2	05:08		06:15 (WEA 4)	05:47		06:16 (WEA 4)	06:38		07:23 (WEA 3)	07:29		08:15 (WEA 1)	07:25	08:17
	21:55	28	06:43 (WEA 4)	21:20	32	06:48 (WEA 4)	20:16	13	07:36 (WEA 3)	19:05	18	08:33 (WEA 1)	16:57	16:16
3	05:09		06:15 (WEA 4)	05:48		06:17 (WEA 4)	06:40		07:26 (WEA 3)	07:31		08:14 (WEA 1)	07:26	08:18
	21:54	29	06:44 (WEA 4)	21:18	30	06:47 (WEA 4)	20:13	5	07:31 (WEA 3)	19:02	19	08:33 (WEA 1)	16:55	16:16
4	05:09		06:15 (WEA 4)	05:50		06:19 (WEA 4)	06:42			07:32		08:13 (WEA 1)	07:28	08:20
	21:54	29	06:44 (WEA 4)	21:17	28	06:47 (WEA 4)	20:11			19:00	20	08:33 (WEA 1)	16:53	16:15
5	05:10		06:15 (WEA 4)	05:51		06:20 (WEA 4)	06:43			07:34		08:13 (WEA 1)	07:30	08:21
	21:53	30	06:45 (WEA 4)	21:15	25	06:45 (WEA 4)	20:09			18:57	20	08:33 (WEA 1)	16:52	16:15
6	05:11		06:15 (WEA 4)	05:53		06:22 (WEA 4)	06:45			07:36		08:13 (WEA 1)	07:32	08:22
	21:53	31	06:46 (WEA 4)	21:13	22	06:44 (WEA 4)	20:06			18:55	20	08:33 (WEA 1)	16:50	16:14
7	05:12		06:14 (WEA 4)	05:55		06:24 (WEA 4)	06:47			07:38		08:12 (WEA 1)	07:34	08:24
	21:52	31	06:45 (WEA 4)	21:11	19	06:43 (WEA 4)	20:04			18:53	20	08:32 (WEA 1)	16:48	16:14
8	05:13		06:14 (WEA 4)	05:56		06:25 (WEA 4)	06:48		07:52 (WEA 2)	07:39		08:13 (WEA 1)	07:36	08:25
	21:52	32	06:46 (WEA 4)	21:09	15	06:40 (WEA 4)	20:02	9	08:01 (WEA 2)	18:50	18	08:31 (WEA 1)	16:46	16:13
9	05:14		06:14 (WEA 4)	05:58		06:27 (WEA 4)	06:50		07:50 (WEA 2)	07:41		08:14 (WEA 1)	07:38	08:26
	21:51	32	06:46 (WEA 4)	21:07	11	06:38 (WEA 4)	19:59	14	08:04 (WEA 2)	18:48	16	08:30 (WEA 1)	16:45	16:13
10	05:15		06:14 (WEA 4)	06:00			06:52		07:48 (WEA 2)	07:43		08:15 (WEA 1)	07:39	08:27
	21:50	33	06:47 (WEA 4)	21:05			19:57	18	08:06 (WEA 2)	18:46	13	08:28 (WEA 1)	16:43	16:13
11	05:16		06:14 (WEA 4)	06:01			06:53		07:46 (WEA 2)	07:45		08:17 (WEA 1)	07:41	08:28
	21:49	33	06:47 (WEA 4)	21:03			19:55	20	08:06 (WEA 2)	18:44	9	08:26 (WEA 1)	16:41	16:13
12	05:17		06:14 (WEA 4)	06:03			06:55		07:45 (WEA 2)	07:46			07:43	08:29
	21:48	34	06:48 (WEA 4)	21:01			19:52	22	08:07 (WEA 2)	18:41			16:40	16:12
13	05:18		06:13 (WEA 4)	06:05			06:57		07:45 (WEA 2)	07:48			07:45	08:30
	21:47	35	06:48 (WEA 4)	20:59			19:50	23	08:08 (WEA 2)	18:39			16:38	16:12
14	05:19		06:14 (WEA 4)	06:06			06:58		07:43 (WEA 2)	07:50			07:47	08:31
	21:46	35	06:49 (WEA 4)	20:57			19:47	24	08:07 (WEA 2)	18:37			16:37	16:12
15	05:21		06:14 (WEA 4)	06:08			07:00		07:43 (WEA 2)	07:52			07:49	08:32
	21:45	36	06:50 (WEA 4)	20:55			19:45	24	08:07 (WEA 2)	18:35			16:35	16:12
16	05:22		06:14 (WEA 4)	06:10			07:02		07:42 (WEA 2)	07:53			07:50	08:33
	21:44	36	06:50 (WEA 4)	20:53			19:43	24	08:06 (WEA 2)	18:32			16:34	16:12
17	05:23		06:13 (WEA 4)	06:11		07:31 (WEA 3)	07:03		07:43 (WEA 2)	07:55			07:52	08:34
	21:43	37	06:50 (WEA 4)	20:51	4	07:35 (WEA 3)	19:40	23	08:06 (WEA 2)	18:30			16:32	16:13
18	05:24		06:13 (WEA 4)	06:13		07:28 (WEA 3)	07:05		07:43 (WEA 2)	07:57			07:54	08:35
	21:42	37	06:50 (WEA 4)	20:49	11	07:39 (WEA 3)	19:38	22	08:05 (WEA 2)	18:28			16:31	16:13
19	05:26		06:14 (WEA 4)	06:15		07:25 (WEA 3)	07:07		07:43 (WEA 2)	07:59			07:56	08:35
	21:41	37	06:51 (WEA 4)	20:47	15	07:40 (WEA 3)	19:35	20	08:03 (WEA 2)	18:26			16:29	16:13
20	05:27		06:14 (WEA 4)	06:16		07:24 (WEA 3)	07:08		07:44 (WEA 2)	08:01			07:57	08:36
	21:40	37	06:51 (WEA 4)	20:45	18	07:42 (WEA 3)	19:33	18	08:02 (WEA 2)	18:24			16:28	16:13
21	05:29		06:13 (WEA 4)	06:18		07:22 (WEA 3)	07:10		07:45 (WEA 2)	08:03			07:59	08:37
	21:38	38	06:51 (WEA 4)	20:43	20	07:42 (WEA 3)	19:31	16	08:01 (WEA 2)	18:21			16:27	16:14
22	05:30		06:13 (WEA 4)	06:20		07:21 (WEA 3)	07:12		07:47 (WEA 2)	08:04			08:01	08:37
	21:37	38	06:51 (WEA 4)	20:41	22	07:43 (WEA 3)	19:28	10	07:57 (WEA 2)	18:19			16:26	16:14
23	05:31		06:14 (WEA 4)	06:21		07:21 (WEA 3)	07:14			08:06			08:03	08:38
	21:36	37	06:51 (WEA 4)	20:38	23	07:44 (WEA 3)	19:26			18:17			16:25	16:15
24	05:33		06:13 (WEA 4)	06:23		07:20 (WEA 3)	07:15			08:08			08:04	08:38
	21:34	38	06:51 (WEA 4)	20:36	24	07:44 (WEA 3)	19:24			18:15			16:23	16:15
25	05:34		06:13 (WEA 4)	06:25		07:20 (WEA 3)	07:17			07:10			08:06	08:39
	21:33	38	06:51 (WEA 4)	20:34	24	07:44 (WEA 3)	19:21			17:13			16:22	16:16
26	05:36		06:14 (WEA 4)	06:26		07:19 (WEA 3)	07:19			07:12			08:08	08:39
	21:31	37	06:51 (WEA 4)	20:32	24	07:43 (WEA 3)	19:19			17:11			16:21	16:17
27	05:37		06:14 (WEA 4)	06:28		07:19 (WEA 3)	07:20			07:13			08:09	08:39
	21:30	37	06:51 (WEA 4)	20:29	24	07:43 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:15 (WEA 4)	06:30		07:19 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	36	06:51 (WEA 4)	20:27	24	07:43 (WEA 3)	19:14			17:07			16:19	16:18
29	05:40		06:14 (WEA 4)	06:31		07:19 (WEA 3)	07:24		08:20 (WEA 1)	07:17			08:12	08:40
	21:27	36	06:50 (WEA 4)	20:25	23	07:42 (WEA 3)	19:12	9	08:29 (WEA 1)	17:05			16:19	16:19
30	05:42		06:15 (WEA 4)	06:33		07:20 (WEA 3)	07:25		08:18 (WEA 1)	07:19			08:14	08:40
	21:25	35	06:50 (WEA 4)	20:23	21	07:41 (WEA 3)	19:09	13	08:31 (WEA 1)	17:03			16:18	16:20
31	05:43		06:15 (WEA 4)	06:35		07:20 (WEA 3)				07:21				08:40
	21:24	35	06:50 (WEA 4)	20:20	19	07:39 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		1065			512			344			190			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-23 - SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:55 (WEA 2)	05:57		06:22 (WEA 4)	05:11		
	16:22	17:12	18:05			20:01	11	08:06 (WEA 2)	20:53	25	06:47 (WEA 4)	21:41		
2	08:39	08:10	07:14			07:02		07:58 (WEA 2)	05:56		06:21 (WEA 4)	05:10		
	16:23	17:13	18:07			20:02	5	08:03 (WEA 2)	20:55	27	06:48 (WEA 4)	21:42		
3	08:39	08:08	07:12			06:59			05:54		06:19 (WEA 4)	05:09		
	16:25	17:15	18:09			20:04			20:57	29	06:48 (WEA 4)	21:43		
4	08:39	08:07	07:10		07:36 (WEA 1)	06:57			05:52		06:18 (WEA 4)	05:08		
	16:26	17:17	18:10	7	07:43 (WEA 1)	20:06			20:58	30	06:48 (WEA 4)	21:44		
5	08:39	08:05	07:07		07:34 (WEA 1)	06:55			05:50		06:17 (WEA 4)	05:07		
	16:27	17:19	18:12	12	07:46 (WEA 1)	20:08			21:00	31	06:48 (WEA 4)	21:45		
6	08:38	08:03	07:05		07:33 (WEA 1)	06:52		07:27 (WEA 3)	05:48		06:17 (WEA 4)	05:07		
	16:28	17:21	18:14	14	07:47 (WEA 1)	20:09	11	07:38 (WEA 3)	21:02	31	06:48 (WEA 4)	21:46		
7	08:38	08:01	07:03		07:31 (WEA 1)	06:50		07:25 (WEA 3)	05:46		06:17 (WEA 4)	05:06		
	16:30	17:23	18:16	16	07:47 (WEA 1)	20:11	14	07:39 (WEA 3)	21:04	32	06:49 (WEA 4)	21:47		
8	08:38	07:59	07:01		07:30 (WEA 1)	06:48		07:24 (WEA 3)	05:44		06:17 (WEA 4)	05:06		
	16:31	17:25	18:18	18	07:48 (WEA 1)	20:13	17	07:41 (WEA 3)	21:05	32	06:49 (WEA 4)	21:48		
9	08:37	07:58	06:58		07:30 (WEA 1)	06:45		07:23 (WEA 3)	05:42		06:16 (WEA 4)	05:05		
	16:32	17:27	18:20	18	07:48 (WEA 1)	20:15	19	07:42 (WEA 3)	21:07	32	06:48 (WEA 4)	21:49		
10	08:36	07:56	06:56		07:29 (WEA 1)	06:43		07:21 (WEA 3)	05:41		06:17 (WEA 4)	05:05		
	16:34	17:29	18:21	18	07:47 (WEA 1)	20:16	20	07:41 (WEA 3)	21:09	32	06:49 (WEA 4)	21:50		
11	08:36	07:54	06:54		07:30 (WEA 1)	06:41		07:21 (WEA 3)	05:39		06:17 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	17	07:47 (WEA 1)	20:18	20	07:41 (WEA 3)	21:10	31	06:48 (WEA 4)	21:50	4	05:39 (WEA 5)
12	08:35	07:52	06:51		07:30 (WEA 1)	06:38		07:21 (WEA 3)	05:37		06:17 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	17	07:47 (WEA 1)	20:20	20	07:41 (WEA 3)	21:12	30	06:47 (WEA 4)	21:51	6	05:41 (WEA 5)
13	08:34	07:50	06:49		07:31 (WEA 1)	06:36		07:21 (WEA 3)	05:35		06:17 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	14	07:45 (WEA 1)	20:22	20	07:41 (WEA 3)	21:14	30	06:47 (WEA 4)	21:52	8	05:42 (WEA 5)
14	08:34	07:48	06:47		07:32 (WEA 1)	06:34		07:20 (WEA 3)	05:34		06:17 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	11	07:43 (WEA 1)	20:24	20	07:40 (WEA 3)	21:15	29	06:46 (WEA 4)	21:52	9	05:43 (WEA 5)
15	08:33	07:46	06:44		07:35 (WEA 1)	06:32		07:21 (WEA 3)	05:32		06:18 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30	4	07:39 (WEA 1)	20:25	18	07:39 (WEA 3)	21:17	28	06:46 (WEA 4)	21:53	10	05:44 (WEA 5)
16	08:32	07:44	06:42			06:29		07:22 (WEA 3)	05:31		06:19 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27	16	07:38 (WEA 3)	21:18	27	06:46 (WEA 4)	21:54	10	05:44 (WEA 5)
17	08:31	07:42	06:40			06:27		07:23 (WEA 3)	05:29		06:19 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29	13	07:36 (WEA 3)	21:20	26	06:45 (WEA 4)	21:54	11	05:45 (WEA 5)
18	08:30	07:40	06:37			06:25		07:25 (WEA 3)	05:28		06:20 (WEA 4)	05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31	9	07:34 (WEA 3)	21:21	25	06:45 (WEA 4)	21:54	11	05:45 (WEA 5)
19	08:29	07:38	06:35			06:23			05:26		06:21 (WEA 4)	05:03		05:34 (WEA 5)
	16:48	17:46	18:38			20:32			21:23	22	06:43 (WEA 4)	21:55	12	05:46 (WEA 5)
20	08:28	07:36	06:32			06:21			05:25		06:22 (WEA 4)	05:03		05:34 (WEA 5)
	16:50	17:48	18:39			20:34			21:25	20	06:42 (WEA 4)	21:55	12	05:46 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23		06:23 (WEA 4)	05:03		05:34 (WEA 5)
	16:51	17:50	18:41	11	07:09 (WEA 2)	20:36			21:26	18	06:41 (WEA 4)	21:55	12	05:46 (WEA 5)
22	08:26	07:32	06:28		06:57 (WEA 2)	06:16			05:22		06:25 (WEA 4)	05:03		05:35 (WEA 5)
	16:53	17:52	18:43	14	07:11 (WEA 2)	20:38			21:27	15	06:40 (WEA 4)	21:56	12	05:47 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)	06:14			05:21		06:27 (WEA 4)	05:03		05:35 (WEA 5)
	16:55	17:54	18:45	18	07:12 (WEA 2)	20:39			21:29	12	06:39 (WEA 4)	21:56	12	05:47 (WEA 5)
24	08:23	07:27	06:23		06:54 (WEA 2)	06:12			05:19		06:29 (WEA 4)	05:04		05:35 (WEA 5)
	16:57	17:55	18:46	19	07:13 (WEA 2)	20:41			21:30	6	06:35 (WEA 4)	21:56	11	05:46 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10			05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	20	07:13 (WEA 2)	20:43			21:32			21:56	11	05:47 (WEA 5)
26	08:20	07:23	06:18		06:52 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	20	07:12 (WEA 2)	20:45	8	06:40 (WEA 4)	21:33			21:56	11	05:47 (WEA 5)
27	08:19	07:21	06:16		06:52 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	21	07:13 (WEA 2)	20:46	13	06:43 (WEA 4)	21:34			21:56	10	05:47 (WEA 5)
28	08:18	07:19	06:13		06:51 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	20	07:11 (WEA 2)	20:48	16	06:44 (WEA 4)	21:36			21:56	9	05:46 (WEA 5)
29	08:16		07:11		07:52 (WEA 2)	06:02		06:26 (WEA 4)	05:13			05:06		05:38 (WEA 5)
	17:06		19:55	19	08:11 (WEA 2)	20:50	19	06:45 (WEA 4)	21:37			21:56	8	05:46 (WEA 5)
30	08:15		07:09		07:53 (WEA 2)	05:59		06:24 (WEA 4)	05:12			05:07		05:38 (WEA 5)
	17:08		19:57	17	08:10 (WEA 2)	20:52	22	06:46 (WEA 4)	21:38			21:55	7	05:45 (WEA 5)
31	08:13		07:06		07:53 (WEA 2)				05:11					
	17:10		19:59	15	08:08 (WEA 2)				21:40					
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				360			311			620			196	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-23 - SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:27 (WEA 4)	06:37		07:20 (WEA 3)	07:27		08:10 (WEA 1)	07:23	08:15
	21:55	5	05:44 (WEA 5)	21:22	31	06:58 (WEA 4)	20:18	20	07:40 (WEA 3)	19:07	15	08:25 (WEA 1)	16:59	16:17
2	05:08			05:47		06:27 (WEA 4)	06:38		07:20 (WEA 3)	07:29		08:09 (WEA 1)	07:25	08:17
	21:55			21:20	31	06:58 (WEA 4)	20:16	20	07:40 (WEA 3)	19:05	17	08:26 (WEA 1)	16:57	16:16
3	05:09			05:48		06:26 (WEA 4)	06:40		07:20 (WEA 3)	07:31		08:07 (WEA 1)	07:26	08:18
	21:54			21:18	32	06:58 (WEA 4)	20:13	19	07:39 (WEA 3)	19:02	18	08:25 (WEA 1)	16:55	16:16
4	05:09			05:50		06:27 (WEA 4)	06:42		07:21 (WEA 3)	07:32		08:07 (WEA 1)	07:28	08:20
	21:54			21:17	32	06:59 (WEA 4)	20:11	17	07:38 (WEA 3)	19:00	18	08:25 (WEA 1)	16:53	16:15
5	05:10			05:51		06:26 (WEA 4)	06:43		07:22 (WEA 3)	07:34		08:07 (WEA 1)	07:30	08:21
	21:53			21:15	32	06:58 (WEA 4)	20:09	15	07:37 (WEA 3)	18:57	18	08:25 (WEA 1)	16:52	16:15
6	05:11			05:53		06:27 (WEA 4)	06:45		07:23 (WEA 3)	07:36		08:08 (WEA 1)	07:32	08:22
	21:53			21:13	31	06:58 (WEA 4)	20:06	11	07:34 (WEA 3)	18:55	17	08:25 (WEA 1)	16:50	16:14
7	05:12			05:55		06:27 (WEA 4)	06:47		07:27 (WEA 3)	07:38		08:07 (WEA 1)	07:34	08:24
	21:52			21:11	32	06:59 (WEA 4)	20:04	3	07:30 (WEA 3)	18:53	16	08:23 (WEA 1)	16:48	16:14
8	05:13			05:56		06:27 (WEA 4)	06:48			07:39		08:08 (WEA 1)	07:36	08:25
	21:52			21:09	31	06:58 (WEA 4)	20:02			18:51	14	08:22 (WEA 1)	16:46	16:13
9	05:14			05:58		06:27 (WEA 4)	06:50			07:41		08:10 (WEA 1)	07:38	08:26
	21:51			21:07	31	06:58 (WEA 4)	19:59			18:48	10	08:20 (WEA 1)	16:45	16:13
10	05:15			06:00		06:28 (WEA 4)	06:52		07:52 (WEA 2)	07:43			07:39	08:27
	21:50			21:05	29	06:57 (WEA 4)	19:57	3	07:55 (WEA 2)	18:46			16:43	16:13
11	05:16			06:01		06:30 (WEA 4)	06:53		07:47 (WEA 2)	07:45			07:41	08:28
	21:49			21:03	26	06:56 (WEA 4)	19:55	11	07:58 (WEA 2)	18:44			16:41	16:13
12	05:17			06:03		06:31 (WEA 4)	06:55		07:45 (WEA 2)	07:46			07:43	08:29
	21:48			21:01	24	06:55 (WEA 4)	19:52	15	08:00 (WEA 2)	18:41			16:40	16:12
13	05:18			06:05		06:33 (WEA 4)	06:57		07:44 (WEA 2)	07:48			07:45	08:30
	21:47			20:59	21	06:54 (WEA 4)	19:50	17	08:01 (WEA 2)	18:39			16:38	16:12
14	05:19			06:06		06:34 (WEA 4)	06:58		07:42 (WEA 2)	07:50			07:47	08:31
	21:46			20:57	18	06:52 (WEA 4)	19:47	19	08:01 (WEA 2)	18:37			16:37	16:12
15	05:21			06:08		06:36 (WEA 4)	07:00		07:42 (WEA 2)	07:52			07:49	08:32
	21:45			20:55	15	06:51 (WEA 4)	19:45	20	08:02 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:40 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	12	06:50 (WEA 4)	19:43	21	08:01 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:40 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	7	06:46 (WEA 4)	19:40	21	08:01 (WEA 2)	18:30			16:32	16:13
18	05:24			06:13			07:05		07:41 (WEA 2)	07:57			07:54	08:35
	21:42			20:49			19:38	20	08:01 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15			07:07		07:40 (WEA 2)	07:59			07:56	08:35
	21:41			20:47			19:36	19	07:59 (WEA 2)	18:26			16:29	16:13
20	05:27		06:38 (WEA 4)	06:16			07:08		07:41 (WEA 2)	08:01			07:57	08:36
	21:40	9	06:47 (WEA 4)	20:45			19:33	17	07:58 (WEA 2)	18:24			16:28	16:13
21	05:29		06:35 (WEA 4)	06:18			07:10		07:42 (WEA 2)	08:03			07:59	08:37
	21:38	14	06:49 (WEA 4)	20:43			19:31	15	07:57 (WEA 2)	18:21			16:27	16:14
22	05:30		06:34 (WEA 4)	06:20			07:12		07:42 (WEA 2)	08:04			08:01	08:37
	21:37	16	06:50 (WEA 4)	20:41			19:28	13	07:55 (WEA 2)	18:19			16:26	16:14
23	05:31		06:33 (WEA 4)	06:21			07:14		07:45 (WEA 2)	08:06			08:03	08:38
	21:36	19	06:52 (WEA 4)	20:38			19:26	6	07:51 (WEA 2)	18:17			16:25	16:15
24	05:33		06:32 (WEA 4)	06:23			07:15			08:08			08:04	08:38
	21:34	21	06:53 (WEA 4)	20:36			19:24			18:15			16:23	16:15
25	05:34		06:31 (WEA 4)	06:25		07:27 (WEA 3)	07:17			07:10			08:06	08:39
	21:33	23	06:54 (WEA 4)	20:34	10	07:37 (WEA 3)	19:21			17:13			16:22	16:16
26	05:36		06:30 (WEA 4)	06:26		07:24 (WEA 3)	07:19			07:12			08:08	08:39
	21:31	25	06:55 (WEA 4)	20:32	14	07:38 (WEA 3)	19:19			17:11			16:21	16:17
27	05:37		06:29 (WEA 4)	06:28		07:23 (WEA 3)	07:20			07:14			08:09	08:39
	21:30	27	06:56 (WEA 4)	20:29	17	07:40 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:29 (WEA 4)	06:30		07:23 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	28	06:57 (WEA 4)	20:27	18	07:41 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:28 (WEA 4)	06:31		07:21 (WEA 3)	07:24		08:13 (WEA 1)	07:17			08:12	08:40
	21:27	29	06:57 (WEA 4)	20:25	20	07:41 (WEA 3)	19:12	9	08:22 (WEA 1)	17:05			16:19	16:19
30	05:42		06:28 (WEA 4)	06:33		07:21 (WEA 3)	07:25		08:11 (WEA 1)	07:19			08:14	08:40
	21:25	30	06:58 (WEA 4)	20:23	20	07:41 (WEA 3)	19:09	13	08:24 (WEA 1)	17:03			16:18	16:20
31	05:43		06:28 (WEA 4)	06:35		07:21 (WEA 3)				07:21				08:40
	21:24	30	06:58 (WEA 4)	20:20	20	07:41 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		276			554			344			143			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-24 - SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:56 (WEA 2)	05:57		06:22 (WEA 4)	05:11		
	16:22	17:12	18:05			20:01	9	08:05 (WEA 2)	20:53	28	06:50 (WEA 4)	21:41		
2	08:39	08:10	07:14			07:02			05:56		06:21 (WEA 4)	05:10		
	16:23	17:13	18:07			20:02			20:55	30	06:51 (WEA 4)	21:42		
3	08:39	08:08	07:12			06:59			05:54		06:21 (WEA 4)	05:09		
	16:25	17:15	18:09			20:04			20:57	30	06:51 (WEA 4)	21:43		
4	08:39	08:07	07:10		07:37 (WEA 1)	06:57			05:52		06:20 (WEA 4)	05:08		05:38 (WEA 5)
	16:26	17:17	18:10	4	07:41 (WEA 1)	20:06			20:58	31	06:51 (WEA 4)	21:44	4	05:42 (WEA 5)
5	08:39	08:05	07:07		07:34 (WEA 1)	06:55		07:29 (WEA 3)	05:50		06:20 (WEA 4)	05:07		05:37 (WEA 5)
	16:27	17:19	18:12	10	07:44 (WEA 1)	20:08	10	07:39 (WEA 3)	21:00	31	06:51 (WEA 4)	21:45	7	05:44 (WEA 5)
6	08:38	08:03	07:05		07:32 (WEA 1)	06:52		07:26 (WEA 3)	05:48		06:19 (WEA 4)	05:07		05:37 (WEA 5)
	16:28	17:21	18:14	14	07:46 (WEA 1)	20:09	14	07:40 (WEA 3)	21:02	31	06:50 (WEA 4)	21:46	9	05:46 (WEA 5)
7	08:38	08:01	07:03		07:30 (WEA 1)	06:50		07:25 (WEA 3)	05:46		06:20 (WEA 4)	05:06		05:36 (WEA 5)
	16:30	17:23	18:16	16	07:46 (WEA 1)	20:11	16	07:41 (WEA 3)	21:04	31	06:51 (WEA 4)	21:47	11	05:47 (WEA 5)
8	08:38	07:59	07:01		07:30 (WEA 1)	06:48		07:24 (WEA 3)	05:44		06:20 (WEA 4)	05:06		05:36 (WEA 5)
	16:31	17:25	18:18	17	07:47 (WEA 1)	20:13	18	07:42 (WEA 3)	21:05	30	06:50 (WEA 4)	21:48	13	05:49 (WEA 5)
9	08:37	07:58	06:58		07:30 (WEA 1)	06:45		07:23 (WEA 3)	05:42		06:19 (WEA 4)	05:05		05:35 (WEA 5)
	16:32	17:27	18:20	17	07:47 (WEA 1)	20:15	19	07:42 (WEA 3)	21:07	31	06:50 (WEA 4)	21:49	14	05:49 (WEA 5)
10	08:36	07:56	06:56		07:29 (WEA 1)	06:43		07:22 (WEA 3)	05:41		06:20 (WEA 4)	05:05		05:35 (WEA 5)
	16:34	17:29	18:21	17	07:46 (WEA 1)	20:16	20	07:42 (WEA 3)	21:09	30	06:50 (WEA 4)	21:50	15	05:50 (WEA 5)
11	08:36	07:54	06:54		07:29 (WEA 1)	06:41		07:22 (WEA 3)	05:39		06:20 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	17	07:46 (WEA 1)	20:18	20	07:42 (WEA 3)	21:10	29	06:49 (WEA 4)	21:50	16	05:51 (WEA 5)
12	08:35	07:52	06:51		07:30 (WEA 1)	06:38		07:22 (WEA 3)	05:37		06:20 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	16	07:46 (WEA 1)	20:20	20	07:42 (WEA 3)	21:12	28	06:48 (WEA 4)	21:51	17	05:52 (WEA 5)
13	08:34	07:50	06:49		07:30 (WEA 1)	06:36		07:22 (WEA 3)	05:35		06:21 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	14	07:44 (WEA 1)	20:22	19	07:41 (WEA 3)	21:14	27	06:48 (WEA 4)	21:52	18	05:52 (WEA 5)
14	08:34	07:48	06:47		07:32 (WEA 1)	06:34		07:22 (WEA 3)	05:34		06:21 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	10	07:42 (WEA 1)	20:24	17	07:39 (WEA 3)	21:15	26	06:47 (WEA 4)	21:52	18	05:52 (WEA 5)
15	08:33	07:46	06:44		07:34 (WEA 1)	06:32		07:23 (WEA 3)	05:32		06:23 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30	4	07:38 (WEA 1)	20:25	15	07:38 (WEA 3)	21:17	24	06:47 (WEA 4)	21:53	19	05:53 (WEA 5)
16	08:32	07:44	06:42			06:29		07:24 (WEA 3)	05:31		06:24 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27	13	07:37 (WEA 3)	21:18	22	06:46 (WEA 4)	21:54	19	05:53 (WEA 5)
17	08:31	07:42	06:40			06:27		07:26 (WEA 3)	05:29		06:24 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29	8	07:34 (WEA 3)	21:20	20	06:44 (WEA 4)	21:54	20	05:54 (WEA 5)
18	08:30	07:40	06:37			06:25			05:28		06:26 (WEA 4)	05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31			21:21	18	06:44 (WEA 4)	21:54	20	05:54 (WEA 5)
19	08:29	07:38	06:35			06:23			05:26		06:27 (WEA 4)	05:03		05:34 (WEA 5)
	16:48	17:46	18:38			20:32			21:23	14	06:41 (WEA 4)	21:55	20	05:54 (WEA 5)
20	08:28	07:36	06:32		07:03 (WEA 2)	06:21			05:25		06:29 (WEA 4)	05:03		05:34 (WEA 5)
	16:50	17:48	18:39	4	07:07 (WEA 2)	20:34			21:25	11	06:40 (WEA 4)	21:55	20	05:54 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23		06:33 (WEA 4)	05:03		05:34 (WEA 5)
	16:51	17:50	18:41	12	07:10 (WEA 2)	20:36			21:26	3	06:36 (WEA 4)	21:55	20	05:54 (WEA 5)
22	08:26	07:32	06:28		06:56 (WEA 2)	06:16			05:22			05:03		05:35 (WEA 5)
	16:53	17:52	18:43	15	07:11 (WEA 2)	20:38			21:27			21:56	20	05:55 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)	06:14			05:21			05:03		05:35 (WEA 5)
	16:55	17:54	18:45	18	07:12 (WEA 2)	20:39			21:29			21:56	20	05:55 (WEA 5)
24	08:23	07:27	06:23		06:54 (WEA 2)	06:12		06:36 (WEA 4)	05:19			05:04		05:35 (WEA 5)
	16:57	17:55	18:46	18	07:12 (WEA 2)	20:41	4	06:40 (WEA 4)	21:30			21:56	20	05:55 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		06:34 (WEA 4)	05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	20	07:13 (WEA 2)	20:43	10	06:44 (WEA 4)	21:32			21:56	20	05:56 (WEA 5)
26	08:20	07:23	06:18		06:52 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	20	07:12 (WEA 2)	20:45	14	06:46 (WEA 4)	21:33			21:56	19	05:55 (WEA 5)
27	08:19	07:21	06:16		06:52 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	20	07:12 (WEA 2)	20:46	17	06:47 (WEA 4)	21:34			21:56	19	05:56 (WEA 5)
28	08:18	07:19	06:13		06:52 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	19	07:11 (WEA 2)	20:48	20	06:48 (WEA 4)	21:36			21:56	19	05:56 (WEA 5)
29	08:16		07:11		07:52 (WEA 2)	06:02		06:26 (WEA 4)	05:13			05:06		05:38 (WEA 5)
	17:06		19:55	18	08:10 (WEA 2)	20:50	23	06:49 (WEA 4)	21:37			21:56	18	05:56 (WEA 5)
30	08:15		07:09		07:53 (WEA 2)	05:59		06:24 (WEA 4)	05:12			05:07		05:38 (WEA 5)
	17:08		19:57	16	08:09 (WEA 2)	20:52	25	06:49 (WEA 4)	21:38			21:55	17	05:55 (WEA 5)
31	08:13		07:06		07:54 (WEA 2)				05:11					
	17:10		19:59	13	08:07 (WEA 2)				21:40					
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				349			331			525			452	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-24 - SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:30 (WEA 4)	06:37		07:21 (WEA 3)	07:27		08:09 (WEA 1)	07:23	08:15
	21:55	16	05:55 (WEA 5)	21:22	29	06:59 (WEA 4)	20:18	20	07:41 (WEA 3)	19:07	15	08:24 (WEA 1)	16:59	16:17
2	05:08		05:40 (WEA 5)	05:47		06:30 (WEA 4)	06:38		07:21 (WEA 3)	07:29		08:08 (WEA 1)	07:25	08:17
	21:55	15	05:55 (WEA 5)	21:20	30	07:00 (WEA 4)	20:16	20	07:41 (WEA 3)	19:05	17	08:25 (WEA 1)	16:57	16:16
3	05:09		05:40 (WEA 5)	05:48		06:30 (WEA 4)	06:40		07:20 (WEA 3)	07:31		08:07 (WEA 1)	07:26	08:18
	21:54	14	05:54 (WEA 5)	21:18	30	07:00 (WEA 4)	20:13	19	07:39 (WEA 3)	19:02	17	08:24 (WEA 1)	16:55	16:16
4	05:09		05:41 (WEA 5)	05:50		06:30 (WEA 4)	06:42		07:21 (WEA 3)	07:32		08:07 (WEA 1)	07:28	08:20
	21:54	13	05:54 (WEA 5)	21:17	30	07:00 (WEA 4)	20:11	18	07:39 (WEA 3)	19:00	17	08:24 (WEA 1)	16:53	16:15
5	05:10		05:42 (WEA 5)	05:51		06:29 (WEA 4)	06:43		07:22 (WEA 3)	07:34		08:07 (WEA 1)	07:30	08:21
	21:53	12	05:54 (WEA 5)	21:15	31	07:00 (WEA 4)	20:09	16	07:38 (WEA 3)	18:57	17	08:24 (WEA 1)	16:52	16:15
6	05:11		05:43 (WEA 5)	05:53		06:29 (WEA 4)	06:45		07:22 (WEA 3)	07:36		08:07 (WEA 1)	07:32	08:22
	21:53	10	05:53 (WEA 5)	21:13	31	07:00 (WEA 4)	20:06	14	07:36 (WEA 3)	18:55	17	08:24 (WEA 1)	16:50	16:14
7	05:12		05:44 (WEA 5)	05:55		06:30 (WEA 4)	06:47		07:24 (WEA 3)	07:38		08:07 (WEA 1)	07:34	08:24
	21:52	8	05:52 (WEA 5)	21:11	31	07:01 (WEA 4)	20:04	10	07:34 (WEA 3)	18:53	15	08:22 (WEA 1)	16:48	16:14
8	05:13		05:44 (WEA 5)	05:56		06:29 (WEA 4)	06:48			07:39		08:08 (WEA 1)	07:36	08:25
	21:52	6	05:50 (WEA 5)	21:09	31	07:00 (WEA 4)	20:02			18:51	12	08:20 (WEA 1)	16:46	16:13
9	05:14			05:58		06:30 (WEA 4)	06:50			07:41		08:10 (WEA 1)	07:38	08:26
	21:51			21:07	30	07:00 (WEA 4)	19:59			18:48	8	08:18 (WEA 1)	16:45	16:13
10	05:15			06:00		06:29 (WEA 4)	06:52			07:43			07:39	08:27
	21:50			21:05	30	06:59 (WEA 4)	19:57			18:46			16:43	16:13
11	05:16			06:01		06:30 (WEA 4)	06:53		07:49 (WEA 2)	07:45			07:41	08:28
	21:49			21:03	29	06:59 (WEA 4)	19:55	8	07:57 (WEA 2)	18:44			16:41	16:13
12	05:17			06:03		06:31 (WEA 4)	06:55		07:46 (WEA 2)	07:46			07:43	08:29
	21:48			21:01	27	06:58 (WEA 4)	19:52	13	07:59 (WEA 2)	18:41			16:40	16:12
13	05:18			06:05		06:33 (WEA 4)	06:57		07:45 (WEA 2)	07:48			07:45	08:30
	21:47			20:59	25	06:58 (WEA 4)	19:50	16	08:01 (WEA 2)	18:39			16:38	16:12
14	05:19			06:06		06:34 (WEA 4)	06:58		07:43 (WEA 2)	07:50			07:47	08:31
	21:46			20:57	22	06:56 (WEA 4)	19:47	18	08:01 (WEA 2)	18:37			16:37	16:12
15	05:21			06:08		06:36 (WEA 4)	07:00		07:42 (WEA 2)	07:52			07:49	08:32
	21:45			20:55	19	06:55 (WEA 4)	19:45	19	08:01 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:41 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	16	06:54 (WEA 4)	19:43	20	08:01 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:41 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	13	06:52 (WEA 4)	19:40	20	08:01 (WEA 2)	18:30			16:32	16:13
18	05:25			06:13		06:41 (WEA 4)	07:05		07:41 (WEA 2)	07:57			07:54	08:35
	21:42			20:49	9	06:50 (WEA 4)	19:38	19	08:00 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15		06:42 (WEA 4)	07:07		07:40 (WEA 2)	07:59			07:56	08:35
	21:41			20:47	2	06:44 (WEA 4)	19:36	19	07:59 (WEA 2)	18:26			16:29	16:13
20	05:27			06:16			07:08		07:41 (WEA 2)	08:01			07:57	08:36
	21:40			20:45			19:33	17	07:58 (WEA 2)	18:24			16:28	16:13
21	05:29			06:18			07:10		07:42 (WEA 2)	08:03			07:59	08:37
	21:38			20:43			19:31	15	07:57 (WEA 2)	18:21			16:27	16:14
22	05:30			06:20			07:12		07:42 (WEA 2)	08:04			08:01	08:37
	21:37			20:41			19:28	13	07:55 (WEA 2)	18:19			16:26	16:14
23	05:31		06:41 (WEA 4)	06:21			07:14		07:45 (WEA 2)	08:06			08:03	08:38
	21:36	8	06:49 (WEA 4)	20:38			19:26	7	07:52 (WEA 2)	18:17			16:25	16:15
24	05:33		06:38 (WEA 4)	06:23			07:15			08:08			08:04	08:38
	21:34	13	06:51 (WEA 4)	20:36			19:24			18:15			16:23	16:15
25	05:34		06:36 (WEA 4)	06:25			07:17			07:10			08:06	08:39
	21:33	17	06:53 (WEA 4)	20:34			19:21			17:13			16:22	16:16
26	05:36		06:36 (WEA 4)	06:26		07:28 (WEA 3)	07:19			07:12			08:08	08:39
	21:31	19	06:55 (WEA 4)	20:32	9	07:37 (WEA 3)	19:19			17:11			16:21	16:17
27	05:37		06:34 (WEA 4)	06:28		07:26 (WEA 3)	07:20			07:14			08:09	08:39
	21:30	21	06:55 (WEA 4)	20:29	13	07:39 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:34 (WEA 4)	06:30		07:25 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	23	06:57 (WEA 4)	20:27	15	07:40 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:33 (WEA 4)	06:31		07:23 (WEA 3)	07:24		08:12 (WEA 1)	07:17			08:12	08:40
	21:27	24	06:57 (WEA 4)	20:25	17	07:40 (WEA 3)	19:12	9	08:21 (WEA 1)	17:05			16:19	16:19
30	05:42		06:33 (WEA 4)	06:33		07:22 (WEA 3)	07:25		08:10 (WEA 1)	07:19			08:14	08:40
	21:25	26	06:59 (WEA 4)	20:23	19	07:41 (WEA 3)	19:09	13	08:23 (WEA 1)	17:03			16:18	16:20
31	05:43		06:31 (WEA 4)	06:35		07:22 (WEA 3)				07:21				08:40
	21:24	28	06:59 (WEA 4)	20:20	19	07:41 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		273			557			343			135			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-25 - SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:55 (WEA 2)	05:57		06:22 (WEA 4)	05:11		
	16:22	17:12	18:05			20:01	9	08:04 (WEA 2)	20:53	28	06:50 (WEA 4)	21:41		
2	08:39	08:10	07:14			07:02			05:56		06:22 (WEA 4)	05:10		05:39 (WEA 5)
	16:23	17:13	18:07			20:02			20:55	29	06:51 (WEA 4)	21:42	3	05:42 (WEA 5)
3	08:39	08:08	07:12			06:59			05:54		06:21 (WEA 4)	05:09		05:39 (WEA 5)
	16:25	17:15	18:09			20:04			20:57	30	06:51 (WEA 4)	21:43	7	05:46 (WEA 5)
4	08:39	08:07	07:10			06:57			05:52		06:21 (WEA 4)	05:08		05:38 (WEA 5)
	16:26	17:17	18:10			20:06			20:58	30	06:51 (WEA 4)	21:44	9	05:47 (WEA 5)
5	08:39	08:05	07:07		07:34 (WEA 1)	06:55		07:29 (WEA 3)	05:50		06:20 (WEA 4)	05:07		05:37 (WEA 5)
	16:27	17:19	18:12	9	07:43 (WEA 1)	20:08	9	07:38 (WEA 3)	21:00	31	06:51 (WEA 4)	21:45	11	05:48 (WEA 5)
6	08:38	08:03	07:05		07:32 (WEA 1)	06:52		07:26 (WEA 3)	05:48		06:20 (WEA 4)	05:07		05:37 (WEA 5)
	16:28	17:21	18:14	13	07:45 (WEA 1)	20:09	13	07:39 (WEA 3)	21:02	30	06:50 (WEA 4)	21:46	13	05:50 (WEA 5)
7	08:38	08:01	07:03		07:30 (WEA 1)	06:50		07:25 (WEA 3)	05:46		06:21 (WEA 4)	05:06		05:36 (WEA 5)
	16:30	17:23	18:16	15	07:45 (WEA 1)	20:11	16	07:41 (WEA 3)	21:04	30	06:51 (WEA 4)	21:47	14	05:50 (WEA 5)
8	08:38	07:59	07:01		07:29 (WEA 1)	06:48		07:24 (WEA 3)	05:44		06:20 (WEA 4)	05:06		05:36 (WEA 5)
	16:31	17:25	18:18	17	07:46 (WEA 1)	20:13	17	07:41 (WEA 3)	21:05	30	06:50 (WEA 4)	21:48	16	05:52 (WEA 5)
9	08:37	07:58	06:58		07:29 (WEA 1)	06:45		07:23 (WEA 3)	05:42		06:20 (WEA 4)	05:05		05:35 (WEA 5)
	16:32	17:27	18:20	17	07:46 (WEA 1)	20:15	19	07:42 (WEA 3)	21:07	30	06:50 (WEA 4)	21:49	17	05:52 (WEA 5)
10	08:36	07:56	06:56		07:28 (WEA 1)	06:43		07:22 (WEA 3)	05:41		06:21 (WEA 4)	05:05		05:35 (WEA 5)
	16:34	17:29	18:21	18	07:46 (WEA 1)	20:16	19	07:41 (WEA 3)	21:09	29	06:50 (WEA 4)	21:50	18	05:53 (WEA 5)
11	08:36	07:54	06:54		07:28 (WEA 1)	06:41		07:22 (WEA 3)	05:39		06:21 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	17	07:45 (WEA 1)	20:18	19	07:41 (WEA 3)	21:10	28	06:49 (WEA 4)	21:50	19	05:54 (WEA 5)
12	08:35	07:52	06:51		07:29 (WEA 1)	06:38		07:22 (WEA 3)	05:37		06:21 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	16	07:45 (WEA 1)	20:20	19	07:41 (WEA 3)	21:12	27	06:48 (WEA 4)	21:51	19	05:54 (WEA 5)
13	08:34	07:50	06:49		07:29 (WEA 1)	06:36		07:22 (WEA 3)	05:35		06:22 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	14	07:43 (WEA 1)	20:22	18	07:40 (WEA 3)	21:14	26	06:48 (WEA 4)	21:52	20	05:54 (WEA 5)
14	08:34	07:48	06:47		07:30 (WEA 1)	06:34		07:22 (WEA 3)	05:34		06:23 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	12	07:42 (WEA 1)	20:24	17	07:39 (WEA 3)	21:15	24	06:47 (WEA 4)	21:52	21	05:55 (WEA 5)
15	08:33	07:46	06:44		07:32 (WEA 1)	06:32		07:23 (WEA 3)	05:32		06:24 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30	6	07:38 (WEA 1)	20:25	15	07:38 (WEA 3)	21:17	22	06:46 (WEA 4)	21:53	21	05:55 (WEA 5)
16	08:32	07:44	06:42			06:29		07:24 (WEA 3)	05:31		06:25 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27	12	07:36 (WEA 3)	21:18	20	06:45 (WEA 4)	21:54	22	05:56 (WEA 5)
17	08:31	07:42	06:40			06:27		07:27 (WEA 3)	05:29		06:26 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29	6	07:33 (WEA 3)	21:20	18	06:44 (WEA 4)	21:54	22	05:56 (WEA 5)
18	08:30	07:40	06:37			06:25			05:28		06:28 (WEA 4)	05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31			21:21	15	06:43 (WEA 4)	21:54	22	05:56 (WEA 5)
19	08:29	07:38	06:35			06:23			05:26		06:29 (WEA 4)	05:03		05:34 (WEA 5)
	16:48	17:46	18:38			20:32			21:23	11	06:40 (WEA 4)	21:55	22	05:56 (WEA 5)
20	08:28	07:36	06:32			06:21			05:25		06:33 (WEA 4)	05:03		05:34 (WEA 5)
	16:50	17:48	18:39			20:34			21:25	3	06:36 (WEA 4)	21:55	23	05:57 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23			05:03		05:34 (WEA 5)
	16:51	17:50	18:41	11	07:09 (WEA 2)	20:36			21:26			21:55	23	05:57 (WEA 5)
22	08:26	07:32	06:28		06:56 (WEA 2)	06:16			05:22			05:03		05:35 (WEA 5)
	16:53	17:52	18:43	14	07:10 (WEA 2)	20:38			21:27			21:56	23	05:58 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)	06:14			05:21			05:03		05:35 (WEA 5)
	16:55	17:54	18:45	17	07:11 (WEA 2)	20:39			21:29			21:56	22	05:57 (WEA 5)
24	08:23	07:27	06:23		06:53 (WEA 2)	06:12		06:36 (WEA 4)	05:19			05:04		05:35 (WEA 5)
	16:57	17:55	18:46	19	07:12 (WEA 2)	20:41	6	06:42 (WEA 4)	21:30			21:56	22	05:57 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		06:34 (WEA 4)	05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	19	07:12 (WEA 2)	20:43	11	06:45 (WEA 4)	21:32			21:56	22	05:58 (WEA 5)
26	08:20	07:23	06:18		06:52 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	19	07:11 (WEA 2)	20:45	15	06:47 (WEA 4)	21:33			21:56	22	05:58 (WEA 5)
27	08:19	07:21	06:16		06:52 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	19	07:11 (WEA 2)	20:46	18	06:48 (WEA 4)	21:34			21:56	21	05:58 (WEA 5)
28	08:18	07:19	06:13		06:51 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	19	07:10 (WEA 2)	20:48	21	06:49 (WEA 4)	21:36			21:56	21	05:58 (WEA 5)
29	08:16		07:11		07:52 (WEA 2)	06:02		06:26 (WEA 4)	05:13			05:06		05:38 (WEA 5)
	17:06		19:55	18	08:10 (WEA 2)	20:50	23	06:49 (WEA 4)	21:37			21:56	20	05:58 (WEA 5)
30	08:15		07:09		07:53 (WEA 2)	05:59		06:24 (WEA 4)	05:12			05:07		05:38 (WEA 5)
	17:08		19:57	16	08:09 (WEA 2)	20:52	26	06:50 (WEA 4)	21:38			21:55	20	05:58 (WEA 5)
31	08:13		07:06		07:53 (WEA 2)				05:11					
	17:10		19:59	13	08:06 (WEA 2)				21:40					
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				338			328			491			535	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-25 - SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:31 (WEA 4)	06:37		07:21 (WEA 3)	07:27		08:08 (WEA 1)	07:23	08:15
	21:55	19	05:58 (WEA 5)	21:22	28	06:59 (WEA 4)	20:18	19	07:40 (WEA 3)	19:07	16	08:24 (WEA 1)	16:59	16:17
2	05:08		05:40 (WEA 5)	05:47		06:31 (WEA 4)	06:38		07:21 (WEA 3)	07:29		08:07 (WEA 1)	07:25	08:17
	21:55	18	05:58 (WEA 5)	21:20	29	07:00 (WEA 4)	20:16	19	07:40 (WEA 3)	19:05	17	08:24 (WEA 1)	16:57	16:16
3	05:09		05:40 (WEA 5)	05:48		06:30 (WEA 4)	06:40		07:20 (WEA 3)	07:31		08:06 (WEA 1)	07:26	08:18
	21:54	17	05:57 (WEA 5)	21:18	29	06:59 (WEA 4)	20:13	19	07:39 (WEA 3)	19:02	17	08:23 (WEA 1)	16:55	16:16
4	05:09		05:41 (WEA 5)	05:50		06:31 (WEA 4)	06:42		07:21 (WEA 3)	07:32		08:06 (WEA 1)	07:28	08:20
	21:54	16	05:57 (WEA 5)	21:17	29	07:00 (WEA 4)	20:11	17	07:38 (WEA 3)	19:00	17	08:23 (WEA 1)	16:53	16:15
5	05:10		05:42 (WEA 5)	05:51		06:30 (WEA 4)	06:43		07:22 (WEA 3)	07:34		08:06 (WEA 1)	07:30	08:21
	21:53	15	05:57 (WEA 5)	21:15	30	07:00 (WEA 4)	20:09	16	07:38 (WEA 3)	18:57	17	08:23 (WEA 1)	16:52	16:15
6	05:11		05:43 (WEA 5)	05:53		06:30 (WEA 4)	06:45		07:22 (WEA 3)	07:36		08:06 (WEA 1)	07:32	08:22
	21:53	14	05:57 (WEA 5)	21:13	30	07:00 (WEA 4)	20:06	13	07:35 (WEA 3)	18:55	16	08:22 (WEA 1)	16:50	16:14
7	05:12		05:44 (WEA 5)	05:55		06:30 (WEA 4)	06:47		07:24 (WEA 3)	07:38		08:06 (WEA 1)	07:34	08:24
	21:52	12	05:56 (WEA 5)	21:11	31	07:01 (WEA 4)	20:04	9	07:33 (WEA 3)	18:53	14	08:20 (WEA 1)	16:48	16:14
8	05:13		05:44 (WEA 5)	05:56		06:30 (WEA 4)	06:48			07:39		08:08 (WEA 1)	07:36	08:25
	21:52	10	05:54 (WEA 5)	21:09	30	07:00 (WEA 4)	20:02			18:51	11	08:19 (WEA 1)	16:46	16:13
9	05:14		05:45 (WEA 5)	05:58		06:30 (WEA 4)	06:50			07:41		08:10 (WEA 1)	07:38	08:26
	21:51	8	05:53 (WEA 5)	21:07	30	07:00 (WEA 4)	19:59			18:48	6	08:16 (WEA 1)	16:45	16:13
10	05:15		05:46 (WEA 5)	06:00		06:30 (WEA 4)	06:52			07:43			07:39	08:27
	21:50	5	05:51 (WEA 5)	21:05	30	07:00 (WEA 4)	19:57			18:46			16:43	16:13
11	05:16			06:01		06:30 (WEA 4)	06:53		07:48 (WEA 2)	07:45			07:41	08:28
	21:49			21:03	30	07:00 (WEA 4)	19:55	8	07:56 (WEA 2)	18:44			16:41	16:13
12	05:17			06:03		06:31 (WEA 4)	06:55		07:45 (WEA 2)	07:46			07:43	08:29
	21:48			21:01	27	06:58 (WEA 4)	19:52	13	07:58 (WEA 2)	18:41			16:40	16:12
13	05:18			06:05		06:33 (WEA 4)	06:57		07:44 (WEA 2)	07:48			07:45	08:30
	21:47			20:59	25	06:58 (WEA 4)	19:50	16	08:00 (WEA 2)	18:39			16:38	16:12
14	05:19			06:06		06:34 (WEA 4)	06:58		07:42 (WEA 2)	07:50			07:47	08:31
	21:46			20:57	23	06:57 (WEA 4)	19:47	18	08:00 (WEA 2)	18:37			16:37	16:12
15	05:21			06:08		06:36 (WEA 4)	07:00		07:41 (WEA 2)	07:52			07:49	08:32
	21:45			20:55	20	06:56 (WEA 4)	19:45	19	08:00 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:40 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	17	06:55 (WEA 4)	19:43	20	08:00 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:40 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	14	06:53 (WEA 4)	19:40	20	08:00 (WEA 2)	18:30			16:32	16:13
18	05:25			06:13		06:41 (WEA 4)	07:05		07:40 (WEA 2)	07:57			07:54	08:35
	21:42			20:49	10	06:51 (WEA 4)	19:38	20	08:00 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15		06:42 (WEA 4)	07:07		07:40 (WEA 2)	07:59			07:56	08:35
	21:41			20:47	5	06:47 (WEA 4)	19:36	18	07:58 (WEA 2)	18:26			16:29	16:13
20	05:27			06:16			07:08		07:40 (WEA 2)	08:01			07:57	08:36
	21:40			20:45			19:33	18	07:58 (WEA 2)	18:24			16:28	16:13
21	05:29			06:18			07:10		07:41 (WEA 2)	08:03			07:59	08:37
	21:38			20:43			19:31	15	07:56 (WEA 2)	18:21			16:27	16:14
22	05:30			06:20			07:12		07:42 (WEA 2)	08:04			08:01	08:37
	21:37			20:41			19:28	12	07:54 (WEA 2)	18:19			16:26	16:14
23	05:31			06:21			07:14		07:45 (WEA 2)	08:06			08:03	08:38
	21:36			20:38			19:26	6	07:51 (WEA 2)	18:17			16:25	16:15
24	05:33		06:41 (WEA 4)	06:23			07:15			08:08			08:04	08:38
	21:34	8	06:49 (WEA 4)	20:36			19:24			18:15			16:23	16:15
25	05:34		06:39 (WEA 4)	06:25			07:17			07:10			08:06	08:39
	21:33	12	06:51 (WEA 4)	20:34			19:21			17:13			16:22	16:16
26	05:36		06:38 (WEA 4)	06:26		07:28 (WEA 3)	07:19			07:12			08:08	08:39
	21:31	16	06:54 (WEA 4)	20:32	7	07:35 (WEA 3)	19:19			17:11			16:21	16:17
27	05:37		06:36 (WEA 4)	06:28		07:26 (WEA 3)	07:20			07:14			08:09	08:39
	21:30	19	06:55 (WEA 4)	20:29	12	07:38 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:35 (WEA 4)	06:30		07:25 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	21	06:56 (WEA 4)	20:27	15	07:40 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:34 (WEA 4)	06:31		07:23 (WEA 3)	07:24		08:11 (WEA 1)	07:17			08:12	08:40
	21:27	23	06:57 (WEA 4)	20:25	17	07:40 (WEA 3)	19:12	10	08:21 (WEA 1)	17:05			16:19	16:19
30	05:42		06:34 (WEA 4)	06:33		07:22 (WEA 3)	07:25		08:09 (WEA 1)	07:19			08:14	08:40
	21:25	24	06:58 (WEA 4)	20:23	18	07:40 (WEA 3)	19:09	14	08:23 (WEA 1)	17:03			16:18	16:20
31	05:43		06:32 (WEA 4)	06:35		07:22 (WEA 3)				07:21				08:40
	21:24	26	06:58 (WEA 4)	20:20	19	07:41 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		283			555			339			131			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-26 - SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04			05:57		06:24 (WEA 4)	05:11		05:40 (WEA 5)
	16:22	17:12	18:05			20:01			20:53	30	06:54 (WEA 4)	21:41	10	05:50 (WEA 5)
2	08:39	08:10	07:14			07:02			05:56		06:24 (WEA 4)	05:10		05:39 (WEA 5)
	16:23	17:13	18:07			20:02			20:55	31	06:55 (WEA 4)	21:42	12	05:51 (WEA 5)
3	08:39	08:08	07:12			06:59		07:34 (WEA 3)	05:54		06:24 (WEA 4)	05:09		05:39 (WEA 5)
	16:25	17:15	18:09			20:04	6	07:40 (WEA 3)	20:57	31	06:55 (WEA 4)	21:43	14	05:53 (WEA 5)
4	08:39	08:07	07:10		07:36 (WEA 1)	06:57		07:31 (WEA 3)	05:52		06:24 (WEA 4)	05:08		05:38 (WEA 5)
	16:26	17:17	18:10	9	07:45 (WEA 1)	20:06	12	07:43 (WEA 3)	20:58	30	06:54 (WEA 4)	21:44	16	05:54 (WEA 5)
5	08:39	08:05	07:07		07:34 (WEA 1)	06:55		07:29 (WEA 3)	05:50		06:23 (WEA 4)	05:07		05:37 (WEA 5)
	16:27	17:19	18:12	13	07:47 (WEA 1)	20:08	15	07:44 (WEA 3)	21:00	31	06:54 (WEA 4)	21:45	17	05:54 (WEA 5)
6	08:38	08:03	07:05		07:33 (WEA 1)	06:52		07:27 (WEA 3)	05:48		06:23 (WEA 4)	05:07		05:37 (WEA 5)
	16:28	17:21	18:14	15	07:48 (WEA 1)	20:09	17	07:44 (WEA 3)	21:02	30	06:53 (WEA 4)	21:46	19	05:56 (WEA 5)
7	08:38	08:01	07:03		07:31 (WEA 1)	06:50		07:27 (WEA 3)	05:46		06:24 (WEA 4)	05:06		05:36 (WEA 5)
	16:30	17:23	18:16	17	07:48 (WEA 1)	20:11	18	07:45 (WEA 3)	21:04	30	06:54 (WEA 4)	21:47	20	05:56 (WEA 5)
8	08:38	07:59	07:01		07:31 (WEA 1)	06:48		07:26 (WEA 3)	05:44		06:24 (WEA 4)	05:06		05:36 (WEA 5)
	16:31	17:25	18:18	17	07:48 (WEA 1)	20:13	19	07:45 (WEA 3)	21:05	29	06:53 (WEA 4)	21:48	21	05:57 (WEA 5)
9	08:37	07:58	06:58		07:31 (WEA 1)	06:45		07:26 (WEA 3)	05:42		06:24 (WEA 4)	05:05		05:35 (WEA 5)
	16:32	17:27	18:20	18	07:49 (WEA 1)	20:15	20	07:46 (WEA 3)	21:07	28	06:52 (WEA 4)	21:49	22	05:57 (WEA 5)
10	08:36	07:56	06:56		07:30 (WEA 1)	06:43		07:25 (WEA 3)	05:41		06:25 (WEA 4)	05:05		05:35 (WEA 5)
	16:34	17:29	18:21	18	07:48 (WEA 1)	20:16	19	07:44 (WEA 3)	21:09	27	06:52 (WEA 4)	21:50	23	05:58 (WEA 5)
11	08:36	07:54	06:54		07:31 (WEA 1)	06:41		07:25 (WEA 3)	05:39		06:25 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	16	07:47 (WEA 1)	20:18	19	07:44 (WEA 3)	21:10	26	06:51 (WEA 4)	21:50	24	05:59 (WEA 5)
12	08:35	07:52	06:51		07:32 (WEA 1)	06:38		07:26 (WEA 3)	05:37		06:26 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	14	07:46 (WEA 1)	20:20	17	07:43 (WEA 3)	21:12	24	06:50 (WEA 4)	21:51	24	05:59 (WEA 5)
13	08:34	07:50	06:49		07:33 (WEA 1)	06:36		07:27 (WEA 3)	05:35		06:27 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	11	07:44 (WEA 1)	20:22	15	07:42 (WEA 3)	21:14	22	06:49 (WEA 4)	21:52	25	05:59 (WEA 5)
14	08:34	07:48	06:47		07:36 (WEA 1)	06:34		07:27 (WEA 3)	05:34		06:28 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	5	07:41 (WEA 1)	20:24	13	07:40 (WEA 3)	21:15	20	06:48 (WEA 4)	21:52	25	05:59 (WEA 5)
15	08:33	07:46	06:44			06:32		07:29 (WEA 3)	05:32		06:29 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30			20:25	9	07:38 (WEA 3)	21:17	18	06:47 (WEA 4)	21:53	26	06:00 (WEA 5)
16	08:32	07:44	06:42			06:29			05:31		06:31 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27			21:18	15	06:46 (WEA 4)	21:54	26	06:00 (WEA 5)
17	08:31	07:42	06:40			06:27			05:29		06:33 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29			21:20	10	06:43 (WEA 4)	21:54	27	06:01 (WEA 5)
18	08:30	07:40	06:37			06:25			05:28			05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31			21:21			21:54	27	06:01 (WEA 5)
19	08:29	07:38	06:35		07:04 (WEA 2)	06:23			05:26			05:03		05:34 (WEA 5)
	16:48	17:46	18:38	5	07:09 (WEA 2)	20:32			21:23			21:55	27	06:01 (WEA 5)
20	08:28	07:36	06:32		07:01 (WEA 2)	06:21			05:25			05:03		05:34 (WEA 5)
	16:50	17:48	18:39	12	07:13 (WEA 2)	20:34			21:25			21:55	27	06:01 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23			05:03		05:34 (WEA 5)
	16:51	17:50	18:41	15	07:13 (WEA 2)	20:36			21:26			21:55	27	06:01 (WEA 5)
22	08:26	07:32	06:28		06:57 (WEA 2)	06:16		06:40 (WEA 4)	05:22			05:03		05:35 (WEA 5)
	16:53	17:52	18:43	18	07:15 (WEA 2)	20:38	3	06:43 (WEA 4)	21:27			21:56	27	06:02 (WEA 5)
23	08:24	07:30	06:25		06:56 (WEA 2)	06:14		06:38 (WEA 4)	05:21			05:03		05:35 (WEA 5)
	16:55	17:54	18:45	18	07:14 (WEA 2)	20:39	9	06:47 (WEA 4)	21:29			21:56	27	06:02 (WEA 5)
24	08:23	07:27	06:23		06:55 (WEA 2)	06:12		06:36 (WEA 4)	05:19			05:04		05:35 (WEA 5)
	16:57	17:55	18:46	20	07:15 (WEA 2)	20:41	13	06:49 (WEA 4)	21:30			21:56	27	06:02 (WEA 5)
25	08:22	07:25	06:21		06:55 (WEA 2)	06:10		06:34 (WEA 4)	05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	20	07:15 (WEA 2)	20:43	17	06:51 (WEA 4)	21:32			21:56	27	06:03 (WEA 5)
26	08:20	07:23	06:18		06:54 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	20	07:14 (WEA 2)	20:45	20	06:52 (WEA 4)	21:33			21:56	26	06:02 (WEA 5)
27	08:19	07:21	06:16		06:55 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	19	07:14 (WEA 2)	20:46	23	06:53 (WEA 4)	21:34			21:56	26	06:03 (WEA 5)
28	08:18	07:19	06:13		06:54 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	18	07:12 (WEA 2)	20:48	25	06:53 (WEA 4)	21:36			21:56	26	06:03 (WEA 5)
29	08:16		07:11		07:55 (WEA 2)	06:02		06:26 (WEA 4)	05:13			05:06		05:38 (WEA 5)
	17:06		19:55	16	08:11 (WEA 2)	20:50	27	06:53 (WEA 4)	21:37			21:56	25	06:03 (WEA 5)
30	08:15		07:09		07:57 (WEA 2)	05:59		06:24 (WEA 4)	05:12		05:42 (WEA 5)	05:07		05:38 (WEA 5)
	17:08		19:57	12	08:09 (WEA 2)	20:52	30	06:54 (WEA 4)	21:38	3	05:45 (WEA 5)	21:55	25	06:03 (WEA 5)
31	08:13		07:06		07:59 (WEA 2)				05:11		05:41 (WEA 5)			
	17:10		19:59	7	08:06 (WEA 2)				21:40	8	05:49 (WEA 5)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				353			366			443			695	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-26 - SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:36 (WEA 4)	06:37		07:24 (WEA 3)	07:27		08:11 (WEA 1)	07:23	08:15
	21:55	24	06:03 (WEA 5)	21:22	24	07:00 (WEA 4)	20:18	19	07:43 (WEA 3)	19:07	14	08:25 (WEA 1)	16:59	16:17
2	05:08		05:40 (WEA 5)	05:47		06:35 (WEA 4)	06:38		07:24 (WEA 3)	07:29		08:10 (WEA 1)	07:25	08:17
	21:55	23	06:03 (WEA 5)	21:20	27	07:02 (WEA 4)	20:16	19	07:43 (WEA 3)	19:05	16	08:26 (WEA 1)	16:57	16:16
3	05:09		05:40 (WEA 5)	05:48		06:34 (WEA 4)	06:40		07:23 (WEA 3)	07:31		08:09 (WEA 1)	07:26	08:18
	21:54	22	06:02 (WEA 5)	21:18	28	07:02 (WEA 4)	20:13	20	07:43 (WEA 3)	19:02	16	08:25 (WEA 1)	16:55	16:16
4	05:09		05:41 (WEA 5)	05:50		06:34 (WEA 4)	06:42		07:23 (WEA 3)	07:32		08:08 (WEA 1)	07:28	08:20
	21:54	21	06:02 (WEA 5)	21:17	29	07:03 (WEA 4)	20:11	19	07:42 (WEA 3)	19:00	18	08:26 (WEA 1)	16:53	16:15
5	05:10		05:42 (WEA 5)	05:51		06:33 (WEA 4)	06:43		07:24 (WEA 3)	07:34		08:08 (WEA 1)	07:30	08:21
	21:53	20	06:02 (WEA 5)	21:15	29	07:02 (WEA 4)	20:09	18	07:42 (WEA 3)	18:57	18	08:26 (WEA 1)	16:52	16:15
6	05:11		05:43 (WEA 5)	05:53		06:33 (WEA 4)	06:45		07:23 (WEA 3)	07:36		08:08 (WEA 1)	07:32	08:22
	21:53	19	06:02 (WEA 5)	21:13	30	07:03 (WEA 4)	20:06	18	07:41 (WEA 3)	18:55	17	08:25 (WEA 1)	16:50	16:14
7	05:12		05:44 (WEA 5)	05:55		06:33 (WEA 4)	06:47		07:24 (WEA 3)	07:38		08:08 (WEA 1)	07:34	08:24
	21:52	18	06:02 (WEA 5)	21:11	31	07:04 (WEA 4)	20:04	16	07:40 (WEA 3)	18:53	16	08:24 (WEA 1)	16:48	16:14
8	05:13		05:44 (WEA 5)	05:56		06:33 (WEA 4)	06:48		07:25 (WEA 3)	07:39		08:08 (WEA 1)	07:36	08:25
	21:52	17	06:01 (WEA 5)	21:09	30	07:03 (WEA 4)	20:02	12	07:37 (WEA 3)	18:51	15	08:23 (WEA 1)	16:46	16:13
9	05:14		05:45 (WEA 5)	05:58		06:33 (WEA 4)	06:50		07:28 (WEA 3)	07:41		08:10 (WEA 1)	07:38	08:26
	21:51	15	06:00 (WEA 5)	21:07	31	07:04 (WEA 4)	19:59	6	07:34 (WEA 3)	18:48	11	08:21 (WEA 1)	16:45	16:13
10	05:15		05:46 (WEA 5)	06:00		06:32 (WEA 4)	06:52			07:43		08:12 (WEA 1)	07:39	08:27
	21:50	13	05:59 (WEA 5)	21:05	31	07:03 (WEA 4)	19:57			18:46	7	08:19 (WEA 1)	16:43	16:13
11	05:16		05:47 (WEA 5)	06:01		06:33 (WEA 4)	06:53			07:45			07:41	08:28
	21:49	11	05:58 (WEA 5)	21:03	30	07:03 (WEA 4)	19:55			18:44			16:41	16:13
12	05:17		05:48 (WEA 5)	06:03		06:32 (WEA 4)	06:55		07:52 (WEA 2)	07:46			07:43	08:29
	21:48	9	05:57 (WEA 5)	21:01	30	07:02 (WEA 4)	19:52	6	07:58 (WEA 2)	18:41			16:40	16:12
13	05:18		05:49 (WEA 5)	06:05		06:33 (WEA 4)	06:57		07:49 (WEA 2)	07:48			07:45	08:30
	21:47	6	05:55 (WEA 5)	20:59	29	07:02 (WEA 4)	19:50	11	08:00 (WEA 2)	18:39			16:38	16:12
14	05:19			06:06		06:34 (WEA 4)	06:58		07:46 (WEA 2)	07:50			07:47	08:31
	21:46			20:57	27	07:01 (WEA 4)	19:47	15	08:01 (WEA 2)	18:37			16:37	16:12
15	05:21			06:08		06:36 (WEA 4)	07:00		07:45 (WEA 2)	07:52			07:49	08:32
	21:45			20:55	25	07:01 (WEA 4)	19:45	17	08:02 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:43 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	22	07:00 (WEA 4)	19:43	19	08:02 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:43 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	19	06:58 (WEA 4)	19:40	19	08:02 (WEA 2)	18:30			16:32	16:13
18	05:25			06:13		06:41 (WEA 4)	07:05		07:43 (WEA 2)	07:57			07:54	08:35
	21:42			20:49	16	06:57 (WEA 4)	19:38	19	08:02 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15		06:42 (WEA 4)	07:07		07:42 (WEA 2)	07:59			07:56	08:35
	21:41			20:47	13	06:55 (WEA 4)	19:36	19	08:01 (WEA 2)	18:26			16:29	16:13
20	05:27			06:16		06:44 (WEA 4)	07:08		07:42 (WEA 2)	08:01			07:57	08:36
	21:40			20:45	8	06:52 (WEA 4)	19:33	19	08:01 (WEA 2)	18:24			16:28	16:13
21	05:29			06:18			07:10		07:43 (WEA 2)	08:03			07:59	08:37
	21:38			20:43			19:31	17	08:00 (WEA 2)	18:21			16:27	16:14
22	05:30			06:20			07:12		07:43 (WEA 2)	08:04			08:01	08:37
	21:37			20:41			19:28	15	07:58 (WEA 2)	18:19			16:26	16:14
23	05:31			06:21			07:14		07:44 (WEA 2)	08:06			08:03	08:38
	21:36			20:38			19:26	13	07:57 (WEA 2)	18:17			16:25	16:15
24	05:33			06:23			07:15		07:46 (WEA 2)	08:08			08:04	08:38
	21:34			20:36			19:24	8	07:54 (WEA 2)	18:15			16:23	16:15
25	05:34			06:25			07:17			07:10			08:06	08:39
	21:33			20:34			19:21			17:13			16:22	16:16
26	05:36		06:46 (WEA 4)	06:26			07:19			07:12			08:08	08:39
	21:31	6	06:52 (WEA 4)	20:32			19:19			17:11			16:21	16:17
27	05:37		06:42 (WEA 4)	06:28			07:20			07:14			08:09	08:39
	21:30	12	06:54 (WEA 4)	20:29			19:16			17:09			16:20	16:18
28	05:39		06:41 (WEA 4)	06:30		07:31 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	16	06:57 (WEA 4)	20:27	9	07:40 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:39 (WEA 4)	06:31		07:28 (WEA 3)	07:24			07:17			08:12	08:40
	21:27	19	06:58 (WEA 4)	20:25	13	07:41 (WEA 3)	19:12			17:05			16:19	16:19
30	05:42		06:38 (WEA 4)	06:33		07:27 (WEA 3)	07:25		08:13 (WEA 1)	07:19			08:14	08:40
	21:25	22	07:00 (WEA 4)	20:23	15	07:42 (WEA 3)	19:09	10	08:23 (WEA 1)	17:03			16:18	16:20
31	05:43		06:37 (WEA 4)	06:35		07:26 (WEA 3)				07:21				08:40
	21:24	23	07:00 (WEA 4)	20:20	17	07:43 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		316			563			354			148			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-27 - SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:57 (WEA 2)	05:58		06:22 (WEA 4)	05:11		05:40 (WEA 5)
	16:22	17:12	18:05			20:01	6	08:03 (WEA 2)	20:53	29	06:51 (WEA 4)	21:41	9	05:49 (WEA 5)
2	08:39	08:10	07:14			07:02			05:56		06:23 (WEA 4)	05:10		05:39 (WEA 5)
	16:23	17:13	18:07			20:02			20:55	29	06:52 (WEA 4)	21:42	11	05:50 (WEA 5)
3	08:39	08:08	07:12			06:59			05:54		06:22 (WEA 4)	05:09		05:39 (WEA 5)
	16:25	17:15	18:09			20:04			20:57	30	06:52 (WEA 4)	21:43	13	05:52 (WEA 5)
4	08:39	08:07	07:10			06:57		07:32 (WEA 3)	05:52		06:22 (WEA 4)	05:08		05:38 (WEA 5)
	16:26	17:17	18:10			20:06	4	07:36 (WEA 3)	20:58	30	06:52 (WEA 4)	21:44	14	05:52 (WEA 5)
5	08:39	08:05	07:07		07:33 (WEA 1)	06:55		07:28 (WEA 3)	05:50		06:22 (WEA 4)	05:07		05:37 (WEA 5)
	16:27	17:19	18:12	9	07:42 (WEA 1)	20:08	12	07:40 (WEA 3)	21:00	30	06:52 (WEA 4)	21:45	16	05:53 (WEA 5)
6	08:38	08:03	07:05		07:32 (WEA 1)	06:52		07:26 (WEA 3)	05:48		06:21 (WEA 4)	05:07		05:37 (WEA 5)
	16:28	17:21	18:14	12	07:44 (WEA 1)	20:09	14	07:40 (WEA 3)	21:02	30	06:51 (WEA 4)	21:46	17	05:54 (WEA 5)
7	08:38	08:01	07:03		07:30 (WEA 1)	06:50		07:25 (WEA 3)	05:46		06:22 (WEA 4)	05:06		05:36 (WEA 5)
	16:30	17:23	18:16	15	07:45 (WEA 1)	20:11	16	07:41 (WEA 3)	21:04	30	06:52 (WEA 4)	21:47	18	05:54 (WEA 5)
8	08:38	07:59	07:01		07:29 (WEA 1)	06:48		07:24 (WEA 3)	05:44		06:22 (WEA 4)	05:06		05:36 (WEA 5)
	16:31	17:25	18:18	16	07:45 (WEA 1)	20:13	18	07:42 (WEA 3)	21:05	29	06:51 (WEA 4)	21:48	20	05:56 (WEA 5)
9	08:37	07:58	06:58		07:29 (WEA 1)	06:45		07:24 (WEA 3)	05:42		06:22 (WEA 4)	05:05		05:35 (WEA 5)
	16:32	17:27	18:20	17	07:46 (WEA 1)	20:15	18	07:42 (WEA 3)	21:07	28	06:50 (WEA 4)	21:49	21	05:56 (WEA 5)
10	08:36	07:56	06:56		07:28 (WEA 1)	06:43		07:22 (WEA 3)	05:41		06:23 (WEA 4)	05:05		05:35 (WEA 5)
	16:34	17:29	18:21	17	07:45 (WEA 1)	20:16	20	07:42 (WEA 3)	21:09	27	06:50 (WEA 4)	21:50	21	05:56 (WEA 5)
11	08:36	07:54	06:54		07:28 (WEA 1)	06:41		07:22 (WEA 3)	05:39		06:23 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	17	07:45 (WEA 1)	20:18	19	07:41 (WEA 3)	21:10	26	06:49 (WEA 4)	21:50	22	05:57 (WEA 5)
12	08:35	07:52	06:51		07:29 (WEA 1)	06:38		07:23 (WEA 3)	05:37		06:23 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	16	07:45 (WEA 1)	20:20	18	07:41 (WEA 3)	21:12	25	06:48 (WEA 4)	21:51	23	05:58 (WEA 5)
13	08:34	07:50	06:49		07:29 (WEA 1)	06:36		07:23 (WEA 3)	05:35		06:25 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	14	07:43 (WEA 1)	20:22	17	07:40 (WEA 3)	21:14	23	06:48 (WEA 4)	21:52	24	05:58 (WEA 5)
14	08:34	07:48	06:47		07:30 (WEA 1)	06:34		07:23 (WEA 3)	05:34		06:25 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	11	07:41 (WEA 1)	20:24	15	07:38 (WEA 3)	21:15	21	06:46 (WEA 4)	21:52	24	05:58 (WEA 5)
15	08:33	07:46	06:44		07:32 (WEA 1)	06:32		07:24 (WEA 3)	05:32		06:27 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30	5	07:37 (WEA 1)	20:25	13	07:37 (WEA 3)	21:17	19	06:46 (WEA 4)	21:53	25	05:59 (WEA 5)
16	08:32	07:44	06:42			06:29		07:26 (WEA 3)	05:31		06:29 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27	9	07:35 (WEA 3)	21:18	16	06:45 (WEA 4)	21:54	25	05:59 (WEA 5)
17	08:31	07:42	06:40			06:27			05:29		06:30 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29			21:20	12	06:42 (WEA 4)	21:54	25	05:59 (WEA 5)
18	08:30	07:40	06:37			06:25			05:28		06:33 (WEA 4)	05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31			21:21	7	06:40 (WEA 4)	21:54	26	06:00 (WEA 5)
19	08:29	07:38	06:35			06:23			05:26			05:03		05:34 (WEA 5)
	16:48	17:46	18:38			20:32			21:23			21:55	26	06:00 (WEA 5)
20	08:28	07:36	06:32		07:02 (WEA 2)	06:21			05:25			05:03		05:34 (WEA 5)
	16:50	17:48	18:39	4	07:06 (WEA 2)	20:34			21:25			21:55	26	06:00 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23			05:03		05:34 (WEA 5)
	16:51	17:50	18:41	11	07:09 (WEA 2)	20:36			21:26			21:55	26	06:00 (WEA 5)
22	08:26	07:32	06:28		06:56 (WEA 2)	06:16			05:22			05:03		05:35 (WEA 5)
	16:53	17:52	18:43	15	07:11 (WEA 2)	20:38			21:27			21:56	26	06:01 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)	06:14		06:38 (WEA 4)	05:21			05:03		05:35 (WEA 5)
	16:55	17:54	18:45	17	07:11 (WEA 2)	20:39	4	06:42 (WEA 4)	21:29			21:56	26	06:01 (WEA 5)
24	08:23	07:27	06:23		06:53 (WEA 2)	06:12		06:36 (WEA 4)	05:19			05:04		05:35 (WEA 5)
	16:57	17:55	18:46	19	07:12 (WEA 2)	20:41	10	06:46 (WEA 4)	21:30			21:56	26	06:01 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		06:34 (WEA 4)	05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	19	07:12 (WEA 2)	20:43	14	06:48 (WEA 4)	21:32			21:56	25	06:01 (WEA 5)
26	08:20	07:23	06:18		06:52 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	19	07:11 (WEA 2)	20:45	17	06:49 (WEA 4)	21:33			21:56	25	06:01 (WEA 5)
27	08:19	07:21	06:16		06:52 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	19	07:11 (WEA 2)	20:46	20	06:50 (WEA 4)	21:34			21:56	25	06:02 (WEA 5)
28	08:18	07:19	06:13		06:51 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	19	07:10 (WEA 2)	20:48	22	06:50 (WEA 4)	21:36			21:56	24	06:01 (WEA 5)
29	08:16		07:11		07:52 (WEA 2)	06:02		06:26 (WEA 4)	05:13			05:06		05:38 (WEA 5)
	17:06		19:55	17	08:09 (WEA 2)	20:50	25	06:51 (WEA 4)	21:37			21:56	24	06:02 (WEA 5)
30	08:15		07:09		07:53 (WEA 2)	05:59		06:24 (WEA 4)	05:12			05:07		05:38 (WEA 5)
	17:08		19:57	15	08:08 (WEA 2)	20:52	27	06:51 (WEA 4)	21:38			21:55	23	06:01 (WEA 5)
31	08:13		07:06		07:54 (WEA 2)				05:11		05:41 (WEA 5)			
	17:10		19:59	12	08:06 (WEA 2)				21:40	6	05:47 (WEA 5)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				335			338			447			656	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-27 - SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:34 (WEA 4)	06:37		07:21 (WEA 3)	07:27		08:08 (WEA 1)	07:23	08:15
	21:55	23	06:02 (WEA 5)	21:22	25	06:59 (WEA 4)	20:18	19	07:40 (WEA 3)	19:07	15	08:23 (WEA 1)	16:59	16:17
2	05:08		05:40 (WEA 5)	05:47		06:33 (WEA 4)	06:38		07:21 (WEA 3)	07:29		08:07 (WEA 1)	07:25	08:17
	21:55	22	06:02 (WEA 5)	21:20	27	07:00 (WEA 4)	20:16	20	07:41 (WEA 3)	19:05	17	08:24 (WEA 1)	16:57	16:16
3	05:09		05:40 (WEA 5)	05:48		06:32 (WEA 4)	06:40		07:21 (WEA 3)	07:31		08:06 (WEA 1)	07:26	08:18
	21:54	21	06:01 (WEA 5)	21:18	28	07:00 (WEA 4)	20:13	18	07:39 (WEA 3)	19:02	17	08:23 (WEA 1)	16:55	16:16
4	05:09		05:41 (WEA 5)	05:50		06:32 (WEA 4)	06:42		07:21 (WEA 3)	07:32		08:06 (WEA 1)	07:28	08:20
	21:54	20	06:01 (WEA 5)	21:17	29	07:01 (WEA 4)	20:11	18	07:39 (WEA 3)	19:00	17	08:23 (WEA 1)	16:53	16:15
5	05:10		05:42 (WEA 5)	05:51		06:31 (WEA 4)	06:43		07:22 (WEA 3)	07:34		08:06 (WEA 1)	07:30	08:21
	21:53	19	06:01 (WEA 5)	21:15	30	07:01 (WEA 4)	20:09	17	07:39 (WEA 3)	18:57	17	08:23 (WEA 1)	16:52	16:15
6	05:11		05:43 (WEA 5)	05:53		06:32 (WEA 4)	06:45		07:22 (WEA 3)	07:36		08:06 (WEA 1)	07:32	08:22
	21:53	18	06:01 (WEA 5)	21:13	29	07:01 (WEA 4)	20:06	15	07:37 (WEA 3)	18:55	16	08:22 (WEA 1)	16:50	16:14
7	05:12		05:44 (WEA 5)	05:55		06:32 (WEA 4)	06:47		07:23 (WEA 3)	07:38		08:06 (WEA 1)	07:34	08:24
	21:52	17	06:01 (WEA 5)	21:11	30	07:02 (WEA 4)	20:04	12	07:35 (WEA 3)	18:53	14	08:20 (WEA 1)	16:48	16:14
8	05:13		05:44 (WEA 5)	05:56		06:31 (WEA 4)	06:48		07:26 (WEA 3)	07:39		08:07 (WEA 1)	07:36	08:25
	21:52	15	05:59 (WEA 5)	21:09	30	07:01 (WEA 4)	20:02	5	07:31 (WEA 3)	18:51	12	08:19 (WEA 1)	16:46	16:13
9	05:14		05:45 (WEA 5)	05:58		06:31 (WEA 4)	06:50			07:41		08:10 (WEA 1)	07:38	08:26
	21:51	14	05:59 (WEA 5)	21:07	31	07:02 (WEA 4)	19:59			18:48	6	08:16 (WEA 1)	16:45	16:13
10	05:15		05:46 (WEA 5)	06:00		06:31 (WEA 4)	06:52			07:43			07:39	08:27
	21:50	12	05:58 (WEA 5)	21:05	30	07:01 (WEA 4)	19:57			18:46			16:43	16:13
11	05:16		05:47 (WEA 5)	06:01		06:31 (WEA 4)	06:53		07:49 (WEA 2)	07:45			07:41	08:28
	21:49	10	05:57 (WEA 5)	21:03	30	07:01 (WEA 4)	19:55	6	07:55 (WEA 2)	18:44			16:41	16:13
12	05:17		05:48 (WEA 5)	06:03		06:31 (WEA 4)	06:55		07:46 (WEA 2)	07:46			07:43	08:29
	21:48	7	05:55 (WEA 5)	21:01	29	07:00 (WEA 4)	19:52	12	07:58 (WEA 2)	18:41			16:40	16:12
13	05:18		05:49 (WEA 5)	06:05		06:33 (WEA 4)	06:57		07:45 (WEA 2)	07:48			07:45	08:30
	21:47	3	05:52 (WEA 5)	20:59	27	07:00 (WEA 4)	19:50	14	07:59 (WEA 2)	18:39			16:38	16:12
14	05:19			06:06		06:34 (WEA 4)	06:58		07:43 (WEA 2)	07:50			07:47	08:31
	21:46			20:57	24	06:58 (WEA 4)	19:47	17	08:00 (WEA 2)	18:37			16:37	16:12
15	05:21			06:08		06:36 (WEA 4)	07:00		07:42 (WEA 2)	07:52			07:49	08:32
	21:45			20:55	22	06:58 (WEA 4)	19:45	18	08:00 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:40 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	19	06:57 (WEA 4)	19:43	20	08:00 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:40 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	16	06:55 (WEA 4)	19:40	20	08:00 (WEA 2)	18:30			16:32	16:13
18	05:25			06:13		06:41 (WEA 4)	07:05		07:40 (WEA 2)	07:57			07:54	08:35
	21:42			20:49	13	06:54 (WEA 4)	19:38	20	08:00 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15		06:42 (WEA 4)	07:07		07:40 (WEA 2)	07:59			07:56	08:35
	21:41			20:47	9	06:51 (WEA 4)	19:36	18	07:58 (WEA 2)	18:26			16:29	16:13
20	05:27			06:16		06:44 (WEA 4)	07:08		07:40 (WEA 2)	08:01			07:57	08:36
	21:40			20:45	3	06:47 (WEA 4)	19:33	18	07:58 (WEA 2)	18:24			16:28	16:13
21	05:29			06:18			07:10		07:41 (WEA 2)	08:03			07:59	08:37
	21:38			20:43			19:31	16	07:57 (WEA 2)	18:21			16:27	16:14
22	05:30			06:20			07:12		07:42 (WEA 2)	08:04			08:01	08:37
	21:37			20:41			19:28	12	07:54 (WEA 2)	18:19			16:26	16:14
23	05:31			06:21			07:14		07:44 (WEA 2)	08:06			08:03	08:38
	21:36			20:38			19:26	7	07:51 (WEA 2)	18:17			16:25	16:15
24	05:33			06:23			07:15			08:08			08:04	08:38
	21:34			20:36			19:24			18:15			16:23	16:15
25	05:34			06:25			07:17			07:10			08:06	08:39
	21:33			20:34			19:21			17:13			16:22	16:16
26	05:36		06:42 (WEA 4)	06:26			07:19			07:12			08:08	08:39
	21:31	10	06:52 (WEA 4)	20:32			19:19			17:11			16:21	16:17
27	05:37		06:39 (WEA 4)	06:28		07:28 (WEA 3)	07:20			07:14			08:09	08:39
	21:30	15	06:54 (WEA 4)	20:29	9	07:37 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:38 (WEA 4)	06:30		07:26 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	18	06:56 (WEA 4)	20:27	13	07:39 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:37 (WEA 4)	06:31		07:24 (WEA 3)	07:24		08:11 (WEA 1)	07:17			08:12	08:40
	21:27	20	06:57 (WEA 4)	20:25	15	07:39 (WEA 3)	19:12	9	08:20 (WEA 1)	17:05			16:19	16:19
30	05:42		06:36 (WEA 4)	06:33		07:23 (WEA 3)	07:25		08:09 (WEA 1)	07:19			08:14	08:40
	21:25	22	06:58 (WEA 4)	20:23	17	07:40 (WEA 3)	19:09	13	08:22 (WEA 1)	17:03			16:18	16:20
31	05:43		06:35 (WEA 4)	06:35		07:23 (WEA 3)				07:21				08:40
	21:24	24	06:59 (WEA 4)	20:20	18	07:41 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		310			553			344			131			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-27a - SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04			05:58		06:24 (WEA 4)	05:11		05:40 (WEA 5)
	16:22	17:12	18:05			20:01			20:53	29	06:53 (WEA 4)	21:41	13	05:53 (WEA 5)
2	08:40	08:10	07:14			07:02			05:56		06:24 (WEA 4)	05:10		05:39 (WEA 5)
	16:23	17:13	18:07			20:02			20:55	30	06:54 (WEA 4)	21:42	15	05:54 (WEA 5)
3	08:39	08:08	07:12			06:59			05:54		06:24 (WEA 4)	05:09		05:39 (WEA 5)
	16:25	17:15	18:09			20:04			20:57	30	06:54 (WEA 4)	21:43	17	05:56 (WEA 5)
4	08:39	08:07	07:10		07:37 (WEA 1)	06:57		07:31 (WEA 3)	05:52		06:23 (WEA 4)	05:08		05:38 (WEA 5)
	16:26	17:17	18:10	2	07:39 (WEA 1)	20:06	9	07:40 (WEA 3)	20:58	30	06:53 (WEA 4)	21:44	18	05:56 (WEA 5)
5	08:39	08:05	07:07		07:33 (WEA 1)	06:55		07:28 (WEA 3)	05:50		06:23 (WEA 4)	05:07		05:37 (WEA 5)
	16:27	17:19	18:12	10	07:43 (WEA 1)	20:08	14	07:42 (WEA 3)	21:00	30	06:53 (WEA 4)	21:45	19	05:56 (WEA 5)
6	08:38	08:03	07:05		07:32 (WEA 1)	06:52		07:26 (WEA 3)	05:48		06:23 (WEA 4)	05:07		05:37 (WEA 5)
	16:28	17:21	18:14	13	07:45 (WEA 1)	20:09	16	07:42 (WEA 3)	21:02	29	06:52 (WEA 4)	21:46	21	05:58 (WEA 5)
7	08:38	08:01	07:03		07:30 (WEA 1)	06:50		07:25 (WEA 3)	05:46		06:24 (WEA 4)	05:06		05:36 (WEA 5)
	16:30	17:23	18:16	15	07:45 (WEA 1)	20:11	18	07:43 (WEA 3)	21:04	29	06:53 (WEA 4)	21:47	22	05:58 (WEA 5)
8	08:38	07:59	07:01		07:29 (WEA 1)	06:48		07:25 (WEA 3)	05:44		06:24 (WEA 4)	05:06		05:36 (WEA 5)
	16:31	17:25	18:18	17	07:46 (WEA 1)	20:13	18	07:43 (WEA 3)	21:05	28	06:52 (WEA 4)	21:48	23	05:59 (WEA 5)
9	08:37	07:58	06:58		07:29 (WEA 1)	06:45		07:25 (WEA 3)	05:42		06:24 (WEA 4)	05:05		05:35 (WEA 5)
	16:32	17:27	18:20	17	07:46 (WEA 1)	20:15	19	07:44 (WEA 3)	21:07	27	06:51 (WEA 4)	21:49	24	05:59 (WEA 5)
10	08:36	07:56	06:56		07:28 (WEA 1)	06:43		07:24 (WEA 3)	05:41		06:25 (WEA 4)	05:05		05:35 (WEA 5)
	16:34	17:29	18:21	17	07:45 (WEA 1)	20:16	19	07:43 (WEA 3)	21:09	26	06:51 (WEA 4)	21:50	24	05:59 (WEA 5)
11	08:36	07:54	06:54		07:29 (WEA 1)	06:41		07:24 (WEA 3)	05:39		06:26 (WEA 4)	05:04		05:35 (WEA 5)
	16:35	17:31	18:23	16	07:45 (WEA 1)	20:18	18	07:42 (WEA 3)	21:10	24	06:50 (WEA 4)	21:50	25	06:00 (WEA 5)
12	08:35	07:52	06:51		07:29 (WEA 1)	06:38		07:24 (WEA 3)	05:37		06:26 (WEA 4)	05:04		05:35 (WEA 5)
	16:37	17:33	18:25	16	07:45 (WEA 1)	20:20	18	07:42 (WEA 3)	21:12	23	06:49 (WEA 4)	21:51	26	06:01 (WEA 5)
13	08:34	07:50	06:49		07:30 (WEA 1)	06:36		07:25 (WEA 3)	05:35		06:27 (WEA 4)	05:03		05:34 (WEA 5)
	16:38	17:35	18:27	13	07:43 (WEA 1)	20:22	16	07:41 (WEA 3)	21:14	21	06:48 (WEA 4)	21:52	26	06:00 (WEA 5)
14	08:34	07:48	06:47		07:31 (WEA 1)	06:34		07:25 (WEA 3)	05:34		06:28 (WEA 4)	05:03		05:34 (WEA 5)
	16:40	17:36	18:29	10	07:41 (WEA 1)	20:24	14	07:39 (WEA 3)	21:15	18	06:46 (WEA 4)	21:52	27	06:01 (WEA 5)
15	08:33	07:46	06:44			06:32		07:27 (WEA 3)	05:32		06:30 (WEA 4)	05:03		05:34 (WEA 5)
	16:41	17:38	18:30			20:25	10	07:37 (WEA 3)	21:17	15	06:45 (WEA 4)	21:53	27	06:01 (WEA 5)
16	08:32	07:44	06:42			06:29			05:31		06:32 (WEA 4)	05:03		05:34 (WEA 5)
	16:43	17:40	18:32			20:27			21:18	12	06:44 (WEA 4)	21:54	28	06:02 (WEA 5)
17	08:31	07:42	06:40			06:27			05:29		06:35 (WEA 4)	05:03		05:34 (WEA 5)
	16:45	17:42	18:34			20:29			21:20	4	06:39 (WEA 4)	21:54	28	06:02 (WEA 5)
18	08:30	07:40	06:37			06:25			05:28			05:03		05:34 (WEA 5)
	16:46	17:44	18:36			20:31			21:21			21:54	28	06:02 (WEA 5)
19	08:29	07:38	06:35			06:23			05:26			05:03		05:34 (WEA 5)
	16:48	17:46	18:38			20:32			21:23			21:55	28	06:02 (WEA 5)
20	08:28	07:36	06:32		07:01 (WEA 2)	06:21			05:25			05:03		05:34 (WEA 5)
	16:50	17:48	18:39	8	07:09 (WEA 2)	20:34			21:25			21:55	29	06:03 (WEA 5)
21	08:27	07:34	06:30		06:58 (WEA 2)	06:18			05:23			05:03		05:34 (WEA 5)
	16:51	17:50	18:41	12	07:10 (WEA 2)	20:36			21:26			21:55	29	06:03 (WEA 5)
22	08:26	07:32	06:28		06:56 (WEA 2)	06:16		06:40 (WEA 4)	05:22			05:03		05:35 (WEA 5)
	16:53	17:52	18:43	16	07:12 (WEA 2)	20:38	2	06:42 (WEA 4)	21:27			21:56	29	06:04 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)	06:14		06:38 (WEA 4)	05:21			05:03		05:35 (WEA 5)
	16:55	17:54	18:45	18	07:12 (WEA 2)	20:39	8	06:46 (WEA 4)	21:29			21:56	29	06:04 (WEA 5)
24	08:23	07:27	06:23		06:54 (WEA 2)	06:12		06:36 (WEA 4)	05:19			05:04		05:35 (WEA 5)
	16:57	17:55	18:46	19	07:13 (WEA 2)	20:41	13	06:49 (WEA 4)	21:30			21:56	28	06:03 (WEA 5)
25	08:22	07:25	06:21		06:54 (WEA 2)	06:10		06:34 (WEA 4)	05:18			05:04		05:36 (WEA 5)
	16:59	17:57	18:48	19	07:13 (WEA 2)	20:43	16	06:50 (WEA 4)	21:32			21:56	28	06:04 (WEA 5)
26	08:20	07:23	06:18		06:53 (WEA 2)	06:08		06:32 (WEA 4)	05:17			05:04		05:36 (WEA 5)
	17:00	17:59	18:50	19	07:12 (WEA 2)	20:45	19	06:51 (WEA 4)	21:33			21:56	28	06:04 (WEA 5)
27	08:19	07:21	06:16		06:53 (WEA 2)	06:06		06:30 (WEA 4)	05:16			05:05		05:37 (WEA 5)
	17:02	18:01	18:52	19	07:12 (WEA 2)	20:46	22	06:52 (WEA 4)	21:34			21:56	28	06:05 (WEA 5)
28	08:18	07:19	06:13		06:52 (WEA 2)	06:04		06:28 (WEA 4)	05:15			05:05		05:37 (WEA 5)
	17:04	18:03	18:54	18	07:10 (WEA 2)	20:48	24	06:52 (WEA 4)	21:36			21:56	27	06:04 (WEA 5)
29	08:16		07:11		07:53 (WEA 2)	06:02		06:26 (WEA 4)	05:13		05:42 (WEA 5)	05:06		05:38 (WEA 5)
	17:06		19:55	17	08:10 (WEA 2)	20:50	27	06:53 (WEA 4)	21:37	6	05:48 (WEA 5)	21:56	27	06:05 (WEA 5)
30	08:15		07:09		07:54 (WEA 2)	06:00		06:24 (WEA 4)	05:12		05:42 (WEA 5)	05:07		05:38 (WEA 5)
	17:08		19:57	14	08:08 (WEA 2)	20:52	29	06:53 (WEA 4)	21:38	9	05:51 (WEA 5)	21:55	26	06:04 (WEA 5)
31	08:13		07:06		07:55 (WEA 2)				05:11		05:41 (WEA 5)			
	17:10		19:59	10	08:05 (WEA 2)				21:40	11	05:52 (WEA 5)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				335			349			431			747	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-27a - SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:39 (WEA 5)	05:45		06:36 (WEA 4)	06:37		07:23 (WEA 3)	07:27		08:09 (WEA 1)	07:23	08:15
	21:55	25	06:04 (WEA 5)	21:22	23	06:59 (WEA 4)	20:18	18	07:41 (WEA 3)	19:07	14	08:23 (WEA 1)	16:59	16:17
2	05:08		05:40 (WEA 5)	05:47		06:36 (WEA 4)	06:38		07:23 (WEA 3)	07:29		08:08 (WEA 1)	07:25	08:17
	21:55	25	06:05 (WEA 5)	21:20	25	07:01 (WEA 4)	20:16	18	07:41 (WEA 3)	19:05	16	08:24 (WEA 1)	16:57	16:16
3	05:09		05:40 (WEA 5)	05:48		06:34 (WEA 4)	06:40		07:22 (WEA 3)	07:31		08:06 (WEA 1)	07:26	08:18
	21:54	24	06:04 (WEA 5)	21:18	27	07:01 (WEA 4)	20:13	19	07:41 (WEA 3)	19:02	17	08:23 (WEA 1)	16:55	16:16
4	05:09		05:41 (WEA 5)	05:50		06:34 (WEA 4)	06:42		07:22 (WEA 3)	07:32		08:06 (WEA 1)	07:28	08:20
	21:54	23	06:04 (WEA 5)	21:17	28	07:02 (WEA 4)	20:11	18	07:40 (WEA 3)	19:00	17	08:23 (WEA 1)	16:53	16:15
5	05:10		05:42 (WEA 5)	05:51		06:33 (WEA 4)	06:43		07:22 (WEA 3)	07:34		08:06 (WEA 1)	07:30	08:21
	21:53	22	06:04 (WEA 5)	21:15	29	07:02 (WEA 4)	20:09	18	07:40 (WEA 3)	18:57	17	08:23 (WEA 1)	16:52	16:15
6	05:11		05:43 (WEA 5)	05:53		06:33 (WEA 4)	06:45		07:22 (WEA 3)	07:36		08:06 (WEA 1)	07:32	08:22
	21:53	21	06:04 (WEA 5)	21:13	29	07:02 (WEA 4)	20:06	16	07:38 (WEA 3)	18:55	17	08:23 (WEA 1)	16:50	16:14
7	05:12		05:44 (WEA 5)	05:55		06:33 (WEA 4)	06:47		07:24 (WEA 3)	07:38		08:06 (WEA 1)	07:34	08:24
	21:52	20	06:04 (WEA 5)	21:11	30	07:03 (WEA 4)	20:04	13	07:37 (WEA 3)	18:53	15	08:21 (WEA 1)	16:48	16:14
8	05:13		05:44 (WEA 5)	05:56		06:33 (WEA 4)	06:48		07:24 (WEA 3)	07:39		08:07 (WEA 1)	07:36	08:25
	21:52	19	06:03 (WEA 5)	21:09	29	07:02 (WEA 4)	20:02	10	07:34 (WEA 3)	18:51	12	08:19 (WEA 1)	16:46	16:13
9	05:14		05:45 (WEA 5)	05:58		06:33 (WEA 4)	06:50			07:41		08:10 (WEA 1)	07:38	08:26
	21:51	17	06:02 (WEA 5)	21:07	30	07:03 (WEA 4)	19:59			18:48	7	08:17 (WEA 1)	16:45	16:13
10	05:15		05:46 (WEA 5)	06:00		06:32 (WEA 4)	06:52			07:43			07:39	08:27
	21:50	16	06:02 (WEA 5)	21:05	30	07:02 (WEA 4)	19:57			18:46			16:43	16:13
11	05:16		05:47 (WEA 5)	06:01		06:33 (WEA 4)	06:53			07:45			07:41	08:28
	21:49	14	06:01 (WEA 5)	21:03	29	07:02 (WEA 4)	19:55			18:44			16:41	16:13
12	05:17		05:48 (WEA 5)	06:03		06:32 (WEA 4)	06:55		07:48 (WEA 2)	07:46			07:43	08:29
	21:48	12	06:00 (WEA 5)	21:01	29	07:01 (WEA 4)	19:52	9	07:57 (WEA 2)	18:41			16:40	16:12
13	05:18		05:49 (WEA 5)	06:05		06:33 (WEA 4)	06:57		07:46 (WEA 2)	07:48			07:45	08:30
	21:47	10	05:59 (WEA 5)	20:59	28	07:01 (WEA 4)	19:50	13	07:59 (WEA 2)	18:39			16:38	16:12
14	05:19		05:51 (WEA 5)	06:06		06:34 (WEA 4)	06:58		07:44 (WEA 2)	07:50			07:47	08:31
	21:46	7	05:58 (WEA 5)	20:57	26	07:00 (WEA 4)	19:47	16	08:00 (WEA 2)	18:37			16:37	16:12
15	05:21		05:52 (WEA 5)	06:08		06:36 (WEA 4)	07:00		07:43 (WEA 2)	07:52			07:49	08:32
	21:45	3	05:55 (WEA 5)	20:55	24	07:00 (WEA 4)	19:45	18	08:01 (WEA 2)	18:35			16:35	16:12
16	05:22			06:10		06:38 (WEA 4)	07:02		07:41 (WEA 2)	07:54			07:50	08:33
	21:44			20:53	21	06:59 (WEA 4)	19:43	19	08:00 (WEA 2)	18:32			16:34	16:12
17	05:23			06:11		06:39 (WEA 4)	07:03		07:41 (WEA 2)	07:55			07:52	08:34
	21:43			20:51	18	06:57 (WEA 4)	19:40	19	08:00 (WEA 2)	18:30			16:32	16:13
18	05:25			06:13		06:41 (WEA 4)	07:05		07:41 (WEA 2)	07:57			07:54	08:35
	21:42			20:49	15	06:56 (WEA 4)	19:38	19	08:00 (WEA 2)	18:28			16:31	16:13
19	05:26			06:15		06:42 (WEA 4)	07:07		07:40 (WEA 2)	07:59			07:56	08:35
	21:41			20:47	12	06:54 (WEA 4)	19:36	19	07:59 (WEA 2)	18:26			16:29	16:13
20	05:27			06:16		06:44 (WEA 4)	07:08		07:41 (WEA 2)	08:01			07:57	08:36
	21:40			20:45	8	06:52 (WEA 4)	19:33	18	07:59 (WEA 2)	18:24			16:28	16:13
21	05:29			06:18			07:10		07:41 (WEA 2)	08:03			07:59	08:37
	21:38			20:43			19:31	17	07:58 (WEA 2)	18:21			16:27	16:14
22	05:30			06:20			07:12		07:42 (WEA 2)	08:04			08:01	08:37
	21:37			20:41			19:28	13	07:55 (WEA 2)	18:19			16:26	16:14
23	05:31			06:21			07:14		07:44 (WEA 2)	08:06			08:03	08:38
	21:36			20:38			19:26	9	07:53 (WEA 2)	18:17			16:25	16:15
24	05:33			06:23			07:15			08:08			08:04	08:38
	21:34			20:36			19:24			18:15			16:23	16:15
25	05:34			06:25			07:17			07:10			08:06	08:39
	21:33			20:34			19:21			17:13			16:22	16:16
26	05:36			06:26			07:19			07:12			08:08	08:39
	21:31			20:32			19:19			17:11			16:21	16:17
27	05:37		06:44 (WEA 4)	06:28		07:32 (WEA 3)	07:20			07:14			08:09	08:39
	21:30	8	06:52 (WEA 4)	20:29	3	07:35 (WEA 3)	19:16			17:09			16:20	16:18
28	05:39		06:42 (WEA 4)	06:30		07:28 (WEA 3)	07:22			07:15			08:11	08:39
	21:28	13	06:55 (WEA 4)	20:27	11	07:39 (WEA 3)	19:14			17:07			16:20	16:18
29	05:40		06:40 (WEA 4)	06:31		07:26 (WEA 3)	07:24		08:12 (WEA 1)	07:17			08:12	08:40
	21:27	16	06:56 (WEA 4)	20:25	14	07:40 (WEA 3)	19:12	8	08:20 (WEA 1)	17:05			16:19	16:19
30	05:42		06:39 (WEA 4)	06:33		07:25 (WEA 3)	07:25		08:10 (WEA 1)	07:19			08:14	08:40
	21:25	19	06:58 (WEA 4)	20:23	16	07:41 (WEA 3)	19:09	12	08:22 (WEA 1)	17:03			16:18	16:20
31	05:43		06:37 (WEA 4)	06:35		07:24 (WEA 3)				07:21				08:40
	21:24	22	06:59 (WEA 4)	20:20	18	07:42 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		336			552			339			132			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-28 - SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar			März			April			Mai			Juni		
1	08:40	08:11			07:16		07:56 (WEA 1)	07:04			05:57		06:28 (WEA 4)	05:11		06:13 (WEA 4)
	16:22	17:12			18:05	23	08:19 (WEA 1)	20:01			20:53	10	06:38 (WEA 4)	21:41	41	06:54 (WEA 4)
2	08:39	08:10			07:14		07:57 (WEA 1)	07:02		07:54 (WEA 3)	05:56		06:24 (WEA 4)	05:10		06:13 (WEA 4)
	16:23	17:13			18:07	22	08:19 (WEA 1)	20:02	4	07:58 (WEA 3)	20:55	18	06:42 (WEA 4)	21:42	41	06:54 (WEA 4)
3	08:39	08:08			07:12		07:57 (WEA 1)	06:59		07:48 (WEA 3)	05:54		06:22 (WEA 4)	05:09		06:14 (WEA 4)
	16:25	17:15			18:09	21	08:18 (WEA 1)	20:04	14	08:02 (WEA 3)	20:57	23	06:45 (WEA 4)	21:43	41	06:55 (WEA 4)
4	08:39	08:06			07:10		07:57 (WEA 1)	06:57		07:46 (WEA 3)	05:52		06:20 (WEA 4)	05:08		06:14 (WEA 4)
	16:26	17:17			18:10	20	08:17 (WEA 1)	20:06	18	08:04 (WEA 3)	20:58	26	06:46 (WEA 4)	21:44	40	06:54 (WEA 4)
5	08:39	08:05			07:07		07:58 (WEA 1)	06:55		07:44 (WEA 3)	05:50		06:18 (WEA 4)	05:07		06:14 (WEA 4)
	16:27	17:19			18:12	18	08:16 (WEA 1)	20:08	22	08:06 (WEA 3)	21:00	30	06:48 (WEA 4)	21:45	40	06:54 (WEA 4)
6	08:38	08:03			07:05		07:59 (WEA 1)	06:52		07:42 (WEA 3)	05:48		06:16 (WEA 4)	05:07		06:15 (WEA 4)
	16:28	17:21			18:14	16	08:15 (WEA 1)	20:09	24	08:06 (WEA 3)	21:02	32	06:48 (WEA 4)	21:46	39	06:54 (WEA 4)
7	08:38	08:01			07:03		08:00 (WEA 1)	06:50		07:41 (WEA 3)	05:46		06:16 (WEA 4)	05:06		06:15 (WEA 4)
	16:30	17:23			18:16	13	08:13 (WEA 1)	20:11	26	08:07 (WEA 3)	21:04	34	06:50 (WEA 4)	21:47	39	06:54 (WEA 4)
8	08:38	07:59			07:01		08:03 (WEA 1)	06:48		07:41 (WEA 3)	05:44		06:15 (WEA 4)	05:05		06:15 (WEA 4)
	16:31	17:25			18:18	7	08:10 (WEA 1)	20:13	26	08:07 (WEA 3)	21:05	36	06:51 (WEA 4)	21:48	39	06:54 (WEA 4)
9	08:37	07:58			06:58			06:45		07:39 (WEA 3)	05:42		06:13 (WEA 4)	05:05		06:15 (WEA 4)
	16:32	17:27			18:20			20:15	28	08:07 (WEA 3)	21:07	38	06:51 (WEA 4)	21:49	38	06:53 (WEA 4)
10	08:36	07:56			06:56			06:43		07:39 (WEA 3)	05:41		06:13 (WEA 4)	05:05		06:16 (WEA 4)
	16:34	17:29			18:21			20:16	28	08:07 (WEA 3)	21:09	39	06:52 (WEA 4)	21:50	38	06:54 (WEA 4)
11	08:36	07:54			06:54			06:41		07:39 (WEA 3)	05:39		06:12 (WEA 4)	05:04		06:17 (WEA 4)
	16:35	17:31			18:23			20:18	28	08:07 (WEA 3)	21:10	40	06:52 (WEA 4)	21:50	37	06:54 (WEA 4)
12	08:35	07:52			06:51			06:38		07:39 (WEA 3)	05:37		06:11 (WEA 4)	05:04		06:16 (WEA 4)
	16:37	17:33			18:25			20:20	28	08:07 (WEA 3)	21:12	41	06:52 (WEA 4)	21:51	37	06:53 (WEA 4)
13	08:34	07:50			06:49			06:36		07:38 (WEA 3)	05:35		06:11 (WEA 4)	05:03		06:17 (WEA 4)
	16:38	17:35			18:27			20:22	28	08:06 (WEA 3)	21:14	42	06:53 (WEA 4)	21:52	36	06:53 (WEA 4)
14	08:34	07:48			06:47		07:24 (WEA 2)	06:34		07:38 (WEA 3)	05:34		06:11 (WEA 4)	05:03		06:17 (WEA 4)
	16:40	17:36			18:29	12	07:36 (WEA 2)	20:23	27	08:05 (WEA 3)	21:15	42	06:53 (WEA 4)	21:52	37	06:54 (WEA 4)
15	08:33	07:46			06:44		07:21 (WEA 2)	06:32		07:38 (WEA 3)	05:32		06:11 (WEA 4)	05:03		06:18 (WEA 4)
	16:41	17:38			18:30	16	07:37 (WEA 2)	20:25	27	08:05 (WEA 3)	21:17	43	06:54 (WEA 4)	21:53	36	06:54 (WEA 4)
16	08:32	07:44			06:42		07:19 (WEA 2)	06:29		07:39 (WEA 3)	05:31		06:10 (WEA 4)	05:03		06:18 (WEA 4)
	16:43	17:40			18:32	20	07:39 (WEA 2)	20:27	25	08:04 (WEA 3)	21:18	44	06:54 (WEA 4)	21:54	36	06:54 (WEA 4)
17	08:31	07:42			06:40		07:18 (WEA 2)	06:27		07:40 (WEA 3)	05:29		06:10 (WEA 4)	05:03		06:19 (WEA 4)
	16:45	17:42			18:34	22	07:40 (WEA 2)	20:29	23	08:03 (WEA 3)	21:20	44	06:54 (WEA 4)	21:54	35	06:54 (WEA 4)
18	08:30	07:40			06:37		07:16 (WEA 2)	06:25		07:41 (WEA 3)	05:28		06:10 (WEA 4)	05:03		06:19 (WEA 4)
	16:46	17:44			18:36	24	07:40 (WEA 2)	20:31	20	08:01 (WEA 3)	21:21	45	06:55 (WEA 4)	21:54	35	06:54 (WEA 4)
19	08:29	07:38			06:35		07:16 (WEA 2)	06:23		07:41 (WEA 3)	05:26		06:10 (WEA 4)	05:03		06:19 (WEA 4)
	16:48	17:46			18:38	25	07:41 (WEA 2)	20:32	18	07:59 (WEA 3)	21:23	44	06:54 (WEA 4)	21:55	35	06:54 (WEA 4)
20	08:28	07:36			06:32		07:15 (WEA 2)	06:21		07:43 (WEA 3)	05:25		06:10 (WEA 4)	05:03		06:19 (WEA 4)
	16:50	17:48			18:39	25	07:40 (WEA 2)	20:34	13	07:56 (WEA 3)	21:25	45	06:55 (WEA 4)	21:55	35	06:54 (WEA 4)
21	08:27	07:34			06:30		07:14 (WEA 2)	06:18		07:47 (WEA 3)	05:23		06:10 (WEA 4)	05:03		06:19 (WEA 4)
	16:51	17:50			18:41	27	07:41 (WEA 2)	20:36	5	07:52 (WEA 3)	21:26	45	06:55 (WEA 4)	21:55	35	06:54 (WEA 4)
22	08:26	07:32		08:08 (WEA 1)	06:28		07:14 (WEA 2)	06:16			05:22		06:10 (WEA 4)	05:03		06:20 (WEA 4)
	16:53	17:52	2	08:10 (WEA 1)	18:43	27	07:41 (WEA 2)	20:38			21:27	45	06:55 (WEA 4)	21:56	35	06:55 (WEA 4)
23	08:24	07:30		08:03 (WEA 1)	06:25		07:14 (WEA 2)	06:14			05:21		06:11 (WEA 4)	05:03		06:20 (WEA 4)
	16:55	17:54	11	08:14 (WEA 1)	18:45	26	07:40 (WEA 2)	20:39			21:29	44	06:55 (WEA 4)	21:56	35	06:55 (WEA 4)
24	08:23	07:27		08:01 (WEA 1)	06:23		07:14 (WEA 2)	06:12			05:19		06:10 (WEA 4)	05:04		06:20 (WEA 4)
	16:57	17:55	16	08:17 (WEA 1)	18:46	25	07:39 (WEA 2)	20:41			21:30	44	06:54 (WEA 4)	21:56	35	06:55 (WEA 4)
25	08:22	07:25		07:59 (WEA 1)	06:21		07:15 (WEA 2)	06:10			05:18		06:10 (WEA 4)	05:04		06:21 (WEA 4)
	16:59	17:57	18	08:17 (WEA 1)	18:48	24	07:39 (WEA 2)	20:43			21:32	45	06:55 (WEA 4)	21:56	35	06:56 (WEA 4)
26	08:20	07:23		07:58 (WEA 1)	06:18		07:15 (WEA 2)	06:08			05:17		06:10 (WEA 4)	05:04		06:20 (WEA 4)
	17:00	17:59	20	08:18 (WEA 1)	18:50	22	07:37 (WEA 2)	20:45			21:33	45	06:55 (WEA 4)	21:56	36	06:56 (WEA 4)
27	08:19	07:21		07:58 (WEA 1)	06:16		07:16 (WEA 2)	06:06			05:16		06:11 (WEA 4)	05:05		06:21 (WEA 4)
	17:02	18:01	21	08:19 (WEA 1)	18:52	20	07:36 (WEA 2)	20:46			21:34	43	06:54 (WEA 4)	21:56	36	06:57 (WEA 4)
28	08:18	07:19		07:58 (WEA 1)	06:13		07:17 (WEA 2)	06:04			05:15		06:11 (WEA 4)	05:05		06:21 (WEA 4)
	17:04	18:03	21	08:19 (WEA 1)	18:54	16	07:33 (WEA 2)	20:48			21:36	43	06:54 (WEA 4)	21:56	36	06:57 (WEA 4)
29	08:16				07:11		08:19 (WEA 2)	06:01			05:13		06:11 (WEA 4)	05:06		06:21 (WEA 4)
	17:06				19:55	12	08:31 (WEA 2)	20:50			21:37	43	06:54 (WEA 4)	21:56	36	06:57 (WEA 4)
30	08:15				07:09			05:59			05:12		06:12 (WEA 4)	05:07		06:21 (WEA 4)
	17:08				19:57			20:52			21:38	43	06:55 (WEA 4)	21:55	36	06:57 (WEA 4)
31	08:13				07:06						05:11		06:12 (WEA 4)			
	17:10				19:59						21:40	43	06:55 (WEA 4)			
Sonnenscheinstunden	255	276			367			418			489			503		
astr.max.mögl.Beschattung			109			483			432			1199			1110	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-28 - SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:21 (WEA 4)	05:45		06:22 (WEA 4)	06:36		07:38 (WEA 3)	07:27			07:23	08:15
	21:55	37	06:58 (WEA 4)	21:22	41	07:03 (WEA 4)	20:18	28	08:06 (WEA 3)	19:07			16:59	16:17
2	05:08		06:20 (WEA 4)	05:47		06:23 (WEA 4)	06:38		07:38 (WEA 3)	07:29			07:25	08:17
	21:55	38	06:58 (WEA 4)	21:20	40	07:03 (WEA 4)	20:16	28	08:06 (WEA 3)	19:05			16:57	16:16
3	05:09		06:21 (WEA 4)	05:48		06:23 (WEA 4)	06:40		07:37 (WEA 3)	07:31			07:26	08:18
	21:54	37	06:58 (WEA 4)	21:18	38	07:01 (WEA 4)	20:13	28	08:05 (WEA 3)	19:02			16:55	16:16
4	05:09		06:21 (WEA 4)	05:50		06:24 (WEA 4)	06:42		07:38 (WEA 3)	07:32			07:28	08:20
	21:54	38	06:59 (WEA 4)	21:17	37	07:01 (WEA 4)	20:11	26	08:04 (WEA 3)	19:00			16:53	16:15
5	05:10		06:21 (WEA 4)	05:51		06:24 (WEA 4)	06:43		07:38 (WEA 3)	07:34			07:30	08:21
	21:53	39	07:00 (WEA 4)	21:15	36	07:00 (WEA 4)	20:09	26	08:04 (WEA 3)	18:57			16:52	16:15
6	05:11		06:21 (WEA 4)	05:53		06:26 (WEA 4)	06:45		07:38 (WEA 3)	07:36		08:38 (WEA 1)	07:32	08:22
	21:53	39	07:00 (WEA 4)	21:13	33	06:59 (WEA 4)	20:06	24	08:02 (WEA 3)	18:55	10	08:48 (WEA 1)	16:50	16:14
7	05:12		06:20 (WEA 4)	05:55		06:26 (WEA 4)	06:47		07:40 (WEA 3)	07:38		08:35 (WEA 1)	07:34	08:24
	21:52	40	07:00 (WEA 4)	21:11	32	06:58 (WEA 4)	20:04	21	08:01 (WEA 3)	18:53	15	08:50 (WEA 1)	16:48	16:14
8	05:13		06:20 (WEA 4)	05:56		06:28 (WEA 4)	06:48		07:40 (WEA 3)	07:39		08:33 (WEA 1)	07:36	08:25
	21:52	40	07:00 (WEA 4)	21:09	29	06:57 (WEA 4)	20:02	18	07:58 (WEA 3)	18:50	18	08:51 (WEA 1)	16:46	16:13
9	05:14		06:20 (WEA 4)	05:58		06:30 (WEA 4)	06:50		07:42 (WEA 3)	07:41		08:32 (WEA 1)	07:38	08:26
	21:51	41	07:01 (WEA 4)	21:07	25	06:55 (WEA 4)	19:59	14	07:56 (WEA 3)	18:48	20	08:52 (WEA 1)	16:45	16:13
10	05:15		06:20 (WEA 4)	06:00		06:31 (WEA 4)	06:52		07:46 (WEA 3)	07:43		08:31 (WEA 1)	07:39	08:27
	21:50	41	07:01 (WEA 4)	21:05	22	06:53 (WEA 4)	19:57	6	07:52 (WEA 3)	18:46	21	08:52 (WEA 1)	16:43	16:13
11	05:16		06:20 (WEA 4)	06:01		06:34 (WEA 4)	06:53			07:45		08:31 (WEA 1)	07:41	08:28
	21:49	42	07:02 (WEA 4)	21:03	16	06:50 (WEA 4)	19:55			18:44	22	08:53 (WEA 1)	16:41	16:12
12	05:17		06:20 (WEA 4)	06:03		06:38 (WEA 4)	06:55			07:46		08:31 (WEA 1)	07:43	08:29
	21:48	42	07:02 (WEA 4)	21:01	7	06:45 (WEA 4)	19:52			18:41	22	08:53 (WEA 1)	16:40	16:12
13	05:18		06:20 (WEA 4)	06:05			06:57			07:48		08:30 (WEA 1)	07:45	08:30
	21:47	42	07:02 (WEA 4)	20:59			19:50			18:39	22	08:52 (WEA 1)	16:38	16:12
14	05:19		06:21 (WEA 4)	06:06			06:58		08:10 (WEA 2)	07:50		08:30 (WEA 1)	07:47	08:31
	21:46	43	07:04 (WEA 4)	20:57			19:47	10	08:20 (WEA 2)	18:37	21	08:51 (WEA 1)	16:37	16:12
15	05:21		06:21 (WEA 4)	06:08			07:00		08:07 (WEA 2)	07:52		08:30 (WEA 1)	07:49	08:32
	21:45	43	07:04 (WEA 4)	20:55			19:45	16	08:23 (WEA 2)	18:35	21	08:51 (WEA 1)	16:35	16:12
16	05:22		06:20 (WEA 4)	06:10			07:02		08:05 (WEA 2)	07:53		08:31 (WEA 1)	07:50	08:33
	21:44	44	07:04 (WEA 4)	20:53			19:43	19	08:24 (WEA 2)	18:32	19	08:50 (WEA 1)	16:34	16:12
17	05:23		06:20 (WEA 4)	06:11			07:03		08:03 (WEA 2)	07:55		08:32 (WEA 1)	07:52	08:34
	21:43	44	07:04 (WEA 4)	20:51			19:40	22	08:25 (WEA 2)	18:30	17	08:49 (WEA 1)	16:32	16:13
18	05:24		06:20 (WEA 4)	06:13			07:05		08:02 (WEA 2)	07:57		08:33 (WEA 1)	07:54	08:35
	21:42	44	07:04 (WEA 4)	20:49			19:38	24	08:26 (WEA 2)	18:28	14	08:47 (WEA 1)	16:31	16:13
19	05:26		06:21 (WEA 4)	06:15			07:07		08:01 (WEA 2)	07:59		08:35 (WEA 1)	07:56	08:35
	21:41	44	07:05 (WEA 4)	20:47			19:35	25	08:26 (WEA 2)	18:26	10	08:45 (WEA 1)	16:29	16:13
20	05:27		06:20 (WEA 4)	06:16			07:08		08:00 (WEA 2)	08:01			07:57	08:36
	21:40	45	07:05 (WEA 4)	20:45			19:33	26	08:26 (WEA 2)	18:24			16:28	16:13
21	05:29		06:20 (WEA 4)	06:18			07:10		08:00 (WEA 2)	08:03			07:59	08:37
	21:38	45	07:05 (WEA 4)	20:43			19:31	26	08:26 (WEA 2)	18:21			16:27	16:14
22	05:30		06:20 (WEA 4)	06:20		07:51 (WEA 3)	07:12		07:59 (WEA 2)	08:04			08:01	08:37
	21:37	45	07:05 (WEA 4)	20:41	7	07:58 (WEA 3)	19:28	26	08:25 (WEA 2)	18:19			16:26	16:14
23	05:31		06:21 (WEA 4)	06:21		07:48 (WEA 3)	07:14		07:59 (WEA 2)	08:06			08:03	08:38
	21:36	44	07:05 (WEA 4)	20:38	13	08:01 (WEA 3)	19:26	26	08:25 (WEA 2)	18:17			16:25	16:15
24	05:33		06:20 (WEA 4)	06:23		07:45 (WEA 3)	07:15		07:59 (WEA 2)	08:08			08:04	08:38
	21:34	45	07:05 (WEA 4)	20:36	18	08:03 (WEA 3)	19:24	26	08:25 (WEA 2)	18:15			16:23	16:15
25	05:34		06:20 (WEA 4)	06:25		07:44 (WEA 3)	07:17		07:59 (WEA 2)	07:10			08:06	08:39
	21:33	45	07:05 (WEA 4)	20:34	20	08:04 (WEA 3)	19:21	24	08:23 (WEA 2)	17:13			16:22	16:16
26	05:36		06:21 (WEA 4)	06:26		07:42 (WEA 3)	07:19		08:00 (WEA 2)	07:12			08:08	08:39
	21:31	44	07:05 (WEA 4)	20:32	23	08:05 (WEA 3)	19:19	22	08:22 (WEA 2)	17:11			16:21	16:17
27	05:37		06:21 (WEA 4)	06:28		07:41 (WEA 3)	07:20		08:01 (WEA 2)	07:13			08:09	08:39
	21:30	44	07:05 (WEA 4)	20:29	25	08:06 (WEA 3)	19:16	20	08:21 (WEA 2)	17:09			16:20	16:18
28	05:39		06:21 (WEA 4)	06:30		07:40 (WEA 3)	07:22		08:02 (WEA 2)	07:15			08:11	08:39
	21:28	44	07:05 (WEA 4)	20:27	27	08:07 (WEA 3)	19:14	18	08:20 (WEA 2)	17:07			16:19	16:18
29	05:40		06:21 (WEA 4)	06:31		07:39 (WEA 3)	07:24		08:03 (WEA 2)	07:17			08:12	08:40
	21:27	43	07:04 (WEA 4)	20:25	27	08:06 (WEA 3)	19:12	14	08:17 (WEA 2)	17:05			16:19	16:19
30	05:42		06:22 (WEA 4)	06:33		07:39 (WEA 3)	07:25		08:07 (WEA 2)	07:19			08:14	08:40
	21:25	43	07:05 (WEA 4)	20:23	28	08:07 (WEA 3)	19:09	6	08:13 (WEA 2)	17:03			16:18	16:20
31	05:43		06:22 (WEA 4)	06:35		07:38 (WEA 3)				07:21				08:40
	21:24	42	07:04 (WEA 4)	20:20	28	08:06 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		1307			572			569			252			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-29 - SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar		März		April		Mai		Juni		
1	08:40	08:11		07:16		08:27 (WEA 1)	07:04		08:08 (WEA 3)	05:57		06:30 (WEA 4)	05:11		06:19 (WEA 4)
	16:22	17:12		18:05	5	08:32 (WEA 1)	20:01	32	08:40 (WEA 3)	20:53	29	06:59 (WEA 4)	21:41	53	07:12 (WEA 4)
2	08:39	08:10		07:14			07:02		08:07 (WEA 3)	05:55		06:28 (WEA 4)	05:10		06:19 (WEA 4)
	16:23	17:13		18:07			20:02	33	08:40 (WEA 3)	20:55	33	07:01 (WEA 4)	21:42	52	07:11 (WEA 4)
3	08:39	08:08		07:12			06:59		08:06 (WEA 3)	05:54		06:27 (WEA 4)	05:09		06:20 (WEA 4)
	16:25	17:15		18:09			20:04	34	08:40 (WEA 3)	20:57	36	07:03 (WEA 4)	21:43	52	07:12 (WEA 4)
4	08:39	08:06		07:10			06:57		08:06 (WEA 3)	05:52		06:26 (WEA 4)	05:08		06:20 (WEA 4)
	16:26	17:17		18:10			20:06	34	08:40 (WEA 3)	20:58	38	07:04 (WEA 4)	21:44	52	07:12 (WEA 4)
5	08:39	08:05		07:07		07:51 (WEA 2)	06:55		08:06 (WEA 3)	05:50		06:24 (WEA 4)	05:07		06:20 (WEA 4)
	16:27	17:19		18:12	8	07:59 (WEA 2)	20:08	34	08:40 (WEA 3)	21:00	41	07:05 (WEA 4)	21:45	51	07:11 (WEA 4)
6	08:38	08:03		07:05		07:47 (WEA 2)	06:52		08:05 (WEA 3)	05:48		06:23 (WEA 4)	05:07		06:21 (WEA 4)
	16:28	17:21		18:14	16	08:03 (WEA 2)	20:09	33	08:38 (WEA 3)	21:02	43	07:06 (WEA 4)	21:46	51	07:12 (WEA 4)
7	08:38	08:01		07:03		07:44 (WEA 2)	06:50		08:06 (WEA 3)	05:46		06:23 (WEA 4)	05:06		06:20 (WEA 4)
	16:30	17:23		18:16	20	08:04 (WEA 2)	20:11	32	08:38 (WEA 3)	21:04	44	07:07 (WEA 4)	21:47	51	07:11 (WEA 4)
8	08:38	07:59		07:01		07:43 (WEA 2)	06:48		08:06 (WEA 3)	05:44		06:21 (WEA 4)	05:05		06:21 (WEA 4)
	16:31	17:25		18:18	22	08:05 (WEA 2)	20:13	31	08:37 (WEA 3)	21:05	47	07:08 (WEA 4)	21:48	51	07:12 (WEA 4)
9	08:37	07:58		06:58		07:42 (WEA 2)	06:45		08:06 (WEA 3)	05:42		06:20 (WEA 4)	05:05		06:21 (WEA 4)
	16:32	17:27		18:20	25	08:07 (WEA 2)	20:15	30	08:36 (WEA 3)	21:07	48	07:08 (WEA 4)	21:49	50	07:11 (WEA 4)
10	08:36	07:56		06:56		07:40 (WEA 2)	06:43		08:06 (WEA 3)	05:41		06:20 (WEA 4)	05:04		06:22 (WEA 4)
	16:34	17:29		18:21	27	08:07 (WEA 2)	20:16	29	08:35 (WEA 3)	21:09	49	07:09 (WEA 4)	21:50	50	07:12 (WEA 4)
11	08:36	07:54		06:54		07:40 (WEA 2)	06:41		08:07 (WEA 3)	05:39		06:19 (WEA 4)	05:04		06:22 (WEA 4)
	16:35	17:31		18:23	27	08:07 (WEA 2)	20:18	26	08:33 (WEA 3)	21:10	50	07:09 (WEA 4)	21:50	50	07:12 (WEA 4)
12	08:35	07:52		06:51		07:39 (WEA 2)	06:38		08:09 (WEA 3)	05:37		06:18 (WEA 4)	05:04		06:22 (WEA 4)
	16:37	17:33		18:25	29	08:08 (WEA 2)	20:20	23	08:32 (WEA 3)	21:12	51	07:09 (WEA 4)	21:51	49	07:11 (WEA 4)
13	08:34	07:50	08:29 (WEA 1)	06:49		07:38 (WEA 2)	06:36		08:09 (WEA 3)	05:35		06:19 (WEA 4)	05:03		06:22 (WEA 4)
	16:38	17:35	3 08:32 (WEA 1)	18:27	29	08:07 (WEA 2)	20:22	20	08:29 (WEA 3)	21:14	51	07:10 (WEA 4)	21:52	50	07:12 (WEA 4)
14	08:34	07:48	08:25 (WEA 1)	06:47		07:38 (WEA 2)	06:34		08:12 (WEA 3)	05:34		06:18 (WEA 4)	05:03		06:23 (WEA 4)
	16:40	17:36	12 08:37 (WEA 1)	18:29	30	08:08 (WEA 2)	20:23	14	08:26 (WEA 3)	21:15	52	07:10 (WEA 4)	21:52	49	07:12 (WEA 4)
15	08:33	07:46	08:23 (WEA 1)	06:44		07:37 (WEA 2)	06:32		08:16 (WEA 3)	05:32		06:18 (WEA 4)	05:03		06:23 (WEA 4)
	16:41	17:38	16 08:39 (WEA 1)	18:30	30	08:07 (WEA 2)	20:25	6	08:22 (WEA 3)	21:17	53	07:11 (WEA 4)	21:53	49	07:12 (WEA 4)
16	08:32	07:44	08:22 (WEA 1)	06:42		07:38 (WEA 2)	06:29			05:31		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:43	17:40	18 08:40 (WEA 1)	18:32	28	08:06 (WEA 2)	20:27			21:18	53	07:10 (WEA 4)	21:54	48	07:12 (WEA 4)
17	08:31	07:42	08:21 (WEA 1)	06:40		07:38 (WEA 2)	06:27			05:29		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:45	17:42	20 08:41 (WEA 1)	18:34	28	08:06 (WEA 2)	20:29			21:20	54	07:11 (WEA 4)	21:54	48	07:12 (WEA 4)
18	08:30	07:40	08:20 (WEA 1)	06:37		07:38 (WEA 2)	06:25			05:28		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:46	17:44	22 08:42 (WEA 1)	18:36	26	08:04 (WEA 2)	20:31			21:21	54	07:11 (WEA 4)	21:54	48	07:12 (WEA 4)
19	08:29	07:38	08:20 (WEA 1)	06:35		07:39 (WEA 2)	06:23			05:26		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:48	17:46	23 08:43 (WEA 1)	18:38	24	08:03 (WEA 2)	20:32			21:23	54	07:11 (WEA 4)	21:55	48	07:12 (WEA 4)
20	08:28	07:36	08:18 (WEA 1)	06:32		07:39 (WEA 2)	06:21			05:25		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:50	17:48	24 08:42 (WEA 1)	18:39	22	08:01 (WEA 2)	20:34			21:25	54	07:11 (WEA 4)	21:55	49	07:13 (WEA 4)
21	08:27	07:34	08:18 (WEA 1)	06:30		07:41 (WEA 2)	06:18			05:23		06:17 (WEA 4)	05:03		06:24 (WEA 4)
	16:51	17:50	24 08:42 (WEA 1)	18:41	19	08:00 (WEA 2)	20:36			21:26	55	07:12 (WEA 4)	21:55	49	07:13 (WEA 4)
22	08:26	07:32	08:19 (WEA 1)	06:28		07:43 (WEA 2)	06:16			05:22		06:17 (WEA 4)	05:03		06:25 (WEA 4)
	16:53	17:52	23 08:42 (WEA 1)	18:43	15	07:58 (WEA 2)	20:38			21:27	55	07:12 (WEA 4)	21:56	49	07:14 (WEA 4)
23	08:24	07:30	08:19 (WEA 1)	06:25		07:46 (WEA 2)	06:14			05:20		06:18 (WEA 4)	05:03		06:25 (WEA 4)
	16:55	17:54	23 08:42 (WEA 1)	18:45	7	07:53 (WEA 2)	20:39			21:29	54	07:12 (WEA 4)	21:56	49	07:14 (WEA 4)
24	08:23	07:27	08:19 (WEA 1)	06:23			06:12			05:19		06:17 (WEA 4)	05:04		06:25 (WEA 4)
	16:57	17:55	23 08:42 (WEA 1)	18:46			20:41			21:30	54	07:11 (WEA 4)	21:56	48	07:13 (WEA 4)
25	08:22	07:25	08:19 (WEA 1)	06:21		07:20 (WEA 3)	06:10			05:18		06:17 (WEA 4)	05:04		06:26 (WEA 4)
	16:59	17:57	21 08:40 (WEA 1)	18:48	13	07:33 (WEA 3)	20:43			21:32	54	07:11 (WEA 4)	21:56	48	07:14 (WEA 4)
26	08:20	07:23	08:20 (WEA 1)	06:18		07:16 (WEA 3)	06:08			05:17		06:17 (WEA 4)	05:04		06:26 (WEA 4)
	17:00	17:59	19 08:39 (WEA 1)	18:50	19	07:35 (WEA 3)	20:45			21:33	54	07:11 (WEA 4)	21:56	48	07:14 (WEA 4)
27	08:19	07:21	08:22 (WEA 1)	06:16		07:14 (WEA 3)	06:06			05:16		06:17 (WEA 4)	05:05		06:25 (WEA 4)
	17:02	18:01	16 08:38 (WEA 1)	18:52	23	07:37 (WEA 3)	20:46			21:34	54	07:11 (WEA 4)	21:56	49	07:14 (WEA 4)
28	08:18	07:19	08:24 (WEA 1)	06:13		07:12 (WEA 3)	06:04		06:41 (WEA 4)	05:15		06:17 (WEA 4)	05:05		06:26 (WEA 4)
	17:04	18:03	12 08:36 (WEA 1)	18:54	26	07:38 (WEA 3)	20:48	9	06:50 (WEA 4)	21:36	54	07:11 (WEA 4)	21:56	49	07:15 (WEA 4)
29	08:16			07:11		08:11 (WEA 3)	06:01		06:36 (WEA 4)	05:13		06:18 (WEA 4)	05:06		06:27 (WEA 4)
	17:06			19:55	28	08:39 (WEA 3)	20:50	19	06:55 (WEA 4)	21:37	53	07:11 (WEA 4)	21:56	49	07:16 (WEA 4)
30	08:15			07:09		08:10 (WEA 3)	05:59		06:33 (WEA 4)	05:12		06:19 (WEA 4)	05:06		06:26 (WEA 4)
	17:08			19:57	30	08:40 (WEA 3)	20:52	24	06:57 (WEA 4)	21:38	53	07:12 (WEA 4)	21:55	49	07:15 (WEA 4)
31	08:13			07:06		08:08 (WEA 3)				05:11		06:19 (WEA 4)			
	17:10			19:59	32	08:40 (WEA 3)				21:40	53	07:12 (WEA 4)			
Sonnenscheinstunden	255	276		367			418			489			503		
astr.max.mögl.Beschattung			299		608			463			1527			1488	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-29 - SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:26 (WEA 4)	05:45		06:29 (WEA 4)	06:36		08:06 (WEA 3)	07:27		08:18 (WEA 2)	07:23	08:15
	21:55	50	07:16 (WEA 4)	21:22	50	07:19 (WEA 4)	20:18	26	08:32 (WEA 3)	19:07	29	08:47 (WEA 2)	16:59	16:17
2	05:08		06:26 (WEA 4)	05:47		06:30 (WEA 4)	06:38		08:05 (WEA 3)	07:29		08:18 (WEA 2)	07:25	08:17
	21:55	50	07:16 (WEA 4)	21:20	49	07:19 (WEA 4)	20:16	29	08:34 (WEA 3)	19:05	29	08:47 (WEA 2)	16:57	16:16
3	05:09		06:26 (WEA 4)	05:48		06:30 (WEA 4)	06:40		08:04 (WEA 3)	07:31		08:18 (WEA 2)	07:26	08:18
	21:54	50	07:16 (WEA 4)	21:18	48	07:18 (WEA 4)	20:13	30	08:34 (WEA 3)	19:02	27	08:45 (WEA 2)	16:55	16:16
4	05:09		06:27 (WEA 4)	05:50		06:31 (WEA 4)	06:42		08:03 (WEA 3)	07:32		08:18 (WEA 2)	07:28	08:20
	21:54	50	07:17 (WEA 4)	21:17	47	07:18 (WEA 4)	20:11	31	08:34 (WEA 3)	19:00	26	08:44 (WEA 2)	16:53	16:15
5	05:10		06:27 (WEA 4)	05:51		06:31 (WEA 4)	06:43		08:03 (WEA 3)	07:34		08:19 (WEA 2)	07:30	08:21
	21:53	51	07:18 (WEA 4)	21:15	46	07:17 (WEA 4)	20:09	32	08:35 (WEA 3)	18:57	24	08:43 (WEA 2)	16:52	16:15
6	05:11		06:27 (WEA 4)	05:53		06:32 (WEA 4)	06:45		08:01 (WEA 3)	07:36		08:21 (WEA 2)	07:32	08:22
	21:53	51	07:18 (WEA 4)	21:13	44	07:16 (WEA 4)	20:06	33	08:34 (WEA 3)	18:55	21	08:42 (WEA 2)	16:50	16:14
7	05:12		06:26 (WEA 4)	05:55		06:33 (WEA 4)	06:47		08:01 (WEA 3)	07:38		08:21 (WEA 2)	07:34	08:24
	21:52	52	07:18 (WEA 4)	21:11	42	07:15 (WEA 4)	20:04	34	08:35 (WEA 3)	18:53	18	08:39 (WEA 2)	16:48	16:14
8	05:13		06:26 (WEA 4)	05:56		06:34 (WEA 4)	06:48		08:00 (WEA 3)	07:39		08:24 (WEA 2)	07:36	08:25
	21:52	52	07:18 (WEA 4)	21:09	40	07:14 (WEA 4)	20:02	34	08:34 (WEA 3)	18:50	12	08:36 (WEA 2)	16:46	16:13
9	05:14		06:26 (WEA 4)	05:58		06:36 (WEA 4)	06:50		08:00 (WEA 3)	07:41			07:38	08:26
	21:51	52	07:18 (WEA 4)	21:07	37	07:13 (WEA 4)	19:59	34	08:34 (WEA 3)	18:48			16:45	16:13
10	05:15		06:26 (WEA 4)	06:00		06:36 (WEA 4)	06:52		08:00 (WEA 3)	07:43			07:39	08:27
	21:50	53	07:19 (WEA 4)	21:05	35	07:11 (WEA 4)	19:57	34	08:34 (WEA 3)	18:46			16:43	16:13
11	05:16		06:26 (WEA 4)	06:01		06:38 (WEA 4)	06:53		08:00 (WEA 3)	07:45			07:41	08:28
	21:49	53	07:19 (WEA 4)	21:03	32	07:10 (WEA 4)	19:55	32	08:32 (WEA 3)	18:44			16:41	16:12
12	05:17		06:26 (WEA 4)	06:03		06:39 (WEA 4)	06:55		08:00 (WEA 3)	07:46			07:43	08:29
	21:48	53	07:19 (WEA 4)	21:01	28	07:07 (WEA 4)	19:52	32	08:32 (WEA 3)	18:41			16:40	16:12
13	05:18		06:26 (WEA 4)	06:05		06:42 (WEA 4)	06:57		08:01 (WEA 3)	07:48		08:58 (WEA 1)	07:45	08:30
	21:47	54	07:20 (WEA 4)	20:59	23	07:05 (WEA 4)	19:50	30	08:31 (WEA 3)	18:39	9	09:07 (WEA 1)	16:38	16:12
14	05:19		06:27 (WEA 4)	06:06		06:44 (WEA 4)	06:58		08:01 (WEA 3)	07:50		08:55 (WEA 1)	07:47	08:31
	21:46	54	07:21 (WEA 4)	20:57	17	07:01 (WEA 4)	19:47	28	08:29 (WEA 3)	18:37	14	09:09 (WEA 1)	16:37	16:12
15	05:21		06:27 (WEA 4)	06:08		06:51 (WEA 4)	07:00		08:02 (WEA 3)	07:52		08:53 (WEA 1)	07:49	08:32
	21:45	54	07:21 (WEA 4)	20:55	4	06:55 (WEA 4)	19:45	26	08:28 (WEA 3)	18:35	18	09:11 (WEA 1)	16:35	16:12
16	05:22		06:27 (WEA 4)	06:10			07:02		08:02 (WEA 3)	07:53		08:52 (WEA 1)	07:50	08:33
	21:44	54	07:21 (WEA 4)	20:53			19:43	24	08:26 (WEA 3)	18:32	20	09:12 (WEA 1)	16:34	16:12
17	05:23		06:27 (WEA 4)	06:11			07:03		08:04 (WEA 3)	07:55		08:51 (WEA 1)	07:52	08:34
	21:43	54	07:21 (WEA 4)	20:51			19:40	20	08:24 (WEA 3)	18:30	22	09:13 (WEA 1)	16:32	16:13
18	05:24		06:27 (WEA 4)	06:13			07:05		08:07 (WEA 3)	07:57		08:51 (WEA 1)	07:54	08:35
	21:42	54	07:21 (WEA 4)	20:49			19:38	14	08:21 (WEA 3)	18:28	22	09:13 (WEA 1)	16:31	16:13
19	05:26		06:27 (WEA 4)	06:15			07:07			07:59		08:50 (WEA 1)	07:56	08:35
	21:41	55	07:22 (WEA 4)	20:47			19:35			18:26	24	09:14 (WEA 1)	16:29	16:13
20	05:27		06:27 (WEA 4)	06:16			07:08		08:35 (WEA 2)	08:01		08:50 (WEA 1)	07:57	08:36
	21:40	55	07:22 (WEA 4)	20:45			19:33	2	08:37 (WEA 2)	18:24	24	09:14 (WEA 1)	16:28	16:13
21	05:29		06:27 (WEA 4)	06:18			07:10		08:29 (WEA 2)	08:02		08:49 (WEA 1)	07:59	08:37
	21:38	55	07:22 (WEA 4)	20:43			19:31	13	08:42 (WEA 2)	18:21	24	09:13 (WEA 1)	16:27	16:14
22	05:30		06:27 (WEA 4)	06:20			07:12		08:26 (WEA 2)	08:04		08:49 (WEA 1)	08:01	08:37
	21:37	54	07:21 (WEA 4)	20:41			19:28	18	08:44 (WEA 2)	18:19	23	09:12 (WEA 1)	16:26	16:14
23	05:31		06:28 (WEA 4)	06:21			07:14		08:24 (WEA 2)	08:06		08:49 (WEA 1)	08:03	08:38
	21:36	54	07:22 (WEA 4)	20:38			19:26	22	08:46 (WEA 2)	18:17	23	09:12 (WEA 1)	16:25	16:15
24	05:33		06:27 (WEA 4)	06:23			07:15		08:23 (WEA 2)	08:08		08:50 (WEA 1)	08:04	08:38
	21:34	55	07:22 (WEA 4)	20:36			19:24	24	08:47 (WEA 2)	18:15	21	09:11 (WEA 1)	16:23	16:15
25	05:34		06:27 (WEA 4)	06:25			07:17		08:21 (WEA 2)	07:10		07:50 (WEA 1)	08:06	08:39
	21:33	54	07:21 (WEA 4)	20:34			19:21	26	08:47 (WEA 2)	17:13	20	08:10 (WEA 1)	16:22	16:16
26	05:36		06:28 (WEA 4)	06:26			07:19		08:20 (WEA 2)	07:12		07:52 (WEA 1)	08:08	08:39
	21:31	54	07:22 (WEA 4)	20:32			19:19	27	08:47 (WEA 2)	17:11	17	08:09 (WEA 1)	16:21	16:17
27	05:37		06:28 (WEA 4)	06:28			07:20		08:19 (WEA 2)	07:13		07:53 (WEA 1)	08:09	08:39
	21:30	53	07:21 (WEA 4)	20:29			19:16	29	08:48 (WEA 2)	17:09	15	08:08 (WEA 1)	16:20	16:17
28	05:39		06:29 (WEA 4)	06:30		08:17 (WEA 3)	07:22		08:19 (WEA 2)	07:15		07:55 (WEA 1)	08:11	08:39
	21:28	53	07:22 (WEA 4)	20:27	7	08:24 (WEA 3)	19:14	29	08:48 (WEA 2)	17:07	10	08:05 (WEA 1)	16:19	16:18
29	05:40		06:28 (WEA 4)	06:31		08:12 (WEA 3)	07:24		08:18 (WEA 2)	07:17			08:12	08:40
	21:27	53	07:21 (WEA 4)	20:25	16	08:28 (WEA 3)	19:12	29	08:47 (WEA 2)	17:05			16:19	16:19
30	05:42		06:28 (WEA 4)	06:33		08:10 (WEA 3)	07:25		08:18 (WEA 2)	07:19			08:14	08:40
	21:25	52	07:20 (WEA 4)	20:23	20	08:30 (WEA 3)	19:09	29	08:47 (WEA 2)	17:03			16:18	16:20
31	05:43		06:29 (WEA 4)	06:35		08:07 (WEA 3)				07:21				08:40
	21:24	51	07:20 (WEA 4)	20:20	24	08:31 (WEA 3)				17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		1639			609			771			492			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-30 - SR-30, Westmark 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar			März			April			Mai			Juni		
1	08:40		08:11			07:16			07:04		08:16 (WEA 3)	05:57		06:32 (WEA 4)	05:11		06:22 (WEA 4)
	16:22		17:12			18:05			20:01	35	08:51 (WEA 3)	20:53	35	07:07 (WEA 4)	21:41	56	07:18 (WEA 4)
2	08:39		08:10			07:14		08:00 (WEA 2)	07:02		08:16 (WEA 3)	05:55		06:30 (WEA 4)	05:10		06:22 (WEA 4)
	16:23		17:13			18:07	5	08:05 (WEA 2)	20:02	35	08:51 (WEA 3)	20:55	38	07:08 (WEA 4)	21:42	56	07:18 (WEA 4)
3	08:39		08:08			07:12		07:56 (WEA 2)	06:59		08:15 (WEA 3)	05:54		06:30 (WEA 4)	05:09		06:22 (WEA 4)
	16:25		17:15			18:09	14	08:10 (WEA 2)	20:04	35	08:50 (WEA 3)	20:57	40	07:10 (WEA 4)	21:43	55	07:17 (WEA 4)
4	08:39		08:06			07:10		07:53 (WEA 2)	06:57		08:15 (WEA 3)	05:52		06:28 (WEA 4)	05:08		06:23 (WEA 4)
	16:26		17:17			18:10	18	08:11 (WEA 2)	20:06	35	08:50 (WEA 3)	20:58	43	07:11 (WEA 4)	21:44	55	07:18 (WEA 4)
5	08:39		08:05			07:07		07:51 (WEA 2)	06:55		08:16 (WEA 3)	05:50		06:27 (WEA 4)	05:07		06:23 (WEA 4)
	16:27		17:19			18:12	22	08:13 (WEA 2)	20:08	33	08:49 (WEA 3)	21:00	45	07:12 (WEA 4)	21:45	55	07:18 (WEA 4)
6	08:38		08:03			07:05		07:50 (WEA 2)	06:52		08:15 (WEA 3)	05:48		06:25 (WEA 4)	05:07		06:23 (WEA 4)
	16:28		17:21			18:14	25	08:15 (WEA 2)	20:09	32	08:47 (WEA 3)	21:02	47	07:12 (WEA 4)	21:46	55	07:18 (WEA 4)
7	08:38		08:01			07:03		07:48 (WEA 2)	06:50		08:16 (WEA 3)	05:46		06:25 (WEA 4)	05:06		06:23 (WEA 4)
	16:30		17:23			18:16	27	08:15 (WEA 2)	20:11	30	08:46 (WEA 3)	21:04	49	07:14 (WEA 4)	21:47	55	07:18 (WEA 4)
8	08:38		07:59			07:01		07:47 (WEA 2)	06:48		08:17 (WEA 3)	05:44		06:24 (WEA 4)	05:05		06:24 (WEA 4)
	16:31		17:25			18:18	29	08:16 (WEA 2)	20:13	28	08:45 (WEA 3)	21:05	50	07:14 (WEA 4)	21:48	54	07:18 (WEA 4)
9	08:37		07:58			06:58		07:47 (WEA 2)	06:45		08:17 (WEA 3)	05:42		06:23 (WEA 4)	05:05		06:24 (WEA 4)
	16:32		17:27			18:20	29	08:16 (WEA 2)	20:15	26	08:43 (WEA 3)	21:07	51	07:14 (WEA 4)	21:49	54	07:18 (WEA 4)
10	08:36		07:56			06:56		07:46 (WEA 2)	06:43		08:18 (WEA 3)	05:41		06:23 (WEA 4)	05:04		06:24 (WEA 4)
	16:34		17:29			18:21	30	08:16 (WEA 2)	20:16	23	08:41 (WEA 3)	21:09	53	07:16 (WEA 4)	21:50	54	07:18 (WEA 4)
11	08:36		07:54		08:32 (WEA 1)	06:54		07:46 (WEA 2)	06:41		08:20 (WEA 3)	05:39		06:22 (WEA 4)	05:04		06:25 (WEA 4)
	16:35		17:31	10	08:42 (WEA 1)	18:23	30	08:16 (WEA 2)	20:18	19	08:39 (WEA 3)	21:10	54	07:16 (WEA 4)	21:50	53	07:18 (WEA 4)
12	08:35		07:52		08:30 (WEA 1)	06:51		07:46 (WEA 2)	06:38		08:23 (WEA 3)	05:37		06:21 (WEA 4)	05:04		06:25 (WEA 4)
	16:37		17:33	15	08:45 (WEA 1)	18:25	30	08:16 (WEA 2)	20:20	13	08:36 (WEA 3)	21:12	55	07:16 (WEA 4)	21:51	53	07:18 (WEA 4)
13	08:34		07:50		08:28 (WEA 1)	06:49		07:45 (WEA 2)	06:36			05:35		06:21 (WEA 4)	05:03		06:25 (WEA 4)
	16:38		17:35	18	08:46 (WEA 1)	18:27	30	08:15 (WEA 2)	20:22			21:14	55	07:16 (WEA 4)	21:52	53	07:18 (WEA 4)
14	08:34		07:48		08:27 (WEA 1)	06:47		07:45 (WEA 2)	06:34			05:34		06:21 (WEA 4)	05:03		06:26 (WEA 4)
	16:40		17:36	20	08:47 (WEA 1)	18:29	30	08:15 (WEA 2)	20:23			21:15	55	07:16 (WEA 4)	21:52	52	07:18 (WEA 4)
15	08:33		07:46		08:27 (WEA 1)	06:44		07:45 (WEA 2)	06:32			05:32		06:21 (WEA 4)	05:03		06:26 (WEA 4)
	16:41		17:38	21	08:48 (WEA 1)	18:30	28	08:13 (WEA 2)	20:25			21:17	56	07:17 (WEA 4)	21:53	52	07:18 (WEA 4)
16	08:32		07:44		08:26 (WEA 1)	06:42		07:46 (WEA 2)	06:29			05:31		06:20 (WEA 4)	05:03		06:26 (WEA 4)
	16:43		17:40	23	08:49 (WEA 1)	18:32	27	08:13 (WEA 2)	20:27			21:18	57	07:17 (WEA 4)	21:54	53	07:19 (WEA 4)
17	08:31		07:42		08:26 (WEA 1)	06:40		07:47 (WEA 2)	06:27			05:29		06:20 (WEA 4)	05:03		06:27 (WEA 4)
	16:45		17:42	24	08:50 (WEA 1)	18:34	25	08:12 (WEA 2)	20:29			21:20	57	07:17 (WEA 4)	21:54	52	07:19 (WEA 4)
18	08:30		07:40		08:26 (WEA 1)	06:37		07:47 (WEA 2)	06:25			05:27		06:20 (WEA 4)	05:03		06:27 (WEA 4)
	16:46		17:44	24	08:50 (WEA 1)	18:36	22	08:09 (WEA 2)	20:31			21:21	58	07:18 (WEA 4)	21:54	52	07:19 (WEA 4)
19	08:29		07:38		08:26 (WEA 1)	06:35		07:49 (WEA 2)	06:23			05:26		06:20 (WEA 4)	05:03		06:27 (WEA 4)
	16:48		17:46	24	08:50 (WEA 1)	18:38	19	08:08 (WEA 2)	20:32			21:23	57	07:17 (WEA 4)	21:55	52	07:19 (WEA 4)
20	08:28		07:36		08:25 (WEA 1)	06:32		07:50 (WEA 2)	06:21			05:25		06:20 (WEA 4)	05:03		06:27 (WEA 4)
	16:50		17:48	24	08:49 (WEA 1)	18:39	14	08:04 (WEA 2)	20:34			21:25	58	07:18 (WEA 4)	21:55	52	07:19 (WEA 4)
21	08:27		07:34		08:25 (WEA 1)	06:30		07:55 (WEA 2)	06:18			05:23		06:20 (WEA 4)	05:03		06:27 (WEA 4)
	16:51		17:50	24	08:49 (WEA 1)	18:41	5	08:00 (WEA 2)	20:36			21:26	58	07:18 (WEA 4)	21:55	52	07:19 (WEA 4)
22	08:26		07:32		08:26 (WEA 1)	06:28		07:30 (WEA 3)	06:16			05:22		06:20 (WEA 4)	05:03		06:28 (WEA 4)
	16:53		17:52	22	08:48 (WEA 1)	18:43	14	07:44 (WEA 3)	20:38			21:27	58	07:18 (WEA 4)	21:56	52	07:20 (WEA 4)
23	08:24		07:30		08:27 (WEA 1)	06:25		07:26 (WEA 3)	06:14			05:20		06:21 (WEA 4)	05:03		06:28 (WEA 4)
	16:55		17:54	21	08:48 (WEA 1)	18:45	20	07:46 (WEA 3)	20:39			21:29	57	07:18 (WEA 4)	21:56	52	07:20 (WEA 4)
24	08:23		07:27		08:28 (WEA 1)	06:23		07:24 (WEA 3)	06:12			05:19		06:20 (WEA 4)	05:04		06:28 (WEA 4)
	16:57		17:55	19	08:47 (WEA 1)	18:46	24	07:48 (WEA 3)	20:41			21:30	58	07:18 (WEA 4)	21:56	52	07:20 (WEA 4)
25	08:22		07:25		08:28 (WEA 1)	06:21		07:23 (WEA 3)	06:10			05:18		06:20 (WEA 4)	05:04		06:29 (WEA 4)
	16:59		17:57	16	08:44 (WEA 1)	18:48	27	07:50 (WEA 3)	20:43			21:32	58	07:18 (WEA 4)	21:56	52	07:21 (WEA 4)
26	08:20		07:23		08:31 (WEA 1)	06:18		07:21 (WEA 3)	06:08			05:17		06:20 (WEA 4)	05:04		06:28 (WEA 4)
	17:00		17:59	11	08:42 (WEA 1)	18:50	29	07:50 (WEA 3)	20:45			21:33	58	07:18 (WEA 4)	21:56	53	07:21 (WEA 4)
27	08:19		07:21			06:16		07:20 (WEA 3)	06:06		06:44 (WEA 4)	05:16		06:20 (WEA 4)	05:05		06:28 (WEA 4)
	17:02		18:01			18:52	31	07:51 (WEA 3)	20:46	13	06:57 (WEA 4)	21:34	58	07:18 (WEA 4)	21:56	52	07:20 (WEA 4)
28	08:18		07:19			06:13		07:18 (WEA 3)	06:04		06:40 (WEA 4)	05:15		06:20 (WEA 4)	05:05		06:29 (WEA 4)
	17:04		18:03			18:54	33	07:51 (WEA 3)	20:48	21	07:01 (WEA 4)	21:36	58	07:18 (WEA 4)	21:56	52	07:21 (WEA 4)
29	08:16					07:11		08:18 (WEA 3)	06:01		06:37 (WEA 4)	05:13		06:21 (WEA 4)	05:06		06:29 (WEA 4)
	17:06					19:55	33	08:51 (WEA 3)	20:50	26	07:03 (WEA 4)	21:37	57	07:18 (WEA 4)	21:56	53	07:22 (WEA 4)
30	08:15					07:09		08:17 (WEA 3)	05:59		06:34 (WEA 4)	05:12		06:22 (WEA 4)	05:06		06:29 (WEA 4)
	17:08					19:57	35	08:52 (WEA 3)	20:52	31	07:05 (WEA 4)	21:38	56	07:18 (WEA 4)	21:55	53	07:22 (WEA 4)
31	08:13					07:06		08:16 (WEA 3)				05:11		06:22 (WEA 4)			
	17:10					19:59	35	08:51 (WEA 3)				21:40	56	07:18 (WEA 4)			
Sonnenscheinstunden	255		276			367			418			489			503		
astr.max.mögl.Beschattung				316			740			435			1645			1596	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-30 - SR-30, Westmark 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:29 (WEA 4)	05:45		06:32 (WEA 4)	06:36		08:19 (WEA 3)	07:27		08:25 (WEA 2)	07:23	08:15
	21:55	53	07:22 (WEA 4)	21:22	54	07:26 (WEA 4)	20:18	19	08:38 (WEA 3)	19:07	30	08:55 (WEA 2)	16:59	16:17
2	05:08		06:29 (WEA 4)	05:47		06:33 (WEA 4)	06:38		08:17 (WEA 3)	07:29		08:25 (WEA 2)	07:25	08:17
	21:55	53	07:22 (WEA 4)	21:20	53	07:26 (WEA 4)	20:16	23	08:40 (WEA 3)	19:05	30	08:55 (WEA 2)	16:57	16:16
3	05:09		06:29 (WEA 4)	05:48		06:33 (WEA 4)	06:40		08:15 (WEA 3)	07:31		08:24 (WEA 2)	07:26	08:18
	21:54	54	07:23 (WEA 4)	21:18	52	07:25 (WEA 4)	20:13	26	08:41 (WEA 3)	19:02	30	08:54 (WEA 2)	16:55	16:16
4	05:09		06:29 (WEA 4)	05:50		06:34 (WEA 4)	06:42		08:14 (WEA 3)	07:32		08:24 (WEA 2)	07:28	08:20
	21:54	54	07:23 (WEA 4)	21:17	51	07:25 (WEA 4)	20:11	28	08:42 (WEA 3)	19:00	29	08:53 (WEA 2)	16:53	16:15
5	05:10		06:30 (WEA 4)	05:51		06:34 (WEA 4)	06:43		08:13 (WEA 3)	07:34		08:24 (WEA 2)	07:30	08:21
	21:53	54	07:24 (WEA 4)	21:15	49	07:23 (WEA 4)	20:09	30	08:43 (WEA 3)	18:57	29	08:53 (WEA 2)	16:52	16:15
6	05:11		06:30 (WEA 4)	05:53		06:35 (WEA 4)	06:45		08:11 (WEA 3)	07:36		08:25 (WEA 2)	07:32	08:22
	21:53	54	07:24 (WEA 4)	21:13	48	07:23 (WEA 4)	20:06	32	08:43 (WEA 3)	18:55	27	08:52 (WEA 2)	16:50	16:14
7	05:12		06:29 (WEA 4)	05:55		06:35 (WEA 4)	06:47		08:11 (WEA 3)	07:38		08:24 (WEA 2)	07:34	08:24
	21:52	55	07:24 (WEA 4)	21:11	47	07:22 (WEA 4)	20:04	33	08:44 (WEA 3)	18:53	26	08:50 (WEA 2)	16:48	16:14
8	05:13		06:29 (WEA 4)	05:56		06:37 (WEA 4)	06:48		08:09 (WEA 3)	07:39		08:25 (WEA 2)	07:36	08:25
	21:52	55	07:24 (WEA 4)	21:09	44	07:21 (WEA 4)	20:02	35	08:44 (WEA 3)	18:50	24	08:49 (WEA 2)	16:46	16:13
9	05:14		06:29 (WEA 4)	05:58		06:38 (WEA 4)	06:50		08:09 (WEA 3)	07:41		08:27 (WEA 2)	07:38	08:26
	21:51	56	07:25 (WEA 4)	21:07	42	07:20 (WEA 4)	19:59	35	08:44 (WEA 3)	18:48	21	08:48 (WEA 2)	16:45	16:13
10	05:15		06:29 (WEA 4)	06:00		06:38 (WEA 4)	06:52		08:09 (WEA 3)	07:43		08:29 (WEA 2)	07:39	08:27
	21:50	56	07:25 (WEA 4)	21:05	40	07:18 (WEA 4)	19:57	35	08:44 (WEA 3)	18:46	17	08:46 (WEA 2)	16:43	16:13
11	05:16		06:29 (WEA 4)	06:01		06:40 (WEA 4)	06:53		08:08 (WEA 3)	07:45		08:31 (WEA 2)	07:41	08:28
	21:49	56	07:25 (WEA 4)	21:03	37	07:17 (WEA 4)	19:55	35	08:43 (WEA 3)	18:44	12	08:43 (WEA 2)	16:41	16:12
12	05:17		06:29 (WEA 4)	06:03		06:41 (WEA 4)	06:55		08:08 (WEA 3)	07:46			07:43	08:29
	21:48	57	07:26 (WEA 4)	21:01	34	07:15 (WEA 4)	19:52	35	08:43 (WEA 3)	18:41			16:40	16:12
13	05:18		06:29 (WEA 4)	06:05		06:43 (WEA 4)	06:57		08:08 (WEA 3)	07:48			07:45	08:30
	21:47	57	07:26 (WEA 4)	20:59	30	07:13 (WEA 4)	19:50	35	08:43 (WEA 3)	18:39			16:38	16:12
14	05:19		06:30 (WEA 4)	06:06		06:45 (WEA 4)	06:58		08:08 (WEA 3)	07:50			07:47	08:31
	21:46	57	07:27 (WEA 4)	20:57	25	07:10 (WEA 4)	19:47	34	08:42 (WEA 3)	18:37			16:37	16:12
15	05:21		06:30 (WEA 4)	06:08		06:48 (WEA 4)	07:00		08:08 (WEA 3)	07:52		09:05 (WEA 1)	07:49	08:32
	21:45	57	07:27 (WEA 4)	20:55	19	07:07 (WEA 4)	19:45	33	08:41 (WEA 3)	18:35	7	09:12 (WEA 1)	16:35	16:12
16	05:22		06:30 (WEA 4)	06:10		06:53 (WEA 4)	07:02		08:08 (WEA 3)	07:53		09:02 (WEA 1)	07:50	08:33
	21:44	57	07:27 (WEA 4)	20:53	10	07:03 (WEA 4)	19:43	32	08:40 (WEA 3)	18:32	13	09:15 (WEA 1)	16:34	16:12
17	05:23		06:30 (WEA 4)	06:11			07:03		08:09 (WEA 3)	07:55		09:00 (WEA 1)	07:52	08:34
	21:43	57	07:27 (WEA 4)	20:51			19:40	30	08:39 (WEA 3)	18:30	17	09:17 (WEA 1)	16:32	16:13
18	05:24		06:30 (WEA 4)	06:13			07:05		08:10 (WEA 3)	07:57		08:59 (WEA 1)	07:54	08:35
	21:42	57	07:27 (WEA 4)	20:49			19:38	27	08:37 (WEA 3)	18:28	19	09:18 (WEA 1)	16:31	16:13
19	05:26		06:29 (WEA 4)	06:15			07:07		08:10 (WEA 3)	07:59		08:58 (WEA 1)	07:56	08:35
	21:41	58	07:27 (WEA 4)	20:47			19:35	25	08:35 (WEA 3)	18:26	21	09:19 (WEA 1)	16:29	16:13
20	05:27		06:30 (WEA 4)	06:16			07:08		08:12 (WEA 3)	08:01		08:57 (WEA 1)	07:57	08:36
	21:40	58	07:28 (WEA 4)	20:45			19:33	21	08:33 (WEA 3)	18:24	23	09:20 (WEA 1)	16:28	16:13
21	05:29		06:30 (WEA 4)	06:18			07:10		08:15 (WEA 3)	08:02		08:55 (WEA 1)	07:59	08:37
	21:38	58	07:28 (WEA 4)	20:43			19:31	15	08:30 (WEA 3)	18:21	24	09:19 (WEA 1)	16:27	16:14
22	05:30		06:30 (WEA 4)	06:20			07:12		08:19 (WEA 3)	08:04		08:55 (WEA 1)	08:01	08:37
	21:37	58	07:28 (WEA 4)	20:41			19:28	6	08:25 (WEA 3)	18:19	24	09:19 (WEA 1)	16:26	16:14
23	05:31		06:31 (WEA 4)	06:21			07:14		08:36 (WEA 2)	08:06		08:55 (WEA 1)	08:03	08:38
	21:36	57	07:28 (WEA 4)	20:38			19:26	12	08:48 (WEA 2)	18:17	24	09:19 (WEA 1)	16:25	16:15
24	05:33		06:30 (WEA 4)	06:23			07:15		08:33 (WEA 2)	08:08		08:55 (WEA 1)	08:04	08:38
	21:34	58	07:28 (WEA 4)	20:36			19:24	18	08:51 (WEA 2)	18:15	24	09:19 (WEA 1)	16:23	16:15
25	05:34		06:30 (WEA 4)	06:25			07:17		08:30 (WEA 2)	07:10		07:55 (WEA 1)	08:06	08:39
	21:33	58	07:28 (WEA 4)	20:34			19:21	22	08:52 (WEA 2)	17:13	24	08:19 (WEA 1)	16:22	16:16
26	05:36		06:31 (WEA 4)	06:26			07:19		08:29 (WEA 2)	07:12		07:56 (WEA 1)	08:08	08:39
	21:31	57	07:28 (WEA 4)	20:32			19:19	24	08:53 (WEA 2)	17:11	22	08:18 (WEA 1)	16:21	16:17
27	05:37		06:31 (WEA 4)	06:28			07:20		08:28 (WEA 2)	07:13		07:56 (WEA 1)	08:09	08:39
	21:30	57	07:28 (WEA 4)	20:29			19:16	26	08:54 (WEA 2)	17:09	22	08:18 (WEA 1)	16:20	16:17
28	05:39		06:31 (WEA 4)	06:30			07:22		08:27 (WEA 2)	07:15		07:57 (WEA 1)	08:11	08:39
	21:28	57	07:28 (WEA 4)	20:27			19:14	28	08:55 (WEA 2)	17:07	20	08:17 (WEA 1)	16:19	16:18
29	05:40		06:31 (WEA 4)	06:31			07:24		08:25 (WEA 2)	07:17		07:58 (WEA 1)	08:12	08:40
	21:27	56	07:27 (WEA 4)	20:25			19:12	29	08:54 (WEA 2)	17:05	18	08:16 (WEA 1)	16:19	16:19
30	05:42		06:31 (WEA 4)	06:33			07:25		08:25 (WEA 2)	07:19		08:00 (WEA 1)	08:14	08:40
	21:25	56	07:27 (WEA 4)	20:23			19:09	30	08:55 (WEA 2)	17:03	14	08:14 (WEA 1)	16:18	16:20
31	05:43		06:32 (WEA 4)	06:35		08:22 (WEA 3)				07:21		08:02 (WEA 1)		08:40
	21:24	55	07:27 (WEA 4)	20:20	13	08:35 (WEA 3)				17:01	9	08:11 (WEA 1)		16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		1742			648			813			600			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-31 - SR-31, Försterweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April	Mai	Juni
1	08:40		09:12 (WEA 1)	08:11		07:16	07:52 (WEA 5)	07:04	05:57	05:11
	16:22	7	09:19 (WEA 1)	17:12		18:05	40	08:32 (WEA 5)	20:01	20:53	21:41
2	08:40		09:12 (WEA 1)	08:10	08:37 (WEA 4)	07:14	07:52 (WEA 5)	07:02	05:55	05:10
	16:23	8	09:20 (WEA 1)	17:13	4	08:41 (WEA 4)	18:07	41	08:33 (WEA 5)	20:02	20:55	21:42
3	08:39		09:11 (WEA 1)	08:08	08:35 (WEA 4)	07:12	07:52 (WEA 5)	06:59	05:54	05:09
	16:25	9	09:20 (WEA 1)	17:15	10	08:45 (WEA 4)	18:09	41	08:33 (WEA 5)	20:04	20:57	21:43
4	08:39		09:11 (WEA 1)	08:07	08:33 (WEA 4)	07:10	07:51 (WEA 5)	06:57	05:52	05:08
	16:26	10	09:21 (WEA 1)	17:17	14	08:47 (WEA 4)	18:10	41	08:32 (WEA 5)	20:06	20:58	21:44
5	08:39		09:11 (WEA 1)	08:05	08:31 (WEA 4)	07:07	07:51 (WEA 5)	06:55	05:50	05:07
	16:27	12	09:23 (WEA 1)	17:19	17	08:48 (WEA 4)	18:12	41	08:32 (WEA 5)	20:08	21:00	21:45
6	08:38		09:10 (WEA 1)	08:03	08:29 (WEA 4)	07:05	07:52 (WEA 5)	06:52	05:48	05:07
	16:28	13	09:23 (WEA 1)	17:21	20	08:49 (WEA 4)	18:14	40	08:32 (WEA 5)	20:09	21:02	21:46
7	08:38		09:09 (WEA 1)	08:01	08:27 (WEA 4)	07:03	07:51 (WEA 5)	06:50	05:46	05:06
	16:30	14	09:23 (WEA 1)	17:23	23	08:50 (WEA 4)	18:16	40	08:31 (WEA 5)	20:11	21:04	21:47
8	08:38		09:10 (WEA 1)	07:59	08:25 (WEA 4)	07:01	07:51 (WEA 5)	06:48	05:44	05:05
	16:31	14	09:24 (WEA 1)	17:25	26	08:51 (WEA 4)	18:18	40	08:31 (WEA 5)	20:13	21:05	21:48
9	08:37		09:10 (WEA 1)	07:58	08:23 (WEA 4)	06:58	07:52 (WEA 5)	06:45	05:42	05:05
	16:32	15	09:25 (WEA 1)	17:27	29	08:52 (WEA 4)	18:20	38	08:30 (WEA 5)	20:15	21:07	21:49
10	08:37		09:10 (WEA 1)	07:56	08:23 (WEA 4)	06:56	07:52 (WEA 5)	06:43	05:41	05:04
	16:34	15	09:25 (WEA 1)	17:29	30	08:53 (WEA 4)	18:21	37	08:29 (WEA 5)	20:16	21:09	21:50
11	08:36		09:11 (WEA 1)	07:54	08:22 (WEA 4)	06:54	07:53 (WEA 5)	06:41	05:39	05:04
	16:35	15	09:26 (WEA 1)	17:31	31	08:53 (WEA 4)	18:23	35	08:28 (WEA 5)	20:18	21:10	21:50
12	08:35		09:11 (WEA 1)	07:52	08:22 (WEA 4)	06:51	07:54 (WEA 5)	06:38	05:37	05:04
	16:37	16	09:27 (WEA 1)	17:33	31	08:53 (WEA 4)	18:25	33	08:27 (WEA 5)	20:20	21:12	21:51
13	08:34		09:12 (WEA 1)	07:50	08:22 (WEA 4)	06:49	07:54 (WEA 5)	06:36	05:35	05:03
	16:38	15	09:27 (WEA 1)	17:35	32	08:54 (WEA 4)	18:27	30	08:24 (WEA 5)	20:22	21:14	21:52
14	08:34		09:06 (WEA 2)	07:48	08:22 (WEA 4)	06:47	07:56 (WEA 5)	06:34	05:34	05:03
	16:40	19	09:27 (WEA 1)	17:36	32	08:54 (WEA 4)	18:29	27	08:23 (WEA 5)	20:24	21:15	21:53
15	08:33		09:04 (WEA 2)	07:46	08:22 (WEA 4)	06:44	07:57 (WEA 5)	06:32	05:32	05:03
	16:41	24	09:28 (WEA 1)	17:38	32	08:54 (WEA 4)	18:30	23	08:20 (WEA 5)	20:25	21:17	21:53
16	08:32		09:03 (WEA 2)	07:44	08:22 (WEA 4)	06:42	08:00 (WEA 5)	06:29	05:31	05:03
	16:43	25	09:28 (WEA 1)	17:40	31	08:53 (WEA 4)	18:32	17	08:17 (WEA 5)	20:27	21:18	21:54
17	08:31		09:02 (WEA 2)	07:42	08:23 (WEA 4)	06:40	08:06 (WEA 5)	06:27	05:29	05:03
	16:45	25	09:27 (WEA 1)	17:42	30	08:53 (WEA 4)	18:34	5	08:11 (WEA 5)	20:29	21:20	21:54
18	08:30		09:02 (WEA 2)	07:40	08:23 (WEA 4)	06:37	06:25	05:27	05:03
	16:46	25	09:27 (WEA 1)	17:44	30	08:53 (WEA 4)	18:36	20:31	21:22	21:55
19	08:29		09:02 (WEA 2)	07:38	08:08 (WEA 5)	06:35	06:23	05:26	05:03
	16:48	25	09:27 (WEA 1)	17:46	40	08:52 (WEA 4)	18:38	20:32	21:23	21:55
20	08:28		09:02 (WEA 2)	07:36	08:05 (WEA 5)	06:32	06:21	05:25	05:03
	16:50	24	09:26 (WEA 1)	17:48	45	08:51 (WEA 4)	18:39	20:34	21:25	21:55
21	08:27		09:01 (WEA 2)	07:34	08:01 (WEA 5)	06:30	06:18	05:23	05:03
	16:51	23	09:24 (WEA 1)	17:50	48	08:49 (WEA 4)	18:41	20:36	21:26	21:55
22	08:26		09:02 (WEA 2)	07:32	08:00 (WEA 5)	06:28	06:16	05:22	05:03
	16:53	23	09:25 (WEA 3)	17:52	48	08:48 (WEA 4)	18:43	20:38	21:28	21:56
23	08:24		09:02 (WEA 2)	07:30	07:58 (WEA 5)	06:25	06:14	05:20	05:03
	16:55	24	09:26 (WEA 3)	17:54	48	08:46 (WEA 4)	18:45	20:39	21:29	21:56
24	08:23		09:02 (WEA 2)	07:27	07:57 (WEA 5)	06:23	06:12	05:19	05:04
	16:57	23	09:25 (WEA 3)	17:55	44	08:43 (WEA 4)	18:46	20:41	21:30	21:56
25	08:22		09:03 (WEA 2)	07:25	07:55 (WEA 5)	06:21	06:10	05:18	05:04
	16:59	23	09:26 (WEA 3)	17:57	36	08:31 (WEA 5)	18:48	20:43	21:32	21:56
26	08:20		09:03 (WEA 2)	07:23	07:55 (WEA 5)	06:18	06:08	05:17	05:04
	17:00	23	09:26 (WEA 3)	17:59	36	08:31 (WEA 5)	18:50	20:45	21:33	21:56
27	08:19		09:04 (WEA 2)	07:21	07:54 (WEA 5)	06:16	06:06	05:16	05:05
	17:02	22	09:26 (WEA 3)	18:01	38	08:32 (WEA 5)	18:52	20:46	21:35	21:56
28	08:18		09:04 (WEA 2)	07:19	07:54 (WEA 5)	06:13	06:04	05:14	05:05
	17:04	22	09:26 (WEA 3)	18:03	39	08:33 (WEA 5)	18:54	20:48	21:36	21:56
29	08:16		09:05 (WEA 2)		07:11	06:01	05:13	05:06
	17:06	20	09:25 (WEA 3)		19:55	20:50	21:37	21:56
30	08:15		09:07 (WEA 2)		07:09	05:59	05:12	05:06
	17:08	17	09:24 (WEA 3)		19:57	20:52	21:38	21:55
31	08:13		09:09 (WEA 2)		07:06		05:11	
	17:10	14	09:23 (WEA 3)		19:59		21:40	
Sonnenscheinstunden	255		276		367	418	489	503
astr.max.mögl.Beschattung		564		844		569		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-31 - SR-31, Försterweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September			Oktober			November			Dezember		
1	05:07	05:45	06:36			07:27		08:33 (WEA 5)	07:23		07:52 (WEA 4)	08:15		08:53 (WEA 1)
	21:55	21:22	20:18			19:07	32	09:05 (WEA 5)	16:59	30	08:22 (WEA 4)	16:17	16	09:09 (WEA 1)
2	05:08	05:47	06:38			07:29		08:32 (WEA 5)	07:25		07:53 (WEA 4)	08:17		08:53 (WEA 1)
	21:55	21:20	20:16			19:05	34	09:06 (WEA 5)	16:57	29	08:22 (WEA 4)	16:16	15	09:08 (WEA 1)
3	05:09	05:48	06:40			07:31		08:30 (WEA 5)	07:26		07:55 (WEA 4)	08:18		08:54 (WEA 1)
	21:54	21:18	20:13			19:02	36	09:06 (WEA 5)	16:55	26	08:21 (WEA 4)	16:16	15	09:09 (WEA 1)
4	05:09	05:50	06:42			07:32		08:29 (WEA 5)	07:28		07:57 (WEA 4)	08:20		08:54 (WEA 1)
	21:54	21:17	20:11			19:00	38	09:07 (WEA 5)	16:53	23	08:20 (WEA 4)	16:15	15	09:09 (WEA 1)
5	05:10	05:51	06:43			07:34		08:29 (WEA 5)	07:30		07:59 (WEA 4)	08:21		08:56 (WEA 1)
	21:53	21:15	20:09			18:57	38	09:07 (WEA 5)	16:52	20	08:19 (WEA 4)	16:15	13	09:09 (WEA 1)
6	05:11	05:53	06:45			07:36		08:28 (WEA 5)	07:32		08:01 (WEA 4)	08:22		08:56 (WEA 1)
	21:53	21:13	20:06			18:55	40	09:08 (WEA 5)	16:50	17	08:18 (WEA 4)	16:14	13	09:09 (WEA 1)
7	05:12	05:55	06:47			07:38		08:27 (WEA 5)	07:34		08:03 (WEA 4)	08:24		08:57 (WEA 1)
	21:52	21:11	20:04			18:53	40	09:07 (WEA 5)	16:48	13	08:16 (WEA 4)	16:14	12	09:09 (WEA 1)
8	05:13	05:56	06:48			07:39		08:26 (WEA 5)	07:36		08:05 (WEA 4)	08:25		08:59 (WEA 1)
	21:52	21:09	20:02			18:50	41	09:07 (WEA 5)	16:46	9	08:14 (WEA 4)	16:13	10	09:09 (WEA 1)
9	05:14	05:58	06:50			07:41		08:26 (WEA 5)	07:38		08:07 (WEA 4)	08:26		09:00 (WEA 1)
	21:51	21:07	19:59			18:48	41	09:07 (WEA 5)	16:45	4	08:11 (WEA 4)	16:13	9	09:09 (WEA 1)
10	05:15	06:00	06:52			07:43		08:26 (WEA 5)	07:39			08:27		09:01 (WEA 1)
	21:50	21:05	19:57			18:46	41	09:07 (WEA 5)	16:43			16:13	8	09:09 (WEA 1)
11	05:16	06:01	06:53			07:45		08:26 (WEA 5)	07:41		08:39 (WEA 2)	08:28		09:02 (WEA 1)
	21:49	21:03	19:55			18:44	41	09:07 (WEA 5)	16:41	15	08:54 (WEA 3)	16:12	7	09:09 (WEA 1)
12	05:17	06:03	06:55			07:46		08:26 (WEA 5)	07:43		08:38 (WEA 2)	08:29		09:03 (WEA 1)
	21:48	21:02	19:52			18:41	41	09:07 (WEA 5)	16:40	17	08:55 (WEA 3)	16:12	6	09:09 (WEA 1)
13	05:18	06:05	06:57			07:48		08:26 (WEA 5)	07:45		08:37 (WEA 2)	08:30		09:04 (WEA 1)
	21:47	21:00	19:50			18:39	39	09:05 (WEA 5)	16:38	20	08:57 (WEA 3)	16:12	4	09:08 (WEA 1)
14	05:19	06:06	06:58			07:50		08:26 (WEA 5)	07:47		08:36 (WEA 2)	08:31		09:05 (WEA 1)
	21:47	20:57	19:47			18:37	39	09:05 (WEA 5)	16:37	21	08:57 (WEA 3)	16:12	3	09:08 (WEA 1)
15	05:21	06:08	07:00			07:52		08:26 (WEA 5)	07:49		08:36 (WEA 2)	08:32		09:06 (WEA 1)
	21:46	20:55	19:45			18:35	38	09:04 (WEA 5)	16:35	22	08:58 (WEA 3)	16:12	2	09:08 (WEA 1)
16	05:22	06:10	07:02			07:54		08:27 (WEA 5)	07:50		08:36 (WEA 2)	08:33		09:07 (WEA 1)
	21:44	20:53	19:43			18:32	36	09:03 (WEA 5)	16:34	23	08:59 (WEA 3)	16:12	1	09:08 (WEA 1)
17	05:23	06:11	07:03			07:55		08:28 (WEA 5)	07:52		08:36 (WEA 2)	08:34		
	21:43	20:51	19:40			18:30	34	09:02 (WEA 5)	16:32	23	08:59 (WEA 3)	16:13		
18	05:24	06:13	07:05			07:57		08:29 (WEA 5)	07:54		08:36 (WEA 2)	08:35		
	21:42	20:49	19:38			18:28	45	09:15 (WEA 4)	16:31	23	08:59 (WEA 3)	16:13		
19	05:26	06:15	07:07			07:59		08:30 (WEA 5)	07:56		08:36 (WEA 2)	08:36		
	21:41	20:47	19:36			18:26	48	09:18 (WEA 4)	16:29	24	09:00 (WEA 3)	16:13		
20	05:27	06:16	07:08			08:01		08:32 (WEA 5)	07:57		08:37 (WEA 2)	08:36		
	21:40	20:45	19:33			18:24	48	09:20 (WEA 4)	16:28	23	09:00 (WEA 3)	16:13		
21	05:28	06:18	07:10			08:03		08:33 (WEA 5)	07:59		08:37 (WEA 2)	08:37		
	21:38	20:43	19:31			18:21	48	09:21 (WEA 4)	16:27	23	09:00 (WEA 1)	16:14		
22	05:30	06:20	07:12			08:04		08:35 (WEA 5)	08:01		08:38 (WEA 2)	08:37		
	21:37	20:41	19:28			18:19	44	09:21 (WEA 4)	16:26	24	09:02 (WEA 1)	16:14		
23	05:31	06:21	07:14			08:06		08:39 (WEA 5)	08:03		08:39 (WEA 2)	08:38		
	21:36	20:38	19:26			18:17	38	09:22 (WEA 4)	16:25	25	09:04 (WEA 1)	16:15		
24	05:33	06:23	07:15			08:08		08:53 (WEA 4)	08:04		08:40 (WEA 2)	08:38		
	21:34	20:36	19:24			18:15	29	09:22 (WEA 4)	16:23	25	09:05 (WEA 1)	16:15		
25	05:34	06:25	07:17			07:10		07:52 (WEA 4)	08:06		08:40 (WEA 2)	08:39		
	21:33	20:34	19:21			17:13	31	08:23 (WEA 4)	16:22	25	09:05 (WEA 1)	16:16		
26	05:36	06:26	07:19			07:12		07:52 (WEA 4)	08:08		08:41 (WEA 2)	08:39		
	21:32	20:32	19:19			17:11	31	08:23 (WEA 4)	16:21	25	09:06 (WEA 1)	16:17		
27	05:37	06:28	07:20		08:43 (WEA 5)	07:14		07:52 (WEA 4)	08:09		08:43 (WEA 2)	08:39		
	21:30	20:29	19:16	14	08:57 (WEA 5)	17:09	31	08:23 (WEA 4)	16:20	24	09:07 (WEA 1)	16:17		
28	05:39	06:30	07:22		08:40 (WEA 5)	07:15		07:51 (WEA 4)	08:11		08:46 (WEA 2)	08:39		09:13 (WEA 1)
	21:28	20:27	19:14	21	09:01 (WEA 5)	17:07	32	08:23 (WEA 4)	16:19	19	09:07 (WEA 1)	16:18	2	09:15 (WEA 1)
29	05:40	06:31	07:24		08:37 (WEA 5)	07:17		07:51 (WEA 4)	08:12		08:52 (WEA 1)	08:40		09:13 (WEA 1)
	21:27	20:25	19:12	25	09:02 (WEA 5)	17:05	32	08:23 (WEA 4)	16:19	15	09:07 (WEA 1)	16:19	3	09:16 (WEA 1)
30	05:42	06:33	07:25		08:35 (WEA 5)	07:19		07:52 (WEA 4)	08:14		08:53 (WEA 1)	08:40		09:12 (WEA 1)
	21:25	20:23	19:09	29	09:04 (WEA 5)	17:03	31	08:23 (WEA 4)	16:18	15	09:08 (WEA 1)	16:20	4	09:16 (WEA 1)
31	05:43	06:35				07:21		07:52 (WEA 4)				08:40		09:12 (WEA 1)
	21:24	20:20				17:01	31	08:23 (WEA 4)				16:21	5	09:17 (WEA 1)
Sonnenscheinstunden	506	456	381			330			263			240		
astr.max.mögl.Beschattung				89			1168			602			163	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-32 - SR-32, Försterweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April	Mai	Juni
1	08:40		09:12 (WEA 1)	08:11	08:38 (WEA 4)	07:16	08:04 (WEA 5)	07:04	05:57	05:11
	16:22	7	09:19 (WEA 1)	17:12	12	08:50 (WEA 4)	18:05	34	08:38 (WEA 5)	20:01	20:53	21:41
2	08:40		09:12 (WEA 1)	08:10	08:37 (WEA 4)	07:14	08:05 (WEA 5)	07:02	05:55	05:10
	16:23	8	09:20 (WEA 1)	17:13	15	08:52 (WEA 4)	18:07	33	08:38 (WEA 5)	20:02	20:55	21:42
3	08:39		09:11 (WEA 1)	08:08	08:35 (WEA 4)	07:12	08:06 (WEA 5)	06:59	05:54	05:09
	16:25	9	09:20 (WEA 1)	17:15	18	08:53 (WEA 4)	18:09	31	08:37 (WEA 5)	20:04	20:57	21:43
4	08:39		09:11 (WEA 1)	08:07	08:33 (WEA 4)	07:10	08:06 (WEA 5)	06:57	05:52	05:08
	16:26	10	09:21 (WEA 1)	17:17	21	08:54 (WEA 4)	18:10	29	08:35 (WEA 5)	20:06	20:58	21:44
5	08:39		09:11 (WEA 1)	08:05	08:31 (WEA 4)	07:07	08:07 (WEA 5)	06:55	05:50	05:07
	16:27	11	09:22 (WEA 1)	17:19	24	08:55 (WEA 4)	18:12	27	08:34 (WEA 5)	20:08	21:00	21:45
6	08:39		09:10 (WEA 1)	08:03	08:29 (WEA 4)	07:05	08:09 (WEA 5)	06:52	05:48	05:07
	16:28	13	09:23 (WEA 1)	17:21	26	08:55 (WEA 4)	18:14	23	08:32 (WEA 5)	20:09	21:02	21:46
7	08:38		09:09 (WEA 1)	08:01	08:28 (WEA 4)	07:03	08:10 (WEA 5)	06:50	05:46	05:06
	16:30	14	09:23 (WEA 1)	17:23	28	08:56 (WEA 4)	18:16	19	08:29 (WEA 5)	20:11	21:04	21:47
8	08:38		09:10 (WEA 1)	08:00	08:28 (WEA 4)	07:01	08:14 (WEA 5)	06:48	05:44	05:05
	16:31	14	09:24 (WEA 1)	17:25	28	08:56 (WEA 4)	18:18	12	08:26 (WEA 5)	20:13	21:05	21:48
9	08:37		09:10 (WEA 1)	07:58	08:28 (WEA 4)	06:58	06:45	05:42	05:05
	16:32	14	09:24 (WEA 1)	17:27	28	08:56 (WEA 4)	18:20	20:15	21:07	21:49
10	08:37		09:10 (WEA 1)	07:56	08:28 (WEA 4)	06:56	06:43	05:41	05:04
	16:34	15	09:25 (WEA 1)	17:29	28	08:56 (WEA 4)	18:21	20:16	21:09	21:50
11	08:36		09:12 (WEA 1)	07:54	08:28 (WEA 4)	06:54	06:41	05:39	05:04
	16:35	14	09:26 (WEA 1)	17:31	28	08:56 (WEA 4)	18:23	20:18	21:10	21:50
12	08:35		09:07 (WEA 2)	07:52	08:28 (WEA 4)	06:51	06:38	05:37	05:04
	16:37	16	09:26 (WEA 1)	17:33	28	08:56 (WEA 4)	18:25	20:20	21:12	21:51
13	08:34		09:05 (WEA 2)	07:50	08:18 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	21	09:26 (WEA 1)	17:35	36	08:56 (WEA 4)	18:27	20:22	21:14	21:52
14	08:34		09:04 (WEA 2)	07:48	08:14 (WEA 5)	06:47	06:34	05:34	05:03
	16:40	22	09:26 (WEA 1)	17:36	41	08:55 (WEA 4)	18:29	20:24	21:15	21:53
15	08:33		09:03 (WEA 2)	07:46	08:12 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	23	09:26 (WEA 1)	17:38	43	08:55 (WEA 4)	18:30	20:25	21:17	21:53
16	08:32		09:03 (WEA 2)	07:44	08:11 (WEA 5)	06:42	06:29	05:31	05:03
	16:43	23	09:26 (WEA 1)	17:40	43	08:54 (WEA 4)	18:32	20:27	21:18	21:54
17	08:31		09:02 (WEA 2)	07:42	08:09 (WEA 5)	06:40	06:27	05:29	05:03
	16:45	23	09:25 (WEA 1)	17:42	44	08:53 (WEA 4)	18:34	20:29	21:20	21:54
18	08:30		09:02 (WEA 2)	07:40	08:08 (WEA 5)	06:37	06:25	05:27	05:03
	16:46	23	09:25 (WEA 1)	17:44	43	08:51 (WEA 4)	18:36	20:31	21:22	21:55
19	08:29		09:02 (WEA 2)	07:38	08:07 (WEA 5)	06:35	06:23	05:26	05:03
	16:48	22	09:24 (WEA 1)	17:46	41	08:48 (WEA 4)	18:38	20:32	21:23	21:55
20	08:28		09:03 (WEA 2)	07:36	08:07 (WEA 5)	06:32	06:21	05:25	05:03
	16:50	21	09:24 (WEA 3)	17:48	33	08:40 (WEA 5)	18:39	20:34	21:25	21:55
21	08:27		09:02 (WEA 2)	07:34	08:05 (WEA 5)	06:30	06:18	05:23	05:03
	16:51	22	09:24 (WEA 3)	17:50	34	08:39 (WEA 5)	18:41	20:36	21:26	21:55
22	08:26		09:03 (WEA 2)	07:32	08:05 (WEA 5)	06:28	06:16	05:22	05:03
	16:53	22	09:25 (WEA 3)	17:52	35	08:40 (WEA 5)	18:43	20:38	21:28	21:56
23	08:24		09:04 (WEA 2)	07:30	08:05 (WEA 5)	06:25	06:14	05:20	05:03
	16:55	21	09:25 (WEA 3)	17:54	35	08:40 (WEA 5)	18:45	20:39	21:29	21:56
24	08:23		09:03 (WEA 2)	07:27	08:05 (WEA 5)	06:23	06:12	05:19	05:04
	16:57	22	09:25 (WEA 3)	17:55	36	08:41 (WEA 5)	18:46	20:41	21:30	21:56
25	08:22		09:05 (WEA 2)	07:25	08:04 (WEA 5)	06:21	06:10	05:18	05:04
	16:59	20	09:25 (WEA 3)	17:57	36	08:40 (WEA 5)	18:48	20:43	21:32	21:56
26	08:20		09:05 (WEA 2)	07:23	08:04 (WEA 5)	06:18	06:08	05:17	05:04
	17:00	19	09:24 (WEA 3)	17:59	36	08:40 (WEA 5)	18:50	20:45	21:33	21:56
27	08:19		09:07 (WEA 2)	07:21	08:04 (WEA 5)	06:16	06:06	05:16	05:05
	17:02	17	09:24 (WEA 3)	18:01	36	08:40 (WEA 5)	18:52	20:46	21:35	21:56
28	08:18		09:08 (WEA 2)	07:19	08:05 (WEA 5)	06:13	06:04	05:14	05:05
	17:04	14	09:22 (WEA 3)	18:03	35	08:40 (WEA 5)	18:54	20:48	21:36	21:56
29	08:16		09:09 (WEA 2)		07:11	06:01	05:13	05:06
	17:06	9	09:20 (WEA 3)		19:55	20:50	21:37	21:56
30	08:15		08:42 (WEA 4)		07:09	05:59	05:12	05:06
	17:08	4	08:46 (WEA 4)		19:57	20:52	21:38	21:55
31	08:13		08:40 (WEA 4)		07:06		05:11	
	17:10	9	08:49 (WEA 4)		19:59		21:40	
Sonnenscheinstunden	255		276		367	418	489	503
astr.max.mögl.Beschattung		502		891		208		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-32 - SR-32, Försterweg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		07:58 (WEA 4)	08:15		08:54 (WEA 1)
	21:55	21:22	20:18	19:07			16:59	28	08:26 (WEA 4)	16:17	14	09:08 (WEA 1)
2	05:08	05:47	06:38	07:29			07:25		07:58 (WEA 4)	08:17		08:53 (WEA 1)
	21:55	21:20	20:16	19:05			16:57	28	08:26 (WEA 4)	16:16	15	09:08 (WEA 1)
3	05:09	05:48	06:40	07:31			07:26		07:58 (WEA 4)	08:18		08:54 (WEA 1)
	21:54	21:18	20:13	19:02			16:55	28	08:26 (WEA 4)	16:16	14	09:08 (WEA 1)
4	05:09	05:50	06:42	07:32			07:28		07:58 (WEA 4)	08:20		08:54 (WEA 1)
	21:54	21:17	20:11	19:00			16:53	27	08:25 (WEA 4)	16:15	14	09:08 (WEA 1)
5	05:10	05:51	06:43	07:34		08:53 (WEA 5)	07:30		07:59 (WEA 4)	08:21		08:56 (WEA 1)
	21:53	21:15	20:09	18:57	7	09:00 (WEA 5)	16:52	26	08:25 (WEA 4)	16:15	13	09:09 (WEA 1)
6	05:11	05:53	06:45	07:36		08:49 (WEA 5)	07:32		08:01 (WEA 4)	08:22		08:56 (WEA 1)
	21:53	21:13	20:06	18:55	16	09:05 (WEA 5)	16:50	24	08:25 (WEA 4)	16:14	13	09:09 (WEA 1)
7	05:12	05:55	06:47	07:38		08:45 (WEA 5)	07:34		08:03 (WEA 4)	08:24		08:57 (WEA 1)
	21:52	21:11	20:04	18:53	21	09:06 (WEA 5)	16:48	21	08:24 (WEA 4)	16:14	12	09:09 (WEA 1)
8	05:13	05:56	06:48	07:39		08:43 (WEA 5)	07:36		08:05 (WEA 4)	08:25		08:59 (WEA 1)
	21:52	21:09	20:02	18:50	25	09:08 (WEA 5)	16:46	18	08:23 (WEA 4)	16:13	10	09:09 (WEA 1)
9	05:14	05:58	06:50	07:41		08:42 (WEA 5)	07:38		08:07 (WEA 4)	08:26		09:00 (WEA 1)
	21:51	21:07	19:59	18:48	27	09:09 (WEA 5)	16:45	15	08:22 (WEA 4)	16:13	9	09:09 (WEA 1)
10	05:15	06:00	06:52	07:43		08:41 (WEA 5)	07:39		08:09 (WEA 4)	08:27		09:01 (WEA 1)
	21:50	21:05	19:57	18:46	29	09:10 (WEA 5)	16:43	12	08:21 (WEA 4)	16:13	8	09:09 (WEA 1)
11	05:16	06:01	06:53	07:45		08:40 (WEA 5)	07:41		08:11 (WEA 4)	08:28		09:02 (WEA 1)
	21:49	21:04	19:55	18:44	31	09:11 (WEA 5)	16:41	8	08:19 (WEA 4)	16:12	7	09:09 (WEA 1)
12	05:17	06:03	06:55	07:46		08:39 (WEA 5)	07:43		08:13 (WEA 4)	08:29		09:03 (WEA 1)
	21:48	21:02	19:52	18:41	33	09:12 (WEA 5)	16:40	4	08:17 (WEA 4)	16:12	6	09:09 (WEA 1)
13	05:18	06:05	06:57	07:48		08:37 (WEA 5)	07:45		08:41 (WEA 2)	08:30		09:04 (WEA 1)
	21:48	21:00	19:50	18:39	35	09:12 (WEA 5)	16:38	10	08:52 (WEA 3)	16:12	5	09:09 (WEA 1)
14	05:19	06:06	06:58	07:50		08:37 (WEA 5)	07:47		08:39 (WEA 2)	08:31		09:05 (WEA 1)
	21:47	20:57	19:47	18:37	35	09:12 (WEA 5)	16:37	15	08:54 (WEA 3)	16:12	4	09:09 (WEA 1)
15	05:21	06:08	07:00	07:52		08:36 (WEA 5)	07:49		08:38 (WEA 2)	08:32		09:06 (WEA 1)
	21:46	20:55	19:45	18:35	36	09:12 (WEA 5)	16:35	18	08:56 (WEA 3)	16:12	3	09:09 (WEA 1)
16	05:22	06:10	07:02	07:54		08:36 (WEA 5)	07:50		08:38 (WEA 2)	08:33		09:07 (WEA 1)
	21:44	20:53	19:43	18:32	36	09:12 (WEA 5)	16:34	19	08:57 (WEA 3)	16:12	2	09:09 (WEA 1)
17	05:23	06:11	07:03	07:55		08:36 (WEA 5)	07:52		08:38 (WEA 2)	08:34		09:08 (WEA 1)
	21:43	20:51	19:40	18:30	36	09:12 (WEA 5)	16:32	20	08:58 (WEA 3)	16:13	2	09:10 (WEA 1)
18	05:24	06:13	07:05	07:57		08:36 (WEA 5)	07:54		08:37 (WEA 2)	08:35		09:09 (WEA 1)
	21:42	20:49	19:38	18:28	36	09:12 (WEA 5)	16:31	22	08:59 (WEA 3)	16:13	1	09:10 (WEA 1)
19	05:26	06:15	07:07	07:59		08:36 (WEA 5)	07:56		08:38 (WEA 2)	08:36		
	21:41	20:47	19:36	18:26	36	09:12 (WEA 5)	16:29	21	08:59 (WEA 3)	16:13		
20	05:27	06:16	07:08	08:01		08:36 (WEA 5)	07:57		08:38 (WEA 2)	08:36		
	21:40	20:45	19:33	18:24	35	09:11 (WEA 5)	16:28	22	09:00 (WEA 3)	16:13		
21	05:28	06:18	07:10	08:03		08:37 (WEA 5)	07:59		08:38 (WEA 2)	08:37		
	21:39	20:43	19:31	18:21	34	09:11 (WEA 5)	16:27	22	09:00 (WEA 3)	16:14		
22	05:30	06:20	07:12	08:04		08:36 (WEA 5)	08:01		08:39 (WEA 2)	08:37		
	21:37	20:41	19:28	18:19	38	09:15 (WEA 4)	16:26	21	09:00 (WEA 3)	16:14		
23	05:31	06:21	07:14	08:06		08:37 (WEA 5)	08:03		08:39 (WEA 2)	08:38		
	21:36	20:38	19:26	18:17	42	09:19 (WEA 4)	16:25	22	09:01 (WEA 1)	16:15		
24	05:33	06:23	07:15	08:08		08:38 (WEA 5)	08:04		08:40 (WEA 2)	08:38		
	21:34	20:36	19:24	18:15	43	09:21 (WEA 4)	16:23	23	09:03 (WEA 1)	16:15		
25	05:34	06:25	07:17	07:10		07:39 (WEA 5)	08:06		08:40 (WEA 2)	08:39		09:12 (WEA 1)
	21:33	20:34	19:21	17:13	43	08:22 (WEA 4)	16:22	23	09:03 (WEA 1)	16:16	1	09:13 (WEA 1)
26	05:36	06:26	07:19	07:12		07:40 (WEA 5)	08:08		08:41 (WEA 2)	08:39		09:12 (WEA 1)
	21:32	20:32	19:19	17:11	43	08:23 (WEA 4)	16:21	24	09:05 (WEA 1)	16:17	1	09:13 (WEA 1)
27	05:37	06:28	07:20	07:14		07:42 (WEA 5)	08:09		08:42 (WEA 2)	08:39		09:12 (WEA 1)
	21:30	20:29	19:16	17:09	42	08:24 (WEA 4)	16:20	24	09:06 (WEA 1)	16:17	2	09:14 (WEA 1)
28	05:39	06:30	07:22	07:15		07:45 (WEA 5)	08:11		08:44 (WEA 2)	08:39		09:13 (WEA 1)
	21:28	20:27	19:14	17:07	40	08:25 (WEA 4)	16:19	22	09:06 (WEA 1)	16:18	3	09:16 (WEA 1)
29	05:40	06:31	07:24	07:17		07:49 (WEA 5)	08:12		08:45 (WEA 2)	08:40		09:13 (WEA 1)
	21:27	20:25	19:12	17:05	34	08:25 (WEA 4)	16:19	21	09:06 (WEA 1)	16:19	4	09:17 (WEA 1)
30	05:42	06:33	07:25	07:19		07:58 (WEA 4)	08:14		08:48 (WEA 2)	08:40		09:12 (WEA 1)
	21:25	20:23	19:09	17:03	28	08:26 (WEA 4)	16:18	16	09:07 (WEA 1)	16:20	5	09:17 (WEA 1)
31	05:43	06:35		07:21		07:58 (WEA 4)				08:40		09:12 (WEA 1)
	21:24	20:20		17:01	28	08:26 (WEA 4)				16:21	6	09:18 (WEA 1)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					889			604			174	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-33 - SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April			Mai			Juni		
1	08:40	08:11	07:16		07:04		07:34 (WEA 3)	05:58		06:34 (WEA 4)	05:11		05:45 (WEA 5)
	16:22	17:12	18:05		20:01	7	07:41 (WEA 3)	20:53	24	06:58 (WEA 4)	21:41	29	06:14 (WEA 5)
2	08:40	08:10	07:14		07:02		07:32 (WEA 3)	05:56		06:35 (WEA 4)	05:10		05:45 (WEA 5)
	16:23	17:13	18:07		20:02	11	07:43 (WEA 3)	20:55	23	06:58 (WEA 4)	21:42	29	06:14 (WEA 5)
3	08:39	08:08	07:12		06:59		07:30 (WEA 3)	05:54		06:36 (WEA 4)	05:09		05:46 (WEA 5)
	16:25	17:15	18:09		20:04	14	07:44 (WEA 3)	20:57	21	06:57 (WEA 4)	21:43	29	06:15 (WEA 5)
4	08:39	08:07	07:10		06:57		07:29 (WEA 3)	05:52		06:37 (WEA 4)	05:08		05:46 (WEA 5)
	16:26	17:17	18:10		20:06	16	07:45 (WEA 3)	20:58	18	06:55 (WEA 4)	21:44	29	06:15 (WEA 5)
5	08:39	08:05	07:07		07:32 (WEA 1)		06:55	07:29 (WEA 3)		05:50	06:38 (WEA 4)	05:07	05:46 (WEA 5)
	16:27	17:19	18:12	5	07:37 (WEA 1)		20:08	16	07:45 (WEA 3)	21:00	15	06:53 (WEA 4)	21:45	29	06:15 (WEA 5)
6	08:38	08:03	07:05		07:29 (WEA 1)		06:52	07:27 (WEA 3)		05:48	06:39 (WEA 4)	05:07	05:46 (WEA 5)
	16:28	17:21	18:14	11	07:40 (WEA 1)		20:09	17	07:44 (WEA 3)	21:02	12	06:51 (WEA 4)	21:46	29	06:15 (WEA 5)
7	08:38	08:01	07:03		07:27 (WEA 1)		06:50	07:28 (WEA 3)		05:46	06:43 (WEA 4)	05:06	05:46 (WEA 5)
	16:30	17:23	18:16	13	07:40 (WEA 1)		20:11	16	07:44 (WEA 3)	21:04	6	06:49 (WEA 4)	21:47	29	06:15 (WEA 5)
8	08:38	07:59	07:01		07:27 (WEA 1)		06:48	07:28 (WEA 3)		05:44		05:06	05:47 (WEA 5)
	16:31	17:25	18:18	14	07:41 (WEA 1)		20:13	16	07:44 (WEA 3)	21:05		21:48	29	06:16 (WEA 5)
9	08:37	07:58	06:58		07:26 (WEA 1)		06:45	07:29 (WEA 3)		05:42		05:05	05:46 (WEA 5)
	16:32	17:27	18:20	16	07:42 (WEA 1)		20:15	14	07:43 (WEA 3)	21:07		21:49	29	06:15 (WEA 5)
10	08:37	07:56	06:56		07:25 (WEA 1)		06:43	07:29 (WEA 3)		05:41		05:05	05:47 (WEA 5)
	16:34	17:29	18:21	16	07:41 (WEA 1)		20:16	11	07:40 (WEA 3)	21:09		21:50	29	06:16 (WEA 5)
11	08:36	07:54	06:54		07:26 (WEA 1)		06:41	07:31 (WEA 3)		05:39		05:04	05:48 (WEA 5)
	16:35	17:31	18:23	15	07:41 (WEA 1)		20:18	7	07:38 (WEA 3)	21:10		21:50	28	06:16 (WEA 5)
12	08:35	07:52	06:51		07:26 (WEA 1)		06:38			05:37		05:04	05:48 (WEA 5)
	16:37	17:33	18:25	14	07:40 (WEA 1)		20:20			21:12		21:51	28	06:16 (WEA 5)
13	08:34	07:50	06:49		07:27 (WEA 1)		06:36			05:35		05:03	05:48 (WEA 5)
	16:38	17:35	18:27	11	07:38 (WEA 1)		20:22			21:14		21:52	28	06:16 (WEA 5)
14	08:34	07:48	06:47		07:28 (WEA 1)		06:34			05:34		05:03	05:48 (WEA 5)
	16:40	17:36	18:29	9	07:37 (WEA 1)		20:24			21:15		21:52	28	06:16 (WEA 5)
15	08:33	07:46	06:44				06:32			05:32		05:03	05:48 (WEA 5)
	16:41	17:38	18:30				20:25			21:17		21:53	28	06:16 (WEA 5)
16	08:32	07:44	06:42				06:29			05:31	05:58 (WEA 5)	05:03	05:49 (WEA 5)
	16:43	17:40	18:32				20:27			21:18	6	06:04 (WEA 5)	21:54	27	06:16 (WEA 5)
17	08:31	07:42	06:40				06:27			05:29	05:56 (WEA 5)	05:03	05:49 (WEA 5)
	16:45	17:42	18:34				20:29			21:20	10	06:06 (WEA 5)	21:54	28	06:17 (WEA 5)
18	08:30	07:40	06:37				06:25		06:49 (WEA 4)	05:28	05:55 (WEA 5)	05:03	05:49 (WEA 5)
	16:46	17:44	18:36				20:31	6	06:55 (WEA 4)	21:21	12	06:07 (WEA 5)	21:54	28	06:17 (WEA 5)
19	08:29	07:38	06:35		07:01 (WEA 2)		06:23		06:46 (WEA 4)	05:26	05:53 (WEA 5)	05:03	05:49 (WEA 5)
	16:48	17:46	18:38	5	07:06 (WEA 2)		20:32	10	06:56 (WEA 4)	21:23	15	06:08 (WEA 5)	21:55	28	06:17 (WEA 5)
20	08:28	07:36	06:32		06:58 (WEA 2)		06:21		06:44 (WEA 4)	05:25	05:52 (WEA 5)	05:03	05:50 (WEA 5)
	16:50	17:48	18:39	11	07:09 (WEA 2)		20:34	14	06:58 (WEA 4)	21:25	17	06:09 (WEA 5)	21:55	27	06:17 (WEA 5)
21	08:27	07:34	06:30		06:56 (WEA 2)		06:18		06:42 (WEA 4)	05:23	05:51 (WEA 5)	05:03	05:50 (WEA 5)
	16:51	17:50	18:41	14	07:10 (WEA 2)		20:36	17	06:59 (WEA 4)	21:26	19	06:10 (WEA 5)	21:55	27	06:17 (WEA 5)
22	08:26	07:32	06:28		06:55 (WEA 2)		06:16		06:40 (WEA 4)	05:22	05:50 (WEA 5)	05:03	05:51 (WEA 5)
	16:53	17:52	18:43	16	07:11 (WEA 2)		20:38	19	06:59 (WEA 4)	21:27	21	06:11 (WEA 5)	21:56	27	06:18 (WEA 5)
23	08:24	07:30	06:25		06:54 (WEA 2)		06:14		06:38 (WEA 4)	05:21	05:49 (WEA 5)	05:03	05:50 (WEA 5)
	16:55	17:54	18:45	17	07:11 (WEA 2)		20:39	22	07:00 (WEA 4)	21:29	23	06:12 (WEA 5)	21:56	28	06:18 (WEA 5)
24	08:23	07:27	06:23		06:53 (WEA 2)		06:12		06:36 (WEA 4)	05:19	05:47 (WEA 5)	05:04	05:50 (WEA 5)
	16:57	17:55	18:46	18	07:11 (WEA 2)		20:41	24	07:00 (WEA 4)	21:30	25	06:12 (WEA 5)	21:56	28	06:18 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)		06:10		06:34 (WEA 4)	05:18	05:46 (WEA 5)	05:04	05:51 (WEA 5)
	16:59	17:57	18:48	18	07:11 (WEA 2)		20:43	26	07:00 (WEA 4)	21:32	26	06:12 (WEA 5)	21:56	28	06:19 (WEA 5)
26	08:20	07:23	06:18		06:53 (WEA 2)		06:08		06:34 (WEA 4)	05:17	05:45 (WEA 5)	05:04	05:51 (WEA 5)
	17:00	17:59	18:50	17	07:10 (WEA 2)		20:45	26	07:00 (WEA 4)	21:33	28	06:13 (WEA 5)	21:56	28	06:19 (WEA 5)
27	08:19	07:21	06:16		06:54 (WEA 2)		06:06		06:33 (WEA 4)	05:16	05:45 (WEA 5)	05:05	05:52 (WEA 5)
	17:02	18:01	18:52	15	07:09 (WEA 2)		20:46	27	07:00 (WEA 4)	21:34	28	06:13 (WEA 5)	21:56	27	06:19 (WEA 5)
28	08:18	07:19	06:14		06:54 (WEA 2)		06:04		06:33 (WEA 4)	05:15	05:45 (WEA 5)	05:05	05:51 (WEA 5)
	17:04	18:03	18:54	13	07:07 (WEA 2)		20:48	27	07:00 (WEA 4)	21:36	28	06:13 (WEA 5)	21:56	28	06:19 (WEA 5)
29	08:16		07:11		07:56 (WEA 2)		06:02		06:33 (WEA 4)	05:13	05:45 (WEA 5)	05:06	05:52 (WEA 5)
	17:06		19:55	9	08:05 (WEA 2)		20:50	26	06:59 (WEA 4)	21:37	28	06:13 (WEA 5)	21:56	28	06:20 (WEA 5)
30	08:15		07:09				06:00		06:34 (WEA 4)	05:12	05:46 (WEA 5)	05:07	05:51 (WEA 5)
	17:08		19:57				20:52	25	06:59 (WEA 4)	21:38	28	06:14 (WEA 5)	21:55	28	06:19 (WEA 5)
31	08:13		07:06							05:12	05:45 (WEA 5)		
	17:10		19:59							21:40	29	06:14 (WEA 5)			
Sonnenscheinstunden	255	276	367				418			489			503		
astr.max.mögl.Beschattung				277				414			462			845	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-33 - SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:52 (WEA 5)	05:45			06:37		07:30 (WEA 3)	07:27		08:06 (WEA 1)	07:23	08:15
	21:55	28	06:20 (WEA 5)	21:22			20:18	7	07:37 (WEA 3)	19:07	13	08:19 (WEA 1)	16:59	16:17
2	05:08		05:52 (WEA 5)	05:47			06:38		07:28 (WEA 3)	07:29		08:05 (WEA 1)	07:25	08:17
	21:55	29	06:21 (WEA 5)	21:20			20:16	11	07:39 (WEA 3)	19:05	15	08:20 (WEA 1)	16:57	16:16
3	05:09		05:52 (WEA 5)	05:48			06:40		07:26 (WEA 3)	07:31		08:03 (WEA 1)	07:26	08:18
	21:54	28	06:20 (WEA 5)	21:18			20:13	14	07:40 (WEA 3)	19:02	16	08:19 (WEA 1)	16:55	16:16
4	05:09		05:52 (WEA 5)	05:50			06:42		07:25 (WEA 3)	07:32		08:03 (WEA 1)	07:28	08:20
	21:54	29	06:21 (WEA 5)	21:17			20:11	16	07:41 (WEA 3)	19:00	16	08:19 (WEA 1)	16:53	16:15
5	05:10		05:52 (WEA 5)	05:51			06:43		07:25 (WEA 3)	07:34		08:03 (WEA 1)	07:30	08:21
	21:53	29	06:21 (WEA 5)	21:15			20:09	16	07:41 (WEA 3)	18:57	16	08:19 (WEA 1)	16:52	16:15
6	05:11		05:53 (WEA 5)	05:53		06:51 (WEA 4)	06:45		07:24 (WEA 3)	07:36		08:04 (WEA 1)	07:32	08:22
	21:53	29	06:22 (WEA 5)	21:13	8	06:59 (WEA 4)	20:06	16	07:40 (WEA 3)	18:55	14	08:18 (WEA 1)	16:50	16:14
7	05:12		05:53 (WEA 5)	05:55		06:49 (WEA 4)	06:47		07:24 (WEA 3)	07:38		08:04 (WEA 1)	07:34	08:24
	21:52	29	06:22 (WEA 5)	21:11	13	07:02 (WEA 4)	20:04	16	07:40 (WEA 3)	18:53	12	08:16 (WEA 1)	16:48	16:14
8	05:13		05:52 (WEA 5)	05:56		06:47 (WEA 4)	06:48		07:23 (WEA 3)	07:39		08:05 (WEA 1)	07:36	08:25
	21:52	29	06:21 (WEA 5)	21:09	16	07:03 (WEA 4)	20:02	16	07:39 (WEA 3)	18:51	9	08:14 (WEA 1)	16:46	16:13
9	05:14		05:52 (WEA 5)	05:58		06:46 (WEA 4)	06:50		07:24 (WEA 3)	07:41			07:38	08:26
	21:51	30	06:22 (WEA 5)	21:07	19	07:05 (WEA 4)	19:59	14	07:38 (WEA 3)	18:48			16:45	16:13
10	05:15		05:53 (WEA 5)	06:00		06:44 (WEA 4)	06:52		07:25 (WEA 3)	07:43			07:39	08:27
	21:50	29	06:22 (WEA 5)	21:05	21	07:05 (WEA 4)	19:57	12	07:37 (WEA 3)	18:46			16:43	16:13
11	05:16		05:53 (WEA 5)	06:01		06:44 (WEA 4)	06:53		07:26 (WEA 3)	07:45			07:41	08:28
	21:49	29	06:22 (WEA 5)	21:03	22	07:06 (WEA 4)	19:55	8	07:34 (WEA 3)	18:44			16:41	16:13
12	05:17		05:53 (WEA 5)	06:03		06:42 (WEA 4)	06:55			07:46			07:43	08:29
	21:48	29	06:22 (WEA 5)	21:02	24	07:06 (WEA 4)	19:52			18:41			16:40	16:12
13	05:18		05:53 (WEA 5)	06:05		06:42 (WEA 4)	06:57			07:48			07:45	08:30
	21:47	29	06:22 (WEA 5)	20:59	25	07:07 (WEA 4)	19:50			18:39			16:38	16:12
14	05:20		05:54 (WEA 5)	06:06		06:41 (WEA 4)	06:58		07:46 (WEA 2)	07:50			07:47	08:31
	21:47	29	06:23 (WEA 5)	20:57	26	07:07 (WEA 4)	19:47	9	07:55 (WEA 2)	18:37			16:37	16:12
15	05:21		05:54 (WEA 5)	06:08		06:41 (WEA 4)	07:00		07:44 (WEA 2)	07:52			07:49	08:32
	21:45	29	06:23 (WEA 5)	20:55	26	07:07 (WEA 4)	19:45	13	07:57 (WEA 2)	18:35			16:35	16:12
16	05:22		05:54 (WEA 5)	06:10		06:41 (WEA 4)	07:02		07:42 (WEA 2)	07:54			07:50	08:33
	21:44	29	06:23 (WEA 5)	20:53	27	07:08 (WEA 4)	19:43	15	07:57 (WEA 2)	18:32			16:34	16:12
17	05:23		05:55 (WEA 5)	06:11		06:40 (WEA 4)	07:03		07:41 (WEA 2)	07:55			07:52	08:34
	21:43	27	06:22 (WEA 5)	20:51	27	07:07 (WEA 4)	19:40	17	07:58 (WEA 2)	18:30			16:32	16:13
18	05:25		05:55 (WEA 5)	06:13		06:41 (WEA 4)	07:05		07:41 (WEA 2)	07:57			07:54	08:35
	21:42	27	06:22 (WEA 5)	20:49	26	07:07 (WEA 4)	19:38	17	07:58 (WEA 2)	18:28			16:31	16:13
19	05:26		05:57 (WEA 5)	06:15		06:42 (WEA 4)	07:07		07:40 (WEA 2)	07:59			07:56	08:36
	21:41	25	06:22 (WEA 5)	20:47	24	07:06 (WEA 4)	19:36	17	07:57 (WEA 2)	18:26			16:29	16:13
20	05:27		05:58 (WEA 5)	06:16		06:44 (WEA 4)	07:08		07:40 (WEA 2)	08:01			07:57	08:36
	21:40	24	06:22 (WEA 5)	20:45	21	07:05 (WEA 4)	19:33	17	07:57 (WEA 2)	18:24			16:28	16:13
21	05:29		05:59 (WEA 5)	06:18		06:46 (WEA 4)	07:10		07:40 (WEA 2)	08:03			07:59	08:37
	21:38	22	06:21 (WEA 5)	20:43	19	07:05 (WEA 4)	19:31	17	07:57 (WEA 2)	18:21			16:27	16:14
22	05:30		06:00 (WEA 5)	06:20		06:47 (WEA 4)	07:12		07:40 (WEA 2)	08:04			08:01	08:37
	21:37	20	06:20 (WEA 5)	20:41	16	07:03 (WEA 4)	19:28	15	07:55 (WEA 2)	18:19			16:26	16:14
23	05:31		06:02 (WEA 5)	06:21		06:49 (WEA 4)	07:14		07:41 (WEA 2)	08:06			08:03	08:38
	21:36	18	06:20 (WEA 5)	20:38	13	07:02 (WEA 4)	19:26	12	07:53 (WEA 2)	18:17			16:25	16:15
24	05:33		06:03 (WEA 5)	06:23		06:50 (WEA 4)	07:15		07:44 (WEA 2)	08:08			08:04	08:38
	21:34	16	06:19 (WEA 5)	20:36	10	07:00 (WEA 4)	19:24	7	07:51 (WEA 2)	18:15			16:23	16:15
25	05:34		06:04 (WEA 5)	06:25		06:52 (WEA 4)	07:17			07:10			08:06	08:39
	21:33	14	06:18 (WEA 5)	20:34	6	06:58 (WEA 4)	19:21			17:13			16:22	08:39
26	05:36		06:06 (WEA 5)	06:26			07:19			07:12			08:08	08:39
	21:31	11	06:17 (WEA 5)	20:32			19:19			17:11			16:21	16:17
27	05:37		06:07 (WEA 5)	06:28			07:20			07:14			08:09	08:39
	21:30	8	06:15 (WEA 5)	20:29			19:16			17:09			16:20	16:18
28	05:39		06:09 (WEA 5)	06:30			07:22			07:15			08:11	08:39
	21:28	4	06:13 (WEA 5)	20:27			19:14			17:07			16:20	16:18
29	05:40			06:31			07:24		08:10 (WEA 1)	07:17			08:12	08:40
	21:27			20:25			19:12	5	08:15 (WEA 1)	17:05			16:19	16:19
30	05:42			06:33			07:25		08:07 (WEA 1)	07:19			08:14	08:40
	21:25			20:23			19:09	11	08:18 (WEA 1)	17:03			16:18	16:20
31	05:43			06:35						07:21				08:40
	21:24			20:20						17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		679			389			318			111			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-34 - SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:34 (WEA 3)	05:58		06:35 (WEA 4)	05:11		05:47 (WEA 5)
	16:22	17:12	18:05			20:01	7	07:41 (WEA 3)	20:53	22	06:57 (WEA 4)	21:41	28	06:15 (WEA 5)
2	08:40	08:10	07:14			07:02		07:31 (WEA 3)	05:56		06:36 (WEA 4)	05:10		05:47 (WEA 5)
	16:23	17:13	18:07			20:02	12	07:43 (WEA 3)	20:55	21	06:57 (WEA 4)	21:42	28	06:15 (WEA 5)
3	08:39	08:08	07:12			06:59		07:29 (WEA 3)	05:54		06:37 (WEA 4)	05:09		05:48 (WEA 5)
	16:25	17:15	18:09			20:04	14	07:43 (WEA 3)	20:57	19	06:56 (WEA 4)	21:43	28	06:16 (WEA 5)
4	08:39	08:07	07:10			06:57		07:29 (WEA 3)	05:52		06:38 (WEA 4)	05:08		05:48 (WEA 5)
	16:26	17:17	18:10			20:06	15	07:44 (WEA 3)	20:58	16	06:54 (WEA 4)	21:44	28	06:16 (WEA 5)
5	08:39	08:05	07:07			06:55		07:28 (WEA 3)	05:50		06:40 (WEA 4)	05:07		05:47 (WEA 5)
	16:27	17:19	18:12			20:08	16	07:44 (WEA 3)	21:00	12	06:52 (WEA 4)	21:45	28	06:15 (WEA 5)
6	08:38	08:03	07:05		07:29 (WEA 1)	06:52		07:27 (WEA 3)	05:48		06:42 (WEA 4)	05:07		05:48 (WEA 5)
	16:28	17:21	18:14	9	07:38 (WEA 1)	20:09	16	07:43 (WEA 3)	21:02	7	06:49 (WEA 4)	21:46	28	06:16 (WEA 5)
7	08:38	08:01	07:03		07:27 (WEA 1)	06:50		07:27 (WEA 3)	05:46			05:06		05:48 (WEA 5)
	16:30	17:23	18:16	12	07:39 (WEA 1)	20:11	16	07:43 (WEA 3)	21:04			21:47	28	06:16 (WEA 5)
8	08:38	07:59	07:01		07:26 (WEA 1)	06:48		07:28 (WEA 3)	05:44			05:06		05:49 (WEA 5)
	16:31	17:25	18:18	14	07:40 (WEA 1)	20:13	15	07:43 (WEA 3)	21:05			21:48	27	06:16 (WEA 5)
9	08:37	07:58	06:58		07:25 (WEA 1)	06:45		07:29 (WEA 3)	05:42			05:05		05:48 (WEA 5)
	16:32	17:27	18:20	16	07:41 (WEA 1)	20:15	13	07:42 (WEA 3)	21:07			21:49	28	06:16 (WEA 5)
10	08:37	07:56	06:56		07:24 (WEA 1)	06:43		07:29 (WEA 3)	05:41			05:05		05:49 (WEA 5)
	16:34	17:29	18:21	16	07:40 (WEA 1)	20:16	10	07:39 (WEA 3)	21:09			21:50	27	06:16 (WEA 5)
11	08:36	07:54	06:54		07:25 (WEA 1)	06:41		07:32 (WEA 3)	05:39			05:04		05:50 (WEA 5)
	16:35	17:31	18:23	15	07:40 (WEA 1)	20:18	5	07:37 (WEA 3)	21:10			21:50	26	06:16 (WEA 5)
12	08:35	07:52	06:51		07:25 (WEA 1)	06:38			05:37			05:04		05:50 (WEA 5)
	16:37	17:33	18:25	14	07:39 (WEA 1)	20:20			21:12			21:51	27	06:17 (WEA 5)
13	08:34	07:50	06:49		07:25 (WEA 1)	06:36			05:35			05:03		05:50 (WEA 5)
	16:38	17:35	18:27	13	07:38 (WEA 1)	20:22			21:14			21:52	26	06:16 (WEA 5)
14	08:34	07:48	06:47		07:27 (WEA 1)	06:34			05:34		06:00 (WEA 5)	05:03		05:50 (WEA 5)
	16:40	17:36	18:29	9	07:36 (WEA 1)	20:24			21:15	2	06:02 (WEA 5)	21:52	26	06:16 (WEA 5)
15	08:33	07:46	06:44			06:32			05:32		05:59 (WEA 5)	05:03		05:51 (WEA 5)
	16:41	17:38	18:30			20:25			21:17	7	06:06 (WEA 5)	21:53	26	06:17 (WEA 5)
16	08:32	07:44	06:42			06:29			05:31		05:58 (WEA 5)	05:03		05:51 (WEA 5)
	16:43	17:40	18:32			20:27			21:18	10	06:08 (WEA 5)	21:54	26	06:17 (WEA 5)
17	08:31	07:42	06:40			06:27		06:51 (WEA 4)	05:29		05:56 (WEA 5)	05:03		05:51 (WEA 5)
	16:45	17:42	18:34			20:29	3	06:54 (WEA 4)	21:20	13	06:09 (WEA 5)	21:54	26	06:17 (WEA 5)
18	08:30	07:40	06:37			06:25		06:49 (WEA 4)	05:28		05:55 (WEA 5)	05:03		05:52 (WEA 5)
	16:46	17:44	18:36			20:31	7	06:56 (WEA 4)	21:21	15	06:10 (WEA 5)	21:54	25	06:17 (WEA 5)
19	08:29	07:38	06:35		07:02 (WEA 2)	06:23		06:46 (WEA 4)	05:26		05:53 (WEA 5)	05:03		05:52 (WEA 5)
	16:48	17:46	18:38	2	07:04 (WEA 2)	20:32	11	06:57 (WEA 4)	21:23	17	06:10 (WEA 5)	21:55	25	06:17 (WEA 5)
20	08:28	07:36	06:32		06:58 (WEA 2)	06:21		06:44 (WEA 4)	05:25		05:52 (WEA 5)	05:03		05:52 (WEA 5)
	16:50	17:48	18:39	10	07:08 (WEA 2)	20:34	14	06:58 (WEA 4)	21:25	19	06:11 (WEA 5)	21:55	25	06:17 (WEA 5)
21	08:27	07:34	06:30		06:55 (WEA 2)	06:18		06:42 (WEA 4)	05:23		05:51 (WEA 5)	05:03		05:52 (WEA 5)
	16:51	17:50	18:41	14	07:09 (WEA 2)	20:36	17	06:59 (WEA 4)	21:26	21	06:12 (WEA 5)	21:55	25	06:17 (WEA 5)
22	08:26	07:32	06:28		06:54 (WEA 2)	06:16		06:40 (WEA 4)	05:22		05:50 (WEA 5)	05:03		05:53 (WEA 5)
	16:53	17:52	18:43	16	07:10 (WEA 2)	20:38	20	07:00 (WEA 4)	21:28	23	06:13 (WEA 5)	21:56	25	06:18 (WEA 5)
23	08:24	07:30	06:25		06:53 (WEA 2)	06:14		06:38 (WEA 4)	05:21		05:49 (WEA 5)	05:03		05:53 (WEA 5)
	16:55	17:54	18:45	17	07:10 (WEA 2)	20:39	22	07:00 (WEA 4)	21:29	25	06:14 (WEA 5)	21:56	25	06:18 (WEA 5)
24	08:23	07:27	06:23		06:53 (WEA 2)	06:12		06:36 (WEA 4)	05:19		05:47 (WEA 5)	05:04		05:53 (WEA 5)
	16:57	17:55	18:46	17	07:10 (WEA 2)	20:41	24	07:00 (WEA 4)	21:30	26	06:13 (WEA 5)	21:56	25	06:18 (WEA 5)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		06:34 (WEA 4)	05:18		05:46 (WEA 5)	05:04		05:53 (WEA 5)
	16:59	17:57	18:48	17	07:10 (WEA 2)	20:43	26	07:00 (WEA 4)	21:32	28	06:14 (WEA 5)	21:56	26	06:19 (WEA 5)
26	08:20	07:23	06:18		06:52 (WEA 2)	06:08		06:34 (WEA 4)	05:17		05:46 (WEA 5)	05:04		05:53 (WEA 5)
	17:00	17:59	18:50	17	07:09 (WEA 2)	20:45	26	07:00 (WEA 4)	21:33	28	06:14 (WEA 5)	21:56	26	06:19 (WEA 5)
27	08:19	07:21	06:16		06:53 (WEA 2)	06:06		06:34 (WEA 4)	05:16		05:46 (WEA 5)	05:05		05:54 (WEA 5)
	17:02	18:01	18:52	15	07:08 (WEA 2)	20:46	26	07:00 (WEA 4)	21:34	28	06:14 (WEA 5)	21:56	26	06:20 (WEA 5)
28	08:18	07:19	06:14		06:53 (WEA 2)	06:04		06:34 (WEA 4)	05:15		05:46 (WEA 5)	05:05		05:53 (WEA 5)
	17:04	18:03	18:54	13	07:06 (WEA 2)	20:48	26	07:00 (WEA 4)	21:36	28	06:14 (WEA 5)	21:56	26	06:19 (WEA 5)
29	08:16		07:11		07:55 (WEA 2)	06:02		06:34 (WEA 4)	05:13		05:46 (WEA 5)	05:06		05:54 (WEA 5)
	17:06		19:55	9	08:04 (WEA 2)	20:50	25	06:59 (WEA 4)	21:37	29	06:15 (WEA 5)	21:56	26	06:20 (WEA 5)
30	08:15		07:09			06:00		06:34 (WEA 4)	05:12		05:47 (WEA 5)	05:07		05:54 (WEA 5)
	17:08		19:57			20:52	24	06:58 (WEA 4)	21:38	29	06:16 (WEA 5)	21:55	26	06:20 (WEA 5)
31	08:13		07:06						05:12		05:47 (WEA 5)			
	17:10		19:59						21:40	29	06:16 (WEA 5)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				265			410			474			792	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-34 - SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		05:54 (WEA 5)	05:45			06:37		07:30 (WEA 3)	07:27		08:04 (WEA 1)	07:23	08:15
	21:55	27	06:21 (WEA 5)	21:22			20:18	6	07:36 (WEA 3)	19:07	14	08:18 (WEA 1)	16:59	16:17
2	05:08		05:54 (WEA 5)	05:47			06:38		07:28 (WEA 3)	07:29		08:04 (WEA 1)	07:25	08:17
	21:55	27	06:21 (WEA 5)	21:20			20:16	10	07:38 (WEA 3)	19:05	14	08:18 (WEA 1)	16:57	16:16
3	05:09		05:54 (WEA 5)	05:48			06:40		07:26 (WEA 3)	07:31		08:02 (WEA 1)	07:26	08:18
	21:54	27	06:21 (WEA 5)	21:18			20:13	13	07:39 (WEA 3)	19:02	16	08:18 (WEA 1)	16:55	16:16
4	05:09		05:54 (WEA 5)	05:50			06:42		07:25 (WEA 3)	07:32		08:02 (WEA 1)	07:28	08:20
	21:54	27	06:21 (WEA 5)	21:17			20:11	15	07:40 (WEA 3)	19:00	16	08:18 (WEA 1)	16:53	16:15
5	05:10		05:54 (WEA 5)	05:51			06:43		07:24 (WEA 3)	07:34		08:02 (WEA 1)	07:30	08:21
	21:53	28	06:22 (WEA 5)	21:15			20:09	16	07:40 (WEA 3)	18:57	15	08:17 (WEA 1)	16:52	16:15
6	05:11		05:55 (WEA 5)	05:53			06:45		07:23 (WEA 3)	07:36		08:03 (WEA 1)	07:32	08:22
	21:53	27	06:22 (WEA 5)	21:13			20:06	17	07:40 (WEA 3)	18:55	13	08:16 (WEA 1)	16:50	16:14
7	05:12		05:55 (WEA 5)	05:55		06:51 (WEA 4)	06:47		07:23 (WEA 3)	07:38		08:03 (WEA 1)	07:34	08:24
	21:52	28	06:23 (WEA 5)	21:11	9	07:00 (WEA 4)	20:04	16	07:39 (WEA 3)	18:53	11	08:14 (WEA 1)	16:48	16:14
8	05:13		05:54 (WEA 5)	05:56		06:48 (WEA 4)	06:48		07:23 (WEA 3)	07:39		08:05 (WEA 1)	07:36	08:25
	21:52	28	06:22 (WEA 5)	21:09	14	07:02 (WEA 4)	20:02	15	07:38 (WEA 3)	18:51	7	08:12 (WEA 1)	16:46	16:13
9	05:14		05:54 (WEA 5)	05:58		06:47 (WEA 4)	06:50		07:23 (WEA 3)	07:41			07:38	08:26
	21:51	28	06:22 (WEA 5)	21:07	17	07:04 (WEA 4)	19:59	14	07:37 (WEA 3)	18:48			16:45	16:13
10	05:15		05:54 (WEA 5)	06:00		06:45 (WEA 4)	06:52		07:25 (WEA 3)	07:43			07:39	08:27
	21:50	29	06:23 (WEA 5)	21:05	20	07:05 (WEA 4)	19:57	11	07:36 (WEA 3)	18:46			16:43	16:13
11	05:16		05:54 (WEA 5)	06:01		06:45 (WEA 4)	06:53		07:26 (WEA 3)	07:45			07:41	08:28
	21:49	29	06:23 (WEA 5)	21:03	21	07:06 (WEA 4)	19:55	7	07:33 (WEA 3)	18:44			16:41	16:13
12	05:17		05:54 (WEA 5)	06:03		06:43 (WEA 4)	06:55			07:46			07:43	08:29
	21:48	29	06:23 (WEA 5)	21:02	23	07:06 (WEA 4)	19:52			18:41			16:40	16:12
13	05:18		05:54 (WEA 5)	06:05		06:43 (WEA 4)	06:57			07:48			07:45	08:30
	21:47	29	06:23 (WEA 5)	20:59	24	07:07 (WEA 4)	19:50			18:39			16:38	16:12
14	05:20		05:56 (WEA 5)	06:06		06:42 (WEA 4)	06:58		07:46 (WEA 2)	07:50			07:47	08:31
	21:47	28	06:24 (WEA 5)	20:57	25	07:07 (WEA 4)	19:47	8	07:54 (WEA 2)	18:37			16:37	16:12
15	05:21		05:56 (WEA 5)	06:08		06:42 (WEA 4)	07:00		07:44 (WEA 2)	07:52			07:49	08:32
	21:45	28	06:24 (WEA 5)	20:55	25	07:07 (WEA 4)	19:45	12	07:56 (WEA 2)	18:35			16:35	16:12
16	05:22		05:56 (WEA 5)	06:10		06:42 (WEA 4)	07:02		07:41 (WEA 2)	07:54			07:50	08:33
	21:44	28	06:24 (WEA 5)	20:53	26	07:08 (WEA 4)	19:43	15	07:56 (WEA 2)	18:32			16:34	16:12
17	05:23		05:56 (WEA 5)	06:11		06:41 (WEA 4)	07:03		07:41 (WEA 2)	07:55			07:52	08:34
	21:43	28	06:24 (WEA 5)	20:51	26	07:07 (WEA 4)	19:40	16	07:57 (WEA 2)	18:30			16:32	16:13
18	05:25		05:56 (WEA 5)	06:13		06:41 (WEA 4)	07:05		07:40 (WEA 2)	07:57			07:54	08:35
	21:42	27	06:23 (WEA 5)	20:49	26	07:07 (WEA 4)	19:38	17	07:57 (WEA 2)	18:28			16:31	16:13
19	05:26		05:57 (WEA 5)	06:15		06:42 (WEA 4)	07:07		07:39 (WEA 2)	07:59			07:56	08:36
	21:41	27	06:24 (WEA 5)	20:47	24	07:06 (WEA 4)	19:36	17	07:56 (WEA 2)	18:26			16:29	16:13
20	05:27		05:58 (WEA 5)	06:16		06:44 (WEA 4)	07:08		07:39 (WEA 2)	08:01			07:57	08:36
	21:40	25	06:23 (WEA 5)	20:45	22	07:06 (WEA 4)	19:33	17	07:56 (WEA 2)	18:24			16:28	16:13
21	05:29		05:59 (WEA 5)	06:18		06:46 (WEA 4)	07:10		07:40 (WEA 2)	08:03			07:59	08:37
	21:38	24	06:23 (WEA 5)	20:43	19	07:05 (WEA 4)	19:31	16	07:56 (WEA 2)	18:21			16:27	16:14
22	05:30		06:00 (WEA 5)	06:20		06:47 (WEA 4)	07:12		07:40 (WEA 2)	08:04			08:01	08:37
	21:37	22	06:22 (WEA 5)	20:41	17	07:04 (WEA 4)	19:28	14	07:54 (WEA 2)	18:19			16:26	16:14
23	05:31		06:02 (WEA 5)	06:21		06:49 (WEA 4)	07:14		07:41 (WEA 2)	08:06			08:03	08:38
	21:36	20	06:22 (WEA 5)	20:38	14	07:03 (WEA 4)	19:26	11	07:52 (WEA 2)	18:17			16:25	16:15
24	05:33		06:03 (WEA 5)	06:23		06:50 (WEA 4)	07:15		07:43 (WEA 2)	08:08			08:04	08:38
	21:34	18	06:21 (WEA 5)	20:36	11	07:01 (WEA 4)	19:24	7	07:50 (WEA 2)	18:15			16:23	16:15
25	05:34		06:04 (WEA 5)	06:25		06:52 (WEA 4)	07:17			07:10			08:06	08:39
	21:33	16	06:20 (WEA 5)	20:34	7	06:59 (WEA 4)	19:21			17:13			16:22	16:16
26	05:36		06:06 (WEA 5)	06:26		06:53 (WEA 4)	07:19			07:12			08:08	08:39
	21:31	14	06:20 (WEA 5)	20:32	2	06:55 (WEA 4)	19:19			17:11			16:21	16:17
27	05:37		06:07 (WEA 5)	06:28			07:20			07:14			08:09	08:39
	21:30	12	06:19 (WEA 5)	20:29			19:16			17:09			16:20	16:18
28	05:39		06:09 (WEA 5)	06:30			07:22			07:15			08:11	08:39
	21:28	9	06:18 (WEA 5)	20:27			19:14			17:07			16:20	16:18
29	05:40		06:10 (WEA 5)	06:31			07:24		08:08 (WEA 1)	07:17			08:12	08:40
	21:27	5	06:15 (WEA 5)	20:25			19:12	7	08:15 (WEA 1)	17:05			16:19	16:19
30	05:42			06:33			07:25		08:06 (WEA 1)	07:19			08:14	08:40
	21:25			20:23			19:09	11	08:17 (WEA 1)	17:03			16:18	16:20
31	05:43			06:35						07:21				08:40
	21:24			20:20						17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		694			372			308			106			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-35 - SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:32 (WEA 3)	05:58		06:46 (WEA 4)	05:11		05:58 (WEA 5)
	16:22	17:12	18:05			20:01	13	07:45 (WEA 3)	20:53	8	06:54 (WEA 4)	21:41	21	06:19 (WEA 5)
2	08:40	08:10	07:14			07:02		07:31 (WEA 3)	05:56			05:10		05:58 (WEA 5)
	16:24	17:13	18:07			20:02	14	07:45 (WEA 3)	20:55			21:42	21	06:19 (WEA 5)
3	08:39	08:08	07:12			06:59		07:30 (WEA 3)	05:54			05:09		06:00 (WEA 5)
	16:25	17:15	18:09			20:04	15	07:45 (WEA 3)	20:57			21:43	19	06:19 (WEA 5)
4	08:39	08:07	07:10			06:57		07:30 (WEA 3)	05:52			05:08		06:00 (WEA 5)
	16:26	17:17	18:10			20:06	15	07:45 (WEA 3)	20:58			21:44	19	06:19 (WEA 5)
5	08:39	08:05	07:07			06:55		07:30 (WEA 3)	05:50			05:07		06:00 (WEA 5)
	16:27	17:19	18:12			20:08	15	07:45 (WEA 3)	21:00			21:45	18	06:18 (WEA 5)
6	08:38	08:03	07:05		07:29 (WEA 1)	06:52		07:30 (WEA 3)	05:48			05:07		06:01 (WEA 5)
	16:28	17:21	18:14	7	07:36 (WEA 1)	20:09	13	07:43 (WEA 3)	21:02			21:46	17	06:18 (WEA 5)
7	08:38	08:01	07:03		07:26 (WEA 1)	06:50		07:31 (WEA 3)	05:46			05:06		06:02 (WEA 5)
	16:30	17:23	18:16	11	07:37 (WEA 1)	20:11	11	07:42 (WEA 3)	21:04			21:47	15	06:17 (WEA 5)
8	08:38	08:00	07:01		07:24 (WEA 1)	06:48		07:32 (WEA 3)	05:44			05:06		06:03 (WEA 5)
	16:31	17:25	18:18	14	07:38 (WEA 1)	20:13	8	07:40 (WEA 3)	21:05			21:48	14	06:17 (WEA 5)
9	08:37	07:58	06:58		07:24 (WEA 1)	06:45			05:42		06:08 (WEA 5)	05:05		06:03 (WEA 5)
	16:32	17:27	18:20	15	07:39 (WEA 1)	20:15			21:07	5	06:13 (WEA 5)	21:49	13	06:16 (WEA 5)
10	08:37	07:56	06:56		07:23 (WEA 1)	06:43			05:41		06:07 (WEA 5)	05:05		06:04 (WEA 5)
	16:34	17:29	18:21	15	07:38 (WEA 1)	20:16			21:09	8	06:15 (WEA 5)	21:50	12	06:16 (WEA 5)
11	08:36	07:54	06:54		07:23 (WEA 1)	06:41			05:39		06:05 (WEA 5)	05:04		06:06 (WEA 5)
	16:35	17:31	18:23	15	07:38 (WEA 1)	20:18			21:10	11	06:16 (WEA 5)	21:50	10	06:16 (WEA 5)
12	08:35	07:52	06:51		07:24 (WEA 1)	06:38			05:37		06:03 (WEA 5)	05:04		06:07 (WEA 5)
	16:37	17:33	18:25	13	07:37 (WEA 1)	20:20			21:12	14	06:17 (WEA 5)	21:51	8	06:15 (WEA 5)
13	08:34	07:50	06:49		07:24 (WEA 1)	06:36			05:35		06:02 (WEA 5)	05:03		06:07 (WEA 5)
	16:38	17:35	18:27	11	07:35 (WEA 1)	20:22			21:14	16	06:18 (WEA 5)	21:52	7	06:14 (WEA 5)
14	08:34	07:48	06:47		07:26 (WEA 1)	06:34			05:34		06:00 (WEA 5)	05:03		06:09 (WEA 5)
	16:40	17:36	18:29	7	07:33 (WEA 1)	20:24			21:15	18	06:18 (WEA 5)	21:52	4	06:13 (WEA 5)
15	08:33	07:46	06:44			06:32		06:55 (WEA 4)	05:32		05:59 (WEA 5)	05:03		
	16:41	17:38	18:30			20:25	5	07:00 (WEA 4)	21:17	20	06:19 (WEA 5)	21:53		
16	08:32	07:44	06:42			06:29		06:53 (WEA 4)	05:31		05:58 (WEA 5)	05:03		
	16:43	17:40	18:32			20:27	9	07:02 (WEA 4)	21:18	22	06:20 (WEA 5)	21:54		
17	08:31	07:42	06:40			06:27		06:51 (WEA 4)	05:29		05:56 (WEA 5)	05:03		
	16:45	17:42	18:34			20:29	12	07:03 (WEA 4)	21:20	24	06:20 (WEA 5)	21:54		
18	08:30	07:40	06:37			06:25		06:49 (WEA 4)	05:28		05:55 (WEA 5)	05:03		
	16:46	17:44	18:36			20:31	15	07:04 (WEA 4)	21:21	26	06:21 (WEA 5)	21:54		
19	08:29	07:38	06:35		06:58 (WEA 2)	06:23		06:46 (WEA 4)	05:26		05:54 (WEA 5)	05:03		
	16:48	17:46	18:38	9	07:07 (WEA 2)	20:32	18	07:04 (WEA 4)	21:23	26	06:20 (WEA 5)	21:55		
20	08:28	07:36	06:32		06:57 (WEA 2)	06:21		06:44 (WEA 4)	05:25		05:54 (WEA 5)	05:03		
	16:50	17:48	18:39	12	07:09 (WEA 2)	20:34	20	07:04 (WEA 4)	21:25	27	06:21 (WEA 5)	21:55		
21	08:27	07:34	06:30		06:55 (WEA 2)	06:18		06:42 (WEA 4)	05:23		05:54 (WEA 5)	05:03		
	16:51	17:50	18:41	14	07:09 (WEA 2)	20:36	22	07:04 (WEA 4)	21:26	27	06:21 (WEA 5)	21:55		
22	08:26	07:32	06:28		06:54 (WEA 2)	06:16		06:40 (WEA 4)	05:22		05:55 (WEA 5)	05:03		
	16:53	17:52	18:43	16	07:10 (WEA 2)	20:38	24	07:04 (WEA 4)	21:28	26	06:21 (WEA 5)	21:56		
23	08:24	07:30	06:25		06:53 (WEA 2)	06:14		06:40 (WEA 4)	05:21		05:55 (WEA 5)	05:03		
	16:55	17:54	18:45	16	07:09 (WEA 2)	20:39	24	07:04 (WEA 4)	21:29	26	06:21 (WEA 5)	21:56		
24	08:23	07:27	06:23		06:53 (WEA 2)	06:12		06:40 (WEA 4)	05:19		05:54 (WEA 5)	05:04		
	16:57	17:55	18:46	16	07:09 (WEA 2)	20:41	24	07:04 (WEA 4)	21:30	26	06:20 (WEA 5)	21:56		
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		06:40 (WEA 4)	05:18		05:55 (WEA 5)	05:04		
	16:59	17:57	18:48	16	07:09 (WEA 2)	20:43	23	07:03 (WEA 4)	21:32	25	06:20 (WEA 5)	21:56		
26	08:20	07:23	06:18		06:53 (WEA 2)	06:08		06:40 (WEA 4)	05:17		05:55 (WEA 5)	05:04		
	17:00	17:59	18:50	14	07:07 (WEA 2)	20:45	22	07:02 (WEA 4)	21:33	25	06:20 (WEA 5)	21:56		
27	08:19	07:21	06:16		06:54 (WEA 2)	06:06		06:41 (WEA 4)	05:16		05:55 (WEA 5)	05:05		
	17:02	18:01	18:52	12	07:06 (WEA 2)	20:46	20	07:01 (WEA 4)	21:34	25	06:20 (WEA 5)	21:56		
28	08:18	07:19	06:14		06:56 (WEA 2)	06:04		06:41 (WEA 4)	05:15		05:56 (WEA 5)	05:05		06:12 (WEA 5)
	17:04	18:03	18:54	7	07:03 (WEA 2)	20:48	19	07:00 (WEA 4)	21:36	24	06:20 (WEA 5)	21:56	4	06:16 (WEA 5)
29	08:16		07:11			06:02		06:42 (WEA 4)	05:13		05:56 (WEA 5)	05:06		06:12 (WEA 5)
	17:06		19:55			20:50	17	06:59 (WEA 4)	21:37	24	06:20 (WEA 5)	21:56	6	06:18 (WEA 5)
30	08:15		07:09		07:37 (WEA 3)	06:00		06:44 (WEA 4)	05:12		05:57 (WEA 5)	05:07		06:10 (WEA 5)
	17:08		19:57	4	07:41 (WEA 3)	20:52	13	06:57 (WEA 4)	21:38	23	06:20 (WEA 5)	21:55	8	06:18 (WEA 5)
31	08:13		07:06		07:33 (WEA 3)				05:12		05:58 (WEA 5)			
	17:10		19:59	10	07:43 (WEA 3)				21:40	22	06:20 (WEA 5)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				254			391			498			216	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-35 - SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:10 (WEA 5)	05:45		06:14 (WEA 5)	06:37			07:27		08:03 (WEA 1)	07:23	08:15
	21:55	9	06:19 (WEA 5)	21:22	13	06:27 (WEA 5)	20:18			19:07	13	08:16 (WEA 1)	16:59	16:17
2	05:08		06:10 (WEA 5)	05:47		06:16 (WEA 5)	06:38			07:29		08:02 (WEA 1)	07:25	08:17
	21:55	11	06:21 (WEA 5)	21:20	10	06:26 (WEA 5)	20:16			19:05	14	08:16 (WEA 1)	16:57	16:16
3	05:09		06:09 (WEA 5)	05:48		06:17 (WEA 5)	06:40			07:31		08:01 (WEA 1)	07:26	08:18
	21:54	12	06:21 (WEA 5)	21:18	7	06:24 (WEA 5)	20:13			19:02	15	08:16 (WEA 1)	16:55	16:16
4	05:09		06:08 (WEA 5)	05:50		06:19 (WEA 5)	06:42		07:29 (WEA 3)	07:32		08:01 (WEA 1)	07:28	08:20
	21:54	14	06:22 (WEA 5)	21:17	3	06:22 (WEA 5)	20:11	8	07:37 (WEA 3)	19:00	15	08:16 (WEA 1)	16:53	16:15
5	05:10		06:08 (WEA 5)	05:51			06:43		07:28 (WEA 3)	07:34		08:01 (WEA 1)	07:30	08:21
	21:53	15	06:23 (WEA 5)	21:15			20:09	11	07:39 (WEA 3)	18:58	14	08:15 (WEA 1)	16:52	16:15
6	05:11		06:08 (WEA 5)	05:53			06:45		07:26 (WEA 3)	07:36		08:02 (WEA 1)	07:32	08:22
	21:53	16	06:24 (WEA 5)	21:13			20:06	13	07:39 (WEA 3)	18:55	12	08:14 (WEA 1)	16:50	16:14
7	05:12		06:08 (WEA 5)	05:55			06:47		07:25 (WEA 3)	07:38		08:03 (WEA 1)	07:34	08:24
	21:52	17	06:25 (WEA 5)	21:11			20:04	15	07:40 (WEA 3)	18:53	9	08:12 (WEA 1)	16:48	16:14
8	05:13		06:06 (WEA 5)	05:56			06:48		07:24 (WEA 3)	07:39		08:05 (WEA 1)	07:36	08:25
	21:52	19	06:25 (WEA 5)	21:09			20:02	15	07:39 (WEA 3)	18:51	5	08:10 (WEA 1)	16:46	16:13
9	05:14		06:06 (WEA 5)	05:58			06:50		07:24 (WEA 3)	07:41			07:38	08:26
	21:51	19	06:25 (WEA 5)	21:07			19:59	15	07:39 (WEA 3)	18:48			16:45	16:13
10	05:15		06:06 (WEA 5)	06:00			06:52		07:24 (WEA 3)	07:43			07:39	08:27
	21:50	20	06:26 (WEA 5)	21:05			19:57	15	07:39 (WEA 3)	18:46			16:43	16:13
11	05:16		06:06 (WEA 5)	06:01			06:53		07:24 (WEA 3)	07:45			07:41	08:28
	21:49	21	06:27 (WEA 5)	21:03			19:55	13	07:37 (WEA 3)	18:44			16:41	16:13
12	05:17		06:05 (WEA 5)	06:03		06:53 (WEA 4)	06:55		07:25 (WEA 3)	07:46			07:43	08:29
	21:48	22	06:27 (WEA 5)	21:02	11	07:04 (WEA 4)	19:52	11	07:36 (WEA 3)	18:41			16:40	16:12
13	05:18		06:05 (WEA 5)	06:05		06:52 (WEA 4)	06:57		07:28 (WEA 3)	07:48			07:45	08:30
	21:47	23	06:28 (WEA 5)	21:00	14	07:06 (WEA 4)	19:50	5	07:33 (WEA 3)	18:39			16:38	16:12
14	05:20		06:06 (WEA 5)	06:06		06:49 (WEA 4)	06:58			07:50			07:47	08:31
	21:47	23	06:29 (WEA 5)	20:57	18	07:07 (WEA 4)	19:47			18:37			16:37	16:12
15	05:21		06:05 (WEA 5)	06:08		06:49 (WEA 4)	07:00		07:47 (WEA 2)	07:52			07:49	08:32
	21:46	24	06:29 (WEA 5)	20:55	19	07:08 (WEA 4)	19:45	5	07:52 (WEA 2)	18:35			16:35	16:12
16	05:22		06:05 (WEA 5)	06:10		06:48 (WEA 4)	07:02		07:43 (WEA 2)	07:54			07:50	08:33
	21:44	25	06:30 (WEA 5)	20:53	21	07:09 (WEA 4)	19:43	11	07:54 (WEA 2)	18:32			16:34	16:12
17	05:23		06:05 (WEA 5)	06:11		06:47 (WEA 4)	07:03		07:42 (WEA 2)	07:55			07:52	08:34
	21:43	25	06:30 (WEA 5)	20:51	22	07:09 (WEA 4)	19:40	13	07:55 (WEA 2)	18:30			16:32	16:13
18	05:25		06:04 (WEA 5)	06:13		06:46 (WEA 4)	07:05		07:41 (WEA 2)	07:57			07:54	08:35
	21:42	26	06:30 (WEA 5)	20:49	24	07:10 (WEA 4)	19:38	15	07:56 (WEA 2)	18:28			16:31	16:13
19	05:26		06:05 (WEA 5)	06:15		06:45 (WEA 4)	07:07		07:39 (WEA 2)	07:59			07:56	08:36
	21:41	26	06:31 (WEA 5)	20:47	24	07:09 (WEA 4)	19:36	16	07:55 (WEA 2)	18:26			16:29	16:13
20	05:27		06:05 (WEA 5)	06:16		06:45 (WEA 4)	07:08		07:39 (WEA 2)	08:01			07:57	08:36
	21:40	26	06:31 (WEA 5)	20:45	25	07:10 (WEA 4)	19:33	17	07:56 (WEA 2)	18:24			16:28	16:13
21	05:29		06:04 (WEA 5)	06:18		06:46 (WEA 4)	07:10		07:39 (WEA 2)	08:03			07:59	08:37
	21:38	27	06:31 (WEA 5)	20:43	24	07:10 (WEA 4)	19:31	16	07:55 (WEA 2)	18:21			16:27	16:14
22	05:30		06:04 (WEA 5)	06:20		06:47 (WEA 4)	07:12		07:39 (WEA 2)	08:04			08:01	08:37
	21:37	27	06:31 (WEA 5)	20:41	22	07:09 (WEA 4)	19:28	15	07:54 (WEA 2)	18:19			16:26	16:14
23	05:31		06:05 (WEA 5)	06:21		06:49 (WEA 4)	07:14		07:40 (WEA 2)	08:06			08:03	08:38
	21:36	26	06:31 (WEA 5)	20:38	20	07:09 (WEA 4)	19:26	13	07:53 (WEA 2)	18:17			16:25	16:15
24	05:33		06:04 (WEA 5)	06:23		06:50 (WEA 4)	07:15		07:41 (WEA 2)	08:08			08:04	08:38
	21:34	27	06:31 (WEA 5)	20:36	17	07:07 (WEA 4)	19:24	10	07:51 (WEA 2)	18:15			16:23	16:15
25	05:34		06:04 (WEA 5)	06:25		06:52 (WEA 4)	07:17		07:45 (WEA 2)	07:10			08:06	08:39
	21:33	27	06:31 (WEA 5)	20:34	15	07:07 (WEA 4)	19:21	3	07:48 (WEA 2)	17:13			16:22	16:16
26	05:36		06:06 (WEA 5)	06:26		06:54 (WEA 4)	07:19			07:12			08:08	08:39
	21:31	25	06:31 (WEA 5)	20:32	12	07:06 (WEA 4)	19:19			17:11			16:21	16:17
27	05:37		06:07 (WEA 5)	06:28		06:55 (WEA 4)	07:20			07:14			08:09	08:39
	21:30	23	06:30 (WEA 5)	20:29	9	07:04 (WEA 4)	19:16			17:09			16:20	16:18
28	05:39		06:09 (WEA 5)	06:30		06:57 (WEA 4)	07:22			07:15			08:11	08:39
	21:28	22	06:31 (WEA 5)	20:27	5	07:02 (WEA 4)	19:14			17:07			16:20	16:18
29	05:40		06:10 (WEA 5)	06:31			07:24		08:08 (WEA 1)	07:17			08:12	08:40
	21:27	20	06:30 (WEA 5)	20:25			19:12	3	08:11 (WEA 1)	17:05			16:19	16:19
30	05:42		06:12 (WEA 5)	06:33			07:25		08:05 (WEA 1)	07:19			08:14	08:40
	21:25	18	06:30 (WEA 5)	20:23			19:09	9	08:14 (WEA 1)	17:03			16:18	16:20
31	05:43		06:13 (WEA 5)	06:35						07:21				08:40
	21:24	15	06:28 (WEA 5)	20:20						17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		650			335			267			97			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-36 - SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar			März			April			Mai			Juni
1	08:40	08:11			07:16		07:51 (WEA 2)	07:04		07:43 (WEA 4)	05:57		06:54 (WEA 5)	05:11
	16:22	17:12			18:05	17	08:08 (WEA 2)	20:01	24	08:07 (WEA 4)	20:53	22	07:16 (WEA 5)	21:41
2	08:40	08:10			07:14		07:45 (WEA 3)	07:02		07:44 (WEA 4)	05:56		06:56 (WEA 5)	05:10
	16:23	17:13			18:07	22	08:07 (WEA 2)	20:02	22	08:06 (WEA 4)	20:55	19	07:15 (WEA 5)	21:42
3	08:39	08:08			07:12		07:43 (WEA 3)	06:59		07:44 (WEA 4)	05:54		06:58 (WEA 5)	05:09
	16:25	17:15			18:09	24	08:07 (WEA 2)	20:04	19	08:03 (WEA 4)	20:57	15	07:13 (WEA 5)	21:43
4	08:39	08:07			07:10		07:41 (WEA 3)	06:57		07:47 (WEA 4)	05:52		07:01 (WEA 5)	05:08
	16:26	17:17			18:10	23	08:04 (WEA 2)	20:06	14	08:01 (WEA 4)	20:58	8	07:09 (WEA 5)	21:44
5	08:39	08:05			07:07		07:40 (WEA 3)	06:55		07:50 (WEA 4)	05:50			05:07
	16:27	17:19			18:12	22	08:02 (WEA 2)	20:08	7	07:57 (WEA 4)	21:00			21:45
6	08:38	08:03			07:05		07:40 (WEA 3)	06:52			05:48			05:07
	16:28	17:21			18:14	17	07:57 (WEA 3)	20:09			21:02			21:46
7	08:38	08:01			07:03		07:39 (WEA 3)	06:50			05:46			05:06
	16:30	17:23			18:16	17	07:56 (WEA 3)	20:11			21:04			21:47
8	08:38	08:00			07:01		07:39 (WEA 3)	06:48			05:44			05:05
	16:31	17:25			18:18	17	07:56 (WEA 3)	20:13			21:05			21:48
9	08:37	07:58			06:58		07:40 (WEA 3)	06:45			05:42			05:05
	16:32	17:27			18:20	15	07:55 (WEA 3)	20:15			21:07			21:49
10	08:37	07:56			06:56		07:40 (WEA 3)	06:43			05:41			05:05
	16:34	17:29			18:21	14	07:54 (WEA 3)	20:16			21:09			21:50
11	08:36	07:54		08:19 (WEA 1)	06:54		07:41 (WEA 3)	06:41		07:04 (WEA 5)	05:39			05:04
	16:35	17:31	7	08:26 (WEA 1)	18:23	11	07:52 (WEA 3)	20:18	13	07:17 (WEA 5)	21:10			21:50
12	08:35	07:52		08:17 (WEA 1)	06:51		07:44 (WEA 3)	06:38		07:02 (WEA 5)	05:37			05:04
	16:37	17:33	10	08:27 (WEA 1)	18:25	6	07:50 (WEA 3)	20:20	17	07:19 (WEA 5)	21:12			21:51
13	08:34	07:50		08:15 (WEA 1)	06:49			06:36		07:00 (WEA 5)	05:35			05:03
	16:38	17:35	14	08:29 (WEA 1)	18:27			20:22	21	07:21 (WEA 5)	21:14			21:52
14	08:34	07:48		08:15 (WEA 1)	06:47			06:34		06:57 (WEA 5)	05:34			05:03
	16:40	17:36	14	08:29 (WEA 1)	18:29			20:24	24	07:21 (WEA 5)	21:15			21:52
15	08:33	07:46		08:15 (WEA 1)	06:44			06:32		06:55 (WEA 5)	05:32			05:03
	16:41	17:38	15	08:30 (WEA 1)	18:30			20:25	27	07:22 (WEA 5)	21:17			21:53
16	08:32	07:44		08:15 (WEA 1)	06:42			06:29		06:54 (WEA 5)	05:31			05:03
	16:43	17:40	15	08:30 (WEA 1)	18:32			20:27	29	07:23 (WEA 5)	21:18			21:54
17	08:31	07:42		08:15 (WEA 1)	06:40			06:27		06:53 (WEA 5)	05:29			05:03
	16:45	17:42	15	08:30 (WEA 1)	18:34			20:29	31	07:24 (WEA 5)	21:20			21:54
18	08:30	07:40		08:15 (WEA 1)	06:37			06:25		06:52 (WEA 5)	05:28			05:03
	16:46	17:44	14	08:29 (WEA 1)	18:36			20:31	32	07:24 (WEA 5)	21:22			21:54
19	08:29	07:38		08:16 (WEA 1)	06:35		06:58 (WEA 4)	06:23		06:51 (WEA 5)	05:26			05:03
	16:48	17:46	12	08:28 (WEA 1)	18:38	7	07:05 (WEA 4)	20:32	32	07:23 (WEA 5)	21:23			21:55
20	08:28	07:36		08:18 (WEA 1)	06:32		06:56 (WEA 4)	06:21		06:50 (WEA 5)	05:25			05:03
	16:50	17:48	9	08:27 (WEA 1)	18:39	12	07:08 (WEA 4)	20:34	34	07:24 (WEA 5)	21:25			21:55
21	08:27	07:34		08:21 (WEA 1)	06:30		06:53 (WEA 4)	06:18		06:50 (WEA 5)	05:23			05:03
	16:51	17:50	1	08:22 (WEA 1)	18:41	16	07:09 (WEA 4)	20:36	34	07:24 (WEA 5)	21:26			21:55
22	08:26	07:32		07:59 (WEA 2)	06:28		06:51 (WEA 4)	06:16		06:50 (WEA 5)	05:22			05:03
	16:53	17:52	3	08:02 (WEA 2)	18:43	19	07:10 (WEA 4)	20:38	33	07:23 (WEA 5)	21:28			21:56
23	08:24	07:30		07:56 (WEA 2)	06:25		06:48 (WEA 4)	06:14		06:50 (WEA 5)	05:21			05:03
	16:55	17:54	10	08:06 (WEA 2)	18:45	22	07:10 (WEA 4)	20:39	33	07:23 (WEA 5)	21:29			21:56
24	08:23	07:27		07:54 (WEA 2)	06:23		06:46 (WEA 4)	06:12		06:50 (WEA 5)	05:19			05:04
	16:57	17:55	13	08:07 (WEA 2)	18:46	25	07:11 (WEA 4)	20:41	33	07:23 (WEA 5)	21:30			21:56
25	08:22	07:25		07:52 (WEA 2)	06:21		06:44 (WEA 4)	06:10		06:50 (WEA 5)	05:18			05:04
	16:59	17:57	16	08:08 (WEA 2)	18:48	27	07:11 (WEA 4)	20:43	32	07:22 (WEA 5)	21:32			21:56
26	08:20	07:23		07:52 (WEA 2)	06:18		06:43 (WEA 4)	06:08		06:50 (WEA 5)	05:17			05:04
	17:00	17:59	16	08:08 (WEA 2)	18:50	28	07:11 (WEA 4)	20:45	32	07:22 (WEA 5)	21:33			21:56
27	08:19	07:21		07:51 (WEA 2)	06:16		06:42 (WEA 4)	06:06		06:51 (WEA 5)	05:16			05:05
	17:02	18:01	18	08:09 (WEA 2)	18:52	29	07:11 (WEA 4)	20:46	30	07:21 (WEA 5)	21:35			21:56
28	08:18	07:19		07:52 (WEA 2)	06:13		06:42 (WEA 4)	06:04		06:51 (WEA 5)	05:15			05:05
	17:04	18:03	17	08:09 (WEA 2)	18:54	28	07:10 (WEA 4)	20:48	29	07:20 (WEA 5)	21:36			21:56
29	08:16				07:11		07:42 (WEA 4)	06:02		06:52 (WEA 5)	05:13			05:06
	17:06				19:55	28	08:10 (WEA 4)	20:50	27	07:19 (WEA 5)	21:37			21:56
30	08:15				07:09		07:42 (WEA 4)	05:59		06:53 (WEA 5)	05:12			05:07
	17:08				19:57	27	08:09 (WEA 4)	20:52	24	07:17 (WEA 5)	21:38			21:55
31	08:13				07:06		07:42 (WEA 4)				05:11			
	17:10				19:59	26	08:08 (WEA 4)				21:40			
Sonnenscheinstunden	255	276			367			418			489			503
astr.max.mögl.Beschattung			219			499			653			64		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-36 - SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August			September			Oktober			November	Dezember
1	05:07	05:45			06:37		07:03 (WEA 5)	07:27			07:23	08:15
	21:55	21:22			20:18	12	07:15 (WEA 5)	19:07			16:59	16:17
2	05:08	05:47			06:38			07:29		08:21 (WEA 3)	07:25	08:17
	21:55	21:20			20:16			19:05	9	08:30 (WEA 3)	16:57	16:16
3	05:09	05:48			06:40			07:31		08:18 (WEA 3)	07:26	08:18
	21:54	21:18			20:13			19:02	13	08:31 (WEA 3)	16:55	16:16
4	05:09	05:50			06:42			07:32		08:17 (WEA 3)	07:28	08:20
	21:54	21:17			20:11			19:00	15	08:32 (WEA 3)	16:53	16:15
5	05:10	05:51			06:43			07:34		08:16 (WEA 3)	07:30	08:21
	21:53	21:15			20:09			18:57	17	08:33 (WEA 3)	16:52	16:15
6	05:11	05:53			06:45			07:36		08:16 (WEA 3)	07:32	08:22
	21:53	21:13			20:06			18:55	17	08:33 (WEA 3)	16:50	16:14
7	05:12	05:55			06:47		07:46 (WEA 4)	07:38		08:15 (WEA 3)	07:34	08:24
	21:52	21:11			20:04	6	07:52 (WEA 4)	18:53	17	08:32 (WEA 3)	16:48	16:14
8	05:13	05:56			06:48		07:41 (WEA 4)	07:39		08:15 (WEA 3)	07:36	08:25
	21:52	21:09			20:02	14	07:55 (WEA 4)	18:51	16	08:31 (WEA 3)	16:46	16:13
9	05:14	05:58		07:09 (WEA 5)	06:50		07:39 (WEA 4)	07:41		08:16 (WEA 3)	07:38	08:26
	21:51	21:07	11	07:20 (WEA 5)	19:59	18	07:57 (WEA 4)	18:48	22	08:38 (WEA 2)	16:45	16:13
10	05:15	06:00		07:06 (WEA 5)	06:52		07:37 (WEA 4)	07:43		08:16 (WEA 3)	07:39	08:27
	21:50	21:05	16	07:22 (WEA 5)	19:57	22	07:59 (WEA 4)	18:46	24	08:40 (WEA 2)	16:43	16:13
11	05:16	06:01		07:04 (WEA 5)	06:53		07:35 (WEA 4)	07:45		08:18 (WEA 3)	07:41	08:28
	21:49	21:03	20	07:24 (WEA 5)	19:55	24	07:59 (WEA 4)	18:44	23	08:41 (WEA 2)	16:41	16:12
12	05:17	06:03		07:02 (WEA 5)	06:55		07:34 (WEA 4)	07:46		08:22 (WEA 3)	07:43	08:29
	21:48	21:02	23	07:25 (WEA 5)	19:52	26	08:00 (WEA 4)	18:41	19	08:42 (WEA 2)	16:40	16:12
13	05:18	06:05		07:01 (WEA 5)	06:57		07:34 (WEA 4)	07:48		08:24 (WEA 2)	07:45	08:30
	21:47	21:00	25	07:26 (WEA 5)	19:50	26	08:00 (WEA 4)	18:39	17	08:41 (WEA 2)	16:38	16:12
14	05:19	06:06		06:59 (WEA 5)	06:58		07:32 (WEA 4)	07:50		08:24 (WEA 2)	07:47	08:31
	21:47	20:57	27	07:26 (WEA 5)	19:47	28	08:00 (WEA 4)	18:37	17	08:41 (WEA 2)	16:37	16:12
15	05:21	06:08		06:59 (WEA 5)	07:00		07:32 (WEA 4)	07:52		08:24 (WEA 2)	07:49	08:32
	21:46	20:55	29	07:28 (WEA 5)	19:45	28	08:00 (WEA 4)	18:35	17	08:41 (WEA 2)	16:35	16:12
16	05:22	06:10		06:58 (WEA 5)	07:02		07:31 (WEA 4)	07:54		08:24 (WEA 2)	07:50	08:33
	21:44	20:53	30	07:28 (WEA 5)	19:43	28	07:59 (WEA 4)	18:32	16	08:40 (WEA 2)	16:34	16:12
17	05:23	06:11		06:57 (WEA 5)	07:03		07:31 (WEA 4)	07:55		08:25 (WEA 2)	07:52	08:34
	21:43	20:51	31	07:28 (WEA 5)	19:40	28	07:59 (WEA 4)	18:30	15	08:40 (WEA 2)	16:32	16:13
18	05:24	06:13		06:57 (WEA 5)	07:05		07:31 (WEA 4)	07:57		08:26 (WEA 2)	07:54	08:35
	21:42	20:49	32	07:29 (WEA 5)	19:38	28	07:59 (WEA 4)	18:28	12	08:38 (WEA 2)	16:31	16:13
19	05:26	06:15		06:56 (WEA 5)	07:07		07:32 (WEA 4)	07:59		08:28 (WEA 2)	07:56	08:36
	21:41	20:47	32	07:28 (WEA 5)	19:36	25	07:57 (WEA 4)	18:26	8	08:36 (WEA 2)	16:29	16:13
20	05:27	06:16		06:56 (WEA 5)	07:08		07:34 (WEA 4)	08:01			07:57	08:36
	21:40	20:45	33	07:29 (WEA 5)	19:33	23	07:57 (WEA 4)	18:24			16:28	16:13
21	05:29	06:18		06:55 (WEA 5)	07:10		07:36 (WEA 4)	08:03		08:50 (WEA 1)	07:59	08:37
	21:38	20:43	33	07:28 (WEA 5)	19:31	20	07:56 (WEA 4)	18:21	6	08:56 (WEA 1)	16:27	16:14
22	05:30	06:20		06:55 (WEA 5)	07:12		07:37 (WEA 4)	08:04		08:47 (WEA 1)	08:01	08:37
	21:37	20:41	33	07:28 (WEA 5)	19:28	17	07:54 (WEA 4)	18:19	10	08:57 (WEA 1)	16:26	16:14
23	05:31	06:21		06:55 (WEA 5)	07:14		07:39 (WEA 4)	08:06		08:45 (WEA 1)	08:03	08:38
	21:36	20:38	33	07:28 (WEA 5)	19:26	13	07:52 (WEA 4)	18:17	13	08:58 (WEA 1)	16:25	16:15
24	05:33	06:23		06:55 (WEA 5)	07:15		07:41 (WEA 4)	08:08		08:45 (WEA 1)	08:04	08:38
	21:34	20:36	32	07:27 (WEA 5)	19:24	9	07:50 (WEA 4)	18:15	14	08:59 (WEA 1)	16:23	16:15
25	05:34	06:25		06:55 (WEA 5)	07:17		07:43 (WEA 4)	07:10		07:44 (WEA 1)	08:06	08:39
	21:33	20:34	32	07:27 (WEA 5)	19:21	2	07:45 (WEA 4)	17:13	15	07:59 (WEA 1)	16:22	16:16
26	05:36	06:26		06:55 (WEA 5)	07:19			07:12		07:44 (WEA 1)	08:08	08:39
	21:31	20:32	30	07:25 (WEA 5)	19:19			17:11	15	07:59 (WEA 1)	16:21	16:17
27	05:37	06:28		06:56 (WEA 5)	07:20			07:14		07:44 (WEA 1)	08:09	08:39
	21:30	20:29	29	07:25 (WEA 5)	19:16			17:09	15	07:59 (WEA 1)	16:20	16:18
28	05:39	06:30		06:57 (WEA 5)	07:22			07:15		07:44 (WEA 1)	08:11	08:39
	21:28	20:27	27	07:24 (WEA 5)	19:14			17:07	15	07:59 (WEA 1)	16:19	16:18
29	05:40	06:31		06:58 (WEA 5)	07:24			07:17		07:45 (WEA 1)	08:12	08:40
	21:27	20:25	24	07:22 (WEA 5)	19:12			17:05	13	07:58 (WEA 1)	16:19	16:19
30	05:42	06:33		07:00 (WEA 5)	07:25			07:19		07:47 (WEA 1)	08:14	08:40
	21:25	20:23	21	07:21 (WEA 5)	19:09			17:03	10	07:57 (WEA 1)	16:18	16:20
31	05:43	06:35		07:02 (WEA 5)				07:21		07:49 (WEA 1)		08:40
	21:24	20:20	17	07:19 (WEA 5)				17:01	6	07:55 (WEA 1)		16:21
Sonnenscheinstunden	506	456			381			330			263	240
astr.max.mögl.Beschattung			620			397			426			

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-37 - SR-37, Weidenweg 1A, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		13:41 (WEA 5)	08:11		14:03 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	60	14:41 (WEA 5)	17:11	38	14:41 (WEA 5)	18:05	20:01	20:53	21:41
2	08:39		13:41 (WEA 5)	08:10		14:05 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	61	14:42 (WEA 5)	17:13	35	14:40 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		13:41 (WEA 5)	08:08		14:07 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	61	14:42 (WEA 5)	17:15	31	14:38 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		13:42 (WEA 5)	08:06		14:10 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	61	14:43 (WEA 5)	17:17	26	14:36 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		13:43 (WEA 5)	08:05		14:13 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	61	14:44 (WEA 5)	17:19	20	14:33 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		13:43 (WEA 5)	08:03		14:19 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	61	14:44 (WEA 5)	17:21	8	14:27 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		13:43 (WEA 5)	08:01			07:03	06:50	05:46	05:06
	16:29	61	14:44 (WEA 5)	17:23			18:16	20:11	21:04	21:47
8	08:38		13:44 (WEA 5)	07:59			07:00	06:48	05:44	05:05
	16:31	61	14:45 (WEA 5)	17:25			18:18	20:13	21:05	21:48
9	08:37		13:44 (WEA 5)	07:58			06:58	06:45	05:42	05:05
	16:32	61	14:45 (WEA 5)	17:27			18:19	20:15	21:07	21:49
10	08:36		13:44 (WEA 5)	07:56			06:56	06:43	05:40	05:04
	16:34	61	14:45 (WEA 5)	17:29			18:21	20:16	21:09	21:50
11	08:36		13:45 (WEA 5)	07:54			06:54	06:41	05:39	05:04
	16:35	60	14:45 (WEA 5)	17:31			18:23	20:18	21:10	21:50
12	08:35		13:46 (WEA 5)	07:52			06:51	06:38	05:37	05:04
	16:37	60	14:46 (WEA 5)	17:33			18:25	20:20	21:12	21:51
13	08:34		13:46 (WEA 5)	07:50			06:49	06:36	05:35	05:03
	16:38	60	14:46 (WEA 5)	17:34			18:27	20:22	21:14	21:52
14	08:34		13:47 (WEA 5)	07:48			06:47	06:34	05:34	05:03
	16:40	60	14:47 (WEA 5)	17:36			18:29	20:23	21:15	21:52
15	08:33		13:47 (WEA 5)	07:46			06:44	06:32	05:32	05:03
	16:41	60	14:47 (WEA 5)	17:38			18:30	20:25	21:17	21:53
16	08:32		13:48 (WEA 5)	07:44			06:42	06:29	05:30	05:03
	16:43	59	14:47 (WEA 5)	17:40			18:32	20:27	21:18	21:54
17	08:31		13:48 (WEA 5)	07:42			06:39	06:27	05:29	05:03
	16:44	59	14:47 (WEA 5)	17:42			18:34	20:29	21:20	21:54
18	08:30		13:49 (WEA 5)	07:40			06:37	06:25	05:27	05:03
	16:46	58	14:47 (WEA 5)	17:44			18:36	20:31	21:21	21:54
19	08:29		13:49 (WEA 5)	07:38			06:35	06:23	05:26	05:03
	16:48	58	14:47 (WEA 5)	17:46			18:38	20:32	21:23	21:55
20	08:28		13:50 (WEA 5)	07:36			06:32	06:20	05:25	05:03
	16:50	57	14:47 (WEA 5)	17:48			18:39	20:34	21:25	21:55
21	08:27		13:50 (WEA 5)	07:34			06:30	06:18	05:23	05:03
	16:51	57	14:47 (WEA 5)	17:50			18:41	20:36	21:26	21:55
22	08:26		13:51 (WEA 5)	07:32			06:28	06:16	05:22	05:03
	16:53	56	14:47 (WEA 5)	17:52			18:43	20:38	21:27	21:56
23	08:24		13:53 (WEA 5)	07:30			06:25	06:14	05:20	05:03
	16:55	54	14:47 (WEA 5)	17:53			18:45	20:39	21:29	21:56
24	08:23		13:53 (WEA 5)	07:27			06:23	06:12	05:19	05:04
	16:57	53	14:46 (WEA 5)	17:55			18:46	20:41	21:30	21:56
25	08:22		13:54 (WEA 5)	07:25			06:21	06:10	05:18	05:04
	16:58	53	14:47 (WEA 5)	17:57			18:48	20:43	21:32	21:56
26	08:20		13:55 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	51	14:46 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		13:56 (WEA 5)	07:21			06:16	06:06	05:16	05:05
	17:02	50	14:46 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:18		13:57 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	48	14:45 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		13:58 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	46	14:44 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		14:00 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	44	14:44 (WEA 5)				19:57	20:52	21:38	21:55
31	08:13		14:01 (WEA 5)				07:06		05:11	
	17:10	41	14:42 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		1753			158					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-37 - SR-37, Weidenweg 1A, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November			Dezember		
1	05:07	05:45	06:36	07:27	07:23			08:15		13:27 (WEA 5)
	21:55	21:22	20:18	19:07	16:59			16:17	60	14:27 (WEA 5)
2	05:08	05:46	06:38	07:29	07:25			08:17		13:27 (WEA 5)
	21:55	21:20	20:16	19:04	16:57			16:16	61	14:28 (WEA 5)
3	05:08	05:48	06:40	07:31	07:26			08:18		13:28 (WEA 5)
	21:54	21:18	20:13	19:02	16:55			16:16	61	14:29 (WEA 5)
4	05:09	05:50	06:41	07:32	07:28			08:20		13:28 (WEA 5)
	21:54	21:17	20:11	19:00	16:53			16:15	61	14:29 (WEA 5)
5	05:10	05:51	06:43	07:34	07:30		13:48 (WEA 5)	08:21		13:29 (WEA 5)
	21:53	21:15	20:09	18:57	16:51	10	13:58 (WEA 5)	16:14	61	14:30 (WEA 5)
6	05:11	05:53	06:45	07:36	07:32		13:42 (WEA 5)	08:22		13:29 (WEA 5)
	21:53	21:13	20:06	18:55	16:50	21	14:03 (WEA 5)	16:14	61	14:30 (WEA 5)
7	05:12	05:55	06:47	07:38	07:34		13:39 (WEA 5)	08:24		13:29 (WEA 5)
	21:52	21:11	20:04	18:53	16:48	27	14:06 (WEA 5)	16:14	61	14:30 (WEA 5)
8	05:13	05:56	06:48	07:39	07:36		13:37 (WEA 5)	08:25		13:30 (WEA 5)
	21:52	21:09	20:02	18:50	16:46	31	14:08 (WEA 5)	16:13	61	14:31 (WEA 5)
9	05:14	05:58	06:50	07:41	07:38		13:35 (WEA 5)	08:26		13:30 (WEA 5)
	21:51	21:07	19:59	18:48	16:44	35	14:10 (WEA 5)	16:13	61	14:31 (WEA 5)
10	05:15	05:59	06:52	07:43	07:39		13:33 (WEA 5)	08:27		13:31 (WEA 5)
	21:50	21:05	19:57	18:46	16:43	39	14:12 (WEA 5)	16:13	60	14:31 (WEA 5)
11	05:16	06:01	06:53	07:45	07:41		13:32 (WEA 5)	08:28		13:31 (WEA 5)
	21:49	21:03	19:55	18:44	16:41	41	14:13 (WEA 5)	16:12	60	14:31 (WEA 5)
12	05:17	06:03	06:55	07:46	07:43		13:31 (WEA 5)	08:29		13:31 (WEA 5)
	21:48	21:01	19:52	18:41	16:40	44	14:15 (WEA 5)	16:12	61	14:32 (WEA 5)
13	05:18	06:04	06:57	07:48	07:45		13:30 (WEA 5)	08:30		13:32 (WEA 5)
	21:47	20:59	19:50	18:39	16:38	46	14:16 (WEA 5)	16:12	60	14:32 (WEA 5)
14	05:19	06:06	06:58	07:50	07:47		13:29 (WEA 5)	08:31		13:32 (WEA 5)
	21:46	20:57	19:47	18:37	16:36	48	14:17 (WEA 5)	16:12	60	14:32 (WEA 5)
15	05:21	06:08	07:00	07:52	07:49		13:28 (WEA 5)	08:32		13:33 (WEA 5)
	21:45	20:55	19:45	18:34	16:35	50	14:18 (WEA 5)	16:12	60	14:33 (WEA 5)
16	05:22	06:09	07:02	07:53	07:50		13:28 (WEA 5)	08:33		13:33 (WEA 5)
	21:44	20:53	19:43	18:32	16:33	51	14:19 (WEA 5)	16:12	61	14:34 (WEA 5)
17	05:23	06:11	07:03	07:55	07:52		13:27 (WEA 5)	08:34		13:34 (WEA 5)
	21:43	20:51	19:40	18:30	16:32	53	14:20 (WEA 5)	16:12	60	14:34 (WEA 5)
18	05:24	06:13	07:05	07:57	07:54		13:27 (WEA 5)	08:35		13:35 (WEA 5)
	21:42	20:49	19:38	18:28	16:31	53	14:20 (WEA 5)	16:13	60	14:35 (WEA 5)
19	05:26	06:15	07:07	07:59	07:56		13:27 (WEA 5)	08:35		13:35 (WEA 5)
	21:41	20:47	19:35	18:26	16:29	54	14:21 (WEA 5)	16:13	60	14:35 (WEA 5)
20	05:27	06:16	07:08	08:01	07:57		13:26 (WEA 5)	08:36		13:35 (WEA 5)
	21:40	20:45	19:33	18:23	16:28	56	14:22 (WEA 5)	16:13	60	14:35 (WEA 5)
21	05:28	06:18	07:10	08:02	07:59		13:26 (WEA 5)	08:37		13:36 (WEA 5)
	21:38	20:43	19:31	18:21	16:27	57	14:23 (WEA 5)	16:14	60	14:36 (WEA 5)
22	05:30	06:20	07:12	08:04	08:01		13:26 (WEA 5)	08:37		13:36 (WEA 5)
	21:37	20:41	19:28	18:19	16:26	57	14:23 (WEA 5)	16:14	60	14:36 (WEA 5)
23	05:31	06:21	07:13	08:06	08:03		13:26 (WEA 5)	08:38		13:36 (WEA 5)
	21:36	20:38	19:26	18:17	16:24	58	14:24 (WEA 5)	16:15	60	14:36 (WEA 5)
24	05:33	06:23	07:15	08:08	08:04		13:26 (WEA 5)	08:38		13:37 (WEA 5)
	21:34	20:36	19:23	18:15	16:23	58	14:24 (WEA 5)	16:15	61	14:38 (WEA 5)
25	05:34	06:25	07:17	07:10	08:06		13:26 (WEA 5)	08:39		13:38 (WEA 5)
	21:33	20:34	19:21	17:13	16:22	59	14:25 (WEA 5)	16:16	60	14:38 (WEA 5)
26	05:36	06:26	07:19	07:12	08:08		13:26 (WEA 5)	08:39		13:38 (WEA 5)
	21:31	20:32	19:19	17:11	16:21	59	14:25 (WEA 5)	16:17	60	14:38 (WEA 5)
27	05:37	06:28	07:20	07:13	08:09		13:27 (WEA 5)	08:39		13:38 (WEA 5)
	21:30	20:29	19:16	17:09	16:20	59	14:26 (WEA 5)	16:17	60	14:38 (WEA 5)
28	05:39	06:30	07:22	07:15	08:11		13:27 (WEA 5)	08:39		13:39 (WEA 5)
	21:28	20:27	19:14	17:07	16:19	60	14:27 (WEA 5)	16:18	60	14:39 (WEA 5)
29	05:40	06:31	07:24	07:17	08:12		13:26 (WEA 5)	08:40		13:39 (WEA 5)
	21:27	20:25	19:12	17:05	16:19	61	14:27 (WEA 5)	16:19	60	14:39 (WEA 5)
30	05:42	06:33	07:25	07:19	08:14		13:27 (WEA 5)	08:40		13:39 (WEA 5)
	21:25	20:23	19:09	17:03	16:18	60	14:27 (WEA 5)	16:20	61	14:40 (WEA 5)
31	05:43	06:35		07:21				08:40		13:40 (WEA 5)
	21:24	20:20		17:01				16:21	60	14:40 (WEA 5)
Sonnenscheinstunden	506	456	381	330	263			240		
astr.max.mögl.Beschattung						1247			1872	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-38 - SR-38, Weidenweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		13:47 (WEA 5)	08:11		14:06 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	60	14:47 (WEA 5)	17:11	43	14:49 (WEA 5)	18:05	20:01	20:53	21:41
2	08:39		13:48 (WEA 5)	08:10		14:08 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	60	14:48 (WEA 5)	17:13	40	14:48 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		13:47 (WEA 5)	08:08		14:10 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	61	14:48 (WEA 5)	17:15	37	14:47 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		13:48 (WEA 5)	08:06		14:12 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	61	14:49 (WEA 5)	17:17	33	14:45 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		13:49 (WEA 5)	08:05		14:15 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	60	14:49 (WEA 5)	17:19	28	14:43 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		13:49 (WEA 5)	08:03		14:18 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	60	14:49 (WEA 5)	17:21	22	14:40 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		13:49 (WEA 5)	08:01		14:22 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	61	14:50 (WEA 5)	17:23	14	14:36 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		13:50 (WEA 5)	07:59			07:00	06:48	05:44	05:05
	16:31	61	14:51 (WEA 5)	17:25			18:18	20:13	21:05	21:48
9	08:37		13:50 (WEA 5)	07:58			06:58	06:45	05:42	05:05
	16:32	61	14:51 (WEA 5)	17:27			18:19	20:15	21:07	21:49
10	08:36		13:50 (WEA 5)	07:56			06:56	06:43	05:40	05:04
	16:34	61	14:51 (WEA 5)	17:29			18:21	20:16	21:09	21:50
11	08:36		13:51 (WEA 5)	07:54			06:54	06:41	05:39	05:04
	16:35	60	14:51 (WEA 5)	17:31			18:23	20:18	21:10	21:50
12	08:35		13:52 (WEA 5)	07:52			06:51	06:38	05:37	05:04
	16:37	60	14:52 (WEA 5)	17:33			18:25	20:20	21:12	21:51
13	08:34		13:52 (WEA 5)	07:50			06:49	06:36	05:35	05:03
	16:38	61	14:53 (WEA 5)	17:34			18:27	20:22	21:14	21:52
14	08:34		13:53 (WEA 5)	07:48			06:47	06:34	05:34	05:03
	16:40	60	14:53 (WEA 5)	17:36			18:29	20:23	21:15	21:52
15	08:33		13:53 (WEA 5)	07:46			06:44	06:32	05:32	05:03
	16:41	60	14:53 (WEA 5)	17:38			18:30	20:25	21:17	21:53
16	08:32		13:54 (WEA 5)	07:44			06:42	06:29	05:30	05:03
	16:43	60	14:54 (WEA 5)	17:40			18:32	20:27	21:18	21:54
17	08:31		13:53 (WEA 5)	07:42			06:39	06:27	05:29	05:03
	16:44	60	14:53 (WEA 5)	17:42			18:34	20:29	21:20	21:54
18	08:30		13:54 (WEA 5)	07:40			06:37	06:25	05:27	05:03
	16:46	59	14:53 (WEA 5)	17:44			18:36	20:31	21:21	21:54
19	08:29		13:55 (WEA 5)	07:38			06:35	06:23	05:26	05:03
	16:48	59	14:54 (WEA 5)	17:46			18:38	20:32	21:23	21:55
20	08:28		13:56 (WEA 5)	07:36			06:32	06:20	05:25	05:03
	16:50	58	14:54 (WEA 5)	17:48			18:39	20:34	21:25	21:55
21	08:27		13:56 (WEA 5)	07:34			06:30	06:18	05:23	05:03
	16:51	57	14:53 (WEA 5)	17:50			18:41	20:36	21:26	21:55
22	08:26		13:57 (WEA 5)	07:32			06:28	06:16	05:22	05:03
	16:53	57	14:54 (WEA 5)	17:52			18:43	20:38	21:27	21:56
23	08:24		13:58 (WEA 5)	07:30			06:25	06:14	05:20	05:03
	16:55	56	14:54 (WEA 5)	17:53			18:45	20:39	21:29	21:56
24	08:23		13:58 (WEA 5)	07:27			06:23	06:12	05:19	05:04
	16:57	55	14:53 (WEA 5)	17:55			18:46	20:41	21:30	21:56
25	08:22		13:59 (WEA 5)	07:25			06:21	06:10	05:18	05:04
	16:58	55	14:54 (WEA 5)	17:57			18:48	20:43	21:32	21:56
26	08:20		14:00 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	53	14:53 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		14:01 (WEA 5)	07:21			06:16	06:06	05:16	05:05
	17:02	52	14:53 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:18		14:02 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	50	14:52 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		14:02 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	49	14:51 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		14:04 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	47	14:51 (WEA 5)				19:57	20:52	21:38	21:55
31	08:13		14:05 (WEA 5)				07:06		05:11	
	17:10	45	14:50 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		1779			217					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-38 - SR-38, Weidenweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November			Dezember		
1	05:07	05:45	06:36	07:27	07:23			08:15		13:33 (WEA 5)
	21:55	21:22	20:18	19:07	16:59			16:17	60	14:33 (WEA 5)
2	05:08	05:46	06:38	07:29	07:25			08:17		13:33 (WEA 5)
	21:55	21:20	20:16	19:04	16:57			16:16	61	14:34 (WEA 5)
3	05:08	05:48	06:40	07:31	07:26			08:18		13:34 (WEA 5)
	21:54	21:18	20:13	19:02	16:55			16:16	61	14:35 (WEA 5)
4	05:09	05:50	06:41	07:32	07:28		13:51 (WEA 5)	08:20		13:34 (WEA 5)
	21:54	21:17	20:11	19:00	16:53	15	14:06 (WEA 5)	16:15	61	14:35 (WEA 5)
5	05:10	05:51	06:43	07:34	07:30		13:47 (WEA 5)	08:21		13:35 (WEA 5)
	21:53	21:15	20:09	18:57	16:51	23	14:10 (WEA 5)	16:14	61	14:36 (WEA 5)
6	05:11	05:53	06:45	07:36	07:32		13:44 (WEA 5)	08:22		13:35 (WEA 5)
	21:53	21:13	20:06	18:55	16:50	29	14:13 (WEA 5)	16:14	61	14:36 (WEA 5)
7	05:12	05:55	06:47	07:38	07:34		13:42 (WEA 5)	08:24		13:35 (WEA 5)
	21:52	21:11	20:04	18:53	16:48	33	14:15 (WEA 5)	16:14	61	14:36 (WEA 5)
8	05:13	05:56	06:48	07:39	07:36		13:40 (WEA 5)	08:25		13:36 (WEA 5)
	21:52	21:09	20:02	18:50	16:46	37	14:17 (WEA 5)	16:13	61	14:37 (WEA 5)
9	05:14	05:58	06:50	07:41	07:38		13:39 (WEA 5)	08:26		13:37 (WEA 5)
	21:51	21:07	19:59	18:48	16:44	40	14:19 (WEA 5)	16:13	60	14:37 (WEA 5)
10	05:15	05:59	06:52	07:43	07:39		13:37 (WEA 5)	08:27		13:37 (WEA 5)
	21:50	21:05	19:57	18:46	16:43	43	14:20 (WEA 5)	16:13	60	14:37 (WEA 5)
11	05:16	06:01	06:53	07:45	07:41		13:36 (WEA 5)	08:28		13:37 (WEA 5)
	21:49	21:03	19:55	18:44	16:41	45	14:21 (WEA 5)	16:12	60	14:37 (WEA 5)
12	05:17	06:03	06:55	07:46	07:43		13:35 (WEA 5)	08:29		13:38 (WEA 5)
	21:48	21:01	19:52	18:41	16:40	47	14:22 (WEA 5)	16:12	59	14:37 (WEA 5)
13	05:18	06:04	06:57	07:48	07:45		13:34 (WEA 5)	08:30		13:38 (WEA 5)
	21:47	20:59	19:50	18:39	16:38	49	14:23 (WEA 5)	16:12	60	14:38 (WEA 5)
14	05:19	06:06	06:58	07:50	07:47		13:34 (WEA 5)	08:31		13:38 (WEA 5)
	21:46	20:57	19:47	18:37	16:36	50	14:24 (WEA 5)	16:12	60	14:38 (WEA 5)
15	05:21	06:08	07:00	07:52	07:49		13:33 (WEA 5)	08:32		13:39 (WEA 5)
	21:45	20:55	19:45	18:34	16:35	52	14:25 (WEA 5)	16:12	60	14:39 (WEA 5)
16	05:22	06:09	07:02	07:53	07:50		13:33 (WEA 5)	08:33		13:40 (WEA 5)
	21:44	20:53	19:43	18:32	16:33	53	14:26 (WEA 5)	16:12	59	14:39 (WEA 5)
17	05:23	06:11	07:03	07:55	07:52		13:32 (WEA 5)	08:34		12:40 (WEA 4)
	21:43	20:51	19:40	18:30	16:32	55	14:27 (WEA 5)	16:12	65	14:40 (WEA 5)
18	05:24	06:13	07:05	07:57	07:54		13:32 (WEA 5)	08:35		12:39 (WEA 4)
	21:42	20:49	19:38	18:28	16:31	55	14:27 (WEA 5)	16:13	68	14:41 (WEA 5)
19	05:26	06:15	07:07	07:59	07:56		13:32 (WEA 5)	08:35		12:38 (WEA 4)
	21:41	20:47	19:35	18:26	16:29	56	14:28 (WEA 5)	16:13	68	14:40 (WEA 5)
20	05:27	06:16	07:08	08:01	07:57		13:32 (WEA 5)	08:36		12:39 (WEA 4)
	21:40	20:45	19:33	18:23	16:28	57	14:29 (WEA 5)	16:13	69	14:41 (WEA 5)
21	05:28	06:18	07:10	08:02	07:59		13:32 (WEA 5)	08:37		12:39 (WEA 4)
	21:38	20:43	19:31	18:21	16:27	57	14:29 (WEA 5)	16:14	70	14:42 (WEA 5)
22	05:30	06:20	07:12	08:04	08:01		13:32 (WEA 5)	08:37		12:39 (WEA 4)
	21:37	20:41	19:28	18:19	16:26	58	14:30 (WEA 5)	16:14	70	14:42 (WEA 5)
23	05:31	06:21	07:13	08:06	08:03		13:32 (WEA 5)	08:38		12:40 (WEA 4)
	21:36	20:38	19:26	18:17	16:24	59	14:31 (WEA 5)	16:15	69	14:42 (WEA 5)
24	05:33	06:23	07:15	08:08	08:04		13:31 (WEA 5)	08:38		12:41 (WEA 4)
	21:34	20:36	19:23	18:15	16:23	59	14:30 (WEA 5)	16:15	68	14:43 (WEA 5)
25	05:34	06:25	07:17	07:10	08:06		13:31 (WEA 5)	08:39		12:42 (WEA 4)
	21:33	20:34	19:21	17:13	16:22	60	14:31 (WEA 5)	16:16	67	14:43 (WEA 5)
26	05:36	06:26	07:19	07:12	08:08		13:32 (WEA 5)	08:39		12:43 (WEA 4)
	21:31	20:32	19:19	17:11	16:21	60	14:32 (WEA 5)	16:17	66	14:44 (WEA 5)
27	05:37	06:28	07:20	07:13	08:09		13:32 (WEA 5)	08:39		12:45 (WEA 4)
	21:30	20:29	19:16	17:09	16:20	60	14:32 (WEA 5)	16:17	62	14:44 (WEA 5)
28	05:39	06:30	07:22	07:15	08:11		13:33 (WEA 5)	08:39		13:45 (WEA 5)
	21:28	20:27	19:14	17:07	16:19	60	14:33 (WEA 5)	16:18	59	14:44 (WEA 5)
29	05:40	06:31	07:24	07:17	08:12		13:32 (WEA 5)	08:40		13:45 (WEA 5)
	21:27	20:25	19:12	17:05	16:19	61	14:33 (WEA 5)	16:19	60	14:45 (WEA 5)
30	05:42	06:33	07:25	07:19	08:14		13:33 (WEA 5)	08:40		13:46 (WEA 5)
	21:25	20:23	19:09	17:03	16:18	60	14:33 (WEA 5)	16:20	60	14:46 (WEA 5)
31	05:43	06:35		07:21				08:40		13:46 (WEA 5)
	21:24	20:20		17:01				16:21	60	14:46 (WEA 5)
Sonnenscheinstunden	506	456	381	330	263			240		
astr.max.mögl.Beschattung						1333			1946	

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

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

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-39 - SR-39, Siegeweg 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar	März	April	Mai	Juni	Juli	August	Septembe	Oktober	November			Dezember		
1	08:40		14:48 (WEA 5)	08:11	07:16	07:04	05:57	05:10	05:07	05:45	06:36	07:27	07:23			08:15		14:35 (WEA 5)
	16:22	35	15:23 (WEA 5)	17:11	18:05	20:01	20:53	21:41	21:55	21:22	20:18	19:07	16:59			16:17	32	15:07 (WEA 5)
2	08:39		14:49 (WEA 5)	08:10	07:14	07:02	05:55	05:10	05:08	05:46	06:38	07:29	07:25			08:17		14:36 (WEA 5)
	16:23	34	15:23 (WEA 5)	17:13	18:07	20:02	20:55	21:42	21:55	21:20	20:16	19:04	16:57			16:16	32	15:08 (WEA 5)
3	08:39		14:48 (WEA 5)	08:08	07:12	06:59	05:53	05:09	05:08	05:48	06:40	07:31	07:26			08:18		14:36 (WEA 5)
	16:24	35	15:23 (WEA 5)	17:15	18:08	20:04	20:57	21:43	21:54	21:18	20:13	19:02	16:55			16:16	33	15:09 (WEA 5)
4	08:39		14:49 (WEA 5)	08:06	07:10	06:57	05:52	05:08	05:09	05:50	06:41	07:32	07:28			08:20		14:36 (WEA 5)
	16:26	35	15:24 (WEA 5)	17:17	18:10	20:06	20:58	21:44	21:54	21:17	20:11	19:00	16:53			16:15	33	15:09 (WEA 5)
5	08:39		14:50 (WEA 5)	08:05	07:07	06:55	05:50	05:07	05:10	05:51	06:43	07:34	07:30			08:21		14:37 (WEA 5)
	16:27	35	15:25 (WEA 5)	17:19	18:12	20:08	21:00	21:45	21:53	21:15	20:09	18:57	16:51			16:14	33	15:10 (WEA 5)
6	08:38		14:50 (WEA 5)	08:03	07:05	06:52	05:48	05:07	05:11	05:53	06:45	07:36	07:32			08:22		14:37 (WEA 5)
	16:28	34	15:24 (WEA 5)	17:21	18:14	20:09	21:02	21:46	21:53	21:13	20:06	18:55	16:50			16:14	34	15:11 (WEA 5)
7	08:38		14:51 (WEA 5)	08:01	07:03	06:50	05:46	05:06	05:12	05:55	06:47	07:38	07:34			08:24		14:36 (WEA 5)
	16:29	33	15:24 (WEA 5)	17:23	18:16	20:11	21:04	21:47	21:52	21:11	20:04	18:53	16:48			16:13	35	15:11 (WEA 5)
8	08:38		14:52 (WEA 5)	07:59	07:00	06:48	05:44	05:05	05:13	05:56	06:48	07:39	07:36			08:25		14:37 (WEA 5)
	16:31	33	15:25 (WEA 5)	17:25	18:18	20:13	21:05	21:48	21:52	21:09	20:02	18:50	16:46			16:13	35	15:12 (WEA 5)
9	08:37		14:52 (WEA 5)	07:58	06:58	06:45	05:42	05:05	05:14	05:58	06:50	07:41	07:38			08:26		14:38 (WEA 5)
	16:32	33	15:25 (WEA 5)	17:27	18:19	20:15	21:07	21:49	21:51	21:07	19:59	18:48	16:44			16:13	34	15:12 (WEA 5)
10	08:36		14:53 (WEA 5)	07:56	06:56	06:43	05:40	05:04	05:15	05:59	06:52	07:43	07:39			08:27		14:38 (WEA 5)
	16:34	32	15:25 (WEA 5)	17:29	18:21	20:16	21:09	21:50	21:50	21:05	19:57	18:46	16:43			16:13	34	15:12 (WEA 5)
11	08:36		14:53 (WEA 5)	07:54	06:54	06:41	05:39	05:04	05:16	06:01	06:53	07:45	07:41			08:28		14:38 (WEA 5)
	16:35	32	15:25 (WEA 5)	17:31	18:23	20:18	21:10	21:50	21:49	21:03	19:55	18:43	16:41			16:12	35	15:13 (WEA 5)
12	08:35		14:55 (WEA 5)	07:52	06:51	06:38	05:37	05:04	05:17	06:03	06:55	07:46	07:43			08:29		14:38 (WEA 5)
	16:37	31	15:26 (WEA 5)	17:33	18:25	20:20	21:12	21:51	21:48	21:01	19:52	18:41	16:40			16:12	35	15:13 (WEA 5)
13	08:34		14:55 (WEA 5)	07:50	06:49	06:36	05:35	05:03	05:18	06:04	06:57	07:48	07:45			08:30		14:39 (WEA 5)
	16:38	31	15:26 (WEA 5)	17:34	18:27	20:22	21:14	21:52	21:47	20:59	19:50	18:39	16:38			16:12	35	15:14 (WEA 5)
14	08:34		14:56 (WEA 5)	07:48	06:47	06:34	05:34	05:03	05:19	06:06	06:58	07:50	07:47			08:31		14:39 (WEA 5)
	16:40	30	15:26 (WEA 5)	17:36	18:29	20:23	21:15	21:52	21:46	20:57	19:47	18:37	16:36			16:12	35	15:14 (WEA 5)
15	08:33		14:57 (WEA 5)	07:46	06:44	06:32	05:32	05:03	05:21	06:08	07:00	07:52	07:48			08:32		14:40 (WEA 5)
	16:41	29	15:26 (WEA 5)	17:38	18:30	20:25	21:17	21:53	21:45	20:55	19:45	18:34	16:35			16:12	35	15:15 (WEA 5)
16	08:32		14:58 (WEA 5)	07:44	06:42	06:29	05:30	05:03	05:22	06:09	07:02	07:53	07:50			08:33		14:40 (WEA 5)
	16:43	28	15:26 (WEA 5)	17:40	18:32	20:27	21:18	21:54	21:44	20:53	19:43	18:32	16:33			16:12	35	15:15 (WEA 5)
17	08:31		14:58 (WEA 5)	07:42	06:39	06:27	05:29	05:03	05:23	06:11	07:03	07:55	07:52			08:34		14:41 (WEA 5)
	16:44	26	15:24 (WEA 5)	17:42	18:34	20:29	21:20	21:54	21:43	20:51	19:40	18:30	16:32			16:12	35	15:16 (WEA 5)
18	08:30		15:00 (WEA 5)	07:40	06:37	06:25	05:27	05:03	05:24	06:13	07:05	07:57	07:54			08:35		14:42 (WEA 5)
	16:46	24	15:24 (WEA 5)	17:44	18:36	20:30	21:21	21:54	21:42	20:49	19:38	18:28	16:31			16:13	35	15:17 (WEA 5)
19	08:29		15:01 (WEA 5)	07:38	06:35	06:23	05:26	05:03	05:26	06:14	07:07	07:59	07:56		14:46 (WEA 5)	08:35		14:41 (WEA 5)
	16:48	23	15:24 (WEA 5)	17:46	18:37	20:32	21:23	21:55	21:41	20:47	19:35	18:26	16:29	5	14:51 (WEA 5)	16:13	35	15:16 (WEA 5)
20	08:28		15:03 (WEA 5)	07:36	06:32	06:20	05:24	05:03	05:27	06:16	07:08	08:01	07:57		14:42 (WEA 5)	08:36		14:42 (WEA 5)
	16:50	20	15:23 (WEA 5)	17:48	18:39	20:34	21:24	21:55	21:40	20:45	19:33	18:23	16:28	13	14:55 (WEA 5)	16:13	35	15:17 (WEA 5)
21	08:27		15:04 (WEA 5)	07:34	06:30	06:18	05:23	05:03	05:28	06:18	07:10	08:02	07:59		14:40 (WEA 5)	08:37		14:43 (WEA 5)
	16:51	17	15:21 (WEA 5)	17:50	18:41	20:36	21:26	21:55	21:38	20:43	19:31	18:21	16:27	17	14:57 (WEA 5)	16:14	35	15:18 (WEA 5)
22	08:25		15:07 (WEA 5)	07:32	06:28	06:16	05:22	05:03	05:30	06:20	07:12	08:04	08:01		14:39 (WEA 5)	08:37		14:43 (WEA 5)
	16:53	13	15:20 (WEA 5)	17:52	18:43	20:38	21:27	21:56	21:37	20:40	19:28	18:19	16:26	20	14:59 (WEA 5)	16:14	35	15:18 (WEA 5)
23	08:24		15:12 (WEA 5)	07:30	06:25	06:14	05:20	05:03	05:31	06:21	07:13	08:06	08:03		14:38 (WEA 5)	08:38		14:43 (WEA 5)
	16:55	5	15:17 (WEA 5)	17:53	18:45	20:39	21:29	21:56	21:36	20:38	19:26	18:17	16:24	23	15:01 (WEA 5)	16:15	35	15:18 (WEA 5)
24	08:23			07:27	06:23	06:12	05:19	05:04	05:33	06:23	07:15	08:08	08:04		14:37 (WEA 5)	08:38		14:44 (WEA 5)
	16:57			17:55	18:46	20:41	21:30	21:56	21:34	20:36	19:23	18:15	16:23	24	15:01 (WEA 5)	16:15	35	15:19 (WEA 5)
25	08:22			07:25	06:21	06:10	05:18	05:04	05:34	06:25	07:17	07:10	08:06		14:37 (WEA 5)	08:39		14:44 (WEA 5)
	16:58			17:57	18:48	20:43	21:32	21:56	21:33	20:34	19:21	17:13	16:22	25	15:02 (WEA 5)	16:16	35	15:19 (WEA 5)
26	08:20			07:23	06:18	06:08	05:17	05:04	05:36	06:26	07:19	07:12	08:08		14:36 (WEA 5)	08:39		14:45 (WEA 5)
	17:00			17:59	18:50	20:45	21:33	21:56	21:31	20:32	19:19	17:11	16:21	28	15:04 (WEA 5)	16:17	35	15:20 (WEA 5)
27	08:19			07:21	06:16	06:05	05:15	05:05	05:37	06:28	07:20	07:13	08:09		14:36 (WEA 5)	08:39		14:45 (WEA 5)
	17:02			18:01	18:52	20:46	21:34	21:56	21:30	20:29	19:16	17:09	16:20	29	15:05 (WEA 5)	16:17	35	15:20 (WEA 5)
28	08:18			07:19	06:13	06:03	05:14	05:05	05:39	06:30	07:22	07:15	08:11		14:36 (WEA 5)	08:39		14:45 (WEA 5)
	17:04			18:03	18:53	20:48	21:36	21:56	21:28	20:27	19:14	17:07	16:19	30	15:06 (WEA 5)	16:18	35	15:20 (WEA 5)
29	08:16				07:11	06:01	05:13	05:06	05:40	06:31	07:24	07:17	08:12		14:36 (WEA 5)	08:40		14:46 (WEA 5)
	17:06				19:55	20:50	21:37	21:56	21:27	20:25	19:12	17:05	16:18	30	15:06 (WEA 5)	16:19	35	15:21 (WEA 5)
30	08:15				07:09	05:59	05:12	05:06	05:42	06:33	07:25	07:19	08:14		14:36 (WEA 5)	08:40		14:46 (WEA 5)
	17:08				19:57	20:52	21:38	21:55	21:25	20:23	19:09	17:03	16:18	31	15:07 (WEA 5)	16:20	35	15:21 (WEA 5)
31	08:13				07:06		05:11		05:43	06:35		07:21				08:40		14:47 (WEA 5)
	17:10				19:59		21:40		21:24	20:20		17:01				16:21	35	15:22 (WEA 5)
Sonnenscheinstunden	255			276	367	418	489	503	506	456	381	330	263			239		
astr.max.mögl.Beschattung		648												275			1070	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-40 - SR-40, Plaggenweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		14:25 (WEA 4)	08:11		15:38 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	23	14:48 (WEA 4)	17:11	35	16:13 (WEA 5)	18:05	20:01	20:53	21:41
2	08:39		14:26 (WEA 4)	08:10		15:38 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	23	14:49 (WEA 4)	17:13	35	16:13 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		14:26 (WEA 4)	08:08		15:40 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	22	14:48 (WEA 4)	17:15	33	16:13 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		14:28 (WEA 4)	08:06		15:40 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	20	14:48 (WEA 4)	17:17	33	16:13 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		14:29 (WEA 4)	08:05		15:41 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	26	15:51 (WEA 5)	17:19	31	16:12 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		14:30 (WEA 4)	08:03		15:42 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	28	15:53 (WEA 5)	17:21	29	16:11 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		14:31 (WEA 4)	08:01		15:43 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	28	15:54 (WEA 5)	17:23	27	16:10 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		14:34 (WEA 4)	07:59		15:45 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	27	15:56 (WEA 5)	17:25	23	16:08 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		14:36 (WEA 4)	07:58		15:47 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	25	15:57 (WEA 5)	17:27	20	16:07 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		15:39 (WEA 5)	07:56		15:49 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	19	15:58 (WEA 5)	17:29	15	16:04 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		15:38 (WEA 5)	07:54		15:54 (WEA 5)	06:54	06:41	05:39	05:04
	16:35	22	16:00 (WEA 5)	17:31	6	16:00 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		15:38 (WEA 5)	07:52			06:51	06:38	05:37	05:04
	16:37	24	16:02 (WEA 5)	17:33			18:25	20:20	21:12	21:51
13	08:34		15:38 (WEA 5)	07:50			06:49	06:36	05:35	05:03
	16:38	26	16:04 (WEA 5)	17:34			18:27	20:22	21:14	21:52
14	08:34		15:38 (WEA 5)	07:48			06:47	06:34	05:34	05:03
	16:40	27	16:05 (WEA 5)	17:36			18:29	20:23	21:15	21:52
15	08:33		15:37 (WEA 5)	07:46			06:44	06:32	05:32	05:03
	16:41	29	16:06 (WEA 5)	17:38			18:30	20:25	21:17	21:53
16	08:32		15:37 (WEA 5)	07:44			06:42	06:29	05:30	05:03
	16:43	30	16:07 (WEA 5)	17:40			18:32	20:27	21:18	21:54
17	08:31		15:36 (WEA 5)	07:42			06:39	06:27	05:29	05:03
	16:44	31	16:07 (WEA 5)	17:42			18:34	20:29	21:20	21:54
18	08:30		15:36 (WEA 5)	07:40			06:37	06:25	05:27	05:03
	16:46	32	16:08 (WEA 5)	17:44			18:36	20:30	21:21	21:54
19	08:29		15:36 (WEA 5)	07:38			06:35	06:23	05:26	05:03
	16:48	33	16:09 (WEA 5)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:36 (WEA 5)	07:36			06:32	06:20	05:24	05:03
	16:50	34	16:10 (WEA 5)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:36 (WEA 5)	07:34			06:30	06:18	05:23	05:03
	16:51	34	16:10 (WEA 5)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:36 (WEA 5)	07:32			06:28	06:16	05:22	05:03
	16:53	35	16:11 (WEA 5)	17:52			18:43	20:38	21:27	21:56
23	08:24		15:36 (WEA 5)	07:29			06:25	06:14	05:20	05:03
	16:55	36	16:12 (WEA 5)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:36 (WEA 5)	07:27			06:23	06:12	05:19	05:04
	16:57	36	16:12 (WEA 5)	17:55			18:46	20:41	21:30	21:56
25	08:22		15:36 (WEA 5)	07:25			06:21	06:10	05:18	05:04
	16:58	37	16:13 (WEA 5)	17:57			18:48	20:43	21:32	21:56
26	08:20		15:36 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	37	16:13 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		15:37 (WEA 5)	07:21			06:16	06:05	05:15	05:05
	17:02	37	16:14 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:17		15:37 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	36	16:13 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		15:36 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	37	16:13 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		15:38 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	36	16:14 (WEA 5)				19:57	20:51	21:38	21:55
31	08:13		15:38 (WEA 5)				07:06		05:11	
	17:10	36	16:14 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		926			287					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-40 - SR-40, Plaggenweg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:18 (WEA 5)	08:15		15:20 (WEA 5)
	21:55	21:22	20:18	19:07			16:59	16	15:34 (WEA 5)	16:17	22	15:42 (WEA 5)
2	05:08	05:46	06:38	07:29			07:25		15:16 (WEA 5)	08:17		15:22 (WEA 5)
	21:55	21:20	20:16	19:04			16:57	21	15:37 (WEA 5)	16:16	20	15:42 (WEA 5)
3	05:08	05:48	06:40	07:31			07:26		15:14 (WEA 5)	08:18		14:20 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	24	15:38 (WEA 5)	16:16	25	15:41 (WEA 5)
4	05:09	05:50	06:41	07:32			07:28		15:13 (WEA 5)	08:20		14:18 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	27	15:40 (WEA 5)	16:15	27	15:40 (WEA 5)
5	05:10	05:51	06:43	07:34			07:30		15:12 (WEA 5)	08:21		14:17 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	29	15:41 (WEA 5)	16:14	28	15:40 (WEA 5)
6	05:11	05:53	06:45	07:36			07:32		15:11 (WEA 5)	08:22		14:16 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	31	15:42 (WEA 5)	16:14	28	15:39 (WEA 5)
7	05:12	05:55	06:46	07:38			07:34		15:10 (WEA 5)	08:24		14:15 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	32	15:42 (WEA 5)	16:13	26	15:37 (WEA 5)
8	05:13	05:56	06:48	07:39			07:36		15:09 (WEA 5)	08:25		14:16 (WEA 4)
	21:52	21:09	20:02	18:50			16:46	34	15:43 (WEA 5)	16:13	20	14:36 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		15:09 (WEA 5)	08:26		14:15 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	35	15:44 (WEA 5)	16:13	22	14:37 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		15:09 (WEA 5)	08:27		14:15 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	35	15:44 (WEA 5)	16:13	23	14:38 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		15:09 (WEA 5)	08:28		14:15 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	36	15:45 (WEA 5)	16:12	23	14:38 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43		15:08 (WEA 5)	08:29		14:15 (WEA 4)
	21:48	21:01	19:52	18:41			16:40	37	15:45 (WEA 5)	16:12	24	14:39 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45		15:08 (WEA 5)	08:30		14:15 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	37	15:45 (WEA 5)	16:12	25	14:40 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47		15:08 (WEA 5)	08:31		14:15 (WEA 4)
	21:46	20:57	19:47	18:37			16:36	37	15:45 (WEA 5)	16:12	26	14:41 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		15:09 (WEA 5)	08:32		14:15 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	37	15:46 (WEA 5)	16:12	26	14:41 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50		15:09 (WEA 5)	08:33		14:16 (WEA 4)
	21:44	20:53	19:43	18:32			16:33	37	15:46 (WEA 5)	16:12	26	14:42 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:09 (WEA 5)	08:34		14:16 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	37	15:46 (WEA 5)	16:12	27	14:43 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:10 (WEA 5)	08:35		14:17 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	36	15:46 (WEA 5)	16:13	27	14:44 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:10 (WEA 5)	08:35		14:16 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	36	15:46 (WEA 5)	16:13	28	14:44 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:11 (WEA 5)	08:36		14:17 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	35	15:46 (WEA 5)	16:13	28	14:45 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:12 (WEA 5)	08:37		14:18 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	34	15:46 (WEA 5)	16:14	28	14:46 (WEA 4)
22	05:30	06:20	07:12	08:04			08:01		15:12 (WEA 5)	08:37		14:18 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	34	15:46 (WEA 5)	16:14	27	14:45 (WEA 4)
23	05:31	06:21	07:13	08:06			08:03		15:13 (WEA 5)	08:38		14:18 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	33	15:46 (WEA 5)	16:15	28	14:46 (WEA 4)
24	05:33	06:23	07:15	08:08			08:04		15:13 (WEA 5)	08:38		14:19 (WEA 4)
	21:34	20:36	19:23	18:15			16:23	32	15:45 (WEA 5)	16:15	28	14:47 (WEA 4)
25	05:34	06:25	07:17	07:10			08:06		15:14 (WEA 5)	08:39		14:19 (WEA 4)
	21:33	20:34	19:21	17:13			16:22	31	15:45 (WEA 5)	16:16	28	14:47 (WEA 4)
26	05:36	06:26	07:19	07:12			08:07		15:15 (WEA 5)	08:39		14:20 (WEA 4)
	21:31	20:32	19:19	17:11			16:21	30	15:45 (WEA 5)	16:17	27	14:47 (WEA 4)
27	05:37	06:28	07:20	07:13			08:09		15:16 (WEA 5)	08:39		14:20 (WEA 4)
	21:30	20:29	19:16	17:09			16:20	29	15:45 (WEA 5)	16:17	27	14:47 (WEA 4)
28	05:39	06:30	07:22	07:15			08:11		15:17 (WEA 5)	08:39		14:21 (WEA 4)
	21:28	20:27	19:14	17:07			16:19	27	15:44 (WEA 5)	16:18	26	14:47 (WEA 4)
29	05:40	06:31	07:24	07:17			08:12		15:18 (WEA 5)	08:39		14:22 (WEA 4)
	21:27	20:25	19:12	17:05			16:18	26	15:44 (WEA 5)	16:19	25	14:47 (WEA 4)
30	05:42	06:33	07:25	07:19			08:14		15:19 (WEA 5)	08:40		14:22 (WEA 4)
	21:25	20:23	19:09	17:03			16:18	25	15:44 (WEA 5)	16:20	26	14:48 (WEA 4)
31	05:43	06:35		07:21		15:22 (WEA 5)				08:40		14:23 (WEA 4)
	21:24	20:20		17:01	9	15:31 (WEA 5)				16:21	25	14:48 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					9			950			796	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-41 - SR-41, Bussen Weg 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		15:22 (WEA 4)	08:11		16:23 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	24	15:46 (WEA 4)	17:11	17	16:40 (WEA 5)	18:05	20:00	20:53	21:41
2	08:39		15:23 (WEA 4)	08:10		16:22 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	25	15:48 (WEA 4)	17:13	20	16:42 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		15:22 (WEA 4)	08:08		16:23 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	26	15:48 (WEA 4)	17:15	22	16:45 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		15:23 (WEA 4)	08:06		16:22 (WEA 5)	07:10	06:57	05:51	05:08
	16:26	26	15:49 (WEA 4)	17:17	25	16:47 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		15:24 (WEA 4)	08:05		16:22 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	26	15:50 (WEA 4)	17:19	26	16:48 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		15:24 (WEA 4)	08:03		16:22 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	26	15:50 (WEA 4)	17:21	26	16:48 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		15:24 (WEA 4)	08:01		16:22 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	26	15:50 (WEA 4)	17:23	26	16:48 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		15:25 (WEA 4)	07:59		16:22 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	26	15:51 (WEA 4)	17:25	25	16:47 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		15:25 (WEA 4)	07:58		16:23 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	26	15:51 (WEA 4)	17:27	24	16:47 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		15:25 (WEA 4)	07:56		16:23 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	27	15:52 (WEA 4)	17:29	24	16:47 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		15:25 (WEA 4)	07:54		16:24 (WEA 5)	06:54	06:41	05:39	05:04
	16:35	27	15:52 (WEA 4)	17:31	22	16:46 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		15:27 (WEA 4)	07:52		16:25 (WEA 5)	06:51	06:38	05:37	05:04
	16:36	26	15:53 (WEA 4)	17:32	20	16:45 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		15:27 (WEA 4)	07:50		16:27 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	26	15:53 (WEA 4)	17:34	17	16:44 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		15:28 (WEA 4)	07:48		16:29 (WEA 5)	06:46	06:34	05:34	05:03
	16:40	25	15:53 (WEA 4)	17:36	13	16:42 (WEA 5)	18:28	20:23	21:15	21:52
15	08:33		15:29 (WEA 4)	07:46		16:32 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	24	15:53 (WEA 4)	17:38	7	16:39 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		15:29 (WEA 4)	07:44			06:42	06:29	05:30	05:03
	16:43	24	15:53 (WEA 4)	17:40			18:32	20:27	21:18	21:54
17	08:31		15:29 (WEA 4)	07:42			06:39	06:27	05:29	05:03
	16:44	23	15:52 (WEA 4)	17:42			18:34	20:29	21:20	21:54
18	08:30		15:30 (WEA 4)	07:40			06:37	06:25	05:27	05:03
	16:46	22	15:52 (WEA 4)	17:44			18:36	20:30	21:21	21:54
19	08:29		15:32 (WEA 4)	07:38			06:35	06:23	05:26	05:03
	16:48	20	15:52 (WEA 4)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:33 (WEA 4)	07:36			06:32	06:20	05:24	05:03
	16:50	19	15:52 (WEA 4)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:34 (WEA 4)	07:34			06:30	06:18	05:23	05:03
	16:51	17	15:51 (WEA 4)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:36 (WEA 4)	07:32			06:28	06:16	05:22	05:03
	16:53	14	15:50 (WEA 4)	17:52			18:43	20:37	21:27	21:56
23	08:24		15:38 (WEA 4)	07:29			06:25	06:14	05:20	05:03
	16:55	11	15:49 (WEA 4)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:42 (WEA 4)	07:27			06:23	06:12	05:19	05:03
	16:57	3	15:45 (WEA 4)	17:55			18:46	20:41	21:30	21:56
25	08:22			07:25			06:20	06:10	05:18	05:04
	16:58			17:57			18:48	20:43	21:32	21:56
26	08:20			07:23			06:18	06:08	05:17	05:04
	17:00			17:59			18:50	20:44	21:33	21:56
27	08:19		16:29 (WEA 5)	07:21			06:16	06:05	05:15	05:05
	17:02	2	16:31 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:17		16:27 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	5	16:32 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		16:25 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	9	16:34 (WEA 5)				19:55	20:50	21:37	21:56
30	08:14		16:25 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	12	16:37 (WEA 5)				19:57	20:51	21:38	21:55
31	08:13		16:24 (WEA 5)				07:06		05:11	
	17:10	15	16:39 (WEA 5)				19:59		21:39	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		582			314					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-41 - SR-41, Bussen Weg 3, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:53 (WEA 5)	08:15		15:08 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	23	16:16 (WEA 5)	16:17	26	15:34 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		15:52 (WEA 5)	08:17		15:08 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	25	16:17 (WEA 5)	16:16	27	15:35 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		15:52 (WEA 5)	08:18		15:09 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	25	16:17 (WEA 5)	16:16	26	15:35 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		15:52 (WEA 5)	08:20		15:09 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	25	16:17 (WEA 5)	16:15	26	15:35 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		15:52 (WEA 5)	08:21		15:09 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	25	16:17 (WEA 5)	16:14	26	15:35 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		15:52 (WEA 5)	08:22		15:10 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	25	16:17 (WEA 5)	16:14	26	15:36 (WEA 4)
7	05:12	05:54	06:46	07:37			07:34		15:52 (WEA 5)	08:24		15:10 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	25	16:17 (WEA 5)	16:13	26	15:36 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		15:53 (WEA 5)	08:25		15:11 (WEA 4)
	21:51	21:09	20:02	18:50			16:46	22	16:15 (WEA 5)	16:13	26	15:37 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		15:53 (WEA 5)	08:26		15:11 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	20	16:13 (WEA 5)	16:13	26	15:37 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		15:54 (WEA 5)	08:27		15:12 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	17	16:11 (WEA 5)	16:13	25	15:37 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		15:55 (WEA 5)	08:28		15:12 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	14	16:09 (WEA 5)	16:12	24	15:36 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43		15:56 (WEA 5)	08:29		15:12 (WEA 4)
	21:48	21:01	19:52	18:41			16:39	12	16:08 (WEA 5)	16:12	24	15:36 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45		15:57 (WEA 5)	08:30		15:13 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	9	16:06 (WEA 5)	16:12	23	15:36 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47		15:59 (WEA 5)	08:31		15:13 (WEA 4)
	21:46	20:57	19:47	18:37			16:36	5	16:04 (WEA 5)	16:12	23	15:36 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		16:01 (WEA 5)	08:32		15:14 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	2	16:03 (WEA 5)	16:12	22	15:36 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50			08:33		15:15 (WEA 4)
	21:44	20:53	19:43	18:32			16:33			16:12	21	15:36 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52			08:34		15:15 (WEA 4)
	21:43	20:51	19:40	18:30			16:32			16:12	21	15:36 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:16 (WEA 4)	08:35		15:16 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	3	15:19 (WEA 4)	16:13	21	15:37 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:12 (WEA 4)	08:35		15:16 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	11	15:23 (WEA 4)	16:13	20	15:36 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:11 (WEA 4)	08:36		15:17 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	14	15:25 (WEA 4)	16:13	20	15:37 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:10 (WEA 4)	08:37		15:17 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	17	15:27 (WEA 4)	16:14	20	15:37 (WEA 4)
22	05:30	06:20	07:12	08:04			08:01		15:09 (WEA 4)	08:37		15:18 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	19	15:28 (WEA 4)	16:14	20	15:38 (WEA 4)
23	05:31	06:21	07:13	08:06			08:02		15:09 (WEA 4)	08:38		15:18 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	20	15:29 (WEA 4)	16:15	20	15:38 (WEA 4)
24	05:33	06:23	07:15	08:08			08:04		15:07 (WEA 4)	08:38		15:19 (WEA 4)
	21:34	20:36	19:23	18:15			16:23	22	15:29 (WEA 4)	16:15	20	15:39 (WEA 4)
25	05:34	06:25	07:17	07:10			08:06		15:07 (WEA 4)	08:39		15:19 (WEA 4)
	21:33	20:34	19:21	17:13			16:22	23	15:30 (WEA 4)	16:16	21	15:40 (WEA 4)
26	05:36	06:26	07:19	07:12			08:07		15:08 (WEA 4)	08:39		15:19 (WEA 4)
	21:31	20:32	19:19	17:11			16:21	23	15:31 (WEA 4)	16:17	21	15:40 (WEA 4)
27	05:37	06:28	07:20	07:13		16:00 (WEA 5)	08:09		15:08 (WEA 4)	08:39		15:20 (WEA 4)
	21:30	20:29	19:16	17:09	10	16:10 (WEA 5)	16:20	24	15:32 (WEA 4)	16:17	21	15:41 (WEA 4)
28	05:39	06:30	07:22	07:15		15:58 (WEA 5)	08:11		15:07 (WEA 4)	08:39		15:20 (WEA 4)
	21:28	20:27	19:14	17:07	14	16:12 (WEA 5)	16:19	25	15:32 (WEA 4)	16:18	22	15:42 (WEA 4)
29	05:40	06:31	07:24	07:17		15:56 (WEA 5)	08:12		15:07 (WEA 4)	08:39		15:20 (WEA 4)
	21:27	20:25	19:12	17:05	18	16:14 (WEA 5)	16:18	26	15:33 (WEA 4)	16:19	22	15:42 (WEA 4)
30	05:42	06:33	07:25	07:19		15:55 (WEA 5)	08:14		15:08 (WEA 4)	08:40		15:21 (WEA 4)
	21:25	20:23	19:09	17:03	20	16:15 (WEA 5)	16:18	26	15:34 (WEA 4)	16:20	22	15:43 (WEA 4)
31	05:43	06:35		07:21		15:54 (WEA 5)				08:40		15:21 (WEA 4)
	21:24	20:20		17:01	22	16:16 (WEA 5)				16:21	24	15:45 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			239		
astr.max.mögl.Beschattung					84			527			712	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-42 - SR-42, Bussen Weg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		15:28 (WEA 4)	08:11		16:28 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	18	15:46 (WEA 4)	17:11	12	16:40 (WEA 5)	18:05	20:00	20:53	21:41
2	08:39		15:29 (WEA 4)	08:10		16:27 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	19	15:48 (WEA 4)	17:13	15	16:42 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		15:29 (WEA 4)	08:08		16:27 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	19	15:48 (WEA 4)	17:15	18	16:45 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		15:29 (WEA 4)	08:06		16:27 (WEA 5)	07:10	06:57	05:51	05:08
	16:26	21	15:50 (WEA 4)	17:17	20	16:47 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		15:30 (WEA 4)	08:05		16:26 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	22	15:52 (WEA 4)	17:19	23	16:49 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		15:30 (WEA 4)	08:03		16:26 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	23	15:53 (WEA 4)	17:21	25	16:51 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		15:30 (WEA 4)	08:01		16:26 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	24	15:54 (WEA 4)	17:23	25	16:51 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		15:31 (WEA 4)	07:59		16:26 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	25	15:56 (WEA 4)	17:25	25	16:51 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		15:31 (WEA 4)	07:58		16:27 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	25	15:56 (WEA 4)	17:27	24	16:51 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		15:31 (WEA 4)	07:56		16:27 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	26	15:57 (WEA 4)	17:29	23	16:50 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		15:31 (WEA 4)	07:54		16:28 (WEA 5)	06:53	06:41	05:39	05:04
	16:35	26	15:57 (WEA 4)	17:31	22	16:50 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		15:32 (WEA 4)	07:52		16:29 (WEA 5)	06:51	06:38	05:37	05:04
	16:36	26	15:58 (WEA 4)	17:32	20	16:49 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		15:33 (WEA 4)	07:50		16:30 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	25	15:58 (WEA 4)	17:34	18	16:48 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		15:33 (WEA 4)	07:48		16:31 (WEA 5)	06:46	06:34	05:34	05:03
	16:40	25	15:58 (WEA 4)	17:36	15	16:46 (WEA 5)	18:28	20:23	21:15	21:52
15	08:33		15:34 (WEA 4)	07:46		16:34 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	25	15:59 (WEA 4)	17:38	10	16:44 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		15:35 (WEA 4)	07:44			06:42	06:29	05:30	05:03
	16:43	24	15:59 (WEA 4)	17:40			18:32	20:27	21:18	21:54
17	08:31		15:34 (WEA 4)	07:42			06:39	06:27	05:29	05:03
	16:44	24	15:58 (WEA 4)	17:42			18:34	20:29	21:20	21:54
18	08:30		15:35 (WEA 4)	07:40			06:37	06:25	05:27	05:03
	16:46	23	15:58 (WEA 4)	17:44			18:36	20:30	21:21	21:54
19	08:29		15:36 (WEA 4)	07:38			06:35	06:23	05:26	05:03
	16:48	22	15:58 (WEA 4)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:38 (WEA 4)	07:36			06:32	06:20	05:24	05:03
	16:50	20	15:58 (WEA 4)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:38 (WEA 4)	07:34			06:30	06:18	05:23	05:03
	16:51	19	15:57 (WEA 4)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:40 (WEA 4)	07:32			06:28	06:16	05:22	05:03
	16:53	17	15:57 (WEA 4)	17:52			18:43	20:37	21:27	21:56
23	08:24		15:42 (WEA 4)	07:29			06:25	06:14	05:20	05:03
	16:55	14	15:56 (WEA 4)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:43 (WEA 4)	07:27			06:23	06:12	05:19	05:03
	16:57	11	15:54 (WEA 4)	17:55			18:46	20:41	21:30	21:56
25	08:22		15:46 (WEA 4)	07:25			06:20	06:10	05:18	05:04
	16:58	6	15:52 (WEA 4)	17:57			18:48	20:43	21:32	21:56
26	08:20			07:23			06:18	06:08	05:17	05:04
	17:00			17:59			18:50	20:44	21:33	21:56
27	08:19			07:21			06:16	06:05	05:15	05:05
	17:02			18:01			18:52	20:46	21:34	21:56
28	08:17			07:19			06:13	06:03	05:14	05:05
	17:04			18:03			18:53	20:48	21:36	21:56
29	08:16		16:31 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	3	16:34 (WEA 5)				19:55	20:50	21:37	21:56
30	08:14		16:30 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	7	16:37 (WEA 5)				19:57	20:51	21:38	21:55
31	08:13		16:29 (WEA 5)				07:06		05:11	
	17:10	10	16:39 (WEA 5)				19:59		21:39	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		549			295					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-42 - SR-42, Bussen Weg 1, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:57 (WEA 5)	08:15		15:13 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	23	16:20 (WEA 5)	16:17	26	15:39 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		15:56 (WEA 5)	08:17		15:14 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	24	16:20 (WEA 5)	16:16	26	15:40 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		15:56 (WEA 5)	08:18		15:15 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	24	16:20 (WEA 5)	16:16	25	15:40 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		15:56 (WEA 5)	08:20		15:15 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	25	16:21 (WEA 5)	16:15	25	15:40 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		15:56 (WEA 5)	08:21		15:15 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	24	16:20 (WEA 5)	16:14	24	15:39 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		15:56 (WEA 5)	08:22		15:16 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	22	16:18 (WEA 5)	16:14	23	15:39 (WEA 4)
7	05:12	05:54	06:46	07:37			07:34		15:57 (WEA 5)	08:24		15:16 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	20	16:17 (WEA 5)	16:13	22	15:38 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		15:57 (WEA 5)	08:25		15:17 (WEA 4)
	21:51	21:09	20:02	18:50			16:46	18	16:15 (WEA 5)	16:13	21	15:38 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		15:58 (WEA 5)	08:26		15:18 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	15	16:13 (WEA 5)	16:13	19	15:37 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		15:59 (WEA 5)	08:27		15:18 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	12	16:11 (WEA 5)	16:13	19	15:37 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		16:00 (WEA 5)	08:28		15:18 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	9	16:09 (WEA 5)	16:12	18	15:36 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43		16:01 (WEA 5)	08:29		15:19 (WEA 4)
	21:48	21:01	19:52	18:41			16:39	7	16:08 (WEA 5)	16:12	17	15:36 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45		16:03 (WEA 5)	08:30		15:19 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	3	16:06 (WEA 5)	16:12	17	15:36 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47			08:31		15:20 (WEA 4)
	21:46	20:57	19:47	18:37			16:36			16:12	16	15:36 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48			08:32		15:21 (WEA 4)
	21:45	20:55	19:45	18:34			16:35			16:12	15	15:36 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50			08:33		15:21 (WEA 4)
	21:44	20:53	19:43	18:32			16:33			16:12	15	15:36 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:19 (WEA 4)	08:34		15:22 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	6	15:25 (WEA 4)	16:12	14	15:36 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:17 (WEA 4)	08:35		15:23 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	11	15:28 (WEA 4)	16:13	14	15:37 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:15 (WEA 4)	08:35		15:23 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	15	15:30 (WEA 4)	16:13	13	15:36 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:15 (WEA 4)	08:36		15:24 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	17	15:32 (WEA 4)	16:13	13	15:37 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:14 (WEA 4)	08:37		15:24 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	19	15:33 (WEA 4)	16:14	13	15:37 (WEA 4)
22	05:30	06:19	07:12	08:04			08:01		15:14 (WEA 4)	08:37		15:25 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	20	15:34 (WEA 4)	16:14	13	15:38 (WEA 4)
23	05:31	06:21	07:13	08:06			08:02		15:13 (WEA 4)	08:38		15:25 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	22	15:35 (WEA 4)	16:15	13	15:38 (WEA 4)
24	05:33	06:23	07:15	08:08			08:04		15:12 (WEA 4)	08:38		15:26 (WEA 4)
	21:34	20:36	19:23	18:15			16:23	23	15:35 (WEA 4)	16:15	13	15:39 (WEA 4)
25	05:34	06:25	07:17	07:10			08:06		15:12 (WEA 4)	08:39		15:26 (WEA 4)
	21:33	20:34	19:21	17:13			16:22	24	15:36 (WEA 4)	16:16	14	15:40 (WEA 4)
26	05:36	06:26	07:19	07:12		16:07 (WEA 5)	08:07		15:13 (WEA 4)	08:39		15:26 (WEA 4)
	21:31	20:32	19:19	17:11	3	16:10 (WEA 5)	16:21	24	15:37 (WEA 4)	16:17	14	15:40 (WEA 4)
27	05:37	06:28	07:20	07:13		16:03 (WEA 5)	08:09		15:13 (WEA 4)	08:39		15:26 (WEA 4)
	21:30	20:29	19:16	17:09	11	16:14 (WEA 5)	16:20	25	15:38 (WEA 4)	16:17	15	15:41 (WEA 4)
28	05:39	06:30	07:22	07:15		16:01 (WEA 5)	08:11		15:12 (WEA 4)	08:39		15:27 (WEA 4)
	21:28	20:27	19:14	17:07	15	16:16 (WEA 5)	16:19	26	15:38 (WEA 4)	16:18	15	15:42 (WEA 4)
29	05:40	06:31	07:24	07:17		15:59 (WEA 5)	08:12		15:13 (WEA 4)	08:39		15:27 (WEA 4)
	21:27	20:25	19:12	17:05	19	16:18 (WEA 5)	16:18	25	15:38 (WEA 4)	16:19	15	15:42 (WEA 4)
30	05:42	06:33	07:25	07:19		15:58 (WEA 5)	08:14		15:14 (WEA 4)	08:40		15:27 (WEA 4)
	21:25	20:23	19:09	17:03	21	16:19 (WEA 5)	16:18	25	15:39 (WEA 4)	16:20	16	15:43 (WEA 4)
31	05:43	06:35		07:21		15:57 (WEA 5)				08:40		15:28 (WEA 4)
	21:23	20:20		17:01	22	16:19 (WEA 5)				16:21	17	15:45 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			239		
astr.max.mögl.Beschattung					91			508			540	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-43 - SR-43, Bussen Weg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		15:30 (WEA 4)	08:11		16:33 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	16	15:46 (WEA 4)	17:11	7	16:40 (WEA 5)	18:05	20:00	20:53	21:41
2	08:39		15:30 (WEA 4)	08:10		16:31 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	18	15:48 (WEA 4)	17:13	11	16:42 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		15:30 (WEA 4)	08:08		16:31 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	18	15:48 (WEA 4)	17:15	14	16:45 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		15:31 (WEA 4)	08:06		16:30 (WEA 5)	07:10	06:57	05:51	05:08
	16:26	19	15:50 (WEA 4)	17:17	17	16:47 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		15:31 (WEA 4)	08:05		16:30 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	21	15:52 (WEA 4)	17:19	19	16:49 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		15:31 (WEA 4)	08:03		16:29 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	22	15:53 (WEA 4)	17:21	22	16:51 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		15:31 (WEA 4)	08:01		16:29 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	23	15:54 (WEA 4)	17:23	24	16:53 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		15:32 (WEA 4)	07:59		16:29 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	24	15:56 (WEA 4)	17:25	25	16:54 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		15:32 (WEA 4)	07:58		16:29 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	25	15:57 (WEA 4)	17:27	25	16:54 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		15:32 (WEA 4)	07:56		16:29 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	26	15:58 (WEA 4)	17:29	25	16:54 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		15:32 (WEA 4)	07:54		16:29 (WEA 5)	06:53	06:41	05:39	05:04
	16:35	26	15:58 (WEA 4)	17:31	25	16:54 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		15:33 (WEA 4)	07:52		16:30 (WEA 5)	06:51	06:38	05:37	05:04
	16:36	27	16:00 (WEA 4)	17:32	24	16:54 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		15:33 (WEA 4)	07:50		16:30 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	27	16:00 (WEA 4)	17:34	23	16:53 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		15:34 (WEA 4)	07:48		16:31 (WEA 5)	06:46	06:34	05:34	05:03
	16:40	26	16:00 (WEA 4)	17:36	22	16:53 (WEA 5)	18:28	20:23	21:15	21:52
15	08:33		15:34 (WEA 4)	07:46		16:32 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	27	16:01 (WEA 4)	17:38	20	16:52 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		15:35 (WEA 4)	07:44		16:34 (WEA 5)	06:42	06:29	05:30	05:03
	16:43	26	16:01 (WEA 4)	17:40	17	16:51 (WEA 5)	18:32	20:27	21:18	21:54
17	08:31		15:34 (WEA 4)	07:42		16:36 (WEA 5)	06:39	06:27	05:29	05:03
	16:44	26	16:00 (WEA 4)	17:42	13	16:49 (WEA 5)	18:34	20:29	21:20	21:54
18	08:30		15:35 (WEA 4)	07:40		16:39 (WEA 5)	06:37	06:25	05:27	05:03
	16:46	26	16:01 (WEA 4)	17:44	6	16:45 (WEA 5)	18:36	20:30	21:21	21:54
19	08:29		15:36 (WEA 4)	07:38			06:35	06:23	05:26	05:03
	16:48	25	16:01 (WEA 4)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:37 (WEA 4)	07:36			06:32	06:20	05:24	05:03
	16:50	24	16:01 (WEA 4)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:37 (WEA 4)	07:34			06:30	06:18	05:23	05:03
	16:51	23	16:00 (WEA 4)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:39 (WEA 4)	07:32			06:28	06:16	05:22	05:03
	16:53	21	16:00 (WEA 4)	17:52			18:43	20:37	21:27	21:56
23	08:24		15:40 (WEA 4)	07:29			06:25	06:14	05:20	05:03
	16:55	20	16:00 (WEA 4)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:41 (WEA 4)	07:27			06:23	06:12	05:19	05:04
	16:57	18	15:59 (WEA 4)	17:55			18:46	20:41	21:30	21:56
25	08:22		15:43 (WEA 4)	07:25			06:20	06:10	05:18	05:04
	16:58	15	15:58 (WEA 4)	17:57			18:48	20:43	21:32	21:56
26	08:20		15:44 (WEA 4)	07:23			06:18	06:08	05:17	05:04
	17:00	13	15:57 (WEA 4)	17:59			18:50	20:44	21:33	21:56
27	08:19		15:48 (WEA 4)	07:21			06:16	06:05	05:15	05:05
	17:02	7	15:55 (WEA 4)	18:01			18:52	20:46	21:34	21:56
28	08:17			07:19			06:13	06:03	05:14	05:05
	17:04			18:03			18:53	20:48	21:36	21:56
29	08:16						07:11	06:01	05:13	05:06
	17:06						19:55	20:50	21:37	21:56
30	08:14						07:09	05:59	05:12	05:06
	17:08						19:57	20:51	21:38	21:55
31	08:13		16:35 (WEA 5)				07:06		05:11	
	17:10	4	16:39 (WEA 5)				19:59		21:39	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		593			339					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-43 - SR-43, Bussen Weg 2, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:58 (WEA 5)	08:15		15:14 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	26	16:24 (WEA 5)	16:17	26	15:40 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		15:58 (WEA 5)	08:17		15:15 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	26	16:24 (WEA 5)	16:16	26	15:41 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		15:58 (WEA 5)	08:18		15:16 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	26	16:24 (WEA 5)	16:16	25	15:41 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		15:59 (WEA 5)	08:20		15:16 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	23	16:22 (WEA 5)	16:15	24	15:40 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		15:59 (WEA 5)	08:21		15:16 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	21	16:20 (WEA 5)	16:14	23	15:39 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		16:00 (WEA 5)	08:22		15:17 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	18	16:18 (WEA 5)	16:14	22	15:39 (WEA 4)
7	05:12	05:54	06:46	07:37			07:34		16:00 (WEA 5)	08:24		15:17 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	17	16:17 (WEA 5)	16:13	21	15:38 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		16:01 (WEA 5)	08:25		15:19 (WEA 4)
	21:51	21:09	20:02	18:50			16:46	14	16:15 (WEA 5)	16:13	19	15:38 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		16:02 (WEA 5)	08:26		15:19 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	11	16:13 (WEA 5)	16:13	18	15:37 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		16:04 (WEA 5)	08:27		15:19 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	7	16:11 (WEA 5)	16:13	18	15:37 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		16:06 (WEA 5)	08:28		15:20 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	3	16:09 (WEA 5)	16:12	16	15:36 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43			08:29		15:20 (WEA 4)
	21:48	21:01	19:52	18:41			16:39			16:12	16	15:36 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45			08:30		15:21 (WEA 4)
	21:47	20:59	19:50	18:39			16:38			16:12	15	15:36 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47			08:31		15:22 (WEA 4)
	21:46	20:57	19:47	18:37			16:36			16:12	14	15:36 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		15:20 (WEA 4)	08:32		15:22 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	7	15:27 (WEA 4)	16:12	14	15:36 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50		15:17 (WEA 4)	08:33		15:23 (WEA 4)
	21:44	20:53	19:43	18:32			16:33	13	15:30 (WEA 4)	16:12	13	15:36 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:16 (WEA 4)	08:34		15:24 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	15	15:31 (WEA 4)	16:12	12	15:36 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:15 (WEA 4)	08:35		15:25 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	18	15:33 (WEA 4)	16:13	12	15:37 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:14 (WEA 4)	08:35		15:25 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	20	15:34 (WEA 4)	16:13	11	15:36 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:14 (WEA 4)	08:36		15:25 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	21	15:35 (WEA 4)	16:13	12	15:37 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:13 (WEA 4)	08:37		15:25 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	23	15:36 (WEA 4)	16:14	12	15:37 (WEA 4)
22	05:30	06:20	07:12	08:04			08:01		15:13 (WEA 4)	08:37		15:26 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	24	15:37 (WEA 4)	16:14	12	15:38 (WEA 4)
23	05:31	06:21	07:13	08:06			08:02		15:13 (WEA 4)	08:38		15:26 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	25	15:38 (WEA 4)	16:15	12	15:38 (WEA 4)
24	05:33	06:23	07:15	08:08		17:07 (WEA 5)	08:04		15:12 (WEA 4)	08:38		15:28 (WEA 4)
	21:34	20:36	19:23	18:15	9	17:16 (WEA 5)	16:23	26	15:38 (WEA 4)	16:15	11	15:39 (WEA 4)
25	05:34	06:25	07:17	07:10		16:05 (WEA 5)	08:06		15:13 (WEA 4)	08:39		15:28 (WEA 4)
	21:33	20:34	19:21	17:13	14	16:19 (WEA 5)	16:22	25	15:38 (WEA 4)	16:16	12	15:40 (WEA 4)
26	05:36	06:26	07:19	07:12		16:03 (WEA 5)	08:07		15:13 (WEA 4)	08:39		15:28 (WEA 4)
	21:31	20:32	19:19	17:11	17	16:20 (WEA 5)	16:21	26	15:39 (WEA 4)	16:17	12	15:40 (WEA 4)
27	05:37	06:28	07:20	07:13		16:01 (WEA 5)	08:09		15:13 (WEA 4)	08:39		15:28 (WEA 4)
	21:30	20:29	19:16	17:09	21	16:22 (WEA 5)	16:20	27	15:40 (WEA 4)	16:17	13	15:41 (WEA 4)
28	05:39	06:30	07:22	07:15		16:00 (WEA 5)	08:11		15:13 (WEA 4)	08:39		15:28 (WEA 4)
	21:28	20:27	19:14	17:07	22	16:22 (WEA 5)	16:19	26	15:39 (WEA 4)	16:18	14	15:42 (WEA 4)
29	05:40	06:31	07:24	07:17		16:00 (WEA 5)	08:12		15:13 (WEA 4)	08:39		15:29 (WEA 4)
	21:27	20:25	19:12	17:05	23	16:23 (WEA 5)	16:18	27	15:40 (WEA 4)	16:19	13	15:42 (WEA 4)
30	05:42	06:33	07:25	07:19		15:59 (WEA 5)	08:14		15:14 (WEA 4)	08:40		15:29 (WEA 4)
	21:25	20:23	19:09	17:03	25	16:24 (WEA 5)	16:18	27	15:41 (WEA 4)	16:20	14	15:43 (WEA 4)
31	05:43	06:35		07:21		15:59 (WEA 5)				08:40		15:29 (WEA 4)
	21:23	20:20		17:01	25	16:24 (WEA 5)				16:21	16	15:45 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			239		
astr.max.mögl.Beschattung					156			542			498	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-44 - SR-44, Bussen Weg 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		15:35 (WEA 4)	08:11		16:37 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	11	15:46 (WEA 4)	17:11	3	16:40 (WEA 5)	18:05	20:00	20:53	21:41
2	08:39		15:35 (WEA 4)	08:10		16:35 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	13	15:48 (WEA 4)	17:13	7	16:42 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		15:35 (WEA 4)	08:08		16:35 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	13	15:48 (WEA 4)	17:15	10	16:45 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		15:35 (WEA 4)	08:06		16:34 (WEA 5)	07:10	06:57	05:51	05:08
	16:26	15	15:50 (WEA 4)	17:17	13	16:47 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		15:36 (WEA 4)	08:05		16:33 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	16	15:52 (WEA 4)	17:19	16	16:49 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		15:36 (WEA 4)	08:03		16:32 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	17	15:53 (WEA 4)	17:21	19	16:51 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		15:36 (WEA 4)	08:01		16:32 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	18	15:54 (WEA 4)	17:23	21	16:53 (WEA 5)	18:16	20:11	21:03	21:47
8	08:38		15:36 (WEA 4)	07:59		16:32 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	20	15:56 (WEA 4)	17:25	23	16:55 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		15:36 (WEA 4)	07:58		16:31 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	21	15:57 (WEA 4)	17:27	25	16:56 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		15:36 (WEA 4)	07:56		16:32 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	22	15:58 (WEA 4)	17:29	24	16:56 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		15:36 (WEA 4)	07:54		16:32 (WEA 5)	06:53	06:41	05:39	05:04
	16:35	24	16:00 (WEA 4)	17:31	24	16:56 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		15:37 (WEA 4)	07:52		16:32 (WEA 5)	06:51	06:38	05:37	05:04
	16:36	25	16:02 (WEA 4)	17:32	24	16:56 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		15:38 (WEA 4)	07:50		16:33 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	25	16:03 (WEA 4)	17:34	23	16:56 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		15:38 (WEA 4)	07:48		16:33 (WEA 5)	06:46	06:34	05:34	05:03
	16:40	26	16:04 (WEA 4)	17:36	22	16:55 (WEA 5)	18:28	20:23	21:15	21:52
15	08:33		15:38 (WEA 4)	07:46		16:34 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	26	16:04 (WEA 4)	17:38	20	16:54 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		15:39 (WEA 4)	07:44		16:36 (WEA 5)	06:42	06:29	05:30	05:03
	16:43	26	16:05 (WEA 4)	17:40	17	16:53 (WEA 5)	18:32	20:27	21:18	21:54
17	08:31		15:38 (WEA 4)	07:42		16:37 (WEA 5)	06:39	06:27	05:29	05:03
	16:44	26	16:04 (WEA 4)	17:42	15	16:52 (WEA 5)	18:34	20:29	21:20	21:54
18	08:30		15:39 (WEA 4)	07:40		16:40 (WEA 5)	06:37	06:25	05:27	05:03
	16:46	25	16:04 (WEA 4)	17:44	9	16:49 (WEA 5)	18:36	20:30	21:21	21:54
19	08:29		15:40 (WEA 4)	07:38			06:35	06:23	05:26	05:03
	16:48	25	16:05 (WEA 4)	17:46			18:37	20:32	21:23	21:55
20	08:28		15:41 (WEA 4)	07:36			06:32	06:20	05:24	05:03
	16:50	24	16:05 (WEA 4)	17:48			18:39	20:34	21:24	21:55
21	08:27		15:41 (WEA 4)	07:34			06:30	06:18	05:23	05:03
	16:51	23	16:04 (WEA 4)	17:50			18:41	20:36	21:26	21:55
22	08:25		15:42 (WEA 4)	07:32			06:28	06:16	05:22	05:03
	16:53	23	16:05 (WEA 4)	17:52			18:43	20:37	21:27	21:56
23	08:24		15:43 (WEA 4)	07:29			06:25	06:14	05:20	05:03
	16:55	22	16:05 (WEA 4)	17:53			18:45	20:39	21:29	21:56
24	08:23		15:44 (WEA 4)	07:27			06:23	06:12	05:19	05:03
	16:57	20	16:04 (WEA 4)	17:55			18:46	20:41	21:30	21:56
25	08:22		15:45 (WEA 4)	07:25			06:20	06:10	05:18	05:04
	16:58	18	16:03 (WEA 4)	17:57			18:48	20:43	21:32	21:56
26	08:20		15:46 (WEA 4)	07:23			06:18	06:08	05:17	05:04
	17:00	16	16:02 (WEA 4)	17:59			18:50	20:44	21:33	21:56
27	08:19		15:49 (WEA 4)	07:21			06:16	06:05	05:15	05:05
	17:02	12	16:01 (WEA 4)	18:01			18:52	20:46	21:34	21:56
28	08:17		15:51 (WEA 4)	07:19			06:13	06:03	05:14	05:05
	17:04	7	15:58 (WEA 4)	18:03			18:53	20:48	21:36	21:56
29	08:16						07:11	06:01	05:13	05:06
	17:06						19:55	20:50	21:37	21:56
30	08:14						07:09	05:59	05:12	05:06
	17:08						19:57	20:51	21:38	21:55
31	08:13						07:06		05:11	
	17:10						19:59		21:39	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		559			315					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-44 - SR-44, Bussen Weg 4, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		16:01 (WEA 5)	08:15		15:18 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	25	16:26 (WEA 5)	16:17	24	15:42 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		16:01 (WEA 5)	08:17		15:19 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	25	16:26 (WEA 5)	16:16	23	15:42 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		16:01 (WEA 5)	08:18		15:20 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	23	16:24 (WEA 5)	16:16	21	15:41 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		16:02 (WEA 5)	08:20		15:20 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	20	16:22 (WEA 5)	16:15	20	15:40 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		16:02 (WEA 5)	08:21		15:21 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	18	16:20 (WEA 5)	16:14	18	15:39 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		16:03 (WEA 5)	08:22		15:22 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	15	16:18 (WEA 5)	16:14	17	15:39 (WEA 4)
7	05:12	05:54	06:46	07:37			07:34		16:04 (WEA 5)	08:24		15:22 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	13	16:17 (WEA 5)	16:13	16	15:38 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		16:05 (WEA 5)	08:25		15:24 (WEA 4)
	21:51	21:09	20:02	18:50			16:46	10	16:15 (WEA 5)	16:13	14	15:38 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		16:06 (WEA 5)	08:26		15:24 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	7	16:13 (WEA 5)	16:13	13	15:37 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		16:08 (WEA 5)	08:27		15:25 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	3	16:11 (WEA 5)	16:13	12	15:37 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41			08:28		15:25 (WEA 4)
	21:49	21:03	19:55	18:43			16:41			16:12	11	15:36 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43			08:29		15:26 (WEA 4)
	21:48	21:01	19:52	18:41			16:39			16:12	10	15:36 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45			08:30		15:26 (WEA 4)
	21:47	20:59	19:50	18:39			16:38			16:12	10	15:36 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47		15:23 (WEA 4)	08:31		15:27 (WEA 4)
	21:46	20:57	19:47	18:37			16:36	7	15:30 (WEA 4)	16:12	9	15:36 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		15:21 (WEA 4)	08:32		15:28 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	12	15:33 (WEA 4)	16:12	8	15:36 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50		15:19 (WEA 4)	08:33		15:29 (WEA 4)
	21:44	20:53	19:43	18:32			16:33	16	15:35 (WEA 4)	16:12	7	15:36 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:18 (WEA 4)	08:34		15:29 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	18	15:36 (WEA 4)	16:12	7	15:36 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:18 (WEA 4)	08:35		15:30 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	20	15:38 (WEA 4)	16:13	7	15:37 (WEA 4)
19	05:26	06:14	07:07	07:59			07:56		15:17 (WEA 4)	08:35		15:30 (WEA 4)
	21:41	20:47	19:35	18:26			16:29	22	15:39 (WEA 4)	16:13	6	15:36 (WEA 4)
20	05:27	06:16	07:08	08:01			07:57		15:17 (WEA 4)	08:36		15:31 (WEA 4)
	21:40	20:45	19:33	18:23			16:28	23	15:40 (WEA 4)	16:13	6	15:37 (WEA 4)
21	05:28	06:18	07:10	08:02			07:59		15:17 (WEA 4)	08:37		15:31 (WEA 4)
	21:38	20:43	19:31	18:21			16:27	23	15:40 (WEA 4)	16:14	6	15:37 (WEA 4)
22	05:30	06:19	07:12	08:04			08:01		15:17 (WEA 4)	08:37		15:32 (WEA 4)
	21:37	20:40	19:28	18:19			16:26	24	15:41 (WEA 4)	16:14	6	15:38 (WEA 4)
23	05:31	06:21	07:13	08:06			08:02		15:17 (WEA 4)	08:38		15:32 (WEA 4)
	21:36	20:38	19:26	18:17			16:24	25	15:42 (WEA 4)	16:15	6	15:38 (WEA 4)
24	05:33	06:23	07:15	08:08		17:09 (WEA 5)	08:04		15:16 (WEA 4)	08:38		15:33 (WEA 4)
	21:34	20:36	19:23	18:15	10	17:19 (WEA 5)	16:23	25	15:41 (WEA 4)	16:15	6	15:39 (WEA 4)
25	05:34	06:25	07:17	07:10		16:06 (WEA 5)	08:06		15:16 (WEA 4)	08:39		15:33 (WEA 4)
	21:33	20:34	19:21	17:13	16	16:22 (WEA 5)	16:22	26	15:42 (WEA 4)	16:16	7	15:40 (WEA 4)
26	05:36	06:26	07:19	07:12		16:05 (WEA 5)	08:07		15:17 (WEA 4)	08:39		15:33 (WEA 4)
	21:31	20:32	19:19	17:11	18	16:23 (WEA 5)	16:21	26	15:43 (WEA 4)	16:17	7	15:40 (WEA 4)
27	05:37	06:28	07:20	07:13		16:04 (WEA 5)	08:09		15:17 (WEA 4)	08:39		15:34 (WEA 4)
	21:30	20:29	19:16	17:09	20	16:24 (WEA 5)	16:20	26	15:43 (WEA 4)	16:17	7	15:41 (WEA 4)
28	05:39	06:30	07:22	07:15		16:03 (WEA 5)	08:11		15:17 (WEA 4)	08:39		15:34 (WEA 4)
	21:28	20:27	19:14	17:07	22	16:25 (WEA 5)	16:19	26	15:43 (WEA 4)	16:18	8	15:42 (WEA 4)
29	05:40	06:31	07:24	07:17		16:02 (WEA 5)	08:12		15:18 (WEA 4)	08:39		15:34 (WEA 4)
	21:27	20:25	19:12	17:05	23	16:25 (WEA 5)	16:18	25	15:43 (WEA 4)	16:19	8	15:42 (WEA 4)
30	05:42	06:33	07:25	07:19		16:02 (WEA 5)	08:14		15:18 (WEA 4)	08:40		15:34 (WEA 4)
	21:25	20:23	19:09	17:03	24	16:26 (WEA 5)	16:18	26	15:44 (WEA 4)	16:20	9	15:43 (WEA 4)
31	05:43	06:35		07:21		16:01 (WEA 5)				08:40		15:35 (WEA 4)
	21:23	20:20		17:01	25	16:26 (WEA 5)				16:21	10	15:45 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			239		
astr.max.mögl.Beschattung					158			529			339	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-45 - SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni
1	08:39	08:11	07:16			07:04		18:50 (WEA 1)	05:57		20:22 (WEA 4)	05:10
	16:22	17:11	18:05			20:00	11	19:01 (WEA 1)	20:53	2	20:24 (WEA 4)	21:41
2	08:39	08:10	07:14			07:02			05:55		20:20 (WEA 4)	05:10
	16:23	17:13	18:07			20:02			20:55	5	20:25 (WEA 4)	21:42
3	08:39	08:08	07:12			06:59			05:53		20:20 (WEA 4)	05:09
	16:24	17:15	18:08			20:04			20:57	8	20:28 (WEA 4)	21:43
4	08:39	08:06	07:10			06:57			05:51		20:19 (WEA 4)	05:08
	16:26	17:17	18:10			20:06			20:58	10	20:29 (WEA 4)	21:44
5	08:39	08:05	07:07			06:55			05:50		20:18 (WEA 4)	05:07
	16:27	17:19	18:12			20:07			21:00	13	20:31 (WEA 4)	21:45
6	08:38	08:03	07:05			06:52			05:48		20:18 (WEA 4)	05:07
	16:28	17:21	18:14			20:09			21:02	14	20:32 (WEA 4)	21:46
7	08:38	08:01	07:03			06:50		19:33 (WEA 2)	05:46		20:17 (WEA 4)	05:06
	16:29	17:23	18:16			20:11	8	19:41 (WEA 2)	21:03	16	20:33 (WEA 4)	21:47
8	08:37	07:59	07:00			06:48		19:30 (WEA 2)	05:44		20:18 (WEA 4)	05:05
	16:31	17:25	18:18			20:13	13	19:43 (WEA 2)	21:05	17	20:35 (WEA 4)	21:48
9	08:37	07:57	06:58			06:45		19:28 (WEA 2)	05:42		20:17 (WEA 4)	05:05
	16:32	17:27	18:19			20:15	16	19:44 (WEA 2)	21:07	20	20:37 (WEA 4)	21:49
10	08:36	07:56	06:56			06:43		19:27 (WEA 2)	05:40		20:17 (WEA 4)	05:04
	16:34	17:29	18:21			20:16	18	19:45 (WEA 2)	21:08	21	20:38 (WEA 4)	21:49
11	08:36	07:54	06:53			06:41		19:26 (WEA 2)	05:39		20:18 (WEA 4)	05:04
	16:35	17:31	18:23			20:18	20	19:46 (WEA 2)	21:10	21	20:39 (WEA 4)	21:50
12	08:35	07:52	06:51			06:38		19:26 (WEA 2)	05:37		20:18 (WEA 4)	05:04
	16:37	17:32	18:25			20:20	20	19:46 (WEA 2)	21:12	23	20:41 (WEA 5)	21:51
13	08:34	07:50	06:49			06:36		19:24 (WEA 2)	05:35		20:19 (WEA 4)	05:03
	16:38	17:34	18:27			20:22	21	19:45 (WEA 2)	21:13	24	20:43 (WEA 5)	21:52
14	08:33	07:48	06:46			06:34		19:24 (WEA 2)	05:34		20:19 (WEA 4)	05:03
	16:40	17:36	18:28			20:23	21	19:45 (WEA 2)	21:15	25	20:44 (WEA 5)	21:52
15	08:33	07:46	06:44			06:32		19:24 (WEA 2)	05:32		20:20 (WEA 4)	05:03
	16:41	17:38	18:30			20:25	21	19:45 (WEA 2)	21:17	25	20:46 (WEA 5)	21:53
16	08:32	07:44	06:42			06:29		19:25 (WEA 2)	05:30		20:21 (WEA 4)	05:03
	16:43	17:40	18:32			20:27	19	19:44 (WEA 2)	21:18	23	20:47 (WEA 5)	21:53
17	08:31	07:42	06:39			06:27		19:25 (WEA 2)	05:29		20:23 (WEA 4)	05:03
	16:44	17:42	18:34			20:29	19	19:44 (WEA 2)	21:20	22	20:49 (WEA 5)	21:54
18	08:30	07:40	06:37			06:25		19:25 (WEA 2)	05:27		20:26 (WEA 4)	05:03
	16:46	17:44	18:36			20:30	17	19:42 (WEA 2)	21:21	19	20:50 (WEA 5)	21:54
19	08:29	07:38	06:35		17:54 (WEA 1)	06:23		19:26 (WEA 2)	05:26		20:37 (WEA 5)	05:03
	16:48	17:46	18:37	11	18:05 (WEA 1)	20:32	14	19:40 (WEA 2)	21:23	14	20:51 (WEA 5)	21:55
20	08:28	07:36	06:32		17:51 (WEA 1)	06:20		19:28 (WEA 2)	05:24		20:37 (WEA 5)	05:03
	16:50	17:48	18:39	15	18:06 (WEA 1)	20:34	10	19:38 (WEA 2)	21:24	16	20:53 (WEA 5)	21:55
21	08:27	07:34	06:30		17:50 (WEA 1)	06:18			05:23		20:38 (WEA 5)	05:03
	16:51	17:50	18:41	18	18:08 (WEA 1)	20:36			21:26	16	20:54 (WEA 5)	21:55
22	08:25	07:32	06:28		17:49 (WEA 1)	06:16			05:22		20:39 (WEA 5)	05:03
	16:53	17:52	18:43	20	18:09 (WEA 1)	20:37			21:27	16	20:55 (WEA 5)	21:55
23	08:24	07:29	06:25		17:47 (WEA 1)	06:14			05:20		20:38 (WEA 5)	05:03
	16:55	17:53	18:45	22	18:09 (WEA 1)	20:39			21:29	16	20:54 (WEA 5)	21:56
24	08:23	07:27	06:23		17:47 (WEA 1)	06:12			05:19		20:39 (WEA 5)	05:04
	16:57	17:55	18:46	22	18:09 (WEA 1)	20:41			21:30	15	20:54 (WEA 5)	21:56
25	08:22	07:25	06:20		17:46 (WEA 1)	06:10			05:18		20:40 (WEA 5)	05:04
	16:58	17:57	18:48	23	18:09 (WEA 1)	20:43			21:32	13	20:53 (WEA 5)	21:56
26	08:20	07:23	06:18		17:46 (WEA 1)	06:08			05:17		20:41 (WEA 5)	05:04
	17:00	17:59	18:50	23	18:09 (WEA 1)	20:44			21:33	12	20:53 (WEA 5)	21:56
27	08:19	07:21	06:16		17:46 (WEA 1)	06:05			05:16		20:42 (WEA 5)	05:05
	17:02	18:01	18:52	23	18:09 (WEA 1)	20:46			21:34	10	20:52 (WEA 5)	21:56
28	08:17	07:19	06:13		17:45 (WEA 1)	06:03			05:14		20:43 (WEA 5)	05:05
	17:04	18:03	18:53	22	18:07 (WEA 1)	20:48			21:36	7	20:50 (WEA 5)	21:56
29	08:16		07:11		18:46 (WEA 1)	06:01			05:13			05:06
	17:06		19:55	21	19:07 (WEA 1)	20:50			21:37			21:55
30	08:14		07:09		18:47 (WEA 1)	05:59			05:12			05:06
	17:08		19:57	19	19:06 (WEA 1)	20:51			21:38			21:55
31	08:13		07:06		18:48 (WEA 1)				05:11			
	17:10		19:59	15	19:03 (WEA 1)				21:39			
Sonnenscheinstunden	255	276	367			418			489			503
astr.max.mögl.Beschattung				254			248			443		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-45 - SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober	November	Dezember
1	05:07			05:45		20:28 (WEA 4)	06:36		19:25 (WEA 2)	07:27	07:23	08:15
	21:55			21:22	22	20:51 (WEA 5)	20:18	20	19:45 (WEA 2)	19:07	16:59	16:17
2	05:08			05:46		20:28 (WEA 4)	06:38		19:26 (WEA 2)	07:29	07:24	08:17
	21:55			21:20	21	20:49 (WEA 4)	20:16	18	19:44 (WEA 2)	19:04	16:57	16:16
3	05:08			05:48		20:27 (WEA 4)	06:40		19:26 (WEA 2)	07:30	07:26	08:18
	21:54			21:18	21	20:48 (WEA 4)	20:13	16	19:42 (WEA 2)	19:02	16:55	16:16
4	05:09			05:50		20:28 (WEA 4)	06:41		19:27 (WEA 2)	07:32	07:28	08:19
	21:54			21:16	18	20:46 (WEA 4)	20:11	13	19:40 (WEA 2)	19:00	16:53	16:15
5	05:10			05:51		20:27 (WEA 4)	06:43		19:29 (WEA 2)	07:34	07:30	08:21
	21:53			21:15	17	20:44 (WEA 4)	20:09	8	19:37 (WEA 2)	18:57	16:51	16:14
6	05:11			05:53		20:27 (WEA 4)	06:45			07:36	07:32	08:22
	21:53			21:13	16	20:43 (WEA 4)	20:06			18:55	16:50	16:14
7	05:12			05:55		20:27 (WEA 4)	06:46			07:37	07:34	08:23
	21:52			21:11	14	20:41 (WEA 4)	20:04			18:53	16:48	16:14
8	05:13			05:56		20:28 (WEA 4)	06:48			07:39	07:36	08:25
	21:51			21:09	11	20:39 (WEA 4)	20:02			18:50	16:46	16:13
9	05:14			05:58		20:28 (WEA 4)	06:50			07:41	07:37	08:26
	21:51			21:07	9	20:37 (WEA 4)	19:59			18:48	16:44	16:13
10	05:15			05:59		20:29 (WEA 4)	06:51			07:43	07:39	08:27
	21:50			21:05	7	20:36 (WEA 4)	19:57			18:46	16:43	16:13
11	05:16			06:01		20:30 (WEA 4)	06:53		18:42 (WEA 1)	07:44	07:41	08:28
	21:49			21:03	4	20:34 (WEA 4)	19:54	11	18:53 (WEA 1)	18:43	16:41	16:12
12	05:17			06:03		20:30 (WEA 4)	06:55		18:40 (WEA 1)	07:46	07:43	08:29
	21:48			21:01	2	20:32 (WEA 4)	19:52	15	18:55 (WEA 1)	18:41	16:40	16:12
13	05:18			06:04			06:57		18:38 (WEA 1)	07:48	07:45	08:30
	21:47			20:59			19:50	18	18:56 (WEA 1)	18:39	16:38	16:12
14	05:19			06:06			06:58		18:37 (WEA 1)	07:50	07:47	08:31
	21:46			20:57			19:47	20	18:57 (WEA 1)	18:37	16:36	16:12
15	05:21		20:54 (WEA 5)	06:08			07:00		18:36 (WEA 1)	07:52	07:48	08:32
	21:45	5	20:59 (WEA 5)	20:55			19:45	22	18:58 (WEA 1)	18:34	16:35	16:12
16	05:22		20:52 (WEA 5)	06:09			07:02		18:34 (WEA 1)	07:53	07:50	08:33
	21:44	9	21:01 (WEA 5)	20:53			19:43	23	18:57 (WEA 1)	18:32	16:33	16:12
17	05:23		20:51 (WEA 5)	06:11			07:03		18:34 (WEA 1)	07:55	07:52	08:34
	21:43	11	21:02 (WEA 5)	20:51			19:40	23	18:57 (WEA 1)	18:30	16:32	16:12
18	05:24		20:50 (WEA 5)	06:13			07:05		18:34 (WEA 1)	07:57	07:54	08:35
	21:42	12	21:02 (WEA 5)	20:49			19:38	23	18:57 (WEA 1)	18:28	16:31	16:13
19	05:26		20:49 (WEA 5)	06:14			07:07		18:33 (WEA 1)	07:59	07:55	08:35
	21:41	14	21:03 (WEA 5)	20:47			19:35	23	18:56 (WEA 1)	18:26	16:29	16:13
20	05:27		20:49 (WEA 5)	06:16			07:08		18:33 (WEA 1)	08:01	07:57	08:36
	21:40	15	21:04 (WEA 5)	20:45			19:33	22	18:55 (WEA 1)	18:23	16:28	16:13
21	05:28		20:48 (WEA 5)	06:18			07:10		18:34 (WEA 1)	08:02	07:59	08:37
	21:38	17	21:05 (WEA 5)	20:43			19:31	21	18:55 (WEA 1)	18:21	16:27	16:14
22	05:30		20:48 (WEA 5)	06:20		19:37 (WEA 2)	07:12		18:34 (WEA 1)	08:04	08:01	08:37
	21:37	17	21:05 (WEA 5)	20:40	2	19:39 (WEA 2)	19:28	19	18:53 (WEA 1)	18:19	16:26	16:14
23	05:31		20:48 (WEA 5)	06:21		19:33 (WEA 2)	07:13		18:35 (WEA 1)	08:06	08:02	08:38
	21:36	16	21:04 (WEA 5)	20:38	10	19:43 (WEA 2)	19:26	16	18:51 (WEA 1)	18:17	16:24	16:15
24	05:33		20:48 (WEA 5)	06:23		19:30 (WEA 2)	07:15		18:37 (WEA 1)	08:08	08:04	08:38
	21:34	15	21:03 (WEA 5)	20:36	14	19:44 (WEA 2)	19:23	12	18:49 (WEA 1)	18:15	16:23	16:15
25	05:34		20:47 (WEA 5)	06:25		19:29 (WEA 2)	07:17		18:40 (WEA 1)	07:10	08:06	08:38
	21:33	14	21:01 (WEA 5)	20:34	17	19:46 (WEA 2)	19:21	4	18:44 (WEA 1)	17:13	16:22	16:16
26	05:36		20:35 (WEA 4)	06:26		19:27 (WEA 2)	07:18			07:12	08:07	08:39
	21:31	20	21:00 (WEA 5)	20:32	19	19:46 (WEA 2)	19:19			17:11	16:21	16:17
27	05:37		20:33 (WEA 4)	06:28		19:26 (WEA 2)	07:20			07:13	08:09	08:39
	21:30	23	20:58 (WEA 5)	20:29	20	19:46 (WEA 2)	19:16			17:09	16:20	16:17
28	05:39		20:32 (WEA 4)	06:30		19:26 (WEA 2)	07:22			07:15	08:11	08:39
	21:28	24	20:58 (WEA 5)	20:27	21	19:47 (WEA 2)	19:14			17:07	16:19	16:18
29	05:40		20:30 (WEA 4)	06:31		19:25 (WEA 2)	07:24			07:17	08:12	08:39
	21:27	25	20:56 (WEA 5)	20:25	21	19:46 (WEA 2)	19:11			17:05	16:18	16:19
30	05:42		20:29 (WEA 4)	06:33		19:25 (WEA 2)	07:25			07:19	08:14	08:39
	21:25	24	20:54 (WEA 5)	20:22	21	19:46 (WEA 2)	19:09			17:03	16:18	16:20
31	05:43		20:29 (WEA 4)	06:35		19:24 (WEA 2)				07:21		08:39
	21:23	23	20:53 (WEA 5)	20:20	21	19:45 (WEA 2)				17:01		16:21
Sonnenscheinstunden	506			456			381			330	263	240
astr.max.mögl.Beschattung		284			328			347				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-46 - SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar			März			April	Mai	Juni
1	08:40	08:11			07:16		07:40 (WEA 4)	07:04	05:57	05:11
	16:22	17:12			18:05	22	08:02 (WEA 4)	20:01	20:53	21:41
2	08:40	08:10			07:14		07:40 (WEA 4)	07:02	05:56	05:10
	16:23	17:13			18:07	22	08:02 (WEA 4)	20:02	20:55	21:42
3	08:39	08:08			07:12		07:40 (WEA 4)	06:59	05:54	05:09
	16:25	17:15			18:09	22	08:02 (WEA 4)	20:04	20:57	21:43
4	08:39	08:07			07:10		07:40 (WEA 4)	06:57	05:52	05:08
	16:26	17:17			18:10	20	08:00 (WEA 4)	20:06	20:59	21:44
5	08:39	08:05			07:07		07:41 (WEA 4)	06:55	05:50	05:07
	16:27	17:19			18:12	19	08:00 (WEA 4)	20:08	21:00	21:45
6	08:39	08:03		08:29 (WEA 2)	07:05		07:42 (WEA 4)	06:52	05:48	05:07
	16:28	17:21	4	08:33 (WEA 2)	18:14	17	07:59 (WEA 4)	20:09	21:02	21:46
7	08:38	08:01		08:27 (WEA 2)	07:03		07:43 (WEA 4)	06:50	05:46	05:06
	16:30	17:23	7	08:34 (WEA 2)	18:16	13	07:56 (WEA 4)	20:11	21:04	21:47
8	08:38	08:00		08:25 (WEA 2)	07:01		07:24 (WEA 5)	06:48	05:44	05:05
	16:31	17:25	10	08:35 (WEA 2)	18:18	13	07:53 (WEA 4)	20:13	21:05	21:48
9	08:37	07:58		08:23 (WEA 2)	06:58		07:22 (WEA 5)	06:45	05:42	05:05
	16:32	17:27	13	08:36 (WEA 2)	18:20	11	07:33 (WEA 5)	20:15	21:07	21:49
10	08:37	07:56		08:22 (WEA 2)	06:56		07:19 (WEA 5)	06:43	05:41	05:04
	16:34	17:29	14	08:36 (WEA 2)	18:21	15	07:34 (WEA 5)	20:17	21:09	21:50
11	08:36	07:54		08:22 (WEA 2)	06:54		07:17 (WEA 5)	06:41	05:39	05:04
	16:35	17:31	14	08:36 (WEA 2)	18:23	18	07:35 (WEA 5)	20:18	21:10	21:50
12	08:35	07:52		08:23 (WEA 2)	06:51		07:15 (WEA 5)	06:38	05:37	05:04
	16:37	17:33	13	08:36 (WEA 2)	18:25	21	07:36 (WEA 5)	20:20	21:12	21:51
13	08:35	07:50		08:23 (WEA 2)	06:49		07:12 (WEA 5)	06:36	05:35	05:03
	16:38	17:35	13	08:36 (WEA 2)	18:27	24	07:36 (WEA 5)	20:22	21:14	21:52
14	08:34	07:48		08:24 (WEA 2)	06:47		07:11 (WEA 5)	06:34	05:34	05:03
	16:40	17:36	11	08:35 (WEA 2)	18:29	26	07:37 (WEA 5)	20:24	21:15	21:53
15	08:33	07:46		08:26 (WEA 2)	06:44		07:10 (WEA 5)	06:32	05:32	05:03
	16:41	17:38	7	08:33 (WEA 2)	18:30	26	07:36 (WEA 5)	20:25	21:17	21:53
16	08:32	07:44			06:42		07:10 (WEA 5)	06:29	05:31	05:03
	16:43	17:40			18:32	26	07:36 (WEA 5)	20:27	21:18	21:54
17	08:31	07:42			06:40		07:10 (WEA 5)	06:27	05:29	05:03
	16:45	17:42			18:34	26	07:36 (WEA 5)	20:29	21:20	21:54
18	08:30	07:40			06:37		07:09 (WEA 5)	06:25	05:28	05:03
	16:46	17:44			18:36	26	07:35 (WEA 5)	20:31	21:22	21:55
19	08:29	07:38			06:35		07:10 (WEA 5)	06:23	05:26	05:03
	16:48	17:46			18:38	24	07:34 (WEA 5)	20:32	21:23	21:55
20	08:28	07:36			06:32		07:11 (WEA 5)	06:21	05:25	05:03
	16:50	17:48			18:39	22	07:33 (WEA 5)	20:34	21:25	21:55
21	08:27	07:34			06:30		07:11 (WEA 5)	06:18	05:23	05:03
	16:51	17:50			18:41	20	07:31 (WEA 5)	20:36	21:26	21:55
22	08:26	07:32			06:28		07:13 (WEA 5)	06:16	05:22	05:03
	16:53	17:52			18:43	17	07:30 (WEA 5)	20:38	21:28	21:56
23	08:24	07:30		07:54 (WEA 4)	06:25		07:14 (WEA 5)	06:14	05:21	05:03
	16:55	17:54	5	07:59 (WEA 4)	18:45	13	07:27 (WEA 5)	20:39	21:29	21:56
24	08:23	07:27		07:52 (WEA 4)	06:23		07:20 (WEA 5)	06:12	05:19	05:04
	16:57	17:55	8	08:00 (WEA 4)	18:46	1	07:21 (WEA 5)	20:41	21:30	21:56
25	08:22	07:25		07:49 (WEA 4)	06:21			06:10	05:18	05:04
	16:59	17:57	12	08:01 (WEA 4)	18:48			20:43	21:32	21:56
26	08:20	07:23		07:47 (WEA 4)	06:18			06:08	05:17	05:04
	17:00	17:59	15	08:02 (WEA 4)	18:50			20:45	21:33	21:56
27	08:19	07:21		07:45 (WEA 4)	06:16			06:06	05:16	05:05
	17:02	18:01	17	08:02 (WEA 4)	18:52			20:46	21:35	21:56
28	08:18	07:19		07:43 (WEA 4)	06:14			06:04	05:15	05:05
	17:04	18:03	20	08:03 (WEA 4)	18:54			20:48	21:36	21:56
29	08:16				07:11			06:02	05:13	05:06
	17:06				19:55			20:50	21:37	21:56
30	08:15				07:09			05:59	05:12	05:07
	17:08				19:57			20:52	21:38	21:55
31	08:13				07:06				05:11	
	17:10				19:59				21:40	
Sonnenscheinstunden	255	276			367			418	489	503
astr.max.mögl.Beschattung			183			464				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-46 - SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September			Oktober			November			Dezember
1	05:07	05:45	06:37			07:27		07:53 (WEA 5)	07:23		07:52 (WEA 2)	08:15
	21:55	21:22	20:18			19:07	22	08:15 (WEA 5)	16:59	14	08:06 (WEA 2)	16:17
2	05:08	05:47	06:38			07:29		07:55 (WEA 5)	07:25		07:53 (WEA 2)	08:17
	21:55	21:20	20:16			19:05	20	08:15 (WEA 5)	16:57	12	08:05 (WEA 2)	16:16
3	05:09	05:48	06:40			07:31		07:56 (WEA 5)	07:27		07:55 (WEA 2)	08:18
	21:54	21:18	20:13			19:02	16	08:12 (WEA 5)	16:55	10	08:05 (WEA 2)	16:16
4	05:09	05:50	06:42			07:32		07:58 (WEA 5)	07:28		07:57 (WEA 2)	08:20
	21:54	21:17	20:11			19:00	13	08:11 (WEA 5)	16:53	7	08:04 (WEA 2)	16:15
5	05:10	05:51	06:43			07:34		08:00 (WEA 5)	07:30		07:59 (WEA 2)	08:21
	21:53	21:15	20:09			18:57	9	08:09 (WEA 5)	16:52	3	08:02 (WEA 2)	16:15
6	05:11	05:53	06:45			07:36		08:02 (WEA 5)	07:32			08:22
	21:53	21:13	20:06			18:55	14	08:32 (WEA 4)	16:50			16:14
7	05:12	05:55	06:47			07:38		08:18 (WEA 4)	07:34			08:24
	21:52	21:11	20:04			18:53	15	08:33 (WEA 4)	16:48			16:14
8	05:13	05:56	06:48			07:39		08:16 (WEA 4)	07:36			08:25
	21:52	21:09	20:02			18:51	18	08:34 (WEA 4)	16:46			16:13
9	05:14	05:58	06:50			07:41		08:15 (WEA 4)	07:38			08:26
	21:51	21:07	19:59			18:48	20	08:35 (WEA 4)	16:45			16:13
10	05:15	06:00	06:52			07:43		08:14 (WEA 4)	07:39			08:27
	21:50	21:05	19:57			18:46	22	08:36 (WEA 4)	16:43			16:13
11	05:16	06:01	06:53			07:45		08:14 (WEA 4)	07:41			08:28
	21:49	21:04	19:55			18:44	22	08:36 (WEA 4)	16:41			16:12
12	05:17	06:03	06:55			07:46		08:14 (WEA 4)	07:43			08:29
	21:48	21:02	19:52			18:41	22	08:36 (WEA 4)	16:40			16:12
13	05:18	06:05	06:57			07:48		08:14 (WEA 4)	07:45			08:30
	21:48	21:00	19:50			18:39	21	08:35 (WEA 4)	16:38			16:12
14	05:19	06:06	06:58			07:50		08:16 (WEA 4)	07:47			08:31
	21:47	20:58	19:47			18:37	19	08:35 (WEA 4)	16:37			16:12
15	05:21	06:08	07:00			07:52		08:18 (WEA 4)	07:49			08:32
	21:46	20:55	19:45			18:35	16	08:34 (WEA 4)	16:35			16:12
16	05:22	06:10	07:02			07:54		08:20 (WEA 4)	07:50			08:33
	21:44	20:53	19:43			18:32	14	08:34 (WEA 4)	16:34			16:12
17	05:23	06:11	07:03			07:55		08:22 (WEA 4)	07:52			08:34
	21:43	20:51	19:40			18:30	11	08:33 (WEA 4)	16:32			16:13
18	05:24	06:13	07:05			07:57		08:24 (WEA 4)	07:54			08:35
	21:42	20:49	19:38			18:28	7	08:31 (WEA 4)	16:31			16:13
19	05:26	06:15	07:07			07:59		08:26 (WEA 4)	07:56			08:36
	21:41	20:47	19:36			18:26	3	08:29 (WEA 4)	16:29			16:13
20	05:27	06:16	07:08		08:01 (WEA 5)	08:01			07:57			08:36
	21:40	20:45	19:33	11	08:12 (WEA 5)	18:24			16:28			16:13
21	05:29	06:18	07:10		07:59 (WEA 5)	08:03			07:59			08:37
	21:39	20:43	19:31	16	08:15 (WEA 5)	18:21			16:27			16:14
22	05:30	06:20	07:12		07:56 (WEA 5)	08:04			08:01			08:37
	21:37	20:41	19:28	19	08:15 (WEA 5)	18:19			16:26			16:14
23	05:31	06:21	07:14		07:55 (WEA 5)	08:06			08:03			08:38
	21:36	20:38	19:26	22	08:17 (WEA 5)	18:17			16:25			16:15
24	05:33	06:23	07:15		07:54 (WEA 5)	08:08			08:04			08:38
	21:34	20:36	19:24	24	08:18 (WEA 5)	18:15			16:23			16:15
25	05:34	06:25	07:17		07:53 (WEA 5)	07:10			08:06			08:39
	21:33	20:34	19:21	25	08:18 (WEA 5)	17:13			16:22			16:16
26	05:36	06:26	07:19		07:52 (WEA 5)	07:12		07:58 (WEA 2)	08:08			08:39
	21:32	20:32	19:19	26	08:18 (WEA 5)	17:11	2	08:00 (WEA 2)	16:21			16:17
27	05:37	06:28	07:20		07:51 (WEA 5)	07:14		07:55 (WEA 2)	08:09			08:39
	21:30	20:29	19:16	27	08:18 (WEA 5)	17:09	8	08:03 (WEA 2)	16:20			16:18
28	05:39	06:30	07:22		07:51 (WEA 5)	07:15		07:53 (WEA 2)	08:11			08:39
	21:28	20:27	19:14	27	08:18 (WEA 5)	17:07	12	08:05 (WEA 2)	16:19			16:18
29	05:40	06:31	07:24		07:50 (WEA 5)	07:17		07:53 (WEA 2)	08:12			08:40
	21:27	20:25	19:12	26	08:16 (WEA 5)	17:05	12	08:05 (WEA 2)	16:19			16:19
30	05:42	06:33	07:26		07:51 (WEA 5)	07:19		07:52 (WEA 2)	08:14			08:40
	21:25	20:23	19:09	25	08:16 (WEA 5)	17:03	14	08:06 (WEA 2)	16:18			16:20
31	05:43	06:35				07:21		07:52 (WEA 2)				08:40
	21:24	20:20				17:01	14	08:06 (WEA 2)				16:21
Sonnenscheinstunden	506	456	381			330			263			240
astr.max.mögl.Beschattung				248			366			46		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-47 - SR-47, Krimpenforter Weg 18/20, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März			April			Mai			Juni		
1	08:39			08:11		15:49 (WEA 1)	07:16		17:00 (WEA 2)	07:04			05:57		20:00 (WEA 5)	05:10		
	16:22			17:11	26	16:15 (WEA 1)	18:05	20	17:20 (WEA 2)	20:00			20:53	24	20:24 (WEA 5)	21:41		
2	08:39			08:10		15:48 (WEA 1)	07:14		16:58 (WEA 2)	07:02			05:55		20:00 (WEA 5)	05:10		
	16:23			17:13	28	16:16 (WEA 1)	18:07	23	17:21 (WEA 2)	20:02			20:55	25	20:25 (WEA 5)	21:42		
3	08:39			08:08		15:48 (WEA 1)	07:12		16:57 (WEA 2)	06:59			05:53		20:00 (WEA 5)	05:09		
	16:24			17:15	29	16:17 (WEA 1)	18:08	26	17:23 (WEA 2)	20:04			20:57	27	20:27 (WEA 5)	21:43		
4	08:39			08:06		15:48 (WEA 1)	07:10		16:56 (WEA 2)	06:57			05:52		20:00 (WEA 5)	05:08		
	16:26			17:17	30	16:18 (WEA 1)	18:10	27	17:23 (WEA 2)	20:06			20:58	27	20:27 (WEA 5)	21:44		
5	08:39			08:05		15:48 (WEA 1)	07:07		16:55 (WEA 2)	06:55			05:50		20:00 (WEA 5)	05:07		
	16:27			17:19	30	16:18 (WEA 1)	18:12	29	17:24 (WEA 2)	20:08			21:00	26	20:26 (WEA 5)	21:45		
6	08:38			08:03		15:48 (WEA 1)	07:05		16:55 (WEA 2)	06:52			05:48		19:59 (WEA 5)	05:07		
	16:28			17:21	30	16:18 (WEA 1)	18:14	29	17:24 (WEA 2)	20:09			21:02	27	20:26 (WEA 5)	21:46		
7	08:38			08:01		15:47 (WEA 1)	07:03		16:53 (WEA 2)	06:50			05:46		19:59 (WEA 5)	05:06		
	16:29			17:23	31	16:18 (WEA 1)	18:16	31	17:24 (WEA 2)	20:11			21:03	26	20:25 (WEA 5)	21:47		
8	08:37			07:59		15:48 (WEA 1)	07:00		16:53 (WEA 2)	06:48		19:37 (WEA 4)	05:44		20:00 (WEA 5)	05:05		
	16:31			17:25	30	16:18 (WEA 1)	18:18	31	17:24 (WEA 2)	20:13	10	19:47 (WEA 4)	21:05	25	20:25 (WEA 5)	21:48		
9	08:37			07:58		15:48 (WEA 1)	06:58		16:54 (WEA 2)	06:45		19:33 (WEA 4)	05:42		20:00 (WEA 5)	05:05		
	16:32			17:27	30	16:18 (WEA 1)	18:19	30	17:24 (WEA 2)	20:15	15	19:48 (WEA 4)	21:07	25	20:25 (WEA 5)	21:49		
10	08:36			07:56		15:48 (WEA 1)	06:56		16:53 (WEA 2)	06:43		19:32 (WEA 4)	05:40		20:01 (WEA 5)	05:04		
	16:34			17:29	30	16:18 (WEA 1)	18:21	30	17:23 (WEA 2)	20:16	17	19:49 (WEA 4)	21:08	23	20:24 (WEA 5)	21:50		
11	08:36			07:54		15:49 (WEA 1)	06:53		16:53 (WEA 2)	06:41		19:30 (WEA 4)	05:39		20:02 (WEA 5)	05:04		
	16:35			17:31	28	16:17 (WEA 1)	18:23	30	17:23 (WEA 2)	20:18	21	19:51 (WEA 4)	21:10	21	20:23 (WEA 5)	21:50		
12	08:35			07:52		15:49 (WEA 1)	06:51		16:53 (WEA 2)	06:38		19:29 (WEA 4)	05:37		20:02 (WEA 5)	05:04		
	16:37			17:32	28	16:17 (WEA 1)	18:25	28	17:21 (WEA 2)	20:20	24	19:53 (WEA 4)	21:12	20	20:22 (WEA 5)	21:51		
13	08:34			07:50		15:50 (WEA 1)	06:49		16:54 (WEA 2)	06:36		19:27 (WEA 4)	05:35		20:04 (WEA 5)	05:03		
	16:38			17:34	26	16:16 (WEA 1)	18:27	27	17:21 (WEA 2)	20:22	27	19:54 (WEA 4)	21:13	17	20:21 (WEA 5)	21:52		
14	08:34			07:48		15:51 (WEA 1)	06:46		16:55 (WEA 2)	06:34		19:26 (WEA 4)	05:34		20:05 (WEA 5)	05:03		
	16:40			17:36	24	16:15 (WEA 1)	18:28	25	17:20 (WEA 2)	20:23	30	19:56 (WEA 4)	21:15	15	20:20 (WEA 5)	21:52		
15	08:33			07:46		15:53 (WEA 1)	06:44		16:56 (WEA 2)	06:32		19:26 (WEA 4)	05:32		20:07 (WEA 5)	05:03		
	16:41			17:38	21	16:14 (WEA 1)	18:30	22	17:18 (WEA 2)	20:25	31	19:57 (WEA 4)	21:17	11	20:18 (WEA 5)	21:53		
16	08:32			07:44		15:55 (WEA 1)	06:42		16:58 (WEA 2)	06:29		19:25 (WEA 4)	05:30		20:10 (WEA 5)	05:03		
	16:43			17:40	17	16:12 (WEA 1)	18:32	18	17:16 (WEA 2)	20:27	32	19:57 (WEA 4)	21:18	5	20:15 (WEA 5)	21:53		
17	08:31			07:42		15:57 (WEA 1)	06:39		17:00 (WEA 2)	06:27		19:25 (WEA 4)	05:29			05:03		
	16:44			17:42	13	16:10 (WEA 1)	18:34	14	17:14 (WEA 2)	20:29	33	19:58 (WEA 4)	21:20			21:54		
18	08:30			07:40		16:03 (WEA 1)	06:37			06:25		19:24 (WEA 4)	05:27			05:03		
	16:46			17:44	2	16:05 (WEA 1)	18:36			20:30	33	19:57 (WEA 4)	21:21			21:54		
19	08:29			07:38			06:35		17:51 (WEA 3)	06:23		19:24 (WEA 4)	05:26			05:03		
	16:48			17:46			18:37	10	18:01 (WEA 3)	20:32	32	19:56 (WEA 4)	21:23			21:55		
20	08:28			07:36			06:32		17:48 (WEA 3)	06:20		19:24 (WEA 4)	05:24			05:03		
	16:50			17:48			18:39	14	18:02 (WEA 3)	20:34	32	19:56 (WEA 4)	21:24			21:55		
21	08:27			07:34			06:30		17:47 (WEA 3)	06:18		19:24 (WEA 4)	05:23			05:03		
	16:51			17:50			18:41	17	18:04 (WEA 3)	20:36	32	19:56 (WEA 4)	21:26			21:55		
22	08:25			07:32			06:28		17:46 (WEA 3)	06:16		19:24 (WEA 4)	05:22			05:03		
	16:53			17:52			18:43	19	18:05 (WEA 3)	20:37	31	19:55 (WEA 4)	21:27			21:56		
23	08:24			07:29			06:25		17:45 (WEA 3)	06:14		19:25 (WEA 4)	05:20			05:03		
	16:55			17:53			18:45	19	18:04 (WEA 3)	20:39	30	19:55 (WEA 4)	21:29			21:56		
24	08:23			07:27			06:23		17:45 (WEA 3)	06:12		19:25 (WEA 4)	05:19			05:04		
	16:57			17:55			18:46	20	18:05 (WEA 3)	20:41	31	20:13 (WEA 5)	21:30			21:56		
25	08:22			07:25			06:20		17:44 (WEA 3)	06:10		19:26 (WEA 4)	05:18			05:04		
	16:58			17:57			18:48	20	18:04 (WEA 3)	20:43	34	20:15 (WEA 5)	21:32			21:56		
26	08:20		15:56 (WEA 1)	07:23			06:18		17:44 (WEA 3)	06:08		19:27 (WEA 4)	05:17			05:04		
	17:00	10	16:06 (WEA 1)	17:59			18:50	19	18:03 (WEA 3)	20:44	35	20:16 (WEA 5)	21:33			21:56		
27	08:19		15:54 (WEA 1)	07:21		17:06 (WEA 2)	06:16		17:45 (WEA 3)	06:05		19:28 (WEA 4)	05:16			05:05		
	17:02	15	16:09 (WEA 1)	18:01	9	17:15 (WEA 2)	18:52	18	18:03 (WEA 3)	20:46	36	20:18 (WEA 5)	21:34			21:56		
28	08:17		15:52 (WEA 1)	07:19		17:02 (WEA 2)	06:13		17:45 (WEA 3)	06:03		19:29 (WEA 4)	05:14			05:05		
	17:04	19	16:11 (WEA 1)	18:03	15	17:17 (WEA 2)	18:53	16	18:01 (WEA 3)	20:48	35	20:19 (WEA 5)	21:36			21:56		
29	08:16		15:51 (WEA 1)				07:11		18:46 (WEA 3)	06:01		19:31 (WEA 4)	05:13			05:06		
	17:06	21	16:12 (WEA 1)				19:55	14	19:00 (WEA 3)	20:50	34	20:21 (WEA 5)	21:37			21:55		
30	08:14		15:50 (WEA 1)				07:09		18:48 (WEA 3)	05:59		19:34 (WEA 4)	05:12			05:06		
	17:08	24	16:14 (WEA 1)				19:57	10	18:58 (WEA 3)	20:51	30	20:22 (WEA 5)	21:38			21:55		
31	08:13		15:49 (WEA 1)				07:06						05:11					
	17:10	26	16:15 (WEA 1)				19:59						21:39					
Sonnenscheinstunden	255			276			367			418			489			503		
astr.max.mögl.Beschattung		115			477			636			665			344				

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-47 - SR-47, Krimpenforter Weg 18/20, 49377 Vechta

Annahmen für Schattenwurfberechnung

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Die Rotorfläche steht immer senkrecht zur Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November			Dezember		
1	05:07			05:45			20:12 (WEA 5)	06:36		19:29 (WEA 4)	07:27		17:33 (WEA 2)	07:23		15:18 (WEA 1)	08:15	
	21:55			21:22	21		20:33 (WEA 5)	20:18	21	19:50 (WEA 4)	19:07	28	18:01 (WEA 2)	16:59	29	15:47 (WEA 1)	16:17	
2	05:08			05:46			20:12 (WEA 5)	06:38		19:31 (WEA 4)	07:29		17:32 (WEA 2)	07:24		15:17 (WEA 1)	08:17	
	21:55			21:20	22		20:34 (WEA 5)	20:16	17	19:48 (WEA 4)	19:04	28	18:00 (WEA 2)	16:57	31	15:48 (WEA 1)	16:16	
3	05:08			05:48			20:11 (WEA 5)	06:40		19:31 (WEA 4)	07:31		17:31 (WEA 2)	07:26		15:17 (WEA 1)	08:18	
	21:54			21:18	23		20:34 (WEA 5)	20:13	15	19:46 (WEA 4)	19:02	30	18:01 (WEA 2)	16:55	31	15:48 (WEA 1)	16:16	
4	05:09			05:50			20:11 (WEA 5)	06:41		19:34 (WEA 4)	07:32		17:31 (WEA 2)	07:28		15:17 (WEA 1)	08:20	
	21:54			21:17	24		20:35 (WEA 5)	20:11	10	19:44 (WEA 4)	19:00	30	18:01 (WEA 2)	16:53	31	15:48 (WEA 1)	16:15	
5	05:10			05:51			20:10 (WEA 5)	06:43			07:34		17:30 (WEA 2)	07:30		15:17 (WEA 1)	08:21	
	21:53			21:15	25		20:35 (WEA 5)	20:09			18:57	31	18:01 (WEA 2)	16:51	31	15:48 (WEA 1)	16:14	
6	05:11			05:53			20:10 (WEA 5)	06:45			07:36		17:30 (WEA 2)	07:32		15:17 (WEA 1)	08:22	
	21:53			21:13	26		20:36 (WEA 5)	20:06			18:55	31	18:01 (WEA 2)	16:50	31	15:48 (WEA 1)	16:14	
7	05:12			05:55			20:09 (WEA 5)	06:46			07:37		17:30 (WEA 2)	07:34		15:18 (WEA 1)	08:23	
	21:52			21:11	26		20:35 (WEA 5)	20:04			18:53	29	17:59 (WEA 2)	16:48	29	15:47 (WEA 1)	16:14	
8	05:13			05:56			20:09 (WEA 5)	06:48			07:39		17:30 (WEA 2)	07:36		15:18 (WEA 1)	08:25	
	21:51			21:09	27		20:36 (WEA 5)	20:02			18:50	29	17:59 (WEA 2)	16:46	29	15:47 (WEA 1)	16:13	
9	05:14			05:58			20:08 (WEA 5)	06:50			07:41		17:30 (WEA 2)	07:37		15:19 (WEA 1)	08:26	
	21:51			21:07	27		20:35 (WEA 5)	19:59			18:48	28	17:58 (WEA 2)	16:44	28	15:47 (WEA 1)	16:13	
10	05:15			05:59			20:09 (WEA 5)	06:52			07:43		17:31 (WEA 2)	07:39		15:20 (WEA 1)	08:27	
	21:50			21:05	26		20:35 (WEA 5)	19:57			18:46	26	17:57 (WEA 2)	16:43	26	15:46 (WEA 1)	16:13	
11	05:16			06:01			20:09 (WEA 5)	06:53			07:44		17:32 (WEA 2)	07:41		15:20 (WEA 1)	08:28	
	21:49			21:03	25		20:34 (WEA 5)	19:54			18:43	24	17:56 (WEA 2)	16:41	25	15:45 (WEA 1)	16:12	
12	05:17			06:03			20:09 (WEA 5)	06:55			07:46		17:32 (WEA 2)	07:43		15:21 (WEA 1)	08:29	
	21:48			21:01	23		20:32 (WEA 5)	19:52			18:41	22	17:54 (WEA 2)	16:40	24	15:45 (WEA 1)	16:12	
13	05:18			06:04			19:41 (WEA 4)	06:57		18:39 (WEA 3)	07:48		17:34 (WEA 2)	07:45		15:23 (WEA 1)	08:30	
	21:47			20:59	32		20:31 (WEA 5)	19:50	9	18:48 (WEA 3)	18:39	18	17:52 (WEA 2)	16:38	21	15:44 (WEA 1)	16:12	
14	05:19			06:06			19:38 (WEA 4)	06:58		18:37 (WEA 3)	07:50		17:36 (WEA 2)	07:47		15:24 (WEA 1)	08:31	
	21:46			20:57	35		20:28 (WEA 5)	19:47	13	18:50 (WEA 3)	18:37	13	17:49 (WEA 2)	16:36	18	15:42 (WEA 1)	16:12	
15	05:21			06:08			19:36 (WEA 4)	07:00		18:35 (WEA 3)	07:52		17:42 (WEA 2)	07:48		15:26 (WEA 1)	08:32	
	21:45			20:55	36		20:27 (WEA 5)	19:45	16	18:51 (WEA 3)	18:34	2	17:44 (WEA 2)	16:35	15	15:41 (WEA 1)	16:12	
16	05:22			06:09			19:34 (WEA 4)	07:02		18:33 (WEA 3)	07:53			07:50		15:29 (WEA 1)	08:33	
	21:44			20:53	36		20:24 (WEA 5)	19:43	18	18:51 (WEA 3)	18:32			16:33	10	15:39 (WEA 1)	16:12	
17	05:23			06:11			19:33 (WEA 4)	07:03		18:33 (WEA 3)	07:55			07:52			08:34	
	21:43			20:51	34		20:22 (WEA 5)	19:40	19	18:52 (WEA 3)	18:30			16:32			16:12	
18	05:24			06:13			19:32 (WEA 4)	07:05		18:32 (WEA 3)	07:57			07:54			08:35	
	21:42			20:49	34		20:21 (WEA 5)	19:38	20	18:52 (WEA 3)	18:28			16:31			16:13	
19	05:26			06:14			19:31 (WEA 4)	07:07		18:31 (WEA 3)	07:59			07:56			08:35	
	21:41			20:47	29		20:00 (WEA 4)	19:35	20	18:51 (WEA 3)	18:26			16:29			16:13	
20	05:27			06:16			19:30 (WEA 4)	07:08		18:31 (WEA 3)	08:01			07:57			08:36	
	21:40			20:45	30		20:00 (WEA 4)	19:33	20	18:51 (WEA 3)	18:23			16:28			16:13	
21	05:28			06:18			19:29 (WEA 4)	07:10		18:32 (WEA 3)	08:02			07:59			08:37	
	21:38			20:43	31		20:00 (WEA 4)	19:31	18	18:50 (WEA 3)	18:21			16:27			16:14	
22	05:30			06:20			19:29 (WEA 4)	07:12		18:31 (WEA 3)	08:04			08:01			08:37	
	21:37			20:40	32		20:01 (WEA 4)	19:28	18	18:49 (WEA 3)	18:19			16:26			16:14	
23	05:31			06:21			19:28 (WEA 4)	07:13		18:33 (WEA 3)	08:06			08:02			08:38	
	21:36			20:38	33		20:01 (WEA 4)	19:26	14	18:47 (WEA 3)	18:17			16:24			16:15	
24	05:33			06:23			19:27 (WEA 4)	07:15		18:34 (WEA 3)	08:08		16:30 (WEA 1)	08:04			08:38	
	21:34			20:36	33		20:00 (WEA 4)	19:23	11	18:45 (WEA 3)	18:15	7	16:37 (WEA 1)	16:23			16:15	
25	05:34			06:25			19:28 (WEA 4)	07:17		18:37 (WEA 3)	07:10		15:26 (WEA 1)	08:06			08:38	
	21:33			20:34	32		20:00 (WEA 4)	19:21	4	18:41 (WEA 3)	17:13	14	15:40 (WEA 1)	16:22			16:16	
26	05:36			06:26			19:27 (WEA 4)	07:19		17:43 (WEA 2)	07:12		15:24 (WEA 1)	08:07			08:39	
	21:31			20:32	32		19:59 (WEA 4)	19:19	11	17:54 (WEA 2)	17:11	18	15:42 (WEA 1)	16:21			16:17	
27	05:37			06:28			19:27 (WEA 4)	07:20		17:40 (WEA 2)	07:13		15:22 (WEA 1)	08:09			08:39	
	21:30			20:29	32		19:59 (WEA 4)	19:16	17	17:57 (WEA 2)	17:09	22	15:44 (WEA 1)	16:20			16:17	
28	05:39		20:19 (WEA 5)	06:30			19:28 (WEA 4)	07:22		17:38 (WEA 2)	07:15		15:21 (WEA 1)	08:11			08:39	
	21:28	9	20:28 (WEA 5)	20:27	31		19:59 (WEA 4)	19:14	21	17:59 (WEA 2)	17:07	24	15:45 (WEA 1)	16:19			16:18	
29	05:40		20:17 (WEA 5)	06:31			19:27 (WEA 4)	07:24		17:35 (WEA 2)	07:17		15:20 (WEA 1)	08:12			08:39	
	21:27	12	20:29 (WEA 5)	20:25	30		19:57 (WEA 4)	19:12	24	17:59 (WEA 2)	17:05	26	15:46 (WEA 1)	16:19			16:19	
30	05:42		20:15 (WEA 5)	06:33			19:28 (WEA 4)	07:25		17:34 (WEA 2)	07:19		15:19 (WEA 1)	08:14			08:39	
	21:25	16	20:31 (WEA 5)	20:23	27		19:55 (WEA 4)	19:09	26	18:00 (WEA 2)	17:03	27	15:46 (WEA 1)	16:18			16:20	
31	05:43		20:14 (WEA 5)	06:35			19:28 (WEA 4)				07:21		15:18 (WEA 1)				08:40	
	21:23	18	20:32 (WEA 5)	20:20	24		19:52 (WEA 4)				17:01	29	15:47 (WEA 1)				16:21	
Sonnenscheinstunden		506			456				381			330			263			240
astr.max.mögl.Beschattung			55			898				362			536			409		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-48 - SR-48, Westmark 2a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April	Mai	Juni
1	08:40		14:57 (WEA 3)	08:11	15:38 (WEA 4)	07:16	16:52 (WEA 5)	07:04	05:57	05:10
	16:22	20	15:17 (WEA 3)	17:11	40	16:18 (WEA 4)	18:05	37	17:29 (WEA 5)	20:01	20:53	21:41
2	08:39		14:57 (WEA 3)	08:10	15:38 (WEA 4)	07:14	16:52 (WEA 5)	07:02	05:55	05:10
	16:23	21	15:18 (WEA 3)	17:13	40	16:18 (WEA 4)	18:07	37	17:29 (WEA 5)	20:02	20:55	21:42
3	08:39		14:57 (WEA 3)	08:08	15:39 (WEA 4)	07:12	16:52 (WEA 5)	06:59	05:53	05:09
	16:24	21	15:18 (WEA 3)	17:15	40	16:19 (WEA 4)	18:08	38	17:30 (WEA 5)	20:04	20:57	21:43
4	08:39		14:58 (WEA 3)	08:06	15:39 (WEA 4)	07:10	16:51 (WEA 5)	06:57	05:52	05:08
	16:26	21	15:19 (WEA 3)	17:17	39	16:18 (WEA 4)	18:10	38	17:29 (WEA 5)	20:06	20:58	21:44
5	08:39		14:59 (WEA 3)	08:05	15:39 (WEA 4)	07:07	16:51 (WEA 5)	06:55	05:50	05:07
	16:27	20	15:19 (WEA 3)	17:19	39	16:18 (WEA 4)	18:12	38	17:29 (WEA 5)	20:08	21:00	21:45
6	08:38		14:59 (WEA 3)	08:03	15:40 (WEA 4)	07:05	16:52 (WEA 5)	06:52	05:48	05:07
	16:28	20	15:19 (WEA 3)	17:21	37	16:17 (WEA 4)	18:14	36	17:28 (WEA 5)	20:09	21:02	21:46
7	08:38		14:59 (WEA 3)	08:01	15:41 (WEA 4)	07:03	16:51 (WEA 5)	06:50	05:46	05:06
	16:29	20	15:19 (WEA 3)	17:23	36	16:17 (WEA 4)	18:16	36	17:27 (WEA 5)	20:11	21:04	21:47
8	08:38		15:01 (WEA 3)	07:59	15:41 (WEA 4)	07:00	16:52 (WEA 5)	06:48	05:44	05:05
	16:31	25	15:54 (WEA 4)	17:25	35	16:16 (WEA 4)	18:18	35	17:27 (WEA 5)	20:13	21:05	21:48
9	08:37		15:01 (WEA 3)	07:58	15:42 (WEA 4)	06:58	16:53 (WEA 5)	06:45	05:42	05:05
	16:32	31	15:57 (WEA 4)	17:27	33	16:15 (WEA 4)	18:19	33	17:26 (WEA 5)	20:15	21:07	21:49
10	08:36		15:01 (WEA 3)	07:56	15:44 (WEA 4)	06:56	16:53 (WEA 5)	06:43	05:40	05:04
	16:34	33	15:58 (WEA 4)	17:29	30	16:14 (WEA 4)	18:21	31	17:24 (WEA 5)	20:16	21:09	21:50
11	08:36		15:02 (WEA 3)	07:54	15:45 (WEA 4)	06:54	16:55 (WEA 5)	06:41	05:39	05:04
	16:35	36	16:00 (WEA 4)	17:31	28	16:13 (WEA 4)	18:23	28	17:23 (WEA 5)	20:18	21:10	21:50
12	08:35		15:04 (WEA 3)	07:52	15:47 (WEA 4)	06:51	16:55 (WEA 5)	06:38	05:37	05:04
	16:37	36	16:02 (WEA 4)	17:33	25	16:12 (WEA 4)	18:25	26	17:21 (WEA 5)	20:20	21:12	21:51
13	08:34		15:05 (WEA 3)	07:50	15:49 (WEA 4)	06:49	16:57 (WEA 5)	06:36	05:35	05:03
	16:38	37	16:04 (WEA 4)	17:34	21	16:10 (WEA 4)	18:27	22	17:19 (WEA 5)	20:22	21:13	21:52
14	08:34		15:06 (WEA 3)	07:48	15:52 (WEA 4)	06:47	17:00 (WEA 5)	06:34	05:34	05:03
	16:40	39	16:06 (WEA 4)	17:36	15	16:07 (WEA 4)	18:29	17	17:17 (WEA 5)	20:23	21:15	21:52
15	08:33		15:07 (WEA 3)	07:46	15:58 (WEA 4)	06:44	17:03 (WEA 5)	06:32	05:32	05:03
	16:41	39	16:07 (WEA 4)	17:38	3	16:01 (WEA 4)	18:30	9	17:12 (WEA 5)	20:25	21:17	21:53
16	08:32		15:09 (WEA 3)	07:44	06:42	06:29	05:30	05:03
	16:43	38	16:09 (WEA 4)	17:40	18:32	20:27	21:18	21:54
17	08:31		15:11 (WEA 3)	07:42	06:39	06:27	05:29	05:03
	16:44	35	16:09 (WEA 4)	17:42	18:34	20:29	21:20	21:54
18	08:30		15:38 (WEA 4)	07:40	06:37	06:25	05:27	05:03
	16:46	32	16:10 (WEA 4)	17:44	18:36	20:30	21:21	21:54
19	08:29		15:38 (WEA 4)	07:38	17:10 (WEA 5)	06:35	06:23	05:26	05:03
	16:48	33	16:11 (WEA 4)	17:46	4	17:14 (WEA 5)	18:37	20:32	21:23	21:55
20	08:28		15:38 (WEA 4)	07:36	17:04 (WEA 5)	06:32	06:20	05:24	05:03
	16:50	35	16:13 (WEA 4)	17:48	15	17:19 (WEA 5)	18:39	20:34	21:24	21:55
21	08:27		15:37 (WEA 4)	07:34	17:01 (WEA 5)	06:30	06:18	05:23	05:03
	16:51	36	16:13 (WEA 4)	17:50	21	17:22 (WEA 5)	18:41	20:36	21:26	21:55
22	08:25		15:37 (WEA 4)	07:32	16:59 (WEA 5)	06:28	06:16	05:22	05:03
	16:53	37	16:14 (WEA 4)	17:52	25	17:24 (WEA 5)	18:43	20:37	21:27	21:56
23	08:24		15:38 (WEA 4)	07:29	16:58 (WEA 5)	06:25	06:14	05:20	05:03
	16:55	37	16:15 (WEA 4)	17:53	28	17:26 (WEA 5)	18:45	20:39	21:29	21:56
24	08:23		15:37 (WEA 4)	07:27	16:57 (WEA 5)	06:23	06:12	05:19	05:04
	16:57	38	16:15 (WEA 4)	17:55	30	17:27 (WEA 5)	18:46	20:41	21:30	21:56
25	08:22		15:37 (WEA 4)	07:25	16:55 (WEA 5)	06:20	06:10	05:18	05:04
	16:58	39	16:16 (WEA 4)	17:57	32	17:27 (WEA 5)	18:48	20:43	21:32	21:56
26	08:20		15:37 (WEA 4)	07:23	16:54 (WEA 5)	06:18	06:08	05:17	05:04
	17:00	39	16:16 (WEA 4)	17:59	34	17:28 (WEA 5)	18:50	20:45	21:33	21:56
27	08:19		15:37 (WEA 4)	07:21	16:54 (WEA 5)	06:16	06:05	05:16	05:05
	17:02	40	16:17 (WEA 4)	18:01	35	17:29 (WEA 5)	18:52	20:46	21:34	21:56
28	08:17		15:37 (WEA 4)	07:19	16:53 (WEA 5)	06:13	06:03	05:14	05:05
	17:04	40	16:17 (WEA 4)	18:03	36	17:29 (WEA 5)	18:53	20:48	21:36	21:56
29	08:16		15:37 (WEA 4)		07:11	06:01	05:13	05:06
	17:06	40	16:17 (WEA 4)		19:55	20:50	21:37	21:56
30	08:14		15:38 (WEA 4)		07:09	05:59	05:12	05:06
	17:08	40	16:18 (WEA 4)		19:57	20:51	21:38	21:55
31	08:13		15:38 (WEA 4)		07:06		05:11	
	17:10	40	16:18 (WEA 4)		19:59		21:39	
Sonnenscheinstunden	255		276		367	418	489	503
astr.max.mögl.Beschattung		1018		721		461		

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-48 - SR-48, Westmark 2a, 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September			Oktober			November			Dezember		
1	05:07	05:45	06:36			07:27		17:36 (WEA 5)	07:23		15:13 (WEA 4)	08:15		14:44 (WEA 3)
	21:55	21:22	20:18			19:07	24	18:00 (WEA 5)	16:59	31	15:44 (WEA 4)	16:17	36	15:42 (WEA 4)
2	05:08	05:46	06:38			07:29		17:33 (WEA 5)	07:25		15:12 (WEA 4)	08:17		14:44 (WEA 3)
	21:55	21:20	20:16			19:04	28	18:01 (WEA 5)	16:57	33	15:45 (WEA 4)	16:16	34	15:42 (WEA 4)
3	05:08	05:48	06:40			07:31		17:32 (WEA 5)	07:26		15:11 (WEA 4)	08:18		14:45 (WEA 3)
	21:54	21:18	20:13			19:02	30	18:02 (WEA 5)	16:55	35	15:46 (WEA 4)	16:16	31	15:41 (WEA 4)
4	05:09	05:50	06:41			07:32		17:30 (WEA 5)	07:28		15:10 (WEA 4)	08:20		14:45 (WEA 3)
	21:54	21:17	20:11			19:00	33	18:03 (WEA 5)	16:53	37	15:47 (WEA 4)	16:15	27	15:39 (WEA 4)
5	05:10	05:51	06:43			07:34		17:30 (WEA 5)	07:30		15:10 (WEA 4)	08:21		14:44 (WEA 3)
	21:53	21:15	20:09			18:57	33	18:03 (WEA 5)	16:51	37	15:47 (WEA 4)	16:14	20	15:04 (WEA 3)
6	05:11	05:53	06:45			07:36		17:29 (WEA 5)	07:32		15:09 (WEA 4)	08:22		14:45 (WEA 3)
	21:53	21:13	20:06			18:55	35	18:04 (WEA 5)	16:50	39	15:48 (WEA 4)	16:14	20	15:05 (WEA 3)
7	05:12	05:55	06:46			07:38		17:27 (WEA 5)	07:34		15:09 (WEA 4)	08:24		14:45 (WEA 3)
	21:52	21:11	20:04			18:53	36	18:03 (WEA 5)	16:48	39	15:48 (WEA 4)	16:14	20	15:05 (WEA 3)
8	05:13	05:56	06:48			07:39		17:27 (WEA 5)	07:36		15:09 (WEA 4)	08:25		14:46 (WEA 3)
	21:51	21:09	20:02			18:50	37	18:04 (WEA 5)	16:46	39	15:48 (WEA 4)	16:13	21	15:07 (WEA 3)
9	05:14	05:58	06:50			07:41		17:26 (WEA 5)	07:38		15:08 (WEA 4)	08:26		14:46 (WEA 3)
	21:51	21:07	19:59			18:48	38	18:04 (WEA 5)	16:44	41	15:49 (WEA 4)	16:13	21	15:07 (WEA 3)
10	05:15	05:59	06:52			07:43		17:26 (WEA 5)	07:39		15:08 (WEA 4)	08:27		14:46 (WEA 3)
	21:50	21:05	19:57			18:46	38	18:04 (WEA 5)	16:43	41	15:49 (WEA 4)	16:13	21	15:07 (WEA 3)
11	05:16	06:01	06:53			07:45		17:26 (WEA 5)	07:41		15:08 (WEA 4)	08:28		14:47 (WEA 3)
	21:49	21:03	19:55			18:43	38	18:04 (WEA 5)	16:41	41	15:49 (WEA 4)	16:12	20	15:07 (WEA 3)
12	05:17	06:03	06:55			07:46		17:25 (WEA 5)	07:43		15:09 (WEA 4)	08:29		14:47 (WEA 3)
	21:48	21:01	19:52			18:41	37	18:02 (WEA 5)	16:40	40	15:49 (WEA 4)	16:12	21	15:08 (WEA 3)
13	05:18	06:04	06:57			07:48		17:25 (WEA 5)	07:45		15:09 (WEA 4)	08:30		14:47 (WEA 3)
	21:47	20:59	19:50			18:39	37	18:02 (WEA 5)	16:38	40	15:49 (WEA 4)	16:12	21	15:08 (WEA 3)
14	05:19	06:06	06:58			07:50		17:26 (WEA 5)	07:47		15:09 (WEA 4)	08:31		14:48 (WEA 3)
	21:46	20:57	19:47			18:37	35	18:01 (WEA 5)	16:36	40	15:49 (WEA 4)	16:12	21	15:09 (WEA 3)
15	05:21	06:08	07:00			07:52		17:26 (WEA 5)	07:48		15:09 (WEA 4)	08:32		14:48 (WEA 3)
	21:45	20:55	19:45			18:34	35	18:01 (WEA 5)	16:35	40	15:49 (WEA 4)	16:12	21	15:09 (WEA 3)
16	05:22	06:09	07:02			07:53		17:27 (WEA 5)	07:50		15:10 (WEA 4)	08:33		14:49 (WEA 3)
	21:44	20:53	19:43			18:32	33	18:00 (WEA 5)	16:33	39	15:49 (WEA 4)	16:12	21	15:10 (WEA 3)
17	05:23	06:11	07:03			07:55		17:28 (WEA 5)	07:52		15:10 (WEA 4)	08:34		14:50 (WEA 3)
	21:43	20:51	19:40			18:30	31	17:59 (WEA 5)	16:32	39	15:49 (WEA 4)	16:12	20	15:10 (WEA 3)
18	05:24	06:13	07:05			07:57		17:29 (WEA 5)	07:54		15:11 (WEA 4)	08:35		14:50 (WEA 3)
	21:42	20:49	19:38			18:28	29	17:58 (WEA 5)	16:31	38	15:49 (WEA 4)	16:13	21	15:11 (WEA 3)
19	05:26	06:14	07:07			07:59		17:30 (WEA 5)	07:56		15:12 (WEA 4)	08:35		14:50 (WEA 3)
	21:41	20:47	19:35			18:26	26	17:56 (WEA 5)	16:29	37	15:49 (WEA 4)	16:13	21	15:11 (WEA 3)
20	05:27	06:16	07:08			08:01		17:31 (WEA 5)	07:57		15:12 (WEA 4)	08:36		14:51 (WEA 3)
	21:40	20:45	19:33			18:23	24	17:55 (WEA 5)	16:28	37	15:49 (WEA 4)	16:13	21	15:12 (WEA 3)
21	05:28	06:18	07:10			08:02		17:32 (WEA 5)	07:59		15:13 (WEA 4)	08:37		14:51 (WEA 3)
	21:38	20:43	19:31			18:21	19	17:51 (WEA 5)	16:27	36	15:49 (WEA 4)	16:14	20	15:11 (WEA 3)
22	05:30	06:20	07:12			08:04		17:35 (WEA 5)	08:01		15:14 (WEA 4)	08:37		14:52 (WEA 3)
	21:37	20:40	19:28			18:19	13	17:48 (WEA 5)	16:26	35	15:49 (WEA 4)	16:14	20	15:12 (WEA 3)
23	05:31	06:21	07:13			08:06			08:02		15:15 (WEA 4)	08:38		14:52 (WEA 3)
	21:36	20:38	19:26			18:17			16:24	33	15:48 (WEA 4)	16:15	20	15:12 (WEA 3)
24	05:33	06:23	07:15			08:08			08:04		15:15 (WEA 4)	08:38		14:53 (WEA 3)
	21:34	20:36	19:23			18:15			16:23	32	15:47 (WEA 4)	16:15	21	15:14 (WEA 3)
25	05:34	06:25	07:17			07:10			08:06		14:49 (WEA 3)	08:39		14:53 (WEA 3)
	21:33	20:34	19:21			17:13			16:22	35	15:47 (WEA 4)	16:16	21	15:14 (WEA 3)
26	05:36	06:26	07:19			07:12			08:07		14:47 (WEA 3)	08:39		14:54 (WEA 3)
	21:31	20:32	19:19			17:11			16:21	38	15:47 (WEA 4)	16:17	20	15:14 (WEA 3)
27	05:37	06:28	07:20			07:13		15:25 (WEA 4)	08:09		14:46 (WEA 3)	08:39		14:54 (WEA 3)
	21:30	20:29	19:16			17:09	8	15:33 (WEA 4)	16:20	39	15:46 (WEA 4)	16:17	20	15:14 (WEA 3)
28	05:39	06:30	07:22			07:15		15:21 (WEA 4)	08:11		14:45 (WEA 3)	08:39		14:54 (WEA 3)
	21:28	20:27	19:14			17:07	16	15:37 (WEA 4)	16:19	39	15:45 (WEA 4)	16:18	21	15:15 (WEA 3)
29	05:40	06:31	07:24		17:41 (WEA 5)	07:17		15:18 (WEA 4)	08:12		14:45 (WEA 3)	08:39		14:55 (WEA 3)
	21:27	20:25	19:12	14	17:55 (WEA 5)	17:05	22	15:40 (WEA 4)	16:18	37	15:44 (WEA 4)	16:19	20	15:15 (WEA 3)
30	05:42	06:33	07:25		17:38 (WEA 5)	07:19		15:16 (WEA 4)	08:14		14:45 (WEA 3)	08:40		14:55 (WEA 3)
	21:25	20:23	19:09	20	17:58 (WEA 5)	17:03	25	15:41 (WEA 4)	16:18	37	15:44 (WEA 4)	16:20	21	15:16 (WEA 3)
31	05:43	06:35				07:21		15:14 (WEA 4)				08:40		14:56 (WEA 3)
	21:24	20:20				17:01	29	15:43 (WEA 4)				16:21	20	15:16 (WEA 3)
Sonnenscheinstunden	506	456	381			330			263			240		
astr.max.mögl.Beschattung				34			789			1124			683	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-49 - SR-49, Plaggenweg 4 (Neubau), 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar			Februar			März	April	Mai	Juni
1	08:40		14:31 (WEA 4)	08:11		16:00 (WEA 5)	07:16	07:04	05:57	05:10
	16:22	39	15:10 (WEA 4)	17:11	34	16:34 (WEA 5)	18:05	20:01	20:53	21:41
2	08:39		14:32 (WEA 4)	08:10		15:59 (WEA 5)	07:14	07:02	05:55	05:10
	16:23	39	15:11 (WEA 4)	17:13	36	16:35 (WEA 5)	18:07	20:02	20:55	21:42
3	08:39		14:32 (WEA 4)	08:08		16:00 (WEA 5)	07:12	06:59	05:53	05:09
	16:24	39	15:11 (WEA 4)	17:15	36	16:36 (WEA 5)	18:08	20:04	20:57	21:43
4	08:39		14:33 (WEA 4)	08:06		15:59 (WEA 5)	07:10	06:57	05:52	05:08
	16:26	38	15:11 (WEA 4)	17:17	38	16:37 (WEA 5)	18:10	20:06	20:58	21:44
5	08:39		14:34 (WEA 4)	08:05		15:59 (WEA 5)	07:07	06:55	05:50	05:07
	16:27	38	15:12 (WEA 4)	17:19	38	16:37 (WEA 5)	18:12	20:08	21:00	21:45
6	08:38		14:34 (WEA 4)	08:03		15:58 (WEA 5)	07:05	06:52	05:48	05:07
	16:28	38	15:12 (WEA 4)	17:21	39	16:37 (WEA 5)	18:14	20:09	21:02	21:46
7	08:38		14:34 (WEA 4)	08:01		15:58 (WEA 5)	07:03	06:50	05:46	05:06
	16:29	38	15:12 (WEA 4)	17:23	40	16:38 (WEA 5)	18:16	20:11	21:04	21:47
8	08:38		14:35 (WEA 4)	07:59		15:58 (WEA 5)	07:00	06:48	05:44	05:05
	16:31	38	15:13 (WEA 4)	17:25	40	16:38 (WEA 5)	18:18	20:13	21:05	21:48
9	08:37		14:36 (WEA 4)	07:58		15:58 (WEA 5)	06:58	06:45	05:42	05:05
	16:32	36	15:12 (WEA 4)	17:27	40	16:38 (WEA 5)	18:19	20:15	21:07	21:49
10	08:36		14:36 (WEA 4)	07:56		15:58 (WEA 5)	06:56	06:43	05:40	05:04
	16:34	36	15:12 (WEA 4)	17:29	40	16:38 (WEA 5)	18:21	20:16	21:09	21:50
11	08:36		14:37 (WEA 4)	07:54		15:58 (WEA 5)	06:54	06:41	05:39	05:04
	16:35	35	15:12 (WEA 4)	17:31	40	16:38 (WEA 5)	18:23	20:18	21:10	21:50
12	08:35		14:39 (WEA 4)	07:52		15:59 (WEA 5)	06:51	06:38	05:37	05:04
	16:37	34	15:13 (WEA 4)	17:33	39	16:38 (WEA 5)	18:25	20:20	21:12	21:51
13	08:34		14:39 (WEA 4)	07:50		15:59 (WEA 5)	06:49	06:36	05:35	05:03
	16:38	34	15:13 (WEA 4)	17:34	39	16:38 (WEA 5)	18:27	20:22	21:13	21:52
14	08:34		14:40 (WEA 4)	07:48		15:59 (WEA 5)	06:47	06:34	05:34	05:03
	16:40	33	15:13 (WEA 4)	17:36	38	16:37 (WEA 5)	18:29	20:23	21:15	21:52
15	08:33		14:41 (WEA 4)	07:46		16:00 (WEA 5)	06:44	06:32	05:32	05:03
	16:41	32	15:13 (WEA 4)	17:38	37	16:37 (WEA 5)	18:30	20:25	21:17	21:53
16	08:32		14:42 (WEA 4)	07:44		16:01 (WEA 5)	06:42	06:29	05:30	05:03
	16:43	30	15:12 (WEA 4)	17:40	35	16:36 (WEA 5)	18:32	20:27	21:18	21:54
17	08:31		14:43 (WEA 4)	07:42		16:02 (WEA 5)	06:39	06:27	05:29	05:03
	16:44	28	15:11 (WEA 4)	17:42	33	16:35 (WEA 5)	18:34	20:29	21:20	21:54
18	08:30		14:44 (WEA 4)	07:40		16:03 (WEA 5)	06:37	06:25	05:27	05:03
	16:46	27	15:11 (WEA 4)	17:44	32	16:35 (WEA 5)	18:36	20:30	21:21	21:54
19	08:29		14:46 (WEA 4)	07:38		16:04 (WEA 5)	06:35	06:23	05:26	05:03
	16:48	24	15:10 (WEA 4)	17:46	29	16:33 (WEA 5)	18:37	20:32	21:23	21:55
20	08:28		14:48 (WEA 4)	07:36		16:05 (WEA 5)	06:32	06:20	05:24	05:03
	16:50	21	15:09 (WEA 4)	17:48	26	16:31 (WEA 5)	18:39	20:34	21:24	21:55
21	08:27		14:49 (WEA 4)	07:34		16:07 (WEA 5)	06:30	06:18	05:23	05:03
	16:51	18	15:07 (WEA 4)	17:50	22	16:29 (WEA 5)	18:41	20:36	21:26	21:55
22	08:25		14:52 (WEA 4)	07:32		16:10 (WEA 5)	06:28	06:16	05:22	05:03
	16:53	14	15:06 (WEA 4)	17:52	17	16:27 (WEA 5)	18:43	20:38	21:27	21:56
23	08:24		14:57 (WEA 4)	07:29		16:15 (WEA 5)	06:25	06:14	05:20	05:03
	16:55	6	15:03 (WEA 4)	17:53	7	16:22 (WEA 5)	18:45	20:39	21:29	21:56
24	08:23		16:10 (WEA 5)	07:27			06:23	06:12	05:19	05:04
	16:57	11	16:21 (WEA 5)	17:55			18:46	20:41	21:30	21:56
25	08:22		16:08 (WEA 5)	07:25			06:21	06:10	05:18	05:04
	16:58	16	16:24 (WEA 5)	17:57			18:48	20:43	21:32	21:56
26	08:20		16:06 (WEA 5)	07:23			06:18	06:08	05:17	05:04
	17:00	20	16:26 (WEA 5)	17:59			18:50	20:45	21:33	21:56
27	08:19		16:05 (WEA 5)	07:21			06:16	06:05	05:16	05:05
	17:02	24	16:29 (WEA 5)	18:01			18:52	20:46	21:34	21:56
28	08:17		16:03 (WEA 5)	07:19			06:13	06:03	05:14	05:05
	17:04	27	16:30 (WEA 5)	18:03			18:53	20:48	21:36	21:56
29	08:16		16:02 (WEA 5)				07:11	06:01	05:13	05:06
	17:06	29	16:31 (WEA 5)				19:55	20:50	21:37	21:56
30	08:15		16:02 (WEA 5)				07:09	05:59	05:12	05:06
	17:08	31	16:33 (WEA 5)				19:57	20:51	21:38	21:55
31	08:13		16:01 (WEA 5)				07:06		05:11	
	17:10	33	16:34 (WEA 5)				19:59		21:40	
Sonnenscheinstunden	255			276			367	418	489	503
astr.max.mögl.Beschattung		906			775					

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-49 - SR-49, Plaggenweg 4 (Neubau), 49377 Vechta

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober			November			Dezember		
1	05:07	05:45	06:36	07:27			07:23		15:28 (WEA 5)	08:15		14:19 (WEA 4)
	21:55	21:22	20:18	19:07			16:59	40	16:08 (WEA 5)	16:17	35	14:54 (WEA 4)
2	05:08	05:46	06:38	07:29			07:25		15:28 (WEA 5)	08:17		14:19 (WEA 4)
	21:55	21:20	20:16	19:04			16:57	40	16:08 (WEA 5)	16:16	36	14:55 (WEA 4)
3	05:08	05:48	06:40	07:31			07:26		15:28 (WEA 5)	08:18		14:20 (WEA 4)
	21:54	21:18	20:13	19:02			16:55	40	16:08 (WEA 5)	16:16	37	14:57 (WEA 4)
4	05:09	05:50	06:41	07:32			07:28		15:28 (WEA 5)	08:20		14:20 (WEA 4)
	21:54	21:17	20:11	19:00			16:53	39	16:07 (WEA 5)	16:15	37	14:57 (WEA 4)
5	05:10	05:51	06:43	07:34			07:30		15:28 (WEA 5)	08:21		14:20 (WEA 4)
	21:53	21:15	20:09	18:57			16:51	39	16:07 (WEA 5)	16:14	38	14:58 (WEA 4)
6	05:11	05:53	06:45	07:36			07:32		15:28 (WEA 5)	08:22		14:20 (WEA 4)
	21:53	21:13	20:06	18:55			16:50	39	16:07 (WEA 5)	16:14	38	14:58 (WEA 4)
7	05:12	05:55	06:46	07:38			07:34		15:29 (WEA 5)	08:24		14:20 (WEA 4)
	21:52	21:11	20:04	18:53			16:48	38	16:07 (WEA 5)	16:14	38	14:58 (WEA 4)
8	05:13	05:56	06:48	07:39			07:36		15:29 (WEA 5)	08:25		14:21 (WEA 4)
	21:51	21:09	20:02	18:50			16:46	37	16:06 (WEA 5)	16:13	38	14:59 (WEA 4)
9	05:14	05:58	06:50	07:41			07:38		15:30 (WEA 5)	08:26		14:21 (WEA 4)
	21:51	21:07	19:59	18:48			16:44	36	16:06 (WEA 5)	16:13	39	15:00 (WEA 4)
10	05:15	05:59	06:52	07:43			07:39		15:31 (WEA 5)	08:27		14:21 (WEA 4)
	21:50	21:05	19:57	18:46			16:43	34	16:05 (WEA 5)	16:13	39	15:00 (WEA 4)
11	05:16	06:01	06:53	07:45			07:41		15:32 (WEA 5)	08:28		14:21 (WEA 4)
	21:49	21:03	19:55	18:43			16:41	32	16:04 (WEA 5)	16:12	39	15:00 (WEA 4)
12	05:17	06:03	06:55	07:46			07:43		15:33 (WEA 5)	08:29		14:21 (WEA 4)
	21:48	21:01	19:52	18:41			16:40	31	16:04 (WEA 5)	16:12	40	15:01 (WEA 4)
13	05:18	06:04	06:57	07:48			07:45		15:34 (WEA 5)	08:30		14:22 (WEA 4)
	21:47	20:59	19:50	18:39			16:38	29	16:03 (WEA 5)	16:12	39	15:01 (WEA 4)
14	05:19	06:06	06:58	07:50			07:47		15:35 (WEA 5)	08:31		14:22 (WEA 4)
	21:46	20:57	19:47	18:37			16:36	27	16:02 (WEA 5)	16:12	40	15:02 (WEA 4)
15	05:21	06:08	07:00	07:52			07:48		15:37 (WEA 5)	08:32		14:23 (WEA 4)
	21:45	20:55	19:45	18:34			16:35	24	16:01 (WEA 5)	16:12	39	15:02 (WEA 4)
16	05:22	06:09	07:02	07:53			07:50		15:39 (WEA 5)	08:33		14:23 (WEA 4)
	21:44	20:53	19:43	18:32			16:33	20	15:59 (WEA 5)	16:12	40	15:03 (WEA 4)
17	05:23	06:11	07:03	07:55			07:52		15:41 (WEA 5)	08:34		14:24 (WEA 4)
	21:43	20:51	19:40	18:30			16:32	16	15:57 (WEA 5)	16:12	40	15:04 (WEA 4)
18	05:24	06:13	07:05	07:57			07:54		15:44 (WEA 5)	08:35		14:25 (WEA 4)
	21:42	20:49	19:38	18:28			16:31	11	15:55 (WEA 5)	16:13	39	15:04 (WEA 4)
19	05:26	06:14	07:07	07:59		16:44 (WEA 5)	07:56		14:31 (WEA 4)	08:35		14:24 (WEA 4)
	21:41	20:47	19:35	18:26	12	16:56 (WEA 5)	16:29	6	14:37 (WEA 4)	16:13	40	15:04 (WEA 4)
20	05:27	06:16	07:08	08:01		16:41 (WEA 5)	07:57		14:27 (WEA 4)	08:36		14:25 (WEA 4)
	21:40	20:45	19:33	18:23	18	16:59 (WEA 5)	16:28	14	14:41 (WEA 4)	16:13	40	15:05 (WEA 4)
21	05:28	06:18	07:10	08:02		16:37 (WEA 5)	07:59		14:25 (WEA 4)	08:37		14:25 (WEA 4)
	21:38	20:43	19:31	18:21	23	17:00 (WEA 5)	16:27	18	14:43 (WEA 4)	16:14	40	15:05 (WEA 4)
22	05:30	06:20	07:12	08:04		16:35 (WEA 5)	08:01		14:24 (WEA 4)	08:37		14:26 (WEA 4)
	21:37	20:40	19:28	18:19	27	17:02 (WEA 5)	16:26	21	14:45 (WEA 4)	16:14	40	15:06 (WEA 4)
23	05:31	06:21	07:13	08:06		16:33 (WEA 5)	08:03		14:23 (WEA 4)	08:38		14:26 (WEA 4)
	21:36	20:38	19:26	18:17	30	17:03 (WEA 5)	16:24	24	14:47 (WEA 4)	16:15	40	15:06 (WEA 4)
24	05:33	06:23	07:15	08:08		16:32 (WEA 5)	08:04		14:21 (WEA 4)	08:38		14:27 (WEA 4)
	21:34	20:36	19:23	18:15	32	17:04 (WEA 5)	16:23	27	14:48 (WEA 4)	16:15	40	15:07 (WEA 4)
25	05:34	06:25	07:17	07:10		15:31 (WEA 5)	08:06		14:21 (WEA 4)	08:39		14:27 (WEA 4)
	21:33	20:34	19:21	17:13	34	16:05 (WEA 5)	16:22	28	14:49 (WEA 4)	16:16	40	15:07 (WEA 4)
26	05:36	06:26	07:19	07:12		15:30 (WEA 5)	08:07		14:21 (WEA 4)	08:39		14:28 (WEA 4)
	21:31	20:32	19:19	17:11	36	16:06 (WEA 5)	16:21	29	14:50 (WEA 4)	16:17	40	15:08 (WEA 4)
27	05:37	06:28	07:20	07:13		15:29 (WEA 5)	08:09		14:20 (WEA 4)	08:39		14:28 (WEA 4)
	21:30	20:29	19:16	17:09	37	16:06 (WEA 5)	16:20	32	14:52 (WEA 4)	16:17	40	15:08 (WEA 4)
28	05:39	06:30	07:22	07:15		15:29 (WEA 5)	08:11		14:19 (WEA 4)	08:39		14:29 (WEA 4)
	21:28	20:27	19:14	17:07	38	16:07 (WEA 5)	16:19	33	14:52 (WEA 4)	16:18	39	15:08 (WEA 4)
29	05:40	06:31	07:24	07:17		15:28 (WEA 5)	08:12		14:19 (WEA 4)	08:39		14:29 (WEA 4)
	21:27	20:25	19:12	17:05	39	16:07 (WEA 5)	16:18	34	14:53 (WEA 4)	16:19	40	15:09 (WEA 4)
30	05:42	06:33	07:25	07:19		15:28 (WEA 5)	08:14		14:20 (WEA 4)	08:40		14:30 (WEA 4)
	21:25	20:23	19:09	17:03	39	16:07 (WEA 5)	16:18	34	14:54 (WEA 4)	16:20	39	15:09 (WEA 4)
31	05:43	06:35		07:21		15:28 (WEA 5)				08:40		14:30 (WEA 4)
	21:24	20:20		17:01	40	16:08 (WEA 5)				16:21	40	15:10 (WEA 4)
Sonnenscheinstunden	506	456	381	330			263			240		
astr.max.mögl.Beschattung					405			872			1209	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-50 - SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März			April			Mai			Juni		
1	08:40	08:11	07:16			07:04		07:45 (WEA 2)	05:57			05:11		05:59 (WEA 4)
	16:22	17:12	18:05			20:01	23	08:08 (WEA 2)	20:53			21:41	35	06:34 (WEA 4)
2	08:39	08:10	07:14			07:02		07:45 (WEA 2)	05:56			05:10		06:00 (WEA 4)
	16:23	17:13	18:07			20:02	23	08:08 (WEA 2)	20:55			21:42	34	06:34 (WEA 4)
3	08:39	08:08	07:12			06:59		07:45 (WEA 2)	05:54			05:09		06:01 (WEA 4)
	16:25	17:15	18:09			20:04	21	08:06 (WEA 2)	20:57			21:43	34	06:35 (WEA 4)
4	08:39	08:06	07:10			06:57		07:45 (WEA 2)	05:52			05:08		06:01 (WEA 4)
	16:26	17:17	18:10			20:06	21	08:06 (WEA 2)	20:58			21:44	33	06:34 (WEA 4)
5	08:39	08:05	07:07			06:55		07:46 (WEA 2)	05:50			05:07		06:01 (WEA 4)
	16:27	17:19	18:12			20:08	19	08:05 (WEA 2)	21:00			21:45	33	06:34 (WEA 4)
6	08:38	08:03	07:05		07:35 (WEA 1)	06:52		07:47 (WEA 2)	05:48			05:07		06:01 (WEA 4)
	16:28	17:21	18:14	10	07:45 (WEA 1)	20:09	15	08:02 (WEA 2)	21:02			21:46	33	06:34 (WEA 4)
7	08:38	08:01	07:03		07:32 (WEA 1)	06:50		07:49 (WEA 2)	05:46		06:12 (WEA 4)	05:06		06:01 (WEA 4)
	16:30	17:23	18:16	14	07:46 (WEA 1)	20:11	11	08:00 (WEA 2)	21:04	10	06:22 (WEA 4)	21:47	33	06:34 (WEA 4)
8	08:38	07:59	07:01		07:31 (WEA 1)	06:48			05:44		06:10 (WEA 4)	05:05		06:02 (WEA 4)
	16:31	17:25	18:18	17	07:48 (WEA 1)	20:13			21:05	14	06:24 (WEA 4)	21:48	32	06:34 (WEA 4)
9	08:37	07:58	06:58		07:30 (WEA 1)	06:45			05:42		06:08 (WEA 4)	05:05		06:02 (WEA 4)
	16:32	17:27	18:20	19	07:49 (WEA 1)	20:15			21:07	18	06:26 (WEA 4)	21:49	32	06:34 (WEA 4)
10	08:36	07:56	06:56		07:29 (WEA 1)	06:43			05:41		06:07 (WEA 4)	05:05		06:03 (WEA 4)
	16:34	17:29	18:21	19	07:48 (WEA 1)	20:16			21:09	21	06:28 (WEA 4)	21:50	31	06:34 (WEA 4)
11	08:36	07:54	06:54		07:29 (WEA 1)	06:41			05:39		06:05 (WEA 4)	05:04		06:03 (WEA 4)
	16:35	17:31	18:23	20	07:49 (WEA 1)	20:18			21:10	24	06:29 (WEA 4)	21:50	31	06:34 (WEA 4)
12	08:35	07:52	06:51		07:29 (WEA 1)	06:38			05:37		06:03 (WEA 4)	05:04		06:03 (WEA 4)
	16:37	17:33	18:25	20	07:49 (WEA 1)	20:20			21:12	26	06:29 (WEA 4)	21:51	31	06:34 (WEA 4)
13	08:34	07:50	06:49		07:28 (WEA 1)	06:36		07:19 (WEA 3)	05:35		06:02 (WEA 4)	05:03		06:04 (WEA 4)
	16:38	17:35	18:27	20	07:48 (WEA 1)	20:22	6	07:25 (WEA 3)	21:14	29	06:31 (WEA 4)	21:52	30	06:34 (WEA 4)
14	08:34	07:48	06:47		07:29 (WEA 1)	06:34		07:14 (WEA 3)	05:34		06:00 (WEA 4)	05:03		06:04 (WEA 4)
	16:40	17:36	18:29	18	07:47 (WEA 1)	20:23	13	07:27 (WEA 3)	21:15	31	06:31 (WEA 4)	21:52	30	06:34 (WEA 4)
15	08:33	07:46	06:44		07:29 (WEA 1)	06:32		07:12 (WEA 3)	05:32		06:00 (WEA 4)	05:03		06:05 (WEA 4)
	16:41	17:38	18:30	16	07:45 (WEA 1)	20:25	17	07:29 (WEA 3)	21:17	32	06:32 (WEA 4)	21:53	29	06:34 (WEA 4)
16	08:32	07:44	06:42		07:30 (WEA 1)	06:29		07:11 (WEA 3)	05:31		06:00 (WEA 4)	05:03		06:05 (WEA 4)
	16:43	17:40	18:32	14	07:44 (WEA 1)	20:27	19	07:30 (WEA 3)	21:18	33	06:33 (WEA 4)	21:54	29	06:34 (WEA 4)
17	08:31	07:42	06:40		07:32 (WEA 1)	06:27		07:10 (WEA 3)	05:29		05:59 (WEA 4)	05:03		06:05 (WEA 4)
	16:45	17:42	18:34	10	07:42 (WEA 1)	20:29	21	07:31 (WEA 3)	21:20	34	06:33 (WEA 4)	21:54	29	06:34 (WEA 4)
18	08:30	07:40	06:37			06:25		07:09 (WEA 3)	05:28		05:59 (WEA 4)	05:03		06:06 (WEA 4)
	16:46	17:44	18:36			20:31	22	07:31 (WEA 3)	21:21	34	06:33 (WEA 4)	21:54	29	06:35 (WEA 4)
19	08:29	07:38	06:35			06:23		07:08 (WEA 3)	05:26		05:58 (WEA 4)	05:03		06:06 (WEA 4)
	16:48	17:46	18:38			20:32	23	07:31 (WEA 3)	21:23	35	06:33 (WEA 4)	21:55	29	06:35 (WEA 4)
20	08:28	07:36	06:32			06:21		07:07 (WEA 3)	05:25		05:58 (WEA 4)	05:03		06:06 (WEA 4)
	16:50	17:48	18:39			20:34	24	07:31 (WEA 3)	21:25	35	06:33 (WEA 4)	21:55	29	06:35 (WEA 4)
21	08:27	07:34	06:30			06:18		07:07 (WEA 3)	05:23		05:58 (WEA 4)	05:03		06:06 (WEA 4)
	16:51	17:50	18:41			20:36	24	07:31 (WEA 3)	21:26	36	06:34 (WEA 4)	21:55	29	06:35 (WEA 4)
22	08:26	07:32	06:28			06:16		07:07 (WEA 3)	05:22		05:58 (WEA 4)	05:03		06:07 (WEA 4)
	16:53	17:52	18:43			20:38	24	07:31 (WEA 3)	21:27	36	06:34 (WEA 4)	21:56	29	06:36 (WEA 4)
23	08:24	07:30	06:25			06:14		07:07 (WEA 3)	05:21		05:58 (WEA 4)	05:03		06:07 (WEA 4)
	16:55	17:54	18:45			20:39	23	07:30 (WEA 3)	21:29	37	06:35 (WEA 4)	21:56	29	06:36 (WEA 4)
24	08:23	07:27	06:23		06:57 (WEA 2)	06:12		07:07 (WEA 3)	05:19		05:57 (WEA 4)	05:04		06:07 (WEA 4)
	16:57	17:55	18:46	5	07:02 (WEA 2)	20:41	23	07:30 (WEA 3)	21:30	37	06:34 (WEA 4)	21:56	29	06:36 (WEA 4)
25	08:22	07:25	06:21		06:53 (WEA 2)	06:10		07:08 (WEA 3)	05:18		05:58 (WEA 4)	05:04		06:07 (WEA 4)
	16:59	17:57	18:48	12	07:05 (WEA 2)	20:43	21	07:29 (WEA 3)	21:32	36	06:34 (WEA 4)	21:56	29	06:36 (WEA 4)
26	08:20	07:23	06:18		06:50 (WEA 2)	06:08		07:08 (WEA 3)	05:17		05:58 (WEA 4)	05:04		06:07 (WEA 4)
	17:00	17:59	18:50	17	07:07 (WEA 2)	20:45	20	07:28 (WEA 3)	21:33	36	06:34 (WEA 4)	21:56	29	06:36 (WEA 4)
27	08:19	07:21	06:16		06:49 (WEA 2)	06:06		07:09 (WEA 3)	05:16		05:58 (WEA 4)	05:05		06:08 (WEA 4)
	17:02	18:01	18:52	19	07:08 (WEA 2)	20:46	17	07:26 (WEA 3)	21:34	36	06:34 (WEA 4)	21:56	29	06:37 (WEA 4)
28	08:18	07:19	06:13		06:47 (WEA 2)	06:04		07:10 (WEA 3)	05:15		05:58 (WEA 4)	05:05		06:07 (WEA 4)
	17:04	18:03	18:54	21	07:08 (WEA 2)	20:48	15	07:25 (WEA 3)	21:36	36	06:34 (WEA 4)	21:56	30	06:37 (WEA 4)
29	08:16		07:11		07:46 (WEA 2)	06:02		07:12 (WEA 3)	05:13		05:58 (WEA 4)	05:06		06:08 (WEA 4)
	17:06		19:55	23	08:09 (WEA 2)	20:50	10	07:22 (WEA 3)	21:37	36	06:34 (WEA 4)	21:56	30	06:38 (WEA 4)
30	08:15		07:09		07:46 (WEA 2)	05:59			05:12		05:59 (WEA 4)	05:07		06:07 (WEA 4)
	17:08		19:57	23	08:09 (WEA 2)	20:52			21:38	36	06:35 (WEA 4)	21:55	31	06:38 (WEA 4)
31	08:13		07:06		07:45 (WEA 2)				05:11		05:59 (WEA 4)			
	17:10		19:59	23	08:08 (WEA 2)				21:40	36	06:35 (WEA 4)			
Sonnenscheinstunden	255	276	367			418			489			503		
astr.max.mögl.Beschattung				340			455			774			920	

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

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

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung**Schattenrezeptor:** SR-50 - SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli			August			September			Oktober			November	Dezember
1	05:07		06:08 (WEA 4)	05:45		06:14 (WEA 4)	06:37			07:27		08:08 (WEA 1)	07:23	08:15
	21:55	30	06:38 (WEA 4)	21:22	25	06:39 (WEA 4)	20:18			19:07	20	08:28 (WEA 1)	16:59	16:17
2	05:08		06:07 (WEA 4)	05:47		06:16 (WEA 4)	06:38			07:29		08:07 (WEA 1)	07:25	08:17
	21:55	31	06:38 (WEA 4)	21:20	23	06:39 (WEA 4)	20:16			19:05	21	08:28 (WEA 1)	16:57	16:16
3	05:09		06:07 (WEA 4)	05:48		06:17 (WEA 4)	06:40			07:31		08:06 (WEA 1)	07:26	08:18
	21:54	32	06:39 (WEA 4)	21:18	20	06:37 (WEA 4)	20:13			19:02	20	08:26 (WEA 1)	16:55	16:16
4	05:09		06:07 (WEA 4)	05:50		06:19 (WEA 4)	06:42			07:32		08:07 (WEA 1)	07:28	08:20
	21:54	32	06:39 (WEA 4)	21:17	17	06:36 (WEA 4)	20:11			19:00	19	08:26 (WEA 1)	16:53	16:15
5	05:10		06:08 (WEA 4)	05:51		06:20 (WEA 4)	06:43		07:46 (WEA 2)	07:34		08:07 (WEA 1)	07:30	08:21
	21:53	32	06:40 (WEA 4)	21:15	13	06:33 (WEA 4)	20:09	11	07:57 (WEA 2)	18:57	18	08:25 (WEA 1)	16:52	16:15
6	05:11		06:08 (WEA 4)	05:53		06:22 (WEA 4)	06:45		07:43 (WEA 2)	07:36		08:08 (WEA 1)	07:32	08:22
	21:53	33	06:41 (WEA 4)	21:13	8	06:30 (WEA 4)	20:06	15	07:58 (WEA 2)	18:55	16	08:24 (WEA 1)	16:50	16:14
7	05:12		06:07 (WEA 4)	05:55			06:47		07:42 (WEA 2)	07:38		08:09 (WEA 1)	07:34	08:24
	21:52	33	06:40 (WEA 4)	21:11			20:04	18	08:00 (WEA 2)	18:53	12	08:21 (WEA 1)	16:48	16:14
8	05:13		06:07 (WEA 4)	05:56			06:48		07:40 (WEA 2)	07:39		08:11 (WEA 1)	07:36	08:25
	21:52	34	06:41 (WEA 4)	21:09			20:02	20	08:00 (WEA 2)	18:50	8	08:19 (WEA 1)	16:46	16:13
9	05:14		06:07 (WEA 4)	05:58			06:50		07:39 (WEA 2)	07:41			07:38	08:26
	21:51	34	06:41 (WEA 4)	21:07			19:59	21	08:00 (WEA 2)	18:48			16:45	16:13
10	05:15		06:07 (WEA 4)	06:00			06:52		07:38 (WEA 2)	07:43			07:39	08:27
	21:50	34	06:41 (WEA 4)	21:05			19:57	23	08:01 (WEA 2)	18:46			16:43	16:13
11	05:16		06:07 (WEA 4)	06:01			06:53		07:37 (WEA 2)	07:45			07:41	08:28
	21:49	35	06:42 (WEA 4)	21:03			19:55	23	08:00 (WEA 2)	18:44			16:41	16:13
12	05:17		06:07 (WEA 4)	06:03			06:55		07:37 (WEA 2)	07:46			07:43	08:29
	21:48	35	06:42 (WEA 4)	21:01			19:52	23	08:00 (WEA 2)	18:41			16:40	16:12
13	05:18		06:07 (WEA 4)	06:05		07:24 (WEA 3)	06:57		07:37 (WEA 2)	07:48			07:45	08:30
	21:47	35	06:42 (WEA 4)	20:59	3	07:27 (WEA 3)	19:50	23	08:00 (WEA 2)	18:39			16:38	16:12
14	05:19		06:08 (WEA 4)	06:06		07:19 (WEA 3)	06:58		07:37 (WEA 2)	07:50			07:47	08:31
	21:46	35	06:43 (WEA 4)	20:57	11	07:30 (WEA 3)	19:47	22	07:59 (WEA 2)	18:37			16:37	16:12
15	05:21		06:08 (WEA 4)	06:08		07:18 (WEA 3)	07:00		07:37 (WEA 2)	07:52			07:49	08:32
	21:45	36	06:44 (WEA 4)	20:55	15	07:33 (WEA 3)	19:45	21	07:58 (WEA 2)	18:35			16:35	16:12
16	05:22		06:07 (WEA 4)	06:10		07:17 (WEA 3)	07:02		07:37 (WEA 2)	07:53			07:50	08:33
	21:44	37	06:44 (WEA 4)	20:53	17	07:34 (WEA 3)	19:43	19	07:56 (WEA 2)	18:32			16:34	16:12
17	05:23		06:07 (WEA 4)	06:11		07:15 (WEA 3)	07:03		07:38 (WEA 2)	07:55			07:52	08:34
	21:43	37	06:44 (WEA 4)	20:51	19	07:34 (WEA 3)	19:40	17	07:55 (WEA 2)	18:30			16:32	16:13
18	05:24		06:07 (WEA 4)	06:13		07:14 (WEA 3)	07:05		07:40 (WEA 2)	07:57			07:54	08:35
	21:42	37	06:44 (WEA 4)	20:49	21	07:35 (WEA 3)	19:38	13	07:53 (WEA 2)	18:28			16:31	16:13
19	05:26		06:08 (WEA 4)	06:15		07:13 (WEA 3)	07:07		07:42 (WEA 2)	07:59			07:56	08:35
	21:41	36	06:44 (WEA 4)	20:47	22	07:35 (WEA 3)	19:35	7	07:49 (WEA 2)	18:26			16:29	16:13
20	05:27		06:08 (WEA 4)	06:16		07:13 (WEA 3)	07:08			08:01			07:57	08:36
	21:40	36	06:44 (WEA 4)	20:45	23	07:36 (WEA 3)	19:33			18:24			16:28	16:13
21	05:29		06:08 (WEA 4)	06:18		07:12 (WEA 3)	07:10			08:03			07:59	08:37
	21:38	36	06:44 (WEA 4)	20:43	23	07:35 (WEA 3)	19:31			18:21			16:27	16:14
22	05:30		06:08 (WEA 4)	06:20		07:12 (WEA 3)	07:12			08:04			08:01	08:37
	21:37	36	06:44 (WEA 4)	20:41	23	07:35 (WEA 3)	19:28			18:19			16:26	16:14
23	05:31		06:08 (WEA 4)	06:21		07:12 (WEA 3)	07:14			08:06			08:03	08:38
	21:36	36	06:44 (WEA 4)	20:38	24	07:36 (WEA 3)	19:26			18:17			16:25	16:15
24	05:33		06:08 (WEA 4)	06:23		07:11 (WEA 3)	07:15			08:08			08:04	08:38
	21:34	36	06:44 (WEA 4)	20:36	23	07:34 (WEA 3)	19:24			18:15			16:23	16:15
25	05:34		06:08 (WEA 4)	06:25		07:12 (WEA 3)	07:17			07:10			08:06	08:39
	21:33	35	06:43 (WEA 4)	20:34	22	07:34 (WEA 3)	19:21			17:13			16:22	16:16
26	05:36		06:09 (WEA 4)	06:26		07:12 (WEA 3)	07:19		08:15 (WEA 1)	07:12			08:08	08:39
	21:31	34	06:43 (WEA 4)	20:32	21	07:33 (WEA 3)	19:19	8	08:23 (WEA 1)	17:11			16:21	16:17
27	05:37		06:09 (WEA 4)	06:28		07:13 (WEA 3)	07:20		08:12 (WEA 1)	07:13			08:09	08:39
	21:30	34	06:43 (WEA 4)	20:29	19	07:32 (WEA 3)	19:16	13	08:25 (WEA 1)	17:09			16:20	16:18
28	05:39		06:10 (WEA 4)	06:30		07:14 (WEA 3)	07:22		08:11 (WEA 1)	07:15			08:11	08:39
	21:28	33	06:43 (WEA 4)	20:27	17	07:31 (WEA 3)	19:14	16	08:27 (WEA 1)	17:07			16:19	16:18
29	05:40		06:10 (WEA 4)	06:31		07:15 (WEA 3)	07:24		08:09 (WEA 1)	07:17			08:12	08:40
	21:27	32	06:42 (WEA 4)	20:25	13	07:28 (WEA 3)	19:12	18	08:27 (WEA 1)	17:05			16:19	16:19
30	05:42		06:12 (WEA 4)	06:33		07:19 (WEA 3)	07:25		08:08 (WEA 1)	07:19			08:14	08:40
	21:25	30	06:42 (WEA 4)	20:23	5	07:24 (WEA 3)	19:09	19	08:27 (WEA 1)	17:03			16:18	16:20
31	05:43		06:13 (WEA 4)	06:35						07:21				08:40
	21:24	28	06:41 (WEA 4)	20:20						17:01				16:21
Sonnenscheinstunden	506			456			381			330			263	240
astr.max.mögl.Beschattung		1054			427			350			134			

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

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

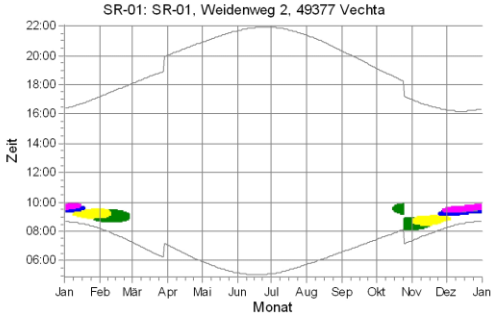
Anlage A4: SHADOW-Grafischer Kalender mit Darstellung der Schattenzeiten je Immissionsort durch die einzelnen WEA über das ganze Jahr

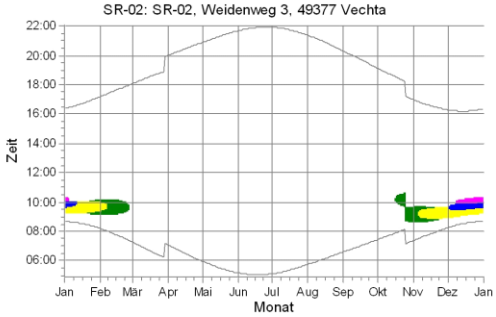
Projekt:
R-2-2021-0491 WP am Standort Vechta

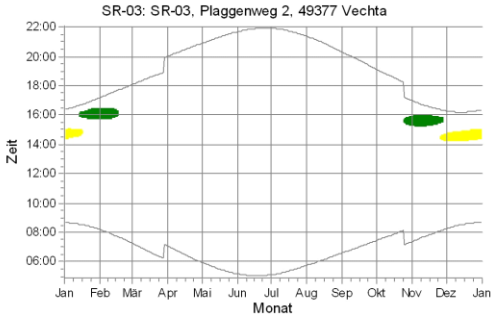
Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

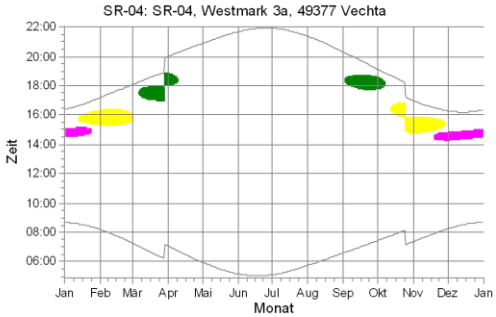
SHADOW - Grafischer Kalender

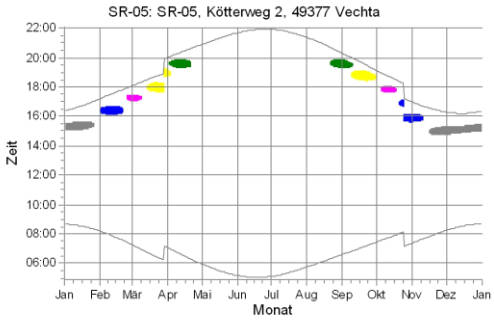
Berechnung: Schattenwurfausbreitung Gesamtbelastung

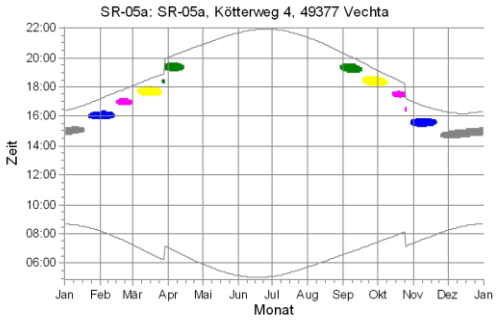












WEA

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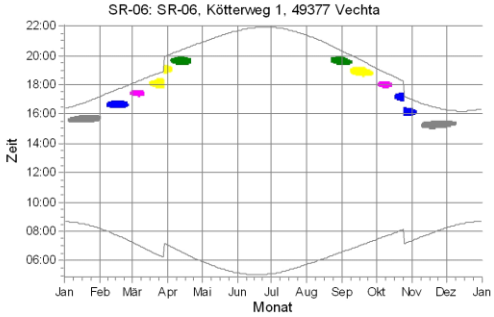
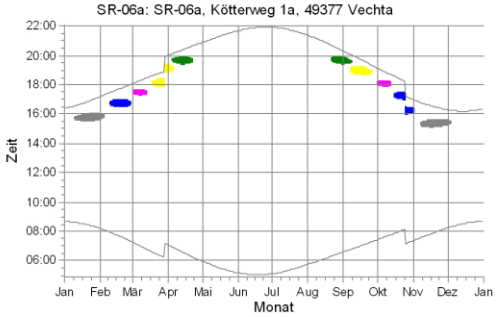
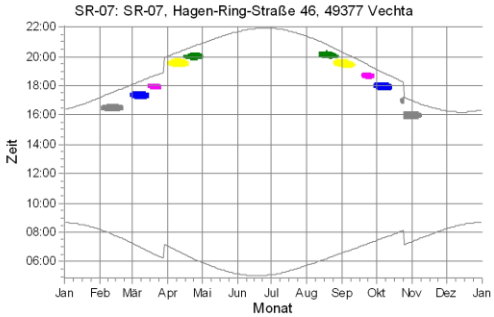
Berechnet:
15.09.2022 08:06/3.5.587

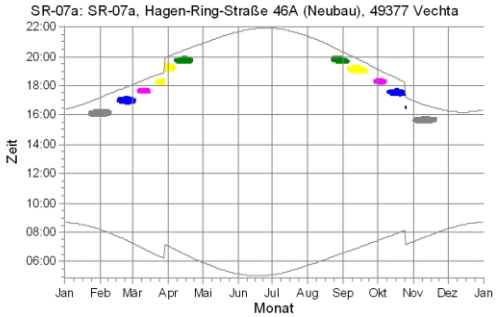
SHADOW - Grafischer Kalender

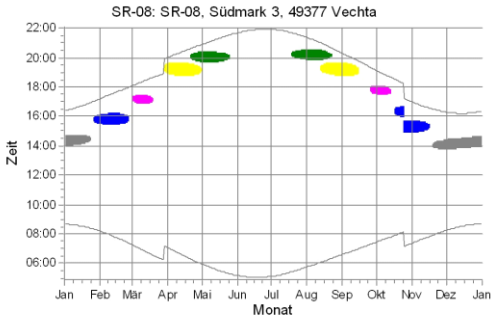
Berechnung: Schattenwurfausbreitung Gesamtbelastung

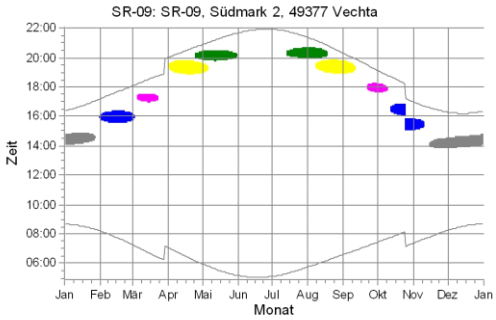












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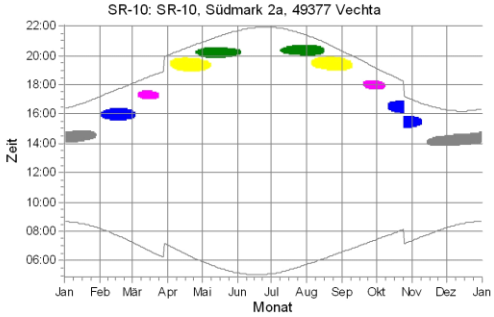

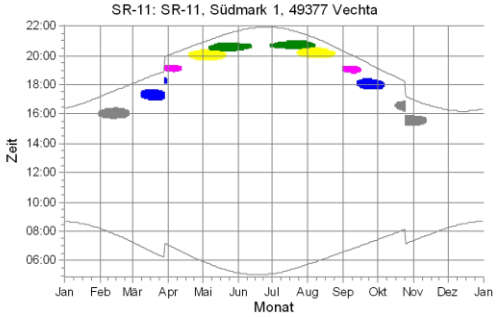

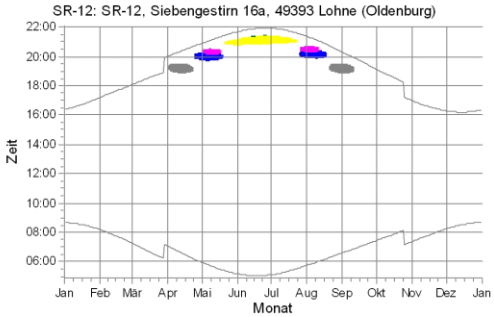

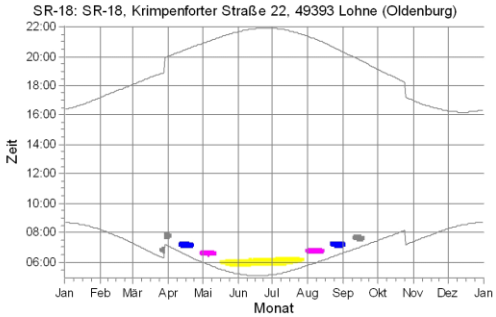

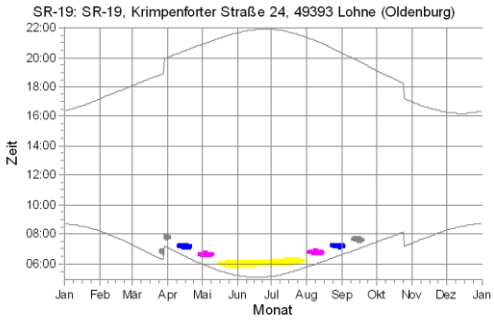

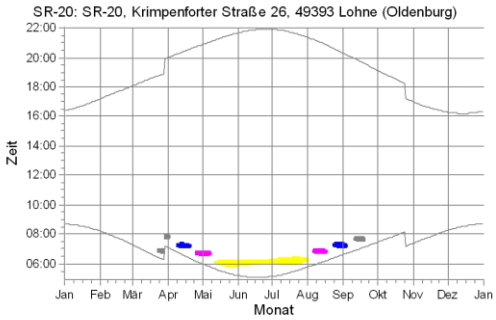

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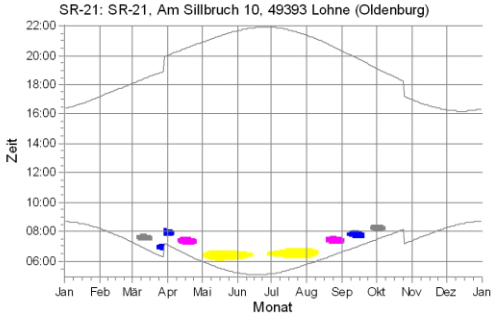

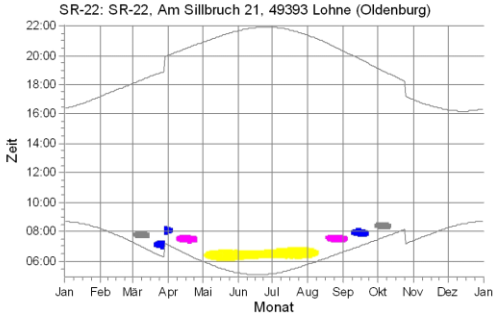

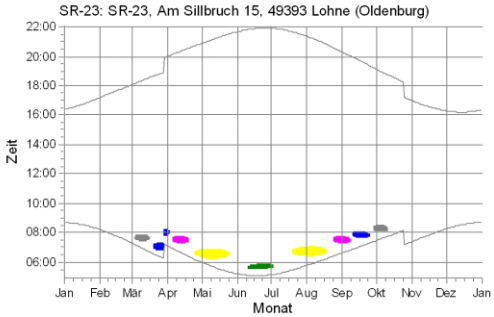

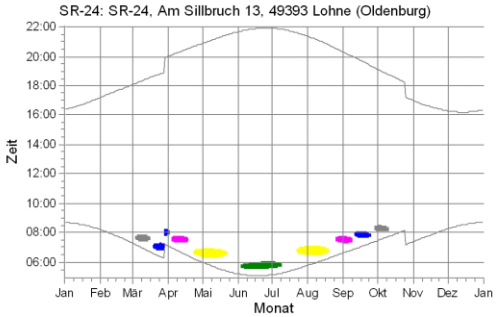

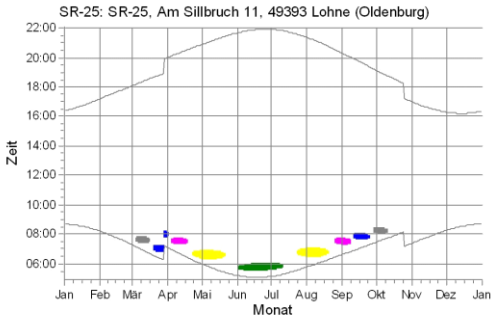

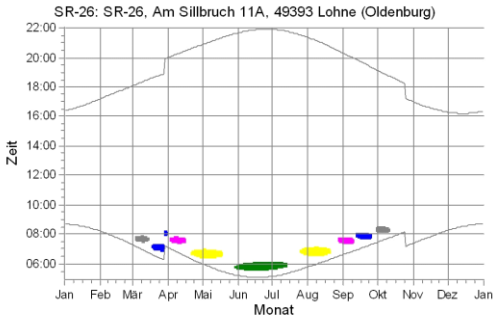

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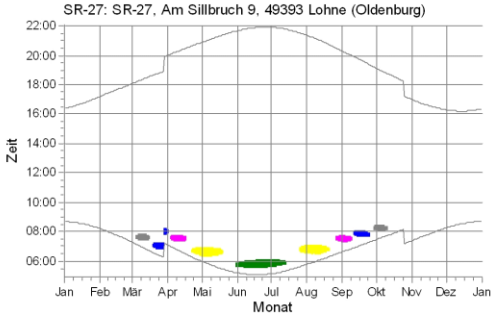

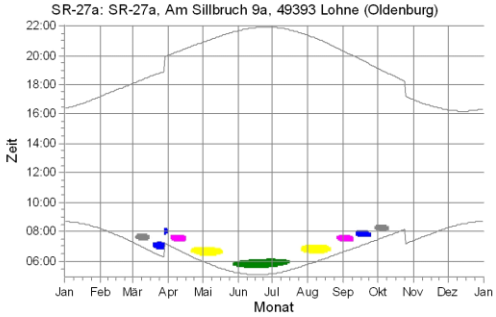

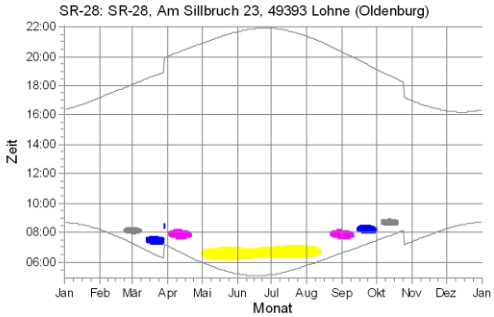

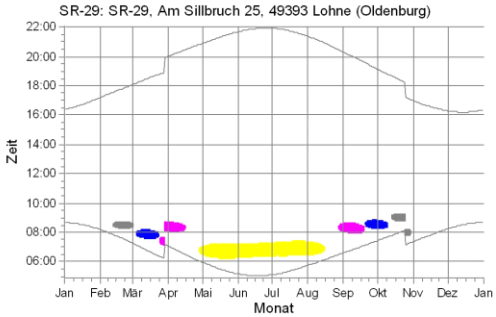

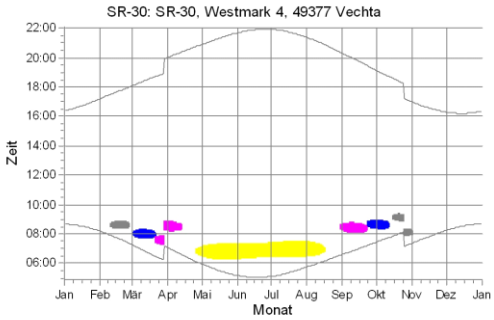

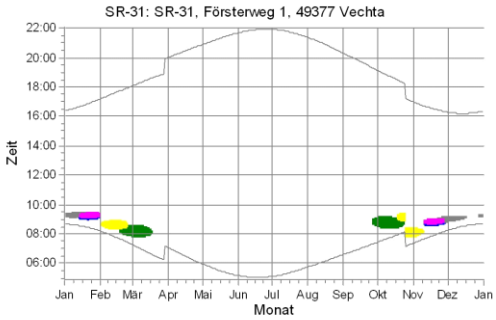

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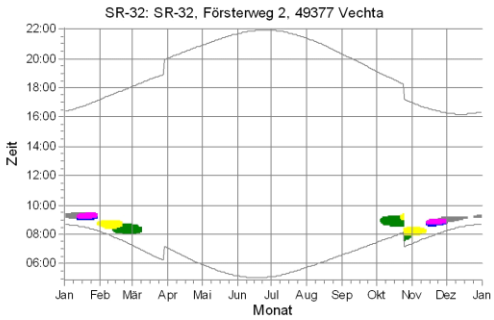
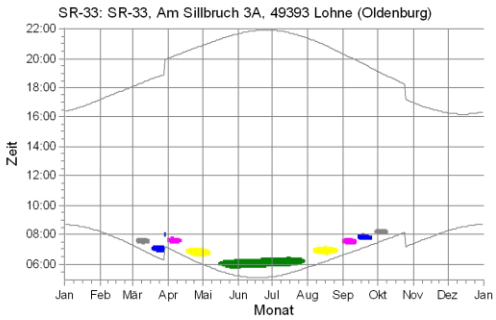
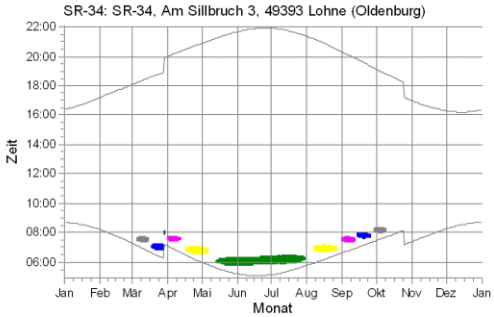
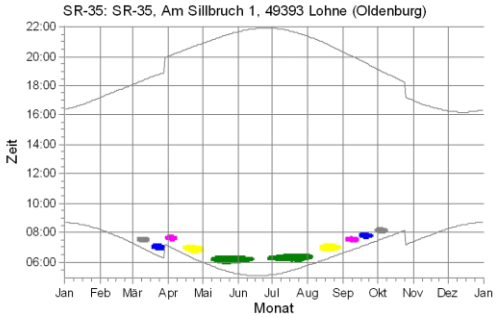
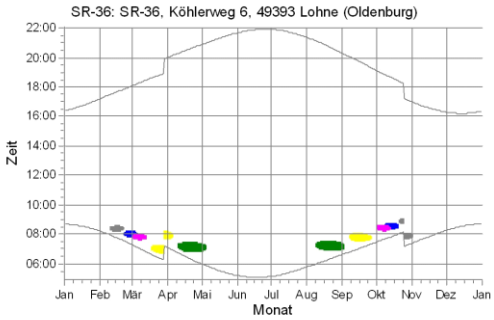
Berechnung: Schattenwurfausbreitung Gesamtbelastung

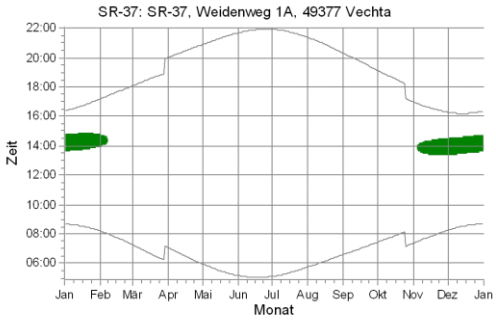












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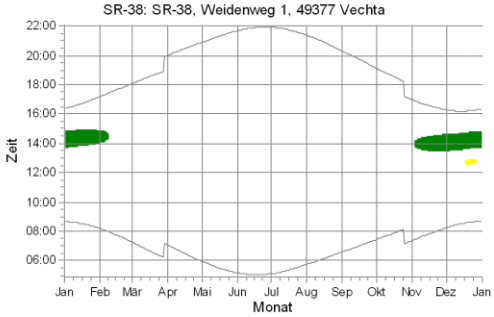

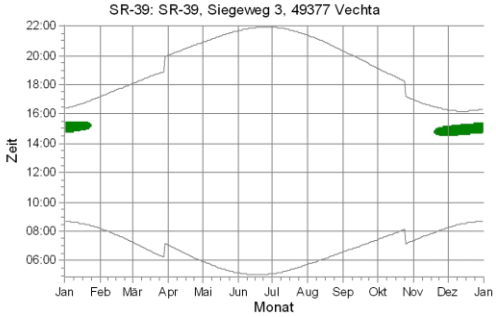

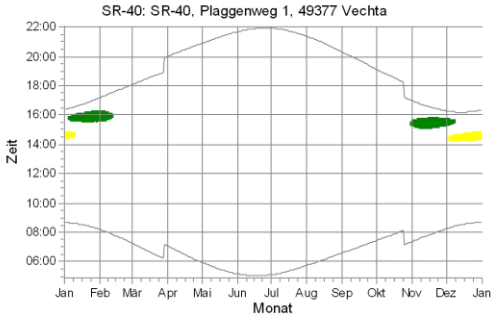

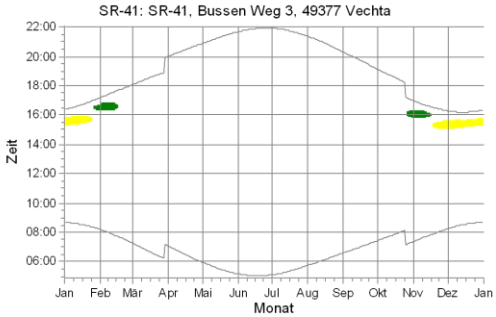

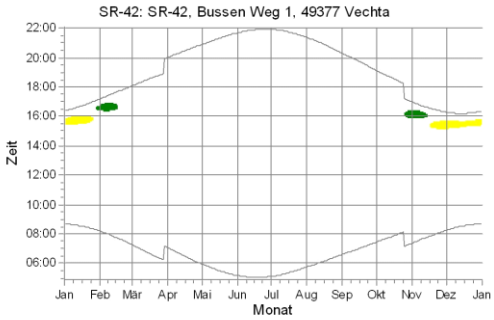

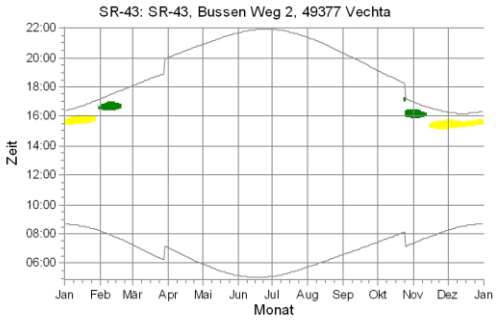

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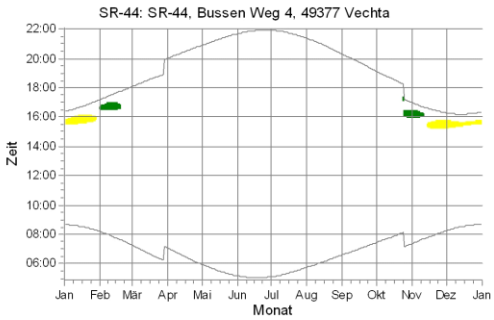

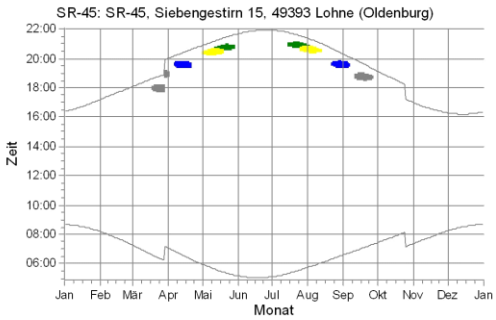

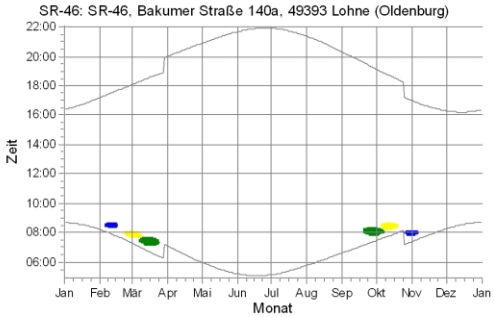

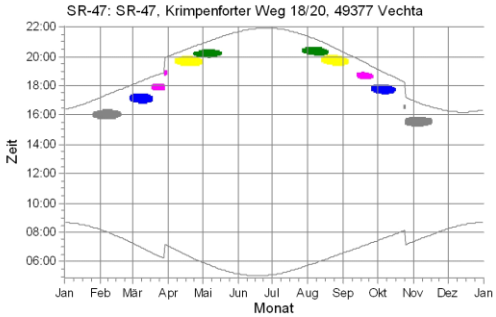

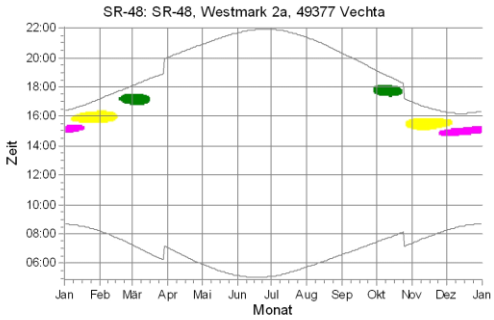

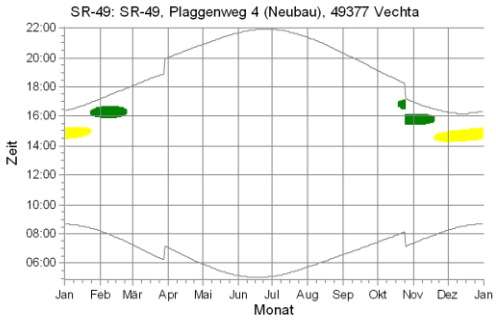

WEA

- WEA 5: ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)
- WEA 4: NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)
- WEA 2: WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)
- WEA 1: WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)
- WEA 3: WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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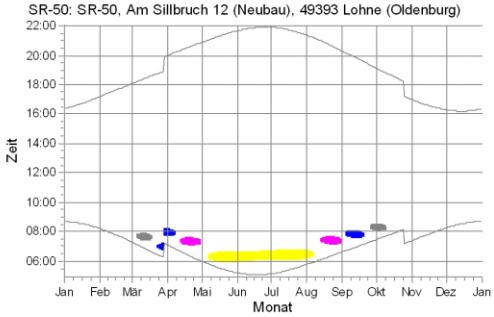
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Grafischer Kalender

Berechnung: Schattenwurfausbreitung Gesamtbelastung



WEA

- WEA 4: NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)
- WEA 2: WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)
- WEA 1: WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)
- WEA 3: WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)

Anlage A5: SHADOW-Kalender pro WEA mit Darstellung der Beschattungszeiten je WEA über das ganze Jahr

Projekt:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 4 - NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:40 14:25-15:10/45 09:16-09:48/32	08:11 15:22-16:18/56 08:58-09:55/57	07:16 07:40-08:02/22	07:04 18:47-19:31/44 19:32-19:34/2	05:57 06:22-07:07/45 19:43-20:19/36	05:10 05:42-07:18/96
	16:22 15:22-15:46/24	17:11 08:38-08:50/12	18:05 15:42-16:00/18	20:01 07:43-08:07/24	20:53 20:22-20:24/2 19:02-19:39/37	21:41 20:50-21:08/18
2	08:39 14:26-15:11/45 09:16-09:49/33	08:10 15:22-16:18/56 09:30-09:55/25	07:14 07:40-08:02/22	07:02 18:49-19:36/47	05:55 06:20-07:08/48 19:43-20:19/36	05:10 05:42-07:18/96
	16:23 15:23-15:48/25	17:13 08:37-08:52/15 08:59-09:29/30	18:07	20:02 07:44-08:06/22	20:55 20:20-20:25/5 19:03-19:37/34	21:42 20:49-21:08/19
3	08:39 14:26-15:11/45 09:16-09:49/33	08:08 15:22-16:19/57 09:32-09:53/21	07:12 07:40-08:02/22	06:59 18:51-19:38/47	05:53 06:19-07:10/51 19:43-20:19/36	05:09 05:43-07:17/94
	16:25 15:22-15:48/26	17:15 08:35-08:53/18 09:00-09:29/29	18:08	20:04 07:44-08:03/19	20:57 20:20-20:28/8 19:05-19:37/32	21:43 20:49-21:09/20
4	08:39 14:28-15:11/43 09:16-09:50/34	08:06 15:22-16:19/57 09:34-09:51/17	07:10 07:40-08:00/20	06:57 18:55-19:40/45	05:52 06:17-07:11/54 19:06-19:35/29	05:08 05:43-07:18/95
	16:26 15:23-15:50/27	17:17 08:33-08:54/21 09:01-09:28/27	18:10	20:06 07:47-08:01/14	20:58 19:43-20:29/46	21:44 20:50-21:11/21
5	08:39 14:29-15:12/43 09:17-09:51/34	08:05 15:21-16:19/58 09:37-09:47/10	07:07 07:41-08:00/19	06:55 18:54-19:42/48	05:50 06:15-07:12/57 19:08-19:33/25	05:07 05:43-07:18/95
	16:27 15:24-15:52/28	17:19 08:31-08:55/24 09:01-09:27/26	18:12	20:08 07:50-07:57/7	21:00 19:43-20:31/48	21:45 20:50-21:11/21
6	08:38 14:30-15:12/42 09:17-09:51/34	08:03 15:21-16:20/59 09:03-09:26/23	07:05 07:42-07:59/17	06:52 18:52-19:43/51	05:48 06:13-07:12/59 19:10-19:31/21	05:07 05:44-07:18/94
	16:28 15:24-15:53/29	17:21 08:29-08:55/26	18:14 17:40-17:48/8	20:09	21:02 19:43-20:32/49	21:46 20:50-21:13/23
7	08:38 14:31-15:12/41 09:17-09:51/34	08:01 15:21-16:20/59 09:04-09:24/20	07:03 07:43-07:56/13	06:50 18:52-19:45/53	05:46 06:12-07:14/62 19:12-19:28/16	05:06 05:44-07:18/94
	16:29 15:24-15:54/30	17:23 08:27-08:56/29	18:16 17:36-17:49/13	20:11	21:04 19:43-20:33/50	21:47 20:50-21:13/23
8	08:38 14:33-15:13/40 09:17-09:53/36	07:59 15:21-16:20/59 09:06-09:22/16	07:00 07:46-07:53/7	06:48 18:51-19:47/56	05:44 06:10-07:14/64 19:18-19:24/6	05:05 05:44-07:18/94
	16:31 15:25-15:56/31	17:25 08:25-08:56/31	18:18 17:34-17:52/18	20:13	21:05 19:44-20:35/51	21:48 20:50-21:14/24
9	08:37 14:33-15:12/39 09:17-09:53/36	07:58 15:21-16:20/59 09:09-09:19/10	06:58 17:32-17:54/22	06:45 18:50-19:48/58	05:42 06:08-07:14/66	05:05 05:44-07:18/94
	16:32 15:25-15:57/32 09:08-09:10/2	17:27 08:23-08:56/33	18:19	20:15	21:07 19:44-20:37/53	21:49 20:50-21:14/24
10	08:36 14:34-15:12/38 09:17-09:54/37	07:56 15:21-16:20/59	06:56 17:30-17:55/25	06:43 18:49-19:49/60	05:41 06:07-07:16/69 19:44-20:16/32	05:04 05:45-07:18/93
	16:34 15:25-15:58/33 09:07-09:12/5	17:29 08:23-08:56/33	18:21	20:16	21:09 20:17-20:38/21	21:50 20:51-21:15/24
11	08:36 14:35-15:12/37 09:18-09:55/37	07:54 15:21-16:20/59	06:54 17:29-17:57/28	06:41 18:49-19:51/62	05:39 06:05-07:16/71 19:45-20:16/31	05:04 05:45-07:18/93
	16:35 15:25-16:00/35 09:07-09:15/8	17:31 08:22-08:56/34	18:23	20:18	21:10 20:18-20:39/21	21:50 20:51-21:16/25
12	08:35 14:37-15:13/36 09:18-09:55/37	07:52 15:21-16:20/59	06:51 17:28-17:58/30	06:38 18:49-19:53/64	05:37 06:03-07:16/73 19:45-20:15/30	05:04 05:46-07:18/92
	16:37 15:27-16:02/35 09:06-09:17/11	17:33 08:22-08:56/34	18:25	20:20	21:12 20:18-20:38/20	21:51 20:51-21:16/25
13	08:34 14:39-15:13/34 09:05-09:56/51	07:50 15:21-16:20/59	06:49 17:27-17:59/32	06:36 18:48-19:54/66	05:35 06:02-07:16/74 19:46-20:15/29	05:03 05:46-07:18/92
	16:38 15:27-16:04/37	17:34 08:22-08:56/34	18:27	20:22	21:13 20:19-20:38/19	21:52 20:51-21:16/25
14	08:34 14:40-15:13/33 09:04-09:56/52	07:48 15:22-16:20/58	06:47 17:27-17:59/32	06:34 18:48-19:56/68	05:34 06:00-07:16/76 19:47-20:14/27	05:03 05:46-07:18/92
	16:40 15:28-16:06/38	17:36 08:22-08:55/33	18:29	20:23	21:15 20:19-20:37/18	21:52 20:51-21:17/26
15	08:33 14:41-15:13/32 09:03-09:57/54	07:46 15:22-16:20/58	06:44 17:26-18:04/38	06:32 18:48-19:57/69	05:32 05:59-07:17/78 19:48-20:13/25	05:03 05:46-07:18/92
	16:41 15:29-16:07/38	17:38 08:22-08:55/33	18:30	20:25 06:55-07:00/5	21:17 20:20-20:36/16	21:53 20:52-21:17/25
16	08:32 14:42-15:12/30 09:02-09:58/56	07:44 08:22-08:54/32	06:42 17:26-18:06/40	06:29 18:48-19:57/69	05:31 05:58-07:17/79 19:49-20:12/23	05:03 05:47-07:19/92
	16:43 15:29-16:09/40	17:40 15:23-16:20/57	18:32	20:27 06:53-07:02/9	21:18 20:21-20:34/13	21:54 20:52-21:17/25
17	08:31 14:43-15:11/28 09:00-09:57/57	07:42 08:23-08:53/30	06:39 17:27-18:09/42	06:27 18:48-19:58/70	05:29 05:56-07:17/81 19:50-20:11/21	05:03 05:47-07:19/92
	16:45 15:29-16:09/40	17:42 15:23-16:19/56	18:34	20:29 06:51-07:03/12	21:20 20:23-20:33/10	21:54 20:52-21:17/25
18	08:30 14:44-15:11/27 08:59-09:58/59	07:40 08:23-08:53/30	06:37 17:26-18:10/44	06:25 18:48-19:57/69	05:27 05:55-07:18/83 19:52-20:10/18	05:03 05:47-07:19/92
	16:46 15:30-16:10/40	17:44 15:24-16:19/55	18:36	20:30 06:49-07:04/15	21:21 20:26-20:32/6	21:54 20:52-21:18/26
19	08:29 14:46-15:10/24 08:58-09:58/60	07:38 08:24-08:52/28	06:35 17:26-18:12/46	06:23 18:48-19:56/68	05:26 05:53-07:17/84	05:03 05:47-07:19/92
	16:48 15:31-16:11/40	17:46 15:25-16:18/53	18:38 06:58-07:05/7	20:32 06:46-07:04/18	21:23 19:53-20:07/14	21:55 20:53-21:18/25
20	08:28 14:48-15:09/21 08:57-09:59/62	07:36 08:25-08:51/26	06:32 17:26-18:13/47	06:20 18:49-19:56/67 20:00-20:06/6	05:25 05:52-07:18/86	05:03 05:48-07:19/91
	16:50 15:30-16:13/43	17:48 15:25-16:17/52	18:39 06:56-07:08/12	20:34 06:44-07:04/20	21:24 19:57-20:05/8	21:55 20:53-21:18/25
21	08:27 14:49-15:07/18 08:56-09:58/62	07:34 08:25-08:49/24	06:30 17:27-18:15/48	06:18 18:50-20:08/78	05:23 05:51-07:18/87	05:03 05:48-07:19/91
	16:51 15:29-16:13/44	17:50 15:26-16:16/50	18:41 06:53-07:09/16	20:36 06:42-07:04/22	21:26	21:55 20:53-21:18/25
22	08:25 14:52-15:06/14 08:56-09:59/63	07:32 08:27-08:48/21	06:28 17:28-18:17/49	06:16 18:50-20:10/80	05:22 05:50-07:18/88	05:03 05:49-07:20/91
	16:53 15:28-16:14/46	17:52 15:27-16:15/48	18:43 06:51-07:10/19	20:38 06:40-07:04/24	21:27 20:54-20:56/2	21:56 20:54-21:19/25
23	08:24 14:57-15:03/6 08:56-09:59/63	07:30 07:54-07:59/5 15:29-16:14/45	06:25 17:29-18:19/50	06:14 18:51-20:11/80	05:20 05:49-07:18/89	05:03 05:49-07:20/91
	16:55 15:28-16:15/47	17:54 08:29-08:46/17	18:45 06:48-07:10/22	20:39 06:38-07:04/26	21:29 20:52-20:56/4	21:56 20:54-21:19/25
24	08:23 15:26-16:15/49	07:27 07:52-08:00/8 15:30-16:13/43	06:23 17:31-18:21/50	06:12 18:52-20:13/81	05:19 05:47-07:18/91	05:04 05:48-07:20/92
	16:57 08:56-09:59/63	17:55 08:32-08:43/11	18:46 06:46-07:11/25	20:41 06:36-07:04/28	21:30 20:52-20:58/6	21:56 20:54-21:19/25
25	08:22 15:26-16:16/50	07:25 07:49-08:01/12	06:21 17:33-18:22/49	06:10 18:53-20:15/82	05:18 05:46-07:18/92	05:04 05:49-07:21/92
	16:58 08:56-09:59/63	17:57 15:31-16:11/40	18:48 06:44-07:11/27	20:43 06:34-07:03/29	21:32 20:51-20:59/8	21:56 20:54-21:19/25
26	08:20 15:25-16:16/51	07:23 07:47-08:02/15	06:18 17:43-18:24/41	06:08 18:55-20:16/81	05:17 05:45-07:18/93	05:04 05:49-07:21/92
	17:00 08:56-09:59/63	17:59 15:33-16:09/36	18:50 06:43-07:11/28	20:45 06:32-07:02/30	21:33 20:51-21:00/9	21:56 20:54-21:19/25
27	08:19 15:25-16:17/52	07:21 07:45-08:02/17	06:16 17:43-18:26/43	06:06 06:30-07:01/31	05:16 05:44-07:18/94	05:05 05:50-07:20/90
	17:02 08:57-09:59/62	18:01 15:35-16:07/32	18:52 06:42-07:11/29	20:46 18:56-20:18/82	21:34 20:50-21:02/12	21:56 20:54-21:19/25
28	08:17 15:24-16:17/53	07:19 07:43-08:03/20	06:13 17:43-18:27/44	06:03 06:28-07:01/33	05:14 05:43-07:18/95	05:05 05:49-07:21/92
	17:04 08:57-09:58/61	18:03 15:38-16:05/27	18:53 06:42-07:10/28	20:48 18:58-20:18/80	21:36 20:50-21:03/13	21:56 20:55-21:20/25
29	08:16 15:23-16:17/54		07:11 18:44-19:29/45	06:01 06:26-07:03/37	05:13 05:42-07:18/96	05:06 05:50-07:22/92
	17:06 08:57-09:57/60		19:55 07:42-08:10/28	20:50 19:00-20:19/79	21:37 20:50-21:04/14	21:56 20:54-21:19/25
30	08:15 15:24-16:18/54 08:58-09:58/60		07:09 18:45-19:29/44	05:59 06:24-07:05/41 19:44-20:19/35	05:12 05:43-07:18/95	05:06 05:49-07:22/93
	17:08 08:42-08:46/4		19:57 07:42-08:09/27	20:51 19:01-19:43/42	21:38 20:49-21:05/16	21:55 20:55-21:20/25
31	08:13 15:23-16:18/55 08:58-09:56/58		07:06 18:45-19:29/44		05:11 05:42-07:18/96	
	17:10 08:40-08:49/9		19:59 07:42-08:08/26		21:40 20:50-21:07/17	
Sonnenscheinstunden	255	276	367	418	489	503
Anzahl Minuten mit Schatten	3572	2483	1426	2455	3499	3500

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:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 4 - NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:07 05:50-07:22/92	05:45 06:14-07:26/72 19:55-20:26/31	06:36 18:48-19:50/62	07:27 18:08-18:38/30	07:23 14:51-15:50/59	08:15 14:17-14:54/37 09:00-09:37/37
	21:55 20:55-21:21/26	21:22 20:28-20:48/20	20:18	19:07	16:59 07:52-08:26/34	16:17 15:08-15:42/34 08:49-08:57/8
2	05:08 05:50-07:22/92	05:46 06:16-07:26/70 19:55-20:27/32	06:38 18:48-19:48/60	07:29 18:07-18:36/29	07:25 14:51-15:50/59 08:38-08:49/11	08:17 14:17-14:55/38 09:00-09:37/37
	21:55 20:55-21:20/25	21:20 20:28-20:49/21	20:16	19:04	16:57 07:53-08:26/33	16:16 15:08-15:42/34 08:50-08:55/5
3	05:09 05:49-07:23/94	05:48 06:17-07:25/68	06:40 18:48-19:46/58	07:31 18:08-18:34/26	07:26 14:51-15:50/59 08:35-08:52/17	08:18 14:17-14:57/40 09:01-09:37/36
	21:54 20:55-21:20/25	21:18 19:54-20:48/54	20:13	19:02	16:55 07:55-08:26/31	16:16 15:09-15:41/32 08:52-08:54/2
4	05:09 05:50-07:23/93	05:50 06:19-07:25/66	06:41 18:48-19:44/56	07:32 18:09-18:32/23	07:28 14:51-15:50/59 08:33-08:54/21	08:20 14:17-14:57/40 09:01-09:37/36
	21:54 20:56-21:20/24	21:17 19:54-20:46/52	20:11	19:00	16:53 07:57-08:25/28	16:15 15:09-15:40/31
5	05:10 05:50-07:24/94	05:51 06:20-07:23/63 19:25-19:35/10	06:43 18:48-19:41/53	07:34 18:10-18:30/20	07:30 14:51-15:49/58 08:32-08:55/23	08:21 14:17-14:58/41 09:03-09:38/35
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6	05:11 05:50-07:24/94	05:53 06:22-07:23/61 19:22-19:39/17	06:45 18:48-19:39/51	07:36 08:21-08:32/11	07:32 14:51-15:49/58 09:06-09:18/12	08:22 14:16-14:58/42 09:03-09:37/34
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	21:24 20:29-20:48/19	20:20		17:01 07:52-08:26/34		16:21 15:21-15:45/24
Sonnenscheinstunden	506	456	381	330	263	240
Anzahl Minuten mit Schatten	3398	3276	1801	1705	3537	3227

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:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 5 - ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:40 14:48-15:23/35	08:11 15:38-16:40/62 08:44-10:07/83	07:16 16:52-17:29/37	07:04 19:11-19:34/23	05:57 19:45-20:24/39	05:10 05:40-06:19/39 20:06-20:20/14
	16:22 13:41-14:47/66	17:11 14:03-14:49/46	18:05 07:52-08:38/46	20:01 18:03-18:48/45	20:53 06:54-07:16/22	21:41 20:24-20:46/22
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	16:23 13:41-14:48/67	17:13 14:05-14:48/43	18:07 07:52-08:38/46	20:02 18:04-18:47/43	20:55 06:56-07:15/19	21:42 20:25-20:45/20
3	08:39 13:41-15:23/102	08:08 15:40-16:45/65 08:43-10:08/85	07:12 16:52-17:30/38	06:59 19:09-19:38/29	05:53 19:45-20:27/42	05:09 05:39-06:19/40 20:10-20:16/6
	16:25	17:15 14:07-14:47/40	18:08 07:52-08:37/45	20:04 18:05-18:45/40	20:57 06:58-07:13/15	21:43 20:25-20:45/20
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	17:10 14:01-14:50/49		19:59 18:02-18:49/47		21:40 20:24-20:47/23	
Sonnenscheinstunden	255	276	367	418	489	503
Anzahl Minuten mit Schatten	4576	4240	2459	1830	2284	1650

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:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 5 - ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:07 05:39-06:21/42 20:38-20:45/7	05:45 19:55-20:51/56	06:36 19:10-19:50/40	07:27 17:36-18:30/54 08:33-09:05/32	07:23 15:18-16:26/68	08:15 15:20-15:42/22 13:27-14:33/66
	21:55 21:14-21:21/7	21:22 06:14-06:27/13	20:18 07:03-07:15/12	19:07 07:53-08:15/22	16:59 08:10-09:37/87	16:17 14:35-15:07/32 09:06-09:26/20
2	05:08 05:40-06:21/41 20:37-20:45/8	05:46 19:55-20:50/55	06:38 19:09-19:48/39	07:29 17:33-18:27/54 08:32-09:06/34	07:25 15:16-16:26/70	08:17 15:22-15:42/20 13:27-14:34/67
	21:55 21:14-21:20/6	21:20 06:16-06:26/10	20:16	19:04 07:55-08:15/20	16:57 08:10-09:38/88	16:16 14:36-15:08/32 09:07-09:24/17
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24	05:33 20:01-21:03/62	06:23 19:29-20:08/39	07:15 07:54-08:18/24	08:08 16:32-17:04/32 08:38-09:07/29	08:04 15:13-15:49/36 13:26-14:30/64	08:38 14:44-15:19/35
	21:34 06:03-06:31/28	20:36 06:55-07:27/32	19:23 17:48-18:38/50	18:15 17:07-17:19/12 09:12-10:33/81	16:23 14:37-15:01/24 08:54-09:32/38	16:15 13:37-14:43/66
25	05:34 20:00-21:01/61	06:25 19:28-20:06/38	07:17 07:53-08:18/25	07:10 15:31-16:22/51 08:11-09:34/83	08:06 15:14-15:48/34 13:26-14:31/65	08:39 14:44-15:19/35
	21:33 06:04-06:31/27	20:34 06:55-07:27/32	19:21 17:47-18:37/50	17:13 07:39-08:06/27	16:22 14:37-15:02/25 08:55-09:31/36	16:16 13:38-14:43/65
26	05:36 20:00-21:00/60	06:26 19:26-19:57/31 19:58-20:03/5	07:19 07:52-08:18/26	07:12 15:30-16:23/53 08:11-09:34/83	08:08 15:15-15:47/32 13:26-14:32/66	08:39 14:45-15:20/35
	21:31 06:06-06:31/25	20:32 06:55-07:25/30	19:19 17:47-18:36/49	17:11 07:40-08:04/24	16:21 14:36-15:04/28 08:57-09:31/34	16:17 13:38-14:44/66
27	05:37 19:58-20:58/60	06:28 19:25-19:58/33 20:00-20:02/2	07:20 07:51-08:18/27 17:48-18:35/47	07:13 15:27-16:24/57 08:10-09:35/85	08:09 15:16-15:46/30 13:27-14:32/65	08:39 14:45-15:20/35
	21:30 06:07-06:30/23	20:29 06:56-07:25/29	19:16 08:43-08:57/14	17:09 07:42-08:02/20	16:20 14:36-15:05/29 08:58-09:30/32	16:17 13:38-14:44/66
28	05:39 19:58-20:58/60	06:30 19:24-19:58/34	07:22 07:51-08:18/27 17:49-18:34/45	07:15 15:25-16:25/60 08:10-09:36/86	08:11 15:17-15:44/27 13:27-14:33/66	08:39 14:45-15:20/35
	21:28 06:09-06:31/22	20:27 06:57-07:24/27	19:14 08:40-09:01/21	17:07 07:45-08:00/15	16:19 14:36-15:06/30 09:00-09:30/30	16:18 13:39-14:44/65
29	05:40 19:57-20:56/59	06:31 19:23-19:57/34	07:24 17:41-18:32/51 08:37-09:02/25	07:17 15:23-16:25/62 08:10-09:36/86	08:12 15:18-15:44/26 13:26-14:33/67	08:40 14:46-15:21/35
	21:27 06:10-06:30/20	20:25 06:58-07:22/24	19:12 07:50-08:16/26	17:05 07:49-07:56/7	16:19 14:36-15:06/30 09:01-09:28/27	16:19 13:39-14:45/66
30	05:42 19:56-20:54/58	06:33 19:16-19:55/39	07:25 17:38-18:31/53 08:35-09:04/29	07:19 15:22-16:26/64	08:14 15:19-15:44/25 13:27-14:33/66	08:40 13:39-15:21/102
	21:25 06:12-06:30/18	20:23 07:00-07:21/21	19:09 07:51-08:16/25	17:03 08:10-09:37/87	16:18 14:36-15:07/31 09:03-09:27/24	16:20
31	05:43 19:56-20:53/57	06:35 19:12-19:52/40		07:21 15:21-16:26/65		08:40 14:47-15:22/35
	21:24 06:13-06:28/15	20:20 07:02-07:19/17		17:01 08:10-09:37/87		16:21 13:40-14:46/66
Sonnenscheinstunden	506	456	381	330	263	240
Anzahl Minuten mit Schatten	2363	1826	2025	3679	5087	3279

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:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 1 - WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:40 14:48-15:27/39 14:02-14:43/41	08:11 15:41-16:20/39	07:16 07:56-08:19/23	07:04 07:39-07:54/15	05:57	05:11
	16:22 09:12-09:19/7 09:32-09:42/10	17:11	18:05 08:27-08:32/5	20:01 18:50-19:01/11	20:53	21:41
2	08:39 14:48-15:28/40 14:03-14:44/41	08:10 15:43-16:20/37	07:14 07:57-08:19/22	07:02 07:40-07:53/13	05:55	05:10
	16:23 09:12-09:20/8 09:33-09:42/9	17:13	18:07 07:46-07:49/3	20:02 19:11-19:19/8	20:55	21:42
3	08:39 14:48-15:28/40 14:02-14:44/42	08:08 15:46-16:21/35	07:12 07:57-08:18/21	06:59 07:40-07:50/10	05:53	05:09
	16:25 09:11-09:20/9 09:33-09:42/9	17:15 16:26-16:34/8	18:08 07:42-07:53/11	20:04 19:06-19:21/15	20:57	21:43
4	08:39 14:49-15:29/40 14:03-14:45/42	08:06 15:48-16:20/32	07:10 07:57-08:17/20	06:57 19:04-19:24/20	05:52	05:08
	16:26 09:11-09:21/10 09:35-09:42/7	17:17 16:23-16:36/13	18:10 07:36-07:54/18	20:06	20:58	21:44
5	08:39 14:49-15:29/40 15:32-15:38/6 09:37-09:41/4	08:05 15:48-16:20/32	07:07 07:58-08:16/18	06:55 19:02-19:25/23	05:50	05:07
	16:27 09:11-09:23/12 14:03-14:45/42	17:19 16:22-16:38/16	18:12 07:32-07:55/23	20:08	21:00	21:45
6	08:38 14:50-15:30/40 15:31-15:40/9	08:03 15:48-16:19/31	07:05 07:29-07:56/27	06:52 19:00-19:25/25	05:48	05:07
	16:28 09:10-09:23/13 14:04-14:46/42	17:21 16:20-16:39/19	18:14 07:59-08:15/16	20:09	21:02	21:46
7	08:38 14:51-15:42/51 14:05-14:46/41	08:01 15:47-16:40/53	07:03 07:26-07:56/30	06:50 18:59-19:26/27	05:46	05:06
	16:30 09:09-09:23/14	17:23	18:16 08:00-08:13/13	20:11	21:03	21:47
8	08:37 14:52-15:44/52 14:06-14:47/41	07:59 15:47-16:41/54	07:00 07:24-07:56/32	06:48 18:59-19:27/28	05:44	05:05
	16:31 09:10-09:24/14	17:25	18:18 08:03-08:10/7	20:13	21:05	21:48
9	08:37 14:52-15:45/53 14:06-14:47/41	07:58 15:46-16:41/55	06:58 07:24-07:56/32	06:45 18:57-19:27/30	05:42	05:05
	16:32 09:10-09:25/15	17:27	18:19	20:15	21:07	21:49
10	08:36 14:53-15:45/52 14:07-14:47/40	07:56 15:46-16:42/56	06:56 07:23-07:55/32	06:43 18:57-19:27/30	05:41	05:04
	16:34 09:10-09:25/15	17:29	18:21	20:16	21:09	21:50
11	08:36 14:54-15:48/54 14:07-14:47/40	07:54 08:32-08:42/10 08:19-08:26/7	06:54 07:23-07:55/32	06:41 18:56-19:27/31	05:39	05:04
	16:35 09:11-09:26/15	17:31 15:45-16:42/57	18:23	20:18	21:10	21:50
12	08:35 14:55-15:50/55 14:09-14:48/39	07:52 08:30-08:45/15 08:17-08:27/10	06:51 07:24-07:54/30	06:38 18:56-19:27/31	05:37	05:04
	16:37 09:11-09:27/16	17:33 15:45-16:42/57	18:25	20:20	21:12	21:51
13	08:34 14:56-15:52/56 14:09-14:48/39	07:50 08:15-08:46/31	06:49 07:24-07:52/28	06:36 18:55-19:26/31	05:35	05:03
	16:38 09:12-09:27/15	17:34 15:45-16:42/57	18:27	20:22	21:13	21:52
14	08:34 14:58-15:53/55 14:10-14:48/38	07:48 08:15-08:47/32	06:47 07:26-07:50/24	06:34 18:56-19:26/30	05:34	05:03
	16:40 09:12-09:27/15	17:36 15:45-16:42/57	18:29	20:23	21:15	21:52
15	08:33 14:59-15:54/55 14:11-14:49/38	07:46 08:15-08:48/33	06:44 07:26-07:45/19	06:32 18:56-19:25/29	05:32	05:03
	16:41 09:13-09:28/15	17:38 15:46-16:42/56	18:30	20:25	21:17	21:53
16	08:32 15:00-15:54/54 14:11-14:48/37	07:44 08:15-08:49/34	06:42 07:28-07:44/16	06:29 18:56-19:25/29	05:31	05:03
	16:43 09:14-09:28/14	17:40 15:46-16:41/55	18:32	20:27	21:18	21:53
17	08:31 15:03-15:08/5 09:13-09:27/14	07:42 08:15-08:50/35	06:39 07:30-07:42/12	06:27 18:57-19:24/27	05:29	05:03
	16:45 15:10-15:56/46 14:12-14:48/36	17:42 15:46-16:40/54	18:34	20:29	21:20	21:54
18	08:30 15:10-15:57/47 14:14-14:48/34	07:40 08:15-08:50/35 16:22-16:39/17	06:37	06:25 18:57-19:22/25	05:27	05:03
	16:46 09:14-09:27/13	17:44 15:47-16:21/34	18:36	20:30	21:21	21:54
19	08:29 15:11-15:58/47 14:15-14:48/33	07:38 08:16-08:50/34 15:48-16:20/32	06:35 17:54-18:05/11	06:23 18:58-19:21/23	05:26	05:03
	16:48 09:16-09:27/11	17:46 16:24-16:37/13	18:37	20:32	21:23	21:55
20	08:28 15:12-15:59/47 14:17-14:48/31	07:36 08:18-08:49/31 15:48-16:19/31	06:32 17:51-18:06/15	06:20 19:00-19:19/19	05:25	05:03
	16:50 09:17-09:26/9	17:48 16:26-16:34/8	18:39	20:34	21:24	21:55
21	08:27 15:13-15:58/45 14:17-14:47/30	07:34 08:18-08:49/31	06:30 17:50-18:08/18	06:18 19:01-19:17/16	05:23	05:03
	16:51 09:19-09:24/5	17:50 15:49-16:18/29	18:41	20:36	21:26	21:55
22	08:25 16:02-16:11/9 14:19-14:47/28	07:32 08:08-08:10/2 15:50-16:17/27	06:28 17:49-18:09/20	06:16 19:04-19:14/10	05:22	05:03
	16:53 15:14-15:59/45	17:52 08:19-08:48/29	18:43	20:37	21:27	21:56
23	08:24 16:01-16:13/12 14:20-14:47/27	07:29 08:03-08:14/11 15:52-16:15/23	06:25 17:47-18:09/22	06:14	05:20	05:03
	16:55 15:16-16:00/44	17:54 08:19-08:48/29	18:45	20:39	21:29	21:56
24	08:23 15:16-16:14/58	07:27 08:01-08:17/16 15:54-16:13/19	06:23 06:47-06:55/8	06:12	05:19	05:04
	16:57 14:21-14:45/24	17:55 08:19-08:47/28	18:46 17:47-18:09/22	20:41	21:30	21:56
25	08:22 15:19-16:16/57	07:25 07:59-08:17/18 15:57-16:10/13	06:21 06:45-06:57/12	06:10	05:18	05:04
	16:58 14:23-14:45/22	17:57 08:19-08:44/25	18:48 17:46-18:09/23	20:43	21:32	21:56
26	08:20 15:31-16:17/46 15:21-15:29/8	07:23 07:58-08:18/20	06:18 06:42-06:57/15	06:08	05:17	05:04
	17:00 14:25-14:43/18	17:59 08:20-08:42/22	18:50 17:46-18:09/23	20:44	21:33	21:56
27	08:19 15:33-16:18/45	07:21 07:58-08:19/21	06:16 06:41-06:58/17	06:06	05:16	05:05
	17:02 14:28-14:41/13	18:01 08:22-08:38/16	18:52 17:46-18:09/23	20:46	21:34	21:56
28	08:17 15:33-16:19/46	07:19 07:58-08:19/21	06:13 06:39-06:57/18	06:03	05:14	05:05
	17:04 14:34-14:36/2	18:03 08:24-08:36/12	18:53 17:45-18:07/22	20:48	21:36	21:56
29	08:16 15:34-16:19/45		07:11 07:39-07:57/18	06:01	05:13	05:06
	17:06		19:55 18:46-19:07/21	20:50	21:37	21:55
30	08:14 15:36-16:20/44		07:09 07:39-07:57/18	05:59	05:12	05:06
	17:08		19:57 18:47-19:06/19	20:51	21:38	21:55
31	08:13 15:38-16:20/42		07:06 07:38-07:55/17		05:11	
	17:10		19:59 18:48-19:03/15		21:39	
Sonnenscheinstunden	255	276	367	418	489	503
Anzahl Minuten mit Schatten	2769	1727	891	556	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:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 1 - WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:07 21:55	05:45 21:22	06:36 18:55-19:26/31 20:18	07:27 08:03-08:33/30 19:07	07:23 15:15-16:11/56 16:59	08:15 14:36-15:30/54 13:49-14:29/40 16:17 08:53-09:09/16
2	05:08 21:55	05:46 21:20	06:38 18:56-19:26/30 20:16	07:29 08:02-08:33/31 19:04	07:25 15:16-16:11/55 16:57	08:17 14:36-15:29/53 13:50-14:30/40 16:16 08:53-09:08/15
3	05:09 21:54	05:48 21:18	06:40 18:55-19:25/30 20:13	07:31 08:01-08:33/32 19:02	07:26 15:16-16:10/54 16:55	08:18 14:35-15:28/53 13:50-14:31/41 16:16 08:54-09:09/15
4	05:09 21:54	05:50 21:17	06:41 18:56-19:24/28 20:11	07:32 08:01-08:33/32 19:00	07:28 15:17-16:10/53 16:53	08:20 14:36-15:28/52 13:50-14:31/41 16:15 08:54-09:09/15
5	05:10 21:53	05:51 21:15	06:43 18:55-19:23/28 20:09	07:34 08:01-08:33/32 18:57	07:30 15:17-15:49/32 16:51 15:50-16:09/19	08:21 14:36-15:27/51 13:50-14:31/41 16:14 08:56-09:09/13
6	05:11 21:53	05:53 21:13	06:45 18:56-19:22/26 20:06	07:36 08:02-08:33/31 18:55 08:38-08:48/10	07:32 15:17-15:50/33 16:50 15:51-16:08/17	08:22 14:36-15:16/40 15:17-15:27/10 16:14 08:56-09:09/13 13:51-14:32/41
7	05:12 21:52	05:55 21:11	06:47 18:57-19:20/23 20:04	07:38 08:03-08:32/29 18:53 08:35-08:50/15	07:34 15:18-15:50/32 16:48 15:53-16:06/13	08:24 14:36-15:16/40 15:18-15:25/7 09:23-09:27/4 16:14 08:57-09:09/12 13:50-14:32/42
8	05:13 21:51	05:56 21:09	06:48 18:58-19:18/20 20:02	07:39 08:05-08:31/26 18:50 08:33-08:51/18	07:36 15:16-15:50/34 16:46 15:56-16:03/7	08:25 14:37-15:17/40 15:22-15:24/2 09:23-09:30/7 16:13 08:59-09:09/10 13:51-14:33/42
9	05:14 21:51	05:58 21:07	06:50 07:35-07:44/9 19:59 19:00-19:16/16	07:41 08:32-08:52/20 18:48 08:10-08:30/20	07:37 15:13-15:51/38 16:44	08:26 14:37-15:17/40 13:52-14:33/41 16:13 09:00-09:09/9 09:22-09:31/9
10	05:15 21:50	06:00 21:05	06:52 07:33-07:46/13 19:57 19:04-19:12/8	07:43 08:31-08:52/21 18:46 08:12-08:28/16	07:39 15:11-15:51/40 16:43	08:27 14:37-15:17/40 13:52-14:33/41 16:13 09:01-09:09/8 09:22-09:31/9
11	05:16 21:49	06:01 21:03	06:53 07:31-07:46/15 19:55 18:42-18:53/11	07:45 08:31-08:53/22 18:44 08:17-08:26/9	07:41 15:09-15:51/42 16:41	08:28 14:38-15:17/39 13:52-14:34/42 16:12 09:02-09:09/7 09:22-09:32/10
12	05:17 21:48	06:03 21:01	06:55 07:31-07:47/16 19:52 18:40-18:55/15	07:46 08:31-08:53/22 18:41	07:43 15:07-15:51/44 16:40	08:29 14:38-15:17/39 13:52-14:34/42 16:12 09:03-09:09/6 09:22-09:33/11
13	05:18 21:47	06:04 20:59	06:57 07:30-07:48/18 19:50 18:38-18:56/18	07:48 08:30-08:52/22 18:39 08:58-09:07/9	07:45 15:06-15:51/45 16:38	08:30 14:38-15:17/39 13:53-14:34/41 16:12 09:04-09:09/5 09:22-09:33/11
14	05:19 21:46	06:06 20:57	06:58 07:29-07:47/18 19:47 18:37-18:57/20	07:50 08:30-08:51/21 18:37 08:55-09:09/14	07:47 15:05-15:51/46 16:36 14:05-14:08/3	08:31 14:39-15:18/39 13:53-14:35/42 16:12 09:05-09:09/4 09:22-09:34/12
15	05:21 21:45	06:08 20:55	07:00 07:30-07:47/17 19:45 18:36-18:58/22	07:52 08:30-08:51/21 18:34 08:53-09:12/19	07:48 15:05-15:50/45 16:35 14:00-14:13/13	08:32 14:39-15:18/39 13:54-14:35/41 16:12 09:06-09:09/3 09:22-09:35/13
16	05:22 21:44	06:09 20:53	07:02 07:29-07:46/17 19:43 18:34-18:57/23	07:53 08:31-08:50/19 16:33-16:38/5 18:32 08:52-09:15/23	07:50 15:04-15:50/46 14:54-15:02/8 16:34 13:58-14:16/18	08:33 14:40-15:18/38 13:54-14:36/42 16:12 09:07-09:09/2 09:23-09:36/13
17	05:23 21:43	06:11 20:51	07:03 07:30-07:46/16 19:40 18:34-18:57/23	07:55 08:32-08:49/17 16:28-16:43/15 18:30 08:51-09:17/26	07:52 14:52-15:49/57 16:32 13:56-14:18/22	08:34 14:40-15:19/39 13:55-14:36/41 16:13 09:08-09:10/2 09:23-09:36/13
18	05:24 21:42	06:13 20:49	07:05 07:32-07:45/13 19:38 18:34-18:57/23	07:57 08:33-08:47/14 16:25-16:46/21 18:28 08:51-09:18/27	07:54 14:50-15:48/58 16:31 13:55-14:19/24	08:35 14:41-15:20/39 13:55-14:37/42 16:13 09:09-09:10/1 09:24-09:37/13
19	05:26 21:41	06:15 20:47	07:07 07:33-07:42/9 19:35 18:33-18:56/23	07:59 08:35-08:45/10 16:23-16:47/24 18:26 08:50-09:19/29	07:56 15:35-15:47/12 13:54-14:21/27 16:29 14:50-15:34/44	08:35 14:41-15:19/38 09:24-09:37/13 16:13 13:55-14:37/42
20	05:27 21:40	06:16 20:45	07:08 18:33-18:55/22 19:33	08:01 08:50-09:20/30 18:23 16:20-16:48/28	07:57 15:37-15:46/9 13:54-14:22/28 16:28 14:49-15:34/45	08:36 14:42-15:20/38 09:25-09:38/13 16:13 13:56-14:38/42
21	05:28 21:38	06:18 19:08-19:19/11 20:43	07:10 18:34-18:55/21 19:31	08:02 08:49-09:19/30 18:21 16:19-16:49/30	07:59 14:49-15:34/45 13:53-14:23/30 16:27 08:55-09:00/5	08:37 14:42-15:20/38 09:25-09:39/14 16:14 13:56-14:38/42
22	05:30 21:37	06:20 19:06-19:22/16 20:40	07:12 18:34-18:53/19 19:28	08:04 08:47-09:19/32 16:18-16:49/31 18:19 16:55-17:05/10	08:01 14:48-15:35/47 13:53-14:24/31 16:26 08:53-09:02/9	08:37 14:43-15:21/38 09:25-09:39/14 16:14 13:57-14:38/41
23	05:31 21:36	06:21 19:04-19:24/20 20:38	07:13 18:35-18:51/16 19:26	08:06 08:45-09:19/34 16:17-16:50/33 18:17 16:53-17:07/14	08:02 14:48-15:35/47 13:53-14:25/32 16:25 08:53-09:04/11	08:38 14:43-15:21/38 09:26-09:39/13 16:15 13:57-14:39/42
24	05:33 21:34	06:23 19:02-19:25/23 20:36	07:15 18:37-18:49/12 19:23	08:08 08:45-09:19/34 16:51-17:09/18 18:15 16:16-16:50/34	08:04 14:47-15:34/47 13:51-14:25/34 16:23 08:52-09:05/13	08:38 14:44-15:22/38 09:27-09:40/13 16:15 13:58-14:40/42
25	05:34 21:33	06:25 19:01-19:26/25 20:34	07:17 18:40-18:44/4 19:21	08:10 07:44-08:19/35 17:13 15:16-16:10/54	08:06 14:41-14:46/5 08:51-09:05/14 16:22 14:48-15:34/46 13:51-14:26/35	08:39 14:44-15:22/38 13:58-14:40/42 16:16 09:12-09:13/1 09:27-09:40/13
26	05:36 21:31	06:26 18:59-19:26/27 20:32	07:19 08:13-08:23/10 19:19	08:12 07:44-08:18/34 17:11 15:15-16:11/56	08:07 14:39-15:34/55 13:50-14:27/37 16:21 08:52-09:06/14	08:39 14:44-15:23/39 13:59-14:40/41 16:17 09:12-09:13/1 09:27-09:40/13
27	05:37 21:30	06:28 18:58-19:27/29 20:29	07:20 08:10-08:25/15 19:16	08:13 07:44-08:18/34 17:09 15:15-16:11/56	08:09 14:38-15:33/55 13:50-14:28/38 16:20 08:52-09:07/15	08:39 14:45-15:23/38 13:59-14:41/42 16:17 09:12-09:14/2 09:28-09:41/13
28	05:39 21:28	06:30 18:58-19:27/29 20:27	07:22 08:09-08:27/18 19:14	08:15 07:44-08:17/33 17:07 15:15-16:12/57	08:11 14:37-15:32/55 13:49-14:27/38 16:19 08:52-09:07/15	08:39 14:45-15:24/39 13:59-14:41/42 16:18 09:13-09:16/3 09:29-09:42/13
29	05:40 21:27	06:31 18:56-19:27/31 20:25	07:24 08:06-08:29/23 19:12	08:17 07:45-08:16/31 17:05 15:15-16:12/57	08:12 14:37-15:32/55 13:50-14:28/38 16:19 08:52-09:07/15	08:39 14:45-15:24/39 14:00-14:41/41 16:19 09:13-09:17/4 09:30-09:42/12
30	05:42 21:25	06:33 18:56-19:27/31 20:23	07:25 08:05-08:31/26 19:09	08:19 08:00-08:14/14 07:47-07:57/10 17:03 15:15-16:12/57	08:14 14:37-15:32/55 13:50-14:29/39 16:18 08:53-09:08/15	08:40 14:46-15:25/39 14:00-14:42/42 16:20 09:12-09:17/5 09:30-09:41/11
31	05:43 21:23	06:35 18:55-19:26/31 20:20		07:21 08:02-08:11/9 07:49-07:55/6 17:01 15:15-16:12/57		08:40 14:47-15:26/39 14:01-14:43/42 16:21 09:12-09:18/6 09:30-09:42/12
Sonnenscheinstunden	506	456	381	330	263	240
Anzahl Minuten mit Schatten	0	273	765	1710	2109	3048

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:

R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 2 - WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:40 09:42-09:59/17	08:11 15:33-16:17/44	07:16 16:51-17:29/38 15:46-16:11/25	07:04 07:45-08:14/29	05:57 19:48-20:12/24	05:10
	16:22 09:20-09:38/18	17:11	18:05 07:51-08:08/17	20:01	20:53	21:41
2	08:39 09:43-10:00/17	08:10 15:32-16:17/45	07:14 07:52-08:07/15 15:49-16:08/19	07:02 07:45-08:13/28	05:55 19:47-20:12/25	05:10
	16:23 09:21-09:38/17	17:13 16:18-16:28/10	18:07 16:52-17:31/39	20:02	20:55	21:42
3	08:39 09:43-09:59/16	08:08 15:32-16:31/59	07:12 07:53-08:10/17 15:53-16:05/12	06:59 07:45-08:10/25	05:53 19:47-20:13/26	05:09
	16:25 09:20-09:38/18	17:15	18:08 16:55-17:32/37	20:04	20:57	21:43
4	08:39 09:44-10:00/16	08:06 15:31-16:33/62	07:10 07:53-08:11/18	06:57 07:45-08:08/23	05:52 19:47-20:13/26	05:08
	16:26 09:21-09:39/18	17:17	18:10 16:56-17:32/36	20:06	20:58	21:44
5	08:39 09:46-10:00/14	08:05 15:31-16:34/63	07:07 07:51-08:13/22	06:55 07:46-08:05/19	05:50 19:46-20:13/27	05:07
	16:27 09:22-09:40/18	17:19	18:12 16:55-17:33/38	20:08	21:00	21:45
6	08:38 09:46-10:00/14	08:03 08:29-08:33/4	07:05 07:47-08:15/28	06:52 07:47-08:02/15	05:48 19:46-20:12/26	05:07
	16:28 09:22-09:40/18	17:21 15:30-16:35/65	18:14 16:55-17:34/39	20:09	21:02	21:46
7	08:38 09:47-09:59/12	08:01 08:27-08:34/7	07:03 07:44-08:15/31	06:50 07:49-08:00/11	05:46 19:46-20:12/26	05:06
	16:29 09:22-09:40/18	17:23 15:30-16:36/66	18:16 16:53-17:33/40	20:11 19:33-19:41/8	21:03	21:47
8	08:38 09:49-09:59/10	07:59 08:25-08:35/10	07:00 07:43-08:16/33	06:48 19:30-19:43/13	05:44 19:47-20:12/25	05:05
	16:31 09:23-09:41/18	17:25 15:29-16:43/74	18:18 16:53-17:33/40	20:13	21:05	21:48
9	08:37 09:50-09:58/8	07:58 08:23-08:36/13	06:58 07:42-08:16/34	06:45 07:11-07:19/8	05:42 19:47-20:12/25	05:05
	16:32 09:24-09:41/17	17:27 15:29-16:46/77	18:19 16:54-17:33/39	20:15 19:28-19:44/16	21:07	21:49
10	08:36 09:52-09:57/5	07:56 08:22-08:36/14	06:56 07:40-08:16/36	06:43 07:08-07:20/12	05:41 19:47-20:11/24	05:04
	16:34 09:24-09:41/17	17:29 15:29-16:48/79	18:21 16:53-17:32/39	20:16 19:27-19:45/18	21:09	21:50
11	08:36 09:25-09:42/17	07:54 08:22-08:36/14	06:54 07:40-08:16/36	06:41 07:06-07:21/15	05:39 19:48-20:11/23	05:04
	16:35	17:31 15:29-16:50/81	18:23 16:53-17:33/40	20:18 19:26-19:46/20	21:10	21:50
12	08:35 09:07-09:09/2	07:52 08:23-08:36/13	06:51 07:39-08:16/37	06:38 07:04-07:22/18	05:37 19:48-20:10/22	05:04
	16:37 09:26-09:42/16	17:33 15:29-16:52/83	18:25 16:53-17:34/41	20:20 19:26-19:46/20	21:12	21:51
13	08:34 09:05-09:12/7	07:50 08:23-08:36/13	06:49 07:38-08:15/37	06:36 07:03-07:22/19	05:35 19:49-20:10/21	05:03
	16:38 09:27-09:42/15	17:34 15:29-16:54/85	18:27 16:54-17:35/41	20:22 19:24-19:45/21	21:13	21:52
14	08:34 09:04-09:13/9	07:48 08:24-08:35/11	06:47 07:24-07:36/12 16:55-17:36/41	06:34 07:01-07:21/20	05:34 19:50-20:08/18	05:03
	16:40 09:28-09:41/13	17:36 15:29-16:55/86	18:29 07:38-08:15/37	20:23 19:24-19:45/21	21:15	21:52
15	08:33 09:03-09:15/12	07:46 08:26-08:33/7	06:44 07:21-08:13/52	06:32 07:01-07:21/20	05:32 19:51-20:08/17	05:03
	16:41 09:29-09:41/12	17:38 15:30-16:56/86	18:30 16:56-17:36/40	20:25 19:24-19:45/21	21:17	21:53
16	08:32 09:03-09:16/13	07:44 15:30-16:57/87	06:42 07:19-08:13/54	06:29 07:00-07:21/21	05:31 19:52-20:06/14	05:03
	16:43 09:30-09:41/11	17:40	18:32 16:58-17:36/38	20:27 19:25-19:44/19	21:18	21:53
17	08:31 09:02-09:16/14	07:42 15:31-17:06/95	06:39 07:18-08:12/54	06:27 07:00-07:20/20	05:29 19:54-20:04/10	05:03
	16:45 09:31-09:39/8	17:42	18:34 17:00-17:37/37	20:29 19:25-19:44/19	21:20	21:54
18	08:30 09:02-09:17/15	07:40 15:32-17:08/96	06:37 07:16-08:09/53	06:25 07:01-07:19/18	05:27 19:59-20:00/1	05:03
	16:46 09:34-09:36/2	17:44	18:36 17:01-17:36/35	20:30 19:25-19:42/17	21:21	21:54
19	08:29 09:02-09:18/16	07:38 15:33-17:10/97	06:35 07:16-08:08/52 17:01-17:37/36	06:23 07:00-07:16/16	05:26	05:03
	16:48	17:46	18:37 06:58-07:09/11	20:32 19:26-19:40/14	21:23	21:55
20	08:28 09:02-09:19/17	07:36 15:33-17:10/97	06:32 07:15-08:04/49 17:00-17:36/36	06:20 07:01-07:15/14	05:25	05:03
	16:50	17:48	18:39 06:57-07:13/16	20:34 19:28-19:38/10	21:24	21:55
21	08:27 09:01-09:18/17	07:34 16:29-17:11/42	06:30 07:14-08:00/46 17:00-17:36/36	06:18 07:02-07:14/12	05:23	05:03
	16:51	17:50 15:34-16:19/45	18:41 06:55-07:13/18	20:36	21:26	21:55
22	08:25 15:58-16:05/7	07:32 16:30-17:12/42 15:36-16:19/43	06:28 06:54-07:41/47 17:01-17:35/34	06:16 07:04-07:12/8	05:22	05:03
	16:53 09:02-09:19/17	17:52 07:59-08:02/3	18:43 07:43-07:58/15	20:37	21:27	21:56
23	08:24 15:56-16:08/12	07:29 16:31-17:12/41 15:38-16:19/41	06:25 06:53-07:40/47 17:00-17:34/34	06:14	05:20	05:03
	16:55 09:02-09:20/18	17:54 07:56-08:06/10	18:45 07:46-07:53/7	20:39	21:29	21:56
24	08:23 15:55-16:10/15	07:27 16:34-17:12/38 15:40-16:18/38	06:23 06:53-07:39/46	06:12	05:19	05:04
	16:57 09:02-09:20/18	17:55 07:54-08:07/13	18:46 17:01-17:34/33	20:41	21:30	21:56
25	08:22 15:54-16:12/18	07:25 16:36-17:12/36 15:41-16:17/36	06:21 06:51-07:39/48	06:10	05:18	05:04
	16:58 09:03-09:20/17	17:57 07:52-08:08/16	18:48 17:01-17:32/31	20:43	21:32	21:56
26	08:20 15:53-16:13/20	07:23 16:38-17:11/33 15:42-16:16/34	06:18 06:49-07:37/48	06:08 19:55-20:06/11	05:17	05:04
	17:00 09:03-09:20/17	17:59 07:52-08:08/16	18:50 17:02-17:31/29	20:44	21:33	21:56
27	08:19 15:53-16:14/21 15:44-15:52/8	07:21 16:50-17:15/25 16:44-16:45/1	06:16 06:48-07:36/48	06:06 19:53-20:08/15	05:16	05:05
	17:02 09:04-09:20/16	18:01 07:51-08:09/18 15:43-16:15/32	18:52 17:04-17:30/26	20:46	21:34	21:56
28	08:17 15:40-16:15/35	07:19 16:50-17:17/27 17:18-17:26/8	06:13 06:46-07:33/47	06:03 19:51-20:10/19	05:14	05:05
	17:04 09:04-09:19/15	18:03 07:52-08:09/17 15:45-16:13/28	18:53 17:04-17:27/23	20:48	21:36	21:56
29	08:16 15:37-16:15/38		07:11 07:46-08:17/31 18:07-18:25/18	06:01 19:50-20:11/21	05:13	05:06
	17:06 09:05-09:18/13		19:55 08:19-08:31/12	20:50	21:37	21:55
30	08:14 15:36-16:16/40		07:09 07:46-08:16/30	05:59 19:49-20:11/22	05:12	05:06
	17:08 09:07-09:18/11		19:57 18:10-18:22/12	20:51	21:38	21:55
31	08:13 15:35-16:17/42		07:06 07:45-08:15/30		05:11	
	17:10 09:09-09:16/7		19:59		21:39	
Sonnenscheinstunden	255	276	367	418	489	503
Anzahl Minuten mit Schatten	927	2326	2373	696	380	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:

R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung**WEA:** WEA 2 - WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:07	05:45 19:58-20:21/23	06:36 07:05-07:20/15	07:27 08:18-08:55/37	07:23 07:52-08:06/14	08:15 09:07-09:24/17
	21:55	21:22	20:18 19:25-19:45/20	19:07 17:33-18:14/41	16:59 14:59-16:17/78	16:17
2	05:08	05:46 19:58-20:22/24	06:38 07:07-07:19/12	07:29 08:18-08:55/37	07:25 07:53-08:05/12	08:17 09:35-09:40/5
	21:55	21:20	20:16 19:26-19:44/18	19:04 17:32-18:11/39	16:57 14:59-16:15/76	16:16 09:07-09:24/17
3	05:09	05:48 19:57-20:22/25	06:40 07:08-07:16/8	07:31 08:18-08:54/36	07:26 07:55-08:05/10	08:18 09:34-09:42/8
	21:54	21:18	20:13 19:26-19:42/16	19:02 17:31-18:10/39	16:55 14:59-16:12/73	16:16 09:08-09:25/17
4	05:09	05:50 19:57-20:22/25	06:41 19:27-19:40/13	07:32 08:18-08:53/35	07:28 07:57-08:04/7	08:20 09:33-09:43/10
	21:54	21:17	20:11	19:00 17:31-18:10/39	16:53 14:59-16:05/66	16:15 09:07-09:25/18
5	05:10	05:51 19:56-20:22/26	06:43 07:46-07:57/11	07:34 08:19-08:53/34	07:30 07:59-08:02/3	08:21 09:33-09:45/12
	21:53	21:15	20:09 19:29-19:37/8	18:57 17:30-18:10/40	16:51 15:00-16:05/65	16:14 09:08-09:26/18
6	05:11	05:53 19:56-20:23/27	06:45 07:43-07:58/15	07:36 08:21-08:52/31	07:32 15:01-16:04/63	08:22 09:32-09:46/14
	21:53	21:13	20:06	18:55 17:30-18:10/40	16:50	16:14 09:08-09:26/18
7	05:12	05:55 19:56-20:22/26	06:47 07:42-08:00/18	07:38 08:21-08:50/29	07:34 15:01-16:02/61	08:24 09:32-09:46/14
	21:52	21:11	20:04	18:53 17:30-18:09/39	16:48	16:14 09:08-09:26/18
8	05:13	05:56 19:56-20:22/26	06:48 07:40-08:01/21	07:39 08:24-08:49/25	07:36 15:02-16:01/59	08:25 09:33-09:48/15
	21:51	21:09	20:02	18:50 17:30-18:09/39	16:46	16:13 09:09-09:27/18
9	05:14	05:58 19:55-20:21/26	06:50 07:39-08:04/25	07:41 08:27-08:48/21	07:38 15:03-15:48/45	08:26 09:32-09:48/16
	21:51	21:07	19:59	18:48 17:30-18:08/38	16:44 15:49-15:59/10	16:13 09:10-09:27/17
10	05:15	06:00 19:56-20:21/25	06:52 07:38-08:06/28	07:43 08:27-08:46/19	07:39 15:04-15:48/44	08:27 09:32-09:49/17
	21:50	21:05	19:57	18:46 17:31-18:07/36	16:43	16:13 09:10-09:27/17
11	05:16	06:01 19:57-20:21/24	06:53 07:37-08:06/29	07:45 08:26-08:43/17 16:25-16:41/16	07:41 15:06-15:47/41	08:28 09:32-09:49/17
	21:49	21:03	19:55	18:44 17:28-18:06/38	16:41 08:39-08:47/8	16:12 09:10-09:28/18
12	05:17	06:03 19:56-20:20/24	06:55 07:37-08:07/30	07:46 17:25-18:03/38 16:21-16:43/22	07:43 15:07-15:47/40	08:29 09:32-09:50/18
	21:48	21:01	19:52	18:41 08:25-08:42/17	16:40 08:38-08:49/11	16:12 09:11-09:28/17
13	05:18	06:04 19:57-20:20/23	06:57 07:37-08:08/31	07:48 17:23-18:01/38 16:18-16:45/27	07:45 15:09-15:47/38	08:30 09:33-09:51/18
	21:47	20:59	19:50 18:01-18:11/10	18:39 08:24-08:41/17	16:38 08:37-08:50/13	16:12 09:11-09:28/17
14	05:19	06:06 19:58-20:18/20	06:58 07:36-08:07/31 17:58-18:15/17	07:50 17:22-17:49/27 16:16-16:46/30	07:47 15:12-15:47/35	08:31 09:33-09:51/18
	21:46	20:57	19:47 08:10-08:20/10	18:37 08:24-08:41/17	16:36 08:36-08:51/15	16:12 09:12-09:29/17
15	05:21	06:08 19:59-20:17/18	07:00 07:36-08:23/47	07:52 17:22-17:44/22 17:13-17:20/7	07:48 15:25-15:46/21 15:16-15:23/7	08:32 09:33-09:52/19
	21:45	20:55	19:45 17:55-18:17/22	18:34 08:24-08:41/17 16:15-16:47/32	16:35 08:36-08:52/16	16:12 09:12-09:29/17
16	05:22	06:09 20:00-20:15/15	07:02 07:36-08:24/48	07:53 17:10-17:44/34 16:14-16:48/34	07:50 15:26-15:45/19	08:33 09:34-09:52/18
	21:44	20:53	19:43 17:52-18:18/26	18:32 08:24-08:40/16	16:34 08:36-08:53/17	16:12 09:13-09:30/17
17	05:23	06:11 20:03-20:12/9	07:03 07:37-08:25/48	07:55 17:07-17:44/37 16:12-16:49/37	07:52 15:27-15:45/18	08:34 09:35-09:53/18
	21:43	20:51	19:40 17:51-18:19/28	18:30 08:25-08:40/15	16:32 08:36-08:53/17	16:13 09:14-09:30/16
18	05:24	06:13	07:05 07:38-08:26/48	07:57 17:04-17:44/40 16:11-16:50/39	07:54 15:29-15:44/15	08:35 09:35-09:54/19
	21:42	20:49	19:38 17:50-18:20/30	18:28 08:26-08:38/12	16:31 08:36-08:53/17	16:13 09:14-09:31/17
19	05:26	06:15	07:07 07:39-08:26/47	07:59 17:02-17:43/41 16:08-16:50/42	07:56 15:30-15:42/12	08:35 09:35-09:54/19
	21:41	20:47	19:35 17:48-18:20/32	18:26 08:28-08:36/8	16:29 08:36-08:54/18	16:13 09:14-09:31/17
20	05:27	06:16	07:08 07:39-08:26/47 17:47-18:20/33	08:01 17:00-17:42/42	07:57 15:33-15:40/7	08:36 09:36-09:55/19
	21:40	20:45	19:33 08:35-08:37/2	18:23 16:06-16:50/44	16:28 08:37-08:54/17	16:13 09:15-09:31/16
21	05:28	06:18 07:09-07:18/9	07:10 07:39-08:26/47 17:46-18:21/35	08:02 16:59-17:41/42 16:52-16:57/5	07:59 08:37-08:54/17	08:37 09:37-09:56/19
	21:38	20:43	19:31 08:29-08:42/13	18:21 16:04-16:50/46	16:27	16:14 09:16-09:32/16
22	05:30	06:20 07:06-07:19/13	07:12 07:59-08:25/26 07:39-07:58/19	08:04 16:03-17:40/97	08:01 08:38-08:55/17	08:37 09:37-09:56/19
	21:37	20:40 19:37-19:39/2	19:28 08:26-08:44/18 17:45-18:20/35	18:19	16:26	16:14 09:16-09:32/16
23	05:31	06:21 07:05-07:20/15	07:13 07:59-08:48/49 17:45-18:20/35	08:06 16:02-17:39/97	08:02 08:39-08:55/16	08:38 09:37-09:56/19
	21:36	20:38 19:33-19:43/10	19:26 07:40-07:57/17	18:17	16:25	16:15 09:16-09:32/16
24	05:33	06:23 07:04-07:20/16	07:15 07:59-08:51/52 17:45-18:20/35	08:08 16:01-17:37/96	08:04 08:40-08:55/15	08:38 09:38-09:57/19
	21:34	20:36 19:30-19:44/14	19:23 07:41-07:54/13	18:15	16:23 09:13-09:14/1	16:15 09:17-09:33/16
25	05:34	06:25 07:03-07:22/19	07:17 07:59-08:52/53 17:44-18:19/35	07:10 15:00-16:34/94	08:06 08:40-08:54/14	08:39 09:38-09:57/19
	21:33	20:34 19:29-19:46/17	19:21 07:45-07:48/3	17:13	16:22 09:09-09:17/8	16:16 09:17-09:34/17
26	05:36 20:07-20:13/6	06:26 07:02-07:23/21	07:19 08:00-08:53/53	07:12 07:58-08:00/2	08:07 08:41-08:54/13	08:39 09:38-09:57/19
	21:31	20:32 19:27-19:46/19	19:19 17:43-18:19/36	17:11 15:00-16:26/86	16:21 09:08-09:19/11	16:17 09:17-09:34/17
27	05:37 20:04-20:16/12	06:28 07:02-07:23/21	07:20 08:01-08:54/53	07:13 07:55-08:03/8	08:09 08:42-08:54/12	08:39 09:39-09:57/18
	21:30	20:29 19:26-19:46/20	19:16 17:40-18:18/38	17:09 14:59-16:25/86	16:20 09:08-09:20/12	16:17 09:18-09:34/16
28	05:39 20:03-20:18/15	06:30 07:03-07:23/20	07:22 08:02-08:55/53	07:15 07:53-08:05/12	08:11 08:44-08:54/10	08:39 09:39-09:58/19
	21:28	20:27 19:26-19:47/21	19:14 17:38-18:18/40	17:07 14:59-16:24/85	16:19 09:08-09:21/13	16:18 09:19-09:36/17
29	05:40 20:01-20:19/18	06:31 07:02-07:22/20	07:24 08:03-08:17/14 17:35-18:16/41	07:17 07:53-08:05/12	08:12 08:45-08:52/7	08:39 09:41-09:59/18
	21:27	20:25 19:25-19:46/21	19:12 08:18-08:54/36	17:05 14:59-16:23/84	16:19 09:07-09:22/15	16:19 09:19-09:36/17
30	05:42 20:00-20:19/19	06:33 07:03-07:22/19	07:25 08:07-08:13/6 17:34-18:15/41	07:19 07:52-08:06/14	08:14 08:48-08:50/2	08:40 09:40-09:58/18
	21:25	20:23 19:25-19:46/21	19:09 08:18-08:55/37	17:03 14:58-16:22/84	16:18 09:07-09:23/16	16:20 09:19-09:36/17
31	05:43 19:59-20:20/21	06:35 07:04-07:22/18		07:21 07:52-08:06/14		08:40 09:41-09:59/18
	21:23	20:20 19:24-19:45/21		17:01 14:58-16:19/81		16:21 09:19-09:37/18
Sonnenscheinstunden	506	456	381	330	263	240
Anzahl Minuten mit Schatten	91	743	1777	2562	1287	1026

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:

R-2-2021-0491 WP am Standort Vechta

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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung **WEA:** WEA 3 - WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:40 14:34-15:17/43 09:32-09:50/18	08:11	07:16 17:07-17:31/24	07:04 08:08-08:51/43 18:59-19:19/20	05:57 06:29-06:48/19	05:11
	16:22 10:06-10:15/9	17:11	18:05	20:01 07:32-07:45/13	20:53	21:41
2	08:39 14:34-15:18/44 09:33-09:50/17	08:10	07:14 07:45-07:52/7	07:02 07:54-07:58/4 07:31-07:45/14	05:55 06:29-06:49/20	05:10
	16:23 10:08-10:15/7	17:13	18:07 17:05-17:33/28	20:02 08:07-08:51/44 18:58-19:19/21	20:55 20:18-20:21/3	21:42
3	08:39 14:34-15:18/44 09:33-09:50/17	08:08	07:12 07:43-07:55/12	06:59 07:48-08:02/14 07:29-07:45/16	05:54 06:28-06:49/21	05:09
	16:25 10:09-10:13/4	17:15	18:08 17:03-17:36/33	20:04 08:06-08:50/44 18:57-19:19/22	20:57 20:16-20:25/9	21:43
4	08:39 14:35-15:19/44	08:06	07:10 07:41-07:55/14	06:57 07:46-08:04/18 07:29-07:45/16	05:52 06:27-06:48/21	05:08
	16:26 09:34-09:51/17	17:17	18:10 17:00-17:36/36	20:06 08:06-08:50/44 18:57-19:19/22	20:58 20:14-20:26/12	21:44
5	08:39 14:36-15:19/43	08:05	07:07 07:40-07:56/16	06:55 07:28-08:49/81	05:50 06:27-06:47/20	05:07
	16:27 09:35-09:52/17	17:19	18:12 16:59-17:37/38	20:08 18:57-19:19/22	21:00 20:13-20:26/13	21:45
6	08:38 14:35-15:19/44	08:03	07:05 16:58-17:43/45	06:52 07:26-08:47/81	05:48 06:26-06:45/19	05:07
	16:28 09:35-09:52/17	17:21	18:14 07:40-07:57/17	20:09 18:56-19:18/22	21:02 20:12-20:27/15	21:46
7	08:38 14:35-15:19/44	08:01	07:03 16:57-17:45/48	06:50 07:25-08:46/81	05:46 06:27-06:45/18	05:06
	16:30 09:35-09:51/16	17:23	18:16 07:39-07:56/17	20:11 18:57-19:17/20	21:04 20:11-20:27/16	21:47
8	08:38 14:37-15:20/43	07:59	07:00 16:56-17:46/50	06:48 07:24-08:45/81	05:44 06:27-06:43/16	05:05
	16:31 09:37-09:52/15	17:25	18:18 07:39-07:56/17	20:13 18:57-19:17/20	21:05 20:11-20:28/17	21:48
9	08:37 14:37-15:20/43	07:58	06:58 16:56-17:47/51	06:45 07:23-08:43/80	05:42 06:27-06:42/15	05:05
	16:32 09:37-09:52/15	17:27	18:19 07:40-07:55/15	20:15 18:57-19:15/18	21:07 20:11-20:27/16	21:49
10	08:36 14:37-15:20/43	07:56	06:56 16:55-17:47/52	06:43 07:21-08:41/80	05:41 06:29-06:41/12	05:04
	16:34 09:38-09:52/14	17:29	18:21 07:40-07:54/14	20:16 18:59-19:13/14	21:09 20:10-20:27/17	21:50
11	08:36 14:37-15:20/43	07:54	06:54 16:56-17:47/51	06:41 07:19-08:39/80	05:39 06:29-06:40/11	05:04
	16:35 09:39-09:52/13	17:31	18:23 07:41-07:52/11	20:18 19:01-19:11/10	21:10 20:11-20:27/16	21:50
12	08:35 14:39-15:20/41	07:52	06:51 16:55-17:46/51	06:38 07:16-08:07/51	05:37 06:31-06:37/6	05:04
	16:37 09:40-09:52/12	17:33	18:25 07:44-07:50/6	20:20 08:09-08:36/27	21:12 20:11-20:26/15	21:51
13	08:34 14:39-15:20/41 09:42-09:51/9	07:50	06:49 16:56-17:46/50	06:36 07:15-08:06/51	05:35 20:12-20:26/14	05:03
	16:38 09:11-09:17/6	17:34	18:27	20:22 08:09-08:29/20	21:13	21:52
14	08:34 14:40-15:20/40 09:43-09:50/7	07:48	06:47 17:33-17:45/12	06:34 07:13-08:05/52	05:34 20:13-20:25/12	05:03
	16:40 09:10-09:19/9	17:36	18:29 16:57-17:32/35	20:23 08:12-08:26/14	21:15	21:52
15	08:33 15:07-15:19/12 14:41-15:06/25	07:46	06:44 17:34-17:42/8	06:32 07:12-08:05/53	05:32 20:14-20:24/10	05:03
	16:41 09:09-09:20/11	17:38	18:30 16:57-17:31/34	20:25 08:16-08:22/6	21:17	21:53
16	08:32 15:09-15:18/9 14:41-15:06/25	07:44 16:58-17:01/3	06:42 17:55-18:02/7	06:29 07:11-08:04/53	05:31 20:15-20:22/7	05:03
	16:43 09:09-09:21/12	17:40	18:32 16:59-17:32/33	20:27	21:18	21:54
17	08:31 15:11-15:16/5 14:41-15:05/24	07:42 16:55-17:05/10	06:39 17:53-18:04/11	06:27 07:10-08:03/53	05:29	05:03
	16:45 09:08-09:21/13	17:42	18:34 17:01-17:31/30	20:29	21:20	21:54
18	08:30 09:08-09:22/14	07:40 16:53-17:07/14	06:37 17:51-18:04/13	06:25 07:09-08:01/52	05:27	05:03
	16:46 14:43-15:05/22	17:44	18:36 17:04-17:30/26	20:30	21:21	21:54
19	08:29 09:08-09:23/15	07:38 16:52-17:08/16	06:35 17:50-18:05/15	06:23 07:08-07:40/32	05:26	05:03
	16:48 14:44-15:05/21	17:46	18:38 17:05-17:29/24	20:32 07:41-07:59/18	21:23	21:55
20	08:28 09:08-09:24/16	07:36 16:50-17:08/18	06:32 17:48-18:05/17	06:20 07:07-07:39/32	05:25	05:03
	16:50 14:45-15:04/19	17:48	18:39 17:05-17:28/23	20:34 07:43-07:56/13	21:24	21:55
21	08:27 09:08-09:24/16	07:34 16:50-17:08/18	06:30 17:47-18:05/18	06:18 07:07-07:38/31	05:23	05:03
	16:51 14:46-15:03/17	17:50	18:41 17:07-17:27/20	20:36 07:47-07:52/5	21:26	21:55
22	08:25 09:08-09:25/17	07:32 16:50-17:08/18	06:28 07:30-07:44/14 17:08-17:25/17	06:16 07:07-07:37/30	05:22	05:03
	16:53 14:48-15:02/14	17:52	18:43 17:46-18:05/19	20:38	21:27	21:56
23	08:24 09:08-09:26/18	07:30 16:50-17:08/18	06:25 07:26-07:46/20 17:10-17:21/11	06:14 07:07-07:36/29	05:20	05:03
	16:55 14:51-15:01/10	17:54	18:45 17:45-18:04/19	20:39	21:29	21:56
24	08:23 09:08-09:25/17	07:27 16:51-17:08/17	06:23 07:24-07:48/24	06:12 07:07-07:35/28	05:19	05:04
	16:57	17:55	18:46 17:45-18:05/20	20:41	21:30	21:56
25	08:22 09:09-09:26/17	07:25 16:50-17:07/17	06:21 07:20-07:50/30	06:10 07:08-07:32/24	05:18	05:04
	16:58	17:57 17:12-17:21/9	18:48 17:44-18:04/20	20:43	21:32	21:56
26	08:20 09:09-09:26/17	07:23 16:52-17:06/14	06:18 07:16-07:50/34	06:08 07:08-07:28/20	05:17	05:04
	17:00	17:59 17:10-17:23/13	18:50 17:44-18:03/19	20:45 06:37-06:46/9	21:33	21:56
27	08:19 09:10-09:26/16	07:21 16:53-17:05/12	06:16 07:14-07:51/37	06:06 07:09-07:26/17	05:16	05:05
	17:02	18:01 17:09-17:24/15	18:52 17:45-18:03/18	20:46 06:36-06:47/11	21:34	21:56
28	08:17 09:10-09:26/16	07:19 16:55-17:01/6	06:13 07:12-07:51/39	06:03 07:10-07:25/15	05:14	05:05
	17:04	18:03 17:07-17:28/21	18:53 17:45-18:01/16	20:48 06:34-06:48/14	21:36	21:56
29	08:16 09:11-09:25/14		07:11 08:11-08:51/40 19:04-19:15/11	06:02 07:12-07:22/10	05:13	05:06
	17:06		19:55 18:46-19:00/14	20:50 06:32-06:48/16	21:37	21:55
30	08:15 09:13-09:24/11		07:09 08:10-08:52/42 07:37-07:41/4	05:59 06:30-06:48/18	05:12	05:06
	17:08		19:57 18:48-18:58/10 19:02-19:17/15	20:51	21:38	21:55
31	08:13 09:14-09:23/9		07:06 08:08-08:51/43 19:00-19:18/18		05:11	
	17:10		19:59 07:33-07:43/10		21:39	
Sonnenscheinstunden	255	276	367	418	489	503
Anzahl Minuten mit Schatten	1291	239	1593	1849	390	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:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

SHADOW - Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung **WEA:** WEA 3 - WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)

Annahmen für Schattenwurfberechnung

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 Sonneneinfallsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	05:07		05:45	06:40-06:49/9	06:36	07:18-08:38/80	07:27	17:35-18:26/51	07:23		08:15	14:19-15:02/43
	21:55		21:22	20:21-20:37/16	20:18	19:00-19:10/10	19:07		16:59		16:17	09:22-09:34/12
2	05:08		05:46	06:39-06:51/12	06:38	07:20-08:40/80	07:29	17:34-18:25/51	07:25		08:17	14:20-15:03/43
	21:55		21:20	20:22-20:38/16	20:16	18:58-19:12/14	19:04	08:21-08:30/9	16:57		16:16	09:21-09:35/14
3	05:09		05:48	06:38-06:51/13	06:40	07:20-08:41/81	07:31	17:33-18:25/52	07:26		08:18	14:21-15:04/43
	21:54		21:18	20:21-20:37/16	20:13	18:55-19:13/18	19:02	08:18-08:31/13	16:55		16:16	09:21-09:36/15
4	05:09		05:50	06:38-06:53/15	06:41	07:21-08:42/81	07:32	17:33-18:25/52	07:28		08:20	14:21-15:04/43
	21:54		21:17	20:21-20:38/17	20:11	18:54-19:14/20	19:00	08:17-08:32/15	16:53		16:15	09:21-09:36/15
5	05:10		05:51	06:36-06:53/17	06:43	07:22-08:43/81	07:34	17:33-18:24/51	07:30		08:21	14:21-15:04/43
	21:53		21:15	20:21-20:37/16	20:09	18:53-19:13/20	18:57	08:16-08:33/17	16:51		16:14	09:21-09:37/16
6	05:11		05:53	06:37-06:55/18	06:45	07:22-08:43/81	07:36	17:33-18:23/50	07:32		08:22	14:22-15:05/43
	21:53		21:13	20:21-20:37/16	20:06	18:52-19:14/22	18:55	08:16-08:33/17	16:50		16:14	09:21-09:38/17
7	05:12		05:55	06:37-06:56/19	06:47	07:23-08:44/81	07:38	17:33-18:20/47	07:34		08:24	14:22-15:05/43
	21:52		21:11	20:21-20:36/15	20:04	18:52-19:14/22	18:53	08:15-08:32/17	16:48		16:14	09:21-09:38/17
8	05:13		05:56	06:36-06:57/21	06:48	07:40-07:58/18 07:23-07:39/16	07:39	08:15-08:31/16	07:36		08:25	14:23-15:07/44
	21:51		21:09	20:22-20:36/14	20:02	08:00-08:44/44 18:51-19:13/22	18:50	17:34-18:13/39	16:46		16:13	09:22-09:39/17
9	05:14		05:58	06:37-06:57/20	06:50	07:42-07:56/14 07:23-07:39/16	07:41	08:16-08:31/15	07:38		08:26	14:23-15:07/44 09:22-09:39/17
	21:51		21:07	20:23-20:34/11	19:59	08:00-08:44/44 18:51-19:13/22	18:48	17:34-18:12/38	16:44		16:13	09:58-10:02/4
10	05:15		06:00	06:36-06:57/21	06:52	07:46-07:52/6 07:24-07:39/15	07:43	08:16-08:30/14	07:39		08:27	14:23-15:07/44 09:22-09:40/18
	21:50		21:05	20:25-20:33/8	19:57	08:00-08:44/44 18:52-19:13/21	18:46	17:36-18:11/35	16:43		16:13	09:57-10:04/7
11	05:16		06:01	06:37-06:58/21	06:53	08:00-08:43/43 18:51-19:11/20	07:45	08:18-08:28/10	07:41	08:45-08:54/9	08:28	14:24-15:07/43 09:23-09:40/17
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12	05:17		06:03	06:37-06:57/20	06:55	08:00-08:43/43 18:52-19:10/18	07:46	08:22-08:24/2	07:43	08:44-08:55/11	08:29	14:24-15:08/44 09:23-09:40/17
	21:48		21:01		19:52	07:25-07:36/11	18:41	17:39-18:05/26	16:40		16:12	09:56-10:06/10
13	05:18		06:04	07:24-07:27/3	06:57	08:01-08:43/42 07:28-07:33/5	07:48	17:40-18:03/23	07:45	08:43-08:57/14	08:30	14:24-15:08/44 09:23-09:41/18
	21:47		20:59	06:39-06:57/18	19:50	18:39-18:48/9 18:52-19:08/16	18:39		16:38		16:12	09:56-10:07/11
14	05:19		06:06	07:19-07:30/11	06:58	08:01-08:42/41 18:54-19:06/12	07:50	17:27-17:35/8	07:47	08:42-08:57/15	08:31	14:25-15:09/44 09:24-09:41/17
	21:46		20:57	06:40-06:56/16	19:47	18:37-18:50/13	18:37	17:41-17:57/16	16:36		16:12	09:56-10:08/12
15	05:21		06:08	07:18-07:33/15	07:00	08:02-08:41/39 19:00-19:01/1	07:52	17:25-17:37/12	07:48	08:42-08:58/16	08:32	14:26-15:09/43 09:24-09:42/18
	21:45		20:55	06:42-06:55/13	19:45	18:35-18:51/16	18:34	17:41-17:56/15	16:35		16:12	09:56-10:09/13
16	05:22		06:10	07:17-07:34/17	07:02	08:02-08:40/38	07:53	17:23-17:39/16	07:50	08:42-08:59/17	08:33	14:26-15:10/44 09:25-09:42/17
	21:44		20:53	06:43-06:54/11	19:43	18:33-18:51/18	18:32	17:43-17:55/12	16:34		16:12	09:56-10:10/14
17	05:23		06:11	07:15-07:35/20	07:03	08:04-08:39/35	07:55	17:22-17:39/17	07:52	08:42-08:59/17	08:34	14:27-15:10/43 09:25-09:43/18
	21:43		20:51	06:45-06:52/7	19:40	18:33-18:52/19	18:30	17:45-17:52/7	16:32		16:13	09:57-10:10/13
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	21:42		20:49		19:38	18:32-18:52/20	18:28		16:31		16:13	09:57-10:11/14
19	05:26		06:15	07:13-07:40/27	07:07	08:10-08:35/25	07:59	17:21-17:40/19	07:56	08:42-09:00/18	08:35	14:28-15:11/43 09:26-09:43/17
	21:41		20:47		19:35	18:31-18:51/20	18:26		16:29	14:25-14:35/10	16:13	09:57-10:11/14
20	05:27		06:16	07:13-07:42/29	07:08	08:12-08:33/21 17:58-18:07/9	08:01	17:20-17:39/19	07:57	08:43-09:00/17	08:36	14:28-15:12/44 09:27-09:44/17
	21:40		20:45		19:33	18:31-18:51/20	18:23		16:28	14:23-14:37/14	16:13	09:58-10:12/14
21	05:28		06:18	07:12-07:42/30	07:10	08:15-08:30/15 17:55-18:10/15	08:02	17:21-17:38/17	07:59	08:44-09:00/16	08:37	14:28-15:11/43 09:28-09:45/17
	21:38		20:43		19:31	18:32-18:50/18	18:21		16:27	14:22-14:39/17	16:14	09:59-10:13/14
22	05:30		06:20	07:12-07:43/31	07:12	08:19-08:25/6 17:52-18:11/19	08:04	17:21-17:38/17	08:01	08:44-09:00/16	08:37	14:29-15:12/43 09:28-09:45/17
	21:37		20:40	07:51-07:58/7	19:28	18:31-18:49/18	18:19		16:26	14:21-14:40/19	16:14	09:59-10:13/14
23	05:31		06:21	07:12-07:44/32	07:13	18:33-18:49/16	08:06	17:22-17:37/15	08:02	08:45-09:00/15	08:38	14:29-15:12/43 09:28-09:45/17
	21:36		20:38	07:48-08:01/13	19:26	17:50-18:12/22	18:17		16:25	14:21-14:42/21	16:15	09:59-10:13/14
24	05:33		06:23	07:11-07:44/33	07:15	18:33-18:49/16	08:08	17:23-17:36/13	08:04	08:46-09:01/15	08:38	14:30-15:14/44 09:29-09:46/17
	21:34		20:36	07:45-08:03/18	19:23	17:49-18:13/24	18:15		16:23	14:20-14:42/22	16:15	10:00-10:14/14
25	05:34		06:25	07:12-08:04/52	07:17	18:33-18:47/14	07:10	16:25-16:34/9	08:06	14:49-14:54/5 14:20-14:43/23	08:39	14:31-15:14/43 09:29-09:46/17
	21:33		20:34		19:21	17:47-18:13/26	17:13		16:22	08:46-09:00/14	16:16	10:00-10:14/14
26	05:36		06:26	07:12-08:05/53	07:19	18:34-18:46/12	07:12		08:07	14:47-14:56/9 14:20-14:44/24	08:39	14:31-15:14/43 09:29-09:47/18
	21:31		20:32		19:19	17:44-18:13/29	17:11		16:21	08:47-09:00/13	16:17	10:01-10:14/13
27	05:37	20:27-20:32/5	06:28	07:13-08:06/53	07:20	18:36-18:44/8	07:13		08:09	14:46-14:58/12 14:20-14:45/25	08:39	14:31-15:14/43 09:30-09:47/17
	21:30		20:29		19:16	17:41-18:13/32	17:09		16:20	08:48-08:59/11	16:17	10:01-10:14/13
28	05:39	20:26-20:34/8	06:30	07:14-08:07/53	07:22	18:15-18:22/7	07:15		08:11	14:19-14:59/40 09:24-09:30/6	08:39	14:31-15:15/44 09:31-09:48/17
	21:28		20:27	08:17-08:24/7	19:14	17:39-18:13/34	17:07		16:19	08:50-08:59/9	16:18	10:02-10:15/13
29	05:40	20:24-20:35/11	06:31	07:14-08:06/52	07:24	18:13-18:24/11	07:17		08:12	14:19-15:00/41 09:22-09:31/9	08:39	14:32-15:15/43 09:32-09:49/17
	21:27		20:25	08:12-08:28/16	19:12	17:37-18:12/35	17:05		16:19	08:51-08:57/6	16:19	10:04-10:16/12
30	05:42	20:23-20:36/13	06:33	07:15-08:07/52	07:25	17:36-18:25/49	07:19		08:14	14:20-15:01/41	08:40	14:32-15:16/44 09:31-09:48/17
	21:25		20:23	08:10-08:30/20	19:09		17:03		16:18	09:22-09:33/11	16:20	10:03-10:15/12
31	05:43	06:44-06:46/2	06:35	07:15-08:06/51			07:21				08:40	14:33-15:16/43 09:32-09:49/17
	21:24	20:22-20:37/15	20:20	08:07-08:35/28			17:01				16:21	10:04-10:15/11
Sonnenscheinstunden	506		456		381		330		263		240	
Anzahl Minuten mit Schatten	54		1164		1996		922		615		2143	

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

Anlage A6: SHADOW-Grafischer Kalender pro WEA mit Darstellung der Beschattungszeiten je WEA an den Immissionsorten über das ganze Jahr

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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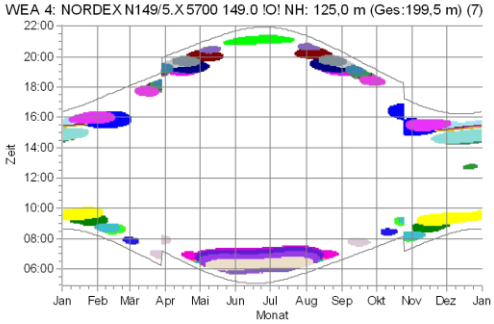
+49 5971 9710-31
André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:06/3.5.587

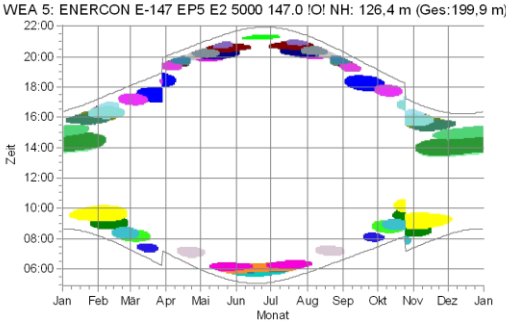
SHADOW - Grafischer Kalender pro WEA

Berechnung: Schattenwurfausbreitung Gesamtbelastung

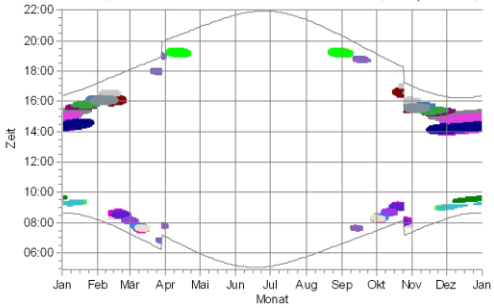
WEA 4: NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)



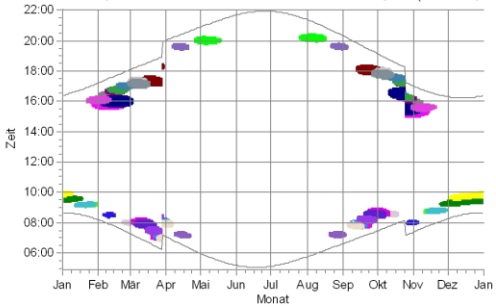
WEA 5: ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)



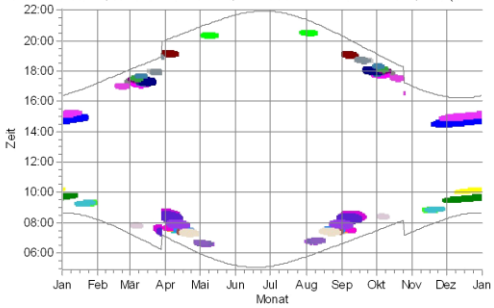
WEA 1: WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 r



WEA 2: WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)



WEA 3: WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)



Schattenrezeptoren

- SR-01: SR-01, Weidenweg 2, 49377 Vechta
- SR-02: SR-02, Weidenweg 3, 49377 Vechta
- SR-04: SR-04, Westmark 3a, 49377 Vechta
- SR-05: SR-05, Kötterweg 2, 49377 Vechta
- SR-08: SR-08, Südmark 3, 49377 Vechta
- SR-09: SR-09, Südmark 2, 49377 Vechta
- SR-10: SR-10, Südmark 2a, 49377 Vechta
- SR-11: SR-11, Südmark 1, 49377 Vechta
- SR-12: SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)
- SR-03: SR-03, Plaggenweg 2, 49377 Vechta
- SR-06: SR-06, Kötterweg 1, 49377 Vechta
- SR-07: SR-07, Hagen-Ring-Straße 46, 49377 Vechta
- SR-23: SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)
- SR-24: SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)
- SR-25: SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)
- SR-26: SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)
- SR-27: SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)
- SR-31: SR-31, Försterweg 1, 49377 Vechta
- SR-32: SR-32, Försterweg 2, 49377 Vechta
- SR-06a: SR-06a, Kötterweg 1a, 49377 Vechta
- SR-27a: SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)
- SR-33: SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)
- SR-34: SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)
- SR-35: SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)
- SR-36: SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)
- SR-37: SR-37, Weidenweg 1A, 49377 Vechta
- SR-38: SR-38, Weidenweg 1, 49377 Vechta
- SR-39: SR-39, Siegeweg 3, 49377 Vechta
- SR-40: SR-40, Plaggenweg 1, 49377 Vechta
- SR-41: SR-41, Bussen Weg 3, 49377 Vechta
- SR-42: SR-42, Bussen Weg 1, 49377 Vechta
- SR-43: SR-43, Bussen Weg 2, 49377 Vechta
- SR-44: SR-44, Bussen Weg 4, 49377 Vechta
- SR-45: SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)
- SR-05a: SR-05a, Kötterweg 4, 49377 Vechta
- SR-46: SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)
- SR-07a: SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta
- SR-47: SR-47, Krimpenforter Weg 18/20, 49377 Vechta
- SR-22: SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)
- SR-21: SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)
- SR-30: SR-30, Westmark 4, 49377 Vechta
- SR-29: SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)
- SR-18: SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)
- SR-19: SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)
- SR-20: SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)
- SR-28: SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)
- SR-48: SR-48, Westmark 2a, 49377 Vechta
- SR-49: SR-49, Plaggenweg 4 (Neubau), 49377 Vechta
- SR-50: SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)

Anlage B: Schattenausbreitung der Vor- und Zusatzbelastung

Anlage B1: SHADOW-Hauptergebnis mit Darstellung der Vorbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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André Raming / a.raming@koetter-consulting.com
Berechnet:
15.09.2022 08:32/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfzeiten Vorbelastung

Annahmen für Schattenwurfberechnung

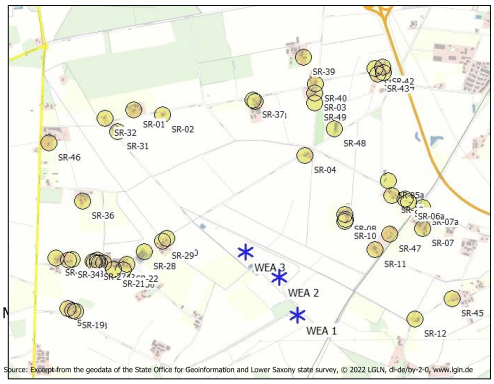
Beschattungsbereich der WEA
Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt
Siehe WEA-Tabelle

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 Sonneneinfallsrichtung
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: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer M
Hindernisse in Berechnung verwendet
Rasterauflösung: 5,0 m

Alle Koordinatenangaben in:
UTM (north)-WGS84 Zone: 32



Maßstab 1:40.000
Existierende WEA
Schattenrezeptor

WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ Ak-tu-ell	Hersteller	Typ	Nenn-leistung	Rotor-durch-messer	Naben-höhe	Schattendaten Beschatt.-Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
WEA 1	449.247	5.838.992	30,0	WEA 1, ENERCON E-115 3...	Nein	ENERCON	E-115-3.000	3.000	115,7	149,0	2.066	12,4
WEA 2	449.116	5.839.268	28,0	WEA 2, ENERCON E-115 3...	Nein	ENERCON	E-115-3.000	3.000	115,7	149,0	2.066	12,4
WEA 3	448.874	5.839.452	28,0	WEA 3, ENERCON E-92 2,...	Ja	ENERCON	E-92 2,3 MW-2.350	2.350	92,0	138,4	1.513	16,0

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	448.073	5.840.490	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-02	SR-02, Weidenweg 3, 49377 Vechta	448.281	5.840.451	29,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	449.389	5.840.595	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-04	SR-04, Westmark 3a, 49377 Vechta	449.315	5.840.143	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05	SR-05, Kötterweg 2, 49377 Vechta	449.945	5.839.851	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	449.919	5.839.956	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06	SR-06, Kötterweg 1, 49377 Vechta	450.037	5.839.822	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	450.063	5.839.803	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	450.166	5.839.608	33,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	450.166	5.839.759	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-08	SR-08, Südmark 3, 49377 Vechta	449.600	5.839.713	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-09	SR-09, Südmark 2, 49377 Vechta	449.606	5.839.678	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-10	SR-10, Südmark 2a, 49377 Vechta	449.598	5.839.665	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-11	SR-11, Südmark 1, 49377 Vechta	449.816	5.839.457	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	450.102	5.838.953	37,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	447.635	5.839.033	29,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	447.615	5.839.040	29,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	447.576	5.839.055	28,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	447.910	5.839.335	31,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	448.011	5.839.372	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	447.844	5.839.380	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	447.810	5.839.384	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	447.794	5.839.382	30,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	447.794	5.839.401	30,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	447.777	5.839.386	30,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	447.767	5.839.392	29,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	448.141	5.839.458	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	448.270	5.839.534	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-30	SR-30, Westmark 4, 49377 Vechta	448.304	5.839.556	28,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-31	SR-31, Försterweg 1, 49377 Vechta	447.953	5.840.333	30,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-32	SR-32, Försterweg 2, 49377 Vechta	447.861	5.840.432	28,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	447.614	5.839.409	28,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:32/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfzeiten Vorbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	447.589	5.839.407	29,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	447.496	5.839.420	30,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	447.691	5.839.830	31,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	448.943	5.840.549	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-38	SR-38, Weidenweg 1, 49377 Vechta	448.956	5.840.541	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-39	SR-39, Siegeweg 3, 49377 Vechta	449.313	5.840.855	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	449.393	5.840.664	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	449.831	5.840.770	31,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	449.885	5.840.780	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	449.850	5.840.729	31,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	449.890	5.840.737	31,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	450.376	5.839.096	37,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	447.454	5.840.258	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	449.923	5.839.566	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-48	SR-48, Westmark 2a, 49377 Vechta	449.532	5.840.337	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	449.388	5.840.527	30,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	447.985	5.839.330	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

Berechnungsergebnisse

Schattenrezeptor

		astron. max. mögl. Beschattungsdauer		
Nr.	Name	Stunden/Jahr	Schattentage/Jahr	Max.Schattendauer/Tag
		[h/a]	[d/a]	[h/d]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	23:50	56	0:30
SR-02	SR-02, Weidenweg 3, 49377 Vechta	15:27	40	0:33
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	0:00	0	0:00
SR-04	SR-04, Westmark 3a, 49377 Vechta	27:12	66	0:28
SR-05	SR-05, Kötterweg 2, 49377 Vechta	45:39	135	0:27
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	39:40	123	0:26
SR-06	SR-06, Kötterweg 1, 49377 Vechta	34:14	115	0:25
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	31:35	107	0:25
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	25:25	86	0:25
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	25:23	90	0:23
SR-08	SR-08, Südmark 3, 49377 Vechta	77:16	160	0:41
SR-09	SR-09, Südmark 2, 49377 Vechta	83:24	167	0:42
SR-10	SR-10, Südmark 2a, 49377 Vechta	86:18	169	0:42
SR-11	SR-11, Südmark 1, 49377 Vechta	54:50	122	0:37
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	39:04	88	0:41
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	16:43	73	0:18
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	15:54	73	0:17
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	15:01	70	0:17
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	22:56	82	0:22
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	27:26	91	0:24
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	19:59	77	0:21
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	18:57	75	0:20
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	18:24	73	0:20
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	18:28	74	0:20
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	18:01	74	0:20
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	17:37	71	0:19
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	34:21	102	0:28
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	44:08	115	0:34
SR-30	SR-30, Westmark 4, 49377 Vechta	47:06	117	0:35
SR-31	SR-31, Försterweg 1, 49377 Vechta	19:18	71	0:25
SR-32	SR-32, Försterweg 2, 49377 Vechta	17:08	72	0:24
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	14:11	64	0:18
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	13:38	63	0:17
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	12:02	60	0:17
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	14:10	59	0:24
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	0:00	0	0:00
SR-38	SR-38, Weidenweg 1, 49377 Vechta	0:00	0	0:00
SR-39	SR-39, Siegeweg 3, 49377 Vechta	0:00	0	0:00
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	0:00	0	0:00
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	0:00	0	0:00
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	0:00	0	0:00

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

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Berechnet:
15.09.2022 08:32/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfzeiten Vorbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	astron. max. mögl. Beschattungsdauer Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	0:00	0	0:00
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	0:00	0	0:00
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	16:55	58	0:23
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	3:34	21	0:14
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	41:12	112	0:31
SR-48	SR-48, Westmark 2a, 49377 Vechta	16:30	54	0:21
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	0:00	0	0:00
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	26:40	90	0:24

Gesamtdauer Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal [h/a]
WEA 1	WEA 1, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (2)	230:48
WEA 2	WEA 2, ENERCON E-115 3000 115.7 !O! NH: 149,0 m (Ges:206,9 m) (1)	236:28
WEA 3	WEA 3, ENERCON E-92 2,3 MW 2350 92.0 !-! NH: 138,4 m (Ges:184,4 m) (1)	204:16

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.

Anlage B2: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Vorbelastung unterteilt in Minuten / Tag und Stunden / Jahr

Projekt:
R-2-2021-0491 WP am Standort Vechta

Lizenzierter Anwender:
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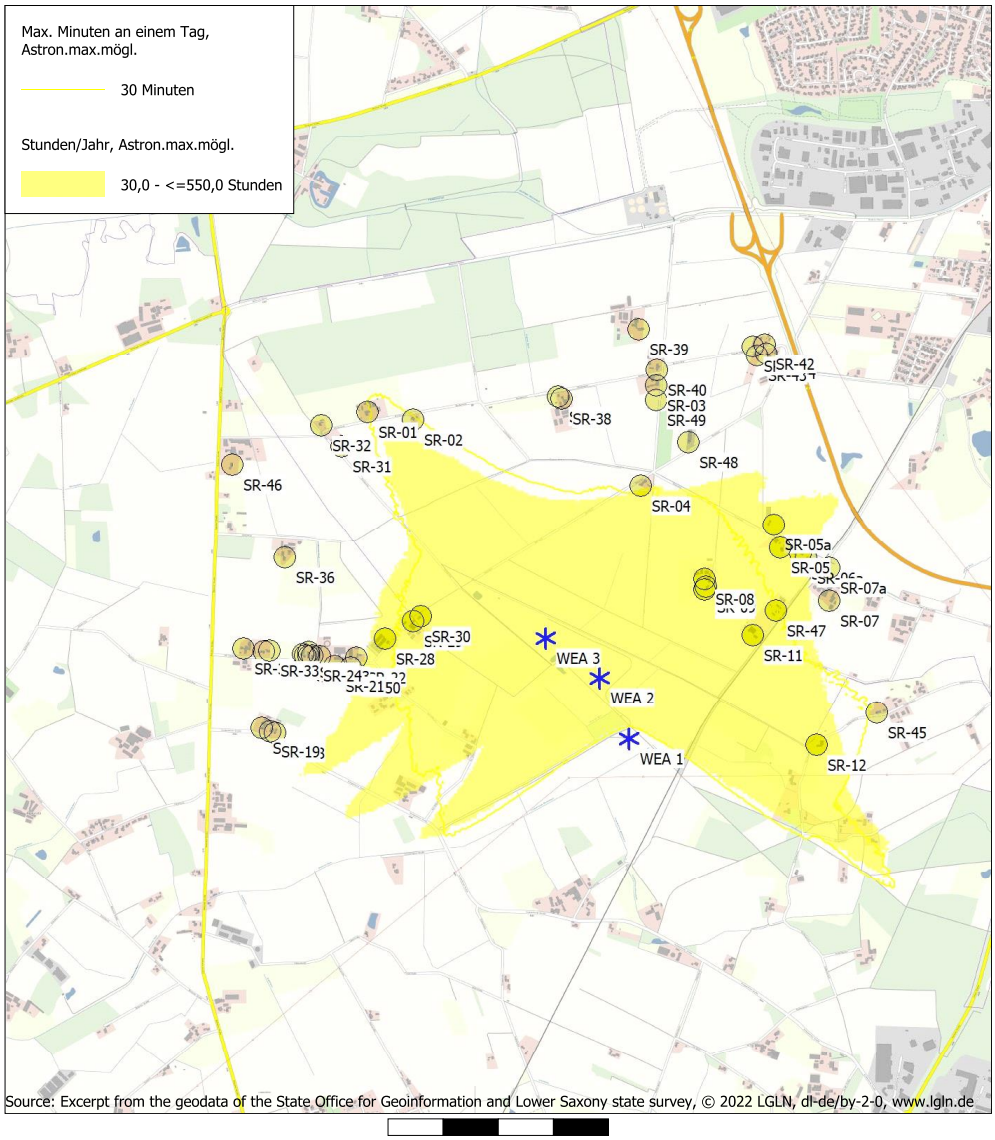
Berechnet:
15.09.2022 08:32/3.5.587

SHADOW - Karte

Berechnung: Schattenwurfzeiten Vorbelastung



0 250 500 750 1000m

Karte: DE Niedersachsen Webatlas , Maßstab 1:25.000, Mitte: UTM (north)-WGS84 Zone: 32 Ost: 448.680 Nord: 5.839.840

Existierende WEA Schattenrezeptor

Höhe der Schattenkarte: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer Mark Nord_EMDGrid_0.wpg (1)

Zeitschritt: 2 Minuten, Schrittweite: 3 Tag(e), Kartenauflösung: 10 m, Sichtbarkeit Auflösung: 5 m, Augenhöhe: 1,5 m

Anlage B3: SHADOW-Hauptergebnis mit Darstellung der Zusatzbelastung, Immissionsorte SR-01 bis SR-50, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
R-2-2021-0491 WP am Standort Vechta

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15.09.2022 08:13/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Zusatzbelastung

Annahmen für Schattenwurfberechnung

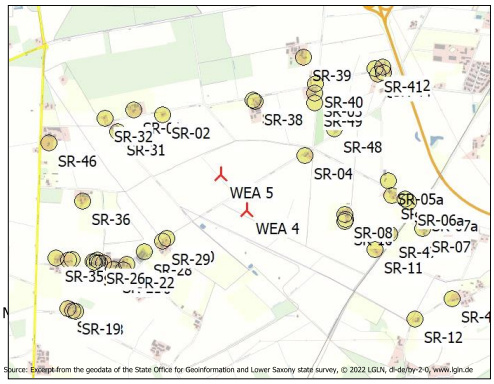
Beschattungsbereich der WEA
Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt
Siehe WEA-Tabelle

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 Sonneneinfallsrichtung
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: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer N
Hindernisse in Berechnung verwendet
Rasterauflösung: 5,0 m

Alle Koordinatenangaben in:
UTM (north)-WGS84 Zone: 32



Maßstab 1:40.000
Neue WEA
Schattenrezeptor

WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ Aktuell	Hersteller	Typ	Nennleistung	Rotordurchmesser	Nabenhöhe	Schattendaten Beschatt.-Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
WEA 4	448.887	5.839.751	28,1	NORDEX N149/5.X 5700 ...	Ja	NORDEX	N149/5.X-5.700	5.700	149,0	125,0	1.808	10,7
WEA 5	448.698	5.840.013	28,9	ENERCON E-147 EP5 E2 ...	Ja	ENERCON	E-147 EP5 E2-5.000	5.000	147,0	126,4	1.968	15,5

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	448.073	5.840.490	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-02	SR-02, Weidenweg 3, 49377 Vechta	448.281	5.840.451	29,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	449.389	5.840.595	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-04	SR-04, Westmark 3a, 49377 Vechta	449.315	5.840.143	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05	SR-05, Kötterweg 2, 49377 Vechta	449.945	5.839.851	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	449.919	5.839.956	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06	SR-06, Kötterweg 1, 49377 Vechta	450.037	5.839.822	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	450.063	5.839.803	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	450.166	5.839.608	33,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	450.166	5.839.759	32,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-08	SR-08, Südmark 3, 49377 Vechta	449.600	5.839.713	31,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-09	SR-09, Südmark 2, 49377 Vechta	449.606	5.839.678	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-10	SR-10, Südmark 2a, 49377 Vechta	449.598	5.839.665	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-11	SR-11, Südmark 1, 49377 Vechta	449.816	5.839.457	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	450.102	5.838.953	37,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	447.635	5.839.033	29,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	447.615	5.839.040	29,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	447.576	5.839.055	28,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	447.910	5.839.335	31,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	448.011	5.839.372	31,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	447.844	5.839.380	32,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	447.810	5.839.384	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	447.794	5.839.382	30,6	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	447.794	5.839.401	30,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	447.777	5.839.386	30,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	447.767	5.839.392	29,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	448.141	5.839.458	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	448.270	5.839.534	29,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-30	SR-30, Westmark 4, 49377 Vechta	448.304	5.839.556	28,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-31	SR-31, Försterweg 1, 49377 Vechta	447.953	5.840.333	30,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-32	SR-32, Försterweg 2, 49377 Vechta	447.861	5.840.432	28,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	447.614	5.839.409	28,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	447.589	5.839.407	29,1	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

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SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Zusatzbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	Ost	Nord	Z [m]	Breite [m]	Höhe [m]	Höhe ü.Gr. [m]	Neigung des Fensters [°]	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr. [m]
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	447.496	5.839.420	30,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	447.691	5.839.830	31,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	448.943	5.840.549	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-38	SR-38, Weidenweg 1, 49377 Vechta	448.956	5.840.541	30,0	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-39	SR-39, Siegeweg 3, 49377 Vechta	449.313	5.840.855	30,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	449.393	5.840.664	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	449.831	5.840.770	31,2	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	449.885	5.840.780	32,5	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	449.850	5.840.729	31,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	449.890	5.840.737	31,4	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	450.376	5.839.096	37,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	447.454	5.840.258	29,8	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	449.923	5.839.566	31,7	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-48	SR-48, Westmark 2a, 49377 Vechta	449.532	5.840.337	31,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	449.388	5.840.527	30,3	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	447.985	5.839.330	30,9	0,1	0,1	2,0	90,0	"Gewächshaus-Modus"	2,1

Berechnungsergebnisse

Schattenrezeptor

Nr.	Name	astron. max. mögl. Beschattungsdauer Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
SR-01	SR-01, Weidenweg 2, 49377 Vechta	53:44	99	0:46
SR-02	SR-02, Weidenweg 3, 49377 Vechta	92:44	133	0:57
SR-03	SR-03, Plaggenweg 2, 49377 Vechta	57:57	115	0:39
SR-04	SR-04, Westmark 3a, 49377 Vechta	118:08	163	0:59
SR-05	SR-05, Kötterweg 2, 49377 Vechta	28:33	76	0:32
SR-05a	SR-05a, Kötterweg 4, 49377 Vechta	29:08	77	0:32
SR-06	SR-06, Kötterweg 1, 49377 Vechta	23:42	70	0:30
SR-06a	SR-06a, Kötterweg 1a, 49377 Vechta	22:47	69	0:29
SR-07	SR-07, Hagen-Ring-Straße 46, 49377 Vechta	19:23	62	0:27
SR-07a	SR-07a, Hagen-Ring-Straße 46A (Neubau), 49377 Vechta	18:37	62	0:27
SR-08	SR-08, Südmark 3, 49377 Vechta	72:00	115	0:56
SR-09	SR-09, Südmark 2, 49377 Vechta	74:17	118	0:59
SR-10	SR-10, Südmark 2a, 49377 Vechta	78:26	123	1:03
SR-11	SR-11, Südmark 1, 49377 Vechta	53:38	109	0:52
SR-12	SR-12, Siebengestirn 16a, 49393 Lohne (Oldenburg)	20:10	61	0:28
SR-18	SR-18, Krimpenforter Straße 22, 49393 Lohne (Oldenburg)	24:44	72	0:26
SR-19	SR-19, Krimpenforter Straße 24, 49393 Lohne (Oldenburg)	24:51	76	0:25
SR-20	SR-20, Krimpenforter Straße 26, 49393 Lohne (Oldenburg)	22:18	81	0:25
SR-21	SR-21, Am Sillbruch 10, 49393 Lohne (Oldenburg)	35:23	88	0:34
SR-22	SR-22, Am Sillbruch 21, 49393 Lohne (Oldenburg)	50:30	99	0:38
SR-23	SR-23, Am Sillbruch 15, 49393 Lohne (Oldenburg)	26:45	79	0:32
SR-24	SR-24, Am Sillbruch 13, 49393 Lohne (Oldenburg)	30:28	91	0:31
SR-25	SR-25, Am Sillbruch 11, 49393 Lohne (Oldenburg)	31:36	93	0:31
SR-26	SR-26, Am Sillbruch 11A, 49393 Lohne (Oldenburg)	35:30	97	0:31
SR-27	SR-27, Am Sillbruch 9, 49393 Lohne (Oldenburg)	33:53	96	0:31
SR-27a	SR-27a, Am Sillbruch 9a, 49393 Lohne (Oldenburg)	36:04	99	0:30
SR-28	SR-28, Am Sillbruch 23, 49393 Lohne (Oldenburg)	66:12	104	0:45
SR-29	SR-29, Am Sillbruch 25, 49393 Lohne (Oldenburg)	87:28	110	0:55
SR-30	SR-30, Westmark 4, 49377 Vechta	95:09	112	0:58
SR-31	SR-31, Försterweg 1, 49377 Vechta	47:21	88	0:48
SR-32	SR-32, Försterweg 2, 49377 Vechta	37:20	77	0:44
SR-33	SR-33, Am Sillbruch 3A, 49393 Lohne (Oldenburg)	44:04	114	0:30
SR-34	SR-34, Am Sillbruch 3, 49393 Lohne (Oldenburg)	43:23	117	0:29
SR-35	SR-35, Am Sillbruch 1, 49393 Lohne (Oldenburg)	33:06	109	0:27
SR-36	SR-36, Köhlerweg 6, 49393 Lohne (Oldenburg)	33:48	85	0:34
SR-37	SR-37, Weidenweg 1A, 49377 Vechta	83:50	94	1:01
SR-38	SR-38, Weidenweg 1, 49377 Vechta	87:55	96	1:10
SR-39	SR-39, Siegeweg 3, 49377 Vechta	33:13	66	0:35
SR-40	SR-40, Plaggenweg 1, 49377 Vechta	49:28	104	0:37
SR-41	SR-41, Bussen Weg 3, 49377 Vechta	36:59	108	0:27
SR-42	SR-42, Bussen Weg 1, 49377 Vechta	33:03	107	0:26
SR-43	SR-43, Bussen Weg 2, 49377 Vechta	35:28	112	0:27

(Fortsetzung nächste Seite)...

Projekt:
R-2-2021-0491 WP am Standort Vechta

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15.09.2022 08:13/3.5.587

SHADOW - Hauptergebnis

Berechnung: Schattenwurfausbreitung Zusatzbelastung

...(Fortsetzung von vorheriger Seite)

Nr.	Name	astron. max. mögl. Beschattungsdauer Stunden/Jahr [h/a]	Schattentage/Jahr [d/a]	Max.Schattendauer/Tag [h/d]
SR-44	SR-44, Bussen Weg 4, 49377 Vechta	31:40	112	0:26
SR-45	SR-45, Siebengestirn 15, 49393 Lohne (Oldenburg)	14:49	57	0:25
SR-46	SR-46, Bakumer Straße 140a, 49393 Lohne (Oldenburg)	18:13	60	0:27
SR-47	SR-47, Krimpenforter Weg 18/20, 49377 Vechta	33:45	78	0:36
SR-48	SR-48, Westmark 2a, 49377 Vechta	64:00	127	0:41
SR-49	SR-49, Plaggenweg 4 (Neubau), 49377 Vechta	69:27	128	0:40
SR-50	SR-50, Am Sillbruch 12 (Neubau), 49393 Lohne (Oldenburg)	47:34	92	0:37

Gesamtdauer Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal [h/a]
WEA 4	NORDEX N149/5.X 5700 149.0 !O! NH: 125,0 m (Ges:199,5 m) (7)	564:39
WEA 5	ENERCON E-147 EP5 E2 5000 147.0 !O! NH: 126,4 m (Ges:199,9 m) (6)	588:18

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.

Anlage B4: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Zusatzbelastung unterteilt in Minuten / Tag und Stunden / Jahr

Projekt:
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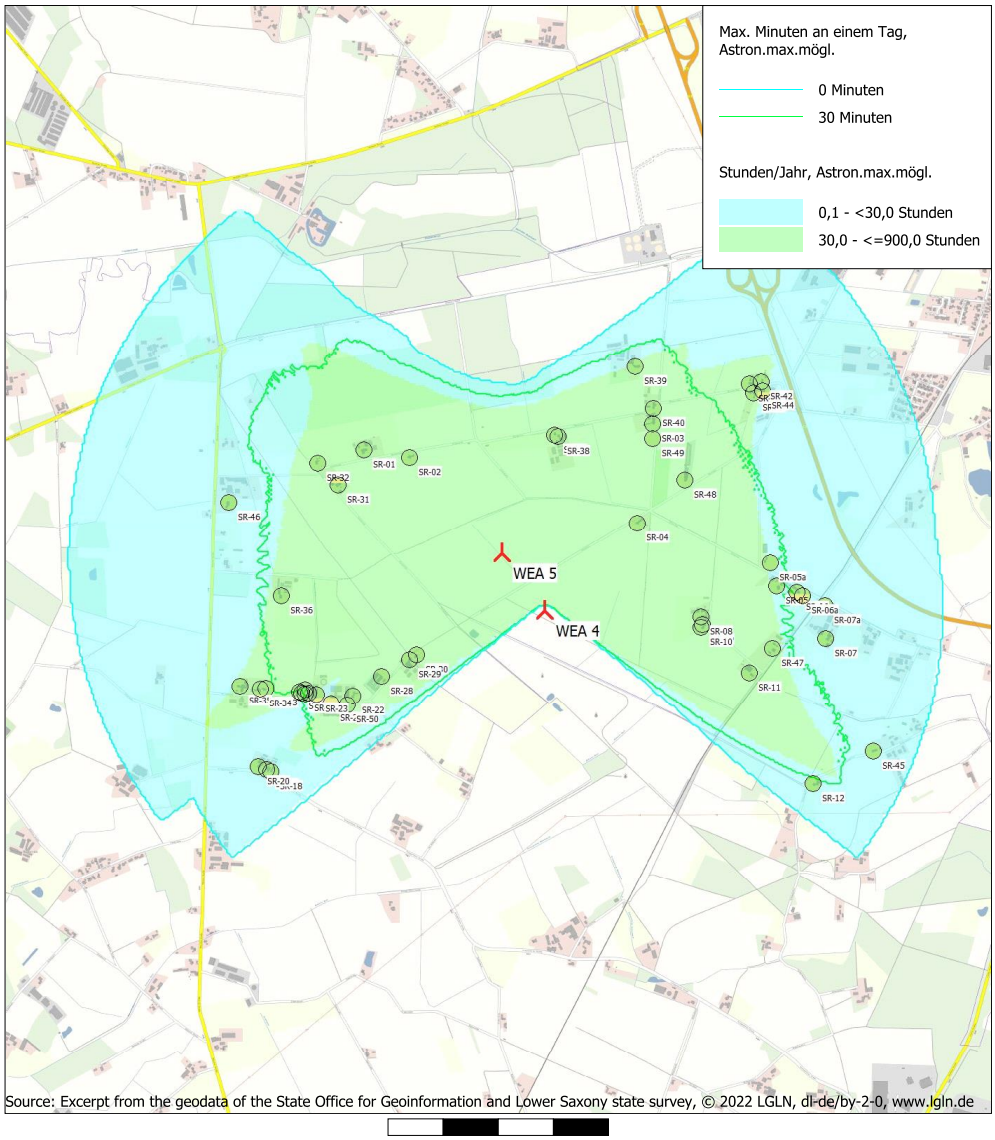
15.09.2022 08:13/3.5.587

SHADOW - Karte

Berechnung: Schattenwurfausbreitung Zusatzbelastung



0 250 500 750 1000m

Karte: DE Niedersachsen Webatlas , Maßstab 1:25.000, Mitte: UTM (north)-WGS84 Zone: 32 Ost: 448.698 Nord: 5.840.013

Neue WEA Schattenrezeptor

Höhe der Schattenkarte: Höhenraster-Objekt: R-2-2020-0451_WP Vechtaer Mark Nord_EMDGrid_0.wpg (1)

Zeitschritt: 2 Minuten, Schrittweite: 3 Tag(e), Kartenauflösung: 10 m, Sichtbarkeit Auflösung: 5 m, Augenhöhe: 1,5 m

Anlage C: Bilder der untersuchten Immissionsorte

Bild 1: Schattenrezeptor SR-01

Bild 2: Schattenrezeptor SR-02

Bild 3: Schattenrezeptor SR-03

Bild 4: Schattenrezeptor SR-04

Bild 5: Schattenrezeptor SR-05

Bild 6: Schattenrezeptor SR-05a

Bild 7: Schattenrezeptor SR-06

Bild 8: Schattenrezeptor SR-06a

Bild 9: Schattenrezeptor SR-07

Bild 10: Schattenrezeptor SR-07a (Neubau), © GoogleEarth 2022

Bild 11: Schattenrezeptor SR-08

Bild 12: Schattenrezeptor SR-09 und SR-10

Bild 13: Schattenrezeptor SR-11

Bild 14: Schattenrezeptor SR-12

Bild 15: Schattenrezeptor SR-18

Bild 16: Schattenrezeptor SR-19

Bild 17: Schattenrezeptor SR-20

Bild 18: Schattenrezeptor SR-21

Bild 19: Schattenrezeptor SR-22

Bild 20: Schattenrezeptor SR-23

Bild 21: Schattenrezeptor SR-24

Bild 22: Schattenrezeptor SR-25 und SR-26

Bild 23: Schattenrezeptor SR-27

Bild 24: Schattenrezeptor SR-27a

Bild 25: Schattenrezeptor SR-28

Bild 26: Schattenrezeptor SR-29 und SR-30, © GoogleEarth 2022

Bild 27: Schattenrezeptor SR-30

Bild 28: Schattenrezeptor SR-31

Bild 29: Schattenrezeptor SR-32

Bild 30: Schattenrezeptor SR-33 und SR-34

Bild 31: Schattenrezeptor SR-35

Bild 32: Schattenrezeptor SR-36

Bild 33: Schattenrezeptor SR-37 und SR-38

Bild 34: Schattenrezeptor SR-39

Bild 35: Schattenrezeptor SR-40

Bild 36: Schattenrezeptor SR-41

Bild 37: Schattenrezeptor SR-42

Bild 38: Schattenrezeptor SR-43

Bild 39: Schattenrezeptor SR-44

Bild 40: Schattenrezeptor SR-45

Bild 41: Schattenrezeptor SR-46

Bild 42: Schattenrezeptor SR-47, © GoogleEarth 2022

Bild 43: Schattenrezeptor SR-48

Bild 44: Schattenrezeptor SR-49

Bild 45: Schattenrezeptor SR-50